

NATIONAL TRANSPORTATION SAFETY BOARD

2022

SAFER SEAS Digest

Lessons Learned from
Marine Investigations



NTSB



Since 2014, the NTSB Office of Marine Safety has issued the *Safer Seas Digest*, an annual publication organized around NTSB marine investigations completed during the previous calendar year. *Safer Seas* shares the safety issues identified and recommendations developed during these investigations with the marine community. It also highlights lessons learned that can prevent or mitigate future losses.

Past issues of *Safer Seas Digest* are available at [ntsb.gov](https://www.ntsb.gov).



Who we are and what we do

The NTSB 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.

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 Federal Aviation Administration (FAA) and US Coast Guard and certificate denials by the FAA
- Advocating for implementation of safety recommendations
- Assisting victims and survivors of transportation disasters and their families



A Message from the Chair

Marine safety leader,

Welcome to the 10th anniversary edition of our *Safer Seas Digest*. Over the last decade, this annual publication has highlighted the lessons learned from hundreds of NTSB marine casualty investigations with one goal in mind: to inspire meaningful safety change on our waterways. This year is no different.

In 2022, the NTSB Office of Marine Safety completed 29 investigations that determine the probable causes of marine casualties in US territorial waters or involving US-flagged vessels.

Two of the casualties described in the pages that follow—the *Emmy Rose* and the *SEACOR Power*—led to the loss of human life. Our investigations into these tragedies once again revealed the critical importance of personal locator beacons (PLBs) for seafarers. PLBs are widely available and relatively low-cost devices that the NTSB has recommended since 2017 for their ability to help locate mariners in distress, thereby increasing their chances of survival. Adding to the heartbreak is the knowledge that the 17 mariners lost on either the *Emmy Rose* or the *SEACOR Power* might be with us today had our PLB recommendation been implemented years ago.

The other events outlined in this report detail major marine casualties that resulted in significant property damage. While the probable cause and circumstances for each are unique, taking a holistic look allows us to consider the broader issues threatening safety on our waterways. In 2022, these issues included the following:

- **Containing Engine Room Fires**
- **Fire Prevention**
- **Importance of Personal Locator Technology**
- **Vessel Stability**
- **Fatigue**
- **Proper Installation, Operation, and Maintenance of Electrical Equipment**
- **Sound Navigation Practice—Avoiding Overreliance on a Single Data Source**
- **Response to Loss of Steering and Propulsion**
- **Effective Communication**
- **Mooring System Arrangements**
- **Engine Repairs**
- **Hull Condition**

The NTSB issued evidence-based recommendations to all parts of the marine industry in 2022 to prevent many of these issues from reoccurring. We will continue to advocate for the implementation of these recommendations, and every NTSB recommendation, for as long as it takes.

The knowledge contained in the *Safer Seas Digest* is only possible because of the dedicated experts of the NTSB Office of Marine Safety. These professionals are on-call 365 days a year, ready to deploy to the scene of a marine casualty anywhere in the world, rain or shine—all in the pursuit of our vital safety mission.

Essential to our work are the men and women of the US Coast Guard, who support our investigations in myriad ways—including every marine casualty in this report. Our relationship remains an outstanding example of government collaboration focused on saving lives and improving safety. The Coast Guard units that worked with us in 2022 are listed on page 76. My sincerest thanks go out to every person who assisted us this year.

I will close with a plea to every mariner and their employer: don't wait for the measures outlined in this report to become mandatory; there is no need to wait. I urge you to voluntarily strengthen safety *now*. A great place to start is by investing in PLBs for every crewmember, which range in price from about \$250 to \$400.

A few hundred dollars to save a life—I can think of no better return on investment.

Sincerely,

Jennifer Homendy
NTSB Chair

2022 SAFER SEAS Digest

Lessons Learned from Marine Investigations



On the cover: Bulk Carrier *Ocean Princess* postcollision (see page 26). SOURCE: BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT



Back cover: Towing vessel *Kevin Michael* following the casualty at the Melvin Price Locks and Dam (see page 24). SOURCE: COAST GUARD



Abbreviations

AB	able seaman
ABS	American Bureau of Shipping
AIS	automatic identification system
CCTV	closed-circuit television
ECDIS	electronic chart display and information system
ECS	electronic charting system
EPIRB	emergency position indicating radio beacon
GPS	global positioning system
mph	miles per hour
MSC	Marine Safety Center
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NTSB	National Transportation Safety Board
NWS	National Weather Service
OSV	offshore supply vessel
PLB	personal locator beacon
PPU	portable pilot unit
RCC	Rescue Coordination Center
rpm	revolutions per minute
SAR	search and rescue
SCP	shipyard competent person
SEND	satellite emergency notification device
SMS	safety management system
VDR	voyage data recorder
VHF	very high frequency
WAP	Waterways Action Plan

Vessel Group Key

■	Cargo, Dry Bulk
■	Cargo, General
■	Cargo, Liquid Bulk
■	Combatant/Military
■	Fishing
■	Offshore
■	Passenger
■	Towing/Barge
■	Yacht/Boat

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VESSEL GROUP

FISHING

Sinking of Commercial Fishing Vessel *Emmy Rose*

Atlantic Ocean, about 27 miles off the coast of Provincetown, Massachusetts

CASUALTY DATE
November 23, 2020

REPORT NUMBER
MIR-22-21

ACCIDENT ID
DCA21FM007

ISSUED
August 23, 2022

Figure 1. *Emmy Rose* underway on an unknown date before the casualty. SOURCE: COAST GUARD



Figure 2. The vessel in 2019 before its purchase by Boat Aaron & Melissa. SOURCE: COAST GUARD

On November 23, 2020, at 0129 local time, the US Coast Guard in Boston, Massachusetts, received a distress signal from the 82-foot-long, 116-gross-ton commercial fishing vessel *Emmy Rose*. A search was initiated, and the vessel was not located. About 6,000 gallons of diesel fuel were on board, and sheening was observed during search missions; none of the crewmembers were located, and they are presumed dead. On May 19, 2021, side scan sonar was used to identify the sinking location and wreckage of *Emmy Rose*, which was about 27 miles northeast of Provincetown, Massachusetts. The estimated value of the *Emmy Rose* was \$325,000.

The *Emmy Rose* had departed Portland, Maine, about 1603 on November 17, after loading supplies and 34,000 pounds of ice. A captain and three deckhands were on board. Over the next 5 days, the crew fished at several locations in the Gulf of Maine.

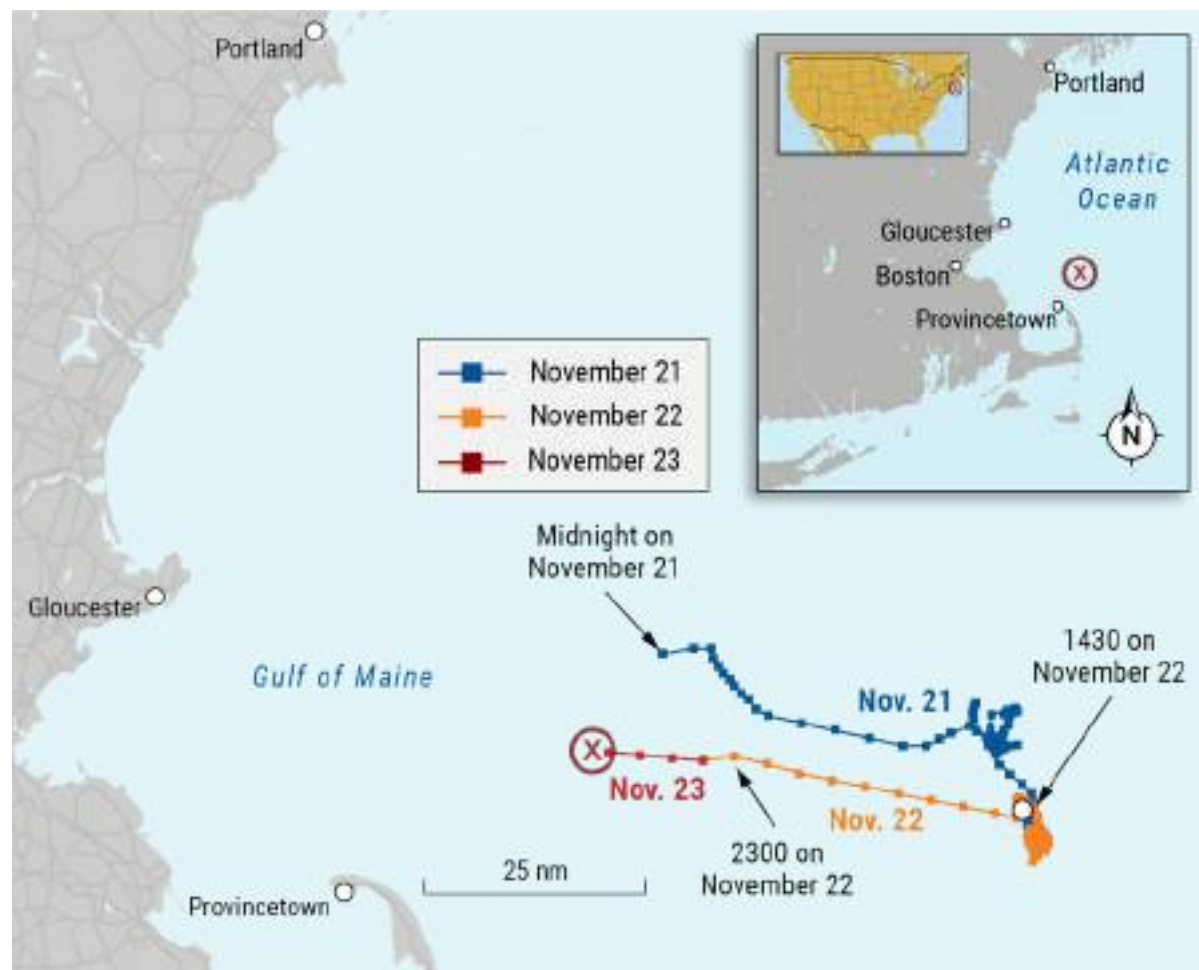
At 1428 on November 22, the captain contacted a seafood distribution facility in Gloucester, Massachusetts, via satellite phone to schedule the *Emmy Rose's* arrival and make offloading arrangements. He reported that the *Emmy Rose* would arrive at the facility at 0600 on November 23 to offload about 45,000 pounds of fish. According to the VMS, after the phone call, the crew of the *Emmy Rose* continued to fish for about 4 hours before starting the transit to Gloucester.

About 1830 on November 22, the *Emmy Rose* departed the fishing grounds and headed for Gloucester at a speed of about 7 knots, which was a typical transit speed. The forecast from the NWS for that evening called for southeast winds at 15–20 knots with gusts up to 25 knots. The seas were predicted to be about 5–8 feet high. The forecast called for patchy fog and a chance of showers after midnight.

Throughout the evening, crewmembers used the vessel's satellite phone to communicate with shoreside contacts. After a call was made from an unknown landline to the *Emmy Rose*'s satellite phone at 2101, no other calls were made to or from the *Emmy Rose*.

About 2300, the *Emmy Rose* passed within 1.3 miles of the fishing vessel *Blue Canyon*. The *Emmy Rose* maneuvered away from the *Blue Canyon* and continued for Gloucester at 7 knots. The captain of the *Blue Canyon* stated that he did not communicate with the crew of the *Emmy Rose* and that he believed he saw crewmembers moving about the aft deck amid the illuminated deck lights.

Figure 3. *Emmy Rose* trackline from November 21 to 23. A red X indicates the location of the confirmed EPIRB signal on November 23. BACKGROUND SOURCE: GOOGLE MAPS



At 0100 on November 23, the *Emmy Rose* was identified on the VMS to be 27 miles northeast of Provincetown, Massachusetts, on a course of 277° at 7 knots. This was the last VMS position transmitted by the *Emmy Rose*.

At 0129 on November 23, 2020, the Coast Guard RCC in Boston received an alert from the 406MHz non-GPS-enabled EPIRB registered to the *Emmy Rose*. This initial "unlocated first alert" position was about 2.4 miles southwest from the 0100 VMS position of the *Emmy Rose*.

At 0130, Coast Guard watchstanders notified the vessel's shoreside manager, and he attempted several times to contact the crew of the *Emmy Rose* on the satellite phone and via email, but there was no response. At 0131, a second EPIRB alert was received with an unconfirmed position, and at 0147, a confirmed alert with an updated position was received. Over the next 3 hours, over a dozen subsequent signals were transmitted as the EPIRB drifted toward the northwest until it was recovered by the Coast Guard. There were no VHF radio transmissions received from the *Emmy Rose*.

Coast Guard SAR assets were deployed to the area of the EPIRB signal, about 27 miles from Provincetown, Massachusetts. SAR efforts continued for 38 hours and covered over 2,200 square miles. During the search, Coast Guard personnel recovered the EPIRB, the liferaft, one life ring, and two wooden fish hold hatch covers from the *Emmy Rose*. None of the crewmembers were located as of the date of the report, and they are presumed dead. The vessel sank in 794 feet of water and was not recovered. In May 2021, side scan sonar and a ROV were used to locate and survey the sunken vessel.

Figure 4. Side scan sonar image of *Emmy Rose* from 246 feet above at 600 kilohertz.

SOURCE: MIND TECHNOLOGIES

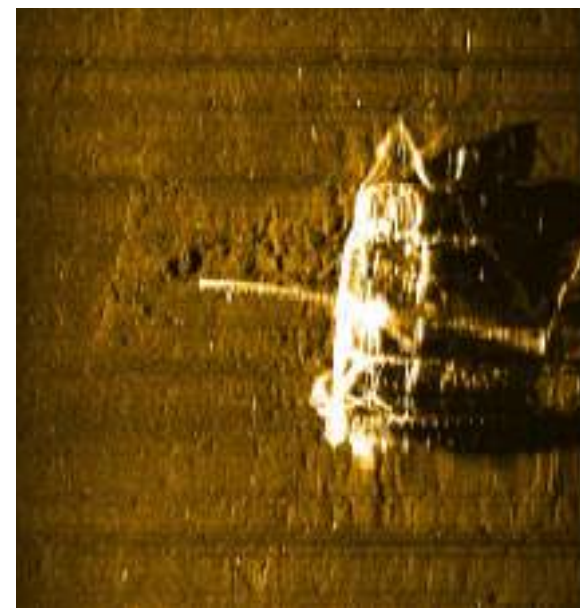




Figure 5. Aft working deck of vessel in 2019 before its purchase by Boat Aaron & Melissa. The storm gates are beneath the net reels and cannot be seen in the photo. BACKGROUND SOURCE: BLUE HARVEST FISHERIES

Figure 6. Status of *Emmy Rose* freeing ports during ROV survey.

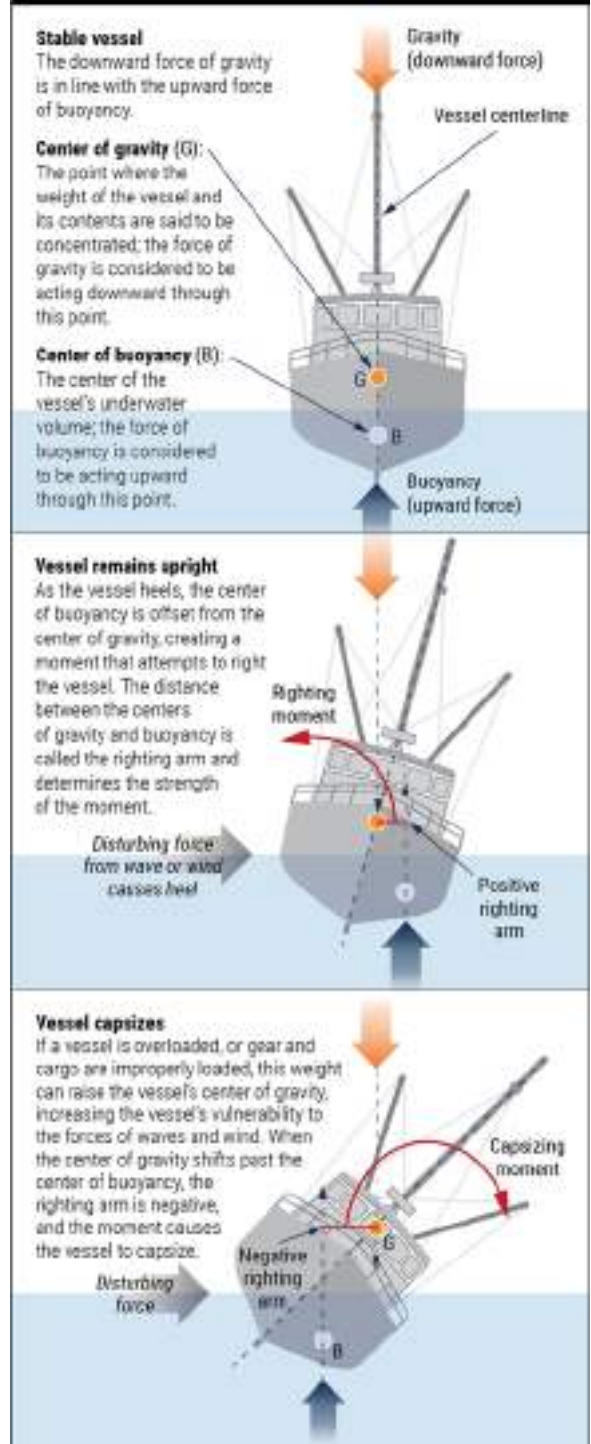


Figure 7. Freeing ports on portside bulwarks.



