NATIONAL TRANSPORTATION SAFETY BOARD | 2024

SAFER SEAS Digest

Lessons Learned from Marine Investigations

NTSB

SPC-25-01

WHO WE ARE AND WHAT WE DO

The National Transportation Safety Board is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in the other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate and issue safety recommendations aimed at preventing future occurrences.

In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate.

We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

OUR MISSION

Making transportation safer. We carry out our mission by—

- Maintaining our congressionally mandated independence.
- Conducting objective, thorough investigations and safety studies.
- Deciding, fairly and objectively, appeals of enforcement actions by the FAA and US Coast Guard and certificate denials by the FAA.
- Advocating implementation of safety recommendations.
- Assisting victims and survivors of transportation disasters and their families.

A Message from the NTSB Chairman

I am proud to present the *Safer Seas Digest* on behalf of the NTSB. This publication encapsulates lessons learned from the 34 investigations completed by the NTSB Office of Marine Safety in 2024. It is our sincere hope that others will apply the knowledge uncovered by our world-renowned investigators to prevent future marine casualties and save lives.

Our work over the past year shows that seemingly small actions can have enormous safety impacts. The 2022 engine room fire aboard the passenger ferry ***Sandy Ground*** near Staten Island, New York, is a prime example. We determined that closed isolation valves in the fuel oil system's return lines caused the system to overpressurize, leading to the fire. Thankfully, all 884 persons aboard were safely evacuated.

As a result of our investigation into the ***Sandy Ground*** fire, we recommended the US Coast Guard and American Bureau of Shipping strengthen current regulations and rules, respectively, around the design of fuel oil return systems to prevent similar overpressurization events. We also issued a related safety alert to industry.

Other investigations, such as the 2023 fire aboard the dinner cruise vessel ***Spirit of Boston***, further demonstrate that no action is too small to affect safety. In this case, the fire was caused by a chafing fuel heating canister that had been improperly extinguished. The canister ignited a plastic glassware rolling cart after it was unintentionally dropped by a hospitality staff member as they attempted to throw it away. Again, we are thankful that all 16 persons aboard the vessel safely evacuated.

The ***Spirit of Boston*** investigation made clear that a safety management system (SMS) would have allowed the operator to identify fire risks and take corrective action *before* the fire occurred. An SMS, for example, would have ensured the operator had documented procedures on the proper handling of open-flame devices, which we found it lacked. As a result, the NTSB recommended the operating company implement an SMS. We also reiterated our longstanding safety recommendation to the Coast Guard to require SMS for *all* US-flagged passenger vessels, which demonstrates how much we believe in the lifesaving potential of SMS.

Those are just two examples of the investigations contained in the pages that follow. While each marine casualty is unique, our investigators uncovered some notable commonalities that all mariners should consider. These include the following:

- Providing adequate procedures and training
- Determining adequate staffing
- Maintaining alertness and vigilance
- Maintaining unimpeded return flow in diesel engine fuel oil return systems
- Mitigating fire risks
- Ensuring watertight integrity
- Installing and testing bilge alarms
- Preventing hull corrosion
- Accounting for hydrodynamic forces
- Planning for current

The US Coast Guard is an integral partner to all NTSB marine investigations. Our relationship with them is a shining example of government collaboration focused on saving lives and improving safety. My sincerest thanks go out to every member of the Coast Guard who assisted us this year. The Coast Guard units that worked with the NTSB in 2024 are listed on page 86.

For every investigation we lead, our mission is to determine what happened and issue evidence-based recommendations to prevent similar events from occurring in the future. It is in pursuit of this mission that the NTSB issued safety recommendations to all parts of the marine industry in 2024. However, stakeholders at all levels can voluntarily implement the lessons learned from our investigations to ensure safety. I hope the pages that follow inspire you to do just that.

Sincerely,

Jennifer L. Homendy
NTSB Chairman

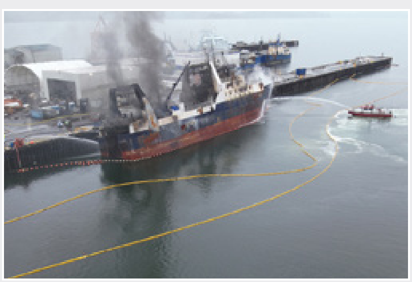
About *Safer Seas Digest*

The *Safer Seas Digest*, issued annually by the NTSB Office of Marine Safety (OMS), summarizes by casualty type the investigations completed in the previous year. Developed specifically for the marine community, the digest shares the circumstances of the casualties and lessons learned discovered during our investigations. Past lessons learned have discussed issues such as vessel stability, engine room fire containment, risk management, and crew communication—to name a few. The OMS casualty types involved in this year's *Safer Seas Digest* include:

- Capsizing/Listing
- Collision
- Contact
- Fire/Explosion
- Flooding/Hull Failure
- Grounding/Stranding
- Machinery Damage

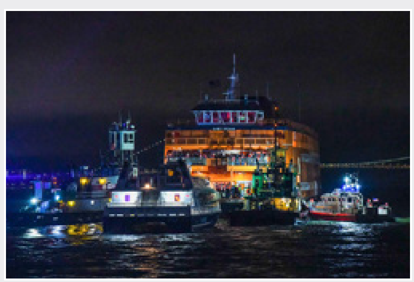
Past issues of the *Safer Seas Digest*, as well as the full investigation reports and docket, can be found on our website at **ntsb.gov**. Use either the investigation's report number or the accident ID to search our investigation pages.

Note: The table at the front of each casualty summary references "estimated damages." Estimated damages typically include vessel and other property damage repair and loss costs. Estimated damages were correct as of the date that the investigation report was issued or adopted.



On the cover: Commercial fishing vessel *Kodiak Enterprise* during firefighting efforts in Tacoma, Washington (*see page 40*).

SOURCE: COAST GUARD



Back cover: Evacuation of passenger ferry *Sandy Ground* near Staten Island, New York (*see page 46*).

SOURCE: NYDOT STATEN ISLAND FERRY

Abbreviations

Abbreviation	Definition
ABS	American Bureau of Shipping
AIS	automatic identification system
ATB	articulated tug and barge
ATF	Bureau of Alcohol, Tobacco, Firearms and Explosives
CCTV	closed-circuit television
CPP	controllable pitch propeller
ECDIS	electronic chart display and information system
ECS	electronic charting system
ENC	electronic navigation chart
EOS	engine operating station
EPIRB	emergency position indicating radio beacon
MCS	machinery control station
mi	miles

Abbreviation	Definition
nm	nautical miles
NOAA	National Oceanic and Atmospheric Administration
NTSB	National Transportation Safety Board
NYCDOT	New York City Department of Transportation
PLB	personal locator beacon
rpm	revolutions per minute
SMS	safety management system
TSMS	towing safety management system
VDR	voyage data recorder
VHF	very high frequency
VTS	vessel traffic service
WAP	Waterways Action Plan
VLCC	very large crude carrier

Vessel Group Key

- Cargo, Dry Bulk
- Cargo, General
- Cargo, Liquid Bulk
- Fishing
- Passenger
- Towing/Barge
- Yacht/Boat
- Other

Contents

CAPSIZING/LISTING

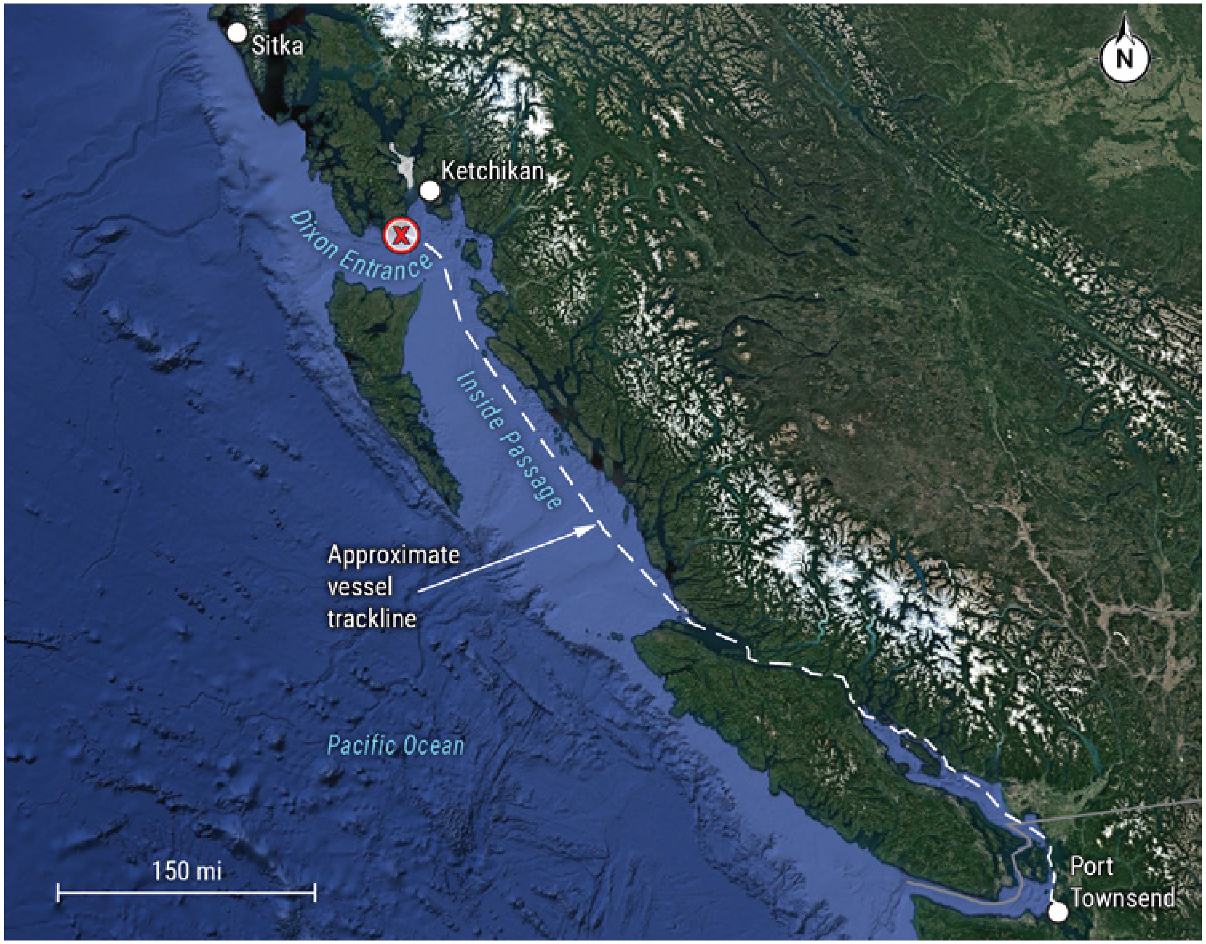
Capsizing and Sinking of Fishing Vessel ***Hotspur***

VESSEL GROUP
Fishing

LOCATION
Dixon Entrance, near Nunez Rocks, 43 mi south-southwest of Ketchikan, Alaska

CASUALTY DATE	ACCIDENT ID
August 2, 2022	DCA22FM033
INJURIES	**ESTIMATED DAMAGES**
None	$1.2 million
REPORT NUMBER	**ISSUED**
MIR-24-03	February 6, 2024

***Hotspur* pierside in Ketchikan, Alaska, before the casualty.** SOURCE: COAST GUARD.



Approximate trackline of the *Hotspur*'s casualty voyage from Port Townsend toward Ketchikan, with the location where the sinking occurred, as indicated by a red *X*. BACKGROUND SOURCE: GOOGLE EARTH.

On August 2, 2022, about 1955 local time, the fishing vessel *Hotspur* developed a list, capsized, and sank while transiting west through Dixon Entrance near Nunez Rocks, off the southern tip of Prince of Wales Island, Alaska. The captain and four crewmembers abandoned the vessel to a liferaft and were rescued by two Good Samaritan vessels. There were no injuries. Multiple sheens were reported. The *Hotspur*, which was declared a total loss, had an estimated value of $1.2 million.

On the afternoon of July 29, 2022, the 53-foot-long *Hotspur* departed Port Townsend, Washington, with a captain and four deckhands aboard. The vessel was loaded with purse seiner netting and tackle along with its 16-foot-long skiff on the stern; the main fish hold was completely filled with water.

Four days later, on August 2, about 1935, the vessel was crossing the Clarence Strait when the captain and senior deckhand, both of whom were at the helm, noticed the vessel listing slightly to port. The captain checked the engine room and did not see any flooding. The fish hold was full of water at departure, and the captain had checked the fuel tank levels and found nothing abnormal, leaving the source of any potential water ingress limited to the port and starboard void spaces or the lazarette. Because the senior deckhand did not see any engine room flooding or experience a loss of steering or unintended reduction in speed, investigators ruled out a failure or issue with the vessel's rudder stock or propeller and shafting (which would have allowed water to enter the shaft alley and then the engine room). Therefore, the list was likely a result of flooding into the lazarette (which would have allowed flood water to shift to the port side) or into the port void space.

About 3 weeks before the casualty voyage, a hole in the hull had been repaired. There was no evidence that the vessel was damaged or that flooding originated from another source; it is possible that the flooding was caused by deterioration of the hull plating in another area, which went undetected.

The captain tried to correct the port list by draining (gravity transfer) some diesel fuel oil out of a portside tank to a starboard-side tank. About 5 minutes into the fuel transfer, the senior deckhand noticed increased rolling to port and saw the seas entering the main aft deck via the freeing ports, submerging the vessel's port quarter.

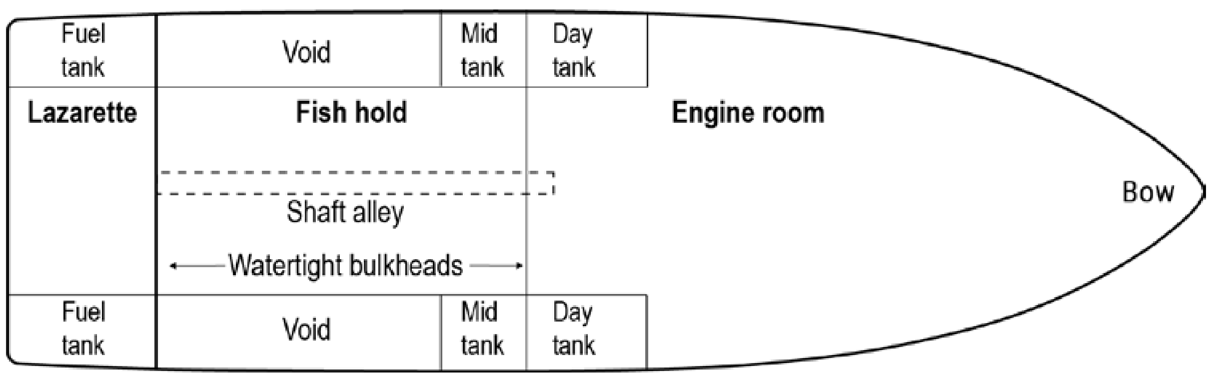
Although the void spaces, lazarette, and engine room had bilge alarms, the captain and senior deckhand did not hear bilge alarms in the wheelhouse before the vessel list became severe—meaning the bilge high-level alarms in the port void space or the lazarette (the most likely areas of flooding) were most likely inoperative. Had the bilge alarm systems in these spaces been operable, the crew would have been alerted and could have taken earlier action.

The captain and crew abandoned ship to the vessel's liferaft and, within minutes, the *Hotspur* turned completely upside down. The vessel sank about 1955. The short time between the captain first noticing a list and the vessel capsizing indicates that the vessel had limited stability—the tendency of a vessel to return to its original upright position when a disturbing force (e.g., wind or wave) is removed—while underway.

Because the *Hotspur* was less than 79 feet, it was not subject to Coast Guard commercial fishing vessel stability requirements, including having stability instructions on board. In this case, without stability instructions providing the crew guidance on loading, the loads carried on board the *Hotspur*—skiff, netting, fuel oil, water, and lube oil—were accepted as satisfactory based solely on the captain's assessment and his hands-on experience regarding how he previously loaded the vessel. Therefore, although the vessel was functionally stable, the casualty loading may not have provided an adequate margin of stability.

At the time of the capsizing, most of the *Hotspur*'s fuel tanks were slack (only partially filled). With slack fuel tanks, a heeling moment from wind, waves, or turning would have likely induced a sustained list as the fuel in the tanks would have flowed to the low (port) side of the vessel. The combination of the weight of floodwater increasing the vessel's draft, the free surface effect from the slack tanks, and the free surface created by flooding of the port void or lazarette decreased the vessel's remaining stability, resulting in capsizing.

THE PROBABLE CAUSE of the capsizing and sinking of fishing vessel *Hotspur* was flooding from an unknown source into the lazarette or the port void space, causing the vessel to lose stability, capsize, and sink.



Layout of *Hotspur* lower level, based on owner's drawing (not to scale).

LESSONS LEARNED:
TESTING OF HIGH-LEVEL ALARMS AND SENSORS

Automatic high-water bilge alarms are intended to provide crews with an early warning of vessel flooding. Manual detection (e.g., visually) often occurs only after flooding is underway and the crew has detected excessive rolling or listing, leaving little time for mitigating action. In inaccessible spaces, or small spaces with limited ability to inspect underway (such as a fishing vessel's smaller compartments, voids, or lazarette), bilge-level-monitoring alarms are often the sole means to alert operators of flooding. Operators should periodically test bilge high-water alarms and follow best marine practices and manufacturer recommendations for inspection and maintenance.

CAPSIZING/LISTING

Capsizing of Dredging Vessel ***WB Wood***

VESSEL GROUP
Specialty/Other

LOCATION
Lower Mississippi River, mile 85, near Meraux, Louisiana

CASUALTY DATE	ACCIDENT ID
January 16, 2023	DCA23FM014
INJURIES	**ESTIMATED DAMAGES**
None	$1.5 million
REPORT NUMBER	**ISSUED**
MIR-24-08	April 15, 2024

Dredging vessel *WB Wood* engaged in dredging operations (with its spuds up) before the casualty.
SOURCE: WOOD RESOURCES.

The overturned hull of the *WB Wood* with its pontoons downside up, the morning after the capsizing.
BACKGROUND SOURCE: COAST GUARD.

On January 16, 2023, about 0050 local time, the dredging vessel *WB Wood* capsized near mile 85 on the Lower Mississippi River about 10 miles east-southeast of New Orleans, Louisiana. The sole crewmember was rescued by a Good Samaritan towing vessel; there were no injuries. An estimated 5,500 gallons of oil were released from the sunken vessel. The *WB Wood* was salvaged but the vessel, valued at $1.5 million, was declared a total loss.

The day before, the *WB Wood* was anchored near mile 85, about 500 feet from the right descending bank. The dredge had been in that location for 9 days, pumping sand from the riverbed to a pit on the right descending bank, with its spuds in the up position. During dredging operations, the crew consisted of a leverman and a deckhand. The day crew worked from 0400 to 1600, and the night leverman and night deckhand worked from 1600 to 0400.

About 2250, the night leverman noticed the dredge was listing abnormally to starboard. Within minutes, he discovered the starboard-side storage space was full of water, and he rigged a portable pump to begin dewatering the space. Although the vessel had just a foot of freeboard aft, both the day and night levermen believed it was unlikely that water ingress from passing vessel wakes, river current, or drift in the river caused the flooding.

For the next 2 hours, two portable pumps could not keep up with the rate of flooding, and the starboard list and stern trim continued to increase. About 0042 on January 16, the *WB Wood* capsized. The night leverman, who was on board at the time, was able to jump into the river as the vessel rolled over and was rescued by a Good Samaritan vessel.

Two days earlier, on January 14, the day leverman had discovered about 2 inches of water in the starboard storage space for which he was unable to identify the source. Although this water was indicative of some source of water ingress in the space, the crew did not regularly check hull spaces and voids while the dredge was operating. The night leverman had completed the company's daily inspection checklist on the evening before the vessel sank, but the checklist did not include checks of any hull tanks, compartments, or hatches for leaks or watertight integrity. Therefore, on the night of the casualty, the crew did not know if any hull compartment had leaks or water in them.

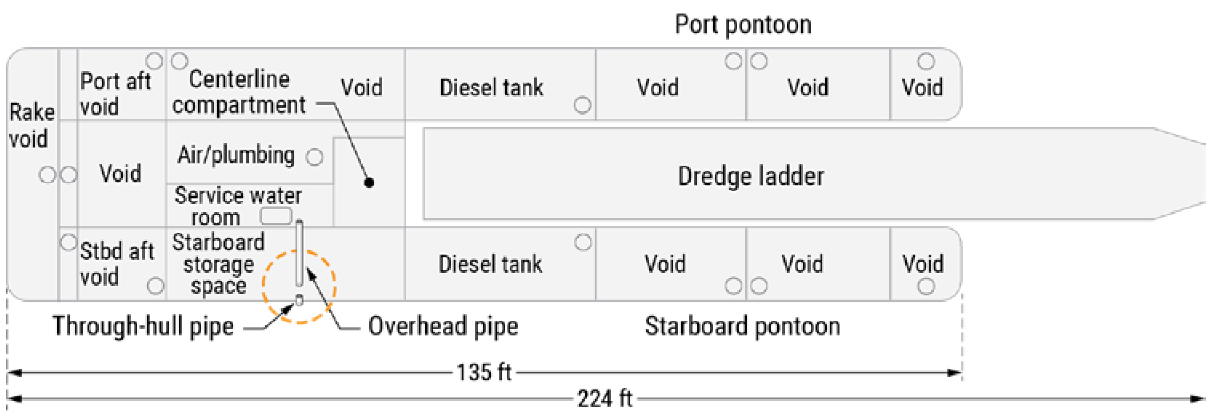
Postrecovery, a 2-inch through-hull pipe into the starboard storage space was found to be open, as its overboard check valve was missing and likely had been since before the casualty. The center of the through-hull pipe was about 5 inches above the dredge's normal waterline, so waves, a list to starboard, and/or an increase in stern trim could have submerged the opening, allowing water to enter the storage space. Thus, it is likely that the initial starboard list was caused by flooding through the unsecurable through-hull pipe.

The starboard storage space showing the overhead pipe and the 2-inch through-hull pipe. Inset: The end of the overhead pipe and the unsecured through-hull pipe. Source: Coast Guard.

About 8 months before the casualty, three aft compartments of the *WB Wood* had flooded (including the starboard storage space). The vessel supervisor believed that the gaskets for the aft port hatches had been compromised during a recent dry dock period. The portside hatch gaskets were subsequently replaced, but the starboard side hatch gaskets were not—thus their condition was unknown. During the capsize, as the quantity of water increased in the storage space, the list to starboard would have increased and the aft freeboard would also have decreased, putting the aft main deck hatches under water, thereby allowing for water across the aft deck to work its way through any compromised gaskets on the aft starboard side and flood into the spaces below.

Investigators found wastage holes along the bottom 10 inches of the transverse forward bulkhead of the starboard aft void. If the adjacent starboard storage space flooded first, the water level in the starboard aft void would eventually increase from communication with the storage space. Additionally, investigators found that the 2-inch through-hull pipe with the missing valve ran transversely along the overhead from the storage space and through the bulkhead into the service water room—where it was uncapped. Therefore, once the storage space filled with water, it would have begun flooding the service water room. The only space fitted with a bilge alarm was the service water room, but the alarm did not activate until just before the dredge rolled over, indicating the room was not the initial compartment to flood. Therefore, progressive flooding through compromised watertight bulkheads occurred, which, combined with the initial flooding, resulted in the capsizing.

THE PROBABLE CAUSE of the capsizing of the dredging vessel *WB Wood* was a lack of company requirements for crew to regularly check compartments below deck, which resulted in undetected flooding from a through-hull pipe that was missing its overboard check valve and subsequent progressive flooding from compromised watertight bulkheads.



Approximate plan view of the *WB Wood*'s hull below the main deck (not to scale). Hatches on the main deck are depicted as circles.

LESSONS LEARNED:
CONDUCTING ROUTINE CHECKS OF VOIDS AND HULL SPACES

Vessel crews should regularly check tanks and voids that are adjacent to the vessel's hull to identify hull integrity issues (such as potential corrosion and steel wastage, and watertight integrity deficiencies) that can lead to flooding. The presence of water can indicate an issue with watertight integrity or wastage and should be addressed. Vessel operators should ensure crews have procedures for anticipating, preventing, and addressing the potential for water ingress and flooding, including establishing scheduled checks. Bilge alarms set to detect water at a low level in voids and other spaces are another means to ensure early detection.

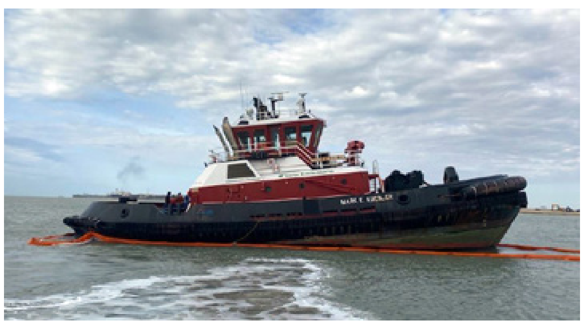
COLLISION

Collision between Tugboat ***Mark E Kuebler*** and Tanker ***Nisalah***

VESSEL GROUPS
Towing/Barge + Cargo, Liquid Bulk

LOCATION
Corpus Christi Ship Channel between Port Aransas and Ingleside, Texas

CASUALTY DATE	ACCIDENT ID
January 22, 2023	DCA23FM016
INJURIES	**ESTIMATED DAMAGES**
None	$6.9 million
REPORT NUMBER	**ISSUED**
MIR-24-04	February 21, 2024



Mark E Kuebler **aground following the collision.** Source: G&H Towing.

Tanker *Nisalah* in 2018. Source: Coast Guard.

On January 22, 2023, about 1530 local time, the tugboat *Mark E Kuebler* and the tanker *Nisalah* collided while the tanker was transiting inbound in the Corpus Christi Ship Channel near Ingleside, Texas. The tugboat's hull was breached and the tanker's propeller was damaged in the collision. The captain of the *Mark E Kuebler* grounded the tugboat to prevent it from sinking, and, while aground, a small sheen of hydraulic oil was observed near the tugboat. The oil was recovered with absorbent pads. No injuries were reported. Damage to the *Mark E Kuebler* was estimated at $3 million; damage to the *Nisalah* was estimated at $3.9 million.

Earlier that day, about 1430, three Aransas-Corpus Christi pilots boarded the VLCC *Nisalah* in the approach to the Aransas Pass, the entrance to Corpus Christi Bay. The pilots were aboard to conn the vessel on its inbound transit through the Aransas Pass and Corpus Christi Ship Channel to the South Texas Gateway Terminal in Ingleside, Texas, where the ship was scheduled to load a cargo of crude oil. The *Nisalah*'s cargo tanks were empty, and the vessel was in ballast condition, with forward and aft drafts of 33.8 and 35.4 feet, respectively.

Five tugboats had been dispatched to provide harbor-assist operations for the *Nisalah*'s arrival, and the pilots assigned the *Mark E Kuebler* to the starboard quarter position when it met the *Nisalah*. The mate was operating the tugboat, and the captain was in his stateroom.

The *Mark E Kuebler*'s hawser and winch were located on the bow of the tugboat. The chock on the *Nisalah*—that the tugboat's hawser would be made up through—was located where the tanker's hull curved inward toward the stern and flared outward from the waterline to the deck edge. Consequently, the mate decided that he would turn the tugboat around and transit in the astern direction so that, when made up, the hawser would tend forward from the tanker and the tugboat could lie alongside the tanker where the side of the ship's hull was vertical.

To prepare to move into position, the *Mark E Kuebler* mate used the tugboat's Z-drives (azimuthing stern drives able to rotate 360° via integral hydraulic motors) to spin the tugboat clockwise 180°. While completing the maneuver, the *Mark E Kuebler* fell back near the stern of the *Nisalah*, so the mate increased power on the tugboat's engines to regain position on the tanker's starboard quarter.

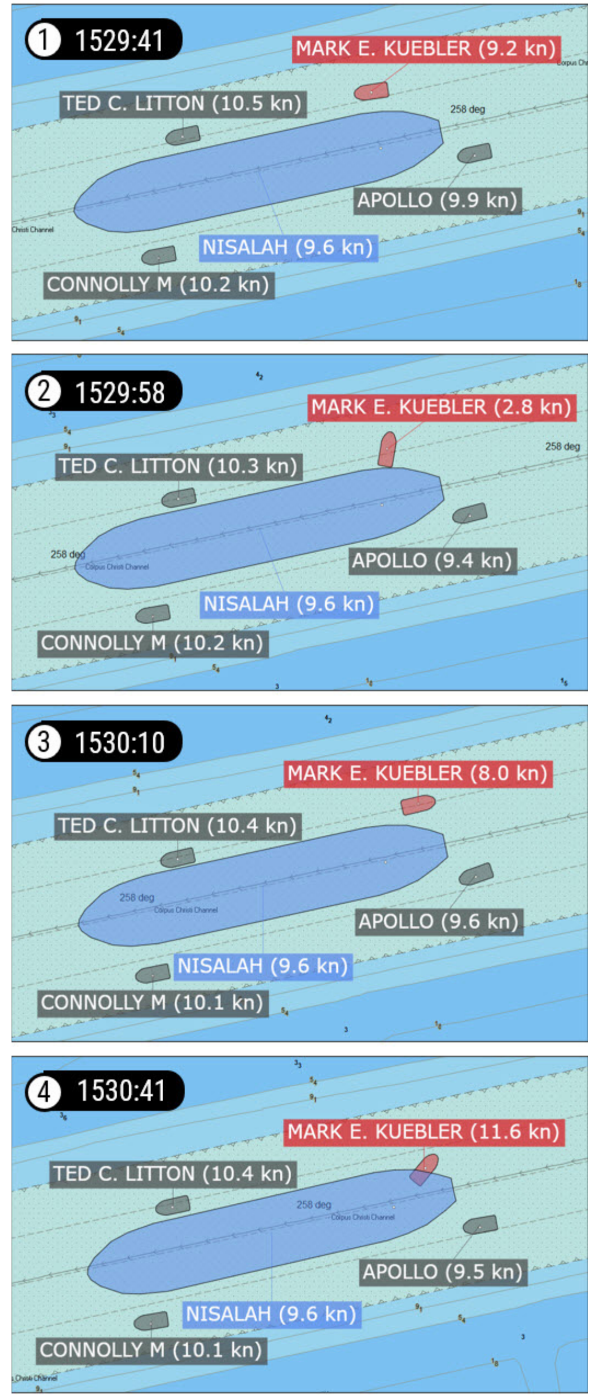
The movement of the *Nisalah* through the water created an area of low pressure near its starboard quarter. Because the *Nisalah* was in ballast, the inward curve of the ship's hull toward the stern at the waterline was more pronounced than it would have been if the ship were loaded. Thus, the pressure near the VLCC's starboard quarter was further reduced as compared to the vessel at its loaded draft. This drop in pressure was further accentuated near the intake side of the *Nisalah*'s propeller. The hydrodynamic suction produced by the low pressure caused the *Mark E Kuebler*'s stern to be drawn into the tanker.

The mate attempted to counteract this motion by increasing engine power and turning the Z-drives to steer the tugboat's stern away from the tanker. As the *Mark E Kuebler* closed on the *Nisalah*, the tanker's speed was 9.6 knots and the tugboat's speed was 11.6 knots (just 1.4 knots less than its maximum-rated ahead speed). Because most of the tugboat engines' power was being used to regain position on the *Nisalah*, the *Mark E Kuebler* had insufficient power to counteract the hydrodynamic forces created by the tanker. Consequently, the *Mark E Kuebler* collided with the *Nisalah*.

In the collision, the *Nisalah*'s propeller struck the *Mark E Kuebler*, resulting in multiple gashes in the *Mark E Kuebler*'s hull at the stern, along with hull warping and damage to the vessel's fendering system. The tugboat's aft peak tank and Z-drive machinery room were breached, flooding both spaces to the waterline and inundating equipment. All four blades on the *Nisalah*'s propeller sustained damage when it struck the *Mark E Kuebler*'s hull.

After the collision, the tugboat's operating company instituted a policy limiting stern-first landings of tugboats on assisted vessels to speeds of 7 knots or less.

THE PROBABLE CAUSE of the collision between the tugboat *Mark E Kuebler* and the tanker *Nisalah* was the mate maneuvering the tugboat near the starboard quarter of the tanker, which resulted in the tugboat being drawn in toward the tanker by hydrodynamic forces that the tugboat had insufficient reserve power to counteract due to the transit speed of the vessels.



***Right*: *Mark E Kuebler/Nisalah* collision sequence from AIS data. 1) *Mark E Kuebler* paces *Nisalah*. 2) Tugboat conducts 180° spin maneuver. 3) *Mark E Kuebler* begins to regain position, transiting in astern direction. 4) Tugboat is pulled in toward tanker, and vessels collide.**

Background source: NOAA ENC US5CRPCF as viewed on Made Smart AIS.

LESSONS LEARNED:

HYDRODYNAMIC FORCES BETWEEN VESSELS IN A CHANNEL

As a large ship moves through a channel, a low-pressure suction is particularly strong on the vessel's quarters near the inlet side of the propeller, and hydrodynamic forces increase exponentially with the vessel's speed. Therefore, a small vessel operating near a larger vessel must maintain a safe operating distance or have sufficient reserve power to counteract the hydrodynamic forces to avoid being pulled into the other vessel and risking collision. If a small vessel must operate near a larger vessel—such as a tugboat conducting harbor-assist operations—the operator of the smaller vessel should be aware of the hazards caused by hydrodynamic forces and, if necessary, maintain a safe distance until the larger vessel slows and the hydrodynamic forces are reduced.

SPEED DURING HARBOR-ASSIST MANEUVERS

Owners and operators of Z-drive tugboats that perform harbor-assist operations should set speed limits for advanced maneuvers such as stern-first approaches. These limits may vary for different classes of tugboats based on design. Tugboat operators should communicate these limits to ship masters or pilots in command of the vessels that they are assisting before engaging in these maneuvers.

COLLISION

Breakaway of Bulk Carrier *Sirocco* and Subsequent Collision with Moored Barge

The forward mooring arrangement of the *Sirocco* at the Convent Marine Terminal dock at 1227 on March 26, 2023. Source: Oldendorff port captain.

VESSEL GROUPS
Cargo, Dry Bulk + Towing/Barge

LOCATION
Lower Mississippi River, mile 160.4, Convent, Louisiana

CASUALTY DATE	ACCIDENT ID
March 27, 2023	DCA23FM024
INJURIES	**ESTIMATED DAMAGES**
None	$5 million
REPORT NUMBER	**ISSUED**
MIR-24-25	August 29, 2024

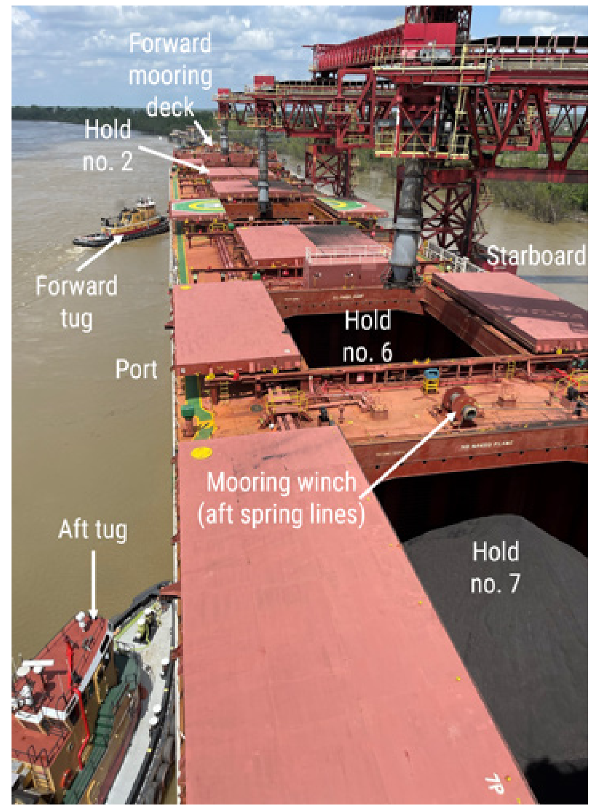
***Sirocco* at anchor after the collision, on March 28, 2023.**

On March 27, 2023, about 0208, the bulk carrier *Sirocco* broke free from its moorings at the Convent Marine Terminal, located at mile 160.9 on the Lower Mississippi River in Convent, Louisiana, drifted downriver, and at 0249 collided with a barge moored at the Mosaic Uncle Sam dock at mile 160.4. There were no injuries, and no pollution was reported. The *Sirocco*, the barge, and the Mosaic Uncle Sam dock sustained damage totaling about $5 million.

On March 14, the river gage at Carrollton exceeded 12 feet, prompting the terminal's high-water loading plan to be activated. The plan required vessels with capacities between 60,001 and 100,000 deadweight tons (like the *Sirocco*) to have one hold-in tug, with an additional tug required when a vessel's mid draft reached 35 feet.

The *Sirocco* moored starboard side to the terminal north dock at 0100 on March 26. The master ordered 16 lines to secure the *Sirocco*; under normal conditions, they would have used 12 lines. Two hold-in tugs were positioned on the port side.

About 0300, cargo loading operations began. Watchstanders checked the lines and heaved in slack as the ship's draft increased due to cargo loading. When the Carrollton gage dropped below 12 feet, the terminal's high-water loading plan was no longer in effect, and therefore the terminal did not require hold-in tugs. The two tugs holding the *Sirocco* were released.



The two tugs on the *Sirocco*'s port side on March 26 at 1314. Background source: Oldendorff port captain.

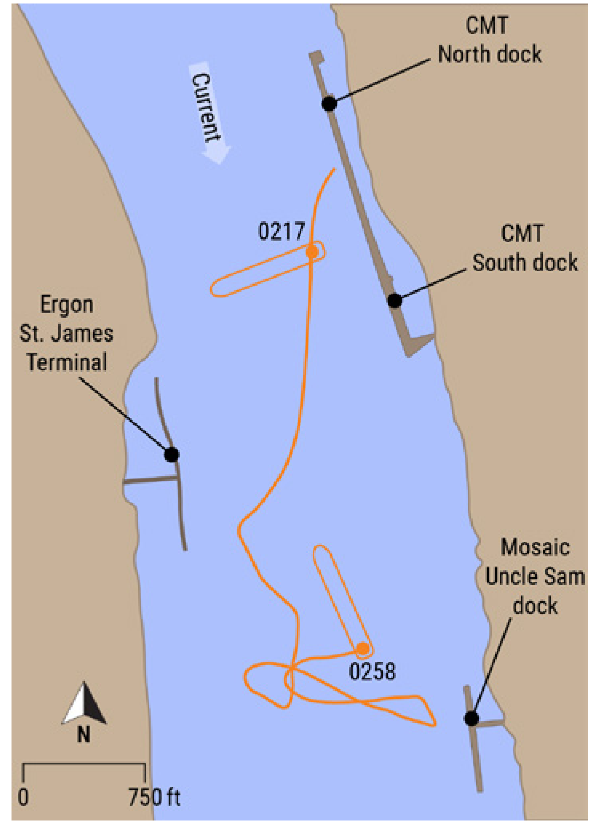
For about 11 hours after the hold-in tugs were released, the crew loaded cargo without incident, and the crewmembers kept the vessel in place at the dock by continuously heaving on the lines to keep them tight. However, the addition of cargo had increased the vessel's draft by 17.6 feet forward and 18 feet aft by the time loading began in the final hold (no. 2, forward) at 0050 on March 27.

As cargo was loaded in the no. 2 hold and the vessel's draft increased, the bow moved lower relative to the dock. Any slack in the mooring lines would have allowed the bow, which was pointed upriver and exposed to the current, to come off the dock. Crewmembers were tending lines but also had other duties while on watch. When the crew attempted to heave the bow back to the dock, they could not, because the mooring winches could not overcome the increased tension.

At 0208, the *Sirocco*'s bow began to move farther to port, away from the dock, with its stern remaining alongside, and greater tension was placed on the stern lines. At the forward mooring deck, the second officer observed smoke and sparks coming from the winches. A postcasualty examination of the winch brake liners on the *Sirocco*'s bow found that they exhibited extreme heat and friction, indicating that the tension on the forward mooring lines exceeded the forward mooring winches' brake-rendering load (capacity). Because the winches' brake-rendering load was exceeded, about 0213, one line parted, and, as the stern started to move away from the dock, the remaining lines began to pay out, causing the vessel to break away from the dock.

As the vessel drifted downriver, the master ordered both anchors—which were hanging out of the pockets—let go at 0213. However, the starboard anchor was not let go until 0220, 7 minutes after the order, because it was unsafe to access the bow while the lines were paying out. The starboard anchor was let out to 1 shot (90 feet) on deck. However, at least 110 feet of anchor chain would have been needed for the anchor to touch the bottom. The port anchor was not let go until about 12 minutes after the ship broke away from the dock. The port anchor chain was let out and held at 5 shots (450 feet) on deck under heavy tension, which (along with two assist tugs) helped slow, but did not stop, the downriver drift of the *Sirocco*. The *Sirocco*'s starboard quarter struck the port side of the barge *MEM 5087*, which was moored at the Mosaic Uncle Sam dock. Had the starboard anchor been let out to an effective length for the depth of the water, both anchors may have held the *Sirocco* in the river, preventing the collision.

THE PROBABLE CAUSE of the breakaway of the bulk carrier *Sirocco* from the Convent Marine Terminal dock and the subsequent collision with moored barge *MEM 5087* was the bow coming off the dock during cargo loading in the forward holds, exposing more of the vessel's underwater hull to the strong river current, resulting in the brake-holding capacities of the ship's mooring winches being exceeded and the lines paying out until the vessel broke free from the dock.



The *Sirocco*'s track after breaking away from the Convent Marine Terminal north dock.
DATA SOURCE: *SIROCCO* ECDIS.

The damaged barge *MEM 5087*.
SOURCE: CAMPANA MARINE SERVICE.

LESSONS LEARNED:

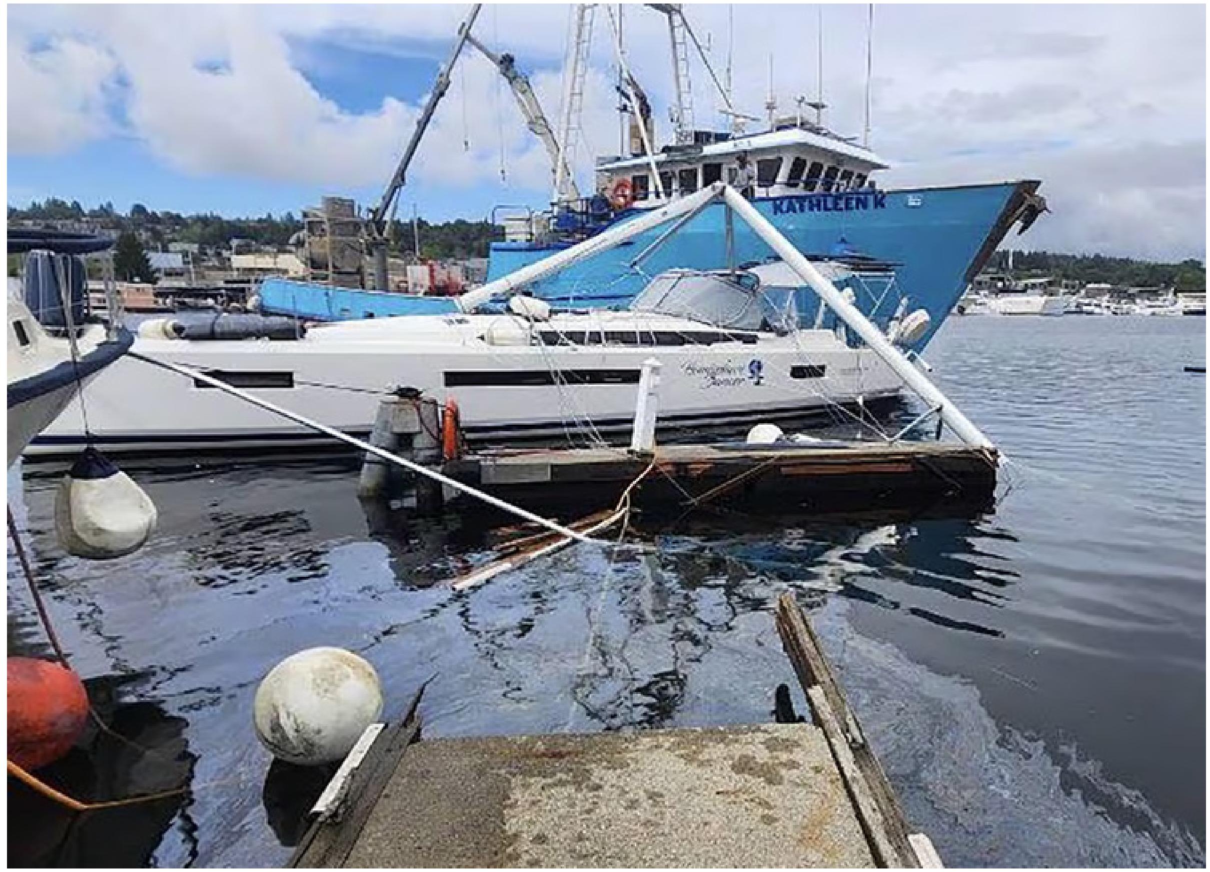
PREVENTING VESSEL BREAKAWAYS WHILE LOADING IN STRONG CURRENTS

To reduce the risk of a vessel breakaway, it is important for vessel crews to understand the forces that act on a vessel when it is moored into a strong current at a dock. Crews should ensure that slack is taken out of lines as the vessel loads, especially as the forward draft increases and the bow begins to sit lower in the water, exposing more of the hull to the current. Continuously monitoring and taking up any slack from bow lines as forward holds are loaded can help to ensure that the bow does not come away from the dock. Developing a response plan for a breakaway can ensure that crews are prepared to respond when one occurs. Vessel masters should also consider incorporating additional safety measures such as keeping propulsion, thrusters, and steering systems on short standby and having anchors ready for immediate use (even if not required by the loading facility). Vessel masters should be familiar with how to request tug support on short notice.

COLLISION

Collision of Fishing Vessel ***Kathleen K*** with Vessels Moored at Marina

VESSEL GROUP Fishing	
LOCATION Salmon Bay, Seattle, Washington	
CASUALTY DATE May 22, 2024	ACCIDENT ID DCA24FM041
INJURIES None	ESTIMATED DAMAGES More than $500,000
REPORT NUMBER MIR-24-33	ISSUED October 22, 2024



The *Kathleen K*, a damaged sailing vessel, and a damaged dock following the collision. Source: Coast Guard.

***Kathleen K* on the day after the collision.** Source: Coast Guard.

On May 22, 2024, about 1024 local time, the fishing vessel *Kathleen K* was transiting from its berth to a fuel dock in Salmon Bay, Seattle, Washington. While en route, the vessel lost engine control and subsequently collided with recreational vessels moored at a marina. A light oil sheen was observed in the water near the marina docks. There were no injuries. Damages to the moored vessels and the docks were estimated to exceed $500,000.

Shortly after 1000, the crew of the 73-foot-long *Kathleen K* got the fishing vessel underway to move it to a fuel dock on the opposite side of the bay. The captain was at the controls in the wheelhouse, while the vessel's two deckhands were on the main deck aft.

As the captain maneuvered the *Kathleen K* away from its berth, he had full control of the vessel's two propulsion engines and two rudders. However, as the vessel proceeded out into Salmon Bay, he noticed that the engines were no longer responding to his commands as he expected: When he shifted the engine control levers from ahead to astern to slow the vessel, the vessel continued to move forward, and when he increased power to the engines with the control levers still astern, the vessel's forward speed increased.

Realizing that there was an issue with engine control, the captain left the wheelhouse unattended and ran down to the engine room. The captain discovered that the port engine transmission was in the ahead position and the mechanical linkage between the control box and the transmission was disconnected.

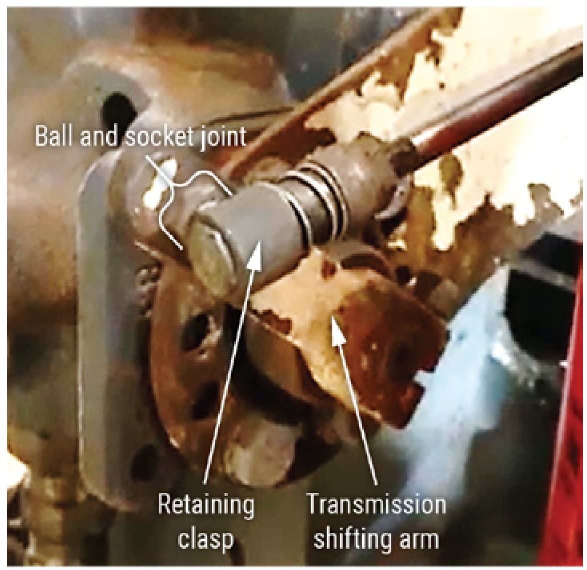
When connected to the transmission, the control box would send speed signals from the port engine control lever in the wheelhouse to the engine, as well as directional signals to the port transmission via a mechanical linkage connected to a shifting lever on the transmission. (The starboard engine was configured in the same way.) The disconnection of the port transmission linkage prevented any direction changes from being transmitted from the wheelhouse control lever to the shifting lever on the port transmission.

Although the starboard engine was likely operating correctly in the astern direction, propellers tend to be more efficient in the ahead direction, and the port engine overpowered the starboard engine. When the captain had increased power to both engines, the port engine's dominance over the starboard engine increased, and the ***Kathleen K*** continued forward.

While the captain was in the engine room, the ***Kathleen K*** had moved toward docks (occupied by recreational sail and motor vessels) at a boatyard across the bay. The ***Kathleen K***'s bow subsequently struck a vessel moored at one of the floating docks, struck another vessel moored at a second floating dock, and pushed that vessel into another vessel moored at a third dock. The ***Kathleen K*** then struck the second floating dock, severing a section of the dock and damaging several other moored vessels. In total, nine moored vessels were damaged.

In the engine room, the captain moved the port transmission from ahead to astern using the transmission shifting lever and then returned to the wheelhouse, where he saw the damage caused by the collisions. He went back to the engine room and moved the port engine transmission shifting lever from astern to neutral and reconnected the linkage. He returned to the wheelhouse again, directed his crew to make up to the severed section of dock that was floating free, and loitered the vessel until authorities arrived on scene.

The casualty voyage was the first time the ***Kathleen K*** had been underway since about November 2023. In the intervening period, the captain had conducted maintenance on the vessel's main propulsion systems. During the maintenance, he had disconnected both engines' transmission linkages at the ball and socket joints, which connected the mechanical linkages to the shifting levers on the transmissions. Each ball on the joint was held in place in the socket with a spring-loaded clasp. The captain reconnected the joints when the maintenance was completed; however, he stated that the ball for the port transmission linkage joint may not have been fully seated in the socket when it was reconnected, even though it would have appeared to be seated correctly. A postcasualty examination found no material discrepancies with the transmission linkage, including the ball and socket joint. Therefore, disconnection of the port transmission linkage at the ball and socket joint was most likely due to the ball not being fully seated in the socket when the joint was reconnected after maintenance.



Kathleen K **transmission mechanical linkage at ball and socket joint.** Source: Coast Guard.

THE PROBABLE CAUSE of the collision of the fishing vessel *Kathleen K* with recreational vessels moored at a marina was the loss of directional control to one of the *Kathleen K*'s propulsion engines due to the disconnection of its transmission linkage, likely because the linkage's ball and socket joint was not fully reconnected after maintenance.

COLLISION

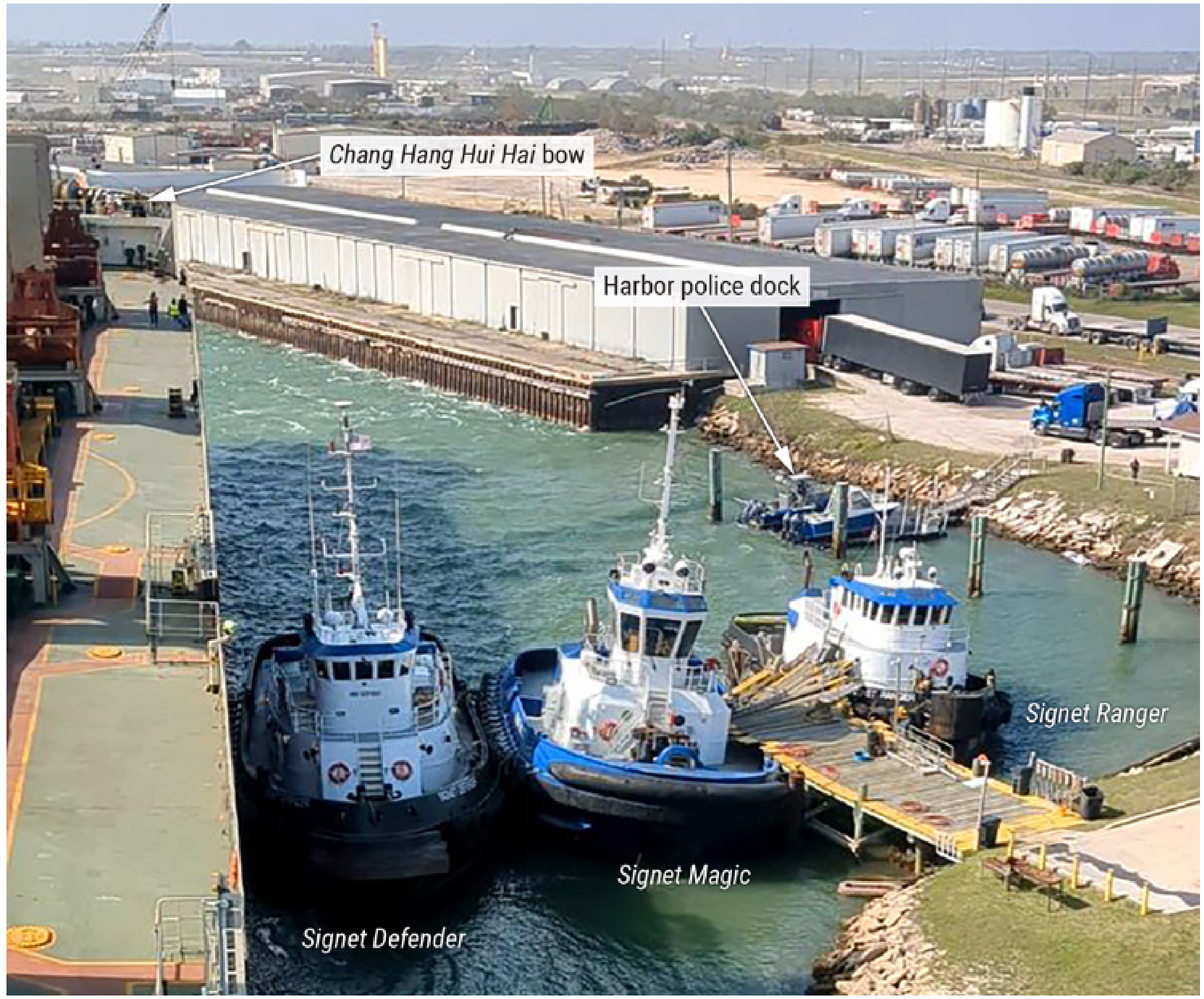
Breakaway of Bulk Carrier ***Chang Hang Hui Hai*** and Subsequent Collision with Tugboat ***Signet Defender***

VESSEL GROUP
Cargo, Dry Bulk + Towing/Barge

LOCATION
Brownsville Ship Channel, Brownsville, Texas

CASUALTY DATE	ACCIDENT ID
January 8, 2024	DCA24FM016
INJURIES	**ESTIMATED DAMAGES**
None	$2.5 million
REPORT NUMBER	**ISSUED**
MIR-24-38	December 16, 2024

Chang Hang Hui Hai **docked on March 3, 2013.** SOURCE: MANUEL HERNANDEZ LAFUENTE.



Chang Hang Hui Hai **colliding with the tugboat** ***Signet Defender.*** BACKGROUND SOURCE: COAST GUARD.

On January 8, 2024, about 1237 local time, the dry bulk carrier *Chang Hang Hui Hai* was moored at dock no. 12 in the Brownsville Ship Channel in Brownsville, Texas, when it broke free during high winds. The vessel drifted across the ship channel and struck the tugboat *Signet Defender*, which was tied up to the tugboat *Signet Magic* at the Signet Maritime pier along with the tugboat *Signet Ranger*. There were no injuries, and no pollution was reported. Damage was estimated at $2.5 million.

Earlier in the morning, the China-flagged *Chang Hang Hui Hai*, a 656-foot-long bulk cargo ship, was moored at dock no. 12, port side to the pier to discharge cargo. The vessel was secured with 10 mooring lines made of polypropylene filament eight-strand rope, each 2.8 inches (72 millimeters) in diameter and 722 feet (220 meters) long, with a nominal breaking load of 134,885 pounds (600 kilonewtons).

At 0919, the National Weather Service broadcast an urgent marine weather message. A small craft advisory was in effect, with a gale warning for the evening. At 0930, the winds were Beaufort 5 (17–21 knots) from the southwest.

As the morning progressed, the winds increased. The chief mate evaluated the increasing wind conditions and ordered additional mooring lines to be deployed, including two breast lines forward, one breast line aft (a bight) and two stern lines. This brought the total number of lines used to 16—all lines available, excluding three spare lines.

As the winds picked up, the higher wind speed increased the wind load (force) acting on the *Chang Hang Hui Hai*'s lateral surface area above the water (the sail area). The bulker's freeboard increased as it offloaded, thereby increasing its sail area. This force, acting on the vessel nearly perpendicular to its length, significantly strained the mooring lines holding the ship to dock no. 12. About 1235, the force of wind—about 50 to 55 knots—against the ship's side overcame the breaking strength of several lines forward, causing them to part and the ship's bow to move away from the pier.

This began a cascading failure as the remaining lines took up additional strain. Ten mooring lines and two bollards (with five lines attached) failed, and one line paid out, leading to the ship drifting away from the dock. The crew let go both anchors, but the ship continued to drift across an 800-foot-wide section of the Brownsville Ship Channel. Although the master had ordered the ship's main engine started, he decided not to use it to assist in controlling the vessel because lines were floating on the water surface and could foul the propeller.

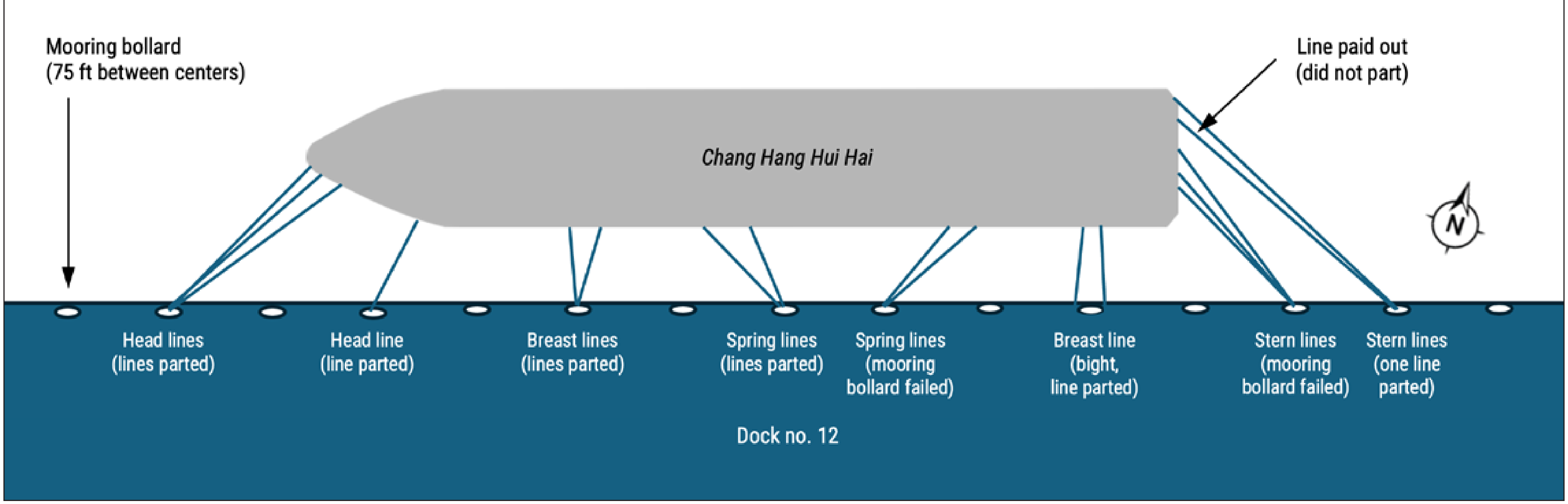
At 1249, the ***Chang Hang Hui Hai*** collided with the tugboat ***Signet Defender***, which was moored on the opposite side of the channel. This first collision led to cascading collisions. The ***Signet Defender*** was pushed into the side of the tugboat ***Signet Magic***, which was moored alongside the ***Signet Defender***. The Signet Maritime pier was destroyed as the ***Signet Magic*** was pushed into it. The pier was pushed into the tugboat ***Signet Ranger***, tied up on the other side of the pier.

The three Signet tugboats, which were not damaged by the collision, got underway and began maneuvering to hold the ***Chang Hang Hui Hai*** in place. While the tugs were assisting the bulk carrier, propeller wash from the ***Signet Defender*** capsized a small harbor police boat and damaged its dock.

Neither postcasualty testing of the mooring lines nor an assessment of the mooring bollards' condition was conducted. However, all the lines were certificated and in good condition, per their last inspection. Nevertheless, without postcasualty tests or an assessment of the condition of the mooring lines and bollards, investigators could not definitively rule out weakened or overloaded mooring lines or overloaded bollards as contributing factors in the casualty.

THE PROBABLE CAUSE of the breakaway of the dry bulk carrier *Chang Hang Hui Hai* from a dock and subsequent collision with the tugboat *Signet Defender* was the force of the wind acting on the exposed freeboard of the *Chang Hang Hui Hai*, which overcame the breaking strength of several mooring lines.

***Chang Hang Hui Hai* mooring line arrangement (scale approximate).**



CONTACT

Contact of ***Susan K*** Tow with Natchez-Vidalia Bridge

VESSEL GROUP	
Towing/Barge	
LOCATION	
Lower Mississippi River, mile 363, Natchez, Mississippi	
CASUALTY DATE	ACCIDENT ID
April 23, 2023	DCA23FM030
INJURIES	ESTIMATED DAMAGES
None	$2 million
REPORT NUMBER	ISSUED
MIR-24-06	March 19, 2024

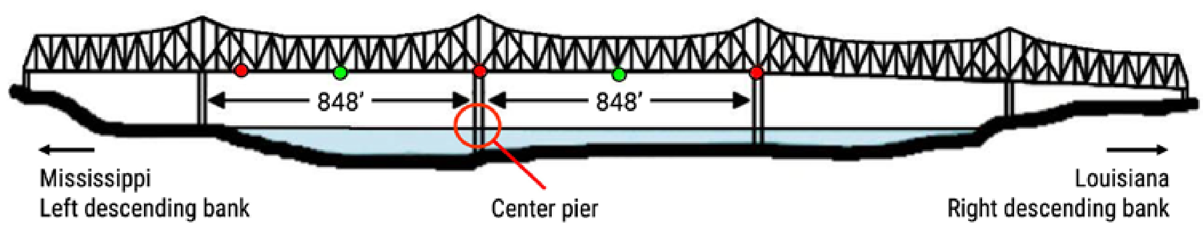
***Susan K* after the contact.**

***Left to right*: Hull indentation on barge *SCF14119B* and partly sunk barge *SCF24145B*.** Source (*right*): Coast Guard.

On April 23, 2023, about 2242 local time, the towing vessel *Susan K* was pushing 25 barges downbound on the Lower Mississippi River when the tow struck the center bridge pier on the Natchez-Vidalia Bridge, which connects the cities of Natchez, Mississippi, and Vidalia, Louisiana. One barge sank, and two other barges were damaged; the *Susan K* was undamaged. No pollution or injuries were reported. Damage to the barges and cargo was estimated at $2 million.

That evening, the captain of the *Susan K* had the watch as the tow rounded the bend above the Natchez-Vidalia Bridge at 10.4 knots. The Natchez-Vidalia Bridge had twin cantilever-style bridges. Both spans had six concrete piers—structures designed to support the spans. Three of the piers on each span formed two main channels for vessels to navigate, the left descending channel and the right descending channel. The US Army Corps of Engineers chart for the Lower Mississippi River listed the horizontal distance between the main channel piers as 848 feet.

After the bend, the captain intended to take the tow through the western (right-descending-bank side) channel under the bridge, which was the recommended track on the navigation chart. However, he told investigators that he "wasn't paying attention to what I was doing … and by the time I was looking for my marks [visual references] to make the bridge, I realized that I was way off my marks." At 2238:47, the AIS position of the *Susan K* was 390 feet left of the sailing line (the sailing line on inland navigational charts is the preferred or recommended route within the reaches of a navigable channel).



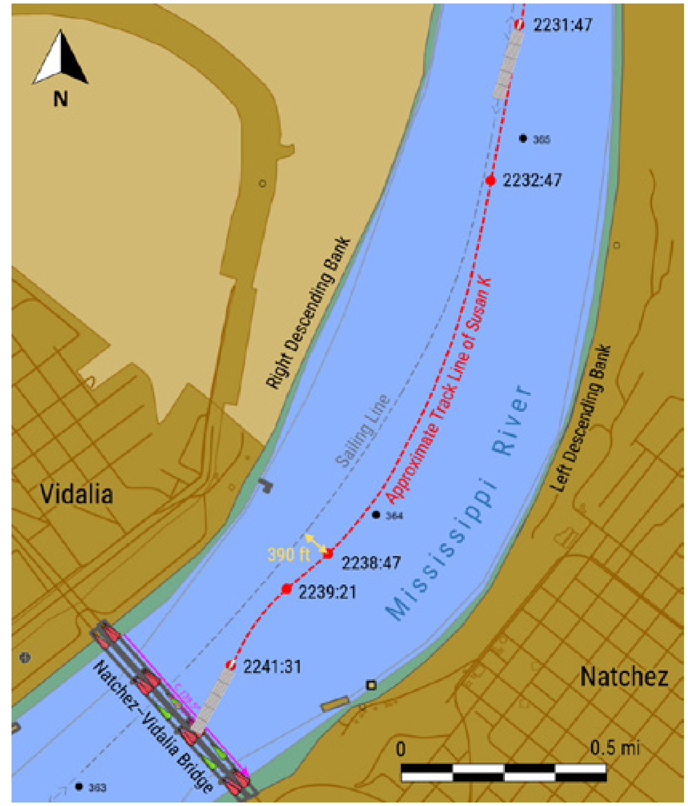
Natchez-Vidalia Westbound Bridge, looking downstream (not to scale).
Background source: US Army Corps of Engineers.

Consequently, he made a "judgment call" to attempt to steer the tow through the eastern (left-descending-bank side) channel under the bridge. The captain increased the ***Susan K***'s engine speed to full power and used various rudder movements to maneuver the tow, but he was unable to avoid hitting the bridge with the tow. At 2242, the second barge in the starboard string of the tow, *SCF11133B*, struck the center pier of the bridge. Two more barges in the starboard string, *SCF14119B* and *SCF24145B*, also contacted the bridge, and the tow broke apart.

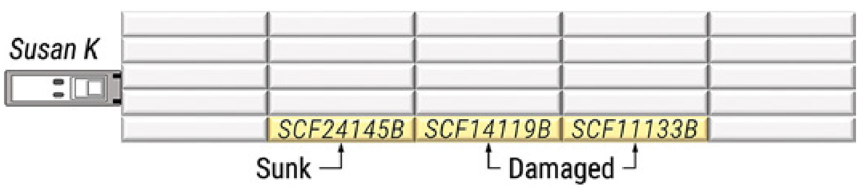
There was no evidence that the captain was fatigued, impaired, or distracted before or during the casualty. The captain had decades of experience captaining towing vessels and maneuvering tows, and he had steered tows through the Natchez-Vidalia Bridge hundreds of times. There was nothing unusual about the transit or approach that would have heightened the captain's awareness or vigilance, such as adverse weather or river conditions, vessel traffic, or mechanical issues with the vessel.

After the casualty, the captain said, "You get complacent sometimes when you do something so many times." Complacency can cause attention lapses that arise from repetition, familiarity, or comfort with a particular task. Repetition and familiarity reduce the required level of cognitive effort required to execute such tasks—even complex, skill-based tasks—increasing the susceptibility to attention lapses or distraction. Attention lapses can delay the detection of subtle abnormalities, affecting an operator's reaction time to and identification of developing hazards. Due to complacency, the *Susan K* captain was inattentive as the tow approached the bridge, which resulted in the tow being out of position for his intended route under the bridge. His awareness of the situation came too late to avoid striking the bridge pier.

THE PROBABLE CAUSE of the contact of the *Susan K* tow with the Natchez-Vidalia Bridge was the captain's complacency, which resulted in his inattention to the tow's position as it approached the bridge.



AIS positions of the *Susan K*, as indicated by red dots. The NTSB approximated the trackline of the *Susan K* due to limited AIS data.
BACKGROUND SOURCE: ROSE POINT ECS.



***Susan K* tow arrangement and barges damaged or sunk in the casualty.**

LESSONS LEARNED

FIGHTING COMPLACENCY

Repetition and monotony can cause even the most experienced and skilled mariner to become complacent and lose situational awareness. Developing strategies that help maintain focus is a good practice. These strategies may include continuous scanning of instruments and surroundings outside the wheelhouse, strict adherence to procedures, eliminating distractions, changing position or moving (standing up or walking around), and getting enough sleep and exercise.

CONTACT

Contact of Tank Vessel ***Bow Triumph*** with Pier

VESSEL GROUP
Cargo, Liquid Bulk

LOCATION
Cooper River, north of Charleston, South Carolina

CASUALTY DATE	ACCIDENT ID
September 5, 2022	DCA22FM040
INJURIES	**ESTIMATED DAMAGES**
None	$29.5 million
REPORT NUMBER	**ISSUED**
MIR-24-09	April 15, 2024

***Bow Triumph* underway before the contact.** SOURCE: ODFJELL TANKERS.

Damage to *Bow Triumph*'s starboard side. SOURCE: COAST GUARD.

Witness photograph taken shortly after the contact showing damage to Pier B. BACKGROUND SOURCE: JACOB WALL.

On September 5, 2022, about 1602 local time, the 600-foot-long tanker *Bow Triumph* was transiting outbound on the Cooper River near Naval Weapons Station, Joint Base Charleston, South Carolina, when the vessel struck Naval Weapons Station Pier B. The vessel's bow sustained significant damage, and a 300-foot section of the pier collapsed. No pollution or injuries were reported. Damage to the vessel and pier was estimated at $29.5 million.

About 1528, the *Bow Triumph* got underway from the INEOS Aromatics Terminal in Wando, South Carolina. About 1541, after the vessel was off the dock and turned around for the downriver transit, the Charleston Branch Pilots Association pilot took the conn from the docking pilot. The pilot conned the vessel through two bends of the 650-foot-wide Joint Base Charleston Channel in the Cooper River. After the second bend in the channel, the pilot continued using rudder commands to steer the ship toward the next bend, a port turn onto the stretch of the river containing Range C.

The pilot maneuvered the vessel to the left side of the channel because he expected to slide toward the outside of the bend, as the 1-knot flood current would push his vessel north when the bow entered the bend. The pilot reduced speed from full to half ahead at 1558:05, dropping the propeller rpm, to allow for a "kick" from the engines for the turn. He ordered port 20° rudder at 1559:40 to begin the turn. He ordered port 10° rudder 9 seconds later.

AIS data showed the *Bow Triumph*'s bow first exited the channel at 1559:55, about 15 seconds after the pilot started his turn.

The pilot ordered full ahead at 1600:11, increasing the propeller rpm, and rudder midships at 1600:14. After ordering the rudder to port 20° at 1600:22, he noticed that the "rate of turn was not increasing." The pilot ordered increased port rudder orders at 1600:31 and 1600:58, and then a full Becker rudder at 1601:08.

Between 1600:22 and 1601:24, as the vessel drew nearer the left bend, its heading had only changed 2° to port and the vessel's course over the ground showed an increase of about 10° to port as it drew closer to the left bank. At 1601:24, as the vessel was not turning as he expected it to, the pilot gave the order to drop anchor. Less than a minute later, at 1602:20, the *Bow Triumph*'s bow struck Pier B at a 90° angle.

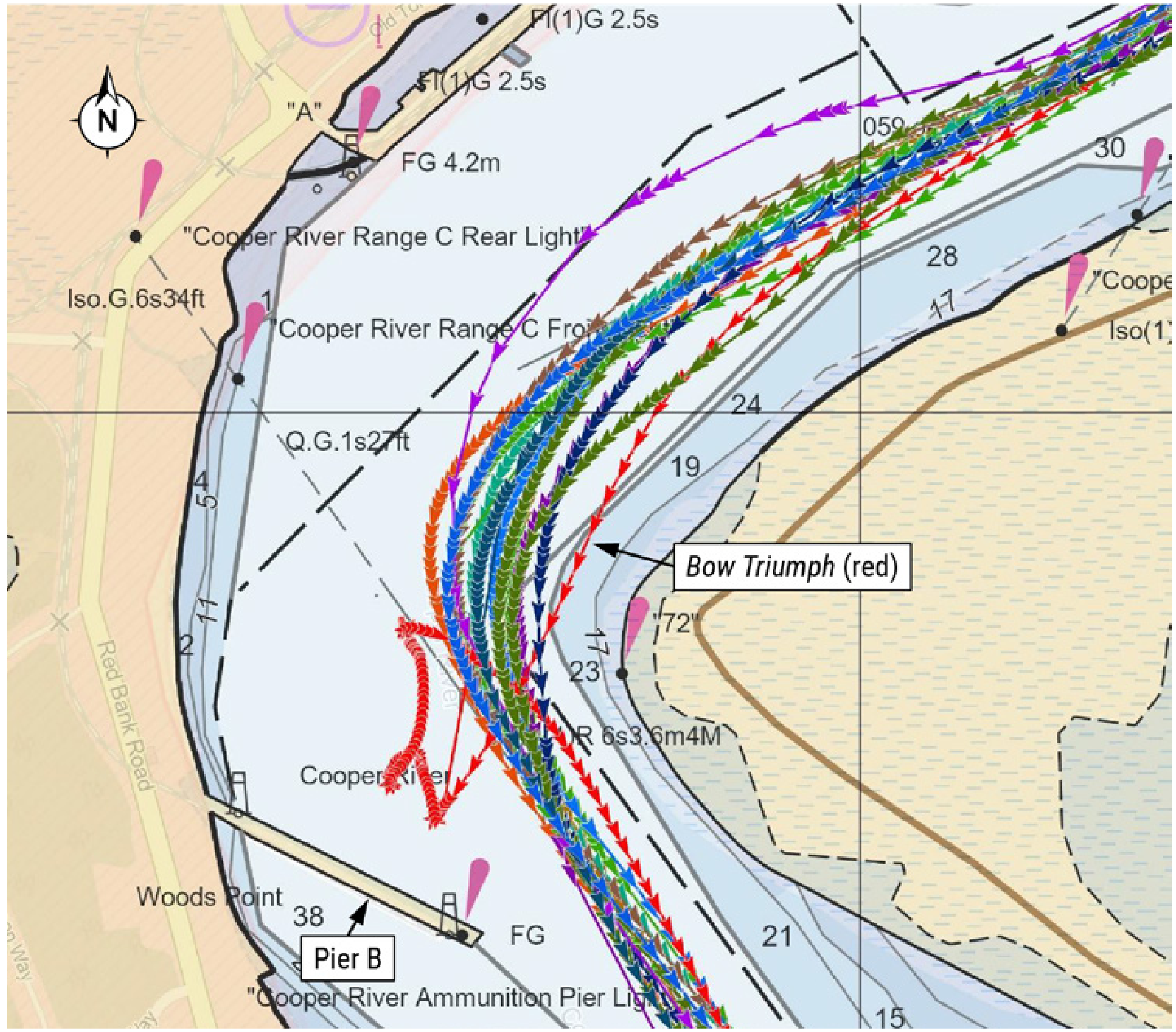
The bridge team and the pilot told investigators that the rudder had responded as ordered by the pilot as the vessel approached the bend and that there was no issue with the vessel's steering; the VDR showed that the rudder response matched the pilot's orders.

When the pilot maneuvered the *Bow Triumph* closer to the left bank while approaching the turn, the vessel was susceptible to bank effect. Bank effect is experienced by ships maneuvering in confined waters. While making headway, water flow down the side of a ship creates positive pressure forward of the pivot point and negative pressure aft. In a channel, the resultant forces can attract a ship's stern toward the bank (bank suction) and yaw the bow away from the bank (bank cushion). Generally, the faster the ship moves, the greater the suction at the stern.

As it moved to the left side of the channel, the vessel traversed a section where shoaling had reduced the depth by more than 10 feet from the project depth. With open water to starboard, there would not have been any opposing forces that offset the bank effect on the vessel's port side. As the pilot attempted to turn the vessel to port, the bank effect forces at the turn would have worked against the port turn by pushing the bow away (to starboard) and pulling the stern toward the bank.

Additionally, as the bow emerged from the shadow of the left bank, the roughly 1-knot current from the flood tide would have affected the submerged portion of the vessel's port bow—pushing it away from the bank and further working against the attempted port turn.

AIS data of the *Bow Triumph* and 14 other vessels of similar size and draft that departed from the INEOS Aromatics Terminal in the 12 months before the casualty show that the *Bow Triumph* pilot attempted to pass the closest to the bend. Transiting in the center of the channel is prudent to avoid the risks associated with bank effect.



***Right*: Tracklines of the *Bow Triumph* and 14 other vessels of similar size that departed from the INEOS Aromatics Terminal within the 12 months before and including September 5, 2022, plotted in the Cooper River near Joint Base Charleston.**

Background source: Coast Guard.

THE PROBABLE CAUSE of the contact of the *Bow Triumph* with Naval Weapons Station Pier B was the pilot's decision to maneuver the vessel close to the left bank while approaching the turn immediately before the pier, exposing the tanker to bank effect, which the pilot's subsequent rudder and engine orders could not overcome.

LESSONS LEARNED:

PLANNING FOR HYDRODYNAMIC FORCES IN AREAS SUBJECT TO SHOALING

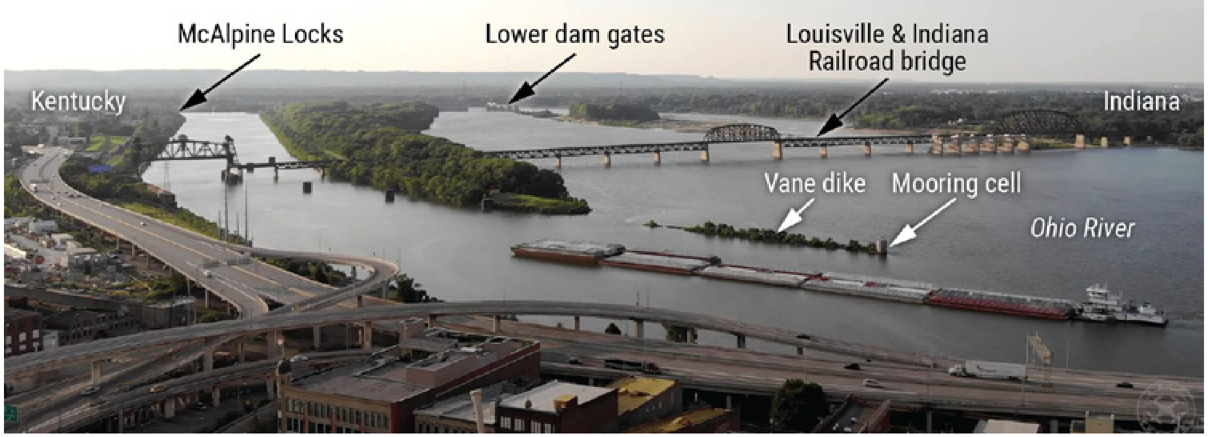
Hydrodynamic forces reduce rudder effectiveness (squat and shallow water effect) and yaw the bow away from the closest bank and pull the stern in (bank effect). Shoaling can reduce the water depth in shallow waters, such as channels, below charted or expected, and therefore exacerbate the forces on a vessel. Bank effect can have an undesired effect on vessels, even for the most experienced shiphandlers. Pilots, masters, and other vessel operators should consider the risks in areas known for shoaling when planning transits.

CONTACT

Contact of *Queen City* Tow with Vane Dike

VESSEL GROUP Towing/Barge	
LOCATION Ohio River, mile 604.3, Louisville, Kentucky	
CASUALTY DATE March 28, 2023	ACCIDENT ID DCA23FM025
INJURIES None	ESTIMATED DAMAGES $1.98 million
REPORT NUMBER MIR-24-12	ISSUED May 7, 2024

***Queen City* underway before the contact.**
Source: Dave Beightol, MarineTraffic.com.



McAlpine Locks and Dam with a similar-size towing vessel and tow configuration (three across) as that of the *Queen City* at the time of the contact. Source: TAPP Channel, YouTube.

On March 28, 2023, about 0224 local time, the towing vessel ***Queen City*** was downbound on the Ohio River in high-water conditions, pushing an 11-barge tow, when the tow struck the vane dike at the arrival point for the McAlpine Locks and Dam in Louisville, Kentucky, and broke apart. No pollution or injuries were reported. Total damages to the barges and cargo were estimated to be $1.98 million.

At 0600, the day before the casualty, the 3,000-hp ***Queen City*** departed from a fleeting area at mile 482, in Hebron, Kentucky. About 2330, the pilot relieved the captain of the watch, and they discussed the transit, including the increased outdraft velocity expected at the McAlpine Locks and Dam because of the high water on the river. On March 25, when the McAlpine Locks and Dam upper gage on the Ohio River rose above 13 feet, the Coast Guard had activated VTS Louisville in accordance with the Mississippi and Ohio Valley and Tributaries WAP. Shortly after, the WAP moved to “action” phase, defined as when the McAlpine Dam gates were fully open and the upper gage reading was approaching 15 feet and rising. Vessels were required to check in with the VTS when operating between Twelve Mile Island (mile 593) and the McAlpine Locks and Dam (mile 606). A Broadcast Notice to Mariners advised mariners to exercise caution transiting the area because of the high water that increased the speed of outdraft currents.

The captain told the pilot to keep the tow “above” (to the left of) the sailing line as he approached the entrance channel to the locks, because the current was going to pull him toward the dam. The pilot checked in with the VTS as he passed the checkpoints.

On March 28 at 0218, the ***Queen City*** passed through the 802-foot-wide channel span of the Clark Memorial Highway Bridge. The entrance to the locks was 800 yards downriver. The pilot said that, as soon as he cleared the bridge, the current “started grabbing me, it wasn’t looking good.” The vessel was on the sailing line at 0220:24. However, as the pilot steered toward the locks entrance, the tow was set to the north, toward the vane dike located just off the eastern end of the entrance to Portland Channel, which led to McAlpine Locks. By 0224:38, the tow had been pulled about 109 yards to the right of the sailing line, in the direction of the lower dam gates, and was sliding toward the lower dam gates at about 33 yards per minute.

About 0224, the tow struck the vane dike mooring cell. The tow broke apart after the contact; six barges went through the lower dam gates, and three were pinned against the gates.

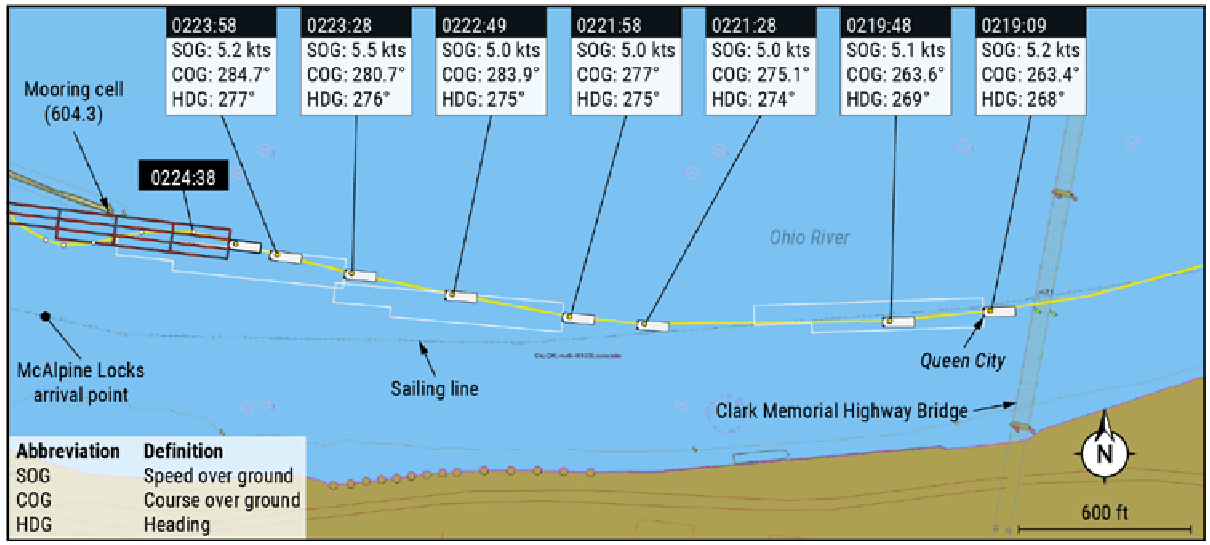
Barges *IN995423* and *IB1938* against the lower dam gates. *IB1913* is receiving methanol from *IB1938* through a cargo transfer hose.
BACKGROUND SOURCE: COAST GUARD.

The WAP had warned that the vane dike area experienced strong outdrafts on the upstream end during high flows. At the time of the contact, the upper gage at the McAlpine Locks measured about 17.5 feet and rising, indicating a period of "extreme high water/extreme high flow conditions," according to the WAP. (The lower streamgage measured water flow at over 400,000 cubic feet per second—nearly the highest in the previous 12 months.)

The pilot had previously transited this portion of the Ohio River, but this was his first time doing so with water levels above 15 feet, and he knew the outdraft would set the tow toward the dam. Company guidance left it up to the captain and the pilot to decide if and how to transit the river at high water. They could have reduced the number of barges—providing a larger horsepower-to-barge ratio, as discussed in the WAP and company policy. (The tow already complied with the company policy to maintain a 250-hp-per-barge ratio.) However, they decided to steer to compensate for the set from the outdraft and did not discuss reducing the number of barges.

When towing vessel operators decide to steer through an area with strong outdrafts, they must steer a course to account for the set from the outdraft. In this casualty, the pilot intended to steer into the entrance channel to the locks, knowing that an outdraft would set the tow toward the vane dike and the dam gates. Although the pilot attempted to steer the tow to the left, he did not anticipate the strength of the outdraft and its effect on the tow. Consequently, his approach to the channel upon passing through the bridge did not effectively compensate for the outdraft that set the tow on to the vane dike.

THE PROBABLE CAUSE of the contact of the *Queen City* tow with the vane dike was the pilot not effectively compensating for the strong outdraft while navigating toward the lock channel entrance during a period of high-flow conditions.



AIS positions, tow outlines (barges), and track of the *Queen City*.

LESSONS LEARNED:
PREPARING FOR DAM OUTDRAFTS

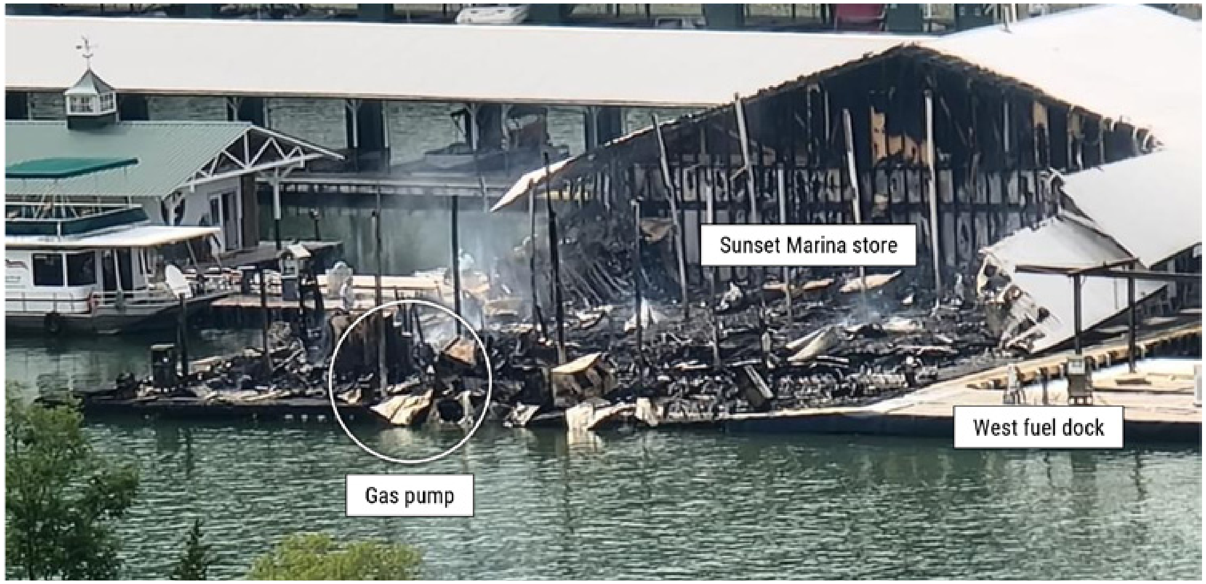
High currents resulting from high water pose unique hazards for vessels transiting inland rivers. In addition, near dams, greater dam openings in high-water conditions lead to high flow rates, which can produce outdraft currents near the dam. Mariners should thoroughly assess the potential impact of outdraft currents when entering or exiting locking channels. Vessel horsepower and vessel handling should be carefully considered. Mariners should also consult available resources, such as Waterways Action Plans and company policies, when passage planning.

CONTACT

Contact of Recreational Vessel ***Flagship 604*** with Dock and Subsequent Marina Fire

VESSEL GROUP	
Yacht/Boat	
LOCATION	
Dale Hollow Reservoir, Byrdstown, Tennessee	
CASUALTY DATE	ACCIDENT ID
August 10, 2023	DCA23FM046
INJURIES	ESTIMATED DAMAGES
1	$1.75 million
REPORT NUMBER	ISSUED
MIR-24-21	July 29, 2024

***Flagship 604* moored in 2024.** SOURCE: SUNSET MARINA.



Sunset Marina store and fuel dock after the fire. BACKGROUND SOURCE: TENNESSEE WILDLIFE RESOURCES AGENCY.

On August 10, 2023, about 1705 local time, the rental houseboat *Flagship 604* (state number TN 0174 BD 219), with nine people aboard, was docking at the Sunset Marina on Dale Hollow Lake in Byrdstown, Tennessee, to refuel, when the bow struck one of the marina's gasoline fuel pumps, knocking it over. Minutes later, a fire began near the gas dispenser and spread to the marina store and three pontoon boats moored at the marina. There was one injury, and no pollution was reported. The houseboat was not damaged. Damage to the marina and the pontoon vessels was estimated at $1.75 million.