BACKGROUND SOURCE: BOAT AARON & MELISSA

Figure 8. Principles of stability.



SAFETY ISSUES

- ◆ **Lack of sufficient vessel stability to meet regulatory criteria.** After the casualty, the Coast Guard MSC conducted a stability analysis of the *Emmy Rose* to determine if the vessel met applicable stability criteria. The MSC found that for all seven sample loading conditions that matched the loading conditions in the 2002 stability instructions, the *Emmy Rose* failed one or more of the stability criteria. The MSC noted that they had to make assumptions in order to calculate the *Emmy Rose*'s buoyant volume, but even with their assumptions, the vessel failed the criteria by a large margin and was thus determined not to be in compliance with regulatory standards for stability at the time of the casualty. Because of the margin of safety in regulatory stability criteria, a vessel may be functionally stable even if it does not meet the criteria. However, by not meeting stability criteria, the *Emmy Rose* had a reduced ability to withstand wind and waves encountered on the voyage and was more susceptible to capsizing.
- ◆ **Ineffective freeing port cover design.** To drain seawater that collected on deck, the *Emmy Rose* was fitted with six freeing ports on each side of the vessel. Each freeing port was equipped with a restrictor plate (cover) that was held up in the open position by a chain and could be lowered down to block the opening. Regulations required that freeing port covers be constructed and fitted such that water could readily flow outboard but not inboard and not diminish the amount of freeing port area. However, the design of the restrictor plates used on board the *Emmy Rose* functioned primarily to prevent catch from going overboard from the working deck of the vessel, and three semi-circle cutouts within each plate allowed limited water to flow in either direction when the plates were closed. With the restrictor plates in the closed position, the *Emmy Rose*'s freeing port area was reduced from 26.3 square feet to 1.6 square feet, or about 3% of the requirements in the regulations. By not meeting the regulatory requirements for the freeing port area and design of freeing port covers, the *Emmy Rose* was more susceptible to accumulating water on deck.

◆ **Lack of securing mechanisms for deck hatches to maintain the vessel's watertight integrity.** A vessel's stability is calculated on the assumption that hatches and other openings (ventilation and doors) can be made watertight or weathertight when closed. However, the lazarette hatch—located on the aft working deck between the net reels on the stern—had a cover that could not be fastened in any way to the hatch coaming (e.g., with dogs or latches). Since the hatch lacked securing mechanisms, the force of waves over the transom or accumulating and sloshing seawater on deck from the conditions the vessel was likely experiencing could have displaced the hatch cover, allowing seawater to downflood through the hatch and quickly fill the lazarette through the 4-square-foot opening. Additionally, the wooden fish hatch covers were recovered by SAR crews after the casualty, indicating they were most likely unsecured at the time of the sinking. With hatch covers that did not have securing mechanisms, the vessel's watertight integrity could not be assured.

◆ **Need for personal locator beacons to enhance search and rescue efforts.** Advancements in technology have resulted in affordable PLBs with GPS location functionality. These devices are meant to be carried by individuals and can provide SAR operations with an accurate, continuously updated location of each person carrying a PLB. It is unlikely that the crew had PLBs; however, if had the crewmembers of the *Emmy Rose* carried PLBs on board and been able to activate them and abandon the vessel, search and rescue crews would have had continuously updated and correct coordinates of individual crewmembers' locations, thus enhancing their chances of survival.

THE PROBABLE CAUSE of the sinking of the fishing vessel *Emmy Rose* was a sudden loss of stability (capsizing) caused by water collecting on the aft deck and subsequently flooding the vessel through deck hatches, which had covers that could not be secured, contrary to the vessel's stability instructions and commercial fishing vessel regulations.

SAFETY RECOMMENDATIONS

As a result of its investigation into this accident, the NTSB issued two new safety recommendations to the US Coast Guard.

We found that at the time of the sinking, the *Emmy Rose*'s freeing ports did not meet regulatory requirements for freeing port area and freeing port cover design, thus making the vessel more susceptible to accumulating water on deck. Additionally, we found that the vessel's lazarette hatch had a nonwatertight cover that had no securing mechanism, which meant the *Emmy Rose* was not being operated in accordance with its stability instructions and fishing vessel regulations, and water likely began flooding the vessel through the hatch that was likely opened by the sloshing seawater on the stern. As a result, we **recommended** that the Coast Guard increase the scope of commercial fishing vessel safety examinations to include inspections of freeing port covers and hatch covers.

We found that had any crewmember been able to evacuate with and activate a personal locator beacon, search and rescue crews would have had continuously updated coordinates of their locations, enhancing the crewmembers' chances of survival. We therefore **reiterated** Safety Recommendation M-17-45 to the Coast Guard to require personal locator beacons for personnel employed on vessels in coastal, Great Lakes, and ocean service to enhance their chances of survival.

VESSEL GROUP

OFFSHORE

Capsizing of Liftboat
SEACOR PowerGulf of Mexico, 7 miles off coast of
Port Fourchon, Louisiana

CASUALTY DATE

April 13, 2021

ACCIDENT ID

DCA21MM024

REPORT NUMBER

MIR-22-26

ISSUED

October 18, 2022



Figure 9. Precasualty photos of the *SEACOR Power* liftboat lifted, or “jacked up” (left) and under way (below).

SOURCE: SEACOR MARINE



Figure 10. *SEACOR Power* after capsizing in the Gulf of Mexico when struck by severe thunderstorm winds.

SOURCE: SOPHIA GERMER, NOLA.COM, THE TIMES-PICAYUNE/THE NEW ORLEANS ADVOCATE

On April 13, 2021, about 1537 local time, the US-flagged liftboat *SEACOR Power* capsized about 7 miles off the coast of Port Fourchon, Louisiana, in a severe thunderstorm. Eleven crew and eight offshore workers were aboard the liftboat. Vessel operators in the area reported heavy rain, winds exceeding 80 knots, and 2- to 4-foot seas at the time of the capsizing. Search and rescue efforts were hampered by 30- to 40-knot winds and seas that quickly built to 10 to 12 feet and persisted throughout the evening and into the next day. Six personnel were rescued by the Coast Guard and Good Samaritan vessels, and the bodies of six fatally injured personnel were recovered. Seven personnel were never found and are presumed dead. The vessel, valued at \$25 million, was a total constructive loss.

On the morning of the casualty, the *SEACOR Power* had been in port in Port Fourchon. It got underway shortly after noon, destined for an oil and gas lease block in the Gulf of Mexico. As the *SEACOR Power* was transiting, a mesoscale convective system—a complex of thunderstorms organized on a scale larger than an individual thunderstorm—moved through the area in a southerly direction. At 1457, the National

Weather Service issued a Special Marine Warning (a warning when severe thunderstorms affecting coastal waters are occurring or imminent) that included the *SEACOR Power*'s location. The 1457 notification advised of wind gusts “34 knots or greater.” The *SEACOR Power* did not receive the warning.

Sometime after 1500, the *SEACOR Power* was overtaken by a rain squall from astern, and the vessel's mate observed a wind gust of 79 miles per hour. During this time, the vessel's speed began increasing, eventually reaching 8.4 knots. A second squall overtook the vessel about 10 minutes later, causing “white out” conditions, according to the mate. The mate suggested to the captain that they lower the liftboat's legs to “soft tag” the bottom, which would have anchored the vessel in place. The captain concurred, and the mate began to lower the vessel's 265-foot-long legs. During the leg-lowering process, the mate turned the *SEACOR Power* into the wind to slow its speed. As the vessel turned, the winds, which had been off the liftboat's stern, moved to the port beam. The *SEACOR Power* heeled to starboard and capsized, coming to rest on its starboard side in 50 feet of water, with the port side hull and deckhouse partially exposed above the waterline.



Figure 11. The *SEACOR Power* departed Port Fourchon en route to Main Pass 138. The location of the capsizing is indicated by a red X. BACKGROUND SOURCE: GOOGLE MAPS

At 1542, the Coast Guard District 8 RCC in New Orleans received notification of an EPIRB for the *SEACOR Power*. The EPIRB alert did not contain location data for the *SEACOR Power*; however, one minute later, a second alert was received that provided location data. At 1607, an RCC watchstander called SEACOR Marine to verify that the *SEACOR Power* was in distress. The SEACOR Marine employee who answered the call told the RCC watchstander that the *SEACOR Power* was in port, so the RCC turned its attention to several other storm-related search and rescue cases. Twenty-one minutes later, the crew of the liftboat *Rockfish* sighted the overturned *SEACOR Power* and radioed Coast Guard Sector New Orleans. This was the first indication of an emergency at the Sector Command Center. Search and rescue efforts then commenced shortly afterward.

Of the 19 personnel on board the vessel, only 9 were known to have survived the initial capsizing and reached unsubmerged doors to get to the exterior of the vessel. Three of the nine became separated from the wreck almost immediately after escaping

the interior of the vessel. They drifted separately in the winds and currents for 2-and-a-half hours or more and were eventually rescued by Good Samaritan vessels miles from the capsizing location. The six remaining survivors gathered on the exposed side of the deckhouse.

Over the next 5 hours, Coast Guard and Good Samaritan vessels, as well as a civilian medevac helicopter, arrived at the scene and attempted to assist the personnel on the *SEACOR Power*'s deckhouse. However, rough seas, diesel fuel, and debris made entering the water dangerous and prevented the rescuers from approaching the wreck, and the orientation of the overturned vessel prevented helicopter crew from reaching them from above. Four of the six personnel were eventually washed off the *SEACOR Power* or jumped into the seas; three were recovered by nearby vessels and one did not survive.

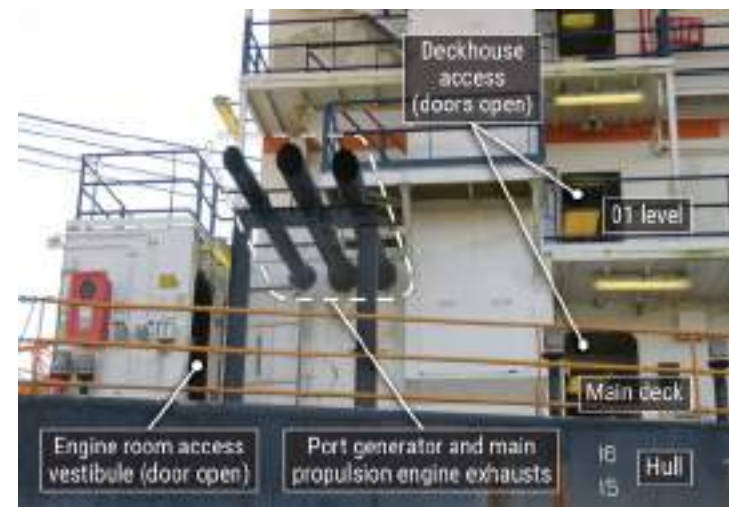


Figure 12. Portside deckhouse and engine room accesses on similar vessel *SEACOR Legacy*.



Figure 13. Left: Port side of the capsized hull about 1755. Some personnel are visible.

SOURCE: GLEN HARRIS



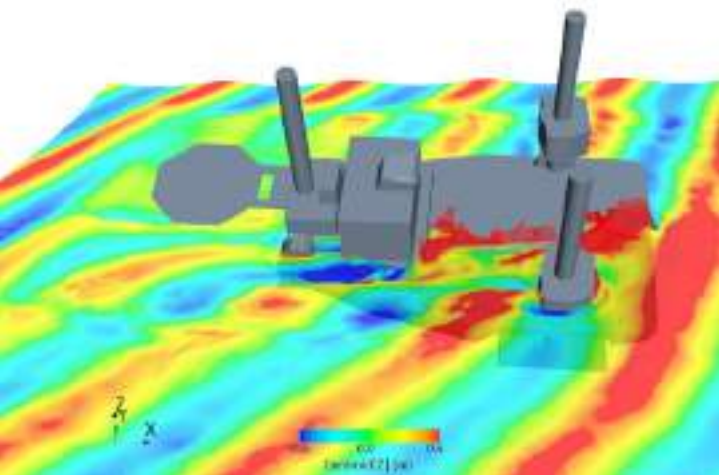
Figure 14. Door to engine room as it was opened at 2153, as seen by the Glen Harris.

SOURCE: GLEN HARRIS

The two remaining personnel entered the *SEACOR Power*'s engine room to escape the winds and seas. By the morning, the door to the engine room was submerged and unreachable by rescuers. Neither of the personnel survived.

THE PROBABLE CAUSE of the capsizing of the liftboat *SEACOR Power* was a loss of stability that occurred when the vessel was struck by severe thunderstorm winds, which exceeded the vessel's operational wind speed limits. Contributing to the loss of life on the vessel were the speed at which the vessel capsized and the angle at which it came to rest, which made egress difficult, and the high winds and seas in the aftermath of the capsizing, which hampered rescue efforts.

Figure 15. Illustration of the computational fluid dynamics model simulating the effect of wind gusts with swells. Colors indicate wave height, with blues in low areas and reds in high areas. The vessel capsized in the simulation.



SAFETY ISSUES

◆ **Gaps in forecasts and communications of weather events.** The NTSB found that the captain's decision to get underway on the day of the casualty was reasonable and was not influenced by commercial pressure. However, weather information that the vessel's operator, SEACOR Marine, provided to the *SEACOR Power*'s crew was insufficient for making weather-related decisions about the liftboat's operation. Additionally, due to a Coast Guard broadcasting station outage, the *SEACOR Power* crew did not receive a NWS Special Marine Warning notifying mariners of a severe thunderstorm that was approaching.

Even if the *SEACOR Power* crew had received the Special Marine Warning, data gaps, including a lack of low-altitude radar visibility over the Louisiana coastal areas, prevented the NWS office that issued the Special Marine Warning from identifying and forecasting the surface wind magnitudes that impacted the *SEACOR Power*. Lowering the angle of the lowest radar beam at select coastal weather radar sites would improve low-altitude radar visibility over coastal waters.

◆ **Operation and stability of restricted-service liftboats in severe thunderstorms.** The capsizing occurred when the *SEACOR Power* was struck by severe thunderstorm-generated winds that exceeded the vessel's operational wind speed limits, causing a loss of stability. Other operational factors may have also played a role in the capsizing, including the liftboat's trim by the stern, its turn to port and speed through the water, a cargo shift, and movement of the vessel's legs.

The NTSB determined that due to the unpredictability of thunderstorm phenomena and the vulnerability of restricted-service liftboats like the *SEACOR Power*, operating restricted-service liftboats in the afloat mode at any time when a Special Marine Warning has been issued for the vessel's planned route increases their risk of capsizing. Further, increasing minimum stability criteria for liftboats in restricted service would improve vessel survivability in severe thunderstorms.

◆ **Effectiveness of the initial response to the capsizing.** The speed at which the *SEACOR Power* capsized and angle at which it came to rest made egress difficult and likely contributed to the fatalities. Following the capsizing, the Coast Guard RCC did not effectively use available information to verify the validity of the location of the *SEACOR Power*'s EPIRB alerts, which led to a delay in dispatching search and rescue units and notifying Good Samaritan vessels of the emergency. Additionally, SEACOR Marine did not have adequate procedures nor did it provide its staff with training for responding to the Coast Guard when contacted regarding emergency position indicating radio beacon alerts, and inaccurate information about the *SEACOR Power*'s location provided to the Coast Guard by a SEACOR Marine employee contributed to the delayed response.