On August 4, a person rented the *Flagship 604*, to be used by a group of nine, from the marina, for the week. The rental agreement designated one of the adults as the "driver" (operator).

On the day of the casualty, the designated operator was approaching the Sunset Marina dock, from the west, to refuel. The operator said that, as he approached the dock (starboard side to), the vessel's engine died. (A marina mechanic did not find any issues with the boat's engine after the casualty.) Even if the 150-hp engine had been fully functional, docking the 74-foot-long houseboat in the reported 10–15 mph winds from the west would have been a challenge because of the houseboat's large sail area, which included the vessel's hull above the water, the superstructure, and the upper deck rail skirts. The winds from the west, acting on the vessel's sail area, set the vessel east along the dock—twisting the houseboat to the east and moving the bow into the dock. The vessel's duckbill bow—a deck overhang that extended over the water 1.25 feet at the center of the bow and up to 3.75 feet on both the port and starboard sides—extended over the dock and struck a gas dispenser (pump).

The gas dispenser was set back 5 feet from the dock face to meet the standard for protecting fuel pipes against physical damage arising from impact for marina fuel docks as required by the Tennessee Fire Code. The setback was intended to prevent contact with the gas dispenser by boats with standard bow designs coming alongside the dock. However, in this casualty, the dock's height and houseboat deck's overhang dimensions (above the water and from the bow stem) allowed the houseboat's duckbill bow to freely move over the fueling dock and strike the dispenser. Therefore, the 5-foot setback was not sufficient to protect the gas dispenser from the contact from the duckbill bow of ***Flagship 604***.

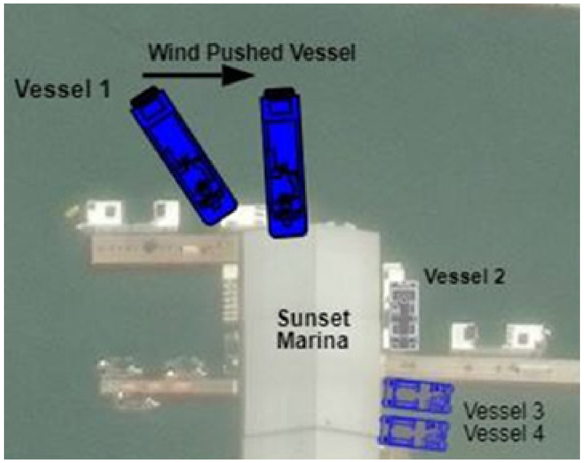
The contact dislodged the gas dispenser, and the fuel line broke, exposing wiring and spraying gasoline from the line onto a bait tank and ice machines powered by electric motors. The marina's general manager pushed the emergency stop for the fuel pump and attempted to close the dispenser's fuel shutoff valve (under the dispenser and above the dock) to stop the flow of fuel from the damaged fuel line. However, before he could close the valve, a fire began, igniting his clothing. With the presence of the exposed wiring and electric motors within the fuel spray's radius, it is likely that an electrical arc ignited gasoline vapors. The marina manager was later transported to a hospital where it was determined that he incurred second- and third-degree burns.

The fire quickly expanded from the dock to the marina building/store just behind the fuel dispenser. Fire department personnel arrived at 1715 and immediately worked to prevent the fire from spreading to other structures in the marina and resort complex. They cleared the location by 2340.

The marina store was destroyed. Three rental pontoon boats tied up on the west side of the marina store incurred damage to their seats and deck carpeting from the heat of the fire. The *Flagship 604* was not damaged.

THE PROBABLE CAUSE of the contact and subsequent fire at the Sunset Marina was a houseboat's "duckbill" bow striking a gasoline fuel dispenser (pump) when docking in windy conditions, which caused an undetermined electrical source on the dock to ignite vapors from the broken gasoline fuel line. Contributing to the contact was the proximity of the gas pump to the dock edge.

Sunset Marina fuel dock and store on fire after the contact. SOURCE: WIRED2FISH.COM.



***Left*: Diagram from the Tennessee Wildlife Resources Agency boating accident report showing the *Flagship 604* (Vessel 1) and the location of the additional damaged vessels.** BACKGROUND SOURCE: TENNESSEE WILDLIFE RESOURCES AGENCY.

***Below*: The *Flagship 604*'s duckbill bow extended over the dock.** SOURCE: TENNESSEE WILDLIFE RESOURCES AGENCY.

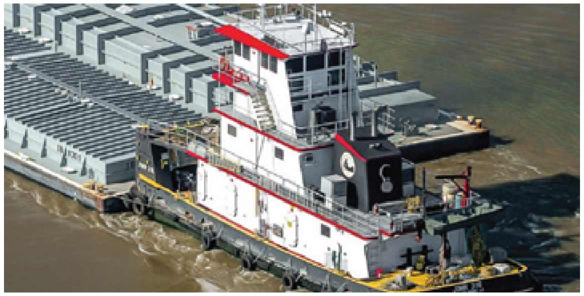
CONTACT

Contact of Towing Vessel *John 3:16* with Pier

VESSEL GROUP
Towing/Barge

LOCATION
Lower Mississippi River, mile 118.6, Saint Rose, Louisiana

CASUALTY DATE	ACCIDENT ID
September 12, 2023	DCA23FM049
INJURIES	**ESTIMATED DAMAGES**
None	$285,441
REPORT NUMBER	**ISSUED**
MIR-24-22	August 1, 2024



***John 3:16* underway on an unknown date before the contact.** SOURCE: MARQUETTE TRANSPORTATION.

Damage to pier (circled). *Left to right*: A vertical piling. Insulated pipe, pier support bracings, and railing.
SOURCE: COAST GUARD.

On September 12, 2023, about 0641 local time, the towing vessel *John 3:16* was transiting the Lower Mississippi River near Saint Rose, Louisiana, when the vessel contacted an industrial cargo pier. No pollution or injuries were reported. The final cost to repair the damages to the towing vessel and pier was $285,441.

The day of the casualty, *John 3:16* was engaged in barge fleet work, with six crewmembers on board. Each crewmember stood a 12-hour watch.

At 0000, the pilot and two deckhands assumed the watch. From 0000 to 0528, the pilot navigated the *John 3:16* on four separate transits, transporting barges between miles 110 and 122. The pilot remained in the wheelhouse during this time.

At 0548, after receiving orders to transit to a barge fleet near mile 143 on the Mississippi River, the *John 3:16* got underway, with the pilot at the helm, from mile 112. The vessel proceeded upriver at 6–7 knots. For this transit, the *John 3:16* was "light boat" (not pushing any barges).

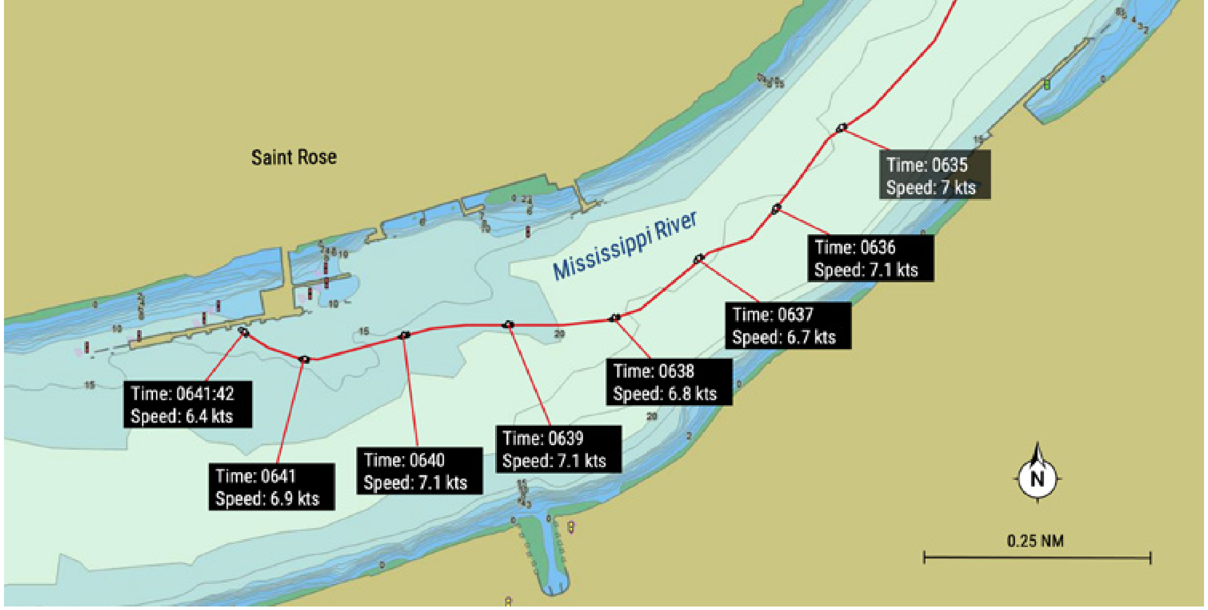
At 0640, the *John 3:16* was transiting at 7 knots near mile 118 when the vessel began to turn to starboard toward an industrial cargo pier. The vessel continued its starboard turn toward the pier, and, at 0641:42, the *John 3:16* contacted the pier at 6 knots, damaging the starboard side of the vessel's wheelhouse. The last thing the pilot remembered before the contact was passing another towing vessel at 0636.

Ten seconds after the contact, the propeller wash from the *John 3:16*'s engines stopped, and, after another 10 seconds, the *John 3:16* began to back away from the pier.

The pilot notified the company port captain, who was responsible for the *John 3:16*, and told the port captain that he fell asleep.

The pilot's cell phone records indicated that he was using his phone while operating the vessel. However, the records showed there were no text messages or phone calls (incoming or outgoing) in the 30 minutes leading up to the contact at 0641, and therefore the pilot was not distracted by cell phone use immediately prior to the contact.

The pilot noted that he was dealing with personal stressors in the days before the contact. These stressors resulted in increased cell phone use during his off-watch time. The pilot reported receiving 3 hours of continuous sleep during his 12 hours of off-watch time before the casualty. However, a review of the pilot's cell phone records during these 12 hours indicated that the longest period between either a sent text message or a connected phone call (indicating some action on the part of the pilot and that he was awake) was only 2 hours. Therefore, because of his cell phone use during his off-watch time, the pilot had an opportunity for less than 2 hours of continuous sleep before taking the casualty watch.



Trackline of the *John 3:16* before the contact. Background source: NOAA ENC US5LU8AH as viewed on Made Smart AIS.

Damage to the *John 3:16* wheelhouse structure.

Fatigue is the human body's desire for sleep and impacts all aspects of human performance. A deficit of as little as 2 hours can result in acute sleep loss and associated performance decrements, including decreased attention, slower reaction time, reduced vigilance, poor decision-making, and an inability to stay awake. While there are differences in the hours of sleep that an individual may require to feel "well-rested" (the pilot noted that he normally received 5 hours of sleep), the pilot had accumulated a significant sleep debt, having likely received less than 5 hours of sleep combined over the 2 days before the contact. This is less sleep than what the pilot typically received, and significantly less than the recommended 7–8 hours of sleep for each 24-hour period needed to avoid fatigue-related performance impacts.

The only policy in the operating company's TSMS related to the mitigation of fatigue for wheelhouse personnel was the requirement for crewmembers to work no more than 12 hours in a 24-hour period. It was therefore the responsibility of each crewmember to obtain sufficient sleep during their 12 hours of off-watch time in order to be well-rested and alert when coming on watch. The company expected crewmembers to exercise their stop work responsibility if they became too fatigued to safely continue operations. Although the pilot was experiencing the performance effects of acute fatigue, he stated he did not feel fatigued when assuming the watch. As such, he did not use the company's stop work responsibility; instead, he continued operations until he fell asleep.

THE PROBABLE CAUSE of the contact of the *John 3:16* with an industrial cargo pier was the pilot falling asleep while navigating due to an accumulated sleep debt. Contributing to the pilot's fatigue was cell phone use during off-watch time, which significantly limited the pilot's opportunity for sleep.

LESSONS LEARNED:

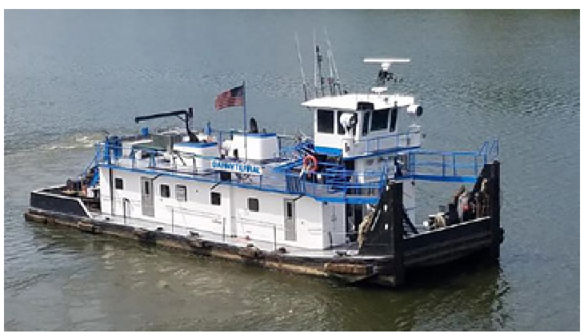
MAXIMIZING SLEEP DURING OFF-WATCH REST PERIODS

Fatigue is often a factor in casualties investigated by the NTSB. Fatigue affects all aspects of human performance, including decision-making, alertness, and reaction time, all of which affect a mariner's ability to safely navigate a vessel. Mariners should understand the performance effects of sleep loss and recognize the dangers of working on board a vessel while fatigued. Individuals typically require 8 hours of quality sleep each 24-hour period to avoid the performance effects of fatigue. A sleep deficit of as little as 2 hours can result in performance decrements caused by acute sleep loss. Obtaining quality, uninterrupted sleep on board a vessel is often challenging due to shipboard environmental factors and external distractions such as cell phones. It is important that mariners get enough sleep during each off-watch period, so they remain alert when assuming watch.

CONTACT

Contact of ***Danny Terral*** Tow with Port of Lake Charles Pier

VESSEL GROUP Towing/Barge	
LOCATION Calcasieu River, mile 33, Lake Charles, Louisiana	
CASUALTY DATE July 8, 2023	ACCIDENT ID DCA23FM042
INJURIES None	ESTIMATED DAMAGES $1 million
REPORT NUMBER MIR-24-24	ISSUED August 20, 2024



***Danny Terral* underway before the contact.**
SOURCE: TERRAL RIVER SERVICE.

***Left to right*: Damage to the Port of Lake Charles pier. Timber from the pier found on the starboard lead barge of the *Danny Terral*.** SOURCE: COAST GUARD.

On July 8, 2023, at 2326, the towing vessel *Danny Terral* was pushing six loaded barges on the Calcasieu River when the starboard lead barge contacted a pier while docking at the Port of Lake Charles. There were no injuries, and no pollution was reported. Damage to the pier was estimated to be about $1 million. The tow remained intact, and there was no reported damage to the barges or towing vessel.

Two days earlier, the 75-foot-long steel towing vessel *Danny Terral* had departed the Old River Fleet on the Lower Old River near Lettsworth, Louisiana, en route to Lake Charles, Louisiana, with five crewmembers on board, including a captain, mate, steersman (in training), and two deckhands. For the transit, the *Danny Terral* was pushing six barges loaded with rock arranged together in two strings of three barges, for a total length (vessel and tow) of 675 feet and maximum width of 70 feet. Before departure, the captain and mate had completed a voyage plan and navigation assessment document, which addressed potential issues related to weather, navigational hazards, river conditions, and traffic along the route. The captain and mate noted no issues on the voyage plan.

On July 8, at 2120, the *Danny Terral* entered the Calcasieu Ship Channel and headed northbound toward Lake Charles. The captain and steersman were on watch in the wheelhouse; a deckhand was also on watch. Just before 2315, the mate arrived in the wheelhouse for his 2330 scheduled watch. The mate and the captain completed a watch changeover and discussed the plan to moor at the Port of Lake Charles. The mate had been credentialed and qualified with the company for about 4 months, but he had never docked at this specific berth location at the Port of Lake Charles—which he later described to investigators as "unique." His only previous docking at the Port of Lake Charles was completed under the supervision of a training captain at a different berth location.

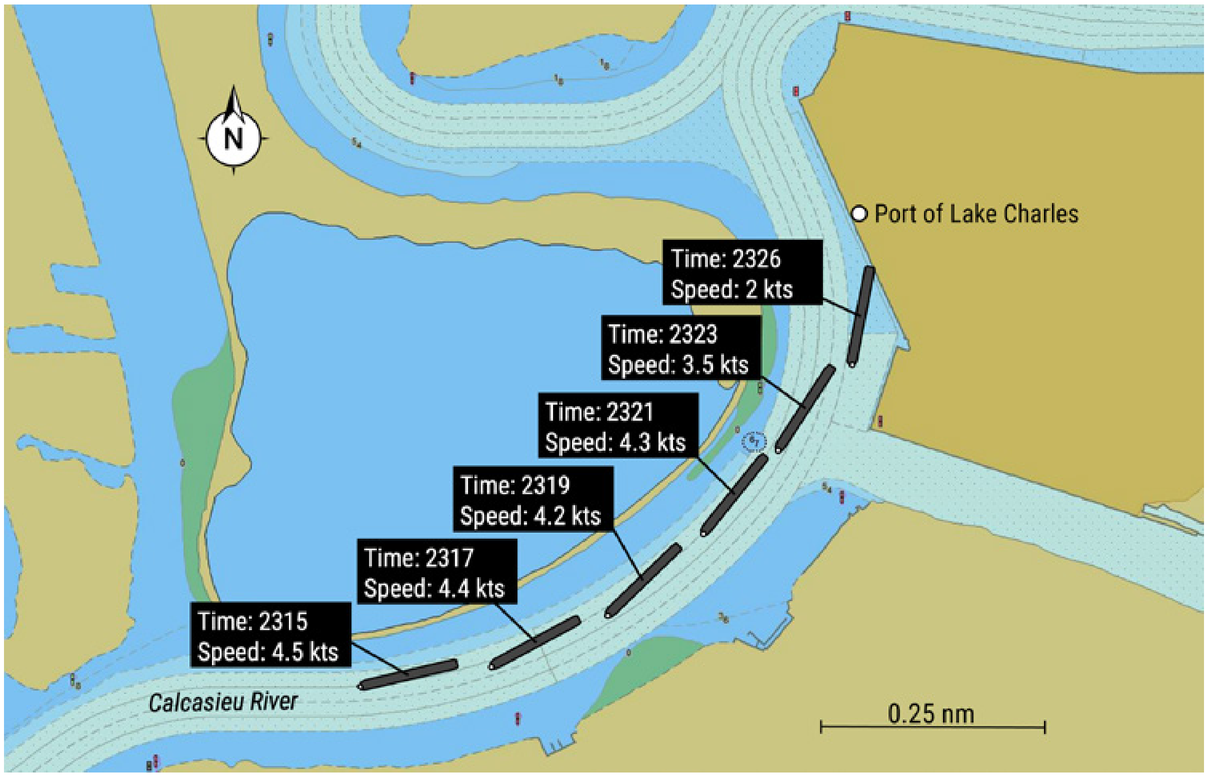
Investigators were not able to interview the captain, so it is unclear if the mate and the captain discussed the outgoing current, berth location, or the mate's experience at the Port of Lake Charles during the watch change. Further, there was no indication that the required navigation assessment form, which included an item for "velocity and direction of currents," was updated for the docking. Either a discussion on the maneuver or a review of the navigation assessment form would have given the captain and mate the opportunity to assess the risks associated with the docking.

After the changeover, the mate and deckhand assumed the watch, and the captain left the wheelhouse. If the captain had any reservations or concerns about the docking, he should have remained on the bridge.

After the watch change, the mate began to slow the tow to prepare for the docking at the pier by pulling the engines back and then into clutch before moving the throttles to full astern while adding "full starboard rudder, flanking rudder." The nighttime conditions required the mate to manually train the spotlight on the unlit pier, in addition to operating the steering and propulsion controls and monitoring the tow's speed and position. He attempted to turn the head of the tow to port while slowing the tow's forward momentum. However, as the tow rounded the bend, the head of the tow "stopped swinging [to port]" but "still had forward momentum," and the outgoing current set the tow towards the pier. The tow continued towards the pier, and, about 2326, the lead starboard barge contacted the pier at 2 knots.

The deckhand, who would typically have been positioned at the head of the tow to call out distances to the operator in the wheelhouse as the tow approached the pier, had left the wheelhouse to do other tasks and had not yet gotten into position for the docking. As a result, he did not communicate with the mate regarding the tow's distance to the pier. The mate's inexperience with the docking location, coupled with the unlit pier and lack of distance information from the deckhand, resulted in him misjudging the approach to the pier.

THE PROBABLE CAUSE of the contact of the *Danny Terral* with the Port of Lake Charles pier was the mate misjudging the approach to an unlit, unfamiliar pier in the dark.



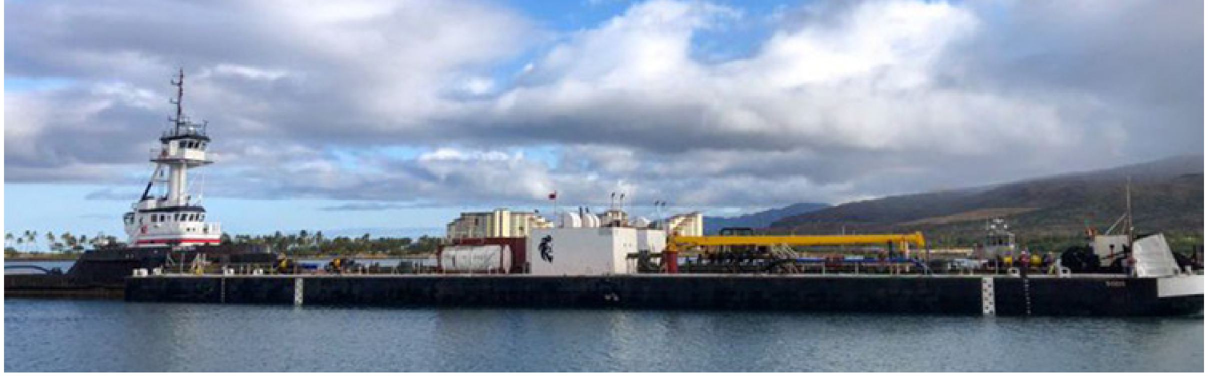
Trackline of the *Danny Terral* as the tow approached the pier at the Port of Lake Charles.
Background source: NOAA Electronic Navigation Chart US5LCHMB as viewed on Made Smart AIS.

CONTACT

Contact of Tugboat ***Olympic Scout*** with Hylebos Bridge Fender

VESSEL GROUP	
Towing/Barge	
LOCATION	
Hylebos Waterway, Tacoma, Washington	
CASUALTY DATE	ACCIDENT ID
October 12, 2023	DCA24FM003
INJURIES	ESTIMATED DAMAGES
None	$2.43 million
REPORT NUMBER	ISSUED
MIR-24-26	September 10, 2024

Olympic Scout **underway at unknown date.**
Source: Olympic Tug & Barge, Inc.



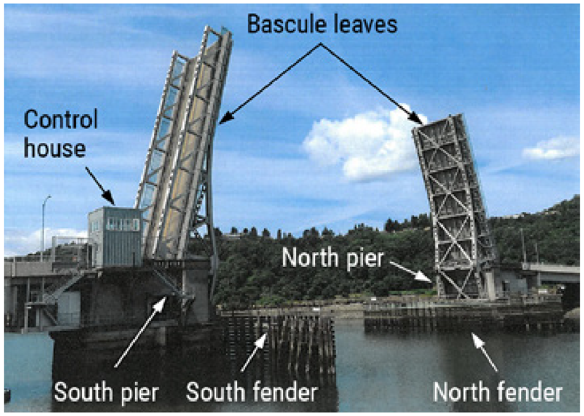
ATB ***Montlake/Sodo*** **underway in July 2023.** Source: Olympic Tug & Barge, Inc.

On October 12, 2023, at 2341 local time, the tugboat *Olympic Scout* was assisting the articulated tug and barge *Montlake* (tugboat) and *Sodo* (barge) as it headed outbound on the Hylebos Waterway in Tacoma, Washington. As the vessels attempted to transit through the Hylebos Bridge, the starboard quarter of the *Olympic Scout* struck the bridge's protective fender system. There were no injuries, and no pollution was reported. The *Olympic Scout* sustained superficial damage; the south side of the bridge's fender system was damaged beyond repair and was replaced at a cost of $2.43 million.

On October 12, the ATB *Montlake*/*Sodo*, with a crew of five, was scheduled to depart from the SeaPort Sound Terminal, located on the north side of the Hylebos Waterway, bound for Seattle, Washington. The *Olympic Scout*, with a crew of four, was dispatched to assist the ATB while getting underway and navigating out of the narrow waterway.

Before getting underway, the captain of the *Montlake* radioed the Hylebos Bridge operator requesting that the bridge be opened. Shortly after, at 2333, the *Montlake*/*Sodo* got underway, but the bridge had not yet opened, prompting the captain to again request it be opened. While awaiting the bridge opening, the ATB had to pause, and the bow of the ATB drifted to port, toward the south side of the channel. Once the bridge was opened a few minutes later and the *Montlake*/*Sodo* began to move forward, the ATB was set farther to port.

The *Olympic Scout* was made up on the port bow of the *Sodo*, with its stern facing in the direction of the ATB's travel. Initially, the *Olympic Scout*'s engines were idle and its rudders midship. The *Montlake* captain steered the ATB to starboard attempting to line up for the bridge, but likely due to the drag on the port bow from the *Olympic Scout*, he was unable to move the ATB appreciably to starboard. Consequently, the ATB was on the port side of the channel, not lined up properly with the bridge, with the *Olympic Scout* in danger of hitting the Hylebos Bridge fender.

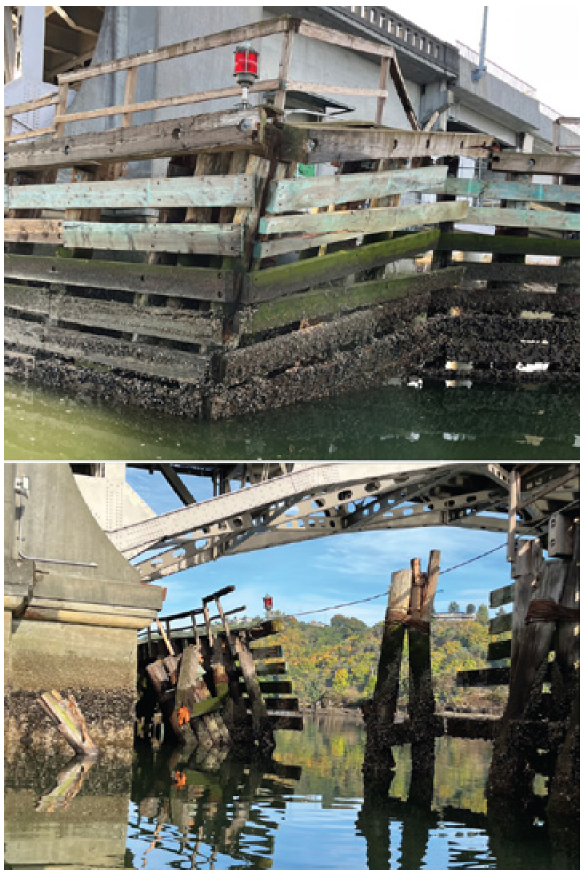


Hylebos Bridge in the open position in 2020.
Background Source: Hardesty & Hanover, LLC.

In an attempt to avoid hitting the fender, the *Olympic Scout* captain had used a starboard twist on his vessel's rudders and engines. Soon after, the *Montlake* captain initiated a port counter twist out of concern that the stern of the *Montlake* would approach the southern bank of the waterway. According to the *Olympic Scout* captain, the starboard twist on his tugboat "wasn't giving us anything." In addition to requiring less effort to turn the ATB, the *Montlake* had almost twice the engine power of the *Olympic Scout* (4,200 hp compared to 2,250 hp). Given the advantages in moment arm and power (turning moment), the *Montlake*'s port counter twist effectively negated the efforts of the *Olympic Scout* to move the ATB's bow back toward the center of the channel. The *Olympic Scout* captain applied progressively more rudder angle and engine speed, and the *Montlake* captain began backing down on his vessel's engines, but, by the time these actions were taken, the fender was too close for the *Olympic Scout* to avoid contact.

At 2341, the *Olympic Scout*'s starboard quarter contacted the fender protecting the south pier of the Hylebos Bridge.

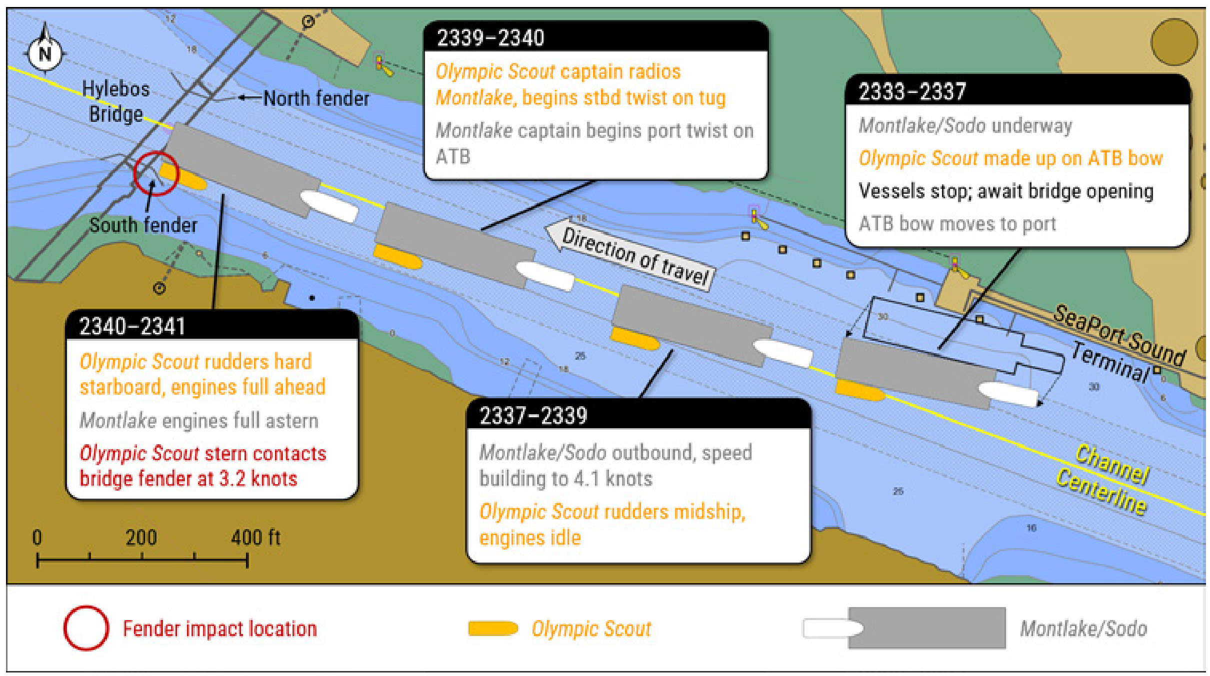
Damage to Hylebos Bridge fender system. *From top*: Displaced center section and damaged dolphin. Broken and missing timber facing boards on eastern and center sections. Source: Coast Guard.



Because of the short distance to the bridge (1,276 feet from the ATB's bow at its berth to the bridge) and the speed of the ATB (4.1 knots), there was insufficient time to correct the lineup before the *Olympic Scout* struck the fender. Given the slim margin of error for making the bridge transit and the short distance to make the approach, slowing or fully stopping the ATB's forward motion earlier would have provided the operators more time to correct the lineup and successfully transit through the opening between the bridge's protective fendering.

The bridge was undamaged during the casualty, but the fender was catastrophically damaged. Precasualty inspections of the bridge's fenders in 2017 and 2022 noted significant deterioration of the fender piles from marine borer damage and fungal decay. A postcasualty inspection found similar damage. It is notable that the entire fender sustained catastrophic damage when the *Olympic Scout* struck it at one end (at an angle—not directly), yet the tugboat sustained almost no damage. The Hylebos Bridge fender system prevented damage to the bridge structure by the *Olympic Scout*; however, the system's degraded condition contributed to its extensive damage.

THE PROBABLE CAUSE of the contact of the assist tugboat *Olympic Scout* with the Hylebos Bridge fender was the captain of the ATB *Montlake/Sodo* not stopping or slowing the ATB's forward motion to correct the ATB's lineup before attempting the bridge transit. Contributing to the severity of damage to the bridge's fender system was the system's deteriorated condition.



Casualty sequence of events. Times of engine speeds and rudder movements are approximate based on crew interviews. Background Source: NOAA ENC US5W22M–Tacoma Harbor, as displayed on Rose Point ECS.

CONTACT

Barge Breakaway from ***Nell Womack*** Tow and Contact with Dock

VESSEL GROUP
Towing/Barge

LOCATION
Lower Mississippi River, mile 727.5,
West Memphis, Arkansas

CASUALTY DATE	ACCIDENT ID
January 29, 2024	DCA24FM022
INJURIES	**ESTIMATED DAMAGES**
None	$500,000
REPORT NUMBER	**ISSUED**
MIR-24-27	September 11, 2024

Nell Womack **on unknown date before the contact.** Source: Wepfer Marine.

Left to right**: The damage to barge *ACBL2549* after the contact (circled), and the damage to the Port of West Memphis dock (circled).** Source: Coast Guard.

On January 29, 2024, about 1230 local time, the towing vessel *Nell Womack* was pushing hopper barges *ACL23401* and *ACBL2549* upbound on the Lower Mississippi River when one of two facing wires connecting the towing vessel to barge *ACL23401* parted. When it became unsafe for the towing vessel to remain attached by one facing wire, the crew released the wire. Both barges drifted downriver, and, at 1240, barge *ACBL2549* struck the Port of West Memphis dock in West Memphis, Arkansas. There were no injuries, and no pollution was reported. Damage to the dock and the barge *ACBL2549* was estimated at $500,000.

About 1135, the *Nell Womack* departed the Wepfer Marine dock in Memphis, Tennessee, with a captain, a steersman, and two deckhands, and maneuvered to a barge staging area located about 2,000 feet away. The deckhands prepared the towing vessel to push a string of two hopper barges, the *ACL23401* and the *ACBL2549*, which were both loaded with steel coils.

The *Nell Womack* was connected to the *ACL23401* with port and starboard facing wires and a center bow line, and the *ACBL2549* was the lead barge. The length of the facing wire from the winch on the towing vessel to the bitt on the barge was about 40 feet. The deckhands visually inspected the 1.5-inch-diameter facing wires and ensured that the tow was properly secured and ready for transit, as per the company's operating procedure. The winches were controlled from the wheelhouse, and the wires were reported as tight before the tow got underway.

About 1144, the captain got the tow underway and navigated it upbound, toward its destination about 16 miles away. The *Nell Womack* was pushing the two barges against a 3-to-5-knot current. At 1230, while the tow was approaching a bend (to the right), the captain, who was at the helm in the wheelhouse, heard a loud "pop." The captain looked out and saw that the starboard facing wire had parted. The current caused the two barges, which were now secured by only a bow line and one facing wire instead of two, to begin turning to port. The captain slowed the towing vessel and steered it to starboard in an attempt to counteract the barges' turn to port. Shortly after, the bow line between the *Nell Womack* and barge *ACL23401* also parted, leaving only the port facing wire connecting the towing vessel to the barges.

The captain and the deckhands tried to gain control of the barges, which continued to swing to port. However, the current pushing the barges to port and downriver caused the towing vessel to roll to port and be dragged by the barges—a situation the captain determined to be dangerous—so he directed the deckhands to disconnect the port facing wire.

After the deckhands disconnected the port facing wire, the two barges, still connected to each other, drifted downriver with the current. The captain maneuvered the vessel in an attempt to regain control of the barges, but, about 1240, roughly 1,200 feet from where the tow became disconnected, barge *ACBL2549* struck the southern corner of the Port of West Memphis dock.

At the time of the breakaway, the facing wires used by the crew of the *Nell Womack* had been in service for about 4 months. The crewmembers visually examined the facing wires each time the towing vessel was moving a barge, in accordance with company policy. The 1.5-inch wires were the correct size for the towing operation and the wires were properly connected to the barge and tightened (no slack) before the tow got underway. Before departing, the crew raised no concerns about the starboard facing wire's condition. As the towing vessel and the barges transited upriver and approached a right bend in the river, the 3-to-5-knot current, acting disproportionately (stronger force) on the starboard side of the lead barge, would have placed additional stress on the point where the *ACL23401* was connected to the *Nell Womack* on the starboard side. Given that there were no visible indications of problems with the condition of the starboard facing wire, it likely parted due to deterioration to its wire strands that was not detected during visual inspections.

THE PROBABLE CAUSE of the breakaway of the barges *ACL23401* and *ACBL2549* and subsequent contact of the barge *ACBL2549* with the Port of West Memphis dock was the parting of the starboard facing wire connecting barge *ACL23401* to the towing vessel *Nell Womack*, likely due to undetected damage to its wire strands.

Parted wire after the breakaway.
Source: Coast Guard.

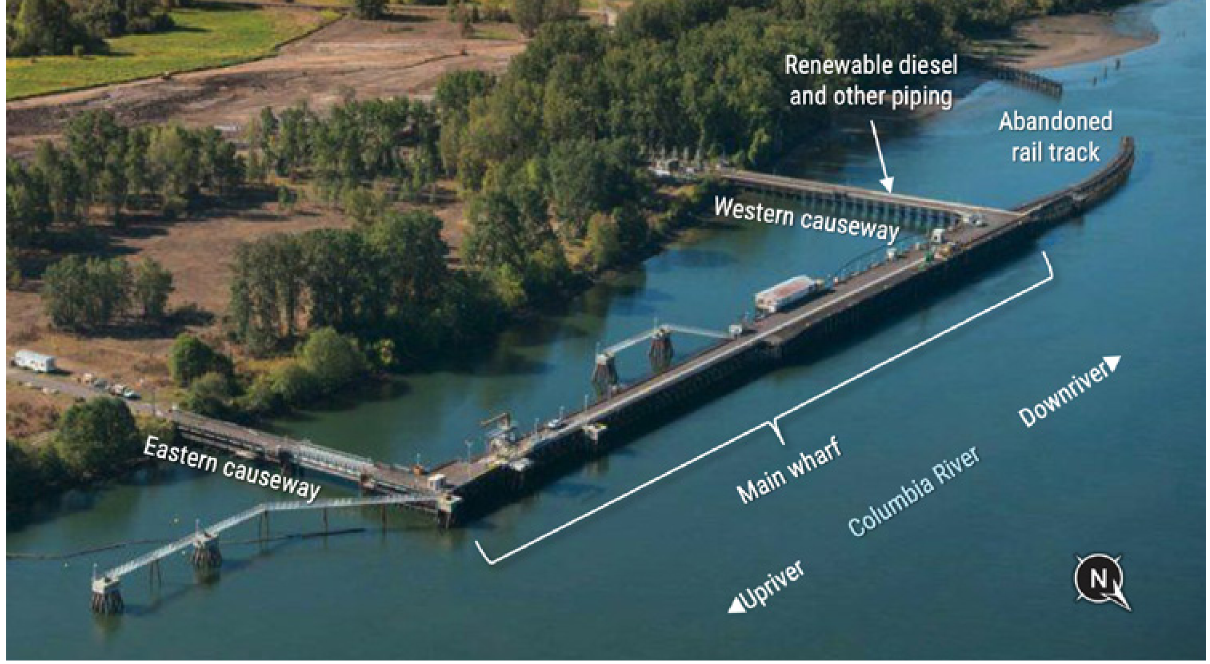
The *Nell Womack* tow arrangement.

CONTACT

Contact of *Cindy B* Tow with Dock

VESSEL GROUP	
Towing/Barge	
LOCATION	
Columbia River, mile 53, near Clatskanie, Oregon	
CASUALTY DATE	ACCIDENT ID
November 12, 2023	DCA24FM010
INJURIES	ESTIMATED DAMAGES
None	$6,047,224
REPORT NUMBER	ISSUED
MIR-24-30	September 23, 2024

***Cindy B* and *St. John* underway after the contact with the Beaver Dock.** Source: Columbia Pacific Bio-Refinery.



The Beaver Dock at an undetermined date before the contact by the *Cindy B* tow.
Background source: Port of Columbia County.

On November 12, 2023, about 0552 local time, the towing vessel *Cindy B* was pushing the loaded deck barge *St. John* upbound on the Columbia River at mile 53 near Clatskanie, Oregon, when the tow gradually moved to starboard out of the navigation channel and struck the Port Westward Beaver Dock. None of the three crewmembers aboard the *Cindy B* were injured. During the cleanup, about 2 gallons of renewable diesel fuel leaked onto the dock from a damaged pipe on the dock, with about 1 gallon going into the river; a portion of the spilled fuel was recovered. Damage to the *St. John* and the Beaver Dock was estimated to be about $6 million.

The *Cindy B* was contracted to tow the *St. John*, hauling aggregate from Westport, Oregon, to Troutdale, Oregon. The job required making several trips, with operations beginning on November 10.

In the early morning on November 12, the *Cindy B* tow was underway upbound on the river with its second load of aggregate. About 0530, the captain asked one of the other crewmembers, deckhand 1, to take the helm while the captain used the lavatory.

At 0544, the *Cindy B* tow began to move to starboard and subsequently exited the main channel at 0548. The tow passed between two sections of the Beaver Dock's abandoned railway structure and then struck the dock's western causeway at 0552. Deckhand 1 later stated that he had fallen asleep, waking only after the tow hit the dock.

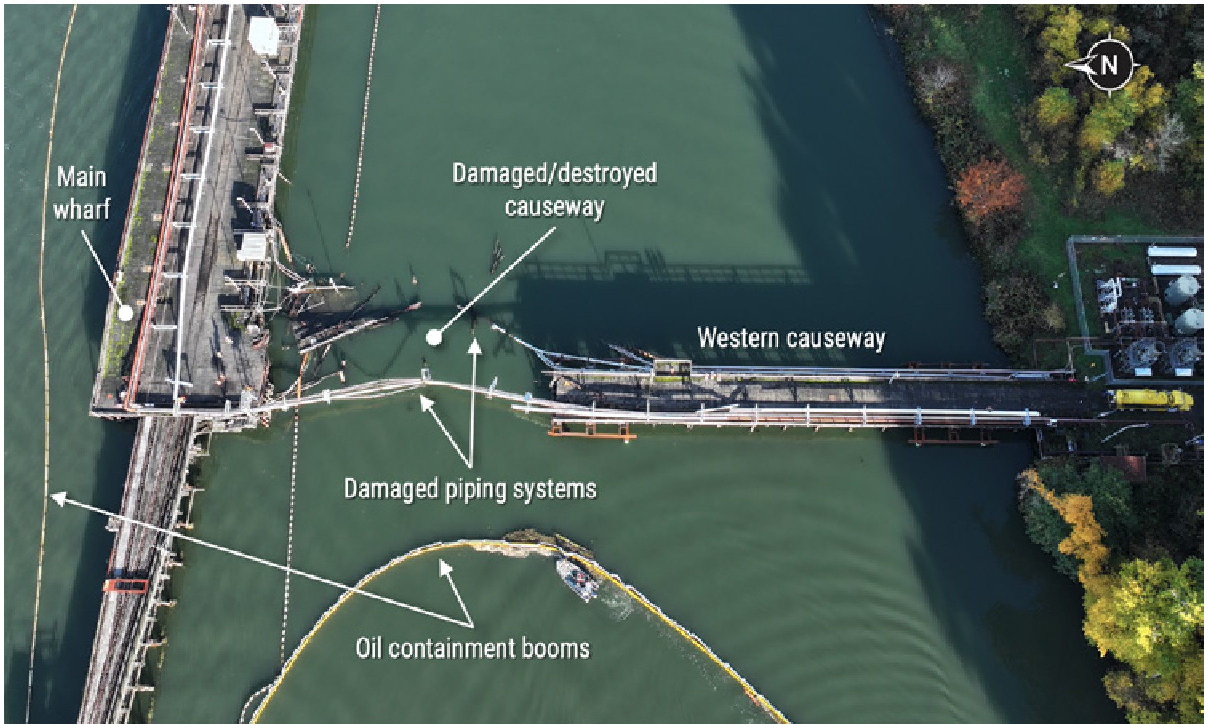
Deckhand 1 fell asleep during the end of his scheduled night watch, which started at 0000 and ended at 0600. Between November 8 and the morning of November 10, deckhand 1 had followed a normal awake/sleep cycle (awake during the day, sleeping at night) and obtained between 7 and 9 hours of uninterrupted sleep. Then, from November 10 until the casualty on November 12, deckhand 1 stood watch from 0000–0600 and 1200–1800, and he reported more-fragmented sleep patterns of just 4–5 hours each off-watch period. When a person changes awake/sleep cycles in order to stand night watches or work night shifts, the person's circadian rhythm, or biological clock, is not synchronized to their new awake/sleep cycle, a condition known as circadian misalignment. The effect is similar to jet lag and may result in excessive sleepiness during watch, at least until the body has adjusted to the change.

The risk of an accident occurring during a night watch was compounded by the fact that the contact occurred during a period considered to be a circadian low (roughly 0200–0600), when the body is normally more fatigued and prone to diminished alertness and degraded performance. The deckhand stated that he did not feel tired before he fell asleep; however, research has shown that self-assessment of fatigue is problematic due to the noted impacts to judgment and decision-making.

To mitigate the risk of an operator becoming incapacitated, including falling asleep, regulations require a pilothouse alerter system on towing vessels like the *Cindy B*. The towing vessel's system was designed to activate successively louder audio and more salient visual alerts when movement was not detected in the wheelhouse for periods of 3, 6, and 10 minutes. Eight minutes elapsed from when the tow began to turn to starboard until it hit the Beaver Dock. Assuming the deckhand fell asleep before the tow began to turn, the alerter's lights and alarms should have activated 3 and 6 minutes after the deckhand had fallen asleep—before the tow struck the dock. However, the system did not alert.

Although postcasualty testing verified that the system operated as designed, during the testing, the vessel captain determined that a VHF microphone hanging by its cord from the wheelhouse overhead could swing and trip the system's motion detectors and reset the system timers, defeating the system and interrupting the activation of any indicators and alarms.

THE PROBABLE CAUSE of the contact of the *Cindy B* tow with the Port Westward Beaver Dock was the deckhand falling asleep at the helm due to fatigue that he did not perceive, which occurred during a night watch, at a low point in his circadian rhythm, and following a change in his awake/sleep cycle. Contributing to the casualty was the pilothouse alerter system not alarming to wake the incapacitated deckhand at the helm because a swinging VHF radio microphone in the motion sensors' field of view defeated the system.



Beaver Dock after contact by the *Cindy B* tow. Background source: Coast Guard.

LESSONS LEARNED:

TRANSITIONING FROM DAYTIME TO NIGHTTIME WORK

Disturbances in awake/sleep cycles caused by transitioning from daytime to nighttime watches or shifts result in increased accidents and occupational mistakes. Although the impacts of these awake/sleep cycle disturbances cannot be fully mitigated, they can be reduced by tools such as pilothouse alerter systems and by allowing longer downtime between watches/shifts.

USING PILOTHOUSE ALERTER SYSTEMS

A pilothouse alerter, when used as intended, is an effective tool that can help ensure that a crewmember remains awake and vigilant while on duty. Established procedures for the operation and use of the system, to include measures to ensure the system cannot be unintentionally reset, help ensure that it operates as designed.

***Left to right*: *Cindy B* pilothouse alerter system motion detector (one of two on board) and strobe light with audible alarm.** Source: WCP Inc.

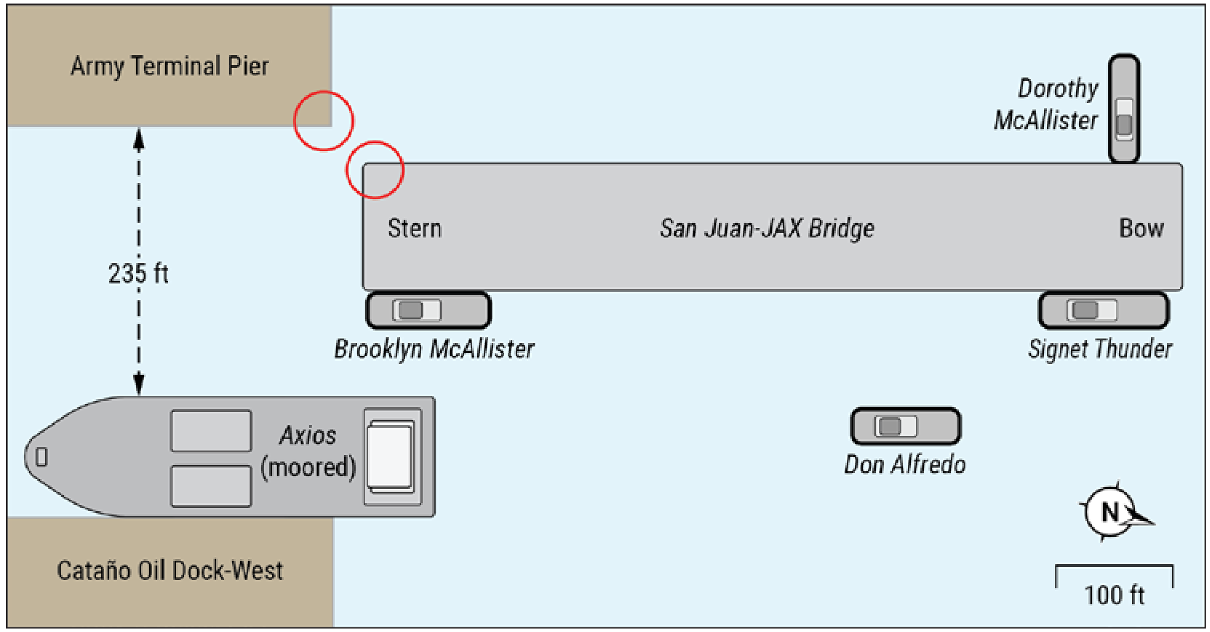
CONTACT

Contact of Barge ***San Juan-JAX Bridge*** with Pier

VESSEL GROUP
Towing/Barge

LOCATION
Army Terminal Pier, Cataño, Puerto Rico

CASUALTY DATE	ACCIDENT ID
June 8, 2023	DCA23FM035
INJURIES	**ESTIMATED DAMAGES**
None	$277,571
REPORT NUMBER	**ISSUED**
MIR-24-32	October 8, 2024



Approximate arrangement of the *San Juan-JAX Bridge*, the assist tugs, and the *Axios* as the barge and tugs approached the dock before the contact (scale approximate). The areas of the barge and pier involved in the contact are circled.

***San Juan-JAX Bridge* moored in Jacksonville, Florida, on unknown date before the contact.**
Source: Trailer Bridge.

On June 8, 2023, about 2130 local time, the freight barge *San Juan-JAX Bridge* contacted the Army Terminal Pier in Cataño, Puerto Rico, while being moored by the ocean tug *Signet Thunder* and three assist tugs. There were no injuries, and no pollution was reported. Damage to the barge was repaired at a cost of $277,571.

On June 3, the *Signet Thunder* left Jacksonville, Florida, towing the *San Juan-JAX Bridge*, en route to Puerto Rico. On June 8, while underway, the *Signet Thunder* suffered a port main engine casualty. The tug's crew repaired the engine and placed it back in service; however, the Coast Guard, after being notified about the engine casualty, required an additional assist tug on arrival until the repairs could be inspected. (In addition to *Signet Thunder*, it would normally take two other harbor tugs to maneuver the barge with its large sail area into the narrow slip.)

After the *Signet Thunder* and *San Juan-JAX Bridge* arrived in San Juan Harbor on the evening of June 8, a docking pilot boarded the barge from one of the assist tugs and prepared to dock the barge, bow out, port side to the pier. He positioned the tugboat *Brooklyn McAllister* on the barge's starboard quarter and the tugboat *Dorothy McAllister* on the port bow. The extra assist tug required by the Coast Guard, the *Don Alfredo*, stood by near the barge. The *Signet Thunder* made up, bow to stern, on the barge's starboard bow. The tugs spun the barge around, stern to the terminal, and attempted to line up parallel to the Army Terminal Pier. They then started to back the barge into the slip and push it alongside.

Across from where the *San Juan-JAX Bridge* barge would moor at the Army Terminal Pier, the chemical tank vessel *Axios*, with a beam of 105 feet, was docked at the Cataño Oil Dock-West. The distance between the

Axios and the Army Terminal Pier was 235 feet. Once the barge, with a beam of 104 feet, was moored, there would be 131 feet separating the two vessels in the slip. During the docking, when tugs (beams of about 34 feet) were assisting, there was even less room to maneuver.

Due to the height of the barge, the captain of the *Brooklyn McAllister* was not able to see the Army Terminal Pier from where his tug was positioned at the barge's starboard quarter. According to the docking pilot, he first instructed the *Brooklyn McAllister*'s captain to keep the barge's stern clear of the *Axios*. However, he then gave instructions intended to move the barge's stern away from the Army Terminal Pier so that the barge would clear the corner of the dock while entering the slip, given a light breeze on the starboard beam. The *Brooklyn McAllister* captain later stated that he had heard the docking pilot's instructions as "ahead and to starboard." The docking pilot stated that he requested and received confirmation that the captain was carrying out his instructions. However, the captain of the *Brooklyn McAllister* maneuvered his vessel in a way that pushed the port quarter of the barge toward the pier, contrary to the docking pilot's intention. The miscommunication resulted in the barge contacting the pier.

THE PROBABLE CAUSE of the contact of the barge *San Juan-JAX Bridge* with the Army Terminal Pier was miscommunication between the docking pilot and an assist tug captain while docking the barge.

***San Juan-JAX Bridge*'s damaged port quarter.**
SOURCE: MCALLISTER TOWING.

CONTACT

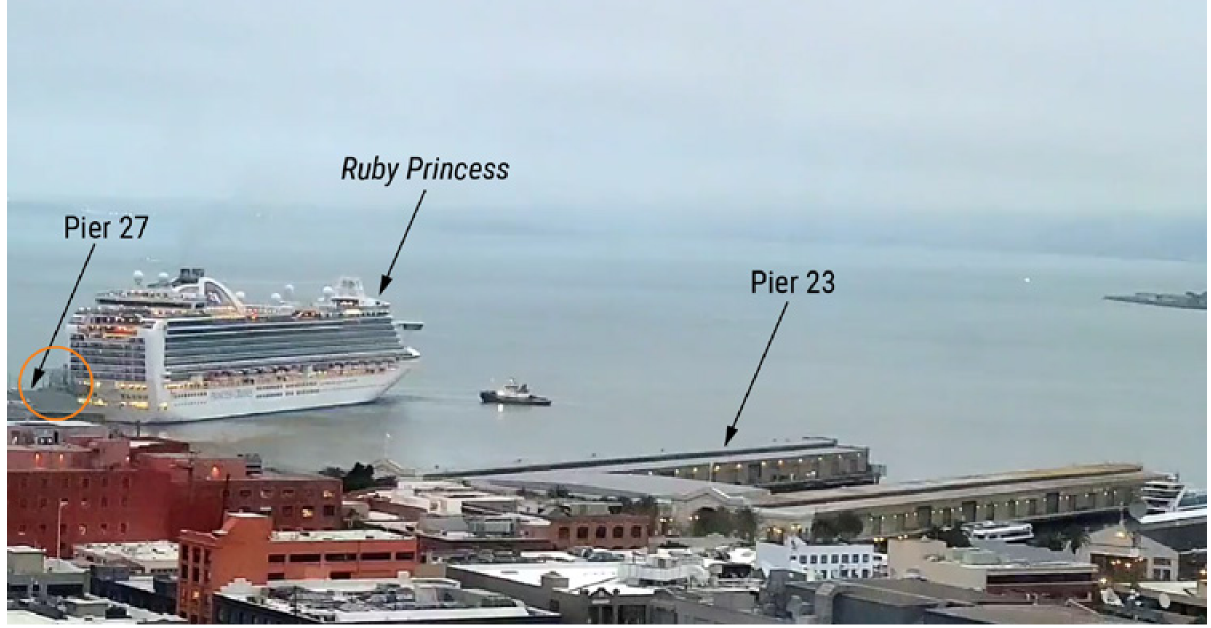
Contact of Cruise Ship ***Ruby Princess*** with Port of San Francisco Pier 27

VESSEL GROUP
Passenger

LOCATION
Pier 27, San Francisco Bay, San Francisco, California

CASUALTY DATE	ACCIDENT ID
July 6, 2023	DCA23FM040
INJURIES	**ESTIMATED DAMAGES**
None	$1.2 million
REPORT NUMBER	**ISSUED**
MIR-24-35	November 7, 2024

***Ruby Princess* underway in San Francisco Bay on September 4, 2023, after the contact.**
SOURCE: ROBERT WHITAKER.



***Ruby Princess* at time of contact (circled) with Pier 27.** BACKGROUND SOURCE: CMPTL FAMILY ON X.

On July 6, 2023, about 0606 local time, the cruise ship *Ruby Princess* was attempting to moor at Port of San Francisco Pier 27 in San Francisco, California, when the vessel's port quarter contacted the pier. There were no injuries, and no pollution was reported. Damage to the vessel and pier was estimated at $1.2 million.

Earlier in the morning that day, the 947-foot-long cruise ship *Ruby Princess* was inbound to San Francisco, about 11 miles west of the Golden Gate Bridge, when a San Francisco Bay pilot boarded the vessel. He and the master held a master/pilot exchange and discussed the planned docking maneuver for their anticipated berth at Pier 27. During the exchange, neither the master nor the pilot expressed concerns about the vessel; they discussed the strong ebb current—calculated to be 2.8 knots—along the waterfront.

The ship had two 28,150-hp (21,000-kW) electric motor-driven main propulsion shafts with fixed-pitch propellers and three bow and three stern thrusters, with all six thrusters online and operating for the docking. Electrical power was provided by a combination of the vessel's six diesel-electric generators (three of its four larger generators and one of its two smaller generators).

The pilot conned the vessel until the ship was southeast of Pier 27 and abeam of (perpendicular to) Pier 23 (the adjacent pier). The master—who had docked at Pier 27 previously—assumed the conn for the final approach to Pier 27. As was required for docking when the ebb current was more than 1.5 knots, two tugs, the *Delta Linda* and *Valor*, were assigned to assist in docking the *Ruby Princess*. The *Delta Linda* had a line attached to its starboard bow, and the *Valor* was standing by off its port quarter (without a line attached).

Anticipating that the strong ebb current near Pier 27 would affect docking, the master and pilot planned an approach that involved rotating the vessel 132° in the space between Piers 23 and 27 so that the "shadow" of Pier 23 would block the current. However, when the master began to rotate the vessel, it wasn't positioned far enough down from the head of Pier 23, leaving the vessel's starboard side exposed to the strong current. The 2.8-knot current accelerated the vessel's lateral movement northward (to port) toward Pier 27, overwhelming the master's ability to maintain control of the vessel's approach to the dock and forcing the *Valor*, which had been positioned off the *Ruby Princess*'s port quarter, to move away from the vessel and dock to avoid contacting the pier. Because the master did not carry out the *Ruby Princess*'s approach as planned (not backed far enough in to be protected from the current by Pier 23), the vessel's stern approached the pier too quickly as the master rotated the vessel.

The master attempted to use the vessel's propulsion and stern thrusters to avoid striking the pier; however, the vessel's lateral movement from the current could not be overcome, and the *Ruby Princess* struck Pier 27.

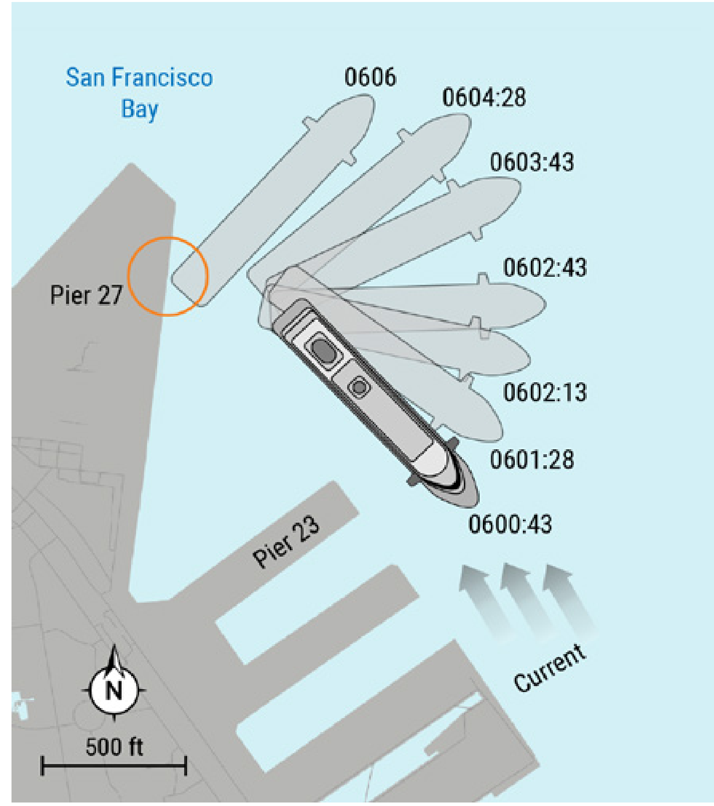
After the contact, the master and pilot took additional measures (reconfigured the *Valor*'s position so it was off the cruise ship's starboard quarter and had a line attached to the stern centerline chock) before again attempting to dock. With these measures in place, they successfully docked the vessel.

THE PROBABLE CAUSE of the contact of the cruise ship *Ruby Princess* with Port of San Francisco Pier 27 was the master not carrying out the approach to the dock as planned to account for the anticipated current.

Pier 27 damage (circled). BACKGROUND SOURCE: KRON4.

Pier 27 damage. BACKGROUND SOURCE: COAST GUARD.

***Ruby Princess* damage.** BACKGROUND SOURCE: COAST GUARD.



***Ruby Princess* positions as the master attempted to rotate the vessel counterclockwise to dock at Pier 27. Scale approximate; two assist tugs not shown.** BACKGROUND SOURCE: GOOGLE MAPS; VESSEL POSITION SOURCE: *RUBY PRINCESS* VDR.

FIRE/EXPLOSION

Fire aboard Fishing Vessel ***Marlins II***

VESSEL GROUP
Fishing

LOCATION
Westhaven Marina, Westport, Washington

CASUALTY DATE	ACCIDENT ID
March 9, 2023	DCA23FM020

INJURIES	ESTIMATED DAMAGES
None	$950,000

REPORT NUMBER	ISSUED
MIR-24-05	March 7, 2024

Fishing vessel *Marlins II* at the dock on unknown date before the fire.
SOURCE: KYLE STUBBS, MARINETRAFFIC.COM.

The burned-out *Marlins II* after the fire. SOURCE: BLOMQUIST MARINE SURVEYS.

On March 9, 2023, about 1808 local time, a fire was reported on the fishing vessel *Marlins II*, which was moored at a dock in Westport, Washington, with no one on board. The local fire department extinguished the fire. No pollution or injuries were reported. Damage to the vessel was estimated at $950,000.

The day before the fire, the *Marlins II*, a 91-foot commercial fishing vessel, arrived alongside the Westhaven Marina dock after returning from a 3-day fishing trip. The crew worked late into the evening freezing their catch of hagfish before being sent home by the captain, who was also the owner, sometime after 0200. The captain remained on the vessel and went to bed.

Later that morning, the captain awoke, secured the vessel's electrical generator, and connected the vessel to shore power. Other vessel machinery systems, including the main engines and catch refrigeration system, had already been secured.

The shore power for the vessel was supplied from a pedestal located at the end of the dock. A 30-amp shore power cord led from the pedestal down the dock to the vessel. The captain attached an adapter to the end of the shore power cord to aid in the connection of two 15-amp, standard, three-prong, general-purpose extension cords that ran onto the vessel. One cord ran down into the vessel's engine room to power a 110-volt bilge pump. The second cord ran into the vessel's galley to provide 110-volt power to a light, a household refrigerator, and a chest freezer.

To avoid running the galley extension cord through a door opening, the captain ran it underneath the vessel's hydraulic tank, down into the engine room, and then back up into the galley through a deck penetration; if it was left in place between uses, it is unlikely that the extension cord could have been effectively inspected for damage before each use.

The captain said that to power the galley appliances while at the dock, he would unplug the appliances in the galley from their wall receptacles and plug them into the extension cord. He had been using this electrical configuration for several years without incident.

About 1130, the captain departed the vessel, leaving it unoccupied. At 1808, the local shoreside fire department was notified that there was a vessel on fire at the Westhaven Marina. Thirteen minutes later, the fire department arrived on scene and discovered the ***Marlins II*** on fire. The captain received a call from the marina operator that his vessel was on fire, and he immediately returned to the dock.

The ***Marlins II*** had a hull and superstructure of steel construction; however, the vessel's internal accommodation spaces were wood framed and paneled. Initially, smoke and flames appeared to be coming from the vessel's galley area. The fire eventually spread to the remainder of the accommodation spaces and the wheelhouse. The fire department extinguished the fire at 2113.

A certified fire and explosions investigator ruled out that the fire started from discarded smoking materials, a lightning strike, or from an issue with the shoreside power supply. He concluded that the fire originated from within the vessel's galley near a chest freezer that had been plugged into an extension cord and energized before the fire. The examination report stated that the cause was most likely a failure of the extension cord that was powering the freezer.

THE PROBABLE CAUSE of the fire on board the fishing vessel *Marlins II* was the failure of an extension cord used to energize galley appliances when on shore power.

***Right*: *Marlins II* at the dock during firefighting efforts.**
Source: South Beach Regional Fire Authority.

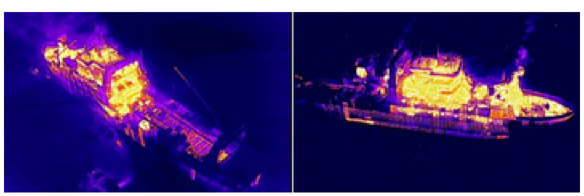
FIRE/EXPLOSION

Fire aboard Commercial Fishing Vessel ***Kodiak Enterprise***

VESSEL GROUP Fishing	
LOCATION Trident Seafoods facility, Pier 25, Tacoma, Washington	
CASUALTY DATE April 8, 2023	ACCIDENT ID DCA23FM026
INJURIES None	ESTIMATED DAMAGES $56.6 million
REPORT NUMBER MIR-24-10	ISSUED April 15, 2024

***Kodiak Enterprise* before the fire.**
Source: Trident Seafoods.

Thermal images of the fire within the *Kodiak Enterprise* on April 11, taken from a drone.
Source: Resolve Marine.



***Kodiak Enterprise* during firefighting efforts.** Source: Coast Guard.

On April 8, 2023, about 0300 local time, a fire was discovered on the commercial fishing vessel *Kodiak Enterprise* while the vessel was docked at the Trident Seafoods facility in Tacoma, Washington. The fire burned for 6 days before first responders declared it extinguished on April 14. No pollution or injuries were reported. The *Kodiak Enterprise*, which was declared a total loss, had an estimated value of $56.6 million.

A couple weeks earlier, the *Kodiak Enterprise* docked at the Trident Seafoods facility in the Port of Tacoma, Washington, for a scheduled overhaul. Four crewmembers (the chief engineer, assistant chief engineer, electrician, and a wiper) lived on board the vessel during the overhaul.

In the early morning hours of April 8, the crew was asleep, and the electrician had left the vessel. No one noted any issues of concern. About 0300, the deckhand on board a nearby docked passenger vessel saw smoke rising from the bow of the *Kodiak Enterprise* near the deck locker door on the 02 deck and smelled what he described as burning wood. At 0306, facility security camera footage showed light smoke coming from the vessel. By 0308, the smoke was heavier.

The vessel had a fire detection and notification system that was designed to send an alarm via text or email when it was set for in-port operation. The director of marine engineering, the chief engineer, and the assistant chief engineer thought the system was turned on and properly working the night of the fire. However, neither of the system's shoreside contacts (the security guard and the Trident Seafoods director of marine engineering) received an alert message.

At 0310, the deckhand from the nearby vessel ran to inform the Trident facility security guard of the fire. At 0319, the security guard called 911 and then contacted Trident to inform them of the fire. Trident then informed the chief engineer on the *Kodiak Enterprise*.

Because the crewmembers living on board were not listed among the notification system's designated contacts, they did not receive a notification from the fire detection and notification system. Additionally, because the system was not designed to alarm audibly throughout the vessel, they would not have heard an alarm while in their quarters. By the time the crewmembers were notified of the fire, it had spread from the dry stores room on the 02 deck into the deck locker and the galley and mess area on the 01 deck. Had the fire detection and notification system operated as intended, the crewmembers would have had greater time to evaluate and potentially attempt to extinguish the fire.

Local firefighters arrived at 0327 and quickly shifted to a defensive posture. The fire burned for 6 days before responders were able to completely extinguish it.

After the fire, investigators examined the deck locker, mess, galley, and dry stores room; they found more “specific and isolated damage” in the dry stores room, meaning the dry stores room was likely the area of origin for the fire.

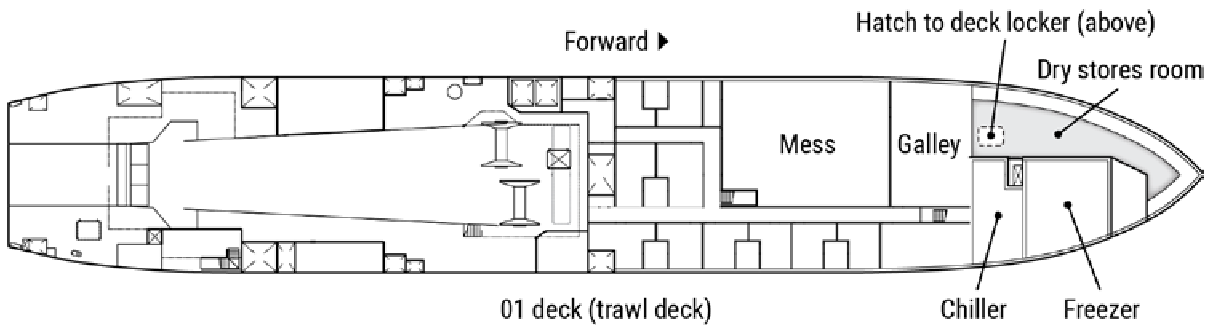
Due to the extensive damage, investigators from both the NTSB and the ATF could not definitively determine the cause of the fire within the dry stores room. Although hot work was conducted on the vessel about 11 hours before the fire was observed, it did not occur in the dry stores room. Additionally, had a fire in the dry stores room started due to the hot work, it likely would have been detectable. However, based on the safety procedures, including a postwork inspection of the project areas, and the timing and location of the fire, investigators ruled out hot work as the cause of the fire.

Investigators considered other potential ignition sources, including improperly extinguished smoking material, the chiller compressors, light fixtures, the clothing washer and dryer, and all electrical outlets in the space. Based on the number of electrical items in the space—and therefore the number of items that could have failed—and the lack of other potential ignition sources, the fire was likely caused by an unknown electrical source.

THE PROBABLE CAUSE of the fire aboard the *Kodiak Enterprise* was an unknown electrical source within the dry stores room. Contributing to the risk to the onboard crewmembers and to the severity of the fire was the vessel’s inadequate fire detection and notification system, which was not designed to sound in crew accommodation spaces, and failed to wirelessly alert shoreside contacts.

The dry stores room, looking forward, before and after the fire.
SOURCES (*LEFT TO RIGHT*): TRIDENT SEAFOODS, COAST GUARD.

Plan view of the *Kodiak Enterprise* 01 deck showing the dry stores room, where the fire most likely originated.
BACKGROUND SOURCE: TRIDENT SEAFOODS.



LESSONS LEARNED:

IN-PORT FIRE DETECTION AND NOTIFICATION SYSTEMS

Vessel wireless monitoring and notification systems with an “in-port” setting notify operators of a potential emergency when a vessel is moored at the dock and crews are not standing a 24-hour watch. Vessel operators should test the system on a set schedule to ensure it properly notifies the recipients of the alert. When the vessel is undergoing repair work that can cause false alarms, such as hot work, crewmembers should check the fire detection and notification system to ensure it is operating following the completion of work. Additionally, crewmembers living or staying on board a vessel while it is in port should be included on the system’s designated contacts to be notified immediately in case of a fire or other emergency.

FIRE/EXPLOSION

Fire aboard Passenger Vessel ***Lady Delray***

VESSEL GROUP
Passenger

LOCATION
Veterans Park, Intracoastal Waterway, Delray Beach, Florida

CASUALTY DATE	ACCIDENT ID
April 12, 2023	DCA23FM028
INJURIES	**ESTIMATED DAMAGES**
None	$500,000
REPORT NUMBER	**ISSUED**
MIR-24-13	May 20, 2024

Lady Delray **docked on unknown date before the fire.**
SOURCE: TRIPADVISOR.COM.

***Left to right*: *Lady Delray* after the fire, with fire-damaged portside window and portside main deck bar area.**

On April 12, 2023, about 0015 local time, the small passenger vessel *Lady Delray* was moored, unattended and locked up, alongside the dock at Veterans Park on the Intracoastal Waterway in Delray Beach, Florida, when a bystander on shore reported a fire on board the vessel. The local fire department responded to the scene and extinguished the fire. The vessel was later towed to a boatyard for repairs. No pollution or injuries were reported. Damage to the vessel was estimated at $500,000.

At the time of the fire, the vessel's electrical system was supplied by 110-volt shore power. A panel on the dock fed 70-amp service to the vessel via a power cord, which was plugged into an outlet on the vessel. On the night of the fire, the only circuits energized were some vessel lighting for security purposes, a security and CCTV system, and the galley refrigerators and freezers (including a two-door, keg-type refrigeration unit). According to the owner, this was a typical electrical configuration while the vessel was at the dock.

According to the state fire investigator's examination report, the fire originated near a corrugated grill located on the lower right-hand side of the rear of the keg-type refrigeration unit in the vessel's bar area. The report attributed the cause of the fire to the refrigeration unit's motor (the hermetically sealed compressor) overheating due to improper ventilation. Improper ventilation can be caused by insufficient clearance in front of the unit. However, there were 6 inches of clearance between the rear of the refrigeration unit and the bulkhead, and the user manual for the unit did not require any clearance for the unit to operate correctly. Therefore, the 6 inches of clearance exceeded the manufacturer's installation requirement and would have provided ample space for ventilation.

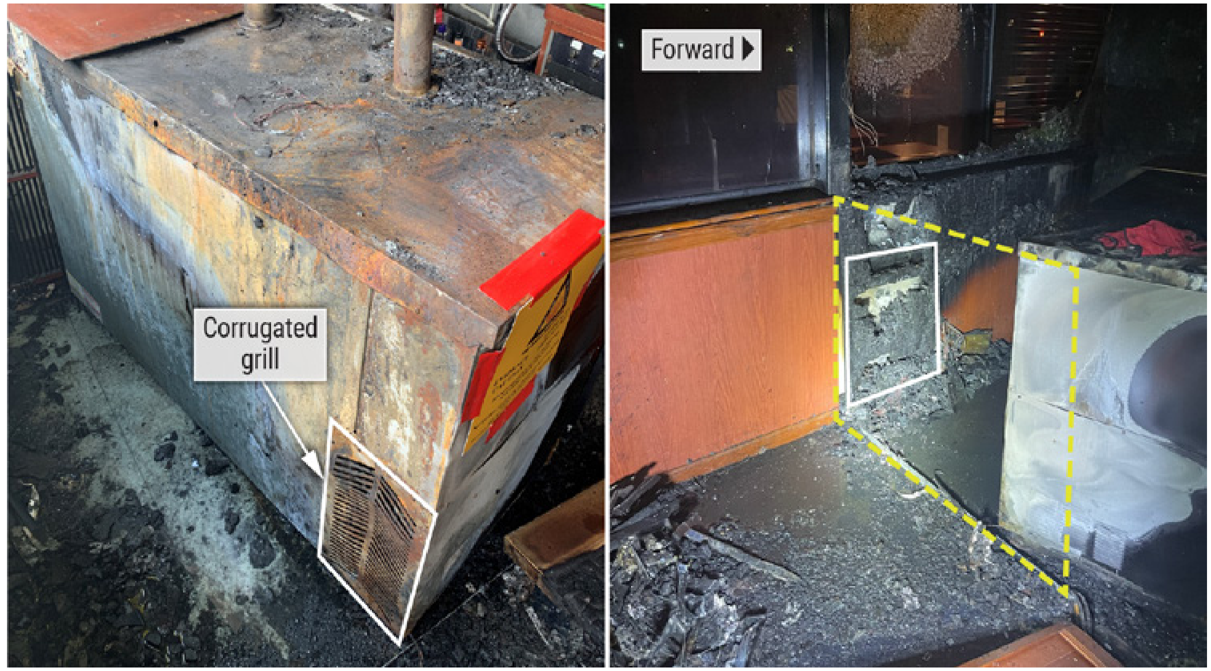
Improper ventilation can also be caused by the accumulation of dirt, which fouls the unit's condenser coils. The owner did not regularly inspect or clean the refrigeration unit's condenser coils, as recommended in the user manual to prevent compressor failure. If dirt accumulated on condenser coils, the heat transfer through the coils would have decreased, and the fan blowing air across the coils would have removed less heat from the unit, causing the unit to run longer/more often, maintain temperature insufficiently, and potentially fail due to the compressor overheating. However, according to the owner, the refrigeration unit had not experienced any of these issues; it had been operated periodically during the 6-month layup and had operated without issue for over 4 years. Therefore, insufficient ventilation due to lack of clearance behind the refrigeration unit or fouling of the unit's condensing coils is unlikely to have caused the fire.

A failure of the refrigeration unit's hermetically sealed compressor or an electrical fault could have caused the fire. If the compressor had overheated and failed, the oil and hydrocarbon refrigerant internal to the unit would have been released and, given sufficient heat, would have ignited and caused a fire. However, when the NTSB's investigation report was published, the forensic examination of the compressor and refrigeration unit's internal components had not been completed, and no conclusion regarding the components could be made about whether the compressor failing led to the fire.

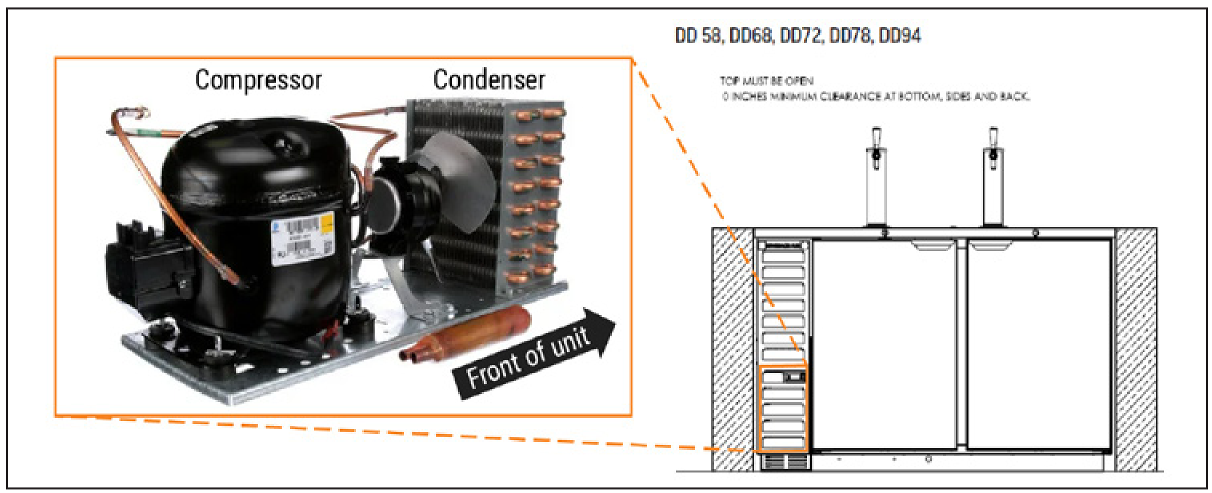
Within the ***Lady Delray*** fire-origin area was a 110-volt electrical receptacle that the refrigeration unit and the vessel's security system were both plugged into. If there was an electrical fault—such as a loose, broken, or frayed wire, or broken receptacle hardware—within the receptacle or nearby circuitry, it could have created excessive resistance heating, which may have led to the ignition of nearby combustibles. However, because responders opened all the vessel's breakers after the fire, it is unknown whether this breaker tripped. Without conclusive evidence, the cause of the fire aboard the ***Lady Delray*** remains undetermined.

Once an ignition source was produced, combustible materials—wood paneling, insulating material, and the carpet—near the fire's origin (the refrigeration unit) caught fire. These materials provided a path for the fire to expand from the bulkhead behind the refrigeration unit into the overhead.

THE PROBABLE CAUSE of the fire on board the passenger vessel *Lady Delray* was either the failure of a two-door, keg-type refrigeration unit's hermetically sealed compressor or an unknown electrical source in the bulkhead directly behind the unit, which ignited wood paneling and other nearby combustible materials.



***Left to right*: Origin area of the fire on corrugated grill (outlined) on main deck bar refrigeration unit, with fire pattern mirrored (outlined) on portside bulkhead. The area of a cabinet end panel in place prior to the fire is indicated by a dashed line.** SOURCE: FLORIDA BUREAU OF FIRE, ARSON, AND EXPLOSIVES.



Exemplar hermetically sealed compressor and condenser coil unit similar to the two-door, keg-type refrigeration unit installed aboard the *Lady Delray*. The condenser end of the unit (outlined and shown in inset) would have been directly behind the grill on the front of the refrigeration unit. BACKGROUND SOURCE: BEVERAGE-AIR.

FIRE/EXPLOSION

Fire aboard Passenger Vessel ***Qualifier 105***

VESSEL GROUP Passenger	
LOCATION Northern Enterprises Boat Yard, Homer, Alaska	
CASUALTY DATE January 19, 2023	ACCIDENT ID DCA23FM015
INJURIES None	ESTIMATED DAMAGES $1.2 million
REPORT NUMBER MIR-24-15	ISSUED June 28, 2024

Qualifier 105 **underway on an unknown date before the fire.** Source: Support Vessels of Alaska.

Qualifier 105 **on fire in the boatyard.** Source: Homer Volunteer Fire Department.

On January 19, 2023, about 1155 local time, a fire started in a stateroom below the main deck of the small passenger vessel *Qualifier 105*, which was being stored ashore for the winter, on blocks, in the Northern Enterprises Boat Yard in Homer, Alaska. The local fire department responded and extinguished the fire. No pollution or injuries were reported. The owners declared the vessel a constructive total loss. Damages were estimated at $1.2 million.

The fire started in stateroom J, below the main deck of the *Qualifier 105*, and was discovered by a crewmember who was serving as the fire watch. At the time the fire started, welders were on board performing aluminum hot work, cleaning up the area around a fuel tank that had been repaired and tested the day before, and reinstalling the deck in a head that was directly above the fuel tank.

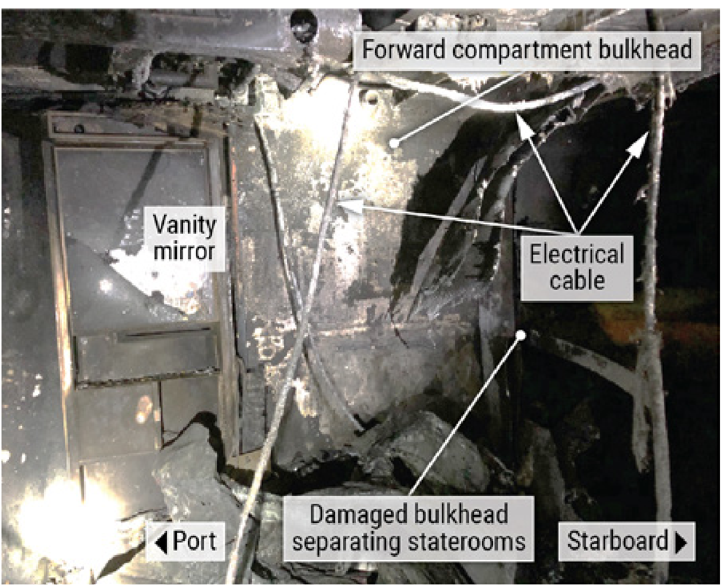
The welding machine's power cable ran up from the engine room hatch aft on the main deck, then forward, through the salon door, down the emergency escape hatch for the aft stateroom compartment, and then to stateroom J. The wire for the spool gun ran from the welding machine in stateroom J, through the passageway, to the head where the welding was taking place.

While hot work can generate sparks and molten material that can ignite combustible materials, the two welders, who were working 8 feet from stateroom J, did not find any signs of a fire after or while conducting their work. Therefore, the hot work was not the source of the fire.

The fire watch and welder 1 each saw a small flame on two different bunks in stateroom J—the first sign of a fire observed. Those small flames were likely caused by hot droplets of plastic sheeting—used to protect the carpet-covered, plywood drop ceiling above—that had melted and caught fire from heat or fire between the aluminum overhead and the drop ceiling. Therefore, it is likely that the initial ignition source and the eventual fire in stateroom J originated from the overhead.

Welder 1 discharged a fire extinguisher into stateroom J. He then left the vessel, using the stairs to the salon, and exited through the aft salon doors. Within a minute, the entire salon was engulfed in flames. The accommodation spaces contained combustible materials—including carpet, wood framing, and plastic sheeting—in the overhead and on the bulkheads that had further fueled the fire.

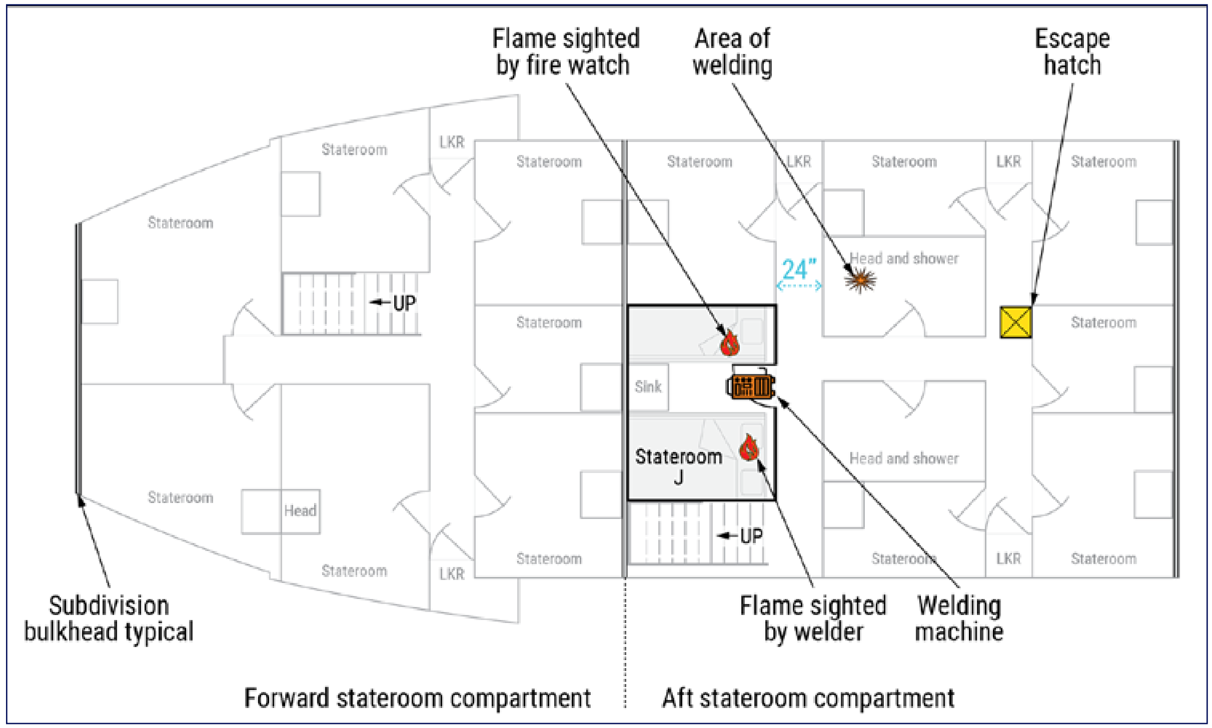
Stray welding current—a fault condition where current goes through unintended conductors, such as metal framing or wires, and back to the return terminal of a welding machine—can result in heating and cause fires. On board the *Qualifier 105*, the welding machine work clamp (the return current clamp) was connected to an aluminum cross member below the deck in stateroom J, about 10 feet from the point of welding. The return current had to travel through the vessel's aluminum structure and/or conducting wires from the spool gun's electrode back to the work clamp. The aluminum structure would have served as a conductor, and the resulting current in the structure may have found its way into the vessel's electrical system.



Qualifier 105 **stateroom J interior postfire.**
BACKGROUND SOURCE: COAST GUARD.

An electrical wire in the overhead of stateroom J could have served as an unintended conductor and become overheated and eventually led to a fire. However, investigators could not definitively determine that stray welding current caused wires to overheat. Additionally, there were several wires and electrical boxes in stateroom J that may have been energized and become a potential electrical ignition source due to a fault. Therefore, the exact ignition source could not be determined.

THE PROBABLE CAUSE of the fire aboard the passenger vessel *Qualifier 105* was an undetermined electrical source that ignited a stateroom ceiling. Contributing to the extent of the fire damage was the substantial use of combustible materials composing the stateroom ceilings and bulkheads throughout the vessel's accommodation spaces.



Qualifier 105 **forward and aft stateroom compartments.**

LESSONS LEARNED:

TAKING PRECAUTIONS FOR STRAY WELDING CURRENT

Stray welding current is a fault condition in which current goes through unintended conductors and back to the return terminal of a welding machine; it can cause fires by overheating wires. To avoid potential fires caused from stray welding current, maintenance personnel, owners, and operators should follow industry practice to place the work clamp (the return current clamp) of the welding machine as close as possible to the point of welding.

FIRE/EXPLOSION

Engine Room Fire on board Passenger Ferry ***Sandy Ground***

VESSEL GROUP
Passenger

LOCATION
Anchorage Channel, New York Harbor, near Staten Island, New York

CASUALTY DATE	ACCIDENT ID
December 22, 2022	DCA23FM010
INJURIES	**ESTIMATED DAMAGES**
None	$12.7 million
REPORT NUMBER	**ISSUED**
MIR-24-17	July 9, 2024

***Sandy Ground* docked after the fire.**

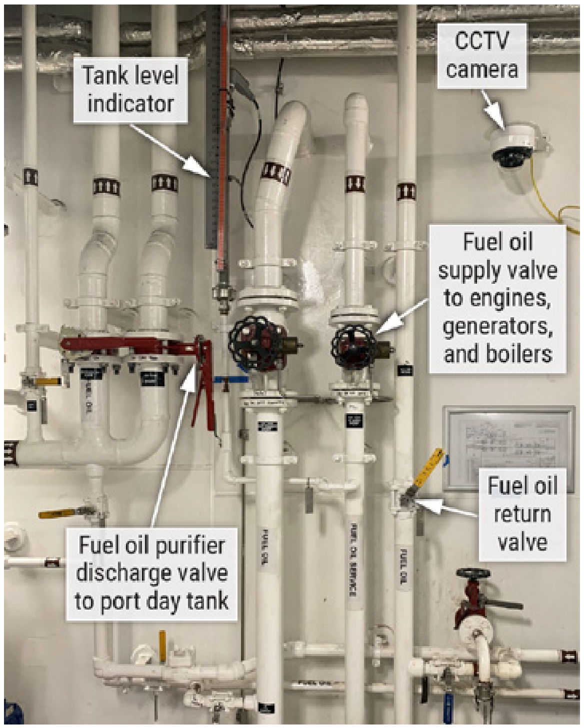
Evacuation of passengers (faces obscured) from the *Sandy Ground* to the *Franklin Delano Roosevelt*.
Source: NYCDOT Ferry Division.