◆ **Difficulty in locating survivors in adverse weather and sea conditions.** High winds and heavy seas, combined with underwater and overhead obstructions, prevented both surface and air resources from getting close enough to the vessel to rescue personnel directly from the wreck, which contributed to the loss of life. In the future, a detailed procedure in Coast Guard mass rescue operations plans combined with mutual aid agreements between the Coast Guard and air rescue providers would improve and expand search and rescue capabilities.

The search and rescue transponder held by the mate after he had been swept into the water from the wreck was not effective in signaling vessels or aircraft. In previous casualty investigations, the NTSB found that mariners have benefited from their vessels or employers providing PLBs; had the crewmembers of the *SEACOR Power* been required to carry PLBs, their chances of being rescued would have been enhanced.

Figure 16. KLIX Level-II 0.525° base velocity images from sweeps initiated about 1441, 1510, 1530, and 1541. Casualty site is denoted by the red circle. The colors represent the calculated wind speed, in knots. SOURCE: NWS

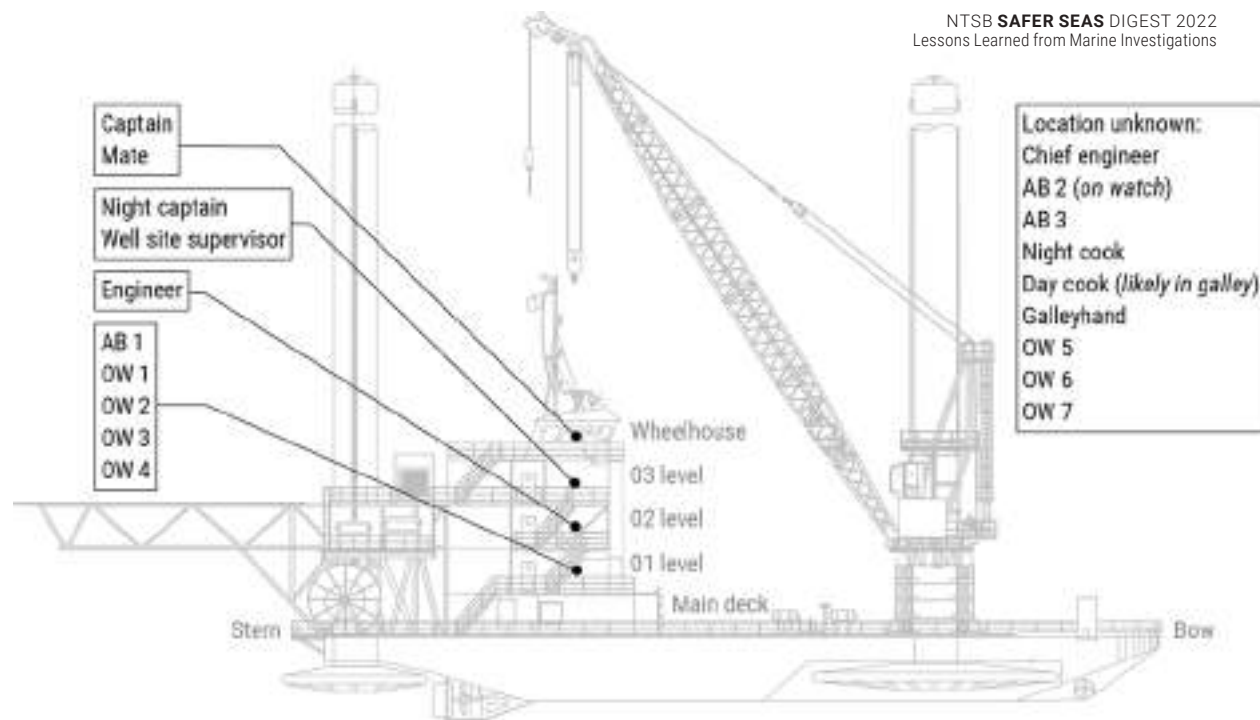
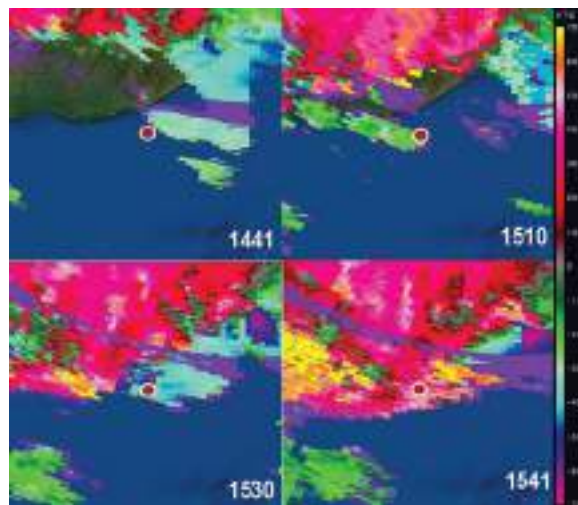


Figure 17. Known crewmember locations at the time of the capsizing.

SAFETY RECOMMENDATIONS

As a result of its investigation into this accident, the NTSB issued three new and one reiterated safety recommendations to the US Coast Guard, one new recommendation to the NWS, one new recommendation to the Federal Aviation Administration and the US Air Force, two new recommendations to the Offshore Marine Service Association, and three new recommendations to SEACOR Marine.

Because the localized weather could not be detected by nearby radars due to their elevation angles (antenna angles relative to the horizon), we **recommended** that the NWS, Federal Aviation Administration, and Air Force work together to assess coastal weather radar sites to determine if it is safe and appropriate to lower the radar angles, and then lower the angles of the lowest radar beams where appropriate.

We also **recommended** that the Coast Guard develop procedures to inform mariners in affected areas whenever there is an outage at a navigational telex broadcasting site; modify restricted-service liftboat stability regulations to require greater stability for newly constructed restricted-service liftboats; and develop procedures to integrate commercial, municipal, and non-profit air rescue providers into Sectors' and Districts' mass rescue operations plans, when appropriate.

We **reiterated** a recommendation to the Coast Guard to require that all personnel employed on vessels in coastal, Great Lakes, and ocean service be provided with a personal locator beacon to enhance their chances of survival. Given the benefits of personal locator beacons, we also recommended that the Offshore Marine Service Association notify members of personal locator beacons' availability and value.

Lastly, we **recommended** that SEACOR Marine review its fleet to ensure its vessels are being operated strictly within the limits specified in operating manuals, stability documentation, and other required guidance, and revise its liftboat safety management system and operations manuals to include a policy requiring the vessel to remain in port or lower its legs and cease afloat operations when a Special Marine Warning has been issued for the vessel's planned route. We similarly **recommended** that the Offshore Marine Service Association inform their members of the circumstances of this accident and the importance of remaining in port or jacking up when a Special Marine Warning has been issued.

VESSEL GROUP

TOWING/BARGE

Collision between *Baxter Southern* Tow and BNSF Coal Train

Upper Mississippi River, mile 372, near Galland, Iowa

CASUALTY DATE

November 13, 2021

ACCIDENT ID

DCA22FM004

REPORT NUMBER

MIR-22-22

ISSUED

August 25, 2022

Figure 18. Approximate position of *Baxter Southern* tow pushed up against the riverbank as the train approached (scale approximate).

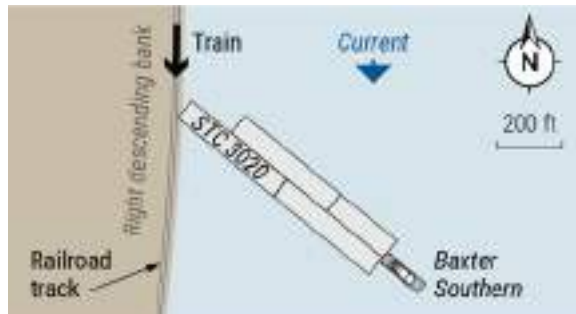


Figure 19. The *Baxter Southern* after the casualty.

SOURCE: COAST GUARD



Figure 20. Drone view of the postcollision derailment of the two locomotives and eight hopper cars. Two additional hopper cars are submerged in the river. SOURCE: BNSF
Inset: Location and close-up of the indentation from the forwardmost barge *STC 3020* in the shoreline next to the railroad track. SOURCE: COAST GUARD



On November 13, 2021, about 2343 local time, the towing vessel *Baxter Southern* had pushed its tow of four empty barges against the shoreline of the Upper Mississippi River at mile 372 near Galland, Iowa, when a BNSF coal train transiting the track along the shoreline struck the bow rake of a forward barge that was overhanging the railroad track. Two locomotives and ten hopper cars (loaded with coal) derailed, and six of the derailed hopper cars entered the river. A sheen was observed in the river following the derailment. The two train personnel sustained minor injuries. Damages to the locomotive and freight cars were estimated at \$1.9 million. The barge sustained minor scrapes.

On the evening of November 13, the 716-foot-long *Baxter Southern* tow (arranged in two rows) was downbound on the Upper Mississippi River when winds began to gradually increase. About 2245, at mile 375, it encountered strong wind gusts from the west that

made the situation unsafe for the tow to continue the transit as planned. In the dark of night, it was also unsafe for the captain to try to top around the tow and head upriver. Additionally, there were two towing vessels ahead, and there was no available mooring space at Lock and Dam no. 19, located downriver at mile 364, so the captain and pilot searched the ECS for an area to push the tow against the shoreline until the winds abated.

They saw an area marked by a magenta dashed line next to the right descending bank near mile 372 that they assumed was a fleeting area. However, the magenta dashed line actually represented a caution area, which warned of the channel's proximity to the railroad trackbed.

Neither the pilot nor the captain queried (cursor-picked) the exclamation point near the area on the ECS to gather further information related to the dashed magenta line. Thus, they missed the cautionary information that stated the area presented a "Railroad Collision and Trackbed Erosion Risk." Had they queried and read the associated information on the ECS, they likely would have realized the risk of pushing up against the riverbank in the caution area and may have sought another location to push up. Additionally, the captain and pilot each had over 20 years of experience on the Mississippi River and had extensively used the ECS over the last several years and completed training in its operation and interpreting its information. They should have been familiar with the magenta dashed line identifying the caution area and how to query the chart to see additional information about marked areas.

Figure 21. *Baxter Southern* Rose Point in nighttime display showing the area marked by the magenta dashed line and exclamation point (left, annotated by NTSB) and information contained in the corresponding caution note (right). SOURCE: SOUTHERN TOWING COMPANY



As the captain prepared to push up against the riverbank in the caution area, he decided that, due to nighttime conditions and high wind gusts, it was unsafe to send a look out forward. Instead, he sent three crewmembers to the bow of the tow's lead barge to determine its location relative to the railroad track after it was pushed up. Within a few minutes of pushing up and before the crewmembers on deck reached the bow of the barge to check the track clearance, the pilot and crewmembers saw the headlight of an approaching BNSF train's lead locomotive as it appeared to the starboard side, coming around a slight bend about

2,000 feet away. The crewmembers on the barges proceeded aft and braced for a potential impact.

The train's conductor and engineer did not realize that the bow of the lead barge had encroached on the tracks until the train (traveling about 37 mph) was about 300 feet from the barge. At that point, the engineer activated the train's emergency brake on its three locomotives and all 143 hopper cars at 2343:42. The *Baxter Southern's* pilot saw the sparks from the train and realized the train was not going to be able to stop, so he put the tug's engines in full astern to move the tow away from the bank. However, the engines took 4.5 seconds to respond because of the pneumatic throttle control. With only seconds to respond, the activation of the train's emergency brake and the placement of the tug's engines in full astern occurred too late to avoid the collision; about 2343:51, the left side of the lead locomotive collided with the port corner of the lead barge's bow, causing two locomotives and 10 of the 143 hopper cars to derail, and the 2-foot overhang of the train impacted the deck of the barge, pushing it into the ground.

THE PROBABLE CAUSE of the collision between the *Baxter Southern* tow and BNSF coal train was the tow's pilot and captain not correctly identifying a caution area on the electronic chart before deciding, due to the high wind's effect on the tow's empty barges, to push the tow up against the riverbank alongside a railroad track.

LESSON LEARNED: Electronic Chart Systems

Electronic chart systems (ECSs) provide a wealth of navigation information to mariners. Depending on user settings and other conditions, electronic chart display and information systems (ECDISs) can display the same feature(s) differently (compared to paper charts, which display the same information constantly). ECDIS enables users to obtain more information about a feature by querying through a "cursor pick." Additionally, there are many features—including warnings and other navigation information—that can be obtained through a cursor pick that are not specifically noted in the default chart display.

Mariners should ensure they understand all symbols and applicable advisories identified in their ECS, and owners and operators should ensure that their crews are proficient in the use of ECSs. For more information about chart symbols, mariners should refer to ① [U.S. Chart No. 1: Symbols, Abbreviations and Terms used on Paper and Electronic Navigational Charts](#) or the US Army Corps of Engineers' ② [Inland Electronic Navigational Charts](#).



Figure 22. Still images of video footage from locomotive BNSF 9251's recorder as the train approached the barge and derailed after hitting the barge. The forward barge of the *Baxter Southern* tow is outlined in orange.

BACKGROUND SOURCE: BNSF



VESSEL GROUPS

OFFSHORE • COMBATANT/MILITARY

Collision between Offshore Supply Vessel *Cheremie Bo-Truc No. 33* and US Coast Guard Cutter *Harry Claiborne*

Sabine Pass, Port Arthur, Texas

CASUALTY DATE

October 11, 2020

ACCIDENT ID

DCA21PM003

REPORT NUMBER

MIR-22-04

ISSUED

February 16, 2022

Figure 23. Screen capture from Vessel Traffic Service camera footage at 1543 (top) and at 1544 (bottom), the time of the collision. SOURCE: COAST GUARD



Figure 24. *Cheremie Bo-Truc No. 33* (left) and *Harry Claiborne* (right) underway before the collision.

SOURCES: SHIPSPOTTING.COM (LEFT); FACEBOOK.COM (RIGHT)

On October 11, 2020, the offshore supply vessel *Cheremie Bo-Truc No. 33* was traveling with a crew of five outbound for sea in Sabine Pass when it collided with the US Coast Guard cutter *Harry Claiborne*, which was servicing a buoy near Texas Point, Texas. The *Cheremie Bo-Truc No. 33* subsequently ran aground. The crew attempted to refloat the vessel, and as it broke free, the current set the offshore supply vessel into the stationary cutter, resulting in a second collision. Three of the 24 crewmembers aboard the *Harry Claiborne* suffered minor injuries; none of the *Cheremie Bo-Truc No. 33* crewmembers were injured. No pollution was reported. The estimated damage to the *Cheremie Bo-Truc No. 33* and the *Harry Claiborne* totaled \$505,951.

On the morning of October 11, at 0848, the *Harry Claiborne* left Galveston to service buoys that had potentially been impacted by Hurricane Delta. At 1526, the *Cheremie Bo-Truc No. 33* was preparing to depart from the Genesis Energy dock on the west side of Sabine Pass. The VTS advised them of the cutter working in the area. Around this time, the *Harry Claiborne* was checking on green buoy no. 27, which appeared off station. Crew had secured the buoy on deck, disconnecting it from the mooring chain. The vessel was displaying dayshapes for a “vessel restricted in her ability to maneuver,” and was working near the west edge of the navigable channel.

The *Cheremie Bo-Truc No. 33* was outfitted with an ECS that displayed AIS targets. The *Harry Claiborne* would have appeared on the display very close to or atop the buoy symbology. The OSV captain, however, assumed the cutter was servicing a buoy that had moved into the channel, so at 1540, he called the *Harry Claiborne* via VHF radio to request a “one-whistle” passing arrangement, indicating the they would overtake the cutter on the cutter’s starboard side. The proposed passing arrangement led the OSV outside of the navigation channel. Had he been monitoring the ECS, the captain would have seen that the cutter was on the edge of the channel at the buoy’s assigned position and that the channel was clear of any other vessels. Although individuals on the cutter’s bridge team reported that they mentally questioned the passing arrangement, they instead deferred to the OSV captain’s judgment, assuming he was more experienced in local waters.