On December 22, 2022, about 1654 local time, an engine room fire broke out aboard the passenger ferry ***Sandy Ground*** while the vessel was underway in Anchorage Channel, New York Harbor, near Staten Island, New York, with 884 persons aboard. The crew extinguished the fire by activating the engine room's fixed fire extinguishing system. The vessel lost propulsion and electricity, and the crew deployed both anchors. The majority of the passengers transferred to responding Good Samaritan vessels; the ***Sandy Ground*** was towed to the St. George Ferry Terminal in Staten Island, where the remaining persons on board disembarked. There were no injuries, and no pollution was reported. Damage to the vessel was estimated at $12.7 million.

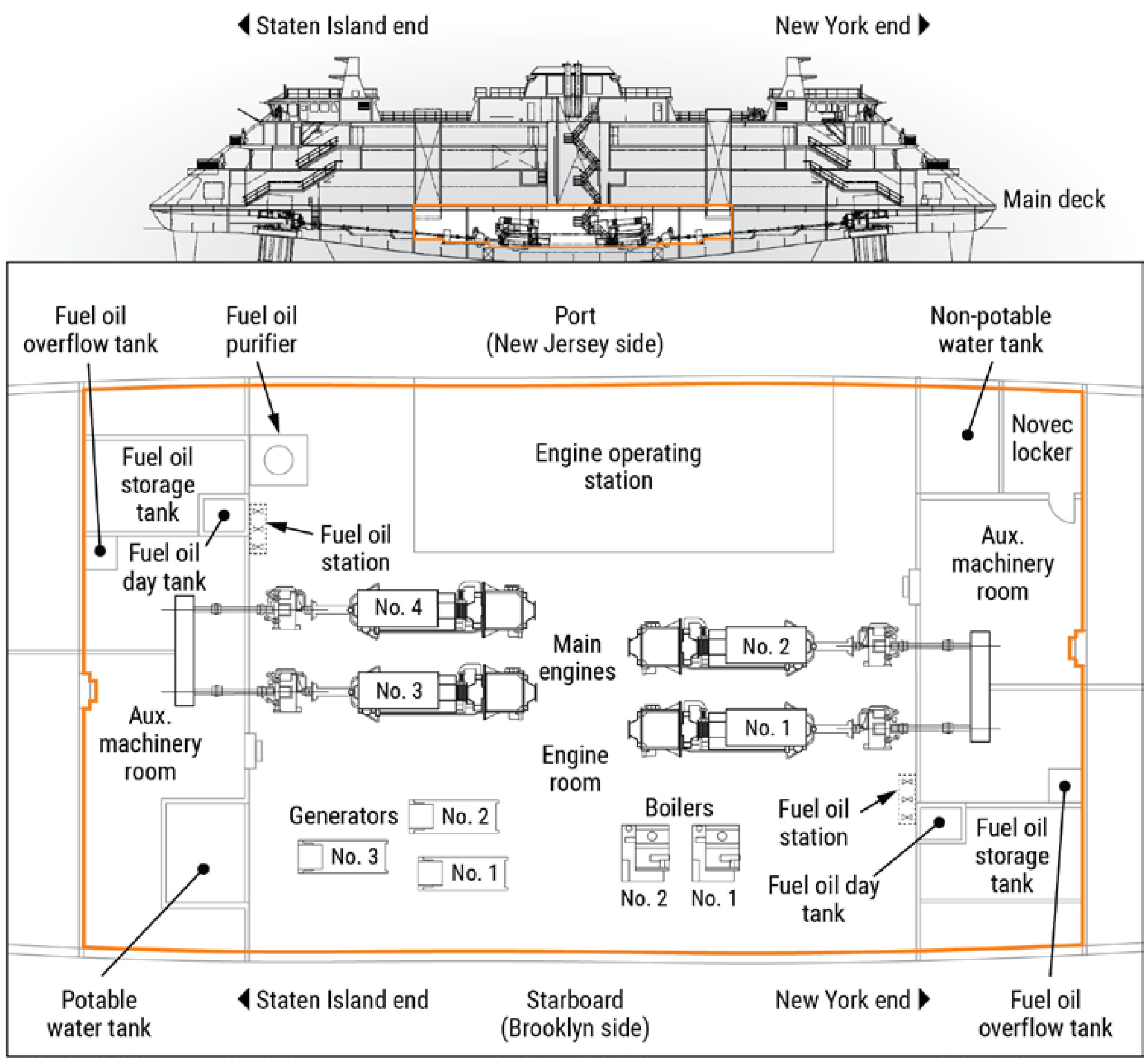
As the ***Sandy Ground*** operated throughout the day on December 22, completing transits between Staten Island and Manhattan, the four operating diesel propulsion engines, one electrical generator, and one boiler consumed fuel oil drawn from two fuel oil day tanks. To operate the fuel oil system and maintain the levels in the day tanks, the engineering crewmembers had to monitor the levels in the vessel's day tanks (port and starboard), and, if needed, adjust fuel oil system valves to keep the levels relatively equal (within a few hundred gallons). The engineering crewmembers obtained tank levels remotely via an MCS in the EOS as well as locally at each tank's sight glass during engine room rounds.

When the afternoon engineering watch took over from the morning watch at 1430, the MCS indicated a difference of 5 gallons between the two day tanks. Over the next four transits and during the casualty transit, as the ferry continued to operate, the engineering crewmembers observed substantial differences in the fuel oil levels of the vessel's two fuel oil day tanks (about 1600, the MCS logged a difference of about 550 gallons between the port and starboard fuel oil day tanks). Additionally, the total amount of fuel oil in the day tanks (combined amount) decreased steadily.

From 1606 to 1640, at the chief engineer's direction, the oilers attempted to balance the levels of the two fuel oil day tanks. They adjusted several valves at both fuel oil stations and adjusted the fuel oil service supply globe valve to the engines, generators, and boilers on the port day tank several times. They also adjusted the fuel oil purifier discharge valves and the fuel oil return isolation ball valves to both day tanks. In their ongoing response to correct the divergence in the fuel oil day tank levels, the oilers closed both the port and starboard day tank fuel oil return isolation ball valves, causing the fuel oil system to overpressurize.



Fuel oil piping at the port (Staten Island end) fuel oil station aboard *SSG Michael H. Ollis*, which was a vessel of the same class as the *Sandy Ground* and had a similar piping arrangement (*SSG Michael H. Ollis* piping shown due to postfire condition of *Sandy Ground* fuel oil station). The fuel oil return valve is a ball-type valve. Note the valve is partially closed (ball valve open-to-close range is 90° and indicated by handle position).

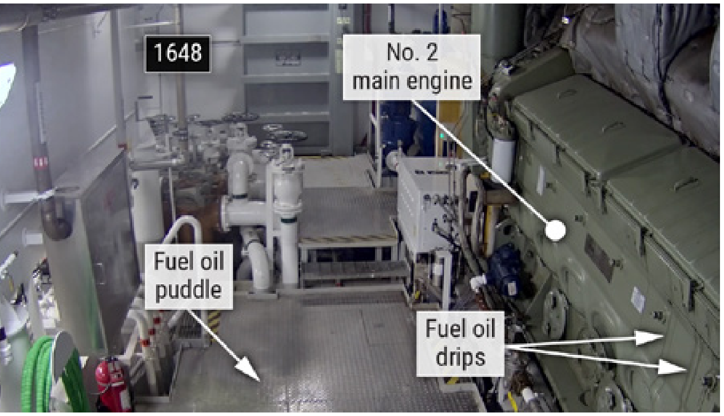


***From top*: *Sandy Ground* inboard profile with engine room highlighted. Layout of *Sandy Ground* machinery spaces and fuel oil tanks.** Background source: NYCDOT Ferry Division.

About 1642, the *Sandy Ground* departed Manhattan for its scheduled southbound transit to Staten Island. About 1647, multiple alarms for all four main engines sounded simultaneously on the MCS, including high fuel oil filter pressure differential alarms; low fuel oil pressure alarms; and "check engine" alarms.

The chief engineer began acknowledging and silencing alarms on the MCS computer. He stepped out into the engine room and saw fuel oil leaking from the no. 2 main engine secondary duplex spin-on fuel filter assembly and that nos. 3 and 4 main engines had "fuel on them." The oilers, who were in the engine room at this time, told the chief engineer they observed fuel oil spraying from the nos. 3 and 4 main engines.

The chief engineer called the pilothouse and advised the assistant captain, who was navigating the vessel, of the fuel oil spraying from the engines, stating that they were going "to lose the plant, I'm going to shut down the plant." Oiler 1 attempted to use absorbent pads to contain the fuel oil spray, but the "pressure was so much that [he] could not hold it."



***Above*: Fuel oil dripping onto the no. 2 main engine and on the adjacent deck in the lower engine room (looking toward the New York end) at 1648.**
BACKGROUND SOURCE: NYCDOT FERRY DIVISION.

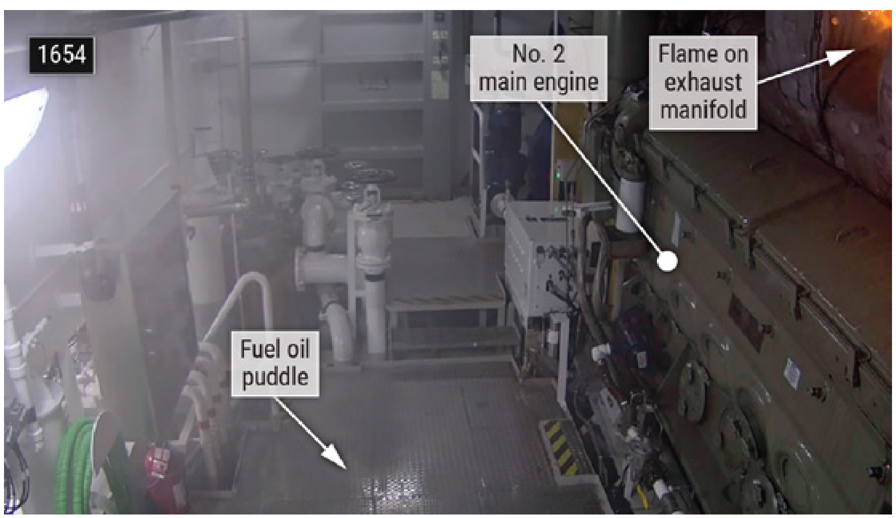
At 1654, when the ***Sandy Ground*** was near buoy 30 in Anchorage Channel, CCTV footage showed a fire breaking out on the exhaust manifold of the no. 2 main engine.

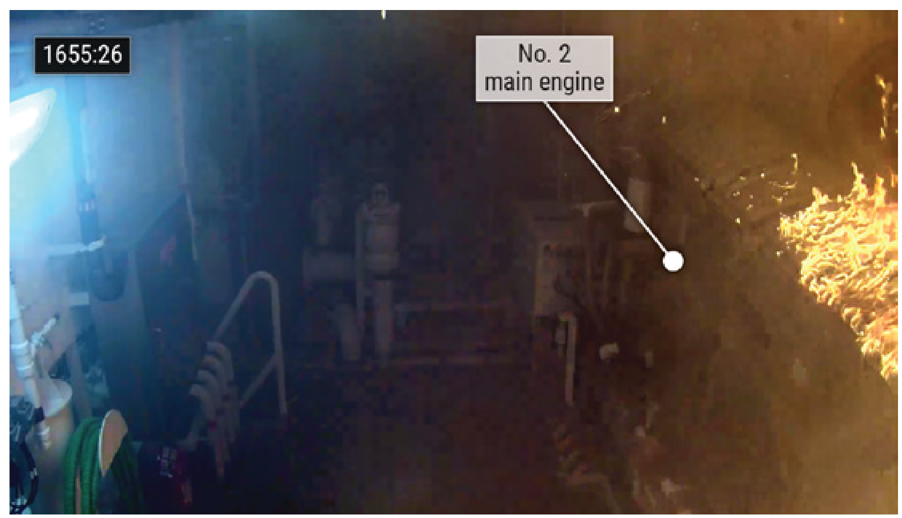
The ***Sandy Ground*** crew responded to the fire by anchoring the vessel, making an emergency broadcast over VHF radio—alerting nearby vessels and VTS to the situation—and distributing lifejackets to passengers. Additionally, the deck crew remotely shut down the engine room ventilation fans and closed their dampers, sealing off the engine room and containing the fire. The chief engineer then activated the emergency fuel oil shutoff valves in the EOS for the fuel oil day tanks, eliminating further fuel oil supply to the engine room, and released the Novec fixed firefighting system, which successfully extinguished the fire. The emergency generator automatically started but tripped offline when a control cable was damaged in the fire. As a result, the vessel lost propulsion and electricity.

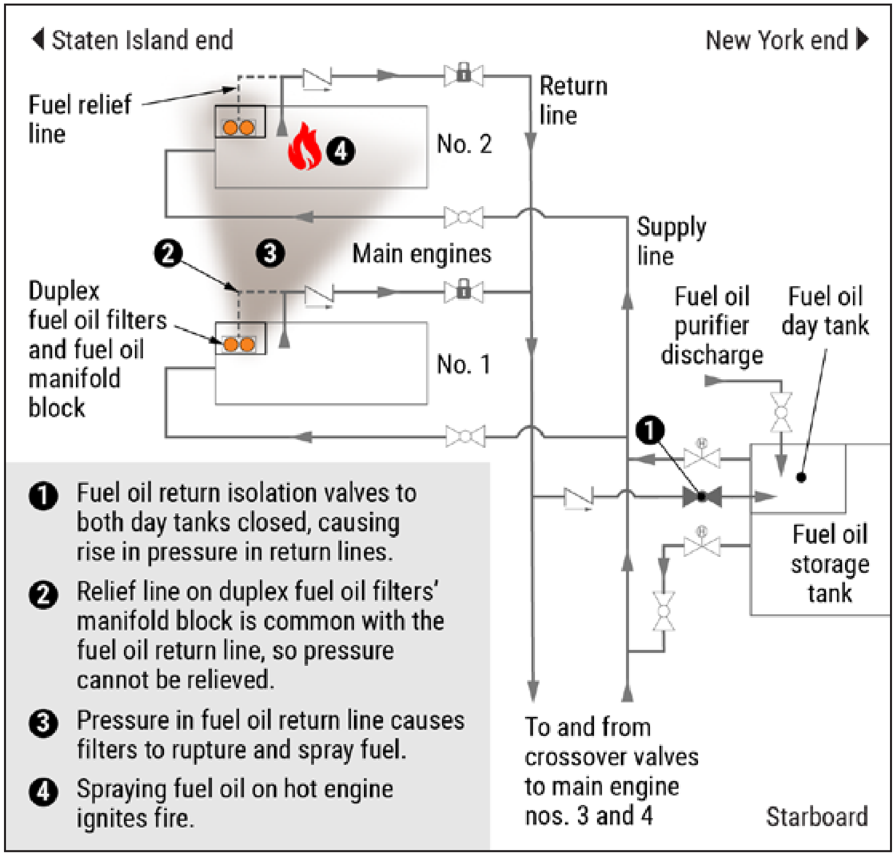
Within a half hour of the ***Sandy Ground*** emergency broadcast, Good Samaritan vessels had responded to the scene and quickly began transferring ***Sandy Ground*** passengers. After most of the passengers transferred, the captain noticed the wind speed increasing from the north and the water getting "choppier," causing the vessel to drag anchor. The deteriorating conditions made it increasingly difficult for the assist tugs to hold the ***Sandy Ground*** in position. In response, the captain decided to call off the evacuation and have the vessel towed to the terminal in Staten Island, where the remaining persons on board disembarked.

THE PROBABLE CAUSE of the engine room fire aboard the passenger ferry *Sandy Ground* was the design of the vessel's diesel engine fuel oil return system, which included isolation valves that could be regularly adjusted by the crew and, when closed, stopped return fuel oil flow from all operating engines, resulting in the overpressurization of the fuel oil system and the ignition of fuel oil spraying from ruptured fuel oil filters onto the exhaust manifold of a running engine. Contributing to the overpressurization was the operator's inadequate training program on fuel oil system operation, which did not provide follow-on instruction after the installation of fuel oil return isolation valves at the day tanks.

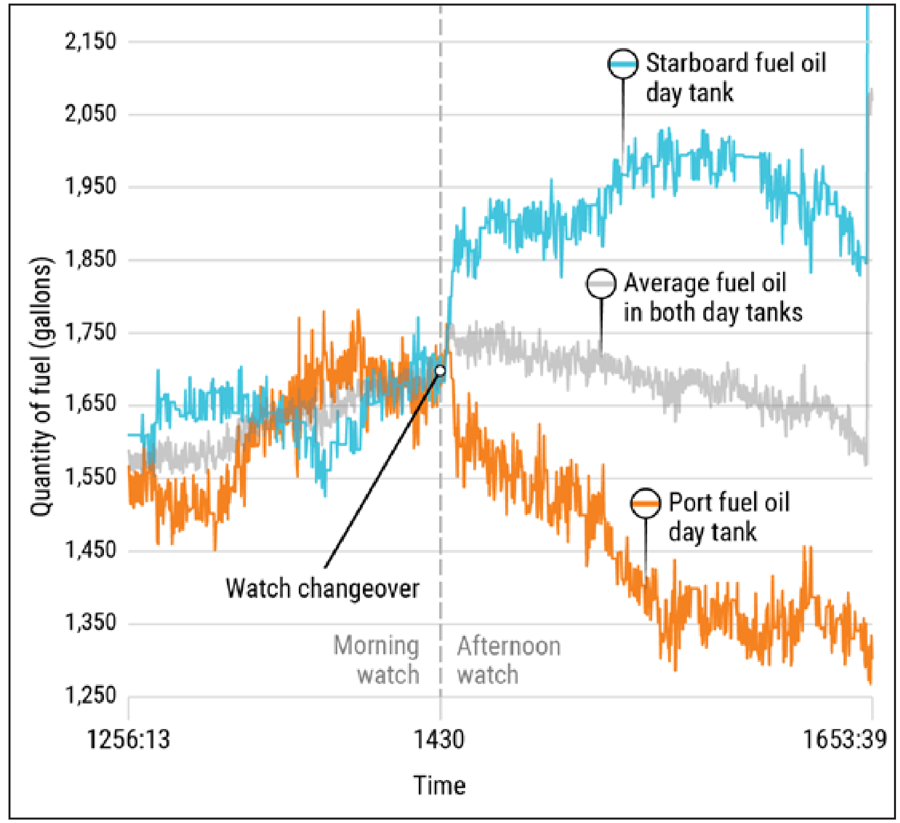
***Below, from left*: Initial fire breaking out on exhaust manifold on no. 2 main engine at 1654. Fire at 1655:26.**
BACKGROUND SOURCE: NYCDOT FERRY DIVISION.



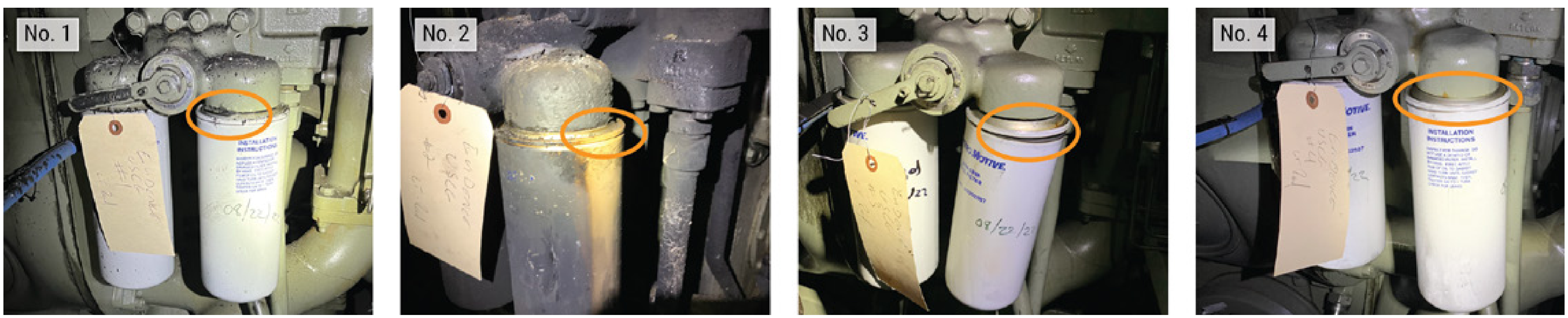




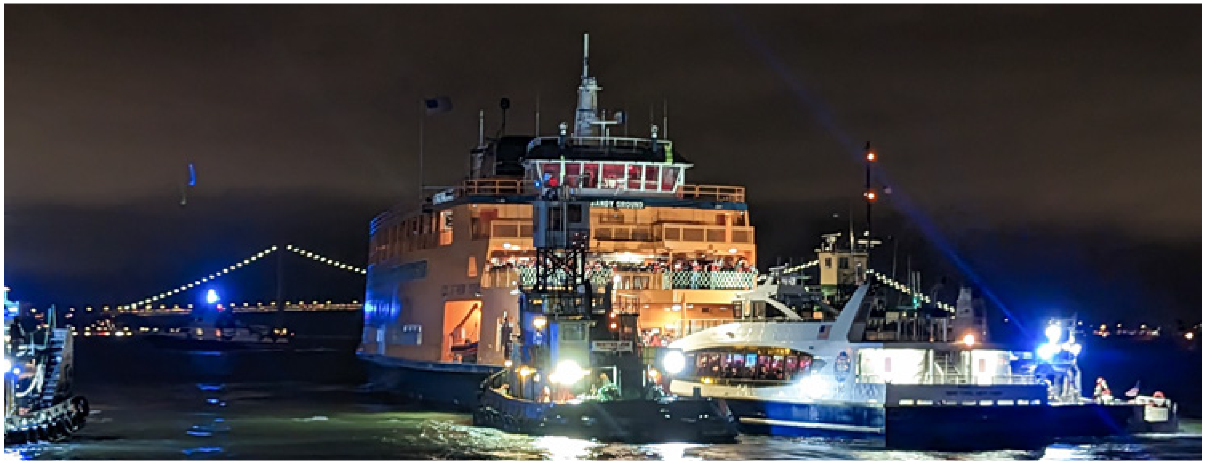
Simplified New York end main engine fuel oil supply/return system drawing for *Sandy Ground* and sequence of events leading to overpressurization and fire.



Graphic representation of fuel oil quantities in port fuel oil day tank and starboard fuel oil day tank. Average fuel oil in both tanks, calculated by NTSB, is depicted in gray. DATA SOURCE: *SANDY GROUND* MCS.



Damage (circled) found on secondary spin-on duplex fuel oil filters from each of the four main engines after the casualty. The no. 1 main engine has a protruding gasket in the direction (outboard) of the no. 2 main engine, and the nos. 2, 3, and 4 main engine filter housings are distorted.



***Sandy Ground* passengers being evacuated to the *River Sprinter*, assisted by other Good Samaritan vessels.**
SOURCE: STATEN ISLAND FERRY.

SAFETY ISSUES

- **Engineering crewmembers' ineffective management of fuel oil day tank levels on the *Sandy Ground*.** We found that the on-duty engineering crewmembers ineffectively managed fuel oil levels in the vessel's two fuel oil day tanks, causing the difference in the two tanks' levels to sharply increase. To correct this difference in levels, the engineering crewmembers closed the fuel oil return isolation ball valves to both day tanks, causing the fuel oil system to overpressurize and the fuel oil filters on the main engines to rupture. Fuel oil spraying from a ruptured fuel oil filter onto the operating no. 2 main engine ignited, causing a fire to break out in the engine room.
- **Inadequate training for engineering crewmembers on the use of fuel oil return isolation ball valves in the fuel oil system.** The engineering crewmembers completed training related to Ollis-class ferries (like the *Sandy Ground*) and their operation. However, we found that Staten Island Ferry's training program for engineering crewmembers was inadequate because crewmembers did not receive follow-on instruction after isolation ball valves were installed in the fuel oil return piping.
- **Need for a requirement to maintain unimpeded return flow in diesel engine fuel oil return systems.** Staten Island Ferry determined that, for operational reasons, the Ollis-class ferries should be fitted with fuel oil return isolation valves before the day tanks to regulate day tank levels by throttling these valves. However, these vessels did not have a means to relieve the pressure in the fuel oil return line after the oilers closed both fuel oil return isolation valves. Had the *Sandy Ground* been equipped with a pressure relief valve installed in the fuel oil return line, the elevated fuel oil pressure caused by the closed fuel oil return isolation ball valves would have been relieved, and fuel oil system overpressurization would have been prevented.
- **Need for additional regulatory and classification society guidance on fuel oil return system design.** Although there is a specific known risk of overpressurization in diesel engine fuel oil return systems should the return flow be restricted or blocked, as of the report's publication, there was no specific guidance in ABS rules or Coast Guard regulations on the installation of valves in diesel engine fuel oil return systems. Specific guidance on maintaining unimpeded diesel engine fuel oil return flow would provide naval architects and engineers with additional information for the safe design of these systems.

SAFETY RECOMMENDATIONS

As a result of its investigation into this accident, the NTSB issued five new safety recommendations to the Coast Guard and ABS. When the fuel oil system drawing (diagram) was initially submitted to the Coast Guard and ABS for approval, the drawing complied with all applicable regulations and classification rules. However, explicit requirements and guidance for maintaining unimpeded return flow in diesel engine fuel oil return systems would mitigate the risk of a system overpressurization. We **recommended** that the Coast Guard update marine engineering regulatory requirements applicable to US-flagged vessels to require diesel engine fuel oil return systems be designed to have either unimpeded return flow from the engine or the installation of a pressure relief valve. We **recommended** that ABS similarly revise its rules used to class vessels.

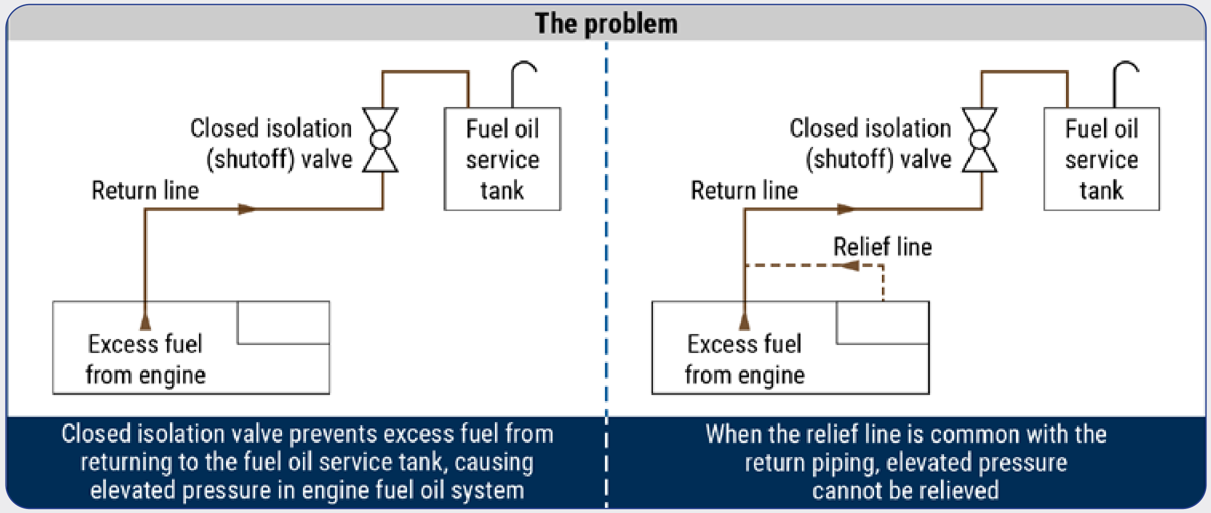
We also **recommended** that, until regulatory requirements can be updated, the Coast Guard develop and disseminate design guidance for new construction diesel engine fuel oil return systems so they have unimpeded flow from the engine or other arrangements to prevent overpressurization. Additionally, we **recommended** that the Coast Guard share our related safety alert with marine inspectors so they can ensure existing vessels' diesel fuel oil systems have unimpeded return flow. Finally, we found that other classification societies would benefit from learning about the circumstances of the engine room fire aboard the *Sandy Ground* and therefore **recommended** that ABS propose to the International Association of Classification Societies that they ensure their rules require diesel engine fuel oil systems to be designed to have unimpeded return flow or other arrangements to prevent system overpressurization.

SAFETY ALERT

Following our investigation into the **Engine Room Fire aboard Passenger Ferry *Sandy Ground*** (MIR-24-17), the NTSB issued Safety Alert 094 in 2024:

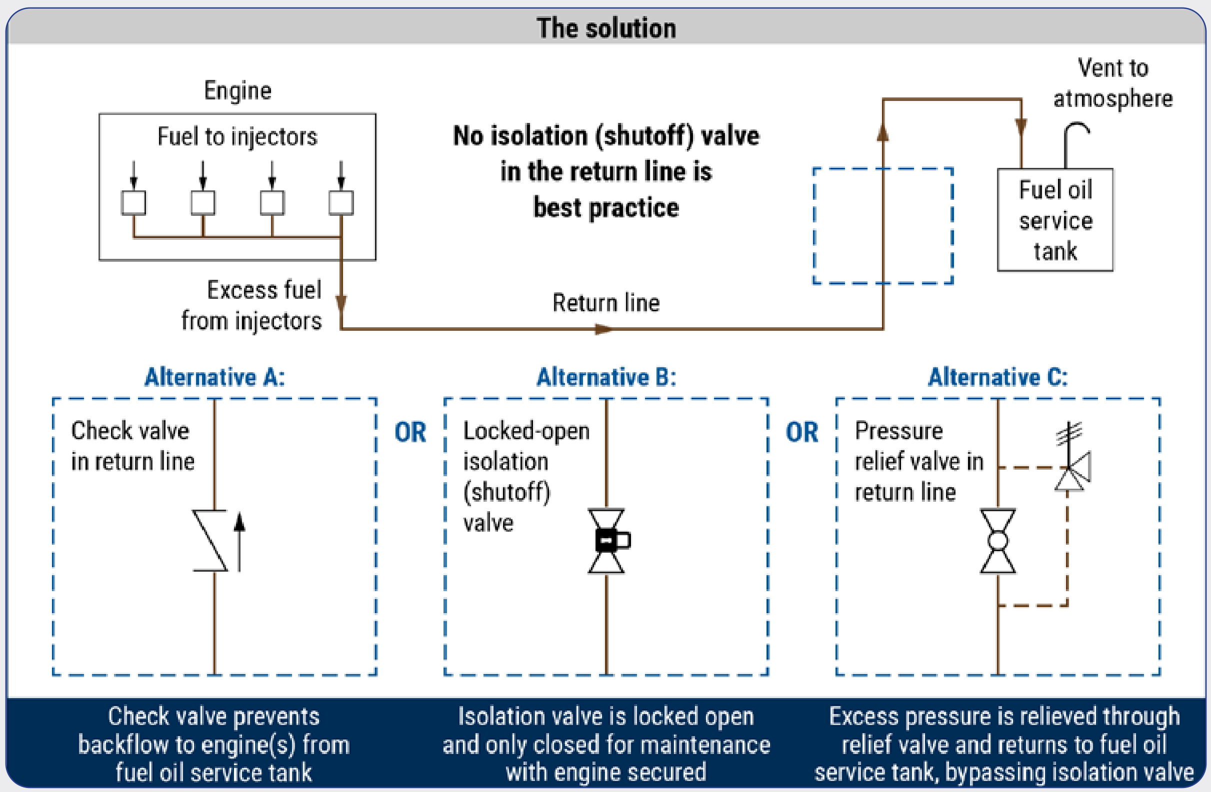
REDUCING THE RISK OF DIESEL ENGINE FUEL RETURN SYSTEM OVERPRESSURIZATION

This Safety Alert is a result of our investigations of casualties in which overpressurization of a main engine fuel return system—caused by closed valves—led to diesel fuel spraying onto hot components and igniting a fire. We found that if an isolation (shutoff) valve is installed in the return line before a tank, closing the valve will result in a pressure buildup in the return line. Additionally, if relief valves are piped into a fuel oil return like that has a closed isolation (shutoff) valve, the relief valves will be ineffective, and pressure will continue to rise. **Vessel owners and operators can mitigate the risk of engine room fires resulting from overpressurization of diesel engine fuel systems by ensuring all return lines leading to the service tank(s) are unimpeded, with no valves in the lines, and providing crewmembers training on diesel engine fuel system design and operations.**



Closed isolation valve prevents excess fuel from returning to the fuel oil service tank, causing elevated pressure in engine fuel oil system

When the relief line is common with the return piping, elevated pressure cannot be relieved



Check valve prevents backflow to engine(s) from fuel oil service tank

Isolation valve is locked open and only closed for maintenance with engine secured

Excess pressure is relieved through relief valve and returns to fuel oil service tank, bypassing isolation valve

***Right, from top*: Simplified diagrams of a diesel engine fuel system showing the problem—a return line with closed isolation (shutoff) valve and relief line common with return piping system; and the solution—a return line with no isolation (shutoff) valve, or, alternatively, with a check valve, locked-open isolation valve, or pressure relief valve in return line.**

Scan to explore NTSB Safety Alerts available at ntsb.gov

FIRE/EXPLOSION

Engine Room Fire aboard Towing Vessel ***Desperado***

VESSEL GROUP	
Towing/Barge	
LOCATION	
Lake Salvador, Bayou Perot, Louisiana	
CASUALTY DATE	ACCIDENT ID
February 17, 2023	DCA23FM018
INJURIES	ESTIMATED DAMAGES
None	$30,000
REPORT NUMBER	ISSUED
MIR-24-18	July 10, 2024

The *Desperado* spudded down in Lake Salvador after the fire. SOURCE: COAST GUARD.

On February 17, 2023, about 1332 local time, an engine room fire occurred on the towing vessel ***Desperado*** while it was transiting Lake Salvador near mile 20 of the Gulf Intracoastal Waterway in Bayou Perot, Louisiana. The three crewmembers aboard were unable to extinguish the fire with portable extinguishers. They secured ventilation and fuel to the engine room and then evacuated to a Good Samaritan vessel. When a responding fire boat arrived, the fire was out. No pollution or injuries were reported. Damage to the vessel totaled $30,000.

Earlier that day, the vessel departed from the Tidewater Dock in Larose, Louisiana, with a captain and two deckhands, en route to the Bayou Couba Oil Field Canal in St. Charles Parish, Louisiana, to offload cargo to a rig and perform barge tendering.

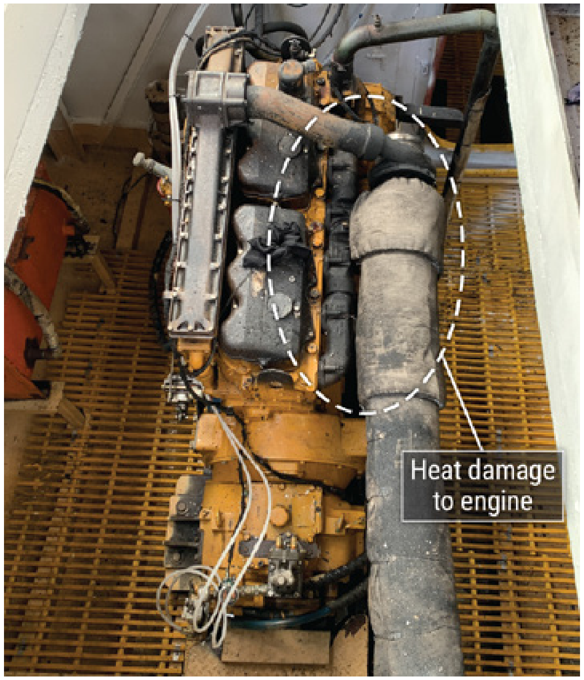
At 1305, the vessel entered Lake Salvador. About 1332, the fire alarm sounded in the wheelhouse, followed by the steering gear hydraulic tank low level alarm. The captain, who was in the wheelhouse, looked aft and saw smoke coming from the stern near the engine room centerline hatch. The captain immediately shut down the main propulsion engines, which stopped the hydraulic pumps that were mechanically driven off them, thereby stopping spraying hydraulic oil from reaching the engines and fueling the fire. He then directed the deckhands to secure ventilation and the emergency fuel shut off valves—effectively stopping additional air and diesel fuel from entering the engine room.

The captain attempted to put out the fire by discharging an extinguisher into the engine room. However, the fire continued to burn. The captain determined that the crew should evacuate the vessel, and he made a mayday call. The Coast Guard and a nearby crew boat responded to the distress call.

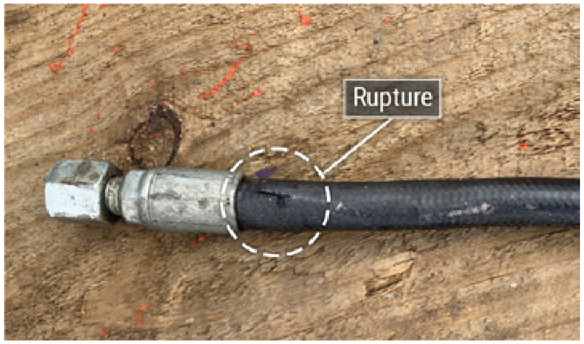
The nearby crew retrieved the ***Desperado*** crew and transited through the Intracoastal Waterway back to the Tidewater Dock. A fire boat crew from Larose arrived at the ***Desperado***'s location and determined that the fire was out.

When inspecting the damage after the fire, the crew found damage was limited to the area of the port main propulsion engine, and, according to the captain, "Except the one [port] engine that was burnt, everything else was pretty much normal." Therefore, the crew's prompt actions to remove the fuel and oxygen sources for the fire helped limit the fire damage and extinguish the fire.

The captain told the Coast Guard that the cause of the fire was a ruptured hydraulic line on the portside steering pump, which subsequently caused flammable hydraulic oil to spray onto the hot port main propulsion engine exhaust manifold and turbocharger and ignite. The line was 0.5 inches in diameter and about 16.5 inches long, and the rupture was found near the hose end crimped fitting. The captain and deckhands removed the ruptured hydraulic line from the portside steering pump directional manifold valve and replaced the hose with an onboard spare.



Port main propulsion engine damage on the *Desperado* after the fire.



The ruptured port steering pump hydraulic hose, after the fire.

The replacement hydraulic hose, with the location of the rupture on the previous hose circled.

After purchasing the *Desperado* in August 2022, the captain and two deckhands had performed a 4-month overhaul of the vessel to prepare it for service. Technicians refurbished the hydraulic steering system in late 2022, and there were no reported issues other than a few minor hydraulic leaks that required tightening of fittings or connections. The captain said that no alterations were made to the steering gear system after install. The hose that ruptured was manufactured on October 7, 2018. It is unknown when this hose was installed; however, based on the manufacture date being 4 years before the refurbishment work, it is unlikely that the older hose was installed during the 2022 refurbishment.

After reviewing photographs of the area where the fire occurred and where the replacement hydraulic hose was installed, investigators identified issues with how the hose had been installed. Contrary to manufacturer guidance, the hose appeared to exceed the bend radius; it was not guided with clamps, fittings, or adapters; and it did not have any protective cover. The manufacturer guidance warned that an improperly installed hose could fail. Given that the original hydraulic hose that ruptured was the same length and diameter as the replacement hose, it is likely that the same issues existed for the ruptured hose. Therefore, the lack of adherence to the hose manufacturer's guidance on installation likely resulted in the hose exceeding its bend radius, rupturing, and spraying fuel, which led to the fire.

THE PROBABLE CAUSE of the fire aboard the towing vessel *Desperado* was a hydraulic hose that likely exceeded its bend radius, eventually causing the hose to rupture, resulting in hydraulic oil spraying onto a hot engine exhaust manifold and turbocharger and igniting.

LESSONS LEARNED:

FOLLOWING MANUFACTURER GUIDANCE FOR HYDRAULIC HOSE INSTALLATION

Mariners and technicians who design, install, and maintain systems should follow the manufacturer's guidance on the minimum bend radius for a hydraulic hose. The minimum bend radius is the radius below which an object cannot (or should not) be bent. Bending or flexing a hose to a radius smaller than the minimum recommended, or subjecting a hose to tension or torque, can place excessive stress on the hose and severely reduce the ability of the hose to withstand pressure. Tight space constraints may cause a hose to bend severely around corners. A machine or cylinder extending and retracting can also bend a hose. Hoses attached to moving parts may bend more than a hose in or near a machine's stationary position. Actions to avoid hose damage or failure include clamping a hose in place to provide support, rerouting a hose assembly by installing fittings and adapters, and using a hose with more reinforcement (two braid instead of one braid).

FIRE/EXPLOSION

Fire aboard Fishing Vessel ***Miss Courtney Kim***

VESSEL GROUP
Fishing

LOCATION
Simeon Bay, southern side of Popof Island, Alaska

CASUALTY DATE	ACCIDENT ID
June 18, 2024	DCA24FM047
INJURIES	**ESTIMATED DAMAGES**
None	$2.4 million
REPORT NUMBER	**ISSUED**
MIR-24-29	September 19, 2024

***Miss Courtney Kim* beginning to sink while burning.** SOURCE: *MISS COURTNEY KIM* OWNER.

***Miss Courtney Kim* on fire on June 18, 2024.**
SOURCE: *MISS COURTNEY KIM* OWNER.

On June 18, 2024, about 0700 local time, the fishing vessel *Miss Courtney Kim* was anchored in Simeon Bay on the southern side of Popof Island, Alaska, when the crew discovered a fire in the engine room. The crew attempted to extinguish the fire but was unsuccessful. The seven crewmembers on board evacuated to a nearby fishing vessel. The *Miss Courtney Kim* continued to burn until it sank about 4 hours later. There were no injuries, and no pollution was reported. The vessel was a total loss estimated at $2.4 million.

Two days earlier, on June 16, the 58-foot-long, fiberglass-hulled commercial fishing vessel *Miss Courtney Kim* departed King Cove, Alaska—with seven crewmembers aboard, including a captain, a deck boss, a cook, three deckhands, and a skiff operator—to participate in the Southern District salmon fishery from June 18 to June 24.

On June 17, after encountering heavy weather with high winds and seas, the captain decided to anchor the vessel in Simeon Bay, on the southern side of Popof Island, to wait for the fishery to open. The next day, at 0300, the crew anchored the vessel, and, about 0330, they went to sleep. While they were sleeping, one of the vessel's two generators remained operating.

About 0630, the captain woke up and walked around the vessel to perform routine checks of the engine room, wheelhouse, and back deck. He did not notice anything unusual and went back inside the vessel.

About 0700, the deck boss was in his stateroom when he noticed a burning smell that he associated with electrical components like "a hot wire." He notified the captain, and he and the captain opened the engine room door. According to the deck boss, a "big rush of smoke [came] rushing out of the engine room;"

the captain said the engine room was "full of smoke." They could not see through the smoke to identify its source. The captain ordered the crew to abandon ship, and the deck boss put survival suits in the vessel's skiff. About the same time, in an attempt to extinguish the fire, the captain shut the engine room door, turned off the engine room ventilation fan, and activated the vessel's halon fixed fire extinguishing system; however, the fire continued to burn. He used a deck hose (a garden-type hose typically used for washing the deck off) to spray water into the engine room toward an "intermittent glow" underneath the main engine, but the smoke got thicker and darker.

The *Just In Case*, a fishing vessel that had been anchored about 200 yards away, came alongside the *Miss Courtney Kim* to assist the crewmembers. While the captain was fighting the fire in the engine room, the deck boss, the cook, and the *Just In Case* crew worked together to salvage equipment and deck gear from the *Miss Courtney Kim*. After about 10–15 minutes of fighting the fire, the captain went out on deck and saw "so much smoke coming out of that galley [above the engine room] like it was completely engulfed in flames in the engine room at that time."

The captain and the deck boss abandoned the vessel onto the *Just In Case*, and by 0720, all *Miss Courtney Kim* crewmembers had transferred to the *Just In Case*.

The fire continued to burn for another 4 hours. About 1130, the *Miss Courtney Kim* sank. The vessel was not recovered/salvaged.

Given the burning electrical smell, the cause of the fire may have been electrical in nature. If there was an electrical fault within nearby circuits or equipment, it could have created excessive resistance heating, which may have led to the ignition of nearby combustibles. However, because the vessel sank and was not recovered, the cause of the fire could not be determined.

Mostly sunk *Miss Courtney Kim*.
SOURCE: *MISS COURTNEY KIM* OWNER.

THE PROBABLE CAUSE of the fire aboard the fishing vessel *Miss Courtney Kim* was an unknown source within the engine room, possibly electrical in nature.

FIRE/EXPLOSION

Engine Room Fire aboard Yacht ***Savage***

VESSEL GROUP	
Yacht/Boat	
LOCATION	
Atlantic Ocean, about 2 nm from Cape Henry, near Virginia Beach, Virginia	
CASUALTY DATE	ACCIDENT ID
March 8, 2024	DCA24FM026
INJURIES	ESTIMATED DAMAGES
None	$600,000
REPORT NUMBER	ISSUED
MIR-24-31	October 2, 2024

***Savage* underway at unknown date before the fire.** Source: Captain Ethan Hanks, NBD Marine Services LLC.

***Savage* during firefighting efforts.** Source: Virginia Beach Fire Department via Coast Guard.

On March 8, 2024, about 0330 local time, a fire broke out in the engine room aboard the 75-foot-long yacht *Savage* while the vessel was transiting about 2 nautical miles off the coast of Cape Henry, near Virginia Beach, Virginia. After attempting to extinguish the fire, all three crewmembers donned immersion suits, entered the water, and were rescued by a nearby pilot boat. The burning vessel was towed to shore and intentionally grounded. A local fire department extinguished the fire from shore. There were no injuries, and no pollution was reported. The *Savage*, valued at $600,000, was a total loss.