While beginning his attempt to pass the cutter to starboard, the *Cheremie Bo-Truc No. 33* captain realized that the vessel would run aground. He decided to steer back toward the cutter to pass to port, but, realizing that it was too late and that a collision was imminent, he reversed the vessel’s engines. He was unable to completely stop the OSV, and at 1544, while traveling at 6 knots, the *Cheremie Bo-Truc No. 33* collided with the *Harry Claiborne*, its bow striking the cutter’s transom on the port side.

The impact slightly displaced the cutter, and two crewmembers sustained minor injuries. The cutter crew secured the buoy chain and dropped the ship's anchor. The cutter's dynamic positioning computer system adjusted the vessel's thrusters to move the vessel back to its programmed position and heading.

After the initial collision, momentum carried the *Cheremie Bo-Truc No. 33* past the *Harry Claiborne* into the mud, where it grounded. For about 45 minutes, the *Cheremie Bo-Truc No. 33* crew worked to refloat the vessel. The *Harry Claiborne* was holding position when the OSV broke free from the mud. The OSV's captain decided to return to the dock, but as they attempted to maneuver, the current set the vessel back onto the cutter's stern. The cutter was attached to the buoy's 12,000-pound sinker on the bottom and therefore unable evade the OSV, and a third Coast Guard crewmember was injured when the fender he placed between the vessels was ripped from his hands as the vessels again collided. If the crews had communicated with each other,

they might have agreed to wait until the cutter could move on, especially considering the proximity of the grounded *Cheremie Bo-Truc No. 33* and the ebb current.

THE PROBABLE CAUSE of the initial collision between the offshore supply vessel *Cheremie Bo-Truc No. 33* and the US Coast Guard cutter *Harry Claiborne* was the offshore supply vessel captain's assumption of the stationary cutter's position, which led to his decision to pass the vessel outside the channel, resulting in a late maneuver toward the *Harry Claiborne* to avoid running aground. Contributing to the collision was the cutter crew not questioning the passing arrangement proposed by the offshore supply vessel captain. Causing a second collision was the lack of coordination and communication between the two vessel operators when the *Cheremie Bo-Truc No. 33* crew refloated their vessel.

Figure 25. Sabine Pass chart showing the path of the *Cheremie Bo-Truc No. 33* (in red) from the Genesis Energy dock to the collision site. BACKGROUND SOURCE: NOAA CHART 11342

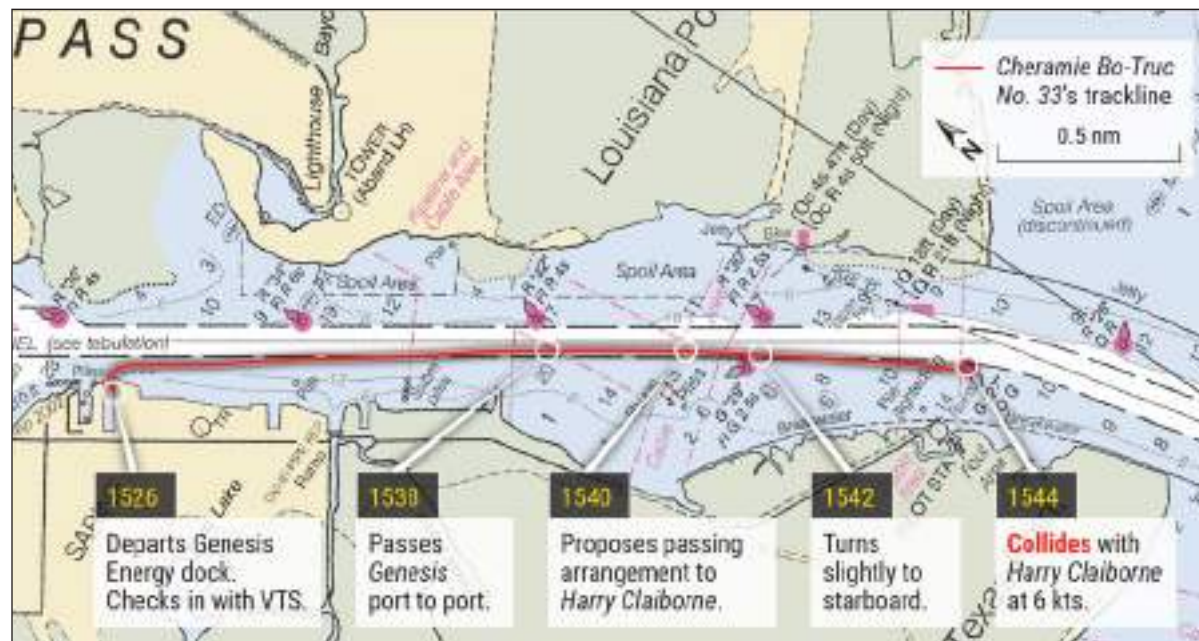
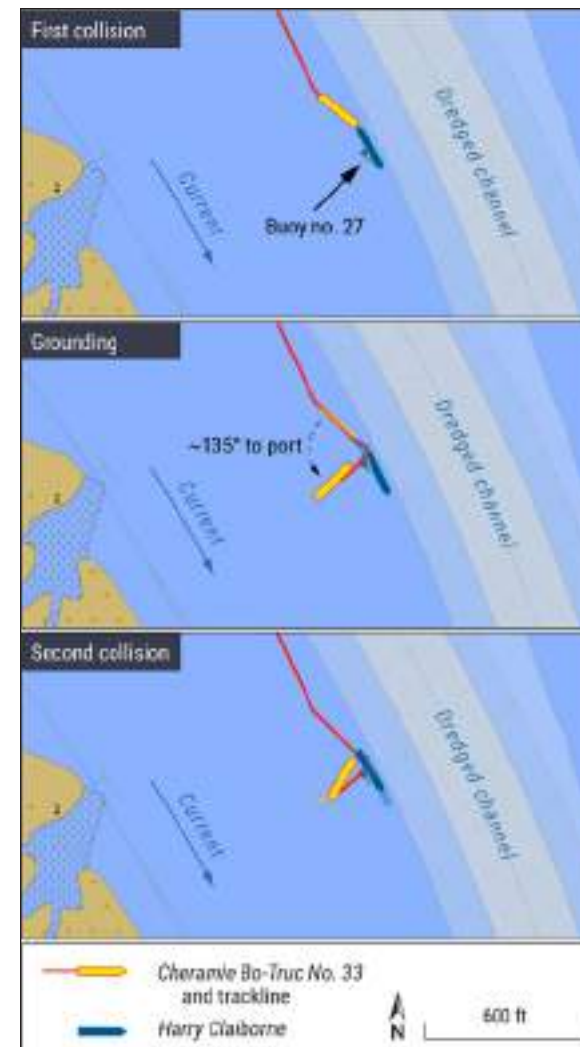


Figure 26. Illustration of the positions of the offshore supply vessel (yellow) and the cutter (blue) with estimated headings relative to buoy no. 27 during the first collision, grounding, and second collision. BACKGROUND SOURCE: NOAA ELECTRONIC NAVIGATIONAL CHART



VESSEL GROUPS

YACHT/BOAT • CARGO, LIQUID BULK

Collision between Yacht *Utopia IV* and Tank Vessel *Tropic Breeze*

Northeast Providence Channel,
20 miles northwest of Nassau, Bahamas

CASUALTY DATE

December 23, 2021

ACCIDENT ID

DCA22FM009

REPORT NUMBER

MIR-22-29

ISSUED

December 22, 2022



Figure 27. Area where the *Utopia IV* and *Tropic Breeze* collided, as indicated by a red X.

BACKGROUND SOURCE: GOOGLE MAPS



Figure 28. *Utopia IV* (left) and *Tropic Breeze* (right) before the casualty.

SOURCES: ROSSINAVI (LEFT); CAPT. CHRIS KNOWLES (RIGHT)

On December 23, 2021, about 2201 local time, the motor yacht *Utopia IV* and tank vessel *Tropic Breeze* were transiting the Northeast Providence Channel, 20 miles northwest of Nassau, Bahamas, when the two vessels collided. The *Tropic Breeze*'s engine room began flooding. The vessel's seven crewmembers abandoned the *Tropic Breeze* to liferafts and a rescue boat before the ship sank, and they were rescued by a Good Samaritan vessel. Three of the 20 persons aboard the *Utopia IV* sustained minor injuries. There were 156,500 gallons of petroleum cargo and fuel lost with the tanker. Damage to the vessels was estimated at \$7.9 million.

On December 23, at 1800, the *Tropic Breeze* departed New Providence Island at a speed of 5 knots en route to Great Stirrup Cay. At 2030, the *Utopia IV* got underway from offshore of New Providence Island toward Bimini Island at a speed of about 20 knots. The yacht carried 7 passengers and 12 crewmembers.

As the yacht approached the tank vessel from nearly directly astern, the captain and bosun of the *Utopia IV* were standing watch in the wheelhouse. Visibility conditions were good (10 miles), and they should have been able to see the *Tropic Breeze*'s stern light, even with bow spray (generated off the plumb bow) on the windshield; however, neither reported seeing the

Tropic Breeze, indicating they were not maintaining a proper lookout through visual scanning. Because the *Utopia IV* was traveling at 20 knots, it would have been prudent for the captain and bosun to be attentive in their lookout duties. However, shortly before the casualty, the captain left the bosun alone in the wheelhouse. The bosun was not certified as mate or captain and therefore was not allowed by regulations to conn the vessel. Further, the bosun was multitasking and therefore was distracted from performing an effective lookout.

The *Utopia IV* and *Tropic Breeze* had their radars set to a 3-mile scale. With the *Utopia IV* approaching the *Tropic Breeze* from astern at a relative speed of 15 knots, the yacht would close 3 miles in just 12 minutes. However, none of the watchstanders on the *Utopia IV* (the captain and bosun) or *Tropic Breeze* (the master and an AB) reported seeing the other vessel on radar; therefore, it is likely none of them had looked at the radar in the 12 minutes leading up to the collision. Additionally, there was no evidence that they used radar for long-range scanning. Therefore, neither crew used their vessel's radar effectively.

The *Tropic Breeze* and *Utopia IV* were equipped with an AIS. However, the tanker's was inoperative due to a power issue: investigators found the unit had not transmitted a position in 11 months. Had the unit

been functioning, it is likely that the *Utopia IV* could have detected the *Tropic Breeze* before the collision. Likewise, with the unit inoperative, the *Tropic Breeze* could not display the *Utopia IV*'s AIS signal and identify the yacht's position relative to the tank vessel.

The *Utopia IV* (as the overtaking vessel) was required by 72 COLREGS to give way to the tank vessel. However, because the watchstanders on the *Utopia IV* were not maintaining a proper lookout, they did not identify the risk of collision. However, once a close-quarters situation had developed, the *Tropic Breeze* should have taken action, but the watchstanders on the tanker did not detect the *Utopia IV* approaching. If they had seen the yacht, they likely would have signaled the potential danger in some way, whether by radio communication, whistle, or other means, and were therefore also not maintaining a proper lookout. Had either vessel kept a proper lookout, they likely would have detected each other and could have taken action to avoid the collision.

At 2200:48, the *Utopia IV* struck the transom of the *Tropic Breeze* from directly astern, slightly to port of the tank vessel's centerline. Several of the yacht's crew were thrown to the deck or into bulkheads; three crewmembers sustained minor injuries.

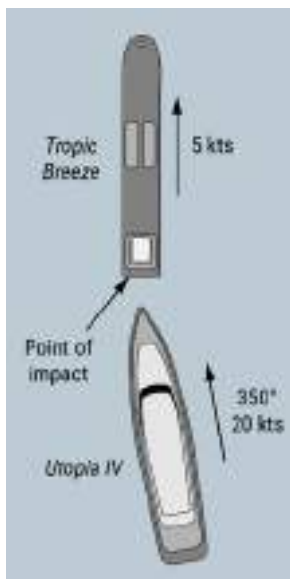


Figure 29. Approximate positions and headings of *Utopia IV* and *Tropic Breeze* before collision (not to scale).

The *Tropic Breeze*'s engine room was flooded rapidly, and about 2215, the captain made a VHF distress call and decided to abandon the vessel. One or two crewmembers boarded the rescue boat, and the remainder of the crew boarded a liferaft.

The *Utopia IV* was maneuvered to recover the *Tropic Breeze*'s crew, and the stern swim platform was lowered to allow them to board; however, sea swells and the height of the platform prevented them from boarding.

The yacht *Amara* heard VHF distress calls, arrived on scene, and dispatched the vessel's 38-foot-long tender with a crew of three, who then recovered all of the tanker's crew from the liferaft and rescue boat. The *Tropic Breeze* sank about 25 minutes after the collision.

Figure 30. *Tropic Breeze* crew wearing lifejackets in the liferaft and rescue boat before rescue. The *Utopia IV* is in the background. SOURCE: AMARA



THE PROBABLE CAUSE of the collision between the yacht *Utopia IV* and the tank vessel *Tropic Breeze* was the *Utopia IV*'s wheelhouse crew not maintaining a proper lookout and therefore not identifying the tank vessel they were overtaking. Contributing was the *Tropic Breeze*'s bridge team also not maintaining a proper lookout.

Figure 31. *Tropic Breeze* sinking by its stern about 15 minutes after the collision. SOURCE: AMARA



Figure 32. Damage to *Utopia IV*'s bow. SOURCE: COAST GUARD

LESSON LEARNED: Proper Lookout

A proper lookout by suitably trained crewmembers is required by the Convention on the International Regulations for Preventing Collisions at Sea, 1972 and is essential in determining the risk of collision. 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. Operators and crews should ensure that vessel bridge teams are staffed with certificated/credentialed mariners who are familiar with all bridge navigation equipment and able to independently take immediate action.

VESSEL GROUP

TOWING/BARGE

Contact of *Ava Claire* Tow with Leland Bowman Lock Gate

**Leland Bowman Lock, Gulf Intracoastal Waterway,
mile 163W, near Intracoastal City, Louisiana**

CASUALTY DATE

March 22, 2021

ACCIDENT ID

DCA21FM022

REPORT NUMBER

MIR-22-09

ISSUED

March 21, 2022

Figure 33. *Ava Claire* underway before the casualty.

SOURCE: GENERAL MARINE SERVICES



Figure 34. The Leland Bowman Lock. SOURCE: GOOGLE EARTH

On March 22, 2021, at 0522 local time, the towing vessel *Ava Claire* was transiting with a crew of four westbound in the Gulf Intracoastal Waterway near Intracoastal City, Louisiana, pushing two fully loaded tank barges. After entering the Leland Bowman Lock at mile 163W, the bow of the lead barge struck a closed lock gate, damaging and disabling the gate. There were no reports of pollution or injuries. Damage to the lock gate was estimated at \$2.5 million.

On March 20, the *Ava Claire* tow departed Norco, Louisiana, located on the Lower Mississippi River, for Port Arthur, Texas. Over the next day and a half, the tow transited down river, locked through to the Gulf Intracoastal Waterway at Algiers, Louisiana, and headed westbound.

On March 22, between 0500 and 0515, the captain awoke after sleeping about 4.5 hours and proceeded to the wheelhouse to assume the navigation watch early (his next watch rotation was 0600–1200) as the tow was approaching the Leland Bowman Lock, near Intracoastal City.

The company's policy prohibited a change of watch from occurring during "a critical move," including operations involving "bridges, locks, and docking operations." The *Ava Claire* pilot offered to take the tow through the Leland Bowman Lock before turning over the watch, but the captain declined the offer and took the helm about 5 minutes before maneuvering the tow into the lock.

At the time, the captain was likely experiencing the effects of sleep inertia—the temporary feeling of grogginess felt immediately upon waking up. Sleep inertia negatively affects an operator's performance, vigilance, alertness, and decision making for 30 minutes or more after waking. The captain also had limited experience with the *Ava Claire*, which, combined with his lack of a full night's sleep, the time of day, and the captain's taking the watch immediately before navigating the *Ava Claire* tow through the Leland Bowman Lock, increased the risk of this critical maneuver.

Figure 35. Area where the *Ava Claire* tow contacted the Leland Bowman Lock gate, as indicated by the red X.

BACKGROUND SOURCE: GOOGLE MAPS



Additional factors on the morning of the casualty added to the captain's challenges as he attempted to maneuver the *Ava Claire* tow. A tidal current may have been pushing the tow from astern, adding speed as the tow approached the lock (initially transiting at 5.2 mph). As the *Ava Claire* entered the lock chamber, the GPS feed to the vessel's ECS was lost, denying the captain his primary electronic source of speed indication. Judging the speed by eye alone, the captain may have been affected by poor depth perception, which is common during nighttime operations.

Problems with radio communications between the deckhand and the captain further impacted the captain's ability to judge speed and distance in the 1,140-foot-long lock chamber. Due to these problems, the captain did not receive reports from the deckhand on the closing distance to the lock gates until the head of the tow was 250 feet from the lock gate, at which time the tow was moving at 3 mph. Given the loss of the GPS feed to ECS at a critical moment of operation and the lack of communication with the deckhand, it would have been prudent for the captain to take extra precautions such as slowing and stopping the tow earlier in the lock.

When the tow was about 200 feet from the gates, the captain put the engines at full astern. The tow continued to slow but did not fully stop before the starboard bow of the *HFL 439* struck gate no. 3 on the northwest side of the lock at 0522. The tow's speed when it contacted the gate was 1.2 mph.

THE PROBABLE CAUSE of the contact of the *Ava Claire* tow with the Leland Bowman Lock gate was the towing vessel captain's decision to assume the helm watch and attempt a predawn transit into the lock immediately after awakening while he was likely impaired by sleep inertia.



Figure 36. Automatic identification system (AIS) track of the *Ava Claire*, as indicated by the red dots, with a scaled representation of the tow added. The AIS antenna was located on the towing vessel, about 615 feet aft of the bow of barge *HFL 439*. BACKGROUND SOURCE: GOOGLE EARTH.

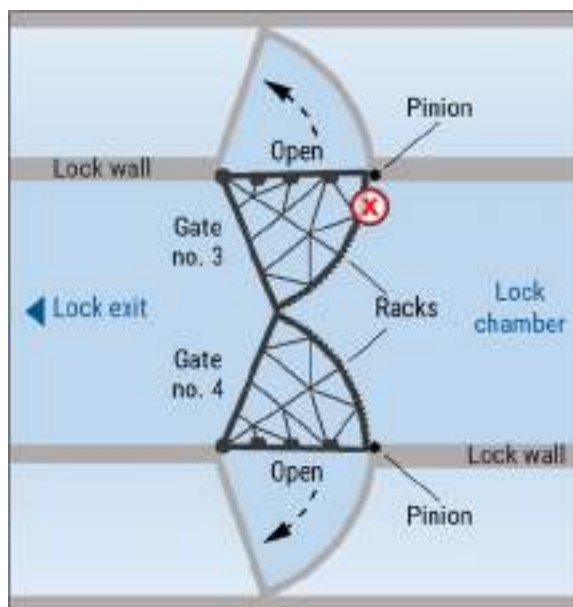


Figure 37. Left: Simplified illustration of Leland Bowman Lock western gates showing the point of contact by barge *HFL 439*, as indicated by the red X.

Figure 38. Below: Damaged steel plating and rack on gate.



LESSON LEARNED: Conducting High-Risk Operations Immediately After Awakening Sleep inertia is the temporary feeling of grogginess felt immediately upon awakening. Studies have shown that the effects of sleep inertia include reduced alertness, slower reaction time, less accuracy, degraded memory, and impaired decision-making ability. Sleep inertia generally lasts for about 30 minutes after waking but may last longer if a person is sleep deprived. Mariners should allow time to fully recover from sleep inertia before taking a watch and performing critical duties.

VESSEL GROUPS

CARGO, LIQUID BULK • TOWING/BARGE

Collision Between Liquefied Petroleum Gas Carrier **Gas Ares** and Moored Tug **Sabine**

Motiva Port Neches Terminal, Neches River, Port Neches, Texas

CASUALTY DATE

November 25, 2021

ACCIDENT ID

DCA22FM006

REPORT NUMBER

MIR-22-27

ISSUED

October 27, 2022

Figure 39. *Gas Ares* after the casualty.

SOURCE: COAST GUARD



Figure 40. Onboard image recording system view from the portside forward looking camera of the *Gas Ares* at 2226.

BACKGROUND SOURCE: KSS LINE

On November 25, 2021, at 2227 local time, the liquefied petroleum gas carrier *Gas Ares* was transiting upbound on the Neches River in Port Neches, Texas, with 24 persons on board, when it collided with the outermost of two harbor tugs moored alongside the no. 1 loading dock at the Motiva Port Neches Terminal. No injuries or pollution were reported. Damage to the tugs and dock was estimated at \$1,057,000.

On November 25, about 1748, a state-licensed pilot from the Sabine Pilots boarded the *Gas Ares* near the sea buoy for the entrance to Sabine Pass and completed a master/pilot exchange with the master. At 1754, the pilot took the conn and began to maneuver the carrier through the Jetty Channel en route to Sunoco Logistics dock on the Neches River. Because of predicted winds from the north, the pilot planned to have one escort tug meet the vessel before the Sabine Neches Canal and a second to assist in turning at the dock. About 2024, while the *Gas Ares* was transiting

the Texaco Island intersection, an escort tug was made fast with a line to the *Gas Ares*.

At 2152, the *Gas Ares* passed through the Rainbow Bridge and proceeded upbound on the Neches River. As the 106-foot-wide *Gas Ares* was transiting half ahead at 8.1 knots, at 2208, the pilot hailed the outbound 688-foot-long tow *Chad Douglas* and proposed a starboard-to-starboard passing. Setting the *Gas Ares* up to meet the tow, the pilot of the *Gas Ares* favored the left (south) part of the 400-foot-wide navigation channel—the same side where vessels were moored at Huntsman and Motiva loading docks. At 2212, about 4 minutes after arranging the passing, the pilot ordered the *Gas Ares* to dead slow ahead to avoid making a wake as the carrier passed a pipeline removal project (to starboard outside of the navigation channel), and about 6 minutes later, the vessel was only making about 3.8 knots. The pilot's decision to order the vessel's speed reduced in anticipation of passing the pipeline removal project

was what initiated the eventual collision with the harbor tug *Sabine*, moored at the Motiva no. 1 dock.

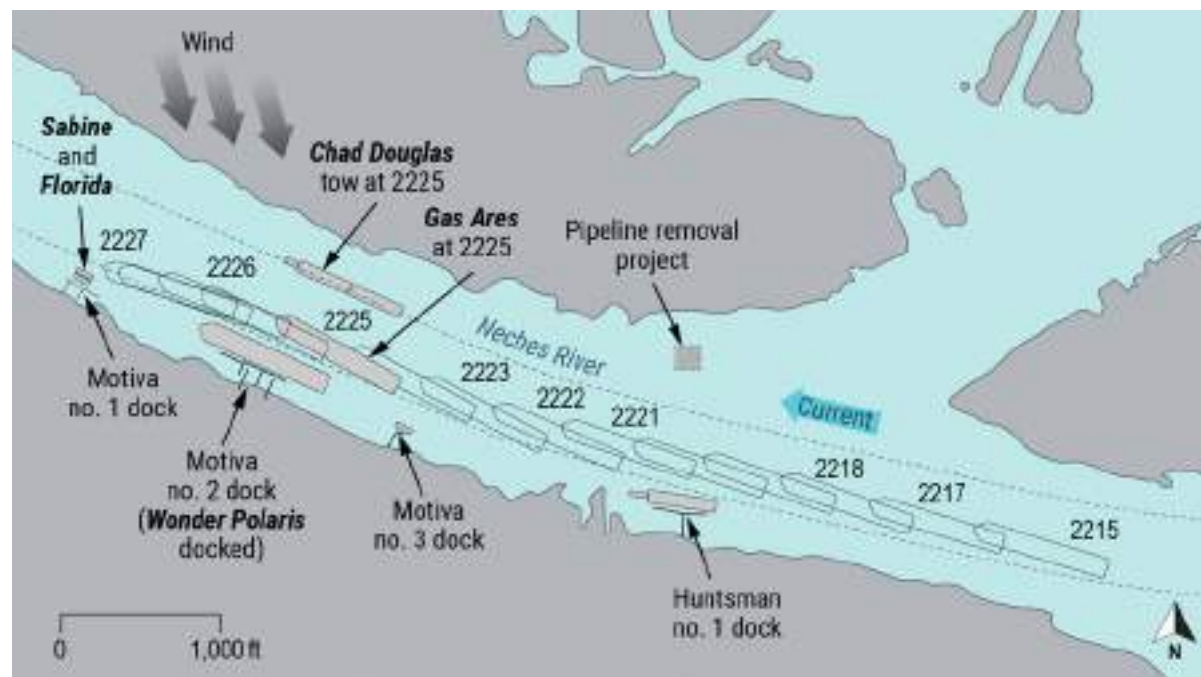
As the *Gas Ares* approached the Huntsman dock (where an articulated tug and barge was moored), Motiva dock no. 2 (where the 144-foot-wide tanker *Wonder Polaris* was moored), and the *Chad Douglas* tow, the pilot faced a close-quarters passing with the vessels moored at each dock. The pilot had the tug *Hayley Moran*—which had been made fast to the stern of the *Gas Ares*—pull the *Gas Ares*'s stern to starboard to keep it from falling onto the *Wonder Polaris*. At the same time, she issued rudder and engine orders intended to keep the LPG carrier from falling farther south and point its bow back into the channel. North-northwesterly winds at 18–27 knots exerted pressure on the exposed (in-ballast) starboard-side hull above the waterline (the 0.4-knot current likely had little impact on the immersed portion of the hull). Thus, the vessel—which was already on the left side

of the narrow channel for the passing arrangement with the *Chad Douglas* tow—was set farther toward the left and the Huntsman and Motiva docks. With the pilot's ordered reduction of the ship's speed, the *Gas Ares*'s rudder became less effective, and the pilot was not able to move the vessel to starboard and away from the nearby moored vessels by rudder and engine alone. The pilot's efforts to use the stern tug to pull the *Gas Ares*'s stern back to starboard and the center of the channel caused the LPG carrier's bow to point more toward the left side of the channel and moored vessels. Without enough headway, the pilot was unable to steer the vessel back to the center of the channel.

As the bow continued to fall to port, the *Gas Ares*'s port bow collided with the *Sabine* on its starboard side. The *Sabine*'s mooring broke, and the tug was pushed into the adjacent tug *Florida* and moved up river. The *Florida* was driven against the dock but remained moored.

Figure 41. Path of the *Gas Ares* before it collided with the moored tug *Sabine* at the Motiva no. 1 dock.

VESSEL DATA SOURCE: GAS ARES VDR



THE PROBABLE CAUSE of the collision between the liquefied petroleum gas carrier *Gas Ares* and the tug *Sabine*, moored alongside the tug *Florida* at the Motiva Port Neches Terminal no. 1 loading dock, was the pilot's decision to reduce the vessel's speed in order to create less wake when passing a pipeline removal project, causing a loss of rudder effectiveness in strong crosswinds that set the carrier toward moored vessels.



Figure 42. View from the *Gas Ares*'s portside forward looking camera at 2227, the time it collided with the tug *Sabine* (not visible in image). SOURCE: KSS LINE



Figure 43. Image recording system views from the Motiva no. 1 dock seconds after the *Gas Ares* collided with the *Sabine*, which broke from its moorings. SOURCE: MOTIVA PORT NECHES TERMINAL

VESSEL GROUP

CARGO, DRY BULK

Contact of Bulk Carrier *Jalma Topic* with Office Barge

Lower Mississippi River, mile 93.5, New Orleans, Louisiana

CASUALTY DATE
July 12, 2021

ACCIDENT ID
DCA21FM032

REPORT NUMBER
MIR-22-23

ISSUED
September 13, 2022

Figure 44. *Jalma Topic* down river of the office barge at 0328 with its port anchor out. Inset shows a close-up of the damage to the vessel's bulbous bow.

BACKGROUND SOURCE: J. CLAVERIE



Figure 45. Postcasualty damage to office barge moorings, catwalks, and gangways.

On July 12, 2021, about 0323 local time, the bulk carrier *Jalma Topic* was transiting upriver on the Lower Mississippi River near New Orleans, Louisiana, when it lost steering and struck a barge with an office accommodation structure on the bank. None of the 3 persons on the office barge or 20 persons (19 crew and a pilot) on the *Jalma Topic* were injured. The office barge and moorings sustained damages estimated at \$6 million. The bow of the *Jalma Topic* sustained an estimated \$215,000 in damages. No pollution was reported.



Figure 46. *Jalma Topic* at anchor after the contact.

At 0320:08 on July 12, the *Jalma Topic* was transiting the Lower Mississippi River with a New Orleans-Baton Rouge Steamship Pilots Association pilot conning the vessel with hand steering engaged and steering pump no. 1 online; the second officer and a helmsman were also on the bridge. The pilot ordered port 10° rudder, and the helmsman complied. The pilot then ordered the

rudder to midship, and the helmsman moved the wheel to 0°, but the rudder remained at port 10° on the rudder angle indicator. Eight seconds later, the pilot ordered "steady." The helmsman moved the wheel to steady the vessel, but the rudder did not move. The pilot saw the bow continue moving to port and saw that the rudder was not responding, and he gave engine and anchor drop requests to minimize or eliminate the headway of the ship towards the bank. The second officer went to the steering stand and switched to non-follow-up (NFU) mode and moved the NFU steering lever to starboard, which did not have any effect on moving the rudder from the port 10° position.

The master, who had briefly stepped off the bridge moments earlier, was not there when the loss of steering control began, thus the second officer was the only bridge team officer available to fulfill the requests of the pilot. When the master arrived back on the bridge at 0321:17, he had to quickly apprise himself of the situation, after which he told the chief engineer to emergency-stop the engine.

The *Jalma Topic* continued turning to port with its rate of turn increasing, moving towards the right descending bank. Ahead of it was a permanently moored office barge connected via catwalk to a work barge, where two barges and three tugs were moored. From his previous experience working in the area, the pilot knew

that there were people on board the office barge and, recognizing the danger to them, he slowed the vessel as much as possible and took immediate and effective action to ensure they were notified.

As the two dispatchers aboard the office barge were attempting to evacuate, one dispatcher heard the blast of the ship's whistle, and shortly after, the bulbous bow of the *Jalma Topic* struck the downriver corner of the office barge at 0322:40, at a speed of 6.2 knots, breaching the *Jalma Topic*'s bulbous bow and breaking the barge from its permanent moorings. The two dispatchers and a cleaner were later able to exit the barge to the shore.

Figure 47. Office barge with detached mooring apparatus and structural penetrations (outlined in white).



During the casualty, the only alarms on the bridge were an audible buzzer and flashing light on the steering stand. The second officer did not check the autopilot data display on the steering stand when he heard it sound, noting that he had no time to check while fulfilling the pilot's engine, anchor and whistle requests and therefore was not aware of the nature of the alarm. After the casualty, investigators determined the alarm indicated a servo loop failure. A technician found the port solid state relay for the steering system servo control board no. 1 (steering pump no. 1 was in use at the time) was faulty and was always in the closed position.

The company's contingency for failure of the steering system did not contain specific, accurate actions for a bridge team to address a servo loop failure like the one that occurred because the company had not received

the relevant procedures (in the form of a caution sticker and important notice) from the steering system's manufacturer. Additionally, the company's SMS guidance for a steering gear failure could have been interpreted in several ways, leaving it up to the operator to evaluate between multiple available alternatives in a timecritical emergency.

THE PROBABLE CAUSE of the contact of the *Jalma Topic* with the office barge was a loss of steering due to the failure of an electrical solid-state relay on the servo control board of the operating control system to the steering gear. Contributing was the lack of specific procedures available to the bridge team to respond to a failure of the steering control system.

LESSON LEARNED: Vessel-specific Procedures for Steering Casualties While Maneuvering

Failures in steering control systems can result in damaging consequences. In channels or during maneuvering, where immediate hazards (grounding, traffic, objects) are in proximity and therefore response time is critical to avoiding a casualty, steering system failure contingencies require immediate crew response. Companies should review and identify potential steering system failures and make quick response procedures readily available to bridge and engine teams. Bridge and engine teams should conduct scenario-based drills to maintain proficiency in implementing these procedures.

Figure 48. Left: Plotted positions of the *Jalma Topic* taken from the vessel's VDR from 0317 to the time when it struck the corner of the Smith's fleet office barge. Right: Smith's fleet barges and tug positions at the time of the contact. BACKGROUND SOURCE: GOOGLE MAPS



VESSEL GROUP

TOWING/BARGE

Contact of *Kevin Michael* Tow with Melvin Price Locks and Dam Guide Wall

Upper Mississippi River, mile 201.1, Alton, Illinois

CASUALTY DATE
March 19, 2021

ACCIDENT ID
DCA21FM021

REPORT NUMBER
MIR-22-08

ISSUED
March 17, 2022

Figure 49. Screenshots of the *Kevin Michael* tow, starting 2 minutes before the contact.