The *Savage* departed from New Bedford, Massachusetts, on March 4, bound for Hampton, Virginia. Before departing, the three-person crew—consisting of a captain, first mate, and a second mate—inspected the lifesaving and firefighting equipment. They also inspected the vessel and found it in good condition. The West Tide boat had three diesel propulsion engines and two 15-kilowatt diesel generators. The vessel was equipped with 10 fire extinguishers, 10 lifejackets, 4 immersion suits, a dinghy, and an EPIRB. In addition, the second mate had a PLB, which was registered to a friend, in her "ditch bag" (abandon ship bag).

The voyage was uneventful until the vessel reached the entrance to the Chesapeake Bay off the coast of Cape Henry, Virginia, on March 8. About 0330, the second mate woke the captain to advise him that she and the first mate had smelled something burning and believed there was an electrical fire on the vessel. At this time, the vessel was transiting at 6 knots. The captain and the first mate went to the wheelhouse (located on the main deck), and, according to the captain, "secured the A/C [air-conditioning] breakers and turned off the vessel's engines." They entered the unoccupied owner's stateroom below the wheelhouse and found it filled with smoke but saw no signs of fire. They looked into the engine room, which was on the same deck as the owner's stateroom, via a window in the engine room door, and saw that it was also filled with smoke, but they did not see any signs of fire.

About a minute later, the second mate yelled that she saw fire in the owner's stateroom. The captain returned to the owner's stateroom with a fire extinguisher but was unable to enter the space due to the severity of the fire. He ordered the first mate to make a distress call on the VHF radio. A nearby pilot boat from the Virginia Pilot Association received the first mate's mayday call and immediately headed toward the *Savage*.

After making the call, the first mate brought three immersion suits to the bow of the vessel. He observed flames covering the main deck as he headed to the bow. Meanwhile, the captain attempted to go down the port side of the exterior main deck (aft) to reach the EPIRB and the dinghy, but flames blocked his path. The captain joined the other crewmembers on the main deck at the bow of the *Savage*, and they began donning their immersion suits.

The crewmembers estimated that they had the immersion suits "about 80%" of the way on before the flames got too close, and they all jumped from the bow into the 50°F water. The captain estimated that they abandoned the vessel about 3 minutes after seeing the first flame. Once in the water, they finished donning their immersion suits, and the captain activated the second mate's PLB. Ten minutes later, about 0345, the responding pilot boat arrived on scene and brought all three crewmembers aboard.

Based on crew statements, the fire originated in the vessel's engine room. The captain said he did not think the fire was electrical, and he believed that the fire originated on the starboard side of the engine room. He estimated that something falling onto the exhaust of an operating engine could have started the fire. The first mate also stated he believed the fire started in the engine room and that the vessel previously had an exhaust problem on one of the engines.

Potential ignition sources include the operating diesel propulsion engines and electrical generator, and other equipment. The extensive damage to the vessel precluded examination of components, and, therefore, the exact ignition source could not be determined.

THE PROBABLE CAUSE of the fire aboard the *Savage* was an undetermined ignition source within the engine room.

The burning *Savage* is towed to shore.
SOURCE: VIRGINIA BEACH FIRE DEPARTMENT VIA COAST GUARD.

Remains of *Savage* on the shoreline after the fire. SOURCE: VIRGINIA BEACH FIRE DEPARTMENT VIA COAST GUARD.

FIRE/EXPLOSION

Fire aboard Fishing Vessel ***Whiskey Business***

VESSEL GROUP	
Fishing	
LOCATION	
Safe Harbor Marina, Orrs Cove, Harpswell, Maine	
CASUALTY DATE	ACCIDENT ID
November 5, 2023	DCA24FM009
INJURIES	ESTIMATED DAMAGES
None	$1 million
REPORT NUMBER	ISSUED
MIR-24-34	October 31, 2024

***Whiskey Business* on November 5, 2023, after the fire.** SOURCE: *WHISKEY BUSINESS* CAPTAIN.

Fire aboard the *Whiskey Business*, about 0918 on November 5, 2024. The shore power cord had been connected from the shore power pedestal to the boat. BACKGROUND SOURCE: MARK LENZI.

On November 5, 2023, about 0900, a fire broke out aboard the fishing vessel *Whiskey Business* while it was moored at the Safe Harbor Marina in Orrs Cove in Harpswell, Maine. No one was on board at the time of the fire, and local fire departments extinguished the fire. There were no injuries, and no pollution was reported. Damage to the vessel was estimated at $1 million.

The fire aboard the 45-foot-long *Whiskey Business* occurred while the vessel was docked and unattended. The vessel was on shore power, and only a refrigerator, a freezer, and two climate control units (one located in the forward stateroom and the other in the port aft corner of the cabin) were energized at the time. Each climate control system integrated cooling, dehumidification, and heating in a compact unit. The self-contained units each consisted of a seawater-cooled, marine air conditioning unit with a reverse cycle heat kit. Seawater cooling was provided by a pump located under the forward stateroom, drawing in seawater from a through-hull penetration, and discharging into each unit's heat exchanger via rubber hoses connected with hose clamps.

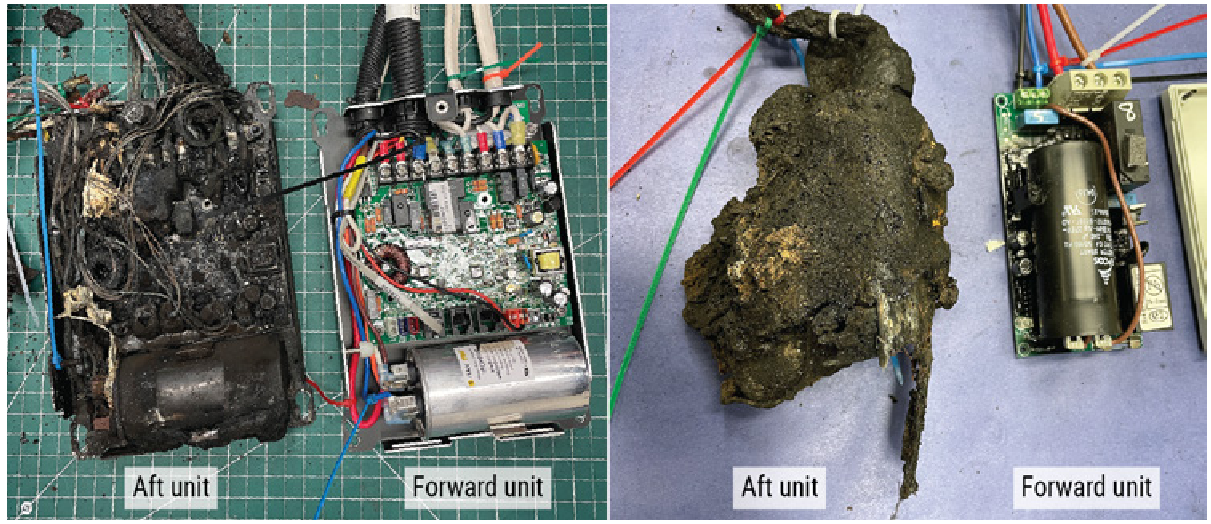
Earlier in the day, about 0850, the owner of a boat docked diagonally across from the *Whiskey Business* arrived at the marina and heard a beeping noise coming from the *Whiskey Business*. At 0901, he noticed light, white smoke escaping from a partially opened window in the port aft corner of the cabin. He called 911, and about 0910, a sheriff's deputy, a member of the marina staff, and firefighters arrived on scene. About 0943, the fire was extinguished.

According to a witness (nearby boat owner), and photos and videos taken at the time of fire, the first signs of smoke and flames originated in the port aft corner of the cabin. The fire grew in intensity in this area and was seen breaking through the port aft windows of the cabin. A postfire examination of the cabin interior space identified the greatest extent of fire and heat damage in the area near the aft air conditioning unit. The examination also found diminishing damage to the starboard side of the cabin and in the forward stateroom, and no fire damage in the engine room. Therefore, the origin of the fire was likely the air conditioning unit in the port aft area of the cabin.

Postfire testing at an engineering laboratory found the shore power cable to be electrically sound; therefore, an electrical fault in the cable likely did not cause the fire. The compressor from the damaged air conditioning unit displayed similar electrical insulation readings as the undamaged compressor, and its connections were not damaged, indicating the compressor's motor had not failed. X-ray images of the debris from the surrounding area showed no potential ignition sources within the debris.

The most heavily damaged component of the air conditioning unit was a soft start control device for the air conditioning unit. According to the captain, he had replaced the device in the aft unit in 2021. Based on the captain's recollection, he believed the device was mounted on the floor without a waterproof enclosure, contrary to the manufacturer's instructions. The air conditioning unit was cooled by pressurized seawater via hoses, so it is possible that a seawater leak from a hose could have sprayed or pooled on the floor and entered the unit's soft start control device, causing an electrical fault. This water intrusion could have resulted in an electrical short circuit in the soft start control device that generated enough heat to start the fire.

THE PROBABLE CAUSE of the fire on board the fishing vessel *Whiskey Business* was a fault within an electrical soft start control device, possibly due to exposure to saltwater, for an air conditioning unit located under a bench in the vessel's cabin.



***Left to right*: Larger soft start control device from damaged air conditioning unit alongside identical forward unit (shown as an exemplar). Smaller soft start control device from damaged air conditioning unit alongside forward unit after fire.**

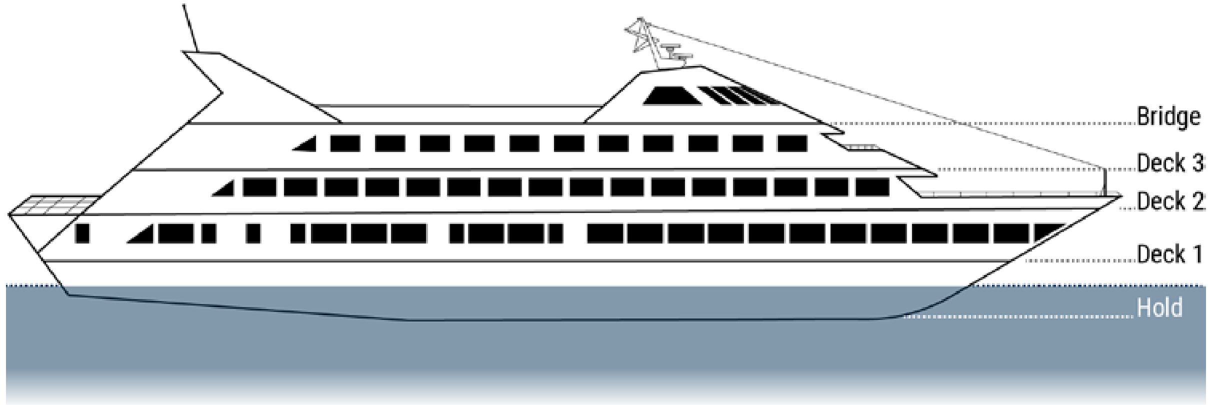
***Left to right*: Air conditioning unit aboard *Whiskey Business* in 2019 after vessel construction, and same unit after fire.** SOURCE (LEFT): *WHISKEY BUSINESS* CAPTAIN.

FIRE/EXPLOSION

Fire aboard Passenger Vessel ***Spirit of Boston***

VESSEL GROUP	
Passenger	
LOCATION	
Boston Harbor, Boston, Massachusetts	
CASUALTY DATE	ACCIDENT ID
March 24, 2023	DCA23FM022
INJURIES	ESTIMATED DAMAGES
None	$3.1 million
REPORT NUMBER	ISSUED
MIR-24-37	December 13, 2024

Passenger vessel *Spirit of Boston* after the fire.



Profile view of *Spirit of Boston*.

On March 24, 2023, about 2252 local time, a fire broke out in the deck 1 wait station on the passenger vessel *Spirit of Boston* while it was moored at the Commonwealth Pier in Boston Harbor, Boston, Massachusetts. All 16 persons aboard evacuated the vessel to the pier. The local fire department responded and extinguished the fire. There were no injuries, and no pollution was reported. Damage to the vessel was estimated at $3.1 million.

Earlier that evening, about 1800, passengers started boarding the *Spirit of Boston* for a 3-hour cruise of Boston Harbor. About an hour later, the vessel departed Commonwealth Pier with 429 passengers (of which about 300 were students) on board—in addition to the 35 crewmembers and hospitality staff who had boarded the vessel earlier in the day to prepare for the cruise.

Toward the end of the cruise, galley staff extinguished the chafing fuel heating canisters—canned heat used to keep food and beverages warm—on the buffet tables in the passenger spaces. Server assistants 1 and 2 began cleaning deck 1, and about 2145, server assistant 2 extinguished the coffee dispenser's chafing fuel heating canister in the deck 1 wait station and left the canister on the counter to cool. Contrary to the manufacturer's guidance, she blew it out instead of placing the lid on to extinguish the flame.

***Left to right*: *Spirit of Boston* chafing dishes (with the chafing fuel heating canisters removed) in passenger areas on deck 2 and deck 3 after the fire. Exemplar coffee maker and dispenser used aboard *Spirit of Boston* with the chafing fuel heating canisters removed from under the dispenser.**

Chafing fuel heating canisters used aboard *Spirit of Boston*.

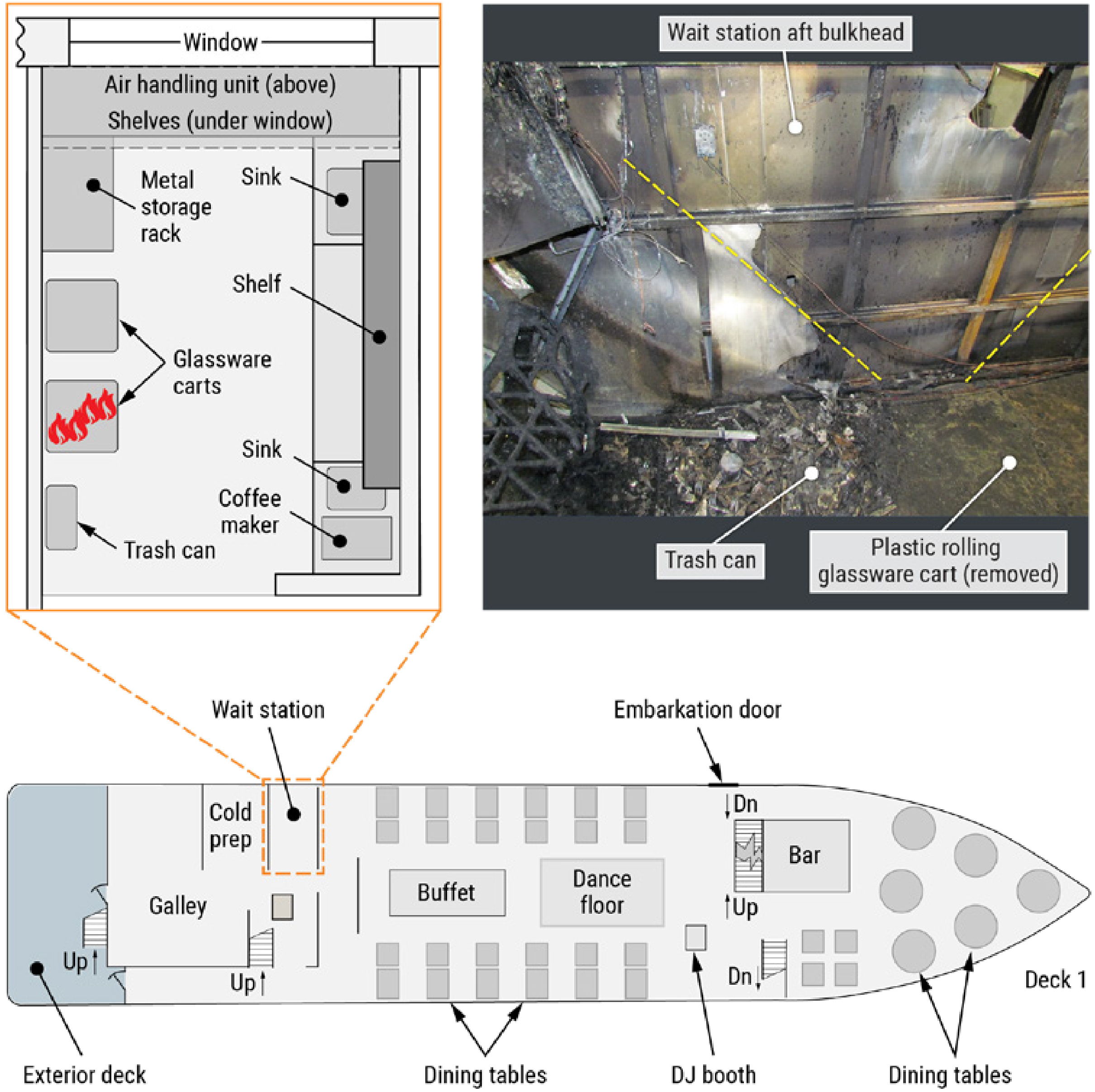
About 2200, the marine crew of the *Spirit of Boston* docked the vessel with its port side to Commonwealth Pier. By 2215, all passengers had safely departed the vessel. The marine crew, galley staff, hospitality staff, and DJs remained aboard the vessel to continue cleaning up, secure the vessel, and prepare the vessel for the next day's cruise. During this time, server assistant 2 threw the coffee dispenser's chafing fuel heating canister into the trash can in the deck 1 wait station.

About 2230, the marine crew switched the vessel's electrical power from ship's power to shoreside power supply. Shortly afterward, the captain-in-training/mate, the four deckhands, and galley staff departed the vessel. The captain, hospitality staff, and two DJs remained aboard.

About 2245, server assistant 1 threw away a chafing fuel heating canister into the deck 1 wait station trash can. Shortly afterward, the captain left the vessel.

Five minutes later, server assistant 2 entered the deck 1 wait station and saw gray smoke near the wait station's overhead light. She saw "a spark moving around" under one of the two plastic glassware rolling carts in the wait station and notified the senior restaurant manager that "something [was] burning."

The restaurant manager entered the wait station and saw smoke and "a line of fire … like a snake basically going across the floor." He believed it was coming from under one of the plastic glassware rolling carts. He called (via cell phone) the captain, who did not answer at that time. About the same time, the senior restaurant manager saw sparks under the plastic glassware cart break out into flames.

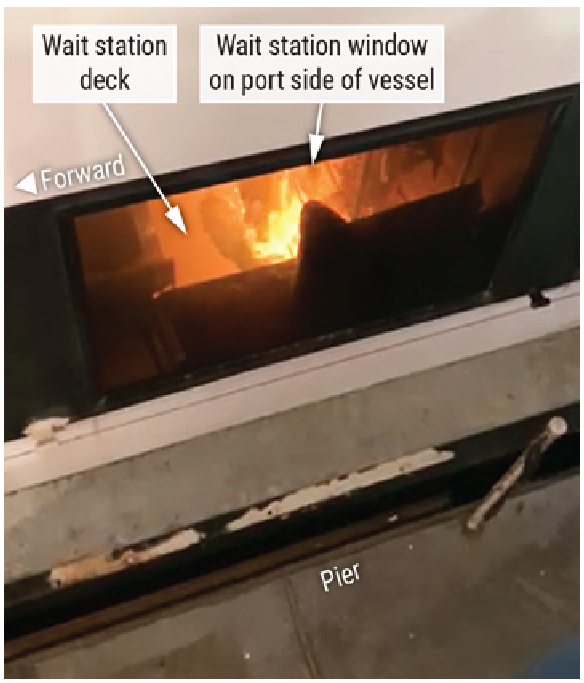


Plan view of *Spirit of Boston* deck 1 and detail of the wait station area including approximate location of fire, indicated by a fire symbol, as reported by the restaurant manager (scale approximate). *Top right*: "V" pattern (shown as yellow dashed lines) as observed by ATF on aft bulkhead of deck 1 wait station near waste trash can and plastic rolling glassware carts. Background source: ATF.

Within a minute of when server assistant 2 initially saw gray smoke, the senior restaurant manager told the restaurant manager to evacuate the staff. None of the hospitality staff attempted to extinguish the fire.

As the hospitality staff evacuated the vessel to the pier, the restaurant manager heard a fire alarm on the vessel, and he called 911 to report a fire on the *Spirit of Boston*. Once on the pier, the senior restaurant manager mustered the hospitality staff and DJs to ensure that everyone was accounted for and called City Cruises US managers to inform them of the fire. After a City Cruises US manager called the captain and advised him of the fire, the captain returned to the pier.

About 2 minutes after the vessel was evacuated, the restaurant manager observed from the pier that the "entire vessel was filled with black smoke."



Screenshot from video taken on the pier at 2307, after hospitality staff evacuated the vessel, showing fire in the *Spirit of Boston* wait station as seen through the wait station window.
SOURCE: *SPIRIT OF BOSTON* HOSPITALITY STAFF MEMBER.

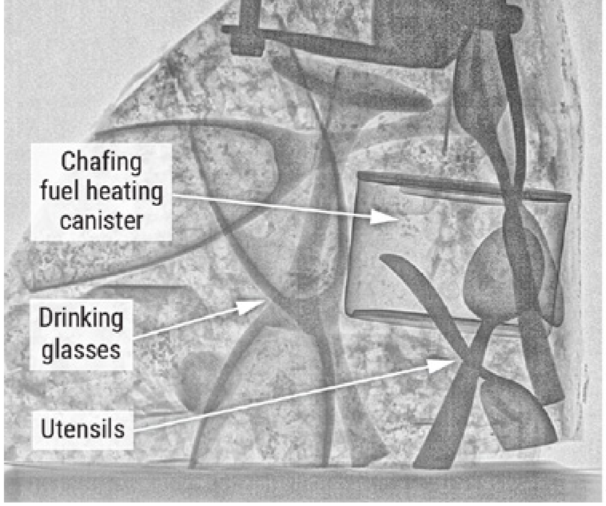
Numerous Boston Fire Department firefighting assets arrived to fight the fire, including a marine firefighting vessel. By 2339, the fire was suppressed, and, at 0106, the Boston Fire Department declared the fire was extinguished.

THE PROBABLE CAUSE of the fire aboard the passenger vessel *Spirit of Boston* was the improper extinguishing and disposal of a chafing fuel heating canister due to City Cruises US's lack of documented procedures for handling open-flame devices, which led to the ignition of a plastic glassware rolling rack. Contributing to the growth and spread of the fire was City Cruises US not requiring a marine crewmember—designated and trained to execute City Cruises US's emergency response plan for a fire aboard a vessel—to remain aboard the vessel until all hospitality staff and other noncrew personnel departed the vessel.

Screenshot of video looking through window of ATF test structure in replicated deck 1 wait station showing flame vectoring and liquified plastic pool (to left of flames) in the area where the plastic glassware rolling cart was located. SOURCE: ATF.

Exemplar plastic glassware rolling cart used aboard *Spirit of Boston*.

***Left to right*: Location of the melted mass of debris—comprising the remains of the plastic glassware rolling carts—removed from the deck 1 wait station on *Spirit of Boston* after the fire. Bottom of the melted mass of debris from the wait station after flooring material was removed.**



***Left to right*: X-ray image of debris removed from the *Spirit of Boston* deck 1 wait station showing chafing fuel heating canister. Closeup of chafing fuel heating canister found in the same debris.**
BACKGROUND SOURCES: ATF, COAST GUARD.

SAFETY ISSUES

- **Absence of marine crewmembers aboard the vessel during an emergency situation while hospitality staff were still aboard.** The operating company had an emergency response plan for the *Spirit of Boston*. As written, the plan relied on the actions of marine crew to mitigate any emergency situation. However, there were no marine crewmembers on board the *Spirit of Boston* at the time of the fire, and there were no additional instructions for company personnel to follow when such a situation occurred. Without a properly trained marine crewmember on board with the remaining hospitality staff, the emergency response plan for a fire could not be executed as intended. Additionally, hospitality staff did not participate in the more thorough training the marine crewmembers completed and therefore had no practical experience in locating and using the vessel's fire safety equipment to fight a fire. Had a marine crewmember been on board at the time of the fire, the marine crewmember likely could have extinguished the fire before it grew and spread.
- **Improper handling of open-flame devices.** City Cruises US's galley staff used open-flame devices (chafing fuel heating canisters) to keep food and beverages warm throughout dinner cruises. Using open-flame devices, like chafing fuel heating canisters, on a vessel poses a fire risk. If such devices must be used—for instance, to keep food and beverages warm—the risk of fire can be mitigated by having documented procedures for how to handle such devices. However, City Cruises US did not have any such procedures for the *Spirit of Boston*. Galley staff and hospitality staff were verbally instructed on how to handle the canisters, including lighting and extinguishing them. Additionally, the hospitality staff did not consistently extinguish the canisters in accordance with the verbal instructions or manufacturer's instructions. The operating company's lack of documented procedures on the proper handling—including extinguishing—of open-flame devices on board its vessels increased the risk of a fire.
- **Lack of established mechanisms for City Cruises US to identify unsafe practices and fire risks.** Although not required to have an SMS for its vessels, City Cruises US had elements of an SMS already in place. However, it did not have procedures for identifying and correcting nonconformities—such as not properly extinguishing chafing fuel heating canisters—nor did it have an audit process. Further, although the company did have an incident management tracking system, which included logging lessons learned from incidents, it did not require procedures to be developed to prevent future casualties. An SMS would have established mechanisms for City Cruises US to identify fire risks and unsafe practices on the *Spirit of Boston* and take corrective action before the fire occurred.

SAFETY RECOMMENDATIONS

As a result of its investigation into this accident, the NTSB issued four new safety recommendations to City Cruises US and the Passenger Vessel Association.

We **recommended** that City Cruises US develop procedures for, and train personnel on, the proper handling and extinguishing of open-flame devices, like chafing fuel heating canisters. Additionally, we **recommended** that City Cruises US require at least one marine crewmember—who is properly trained to respond to shipboard emergencies, including fire—to remain on board the company's vessels until all other noncrew personnel depart. Documented procedures—such as procedures for handling open-flame devices and requirements for crewmembers to be on board—would typically be included in an SMS. However, City Cruises US did not have an SMS (nor were they required to). Therefore, we **recommended** they implement an SMS. We also **recommended** that the Passenger Vessel Association share the circumstances of this accident and the safety issues we identified during our investigation.

The NTSB has long advocated for the implementation of SMSs for all US passenger vessels and believes that an SMS, scalable to the size of every operation and vessel group/type, is an essential tool for enhancing safety. In the case of the *Spirit of Boston* and City Cruises US, a Coast Guard requirement for an SMS would likely have ensured the development of risk mitigation measures. Therefore, we **reiterated** Safety Recommendation M-12-5 to the Coast Guard to require all operators of US-flagged passenger vessels to implement an SMS.

FLOODING/HULL FAILURE

Flooding and Sinking of the Towed Cargo Vessel ***Carib Trader II***

VESSEL GROUPS
Cargo, General + Towing/Barge

LOCATION
Magallanes Bank, 29 nm northwest of Santo Domingo Cay, Bahamas

CASUALTY DATE	ACCIDENT ID
March 6, 2022	DCA22FM011
INJURIES	ESTIMATED DAMAGES
None	$752,700
REPORT NUMBER	ISSUED
MIR-24-02	January 24, 2024

On March 6, 2022, about 1620 local time, near the Magallanes Bank, about 25 nautical miles northwest of Santo Domingo Cay, Bahamas, the uncrewed general cargo vessel ***Carib Trader II*** took on water and sank while being towed by the towing vessel ***Capt. Beau***, which had five crewmembers aboard. A small debris field was reported. There were no injuries. Damage to the vessel was estimated at $752,700.

Three days earlier, on March 3, the 108-foot-long towing vessel ***Capt. Beau*** began a dead ship tow of the 274-foot-long ***Carib Trader II*** out of the Port of Miami, bound for Gonaïves, Haiti, a 4-day transit. ***Carib Trader II*** was being relocated to a Haiti shipyard for repairs. The ***Carib Trader II***, which had a history of substandard care and maintenance, had been in layup for 2 years. The inspection history of the vessel suggested the ***Carib Trader II*** was in poor condition.

The ***Carib Trader II*** was towed astern of the ***Capt. Beau*** on a 2-inch wire rope with approximately 1,000 feet extended, which was connected to a 1 3/4-inch Spectra bridle. The bridle lines were connected to a 2-inch chain used as chafing gear, run through the ***Carib Trader II***'s chocks, and connected to 1 3/4-inch wires, which were wrapped around the port and starboard mooring bitts. According to a tow plan provided by the vessel manager and approved by the Coast Guard, the tow was not to occur if winds were forecasted to exceed 25 knots sustained or the sea state or swells were expected to be greater than 8–10 feet.

On March 6 at midnight, the tow was making 4.2 knots, with winds 24–30 knots and seas 7–9 feet. At 0035, the mate on watch said he heard a "bang" and the ***Capt. Beau***'s speed increased, which he believed indicated that the tow had broken free.

The tow line bridle to the ***Carib Trader II*** had parted in winds and seas that were near the maximum allowed in the tow plan. The ***Capt. Beau*** crew found that the ***Carib Trader II***'s port anchor chain had payed out and the ship was riding lower at the stern. The increased drag from the tow's greater draft and a trailing anchor, combined with dynamic loading of the towline assembly in the 7- to 9-foot seas and 24- to 30-knot winds, would have increased forces on the bridle.

The *Carib Trader II* in 2019. Source: Gordon Dalzell, shipspotting.com.

***Left to right*: *Carib Trader II* while flooding and sinking.** Source: *Capt. Beau* crew.

The crew reattached the tow line to what was left of the port leg of the Spectra bridle and, by 0400, took the *Carib Trader II* back under tow at a slow speed, with a plan to reevaluate the situation at daylight.

After sunrise, the captain thought the ship was trimmed by the stern more than it had been when they recovered the tow several hours earlier. At 0720, the mate boarded the *Carib Trader II* and found the engine room flooded, with water above the main engine. The mate was not able to identify the source of the flooding. Because the engine room was found to be flooding rapidly, it is likely that the source of the flooding was below the waterline. Although the mate attempted to dewater with a portable pump prestaged for the dead ship tow, the pump was not able to keep up with the flooding.

By 1500, it became obvious that the *Carib Trader II* would sink. The *Carib Trader II* started listing to starboard and, about 1520, the mate departed the cargo vessel. The captain did not think the crew would be able to disconnect the tow before the *Carib Trader II* sank, so all of the tow wire was payed out to get the *Capt. Beau* as far away from the towed vessel as possible before the engineer cut the wire. The *Capt. Beau* remained nearby while the *Carib Trader II* continued to sink.

At 1620, the *Carib Trader II* sank stern first in a water depth of about 3,300 feet, taking the towing wire and bridle with it.

THE PROBABLE CAUSE of the flooding and subsequent sinking of the *Carib Trader II* while under dead ship tow was the uncontrolled flooding of the engine room from an undetermined location below the waterline.

The *Capt. Beau* in 2022. Source: P&L Towing.

Area where the *Carib Trader II* sank, as indicated by a circled *X*. Background source: Google Maps.

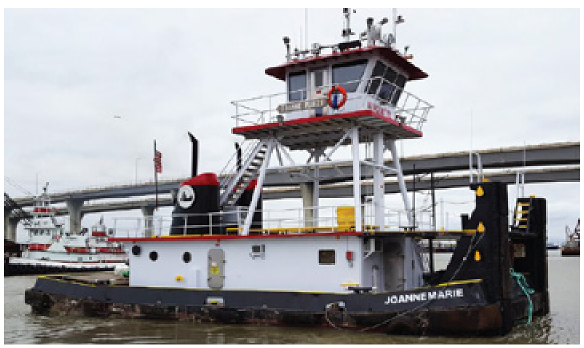
FLOODING/HULL FAILURE

Flooding and Partial Sinking of Towing Vessel ***Joanne Marie***

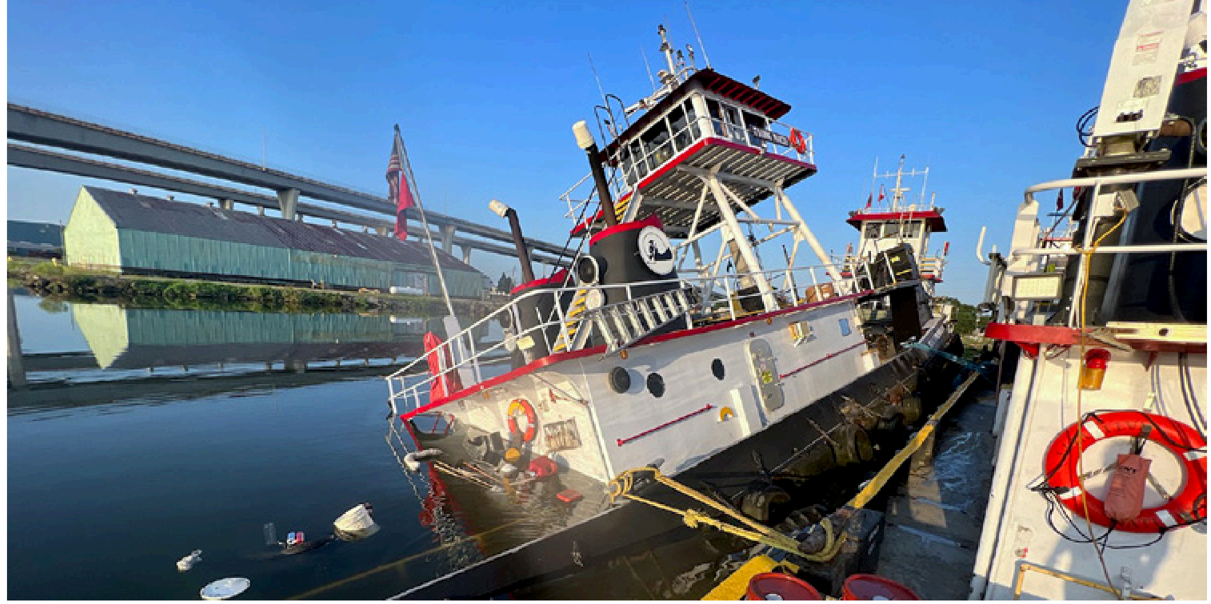
VESSEL GROUP
Towing/Barge

LOCATION
Harvey Canal, New Orleans, Louisiana

CASUALTY DATE	ACCIDENT ID
June 25, 2023	DCA23FM037
INJURIES	**ESTIMATED DAMAGES**
None	$176,751
REPORT NUMBER	**ISSUED**
MIR-24-07	April 8, 2024



Joanne Marie **underway at unknown date before the vessel sank.**
SOURCE: MARQUETTE TRANSPORTATION.



Joanne Marie **listing at the shipyard on the morning of June 25.** SOURCE: COAST GUARD.

On June 25, 2023, about 0600 local time, the inspected towing vessel *Joanne Marie* was found partially submerged while moored at a shipyard on the Harvey Canal near New Orleans, Louisiana. There were no crewmembers or shipyard workers on board the vessel. An estimated 10 gallons of diesel fuel were released into the water. Damage to the vessel was $176,751.

On June 23, the *Joanne Marie* was moored and "deactivated" at the Bollinger Quick Repair Shipyard alongside a fleet of seven other towboats. The port captain assisted with, and oversaw the crew as they completed, the required vessel deactivation tasks. In addition, the port captain tightened the vessel's propulsion shaft seals. Afterward, the port captain shut down the vessel's main diesel engines and generators, leaving the *Joanne Marie* with no power, and the crew and port captain departed the vessel.

The vessel's shaft seal cofferdam discharge system had two bilge pumps whose discharges combined into a single overboard line. The discharge lines had valves installed to prevent water ingress. There was an overboard shutoff valve installed just before the through-hull pipe (combined overboard discharge) to prevent the accidental admission of water from moving through the discharge system into the engine room. Additionally, each bilge pump had a check valve on its individual discharge line before the lines combined into a single overboard line.

The deactivation procedures in the operating company's TSMS, however, were limited to housekeeping items and did not address the configuration of onboard systems to prevent a casualty, such as closing the overboard shutoff valve. Therefore, the valve was left open when the *Joanne Marie* was secured on June 23. Additionally, after the casualty, investigators found that a wire nut had lodged in a spring-loaded check valve on the starboard-side bilge pump discharge line, obstructing the valve, forcing it to remain partially open, and leaving it susceptible to backflow. With the overboard shutoff valve left open and the spring-loaded check valve stuck partially open, water entered through the through-hull pipe—which was near or potentially below the waterline—causing the cofferdam—which was not watertight—to overflow and water to flood the engine room.

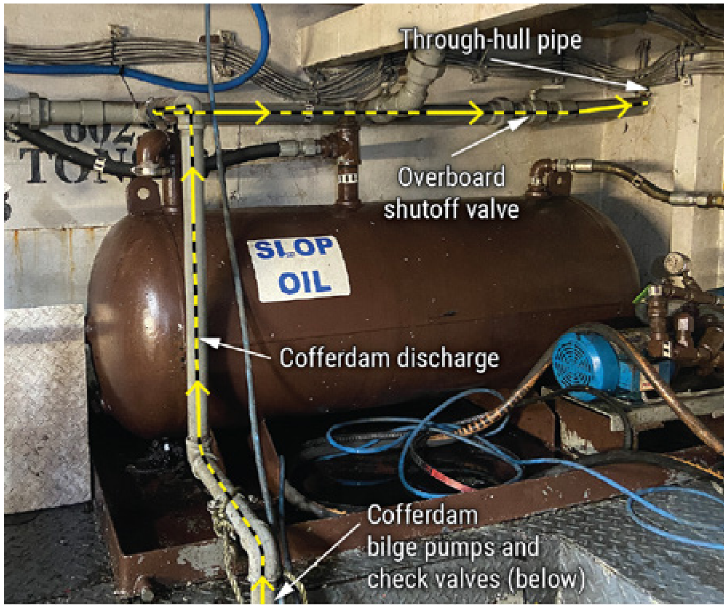
Had the TSMS deactivation procedures accounted for the configuration of vessel systems, such as closing the overboard shutoff valve, the procedures would have accounted for the possibility of the spring-loaded check valve becoming stuck and resulting in flooding.

As water continued to ingress through the through-hull pipe for the cofferdam overboard discharge, the added weight from the water in the engine room would have increased the vessel's draft near the stern, further submerging the through-hull pipe. Based on the specifications of the 1.5-inch Schedule 40 pipe used for the cofferdam discharge system as well as the postcasualty examination of the spring-loaded check valve, which showed the wire nut blocked about 50% of the pipe/flow of water into the cofferdam, investigators calculated a rough initial rate of flooding of 1,508 gallons per hour once the center of the overboard discharge was submerged at a depth of 1 foot. As the vessel's stern sank lower and the overboard discharge moved farther underwater, the rate of flooding would have increased until the port quarter rested on the bottom of the canal.

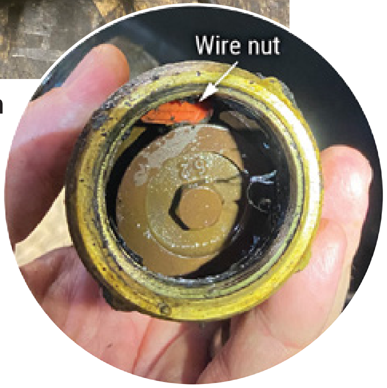
The flooding went undetected until about 0530 on June 25, for about 17 hours after a port captain had completed a daily round of the *Joanne Marie*'s exterior on June 24. Per company policy, monitoring of deactivated vessels did not include checks of vessel interior spaces, such as the engine room. As such, the port captain's June 24 round was not sufficient to detect water ingress. The vessel was equipped with bilge alarms as well as bilge pumps. However, the alarms were not active because the vessel was not connected to shore power (nor was it required to be). Without crewmembers conducting more thorough and frequent rounds or functioning bilge alarms, company personnel remained unaware of the flooding until the vessel had already partially sunk.

THE PROBABLE CAUSE of the flooding and partial sinking of the *Joanne Marie* was the ingress of water into the engine room through a through-hull pipe located near the waterline due to an obstructed spring-loaded check valve on a cofferdam bilge pump discharge. Contributing to the sinking were inadequate procedures for securing unattended vessels.

***Joanne Marie* through-hull pipe for the cofferdam pumps' overboard discharge on the port quarter shown postcasualty**.
Background source: Coast Guard.



***Joanne Marie* cofferdam discharge system (facing aft).** Background source: Coast Guard.



Cofferdam bilge pump with inlet shown with strainer removed. Inset shows associated spring-loaded check valve shown with lodged wire nut.
Background source: Coast Guard.

LESSONS LEARNED:
ENSURING OVERSIGHT OF INACTIVE VESSELS

It is good marine practice for owners and operators of towing vessels to assess risks and develop tasks in their TSMS for vessels that are unattended or in layup status. TSMS task lists for such vessels should address factors in the configuration of the vessel that could lead to a casualty. To reduce the potential for flooding, operators should consider closing through-hull fitting valves (such as skin valves or seacocks) and tightening packing glands for propulsion shaft seals, or other machinery, as needed. Additionally, conducting periodic rounds of vessel spaces and installing high-water bilge alarms and fire detection systems that remotely alert responsible personnel facilitates the early detection and mitigation of potential safety risks, such as flooding or fire.

***Jacqueline A* rescue operations. *Left to right*: Rescue swimmer (fluorescent yellow) assisting crewmember into the water. Response vessels on scene.** Source: North Myrtle Beach Rescue Squad.

FLOODING/HULL FAILURE

Flooding and Sinking of Towing Vessel ***Jacqueline A***

VESSEL GROUP
Towing/Barge

LOCATION
Atlantic Ocean, 3 nm east of North Myrtle Beach, South Carolina

CASUALTY DATE August 8, 2023	ACCIDENT ID DCA23FM044
INJURIES None	ESTIMATED DAMAGES $660,000
REPORT NUMBER MIR-24-20	ISSUED July 25, 2024

***Jacqueline A* following salvage after the sinking.**

On August 8, 2023, about 1859 local time, the towing vessel ***Jacqueline A*** sank about 3 nautical miles east of North Myrtle Beach, South Carolina, after taking on water while transiting in the Atlantic Ocean. The three crewmembers abandoned the vessel and were recovered by local emergency responders. There were no injuries. Most of the estimated 5,000 gallons of diesel fuel on board the vessel leaked into the sea. Following salvage, the vessel was determined to be a constructive total loss valued at $660,000.

In mid-2023, the owner of the ***Jacqueline A*** hired a crew of three to transit the vessel from Virginia to a Louisiana shipyard. The crew arrived at the ***Jacqueline A*** in Virginia on August 5 and got the vessel underway the following day.

On August 8, while transiting in the Atlantic Ocean about 3 nautical miles off the coast of South Carolina with the captain at the helm, the ***Jacqueline A*** began taking on water. The captain found water in the bilge, on the port side aft, up to the bottom of the engine. The crew started the bilge pump, but the vessel continued to flood. The captain transmitted a mayday call, and the crew was rescued by local emergency responders. Shortly afterward, the vessel fully sank.

The vessel's stern sank first, with the bow remaining above the water for a period of time, indicating the flooding originated in the aft portion of the vessel. After the vessel was salvaged, investigators found several large wastage holes in the main deck plating above the lazarette within the voids formed by the enclosed bulwark on the main deck. The bulwarks on the ***Jacqueline A*** had been modified by adding plating to the inboard side of the bulwark frames, creating small void spaces within the bulwarks. The voids were inaccessible spaces in which corrosion cells developed and eventually progressed into large wastage holes. Wastage holes were also found on the top and outboard side plating of the bulwarks.

When the ***Jacqueline A*** had entered open ocean waters a few hours before it sank, the vessel began rolling in 4-foot seas. Given the combined freeboard and bulwark height of 4.5 feet along the aft deck and the stern, the vessel was likely taking significant quantities of seawater over the bulwarks and deck. Under these conditions, seawater would have entered the bulwark voids through the wastage holes in the side plating and top and flowed down through the wastage holes in the main deck plating to the lazarette below. Water continued to wash onto the main deck and seep into the lazarette until the vessel's aft main deck was submerged.

Although there were potable water tanks between the lazarette and engine room, two wire runs through the potable tanks effectively created a common bulkhead between the lazarette and engine room. Penetrations of watertight bulkheads on vessels are normally sealed with a water-blocking compound or other material to prevent or slow progressive flooding. However, the wire runs on the ***Jacqueline A*** were not sealed, and thus, once the lazarette was filled, water poured into the engine room. The lazarette was a relatively small space compared to the engine room. If the wire runs had been sealed, flooding would have been contained to the lazarette, and the vessel likely would have remained afloat. Instead, the ***Jacqueline A*** sank as a result of water ingress into the lazarette through the bulwark wastage holes and progressive flooding from the lazarette into the engine room through the unsealed wire runs.

The *Jacqueline A* had only one bilge high-water level sensor, a float-type switch located at the forward end of the engine room about a foot above the hull bottom plate. Because the vessel sank by the stern, the float on the sensor would not have lifted until the lazarette was completely filled and the aft end of the engine room was inundated. Therefore, as it was configured, the bilge high-water level alarm system was ineffective as a means to alert the crew. Had an additional sensor been installed in the lazarette, the crew would have had a much earlier indication of the flooding and may have been able to act earlier to address it.

THE PROBABLE CAUSE of the flooding and sinking of the towing vessel *Jacqueline A* was a lack of watertight integrity due to the poor material condition of the vessel's bulwarks and main deck plating, which allowed water to ingress through wastage holes into the lazarette, and unsealed penetrations in transverse bulkheads, which led to progressive flooding forward into the engine room. Contributing to the sinking was the lack of a high-water bilge sensor in the lazarette, which prevented early detection of flooding into the space.