SOURCE: US ARMY CORPS OF ENGINEERS



Figure 50. *Kevin Michael* underway at the Melvin Price Locks and Dam following the casualty. SOURCE: COAST GUARD

On March 19, 2021, about 1138 local time, the towing vessel *Kevin Michael* was transiting down river on the Mississippi River with a crew of nine pushing a 15-barge tow when the tow struck the bull nose of the upstream main lock chamber guide wall at the Melvin Price Locks and Dam in Alton, Illinois, resulting in the tow breaking apart and damaging the dam gates. No pollution or injuries were reported. Total damages to the barges and dam gates were estimated to be \$1,172,227.

The *Kevin Michael* departed Hennepin, Illinois, on March 17, and headed down river on the Illinois and Mississippi Rivers for St. Louis, Missouri. On the morning of March 19, the tow neared the Melvin Price Locks and Dam. The dam was in “open river” condition, with all nine dam gates raised above the water surface, between 5 and 8 feet, allowing unrestricted water flow. The water flow rate, about 293,000 cubic feet per second, was at the high end of historical flows. The river gage at the dam measured 22.8 feet and was rising. The WAP for the Upper Mississippi River defined this river level as the highwater “watch” phase, which began when the gage measured 21 feet.

After transiting through the Clark Bridge and approaching the upstream lock of the Melvin Price Locks and Dam, the *Kevin Michael's* pilot knew that, under the dam flow conditions and prevailing winds, a successful landing on the lock's guide wall depended on placing the tow nearer the left descending bank of the river as he approached the forebay, and he tried to move his tow in that direction. Despite lining up in a position he felt would provide for a successful approach to the forebay, the tow slowly slid toward the center of the river and contacted the guide wall. He was unsuccessful because the forces of the dam-induced outdraft and wind acting on the tow overcame the developed forces of the *Kevin Michael's* engines and rudders from his orders, setting the tow to starboard and toward the center of the river before contacting the guide wall's bull nose.

Though the outdraft and wind conditions increased the difficulty for landing the tow on the main guide wall, the pilot anticipated the conditions and expected to enter the lock's forebay successfully. Based on the WAP guidance, the Coast Guard and other waterway stakeholders judged the water level and flow conditions to be within the capability of pilots experienced with

high-water operations on the Mississippi River. The pilot used his knowledge, experience, and judgment to assess conditions and then make decisions regarding his vessel. As the pilot of the *Kevin Michael* passed through the Clark Bridge and prepared to enter the lock 1.3 miles ahead, he was aware of the increased outdraft in the approach to the lock because he was familiar with transiting the Melvin Price Locks and Dam and knew the dam gates were fully open (above the surface). He was also aware of the gusting wind, which he was monitoring by observing the vessel's anemometer.

There were no restrictions for operators transiting the locks on the date of the casualty. The Coast Guard was monitoring the water levels and the dangers caused by the currents associated with high water. The pilot met the WAP recommendation that towing vessel operators transiting during a high-water watch phase should have highwater experience.

Based on a safety improvement effort in response to several casualties where vessels contacted the Melvin Price Locks and Dam guide wall, the Army Corps of Engineers, at the request of other towing vessel operators, moved the sailing line in 2018—the preferred or recommended route within the reaches of a navigable channel. The sailing line was moved toward the left descending bank of the river to compensate for the outdraft that set tows sideways to their intended course, toward the center of the river, before the approach to the guide wall. Though the pilot was unaware that the Corps of Engineers had addressed the risk from the outdraft by moving the sailing line, he had made many successful transits through the Melvin Price Locks and Dam since 2018. Although his course, which was based on experience and knowledge, was closer to the bank than the original sailing line, it was not as close to the bank as the revised sailing line, which left the *Kevin Michael's* pilot with less room to compensate for the strong outdraft and high winds as the tow approached the locks.

Figure 51. Barges upstream of the Melvin Price Locks and Dam west of the guide wall following the casualty.

SOURCE: COAST GUARD

Figure 52. Annotated ECS track history of the *Kevin Michael* tow over the last 12 minutes leading up to the casualty. BACKGROUND SOURCE: GOOGLE EARTH



THE PROBABLE CAUSE of the contact of the *Kevin Michael* tow with the Melvin Price Locks and Dam guide wall was the *Kevin Michael* pilot not effectively compensating for the strong outdraft and wind above the dam while navigating toward the lock during a period of high-flow conditions.

LESSON LEARNED: Use of Charted Sailing Lines

Generally, a sailing line is assigned to a known safe route used by commercial vessels. A sailing line is developed under considerations of channel depth, current patterns, and any other known obstructions to navigation. In some areas, a sailing line is positioned to address a specific navigational hazard, such as the outdraft near the Melvin Price Locks and Dam. A charted sailing line provides for a safe and successful transit when used as a guide along with the mariner's own experience and assessment of the existing circumstances.



VESSEL GROUP

CARGO, DRY BULK

Contact of Bulk Carrier *Ocean Princess* with Oil and Gas Production Platform SP-83A

Gulf of Mexico, South Pass Block 83,
near Pilottown, Louisiana

CASUALTY DATE
January 7, 2021

ACCIDENT ID
DCA21FM013

REPORT NUMBER
MIR-22-18

ISSUED
August 9, 2022

Figure 53. The final events leading up to the *Ocean Princess* contact with platform SP-83A (inset).

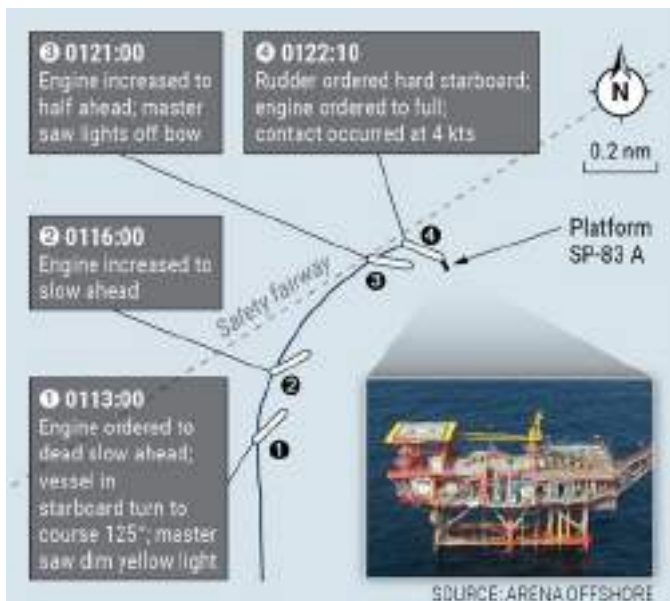


Figure 54. Knocked down mast and damaged bulwark, anchor windlass, and handrails on the *Ocean Princess* following the casualty. SOURCE: BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT

On January 7, 2021, at 0122 local time, the bulk carrier *Ocean Princess*, with a crew of 24, struck the uncrewed/out-of-service oil and gas production platform SP83A while operating in the Gulf of Mexico, 24 miles south of Pilottown, Louisiana. No pollution or injuries were reported. Damage to the vessel and platform was estimated at \$1.5 million.

On January 6, the *Ocean Princess* got underway from New Orleans. Upon entering the Gulf of Mexico, the master's night orders instructed the bridge team to drift with the engine on 15-minute standby and if approaching traffic or platforms, maneuver as necessary. To rest crewmembers that cleaned cargo holds throughout the day, the master reconfigured the bridge watch so that he would be a member of the bridge team and perform their duties (including lookout). About 2000, the master worked alongside the mate on watch (third officer), and then the second officer after he relieved the third officer about midnight.

In addition to watchstanding, the master performed other tasks such as reviewing stability calculations. From about 0055 until 0120, about a minute before the casualty, the master engaged in a mostly one-sided conversation about non-navigational, nonpertinent matters with the mate. These competing tasks likely distracted the master and the second officer from their primary navigation duties.

Figure 55. *Ocean Princess* before the casualty.

SOURCE: MALCOM COTTE; MARINETRAFFIC.COM



About 0100, the mate informed the master that the vessel was approaching a safety fairway. About 10 minutes later, the master took the conn. The master saw a dim yellow light and checked the radar. Not seeing any contacts, he checked the ECDIS and thought the light was from an oil platform 56 miles away, roughly on the same bearing. Through binoculars, the mate saw a light but could not tell its distance. The mate did not check the radar, but looked at the ECDIS and thought the light was a contact 5 miles away. Neither officer took additional steps to verify whether the light posed a risk. At 0122:10, the *Ocean Princess* struck platform SP-83A at 4 knots.

Although SP-83A was depicted on the British Admiralty paper chart on the bridge, it nor other nearby platforms were marked as obstacles as required by the company's SMS. The mate was aware of the platform when he plotted fixes on the paper chart nearly an hour before the casualty but did not think it was of concern. He also did not tell the master about the platform on the chart and assumed the master was aware of it.

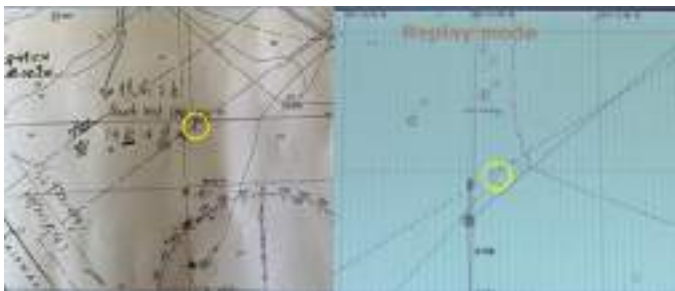


Figure 56. Navigation aids used by the *Ocean Princess* bridge team, with the location of platform SP-83A shown annotated by NTSB with a yellow circle (images are at different scales). The British Admiralty chart 3857 (left) and ECDIS screenshot from the *Ocean Princess* fed by NOAA ENCs (right), which were up to date at the time of the casualty. The British Admiralty chart shows SP-83A while the ECDIS image does not.

The bridge officers never identified platform SP-83A on the radar. In varying visibility, they used only one of two radars available, the S-band/10-cm radar. The X-band/3-cm radar, which was energized and available, was in standby. With only one radar in use, the bridge team's detection of traffic or other navigation obstructions was limited by the selected range and accuracy of this radar's display.

Platform SP-83A was not charted on US electronic or paper navigation charts that provided data to the vessel's ECDIS. The platform had been added to the US paper charts when installed in 1990, but for an unknown reason was omitted 20 years later and remained off the two larger-scale US paper charts and ENCs for over 11 years—until after the casualty. Following the casualty, NOAA corrected the electronic and paper charts and believes that this type of omission could not happen today.

The master likely received less than 3.5 hours of sleep in the 20 hours before the contact—placing him outside of the Standards of Training, Certification and Watchkeeping work/rest limitations and susceptible to the effects of acute fatigue, which likely impacted his performance in simultaneous roles as master and lookout, affecting his judgment and situational awareness.

When the master stood the bridge watch, he effectively became part of the bridge navigation team, as opposed to a master overseeing the bridge team. However, there was no clear delineation of duties between the mate and master.

The master's presence on the bridge also could have impacted the mate's behavior. Before the master took the conn, the mate had operational control of the vessel. However, because of the master's positional authority, superior knowledge, and experience, the master's presence could have caused the mate to make assumptions that he would not have made with a crewmember.

The tendency to rely more heavily on information that reinforces one's expectations and discount information that may contradict those expectations is called confirmation bias. In this case, both the master and the mate saw the lights of the platform they eventually struck but were under a belief, or bias, that SP-83A was farther away because it did not appear on the radar or the ECDIS.

THE PROBABLE CAUSE of the contact of the dry bulk carrier *Ocean Princess* with the oil and gas production platform SP-83A was poor bridge resource management, which resulted in the bridge team not identifying the platform and recognizing the risk it posed to their safe navigation even though they saw its lights about 10 minutes before the casualty. Contributing was platform SP-83A not being shown on the vessel's electronic chart display and information system due to a charting error.

LESSON LEARNED: Overreliance on the Electronic Chart Display and Information System

The effective use of all available resources by a bridge team, including paper charts, electronic charts, and radars, increases collective situational awareness and contributes to a safe navigation watch. When identifying hazards, bridge teams should avoid overreliance on a single data source by cross-checking information with available bridge resources and communicating identified risks with fellow watchstanders to ensure a shared mental model.

VESSEL GROUP

CARGO, LIQUID BULK

Contact of Tanker *Riverside* with Moda Ingleside Energy Center No. 4 Loading Dock

Corpus Christi Channel, Ingleside, Texas

CASUALTY DATE
March 15, 2021

ACCIDENT ID
DCA21FM017

REPORT NUMBER
MIR-22-07

ISSUED
March 16, 2022

Figure 57. *Riverside* before the casualty.

SOURCE: GLORY RIVERSIDE NAVIGATION LTD



Figure 58. Damage to the no. 4 Moda dock catwalk (left) and the *Riverside* (right, circled). SOURCE: COAST GUARD

On March 15, 2021, about 1302 local time, the oil tanker *Riverside* with a crew of 21 and 2 pilots was transiting outbound from the port of Corpus Christi, near Ingleside, Texas, in a loaded condition when the vessel lost propulsion and struck the no. 4 loading dock at the Moda Ingleside Energy Center. No pollution or injuries were reported. Damage to the vessel was estimated at \$550,000. The estimated property damage to the facility was \$7 million.

At 1054, the *Riverside* departed the EPIC Marine Terminal with two pilots aboard and two tugs assisting. Once the *Riverside* entered Corpus Christi Bay at 1200, the tug escorts departed, and pilot 2 took control and increased speed to 10.5 knots at a half-ahead bell. At 1245, the pilot aboard the tank vessel *Nordic Aquarius*, located at the no. 4 Moda dock, informed pilot 2 that it was departing. The *Riverside* pilots agreed to slow down to allow the *Nordic Aquarius* to safely depart.

At 1247, pilot 2 started to slow the *Riverside* by ringing half ahead, then slow ahead at 1248, and dead slow ahead at 1251. At 1255, after the *Riverside* passed buoys 43/44 at the port bend in the channel, pilot 2 ordered stop engines to further slow the vessel, which was moving ahead at 8 knots. After slowing to about 6 knots, the *Riverside* began to sheer to port. At 1258, pilot 2 ordered the rudder hard to starboard to counteract the heading change to port, but the rudder movement had no effect. He then ordered dead slow

ahead, which required restarting the slow-speed diesel engine. The engine failed to start from the bridge. The chief engineer tried to start the engine from the engine control room; the engine again failed to start. Meanwhile, at 1258, the *Nordic Aquarius* had entered the channel and was proceeding outbound.

The captain informed pilot 2 that they had "lost the engine." Pilot 2 contacted a nearby tug, *Honor*, which pushed against the *Riverside*'s port bow and affected the vessel's direction back toward the channel. Pilot 2 ordered dead slow astern, and the chief engineer tried to start the engine astern locally, but it failed to start. At 1302, the *Riverside*'s port bow struck the mooring dolphin and catwalk at the end of the no. 4 Moda dock at 5 knots.

The engine's failure to reliably start was discovered 3 days before the casualty, before the *Riverside* entered the port and while the vessel was waiting for pilots offshore. The chief engineer and the operating company technician evaluated the engine, and, after about 5 hours, the engine started when the chief engineer engaged the limit cancel mode for fuel, allowing 10% more fuel into each piston. According to technicians from the engine's manufacturer, the engagement of the limit cancel mode had no effect on the starting of the engine. Therefore, the cause of the start failure was not properly identified or corrected, leaving the engine unreliable to respond to the maneuvering demands encountered.



Figure 59. Approximation of *Riverside* transiting the Corpus Christi Channel outbound about 18 minutes before the casualty, with *Nordic Aquarius* preparing to depart the dock. BACKGROUND SOURCE: NOAA

Following the contact, technicians identified that the cause of the main engine start failures was the inability of the no. 6 actuator to initiate piston rotation due to hardened grease and dirt preventing proper movement. Technicians discovered other problems within several main engine systems, including the fuel pumps, the control air drying system and start air system, and numerous pneumatic air control valves. They told investigators that the engine start system failed because the vessel's engineers did not clear moisture from the start air system by draining the air tanks on a routine basis, as was required by the chief engineer's written standing orders. Over time, hardened grease built up in the actuator.