Wastage holes (circled) on outboard plating of stern bulwarks.

***Left to right*: Wastage holes on top rail of portside aft bulwarks and in main deck above lazarette within enclosed bulwarks.**

LESSONS LEARNED:

CORROSION HAZARDS IN INACCESSIBLE VOID SPACES

Inaccessible voids or difficult to reach pockets or crevices that are poorly ventilated and provide no access for maintenance pose a risk to vessels due to the potential for severe rusting/corrosion. Because these spaces are inaccessible, corrosion can grow undetected. Operators and manufacturers should keep these risks in mind when designing, constructing, or modifying a vessel. Ensuring all spaces are accessible enables maintenance personnel to check for and remediate any potential hazards, such as corrosion.

SEALING WATERTIGHT BULKHEAD PENETRATIONS

For the safety of a vessel and all on board, the integrity of the hull and watertight bulkheads must be maintained, and any deficiencies must be appropriately addressed. Known issues with watertight integrity, including unsealed watertight bulkhead and deck penetrations and deck and hull plate wastage, need to be addressed by permanent means. The Coast Guard advises, "Ensure electrical cables and conduits, piping runs, remote valve actuators, and other components that penetrate watertight bulkheads, decks, and compartments are inspected frequently and properly maintained. Each may have a unique sealing method involving glands with packing assemblies, penetration seals, or other methods. Frequent inspection and proper maintenance of these various fittings and assemblies will assist in minimizing the possibility of progressive flooding."

INSTALLING BILGE HIGH-WATER LEVEL ALARMS AND SENSORS

Automatic high-water bilge alarms are intended to provide crews with an early warning of vessel flooding. Manual detection (e.g., visually) often occurs only after flooding is underway and the crew has detected excessive rolling or listing, leaving little time for mitigating action. In inaccessible spaces, or small spaces that are difficult to inspect underway (such as a towing vessel's smaller compartments, voids, or lazarette), bilge-level monitoring alarms are often the sole means to alert operators of flooding. Sensors installed in all spaces where flooding may have a significant effect on the vessel's stability and buoyancy can prevent undetected flooding. The Coast Guard advises that "high level bilge alarms should be set as low as possible to the deck or bilge well and positioned along the centermost area of the compartment or in a location at which the fluids will gravitate to first. In areas where bilge water routinely accumulates, the bilge high-water level alarms should be placed just above the point where under normal working conditions the accumulation would be pumped to a holding tank, overboard, or through an oily water separation system if required."

FLOODING/HULL FAILURE

Flooding and Sinking of Fishing Vessel ***Christian G***

VESSEL GROUP Fishing	
LOCATION Gulf of America, about 70 nm southeast of Port Arthur, Texas	
CASUALTY DATE October 2, 2023	ACCIDENT ID DCA24FM002
INJURIES None	ESTIMATED DAMAGES $945,000
REPORT NUMBER MIR-24-28	ISSUED September 17, 2024

***Christian G* in July 2003.** Source: Coast Guard.

***Christian G* sinking in the Gulf of America on October 4, 2023.** Source: Crew of the *Christian G*.

On October 2, 2023, about 0600 local time, the fishing vessel ***Christian G*** was anchored in the Gulf of America about 70 miles southeast of Port Arthur, Texas, when the captain discovered the engine room was flooding. For the next 19 hours, the three-person crew of the ***Christian G*** and the crew of the Good Samaritan fishing vessel ***Kenneth Holt*** attempted to stop the flooding, but they were unsuccessful. The crew of the ***Christian G*** ultimately abandoned ship and transferred to the fishing vessel ***Miss Hilary***. On October 5, about 1000, the ***Christian G*** sank. There were no injuries. An oil sheen was observed at the site of the sinking. The lost cargo of bagged shrimp had an estimated value of $150,000, and the ***Christian G***, which was declared a total loss, had an estimated value of $795,000.

On August 24, the 79-foot-long steel-hulled fishing vessel ***Christian G*** departed Palacios, Texas, to catch shrimp off the coast of Louisiana with a crew consisting of the captain and two deckhands. The crew shrimped throughout the gulf until midnight on October 2, when the ship anchored to wait out adverse weather. A crewmember on watch from midnight to 0300 checked the engine room bilge before going to bed. No one was on watch after 0300.

At 0600, the engine room bilge alarm sounded. By the time the captain got to the engine room, water was already about 1 foot deep in the engine room bilge, which hampered him from locating a potential hull leak in that area.

Two electrically driven pumps installed in the engine compartment were discharging water but could not keep up. At 0700, the pumps stopped working when rising water submerged the ship's generators, cutting off power to the pumps. The captain called the nearby fishing vessel ***Kenneth Holt*** to request assistance. Once on scene, the ***Kenneth Holt*** provided the crew an additional portable electric pump.

The three pumps were not keeping up with the flooding, so at 1010, the ***Christian G*** captain called the Coast Guard and requested portable bilge pumps. At 1245, a Coast Guard helicopter lowered two gasoline-powered portable pumps to the vessel. One of the pumps did not draw water because of a damaged suction hose. At 1351, the other gasoline-powered pump stopped working because it ran out of fuel.

The three portable electrical pumps continued to run, but the flooding continued to outpace their discharge.

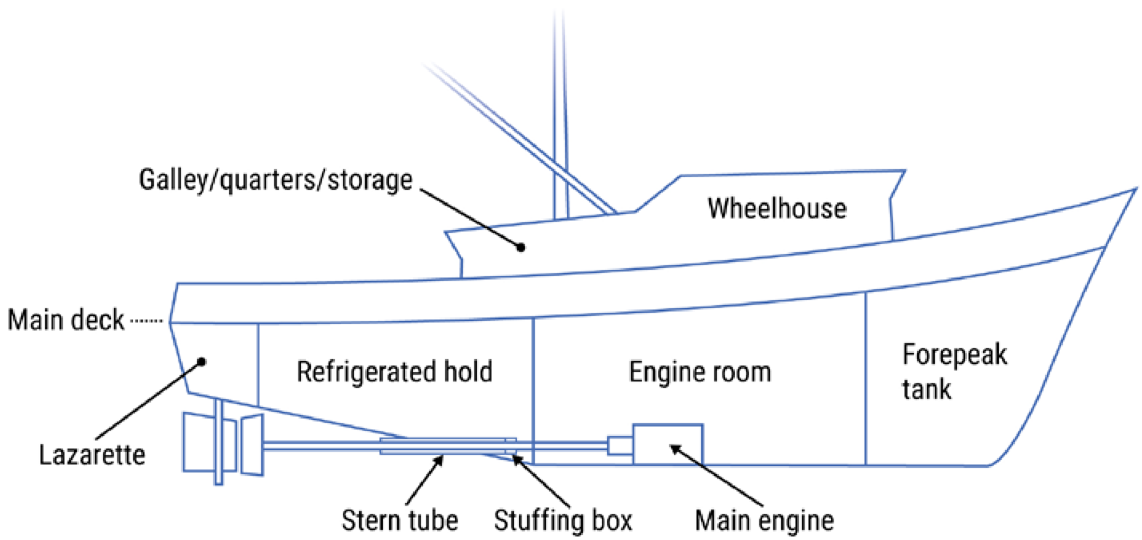
At 1758, the captain directed one of the deckhands to abandon the vessel—wearing a lifejacket—and swim to the *Kenneth Holt*.

At 1811, the *Kenneth Holt* began towing the *Christian G*. As the vessel was towed behind the *Kenneth Holt* in 8-foot waves, water came over the *Christian G*'s bow. The water downflooded through an open exterior galley door, into the deckhouse. The water would have then flooded into the engine room through the companionway connecting it to the deckhouse. The rate of engine room flooding was therefore accelerated by this downflooding.

At 2235, the tow line between the *Kenneth Holt* and the *Christian G* parted, and the connection for the extension cord broke. The *Miss Hilary*, which the *Christian G*'s vessel manager had called to assist, arrived about 2345. The next day, on October 3, an additional attempt to tow the *Christian G* again was unsuccessful. At 1540, the *Christian G* captain and the other deckhand abandoned the vessel—wearing lifejackets—and swam to the *Miss Hilary*. On October 4, the vessel's EPIRB activated, and, about an hour later, the *Christian G* sank.

Because the vessel was not salvaged, a postcasualty vessel examination could not be performed, and the source of the flooding could not be determined. Because the flooding was initially found in the engine room and the captain could not locate the source of the leak elsewhere in the vessel, it is likely that the leak originated in the hull steel plate beneath the engine room. The vessel's manager told investigators that the *Christian G* was last out of the water in 2018 but could not recall what maintenance was performed. The steel plating had possibly developed a hole from deterioration during the intervening time. The hole in the plate was likely not large based on the rate of flooding with bilge pumps continuously pumping and the vessel remaining afloat for 52 hours.

THE PROBABLE CAUSE of the sinking of the *Christian G* was flooding into the engine room—possibly caused by steel hull plating deterioration.



Simple profile of *Christian G* (not to scale).

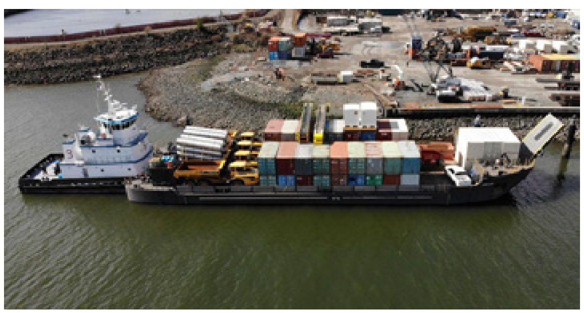
GROUNDING/STRANDING

Grounding of Articulated Tug and Barge ***Cingluku/Jungjuk***

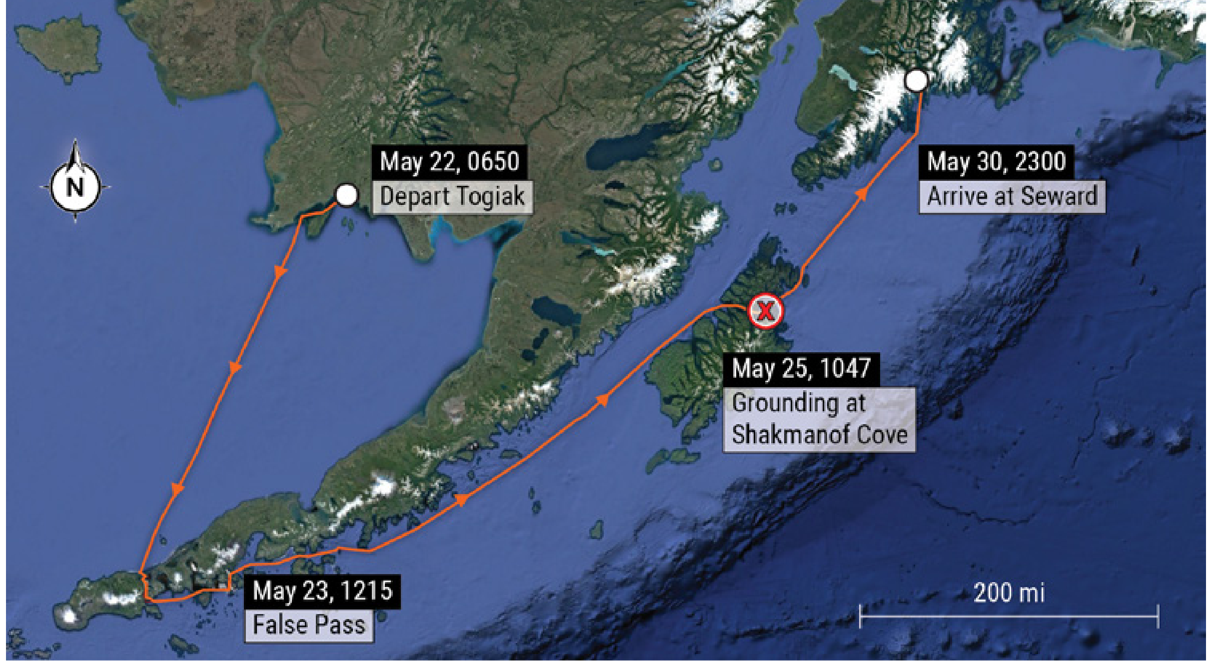
VESSEL GROUP
Towing/Barge

LOCATION
Shakmanof Cove, near Kodiak, Alaska

CASUALTY DATE	ACCIDENT ID
May 25, 2023	DCA23FM033
INJURIES	**ESTIMATED DAMAGES**
None	$1.47 million
REPORT NUMBER	**ISSUED**
MIR-24-14	June 13, 2024



ATB *Cingluku/Jungjuk* before the grounding.
SOURCE: TOBY HARTILL, MARINETRAFFIC.COM.



Approximate voyage trackline of the *Cingluku/Jungjuk*. BACKGROUND SOURCE: GOOGLE EARTH.

On May 25, 2023, about 1047 local time, the articulated tug and barge ***Cingluku*** (tugboat) and ***Jungjuk*** (barge), was transiting into Shakmanof Cove from Marmot Bay near Kodiak, Alaska, with six crewmembers on board. While approaching the entrance to the cove, the barge grounded on a submerged rock, damaging the barge's steel hull. No pollution or injuries were reported, and there was no damage to the tugboat. The total cost to repair the damage to the barge was estimated at $1.47 million.

Three days earlier, the ATB ***Cingluku/Jungjuk*** departed Togiak, Alaska, en route to Seward, Alaska. Along the route, the crew—a captain, a mate, engineer, and three deckhands—planned to stop in Shakmanof Cove on Kodiak Island near Marmot Bay to drop off supplies for another vessel. The ***Jungjuk*** was not fully loaded with cargo and therefore was partially ballasted, and the deepest draft of the ATB was 5.5 feet at the stern of the barge.

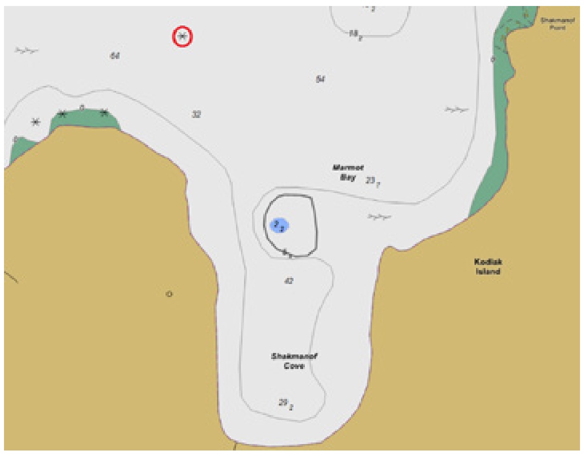
On May 23, the ***Jungjuk*** transited through False Pass. About this time, the captain plotted a route into Shakmanof Cove in the vessel's ECS using the NOAA ENC for Marmot Bay and Kupreanof Strait (NOAA ENC US4AK5PM). This was his first time navigating into Shakmanof Cove.

Throughout the day on May 24 and into the early hours of May 25, the ATB transited northeast between False Pass and Kodiak Island, through Kupreanof Strait, and into Marmot Bay.

On May 25, as the ***Cingluku/Jungjuk*** approached the entrance to Shakmanof Cove, the ATB's barge ran aground on a charted submerged rock. The tug did not contact the rock and remained coupled to the ***Jungjuk***. The rising tide eventually lifted the ***Jungjuk*** off the rock, and the vessel continued into Shakmanof Cove without issue.

According to the captain, the rock was not visible from the wheelhouse, nor did it appear on radar. Additionally, the crew's forward visibility over the bow was partially obscured by the ***Jungjuk***'s bow ramp. Since the water level at the time of the grounding was still 2.2 feet above mean lower low water, the rock would have been submerged and would not have been detectable by radar or a visual lookout.

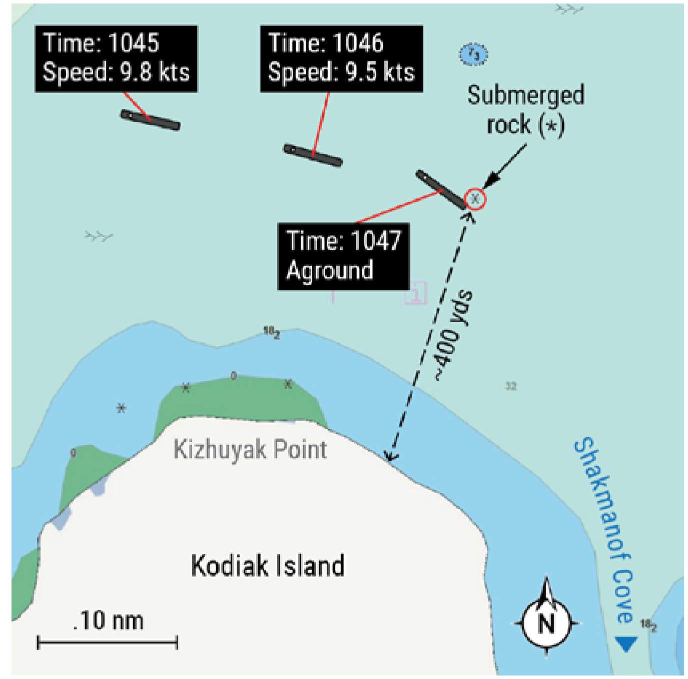
Although the rock was charted on the ENC, the captain did not notice the asterisk marking the rock's location. Because ENCs are customizable based on vessel characteristics and user settings, investigators were unable to determine precisely how the information was presented to the captain when he was planning the ATB's route. However, when investigators viewed the area on an equivalent ECS, the asterisk marking the rock was displayed alongside soundings of similar size and color, so it is possible that the captain mistook the asterisk for a depth sounding or other chart information when plotting and reviewing the route. The vessel had a copy of the *United States Coast Pilot* for the area, which called out the rock's location, on board. However, the captain did not reference it and relied on the ENC when planning and reviewing the route. Using other available resources, such as the *Coast Pilot*, would have helped the captain in identifying the rock when planning and reviewing the route.



ENC US4AK5PM, for the area near Shakmanof Cove, as viewed by investigators using an equivalent ECS. The asterisk symbol for the rock in the area of the grounding is indicated by a red circle. Background source: NOAA ENC as viewed on Rose Point ECS.

Additionally, the captain of the *Cingluku* told investigators that he was not aware that certain grounding avoidance features of the ECS were disabled on the day of the grounding—including the isolated danger symbol feature, which, when enabled, displayed an isolated danger symbol over the rock, regardless of the entered safety contour depth or vessel draft. The crew stated that they did not use the contour depth features on the ECS and likely did not enter the ATB's draft into the ECS, and thus did not receive obstacle alerts or warnings when plotting and loading the route. The operating company did not offer any training to the ATB crew on using the ECS software on their vessels and only offered tutorials on an as-needed basis. There were also no procedures in the company's SMS to ensure that preconditions—such as setting the contour depths or entering the vessel's draft—were enabled for use of the ECS's grounding avoidance features. Therefore, the crew did not use the ECS functions that could have helped them identify the rock's location, nor did the company ensure they used or understood these functions.

THE PROBABLE CAUSE of the grounding of the articulated tug and barge *Cingluku/Jungjuk* was the captain not identifying a rock that was indicated on the displayed electronic navigation chart when planning the vessel's route into Shakmanof Cove. Contributing was the captain not using all available navigational resources, including the *Coast Pilot* and the grounding avoidance features of the electronic chart system, when planning the route.



Track of the *Cingluku/Jungjuk* as it approached Shakmanof Cove. Background source: NOAA ENC US4AK5PM as viewed on Made Smart AIS.

LESSONS LEARNED:

TRAINING ON ELECTRONIC CHART SYSTEMS

Owners and operators should ensure their crews are sufficiently trained in the use of their ECS and understand how to use the different functionalities of the ECS. An ECS can provide a wealth of navigation information to mariners and can display the same feature(s) differently depending on user settings and entered vessel characteristics, such as draft and contour depth settings. Raster navigational charts, displayed on the ECS, do not have this capability.

An ECS offers advanced features that can help users increase their vessel's safety and crew situational awareness of potential safety hazards. In some cases, incorrect, or non-use of these features may even reduce situational awareness to certain hazards, such as submerged rocks.

While categorically different than an ECDIS, ECSs operate similarly and implement many of the same features as International Maritime Organization-compliant ECDIS equipment. ECDIS training is a mandatory course for most credentialed mariners on oceangoing vessels; however, there is no such requirement for the operation of an ECS. For more information about ENC and chart symbols, mariners should refer to **U.S. Chart No. 1: Symbols, Abbreviations and Terms used on Paper and Electronic Navigational Charts**.

GROUNDING/STRANDING

Grounding of the Bulk Carrier *American Mariner*

VESSEL GROUP	
Cargo, Dry Bulk	
LOCATION	
St. Marys River, Sault Ste. Marie, Ontario	
CASUALTY DATE	ACCIDENT ID
January 7, 2023	DCA23FM013
INJURIES	ESTIMATED DAMAGES
None	$600,000
REPORT NUMBER	ISSUED
MIR-24-16	July 9, 2024

***American Mariner* underway before the grounding.** SOURCE: COAST GUARD.

On January 7, 2023, about 0734 local time, the bulk carrier *American Mariner* had begun transiting outbound in the Vidal Shoals Channel, near Sault Ste. Marie, Ontario, en route to Superior, Wisconsin, when the vessel grounded and sustained damage to three ballast water tanks. No pollution or injuries were reported. Damage to the vessel was $600,000.

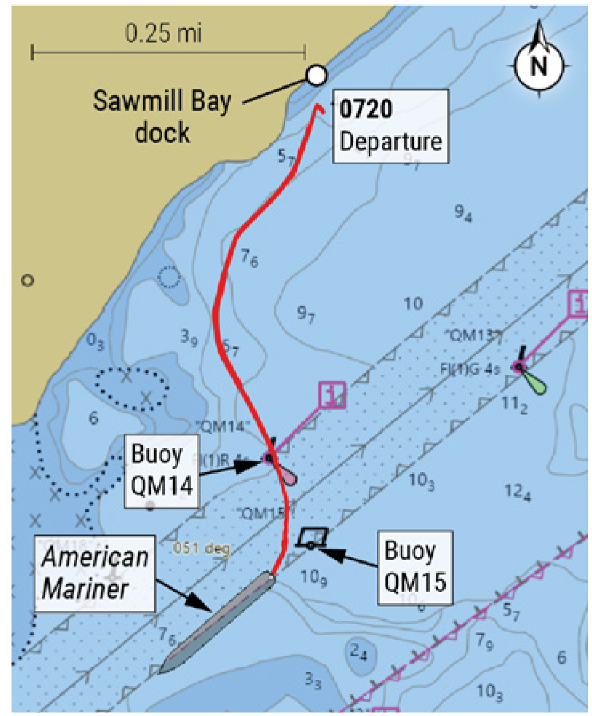
Three days earlier, the *American Mariner* left Ashtabula, Ohio, on Lake Erie with 19 crew aboard, en route to the Algoma Steel facility at Sault Ste. Marie. At 1910 on January 6, the vessel arrived at the locks at Sault Ste. Marie. The vessel deballasted before entering the locks in order to arrive at the Algoma Steel facility as light as possible.

At 2224, the ship arrived at, and moored starboard side to, the Algoma Steel Sawmill Bay Dock along the St. Marys River. At 2349, the crew started discharging cargo. About 0652 the next morning, the crew finished the cargo unloading.

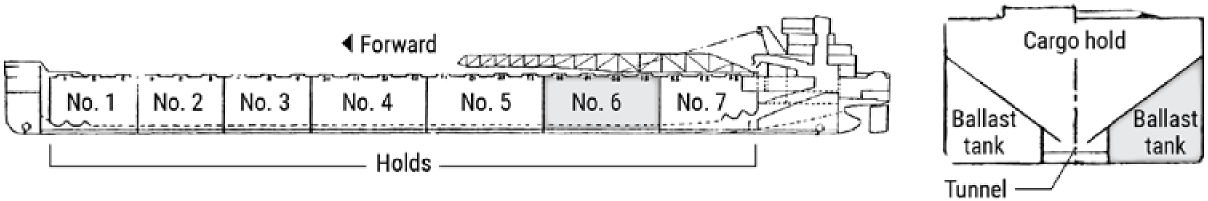
At 0720, the *American Mariner* departed with drafts at 15 feet, 11 inches forward and 19 feet, 10 inches aft. The master, who was alone at the helm, maneuvered the vessel into the Vidal Shoals Channel. (Forty-five minutes before departure, depths in the channel were 25 feet 3 inches.) The master expected current in the channel beginning at the north side buoy (QM14), so he entered the channel with the bow thruster still on, traveling at 4 knots. He then turned the ship to starboard into the channel.

When the vessel departed, it was dark, and the seasonal channel buoys were unlit, which would have made it more difficult for the master to see the channel. Although the master was using Rose Point ECS software to navigate, he was not using the software's vessel footprint overlay feature, so the ship appeared as a dot/small icon at the position of the GPS antenna or an offset reference point. Additionally, the captain was alone on the bridge, having to multi-task the navigation, steering, and lookout duties as the vessel departed the dock and attempted to enter the channel. Without additional personnel on the bridge, the master had to split his concentration among these tasks, which, in conjunction with the darkness, unlit buoys, and not using the ECS footprint feature, likely compromised his ability to successfully navigate the vessel into the channel.

While the master was maneuvering the vessel into the Vidal Shoals Channel, crewmembers reported a sound and "shudder;" they then discovered that one of the vessel's ballast tanks appeared to be communicating with the lake, and therefore was likely damaged. Although the master stated the ship was in the channel, the shoals were located immediately outside the buoyed channel, and the AIS data from that time showed the vessel on the far (southeast) side of the channel.



***American Mariner*'s AIS path after it left the facility, in relation to the buoys, channel, and shoal water (final vessel position shown is at 0730:55). Soundings are in meters; shoal water is indicated with darker blue.** BACKGROUND SOURCE: NOAA ENC US4MI2QU AS VIEWED ON MADE SMART AIS.



***Left to right*: Inboard profile drawing of *American Mariner*. Section drawing showing the vessel's no. 6P ballast tank (highlighted), where the engineers detected flooding, in relation to the cargo hold, void, and fore and aft tunnel.** Background source: Grand River Navigation.

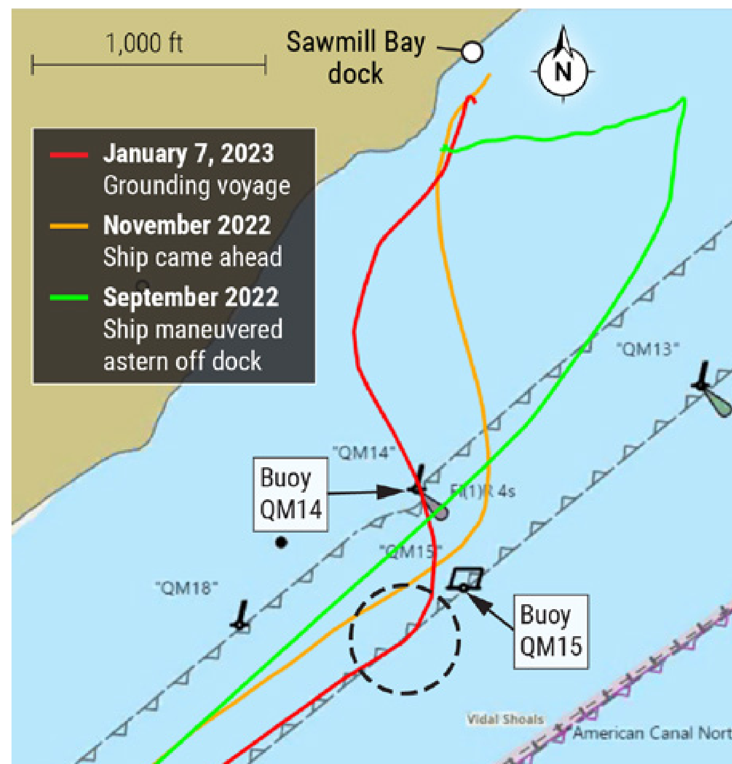
***American Mariner*'s bridge and centerline conning station.** Source: Coast Guard.

The vessel proceeded to a shipyard in Superior, Wisconsin, where it was drydocked, and damage to three ballast tanks at the bilge chine along the port side was found—including breaches of the hull to hold no. 6. Given the crew reports, damage to the port chine and bottom plating, and the vessel's position at the southeast edge of the channel, the *American Mariner* grounded on Vidal Shoals at the edge of the channel.

The NTSB reviewed data for 2 years of port calls at the dock. Four of the seven times *American Mariner* left the facility, including all three times after the grounding, the vessel moved astern about a ship's length, where there was more room to maneuver, before coming ahead and entering the channel at a shallow angle and lining up on the centerline. On the casualty voyage, the master did not leave enough room between the ship and shoal water by buoy QM14, forcing a hard port turn once underway. The heading and position from that turn resulted in the ship entering the channel at a steep angle, which required a sharp turn to starboard to stay within the channel and avoid the shoals at the opposite side of the channel. Therefore, the master's initial angle of departure from the dock and close approach to the shoal water positioned the vessel at a poor angle to successfully maneuver into the channel, which resulted in the vessel overshooting the turn and grounding on the shoals on the opposite side of the channel.

THE PROBABLE CAUSE of the grounding of the bulk carrier *American Mariner* was the master maneuvering the vessel away from the dock and into the channel while alone on the bridge, which required him to multitask (navigation, steering, and lookout duties) and resulted in the vessel overshooting the turn into the channel and running aground on the shoals on the opposite side of the channel.

AIS tracklines of the *American Mariner* navigating into the channel from the facility. The area where the vessel's course took it near the edge of the channel is circled with dashes. Background source: NOAA ENC US4MI2QU as viewed on Made Smart AIS.



LESSONS LEARNED:
DETERMINING BRIDGE TEAM STAFFING

While maneuvering in confined waters, it is difficult for a single bridge crewmember to effectively drive, lookout, and monitor and use available bridge equipment. The composition of a bridge team may vary based on the complexity of the maneuver or operation being carried out. Typically, maneuvers like docking or undocking, transiting in or out of port, or operating in areas of high traffic density require additional personnel to handle navigation-related duties. Owners, operators, and vessel masters are responsible for ensuring that bridge teams are staffed with a sufficient number of certified/credentialed mariners who are familiar with all bridge navigation equipment and able to independently take immediate action. Additionally, the effective use of all available resources by a bridge team, including visual scanning, radars, electronic charts, and an automatic identification system, increases collective situational awareness and contributes to a safe navigation watch.

MACHINERY DAMAGE

Loss of Propulsion aboard Containership *Maunalei*

VESSEL GROUP Cargo, General	
LOCATION North Pacific Ocean, 245 nm from Columbia River entrance, Oregon	
CASUALTY DATE August 11, 2022	ACCIDENT ID DCA22FM039
INJURIES None	ESTIMATED DAMAGES $3.03 million
REPORT NUMBER MIR-24-11	ISSUED April 18, 2024

Maunalei **underway before the casualty.**
SOURCE: MATSON.

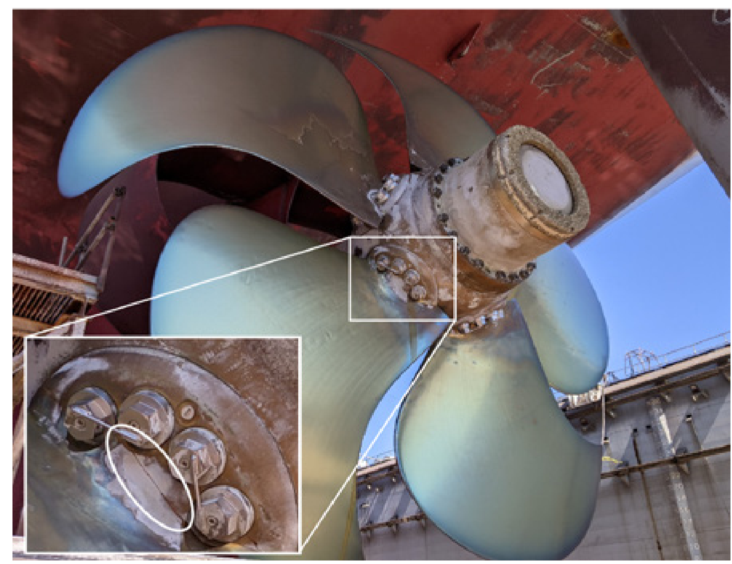
On August 11, 2022, about 1834 local time, the containership *Maunalei* was transiting the North Pacific Ocean, about 245 nautical miles northwest of the entrance to the Columbia River, en route to Portland, Oregon, when the crew intentionally shut down the main engine due to problems in the CPP system, resulting in a loss of propulsion. The vessel's CPP may have lost up to 1,632 gallons of hydraulic oil. There were no injuries reported. Damage to the vessel was estimated at $3.03 million.

On August 4, while the 681-foot-long *Maunalei* was underway en route from Tacoma, Washington, to Anchorage, Alaska, the engine crew discovered the vessel's CPP hub lubricating system was leaking hydraulic oil. The engineering crew attempted to mitigate the loss of hydraulic oil and its effect on the propulsion system by reducing the pitch of the propeller as needed and replenishing the hydraulic oil in the CPP hub head tank. The engineering crew believed the CPP system had experienced a blade seal failure, but, because the vessel was at sea, they could not attempt repairs, and the vessel continued to Anchorage.

Three days later, the vessel arrived in Anchorage, where technicians boarded the vessel, examined and tested the CPP system, and determined the vessel should be drydocked to further inspect and repair the system. After the port engineer and captain informed the Coast Guard of the situation, the vessel headed toward a shipyard in Oregon for an emergency drydocking.

On the voyage, despite their efforts, the loss of hydraulic oil continued to worsen—so much so that the crew began using fresh water to supplement the hydraulic oil in the CPP system. The system continued to lose the combined water and hydraulic oil, and the crew noticed the hydraulic oil in the stern tube lubricating system was being contaminated with water. Because the stern tube lubricating system was compromised, the continued use of fresh water as a substitute for hydraulic oil to lubricate and seal the system could have rendered the propulsion system inoperable, risking a full seizure of operation and the potential for the ingress of seawater into the machinery space. As a result, the chief engineer and master decided—in consultation with the owner/operating company—to shut down the main engine and have the vessel towed the remaining way to the shipyard.

The CPP had five blades, each secured to the hub by seven bolts at the blade's base. At the shipyard, a diver conducted an underwater survey and found fractures and cracks on two of the propeller blades (nos. 2 and 4). The free surface cracks found on the no. 2 blade did not extend to the base of the hub and therefore would not have allowed hydraulic oil to leak. The fracture on the no. 4 blade was larger, extending from the hub near the leading edge, through the bolts, and approaching the trailing edge. Additionally, postcasualty examination and testing found that the potable water used to supplement the hydraulic oil during the casualty transit drained from the no. 4 blade, but not the no. 2 blade. Therefore, the fracture in the no. 4 blade base of the CPP system allowed hub hydraulic oil to exit the CPP system, diminishing the fluid reservoir to a level that the crew felt was unsafe to continue to operate the system.

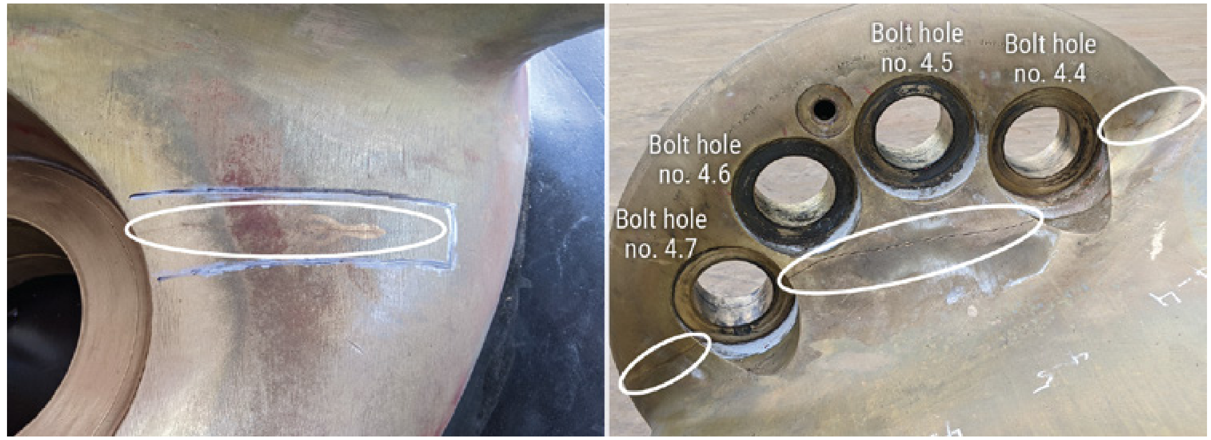


The CPP on the *Maunalei* after the casualty, showing a fracture (inset) at the base of the no. 4 blade.
BACKGROUND SOURCE: COAST GUARD.

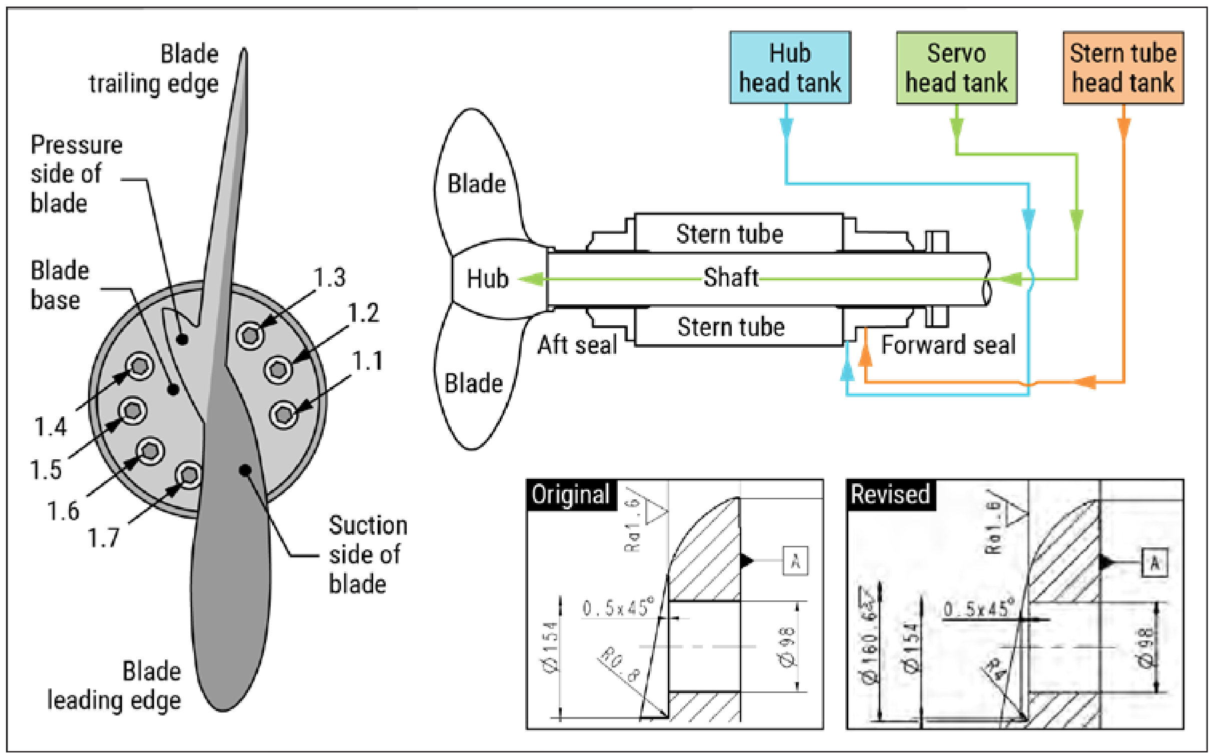
Postcasualty testing completed by a third-party company found that the cracks and fractures on the no. 4 blade base initiated at the bolt hole counterbore radius and were consistent with progressive cracking due to high cycle fatigue. The company also found that the bolt hole counterbore radius did not meet manufacturer machining requirements (the radius was about 0.2 millimeters smaller than the required 0.8 millimeters). Additionally, the no. 4 blade did not meet other manufacturer design specifications, such as material specifications for Charpy impact toughness—which measures the material's tendency to resist breaking when subjected to a sudden shock—tensile strength, yield strength, or percent elongation. Lastly, the chemical composition of the blade did not meet compositional requirements (the silicon content exceeded the specified minimum). Propeller blades require adherence to specified engineering design, material selection, and manufacturing requirements to maintain optimum performance and extend fatigue life. Because the no. 4 blade did not meet manufacturer design specifications, it was more susceptible to high cycle fatigue, which resulted in the development of cracks and fractures in the blade base. As a result of the *Maunalei*'s loss of propulsion, the CPP blade manufacturer revised the internal radius requirement—enlarging it—for all seven bolt hole counterbores to improve fatigue fracture resistance.

Based on the *Maunalei*'s no. 4 blade not meeting specifications and the manufacturer's postcasualty finite element analysis of other five-bladed CPP systems on similar vessels (which did not identify any other instances of cracks), the crack and fracture that developed on the no. 4 blade of the *Maunalei* CPP system was likely an isolated occurrence.

THE PROBABLE CAUSE of the loss of propulsion on the containership *Maunalei* was a crack developing in a controllable pitch propeller blade base and progressing into a fracture due to high cycle fatigue as a result of the blade not meeting manufacturer design specifications.



***Left to right*: Fractures (circled) on propeller blade no. 2, suction side and no. 4, pressure side.**
BACKGROUND SOURCE: COAST GUARD.



***Maunalei* propeller blade no. 1 bolt positions and simplified schematic of hydraulic oil system head tanks for CPP system. Insets show CPP blade original and revised machining drawings reflecting the increased internal radius required for the bolt holes.** INSET SOURCE: MAN ENERGY SOLUTIONS.

Lessons Learned

This year's investigations resulted in lessons learned—including some we have seen before—about a variety of hazards to marine transportation. Most of the accidents we investigated were preventable.

It is critical for owners, operators, mariners, and vessel designers to keep in mind the circumstances of accidents aboard similar vessels while reviewing their own operations. What lessons can be learned from our investigations? **As you review the following lessons learned, think about how each issue manifested into a safety problem and how it might apply to your operation.** By considering our lessons learned in each accident, or by finding your own lessons learned, it is our hope that mariners can make changes to avoid a similar accident.

Yacht *Savage* during firefighting efforts (*see page 56*).
SOURCE: VIRGINIA BEACH FIRE DEPARTMENT VIA COAST GUARD.

Providing Adequate Procedures and Training

Improper operation of equipment, poor planning, and ineffective action to prevent or mitigate an emergency can often be traced to the absence of adequate procedures or training. Safe vessel operations and compliance with mandatory rules and regulations can be achieved in part by vessel owners and operators establishing clear standard operating and emergency response procedures—as found in an effective SMS. Manufacturer guidance and industry standards can provide practiced and proven methods for properly and safely completing tasks with minimal risk to the vessel. Once procedures have been implemented, owners and operators should ensure crewmembers and personnel involved in operations are thoroughly trained in and adhere to the procedures. By actively ensuring procedures are established and followed, owners and operators can identify and correct nonconformities and take steps to mitigate future risks.

A lack of documented procedures for handling open-flame devices led to the fire aboard the ***Spirit of Boston***. In the ***Cingluku/Jungjuk*** casualty, the operating company did not ensure the crew used or understood ECS functions, leading to the vessel grounding. In the ***Sandy Ground*** casualty, inadequate training led to engineering crewmembers having different perceptions about how to operate the fuel oil return system, resulting in the overpressurization of the system. The installation of a hydraulic hose that exceeded its bend radius—against manufacturer's guidance—caused the fire aboard the ***Desperado***.

Determining Adequate Staffing

The composition of a vessel's crew may vary based on the complexity of operations. Typically, maneuvers like docking or undocking, transiting in or out of port, or operating in areas of high traffic density require additional bridge personnel to handle navigation-related duties. Fewer crewmembers may be required when a vessel is docked, but an appropriate number must remain on board to ensure the safety and security aboard the vessel. Owners, operators, and vessel captains are responsible for ensuring that crews are staffed with a sufficient number of properly trained and/or credentialed mariners who are familiar with critical vessel systems and able to independently take immediate action.

In the ***American Mariner*** casualty, the master was alone on the bridge while maneuvering the vessel away from the dock, compromising his ability to successfully navigate the vessel. In the ***Spirit of Boston*** casualty, the absence of marine crewmembers aboard with hospitality staff while the vessel was docked meant the vessel's emergency response plan for a fire could not be executed as intended.

Spirit of Boston *(see page 60)*

Maintaining Alertness and Vigilance

Fatigue and complacency can both affect mariners' ability to remain alert and vigilant. Fatigue impacts all aspects of human performance—including decision-making, alertness, and reaction time—all of which affect a mariner's ability to safely navigate a vessel. Additionally, the impacts of awake/sleep cycle disturbances can be reduced by using tools such as pilothouse alerter systems and by allowing longer downtime between watches/shifts. It is important that mariners get enough sleep during each off-watch period, so they remain alert when assuming watch. Repetition and monotony can also cause even the most experienced and skilled mariner to become complacent and lose situational awareness. It is also good practice to develop strategies that help mariners maintain focus, such as changing position, eliminating distractions, and continuous scanning of instruments.