Engaging the limit cancel mode was not recommended by the main engine's operating manual and should have indicated that the engine had an unresolved condition. Had the chief engineer or the company technical representative decided to further inspect the engine or request an inspection by a diesel engine technician before the *Riverside* entered port, or alongside the berth before departing, the buildup on the starting air valve would have likely been identified and corrected.

THE PROBABLE CAUSE of the contact of the tanker *Riverside* with the Moda Ingleside Energy Center no. 4 loading dock was the ineffective evaluation and incorrect solution for a main engine start issue by the company and shipboard engineers, overlooking the fouling of the main engine's no. 6 air start actuator valve within the starting air distributor. Contributing to the casualty was the presence of moisture in and lack of routine drainage of the air start system, which allowed the buildup of hardened grease within the air start actuator valve.

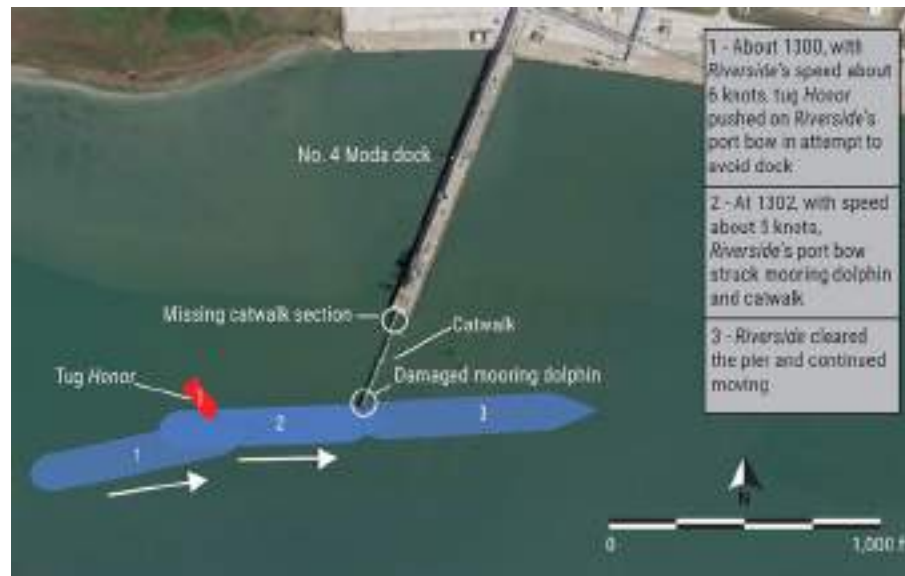


Figure 60. Final events surrounding the *Riverside*'s contact with the no. 4 Moda dock. BACKGROUND SOURCE: GOOGLE EARTH

LESSON LEARNED: Evaluation of Engine Start Issues

On vessels with slow-speed diesel propulsion engines, starting and stopping main engines is a critical function for effective maneuverability. The NTSB has investigated multiple casualties involving slow-speed engine pneumatic starting and control systems and, in particular, air actuating valves within the systems. Vessel operators should ensure their crews are equipped with the resources and training to execute timely and thorough maintenance and repair on engines. If the root cause of an engine operating issue cannot be determined, it is critical for a chief engineer and vessel owner/operator to have a diesel technician further evaluate and determine the cause of the malfunction. Vessel reliability is dependent on the complete resolution of equipment malfunctions and abnormalities when they occur.

VESSEL GROUP

TOWING/BARGE

Contact of **Robert Cenac** Tow with CSX Railway Rigolets Bridge

Lake Borgne, near Slidell, Louisiana

CASUALTY DATE

January 12, 2021

ACCIDENT ID

DCA21FM014

REPORT NUMBER

MIR-22-01

ISSUED

January 13, 2022

Figure 61. *Robert Cenac* following the casualty.

SOURCE: ANONYMOUS



Figure 62. January 29, 2021, post-casualty photo of the Rigolets Bridge (*in the closed position*), as it would have been approached from the south, heading north. Red navigation lights on the long and short fenders are circled. Note there are no navigation lights at the top of and each end of the swing span, and there are no red navigation lights at either end of the short or long fenders, nor anywhere on the south side of the bridge on the short or long fenders.

BACKGROUND SOURCE: BULLARD MARINE SOLUTIONS

On January 12, 2021, about 2359 local time, the towing vessel *Robert Cenac* was pushing one empty barge when the barge struck the CSX railway Rigolets swing bridge, located about 11 miles southeast of Slidell, Louisiana. No pollution or injuries were reported. Damages to the bridge and barge were estimated at \$1.1 million and \$5,000, respectively.

About 2231, the *Robert Cenac* pilot radioed the Rigolets Bridge operator that the tow was 30 minutes away inbound and requested the bridge be opened. The pilot recalled the bridge operator saying that two trains must pass before the bridge could open, so he reduced the tow's speed. About 2253, he steered out of the Gulf Intracoastal Waterway toward the Rigolets Bridge, about 2.4 miles ahead, and idled the engines.

At 2306, with the tow holding about 1.5 miles southeast of the bridge, the pilot saw both trains' lights as they crossed the bridge. Sometime after 2330, while the pilot and the captain were changing the watch, the pilot called the bridge operator to remind him they were still waiting and ask if the bridge was opened; the bridge operator responded that he would "get it open."

About 2345, the captain took the helm. The captain said the bridge operator informed him that the bridge was open. At 2348, the *Robert Cenac* began to make headway toward the bridge. Anticipating a westerly set from the current, the captain approached the span at an

angle. He noted that there were "hardly any lights" on the bridge, and he could see only two red lights on the long fender wall. About a half to a quarter mile away, he used the spotlight on top of the wheelhouse to look for the bridge fendering, and he lined up the tow to pass through the opening. As the tow approached the long fender, he saw the swing span was overhanging the long fender "looking as if it was three-quarters of the way open." By the time he began to back down (full astern), the tow was too close to stop, as the current set the tow toward the span. About 2359, the barge struck the overhanging south end of the swing span.

The bridge operator said he told the *Robert Cenac's* captain he was starting to operate the bridge and that he would let them know when it was fully open and clear to come through. He also told investigators that he did not communicate that the bridge was fully open.

The captain and pilot stated it was difficult to see the channel through the bridge fenders, and investigators determined that required navigation lights were not located at the fender ends. Investigators also found that the swing span was not fitted with any navigation lighting, as required by regulation, to indicate that it was in the open or closed position. Had the swing span been lighted as required, the captain would likely have been able to visually determine the position of the swing span throughout its opening sequence.

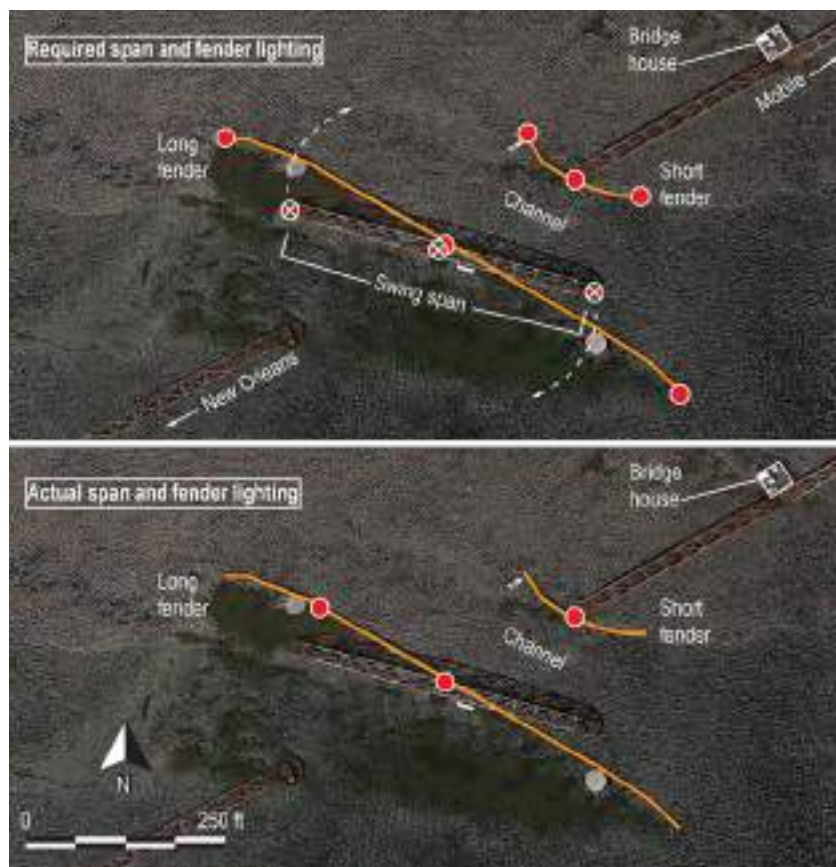


Figure 63. (Above) Trackline of the *Robert Cenac*, based on AIS course over ground data and the approximate position of the tow upon its contact with the Rigolets Bridge. Bridge position in the photo is about three-quarters of the way open. Tow headings are estimated. BACKGROUND SOURCE: GOOGLE EARTH

Figure 64. August 2015 images of the Rigolets Bridge channel and fendering with the swing span about three-quarters of the way open. BACKGROUND SOURCE: GOOGLE EARTH

CSX records indicated the second train was clear of the bridge at 2334. Based on that time and the span's opening time of 12 minutes, the earliest time that the bridge could have been fully opened would have been about 2346, roughly 12 minutes before the casualty.

Drawbridge regulations (33 CFR 117.9) require land and water traffic to pass over or through the draw as soon as possible to prevent unnecessary delays in opening and closure of the draw. However, the bridge operator did not immediately open the bridge after the second train had cleared the track circuit.



The captain's and the bridge operator's accounts of the communication surrounding the casualty differed. There were no audio recordings of or witnesses to their communications, and there was no evidence to determine with accuracy their context and timing.

The bridge was not fully open when the captain made his approach. Additionally, the captain stated that the bridge was poorly lit. Therefore, the captain should have verbally confirmed with the bridge operator that the bridge was open. Furthermore, the bridge operator should have radioed the captain if he saw the bridge was not all the way open as the towboat approached. This was an instance of poor communication; both parties were responsible for exercising good judgment and practices, and both should have exchanged clear and unambiguous requests, orders, or direction in an effort to execute the transit safely.

THE PROBABLE CAUSE of the contact of the *Robert Cenac* tow with the CSX Rigolets railway swing bridge was the poor communication between the bridge operator and vessel operator. Contributing to the accident was the absence of bridge span navigation lighting that would have provided the vessel operator with a visual indication of the bridge's opening status.

LESSON LEARNED: Communication Between Drawbridge Operators and Vessel Operators

Communication between drawbridge operators and vessel operators requesting bridge openings must be clear. Commonly used in all modes of transportation, closed loop communication, in which the sender confirms the message is understood or provides additional information or clarification, ensures the receiver understands the message.

VESSEL GROUP

FISHING

Fire aboard Fish Processor *Aleutian Falcon*

Pier 25, Tacoma Harbor, near Tacoma, Washington

CASUALTY DATE

February 17, 2021

ACCIDENT ID

DCA21FM016

REPORT NUMBER

MIR-22-10

ISSUED

March 23, 2022

Figure 65. *Aleutian Falcon* pierside before the fire.

SOURCE: TRIDENT SEAFOODS



Figure 66. *Aleutian Falcon* bridge deck post-fire, depicting hot work area on the day of the casualty.

BACKGROUND SOURCE: BUREAU OF ALCOHOL, TOBACCO, FIREARMS AND EXPLOSIVES

On February 17, 2021, about 2232 local time, a fire was reported on the commercial fish processor *Aleutian Falcon* while the vessel was docked for repairs at the Trident Seafoods shipyard in Tacoma, Washington. Firefighting crews from the Tacoma Fire Department responded, and the fire was extinguished over 4 days later on February 22. No one was on board the vessel at the time of the fire, and there were no injuries reported. An estimated 20–30 gallons of hydraulic oil leaked into the water but were captured by a containment boom. The vessel was declared a constructive total loss with an estimated value of \$16,460,850.

At the end of the fishing season in August 2020, the *Aleutian Falcon* docked at the Trident Seafoods facility to complete maintenance and repairs. Workers came on board during the day to perform tasks, but no crew remained on board.

On February 17, 2021, workers planned to continue ongoing hot work by removing corroded steel deck plating located on the bridge deck above the pantry, dry stores area, and walk-in refrigerator. Because the work was in an area that adjoined foam insulation below, a marine chemist had previously been brought

on board to examine the areas involved. The port engineer, shipyard competent person, and lead welder (all supervisory personnel) understood that replacing the wasted deck plating meant that the old steel had to be both cut out and new steel welded in place. Therefore, they should have been aware that the spaces immediately beneath the deck would be subject to flames, heat, and sparks. However, it was unclear whether the port engineer explained to the marine chemist that they would be cutting through the bridge deck plating. The marine chemist issued a certificate, signed by the port engineer, that stipulated that work must be completed “without penetrating” the bridge deck. It is unclear whether the port engineer or SCP noticed or whether the lead welder or workers were informed of the restrictions listed in the certificate.

The SCP was required to complete a safety inspection of the area where hot work would be completed to ensure the space was adequately prepared. If either the SCP or port engineer had performed a thorough inspection, they would have been aware that the planned work would involve cutting through the deck directly above a wooden bulkhead and foam insulation separating the walk-in refrigerator from the pantry—violating the conditions of the marine chemist certificate. If the supervisory

personnel were confused by the restrictions listed on the certificate, they could have requested clarification from the marine chemist, but none of them did so.

Despite the certificate's requirement to remove all foam insulation within 12 inches of the hot work area, the workers did not remove the foam-filled wooden bulkhead, which was combustible; instead, they covered the area in fire blankets and stationed a fire watch in the walk-in refrigerator. The wooden bulkhead was of sandwich-style construction, which would have made it almost impossible to adequately protect the bulkhead without removing it completely. While the lead welder should have been aware of the presence of the wooden bulkhead, there is no indication he communicated as much to the SCP or port engineer.

At 2232 that evening, a motorist noticed smoke and an orange glow and made a 911 call to report a fire aboard the vessel. The fire's most likely area of origin was near the longitudinal wooden bulkhead located forward in the walk-in refrigerator space, directly below the area where hot work had been completed for the day. Sparks and slag from hotwork likely traveled from the deck above (overhead) into the wooden bulkhead, igniting the combustible materials in the area, as well as the bulkhead, and allowing for a smoldering fire to become established, which would have likely gone unnoticed by a fire watch before they departed the vessel after work was completed for the day about 1631. The vessel's fire-detection system would have alarmed only in the pilothouse, an area that was unmanned at the time, so no one was alerted, and the shipyard security guard did not notice anything unusual when he walked by the ship at 2122. The fire expanded to a point that responding firefighters could not enter the vessel; it was eventually extinguished on February 22.

THE PROBABLE CAUSE of the fire aboard the fish processor *Aleutian Falcon* was the company's supervisory personnel inadequately planning for hot work, as well as shoreside workers' inadequately protecting hot work areas, allowing slag from hot work to ignite combustible material near an insulated wooden bulkhead of a walk-in refrigerator that had not been removed or sufficiently protected. Contributing to the casualty was the ineffective communication between the supervisory personnel, marine chemist, and workers.

LESSON LEARNED: Preparing for Hot Work
It is critical for supervisory personnel to evaluate hot work areas for fire hazards to ensure that affected spaces are completely understood, prepared, and protected for planned hot work in accordance with regulatory guidelines, company policies, and marine chemist certificates. Adherence to proper policies and procedures is vital to completing a safe hot work operation. Additionally, crewmembers and personnel involved in hot work should be able to identify hazards and take action to remove or mitigate potential risks to the vessel.