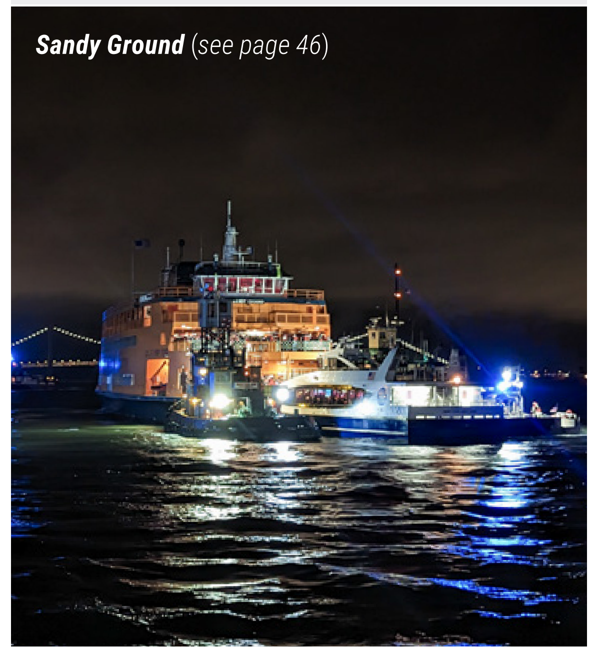
In the ***Cindy B*** casualty, a deckhand fell asleep at the helm due to fatigue related to changing day/night sleep cycles, causing the tow to contact a dock. In the ***John 3:16*** casualty, the pilot fell asleep while navigating due to an accumulated sleep deficit, causing the vessel to contact a pier. In the ***Susan K*** casualty, the captain's complacency resulted in his inattention to the tow's position as it approached and struck a bridge.

Susan K *(see page 16)*

Maintaining Unimpeded Return Flow in Diesel Engine Fuel Oil Return Systems

Diesel engine fuel return systems are designed to return unburned, excess fuel from an engine back to a designated tank, typically at atmospheric pressure. If an isolation (shutoff) valve is installed in the return line before the tank, closing the valve will result in a pressure build up in the return line. Pressure can build up in a closed return line such that the fuel system components rupture, causing fuel to spray into the engine room and possibly ignite a fire. Vessel owners and operators can mitigate the risk of engine room fires resulting from overpressurization by ensuring return lines leading to service tanks are unimpeded.

The ***Sandy Ground*** engine crewmembers closed both isolation valves in the diesel engine fuel oil return lines, causing the fuel oil system to overpressurize and spray fuel oil on a main engine, igniting a fire.



Sandy Ground *(see page 46)*

Mitigating Fire Risks

Fire aboard a vessel—no matter the cause—is an emergency situation with potentially disastrous consequences. To mitigate the risk of fire, mariners and other personnel should follow standard industry practice, company policies (often contained in an SMS), and manufacturer guidance when conducting maintenance work (such as hot work) and handling open-flame devices. Ensuring fire detection and notification systems are functional once work is completed can help detect fires early before they grow. When a fire is detected, mariners can limit its spread by securing ventilation; activating fixed fire extinguishing systems, where installed; and ensuring the appropriate response activities occur. Additionally, owners and operators can mitigate the risk of fire spreading by limiting the use and storage of combustible materials—such as wood paneling, candles, or chafing fuel canisters—aboard a vessel.

The improper extinguishment of an open-flame device caused the fire aboard the ***Spirit of Boston***, and appropriate personnel were not on board to promptly extinguish the fire. The use of combustible materials in the ***Qualifier 105***'s and ***Lady Delray***'s interior spaces contributed to the fire damage aboard those vessels. The ***Kodiak Enterprise***'s inadequate fire detection and notification system contributed to the severity of the fire aboard the vessel. Both the ***Sandy Ground*** and ***Desperado*** casualties showed how the crew's quick securing of engine room ventilation helped quickly contain an engine room fire.

Kodiak Enterprise
(see page 40)

Ensuring Watertight Integrity

To prevent vessel flooding, the integrity of the hull and watertight bulkheads must be maintained, and any deficiencies must be appropriately addressed. Conducting periodic rounds of vessel spaces and regularly checking tanks and voids adjacent to the vessel's hull can help crews identify hull integrity issues that can possibly lead to flooding. Addressing known issues with watertight integrity—including unsealed watertight bulkheads, unsealed deck penetrations, and deck and hull plate wastage—by permanent means can help mitigate the risk of a vessel flooding. Additionally, when a vessel is unattended, closing through-hull fitting valves and tightening packing glands for propulsion shaft seals or other machinery can reduce the potential for flooding.

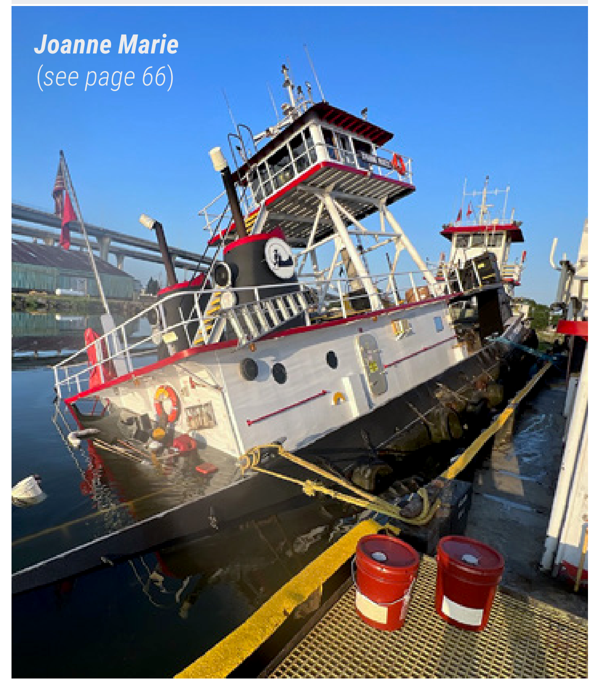
In the flooding of the ***Joanne Marie***, open valves for a through-hull pipe allowed water to enter and flood the vessel. In the ***WB Wood*** casualty, undetected flooding from a through-hull pipe and compromised watertight bulkheads led to the vessel capsizing. Unsealed penetrations in the ***Jacqueline A***'s transverse bulkheads led to progressive flooding.

WB Wood *(see page 6)*

Installing and Testing Bilge Alarms

Automatic high-water bilge alarms are intended to provide crews with an early warning of vessel flooding. In inaccessible spaces or small spaces with limited ability to inspect while underway (such as smaller compartments, voids, or a lazarette), these alarms are often the sole means to alert vessel crews of flooding. Owners and operators should install bilge high-water sensors in all spaces where flooding may have a significant effect on the vessel's stability and buoyancy and periodically test the alarms.

In the ***Hotspur*** and ***Joanne Marie*** casualties, inoperable or inactive bilge alarms prevented early detection of flooding. In the ***Jacqueline A*** casualty, the ineffective configuration of the bilge alarm system prevented early detection of flooding. In the ***WB Wood*** casualty, the vessel's sole bilge alarm didn't activate until multiple spaces had flooded.



Joanne Marie
(see page 66)

Preventing Hull Corrosion

Because of exposure to environmental conditions, steel hulls are susceptible to corrosion, erosion, and damage over time. Corrosion can also grow undetected in inaccessible voids or difficult-to-reach pockets. To avoid flooding or weakening of the hull due to corrosion or other factors, it is good marine practice for owners to conduct regular oversight and maintenance of hulls, including between drydock periods. Additionally, when designing, constructing, or modifying a vessel, designers, manufacturers, and operators should ensure all spaces are accessible so maintenance personnel can check for and remediate any potential hazards, such as corrosion.

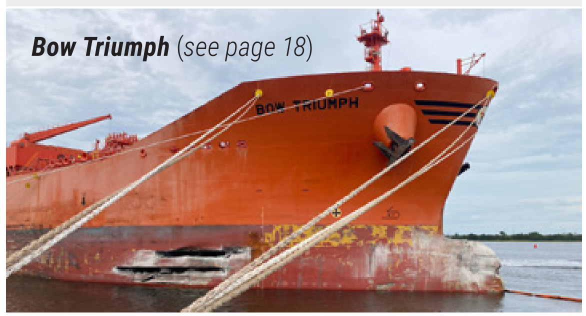
In the ***Jacqueline A*** casualty, flooding was caused by water ingress through wastage holes caused by corrosion that developed in inaccessible voids. The deterioration of hull plating may have caused flooding in the ***Hotspur*** casualty.

Jacqueline A *(see page 68)*

Accounting for Hydrodynamic Forces

In narrow channels, hydrodynamic forces reduce rudder effectiveness (squat and shallow water effect) and yaw the bow away from the closest bank and pull the stern in (bank effect). Bank effect can have an undesired effect on vessels, even for the most experienced shiphandlers; pilots, masters, and other vessel operators should be aware of the risks in areas known for hydrodynamic forces. Additionally, as a large ship moves through a channel, a low-pressure suction is particularly strong on the vessel's quarters near the inlet side of the propeller. If a small vessel must operate near a larger vessel—such as a tugboat conducting harbor-assist operations for a ship—the operator of the smaller vessel should be aware of the hazards caused by hydrodynamic forces due to the larger vessel, and, if necessary, maintain a safe distance until the larger vessel slows and the hydrodynamic forces are reduced.

In the ***Bow Triumph*** casualty, the pilot's maneuvering of the vessel left it exposed to bank effect on its port side, overcoming his ability to safely navigate the vessel and leading to the vessel striking a pier. In the ***Mark E Kuebler/Nisalah*** collision, hydrodynamic forces drew the tugboat in toward the tanker, causing the two vessels to collide.



Bow Triumph *(see page 18)*

Planning for Current

Strong currents resulting from high water pose unique hazards for vessels transiting inland rivers, where operators may have limited space to maneuver vessels. In addition, near dams, greater dam openings in high-water conditions lead to high flow rates, which can produce outdraft currents near the dam. Mariners should thoroughly assess the potential impact of currents—whether from high water or outdraft—when planning a transit. The vessel's horsepower and handling, as well as the incorporation of additional safety measures, such as having anchors ready, should be considered to reduce the risk of a casualty.

A strong current overcame the ***Sirocco***'s mooring winches' brake-holding capacities, causing the vessel to break away from the dock during loading. The ***Queen City*** contacted a dike when the pilot did not effectively compensate for strong outdraft while navigating a tow near a dam.

Sirocco *(see page 10)*

> **"It is our sincere hope that others will apply the knowledge uncovered by our world-renowned investigators to prevent future marine casualties and save lives."** — Jennifer L. Homendy, NTSB Chairman

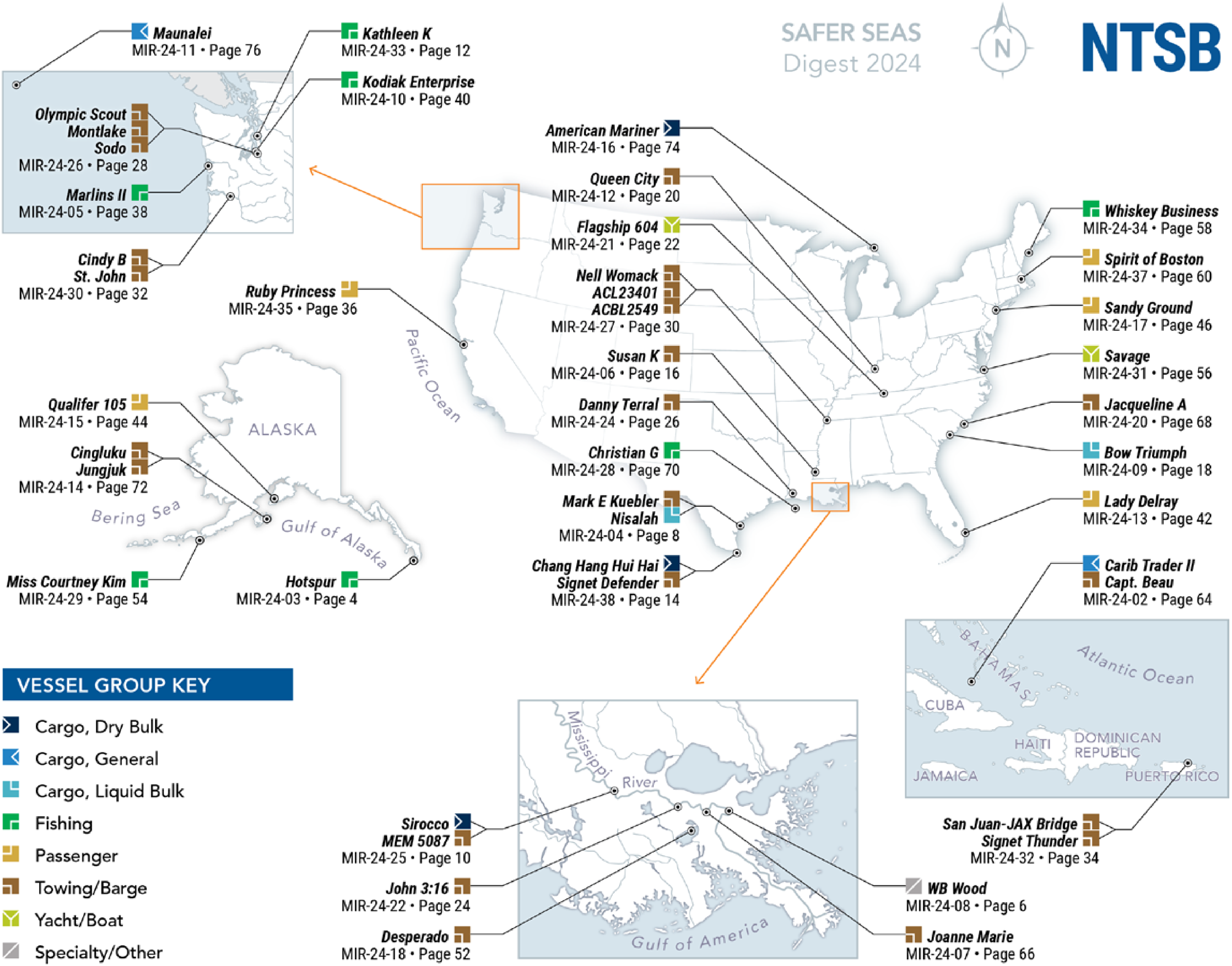
Table of Vessel Particulars by Vessel Group

REPORT NUMBER	VESSEL NAME	VESSEL SUBTYPE	FLAG	LENGTH	BREADTH	DRAFT	PERSONS ON BOARD	PAGE
Cargo, Dry Bulk								
MIR-24-16	***American Mariner***	Bulk carrier	United States	714.8 ft (217.9 m)	78.0 ft (23.8 m)	19.8 ft (6.0 m)	**19**	74
MIR-24-25	***Sirocco***	Bulk carrier	Panama	753.1 ft (229.5 m)	105.8 ft (32.2 m)	37.1 ft (11.3 m) fwd 41.8 ft (12.7 m) aft	**31**	10
MIR-24-38	***Chang Hang Hui Hai***	Dry bulk carrier	China	656.1 ft (200.0 m)	105.0 ft (32.0 m)	41.0 ft (12.5 m)	**27**	14
Cargo, General								
MIR-24-02	***Carib Trader II***	Containership	St. Vincent and the Grenadines	273.9 ft (83.5 m)	45.9 ft (14.0 m)	6.5 ft (2.0 m)	**0**	64
MIR-24-11	***Maunalei***	Containership	United States	680.6 ft (207.5 m)	97.8 ft (29.8 m)	33.5 ft (10.2 m)	**23**	76
Cargo, Liquid Bulk								
MIR-24-04	***Nisalah***	Tanker	Saudi Arabia	1,092.5 ft (333.0 m)	196.9 ft (60.0 m)	34.6 ft (10.6 m)	**27**	8
MIR-24-09	***Bow Triumph***	Tanker	Norway	599.3 ft (182.7 m)	105.6 ft (32.2 m)	26.6 ft (8.1 m) fwd 27.6 ft (8.4 m) aft	**26**	18
Fishing								
MIR-24-03	***Hotspur***	Fishing vessel	United States	52.6 ft (16.0 m)	16.2 ft (4.9 m)	5.8 ft (1.8 m)	**5**	4
MIR-24-05	***Marlins II***	Fishing vessel	United States	91.2 ft (27.8 m)	24.0 ft (7.3 m)	8.0 ft (2.4 m)	**0**	38
MIR-24-10	***Kodiak Enterprise***	Fishing vessel	United States	252.3 ft (76.9 m)	44.0 ft (13.4 m)	31.5 ft (9.6 m)	**3**	40
MIR-24-28	***Christian G***	Fishing vessel	United States	79.2 ft (24.1 m)	24.0 ft (7.3 m)	8.0 ft (2.4 m)	**3**	70
MIR-24-29	***Miss Courtney Kim***	Fishing vessel	United States	58.0 ft (17.7 m)	19.1 ft (5.8 m)	10.0 ft (3.0 m)	**7**	54
MIR-24-33	***Kathleen K***	Fishing vessel	United States	73.3 ft (22.3 m)	26.0 ft (7.9 m)	9.3 ft (2.8 m)	**3**	12
MIR-24-34	***Whiskey Business***	Fishing vessel	United States	45.0 ft (13.7 m)	15.0 ft (4.6 m)	5.0 ft (1.5 m)	**0**	58
Passenger								
MIR-24-13	***Lady Delray***	Small passenger vessel	United States	80.8 ft (24.6 m)	20.0 ft (6.1 m)	5.0 ft (1.5 m)	**0**	42
MIR-24-15	***Qualifier 105***	Small passenger vessel	United States	105.0 ft (32.0 m)	27.4 ft (8.4 m)	N/A	**3**	44
MIR-24-17	***Sandy Ground***	Ferry	United States	304.2 ft (92.7 m)	69.0 ft (21.0 m)	13.0 ft (4.0 m)	**884**	46
MIR-24-35	***Ruby Princess***	Cruise ship	Bermuda	946.8 ft (288.6 m)	118.3 ft (36.0 m)	27.4 ft (8.4 m)	**3,998**	36
MIR-24-37	***Spirit of Boston***	Passenger vessel	United States	192.0 ft (58.5 m)	35.0 ft (10.7 m)	10.4 ft (3.2 m)	**16**	60

REPORT NUMBER	VESSEL NAME	VESSEL SUBTYPE	FLAG	LENGTH	BREADTH	DRAFT	PERSONS ON BOARD	PAGE
Towing/Barge								
MIR-24-02	***Capt. Beau***	Towing vessel	United States	107.7 ft (32.8 m)	26.9 ft (8.2 m)	12.3 ft (3.7 m)	5	64
MIR-24-04	***Mark E Kuebler***	Tugboat	United States	98.5 ft (30.0 m)	42.7 ft (13.0 m)	20.0 ft (6.1 m)	5	8
MIR-24-06	***Susan K***	Towing vessel	United States	160.0 ft (48.8 m)	48.0 ft (14.6 m)	12.1 ft (3.7 m)	9	16
MIR-24-07	***Joanne Marie***	Towing vessel	United States	65.0 ft (19.8 m)	24.0 ft (7.3 m)	9.2 ft (2.8 m)	0	66
MIR-24-12	***Queen City***	Towing vessel	United States	102.5 ft (31.2 m)	34.0 ft (10.4 m)	7.5 ft (2.3 m)	7	20
MIR-24-14	***Cingluku*** (tug of ATB)	Towing vessel	United States	78.8 ft (24.0 m)	32.0 ft (9.8 m)	5.5 ft (1.7 m)	6	72
MIR-24-14	***Jungjuk*** (barge of ATB)	Freight barge	United States	185.0 ft (56.4 m)	55.0 ft (16.8 m)	6.0 ft (1.8 m)	0	72
MIR-24-18	***Desperado***	Towing vessel	United States	58.5 ft (17.8 m)	20.1 ft (6.1 m)	5.7 ft (1.7 m)	3	52
MIR-24-20	***Jacqueline A***	Towing vessel	United States	60.0 ft (18.3 m)	24.0 ft (7.3 m)	8.0 ft (2.4 m)	3	68
MIR-24-22	***John 3:16***	Towing vessel	United States	70.6 ft (21.5 m)	28.0 ft (8.5 m)	10.0 ft (3.0 m)	6	24
MIR-24-24	***Danny Terral***	Towing vessel	United States	75.0 ft (22.9 m)	42.0 ft (12.8 m)	9.0 ft (2.7 m)	5	26
MIR-24-25	***MEM 5087***	Barge	United States	200.0 ft (61.0 m)	35.0 ft (10.7 m)	N/A	0	10
MIR-24-26	***Olympic Scout***	Tugboat	United States	91.8 ft (28.0 m)	26.2 ft (8.0 m)	11.4 ft (3.5 m)	4	28
MIR-24-26	***Montlake*** (tug of ATB)	ATB	United States	112.2 ft (34.2 m)	34.0 ft (10.4 m)	16.5 ft (5.0 m)	5	28
MIR-24-26	***Sodo*** (barge of ATB)	ATB	United States	287.5 ft (87.6 m)	77.7 ft (23.7 m)	9.3 ft (2.8 m)	0	28
MIR-24-27	***Nell Womack***	Towing vessel	United States	68.9 ft (21.0 m)	26.1 ft (8.0 m)	9.3 ft (2.8 m)	4	30
MIR-24-27	***ACL23401*** (barge of ***Nell Womack***)	Barge	United States	200.0 ft (60.9 m)	35.0 ft (10.7 m)	11.0 ft (3.4 m)	0	30
MIR-24-27	***ACBL2549*** (barge of ***Nell Womack***)	Barge	United States	200.0 ft (60.9 m)	35.0 ft (10.7 m)	11.0 ft (3.4 m)	0	30
MIR-24-30	***Cindy B***	Towing vessel	United States	101.0 ft (30.8 m)	30.0 ft (9.1 m)	8.5 ft (2.6 m)	3	32
MIR-24-30	***St. John*** (barge of ***Cindy B***)	Barge	United States	250.0 ft (76.2 m)	76.0 ft (23.2 m)	12.8 ft (3.9 m)	0	32
MIR-24-32	***San Juan-JAX Bridge***	Freight barge	United States	699.2 ft (213.1 m)	104.0 ft (31.7 m)	9.7 ft (3.0 m)	1	34
MIR-24-32	***Signet Thunder***	Ocean tug	United States	120.0 ft (36.6 m)	36.0 ft (11.0 m)	16.4 ft (5.0 m)	7	34
MIR-24-38	***Signet Defender***	Tugboat	United States	103.5 ft (31.5 m)	37.0 ft (11.3 m)	14.0 ft (4.3 m)	0	14
Yacht/Boat								
MIR-24-21	***Flagship 604***	Boat	United States	74.0 ft (22.6 m)	20.0 ft (6.1 m)	1.8 ft (0.5 m)	9	22
MIR-24-31	***Savage***	Yacht	United States	75.0 ft (22.9 m)	19.6 ft (6.0 m)	11.0 ft (3.4 m)	3	56
Specialty/Other								
MIR-24-08	***WB Wood***	Dredge vessel	United States	135.0 ft (41.1 m)	35.0 ft (10.7 m)	5.0 ft (1.5 m)	1	6

Table of Casualty Investigations and Location Map

REPORT NO.	VESSEL NAME	VESSEL GROUP AND SUBTYPE	CASUALTY LOCATION	PAGE
CAPSIZING/LISTING				
MIR-24-03	***Hotspur***	Fishing vessel	Dixon Entrance, near Nunez Rocks, 43 mi south-southwest of Ketchikan, **Alaska**	4
MIR-24-08	***WB Wood***	Dredge vessel	Lower Mississippi River, mile 85, near Meraux, **Louisiana**	6
COLLISION				
MIR-24-04	***Mark E Kuebler / Nisalah***	Tugboat / Tanker	Corpus Christi Ship Channel between Port Aransas and Ingleside, **Texas**	8
MIR-24-25	***Sirocco / MEM5087***	Bulk carrier / Barge	Lower Mississippi River, mile 160.4, Convent, **Louisiana**	10
MIR-24-33	***Kathleen K***	Fishing vessel	Salmon Bay, Seattle, **Washington**	12
MIR-24-38	***Chang Hang Hui Hai / Signet Defender***	Dry bulk carrier / Tugboat	Brownsville Ship Channel, Brownsville, **Texas**	14
CONTACT				
MIR-24-06	***Susan K***	Towing vessel	Lower Mississippi River, mile 363, Natchez, **Mississippi**	16
MIR-24-09	***Bow Triumph***	Tanker	Cooper River, north of Charleston, **South Carolina**	18
MIR-24-12	***Queen City***	Towing vessel	Ohio River, mile 604.3, Louisville, **Kentucky**	20
MIR-24-21	***Flagship 604***	Boat	Dale Hollow Reservoir, Byrdstown, **Tennessee**	22
MIR-24-22	***John 3:16***	Towing vessel	Lower Mississippi River, mile 118.6, Saint Rose, **Louisiana**	24
MIR-24-24	***Danny Terral***	Towing vessel	Calcasieu River, mile 33, Lake Charles, **Louisiana**	26
MIR-24-26	***Olympic Scout / Montlake/Sodo***	Tugboat / ATB	Hylebos Waterway, Tacoma, **Washington**	28
MIR-24-27	***Nell Womack / ACL23401 / ACBL2549***	Towing vessel / Barge / Barge	Lower Mississippi River, mile 727.5, West Memphis, **Arkansas**	30
MIR-24-30	***Cindy B / St. John***	Towing vessel / Barge	Columbia River, mile 53, near Clatskanie, **Oregon**	32
MIR-24-32	***San Juan-JAX Bridge / Signet Thunder***	Freight barge / Ocean tug	Army Terminal Pier, Cataño, **Puerto Rico**	34
MIR-24-35	***Ruby Princess***	Cruise ship	Pier 27, San Francisco Bay, San Francisco, **California**	36
FIRE/EXPLOSION				
MIR-24-05	***Marlins II***	Fishing vessel	Westhaven Marina, Westport, **Washington**	38
MIR-24-10	***Kodiak Enterprise***	Fishing vessel	Trident Seafoods facility, Pier 25, Tacoma, **Washington**	40
MIR-24-13	***Lady Delray***	Small passenger vessel	Veterans Park, Intracoastal Waterway, Delray Beach, **Florida**	42
MIR-24-15	***Qualifer 105***	Small passenger vessel	Northern Enterprises Boat Yard, Homer, **Alaska**	44
MIR-24-17	***Sandy Ground***	Ferry	Anchorage Channel, New York Harbor, near Staten Island, **New York**	46
MIR-24-18	***Desperado***	Towing vessel	Lake Salvador, Bayou Perot, **Louisiana**	52
MIR-24-29	***Miss Courtney Kim***	Fishing vessel	Simeon Bay, southern side of Popof Island, **Alaska**	54
MIR-24-31	***Savage***	Yacht	Atlantic Ocean, about 2 nm from Cape Henry, near Virginia Beach, **Virginia**	56
MIR-24-34	***Whiskey Business***	Fishing vessel	Safe Harbor Marina, Orrs Cove, Harpswell, **Maine**	58
MIR-24-37	***Spirit of Boston***	Passenger vessel	Boston Harbor, Boston, **Massachusetts**	60
FLOODING/HULL FAILURE				
MIR-24-02	***Carib Trader II / Capt. Beau***	Containership / Towing vessel	Magallanes Bank, 29 nm northwest Santo Domingo Cay, **Bahamas**	64
MIR-24-07	***Joanne Marie***	Towing vessel	Harvey Canal, New Orleans, **Louisiana**	66
MIR-24-20	***Jacqueline A***	Towing vessel	Atlantic Ocean, 3 nm east of North Myrtle Beach, **South Carolina**	68
MIR-24-28	***Christian G***	Fishing vessel	Gulf of America, about 70 nm southeast of Port Arthur, **Texas**	70
GROUNDING/STRANDING				
MIR-24-14	***Cingluku / Jungjuk***	Towing vessel / Freight barge	Shakmanof Cove, near Kodiak, **Alaska**	72
MIR-24-16	***American Mariner***	Bulk carrier	St. Marys River, Sault Ste. Marie, **Ontario**	74
MACHINERY DAMAGE				
MIR-24-11	***Maunalei***	Containership	North Pacific Ocean, 245 nm from Columbia River entrance, **Oregon**	76


SAFER SEAS
Digest 2024
N
NTSB
Maunalei
MIR-24-11 • Page 76
Kathleen K
MIR-24-33 • Page 12
Kodiak Enterprise
MIR-24-10 • Page 40
Olympic Scout
Montlake
Sodo
MIR-24-26 • Page 28
Marlins II
MIR-24-05 • Page 38
Cindy B
St. John
MIR-24-30 • Page 32
Ruby Princess
MIR-24-35 • Page 36
Pacific Ocean
Qualifer 105
MIR-24-15 • Page 44
ALASKA
Cingluku
Jungjuk
MIR-24-14 • Page 72
Bering Sea
Gulf of Alaska
Miss Courtney Kim
MIR-24-29 • Page 54
Hotspur
MIR-24-03 • Page 4
American Mariner
MIR-24-16 • Page 74
Queen City
MIR-24-12 • Page 20
Flagship 604
MIR-24-21 • Page 22
Nell Womack
ACL23401
ACBL2549
MIR-24-27 • Page 30
Susan K
MIR-24-06 • Page 16
Danny Terral
MIR-24-24 • Page 26
Christian G
MIR-24-28 • Page 70
Mark E Kuebler
Nisalah
MIR-24-04 • Page 8
Chang Hang Hui Hai
Signet Defender
MIR-24-38 • Page 14
Whiskey Business
MIR-24-34 • Page 58
Spirit of Boston
MIR-24-37 • Page 60
Sandy Ground
MIR-24-17 • Page 46
Savage
MIR-24-31 • Page 56
Jacqueline A
MIR-24-20 • Page 68
Bow Triumph
MIR-24-09 • Page 18
Lady Delray
MIR-24-13 • Page 42
Carib Trader II
Capt. Beau
MIR-24-02 • Page 64
BAHAMAS
Atlantic Ocean
CUBA
HAITI
DOMINICAN REPUBLIC
JAMAICA
PUERTO RICO
San Juan-JAX Bridge
Signet Thunder
MIR-24-32 • Page 34
Mississippi River
Gulf of America
Sirocco
MEM 5087
MIR-24-25 • Page 10
John 3:16
MIR-24-22 • Page 24
Desperado
MIR-24-18 • Page 52
WB Wood
MIR-24-08 • Page 6
Joanne Marie
MIR-24-07 • Page 66
VESSEL GROUP KEY
Cargo, Dry Bulk
Cargo, General
Cargo, Liquid Bulk
Fishing
Passenger
Towing/Barge
Yacht/Boat
Specialty/Other

Acknowledgment

For many of the marine casualties the NTSB investigated, investigators from the Office of Marine Safety worked closely with the Coast Guard Office of Investigations and Casualty Analysis in Washington, DC, and with the following Coast Guard units:

REPORT NUMBER	VESSEL NAME(S)	UNIT
MIR-24-02	***Carib Trader II / Capt. Beau***	Coast Guard Sector **Miami**
MIR-24-03	***Hotspur***	Coast Guard Sector **Southeast Alaska**, Marine Safety Detachment **Ketchikan**
MIR-24-04	***Mark E Kuebler / Nisalah***	Coast Guard Sector **Corpus Christi**
MIR-24-05	***Marlins II***	Coast Guard Marine Safety Unit **Portland**
MIR-24-06	***Susan K***	Coast Guard Marine Safety Detachment **Vicksburg**
MIR-24-07	***Joanne Marie***	Coast Guard Sector **New Orleans**
MIR-24-08	***WB Wood***	Coast Guard Sector **New Orleans**
MIR-24-09	***Bow Triumph***	Coast Guard Sector **Charleston**
MIR-24-10	***Kodiak Enterprise***	Coast Guard Sector **Puget Sound**
MIR-24-11	***Maunalei***	Coast Guard Sector **Columbia River**
MIR-24-12	***Queen City***	Coast Guard Sector **Ohio Valley**
MIR-24-13	***Lady Delray***	Coast Guard Sector **Miami**
MIR-24-14	***Cingluku / Jungjuk***	Coast Guard Sector **Anchorage**
MIR-24-15	***Qualifier 105***	Coast Guard Marine Safety Detachment **Homer**
MIR-24-16	***American Mariner***	Coast Guard Sector **Sault Ste. Marie** (renamed Sector **Northern Great Lakes** in 2023)
MIR-24-17	***Sandy Ground***	Coast Guard Sector **New York**
MIR-24-18	***Desperado***	Coast Guard Sector **New Orleans**
MIR-24-20	***Jacqueline A***	Coast Guard Sector **Charleston** and Coast Guard Detached Duty Office **Myrtle Beach**
MIR-24-22	***John 3:16***	Coast Guard Sector **New Orleans**
MIR-24-24	***Danny Terral***	Coast Guard Marine Safety Unit **Lake Charles**
MIR-24-25	***Sirocco / MEM 5087***	Coast Guard Sector **New Orleans**
MIR-24-26	***Olympic Scout / Montlake / Sodo***	Coast Guard Sector **Puget Sound**
MIR-24-27	***Nell Womack / ACL23401 / ACBL2549***	Coast Guard Sector **Lower Mississippi River**
MIR-24-28	***Christian G***	Coast Guard Marine Safety Unit **Port Arthur**
MIR-24-29	***Miss Courtney Kim***	Coast Guard Sector **Western Alaska** and **US Arctic**
MIR-24-30	***Cindy B / St. John***	Coast Guard Sector **Columbia River**
MIR-24-31	***Savage***	Coast Guard Sector **Virginia**
MIR-24-32	***San Juan-JAX Bridge / Signet Thunder***	Coast Guard Sector **San Juan**
MIR-24-33	***Kathleen K***	Coast Guard Sector **Puget Sound**
MIR-24-34	***Whiskey Business***	Coast Guard Sector **Northern New England**
MIR-24-35	***Ruby Princess***	Coast Guard Sector **San Francisco**
MIR-24-37	***Spirit of Boston***	Coast Guard **District 1** Formal Marine Board of Investigation
MIR-24-38	***Chang Hang Hui Hai***	Coast Guard Marine Safety Unit **Brownsville**

Who Has the Lead:
USCG or NTSB?

In a memorandum of understanding signed June 17, 2021, the NTSB and the Coast Guard agreed that when both agencies investigate a marine casualty, one agency will serve as the lead federal agency for the investigation. The NTSB Chairman and the Coast Guard Commandant, or their designees, will determine which agency will lead the investigation.

The NTSB may lead a major marine casualty investigation when, as defined in the memorandum of understanding, there is another transportation mode involved; serious threat of, or presumed loss of six or more lives on a passenger vessel; serious threat of, or presumed loss of 12 or more lives on a commercial vessel; serious threat of, or presumed high loss of life beyond the vessel(s) involved; significant safety issues relating to the infrastructure of the maritime transportation system or the environment by hazardous materials; safety issues of a recurring character; or significant safety issues relating to Coast Guard statutory missions, specifically aids to navigation, search and rescue, and marine safety.

NTSB Chairman Jennifer L. Homendy and Coast Guard personnel.

NTSB Office of Marine Safety

The **Office of Marine Safety** (OMS) investigates and determines the probable cause of major marine casualties in US territorial waters, major marine casualties involving US-flagged vessels worldwide, and marine accidents involving a public (government) vessel and any other vessel. Additionally, the NTSB fulfills US obligations with regard to foreign accident investigations, established under the auspices of the International Maritime Organization (IMO), by participating with the Coast Guard as a substantially interested State in investigations of certain serious marine casualties involving foreign-flagged vessels in international waters. Learn more about our "International Investigations." The office also may investigate accidents when the Board determines that they are catastrophic or the accident involves problems of a recurring character.

Investigations of "Major Marine" Casualties

The US Coast Guard conducts preliminary investigations of all marine casualties and notifies the OMS when an event qualifies as a major marine casualty, which is a casualty that results in:

- the loss of six or more lives.
- the loss of a mechanically propelled vessel of 100 or more gross tons.
- property damage initially estimated to be $500,000 or more.
- a serious threat, as determined by the Commandant of the Coast Guard with the concurrence of the NTSB Chairman, to life, property, or the environment by hazardous materials.

Independent Marine Investigations

The NTSB is the only federal organization that performs independent, comprehensive, and transparent multidisciplinary investigations to determine the probable cause of marine accidents, with the goal of making safety recommendations to prevent similar events from occurring in the future. The thoroughness and independence of these investigations maintain public confidence in marine transportation systems and provide policymakers with unbiased analysis.

After investigating each major marine casualty, the OMS identifies safety issues and releases an investigation report with a probable cause, which may include safety recommendations to federal government agencies (such as the Coast Guard), state agencies, vessel owners and operators, vessel classification societies, or maritime industry organizations. We may also issue close-out memos, which note the general facts of an accident, in cases where we do not produce an investigation report.

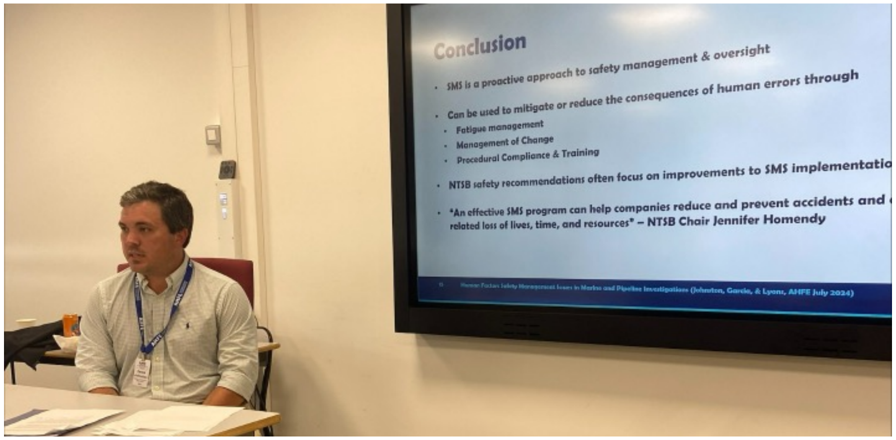
OMS investigator examines a cargo vessel.

OMS investigator inspects a vessel's safety locker.

Marine Safety Outreach

Sharing the lessons learned from our casualty investigations is a key part of NTSB's mission. OMS staff routinely engage with various marine stakeholders to share information about important safety issues. The following are some outreach highlights from 2024.

OMS investigators present to Maine Maritime Academy cadets on casualty analysis and watchkeeping, Castine, Maine, March 2024.



An OMS investigator discusses the value of SMS at the Applied Human Factors and Ergonomics International Conference, Nice, France, July 2024.

An OMS staff member presents to the I'm A Star Foundation at NTSB headquarters, Washington, DC, September 2024.

Marine Safety Issue Spotlight

Safety Management Systems for Passenger Vessels

A **safety management system** (**SMS**) is a formal, documented system for owners and operators to ensure that rules and procedures related to safe operations are in place. An SMS is an effective tool for safety oversight; it is designed to reduce human error, create a culture of safety at all organization levels, and reduce the risk of maritime casualties. Yet many operators either do not have one in place or have an ineffective one.

The goal of an SMS is to provide safe working practices for ship operation; continuously assess and identify risks to the vessel, personnel and the environment; and establish appropriate safeguards to those risks. Regardless of the size of the company, an SMS ensures standardized and unambiguous procedures for each crewmember during both routine and emergency operations—an SMS accounts for a vessel's characteristics, operations, and nature of service.

Elements of an SMS

An SMS should:

- establish policies for safety and environmental protection;
- set instructions and procedures to ensure the safe operation of vessels and the protection of the environment;
- define levels of authority and lines of communication between, and amongst, shore and shipboard personnel;
- define procedures for reporting accidents and nonconformities;
- specify procedures to prepare for and respond to emergency situations; and
- include procedures for internal audits and management reviews.

NTSB SMS Recommendation

The Coast Guard requires US-flagged vessels engaged in oceangoing international service to have an SMS. **However, there is no such requirement for the domestic passenger fleet.** The NTSB has a long-standing open safety recommendation (**M-12-03**) to the Coast Guard to issue a regulation that requires all operators of US-flag passenger vessels to implement an SMS. Safety Recommendation M-12-03 is currently classified Open-Unacceptable Response by the NTSB because the Coast Guard has not published a notice of proposed rulemaking in the 12 years since this recommendation was issued.

The NTSB continues to believe that an SMS is an essential tool for enhancing safety on board all US passenger vessels and that the Coast Guard is the appropriate authority to ensure implementation and enforcement of such a system. **Many US operators have already developed SMSs, and we encourage other vessel operators to voluntarily develop SMSs to reduce risk in their fleets and save lives.**

Act Now!

We've heard from smaller operators that implementing an SMS is too burdensome. That doesn't have to be the case. **A good SMS should be appropriately scaled to fit your operation and business**, considering factors such as size of fleet, nature of service, vessel routes, and number of crewmembers.

There is help available. The Coast Guard has guidance for voluntarily establishing an SMS.

Operators of small passenger vessels, regardless of whether they are subject to regulatory requirements, can use the guidance to develop an SMS that:

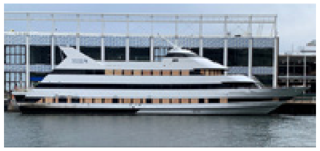
- provides for safe practices in ship operation;
- establishes safeguards against identified risks; and
- documents personnel responsible for safety and pollution prevention policies, functional safety and operational requirements, and recordkeeping and reporting responsibilities.

Don't delay. Implement your SMS today. Implementing an SMS to ensure the safety of your passengers and crew is not only the right thing to do, it's good business.

Scan to learn more about SMS on our SAFETY ISSUES page at ntsb.gov

Related Investigations

Take note of the lessons learned from the following casualties that resulted in recommendations involving SMS. Use the investigation ID to search our website at **ntsb.gov**.



Fire aboard Small Passenger Vessel *Spirit of Boston*

INVESTIGATION ID	CASUALTY DATE	LOCATION
DCA23FM022	March 24, 2023	Boston, MA

Fire aboard Small Passenger Vessel *Conception*

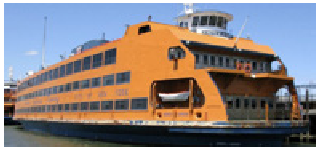
INVESTIGATION ID	CASUALTY DATE	LOCATION
DCA19MM047	September 2, 2019	Santa Cruz Island, CA

Fire on board US Small Passenger Vessel *Island Lady*

INVESTIGATION ID	CASUALTY DATE	LOCATION
DCA18FM010	January 14, 2018	Port Richey, FL

Allision of Ferry *Seastreak Wall Street* with Pier

INVESTIGATION ID	CASUALTY DATE	LOCATION
DCA13MM005	January 9, 2013	New York, NY



Allision of Passenger Ferry *Andrew J. Barberi* with St. George Terminal

INVESTIGATION ID	CASUALTY DATE	LOCATION
DCA10MM017	May 8, 2010	Staten Island, NY

Allision of Staten Island Ferry *Andrew J. Barberi*

INVESTIGATION ID	CASUALTY DATE	LOCATION
DCA04MM001	October 15, 2003	Staten Island, NY

"2025 **MARKS 20 YEARS** since the NTSB first issued a recommendation to the Coast Guard for SMS related to ferries and 13 years since the NTSB issued a recommendation to the Coast Guard to require operators of ALL US-flagged passenger vessels to implement SMS. Since then, the NTSB has investigated many fatal marine accidents, necessitating that we reiterate the recommendation. One of those fatal marine accidents was my first marine investigation as an NTSB Board member. The tragic fire and sinking of the *Conception* dive boat off the coast of Santa Barbara, California, in 2019 resulted in the unnecessary deaths of the 34 people who had been asleep on board, below deck.

As we await implementation of this crucial safety recommendation, every company and vessel without a safety management system creates unnecessary risks for crew and passengers alike."

Jennifer L. Homendy
NTSB Chairman

Chairman Homendy joins the families of the *Conception* fire victims during an observance of the casualty's 5-year anniversary.

NTSB Marine Safety Recommendations

The NTSB issues safety recommendations to address specific safety concerns uncovered during investigations and to specify actions to help prevent similar casualties from occurring in the future. Safety recommendations are our most important product because they alert government, industry, and the public to the critical changes that are needed to prevent transportation accidents and crashes, reduce injuries, and save lives. We issue recommendations to the organizations best able to take corrective action, other federal and state agencies, manufacturers, operators, and industry and trade organizations. We also monitor the progress of action to implement each recommendation until it is closed, which usually takes several years.

Overview

- Since 1967, the NTSB has issued more than 2,600 marine safety recommendations.
- At the end of 2024, there were 100 marine safety recommendations still open.
- Historically, we have issued about two-thirds of our marine safety recommendations to the Coast Guard.

Recommendations Closed in 2024

- In 2024, we closed eight marine safety recommendations acceptably, as follows:
- one (**M-19-16**) to the Coast Guard from our 2019 Safety Recommendation Report related to the July 19, 2018, sinking of the amphibious passenger vessel ***Stretch Duck 7*** in which 17 of the 31 persons aboard died;
- two (**M-20-21** and **M-20-22**) to the Passenger Vessel Association, Sportfishing Association of California, and National Association of Charterboat Operators from our investigation into the September 2, 2019, fire aboard the small passenger vessel ***Conception***, in which 33 passengers and one crewmember died;
- two — one (**M-22-2**) to the American Bureau of Shipping and one (**M-22-3**) to Key Lakes, Inc. — from our investigation into the February 1, 2021, engine room fire aboard the bulk carrier ***Roger Blough***;
- one (**M-24-4**) to the Marine Exchange of Southern California from our investigation into the October 1, 2021, crude oil release from an underwater pipeline in San Pedro Bay; and
- two (**M-24-5** and **M-24-7**) to the Coast Guard from our investigation into the December 22, 2022, engine room fire aboard the passenger ferry ***Sandy Ground***.

CASE ANALYSIS AND REPORTING ONLINE (CAROL)

The NTSB maintains a searchable public database of all its safety recommendations, from every mode of transportation, including the current status and all of the correspondence related to every recommendation. You can search our investigation and recommendation data via our CAROL query tool.

Ask CAROL at carol.ntsb.gov

NATIONAL TRANSPORTATION SAFETY BOARD


SANDY GROUND
NTSB