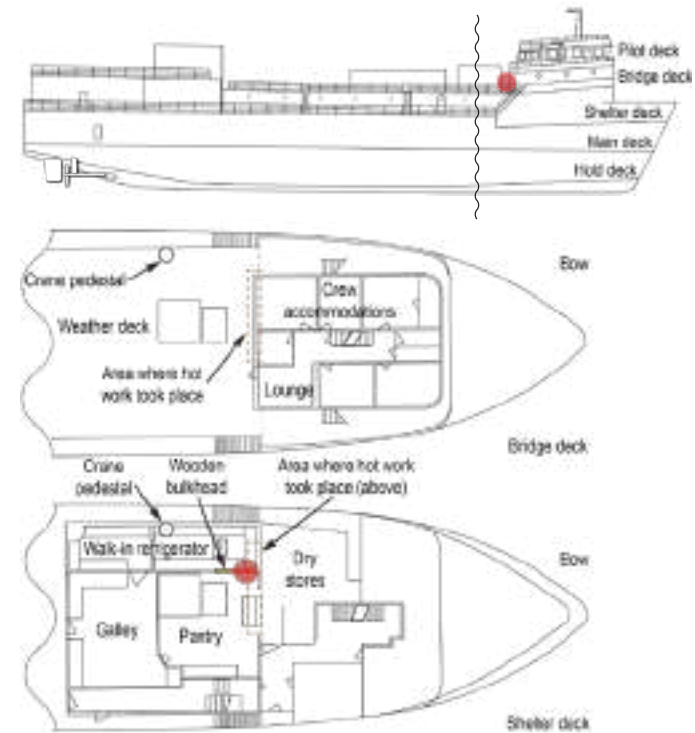
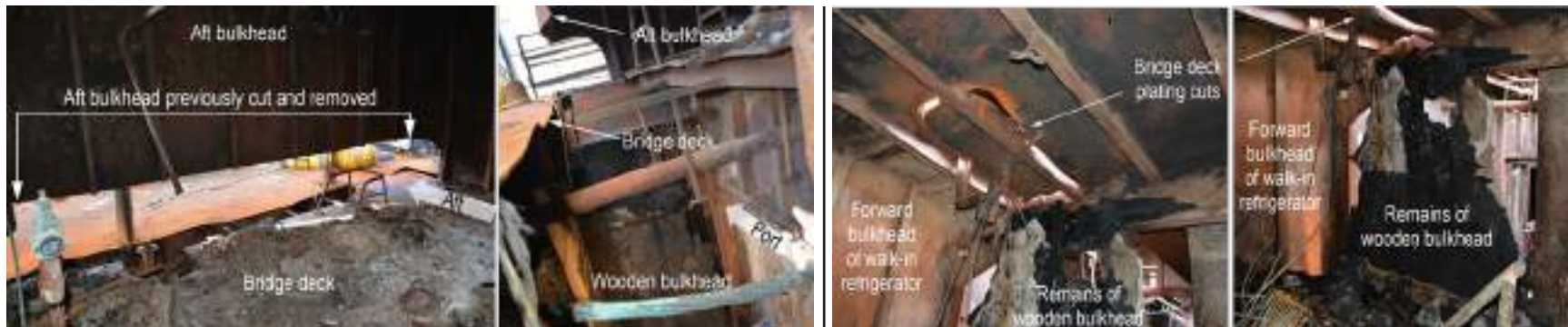


Figure 67. Profile (top) and bridge and shelter deck arrangements (bottom) of *Aleutian Falcon*. The area where the fire began on the shelter deck is indicated by a red circle. The area of the bridge deck where the deck was being cut is highlighted with orange dashed lines.

BACKGROUND SOURCE: TRIDENT SEAFOODS

Figure 68. *Aleutian Falcon* post-fire, depicting hot work area on the day of the casualty. The bridge deck (left two photos) and forward end of walk-in refrigerator on the shelter deck (right two photos).

BACKGROUND SOURCE: BUREAU OF ALCOHOL, TOBACCO, FIREARMS AND EXPLOSIVES



VESSEL GROUP

FISHING

Fire aboard Fishing Vessel *Blue Dragon*

North Pacific Ocean, 350 miles offshore of
Monterey, California

CASUALTY DATE
November 10, 2021

ACCIDENT ID
DCA22FM003

REPORT NUMBER
MIR-22-20

ISSUED
August 23, 2022

Figure 69. *Blue Dragon* underway before the fire.

SOURCE: KIM BRIDGES, MARINETRAFFIC.COM



Figure 70. NordRubicon rescue boat with *Blue Dragon* liferaft in tow. SOURCE: NORDRUBICON



Figure 71. *Blue Dragon* smoldering with NordRubicon's rescue boat in foreground. SOURCE: NORDRUBICON

On November 10, 2021, about 0015, the fishing vessel *Blue Dragon* was underway in the North Pacific Ocean, 350 miles offshore of Monterey, California, engaged in longline fishing operations, when the vessel caught fire. The *Blue Dragon's* six crewmembers and a National Marine Fisheries Service observer attempted to fight the fire but were unsuccessful. They abandoned the *Blue Dragon* and were rescued by a Good Samaritan vessel. The *Blue Dragon* was later towed to San Pedro, California. No pollution or injuries were reported. Damage to the vessel was estimated at over \$500,000.

On October 25, the *Blue Dragon* left Honolulu, Hawaii, with a crew of six and one National Marine Fisheries Service observer to fish. The captain intended to offload their catch in Long Beach, California. The NMFS observer brought with him a survival suit, an EPIRB, a PLB, and a SEND, all issued by NMFS.

About 2330 on November 9, as the crew was preparing to retrieve fishing gear that had been set earlier in the day, the National Marine Fisheries Service observer went to the wheelhouse and discovered a fire "underneath of the control panel [console]." The origin of the fire was likely under the wheelhouse console. Because the wheelhouse was destroyed by fire, investigators could not determine the cause of the fire. However, the captain stated that he believed the cause was electrical. After the casualty, investigators examined a similar vessel owned by the same company

(*Blue Dragon II*) and found wiring that did not meet typical marine standards (improper connections, loose, disorganized, and bare wires) under the wooden wheelhouse console, as well as computer equipment and batteries. Such substandard electrical outfitting can result in an electrical fault, which can serve as a source of ignition for a fire. Given that both vessels were owned and operated by the same company and were designed with similar console equipment, the condition of the *Blue Dragon's* wiring was likely comparable to the *Blue Dragon II's*. Additionally, because there was similar electrical equipment stowed under both consoles, it is likely the fire started from an electrical source.

Figure 72. *Blue Dragon II* pilothouse console wiring.

SOURCE: COAST GUARD



The crew fought the fire for about 10 minutes using fire extinguishers and a water (wash down) hose. The vessel's wheelhouse and accommodations consisted of combustible interior joinery construction, outfitting, and furnishings—a high fire load. Additionally, paint cans and welding rods (also combustible materials) were found in the void space beneath the wheelhouse. All of these materials fueled a fire that could not be contained with the limited firefighting equipment available—the water hose did not reach the location of the fire, leaving only extinguishers to fight the fire.



Figure 73. *Blue Dragon* wheelhouse exterior (top) and interior looking forward (bottom), following the fire. The framing of the false deck below indicates the location of what was the wheelhouse deck. SOURCE: COAST GUARD



Figure 74. Main deck general layout (not to scale) with location of fire indicated by flame symbol.

The observer and deckhand contributed to the survival of all hands by retrieving the *Blue Dragon's* satellite-enabled EPIRB and 10-person liferaft from above the wheelhouse before they could be burned by the fire. About 20 minutes after the fire was discovered, the captain, crew, and observer decided to abandon the vessel to the inflated liferaft, which was tethered to the *Blue Dragon* by its sea painter. The crew's survival suits burned in the fire, so without the liferaft, the crew would have been at risk in the seas without a means to abandon the vessel to an out-of-water lifesaving appliance. The National Marine Fisheries Service observer activated the vessel's EPIRB and used his NMFS-issued EPIRB, PLB, and SEND, which further contributed to the crew's timely rescue, coordinated by the RCC, since the equipment transmitted the crew's location (both EPIRBs transmitted a satellite-derived position).



The RCC retrieved the *Blue Dragon's* AIS information, which correlated with all of the beacon information they received and increased their confidence of an emergency, later confirmed by the SEND text, "Fire." That text, transmitted by the observer, informed the RCC of the nature of the emergency, which would not have been possible using just the EPIRB or PLB. In this case, the SEND and PLB signals were received over 30 minutes before the EPIRB by SAR coordinators in the RCC (likely because of the sequence in which the NMFS observer activated the devices). The RCC then launched an aircraft to investigate and reached out directly to the nearby bulk carrier *NordRubicon*, resulting in the rescue of all crewmembers and the NMFS observer.

THE PROBABLE CAUSE of the fire aboard the fishing vessel *Blue Dragon* was from an unknown source, likely electrical in nature, which ignited the wooden wheelhouse console. Contributing to the extent of the fire damage was the substantial use of combustible materials in the joinery, outfitting, and furnishings in the wheelhouse and accommodation spaces.

LESSONS LEARNED:

Electrical Installations

Substandard electrical installation and outfitting—including bare wires, unsecured wire nuts, overloaded circuits, loose wiring, and household wiring not designed for marine use—is a common cause of electrical fires. Additionally, batteries have been identified as ignition sources of fires in multiple modes of transportation. Vessel operators should ensure electrical systems are adequately designed, installed, and maintained in accordance with established marine standards to prevent fires.

Personal Locator Beacons and Satellite Emergency Notification Devices

In this casualty, personal locator beacons (PLBs) helped validate the position of the vessel's emergency position indicating radio beacon (EPIRB), and a satellite emergency notification device (SEND) helped responders identify the nature of the emergency. Vessel owners and operators can enhance the safety of their crews by equipping their vessels and crews with these additional satellite technologies to supplement EPIRBs.

VESSEL GROUP

TOWING/BARGE

Engine Room Fire on board Towing Vessel *Capt. Kirby Dupuis*

Ohio River, mile 501, near Bellevue, Kentucky

CASUALTY DATE

November 9, 2021

ACCIDENT ID

DCA22FM002

REPORT NUMBER

MIR-22-24

ISSUED

September 29, 2022



Figure 75. Firefighters deploying water into the engine room of the *Capt. Kirby Dupuis* through an open window.

SOURCE: LT MEGHAN G. KEITH, DEARBORN COUNTY WATER RESCUE



Figure 76. *Capt. Kirby Dupuis* docked following the casualty.

On November 9, 2021, about 0708 local time, a fire broke out on the port main diesel engine on board the towing vessel *Capt. Kirby Dupuis*. The vessel was pushing thirteen loaded dry cargo barges while transiting upbound on the Ohio River at mile marker 501 near Bellevue, Kentucky, with a crew of six. Crewmembers fought the fire using portable extinguishers and attempted to use the vessel's fixed fireextinguishing system. The fire was extinguished by local firefighters in the early afternoon, and the vessel was towed to port. No pollution or injuries were reported. Damage to the vessel was estimated at \$1,800,000.

On November 4, 2021, at 0600, the *Capt. Kirby Dupuis*

departed Paducah, Kentucky, bound upriver for Steubenville, Ohio, pushing thirteen dry cargo barges. The vessel had a crew of six: the captain, pilot, a "deckineer" (a deckhand who was not licensed as an engineer but shared deck and engine responsibilities), and three deckhands.

On the morning of November 9, the towboat was transiting with both 12-cylinder Caterpillar 3512C diesel engines about 1,275 rpm (typical underway engine loading) for a speed of about 5–6 knots. At 0708, lube oil began to spray from the port main engine into the center of the engine room. About 10 seconds later, a flame at the top of the forward part of the engine

by the exhaust manifold erupted inboard toward the starboard engine. Immediately after, the vessel's fire detection system alarmed. The captain, on watch in the wheelhouse, had noticed a flash on the engine room video display and sounded the general alarm.

Post-casualty, a service manager from Louisiana Cat (Caterpillar) determined that a broken O-ring was missing from a lube oil tube on the port engine. The tube was also missing a retaining ring and supporting hardware. A sheared bolt indicated that the supporting clips and hardware had originally been installed on the engine but had failed at some point. Without the clips and hardware, the tube was unsupported and more susceptible to vibration and associated movement. It is unknown how long the engine had been operating without the retaining ring, supporting clips, and hardware on the lube oil tube. The technician concluded that the cause of the fire was "a severe oil leak" that sprayed onto the exhaust manifold and ignited.

When attempts to fight the fire failed, the deckineer contacted the captain via handheld radio to activate the fixed fire-extinguishing (suppression) system for the engine room. The *Capt. Kirby Dupuis's* system was designed to extinguish a fire by flooding the engine room with a specialized gas. The system was activated by two remote pull levers on the main deck in the accommodation space: one lever was connected to a nitrogen-filled pilot cylinder, and the other lever was connected to a globe valve that would allow nitrogen to activate the valves on the two cylinders filled with suppression fluid. Both the nitrogen actuator lever and the globe valve needed to be opened for proper operation of the system. The system could also be activated locally near the cylinders.

The deckineer activated the remote emergency fuel shut offs for the engines and then "hit the first fire suppression system" by pulling one of the two remote pull levers. However, the fire continued to grow. When the fire started back up on the port side of the engine room, the deckineer informed the captain that he needed to "hit the second fire suppression system" and the deckineer pulled the second remote lever.



Figure 77. Screenshots from the *Capt. Kirby Dupuis* engine room video camera (looking aft).

However, investigators determined that the system was not activated during the fire. The deckineer did not hear the system's sirens nor product discharging into the engine room. After the fire, both suppression fluid cylinders were full, and the nitrogen pilot cylinder lever was found in the "set" position with its cylinder still fully charged.

None of the documented drills and safety meetings held aboard the *Capt. Kirby Dupuis* included familiarization or training on the fixed fire-extinguishing system. Had the crew been more familiar with the system, and activated it properly, the system would have shut down the engines and ventilation fans before a complete release of both cylinders of suppression fluid into the engine room and may have quickly extinguished the fire.

THE PROBABLE CAUSE of the engine room fire aboard the towing vessel *Capt. Kirby Dupuis* was a lube oil tube on the port main engine that vibrated out of a joint due to a missing retaining ring and mounting bracket, spraying pressurized oil that made contact with a hot exhaust surface and ignited. Contributing to the severity of the fire damage was the crew's unfamiliarity with activation procedures for the fixed fire-extinguishing system, which resulted in an unsuccessful attempt to release the fire suppression fluid and extinguish the fire.

LESSON LEARNED: Crew Training in Use of Fixed Fire-extinguishing Systems

The small confines of the engine room space and the location of fire equipment within that same space demonstrate a risk to crews fighting engine room fires. On towing vessels, the risk to crews fighting engine room fires has led to the development of designs that incorporate both a means for securing ventilation to the engine room and a fire-extinguishing system to extinguish the fire without requiring crews to enter the space. Crewmembers should train for engine room fires and review extinguishing system instructions. Training drills should ensure that crewmembers are familiar with fixed fire-extinguishing systems and procedures, including confirming crew evacuation, isolating the protected space, and activating the system.

VESSEL GROUP
YACHT/BOAT

Engine Room Fire aboard Yacht *La Dolce Vita*

Marquesas Key, FloridaCASUALTY DATE
March 16, 2021ACCIDENT ID
DCA21FM020REPORT NUMBER
MIR-22-16ISSUED
May 13, 2022**Figure 78.** *La Dolce Vita* before the fire.

SOURCE: HARGRAVE CUSTOM YACHTS

**Figure 79.** *La Dolce Vita* on fire shortly after passengers and crew abandoned the vessel (inset), and the yacht afire shortly after sunset on March 16. SOURCE: LINDSEY SCHULT, CAPTAIN OF *LA DOLCE VITA*

On March 16, 2021, about 1807 local time, the yacht *La Dolce Vita* was anchored 1 mile north of Marquesas Keys in the Gulf of Mexico, 17 miles west of Key West, Florida, when a fire was discovered in the engine room. After an unsuccessful attempt to fight the fire, the crew of four and both passengers abandoned the yacht into the vessel's 20-foot tender boat and were then assisted by two Coast Guard boats. The yacht burned to the waterline and sank the next day. No injuries were reported, and a sheen of diesel fuel was observed. The vessel was a total loss, with an estimated value of \$3.9 million.

La Dolce Vita was a 100-foot yacht built in 2008. The vessel was registered in the Cayman Islands as a pleasure yacht and was also offered for charter four to six times a year. *La Dolce Vita* left Key West, Florida, at 1050 on March 16, 2021, with two passengers and four crew, and anchored at 1300 about a mile north of the largest islet in the Marquesas Keys. The yacht had been chartered for 4 days with the owner providing the boat, its equipment, provisioning, and a captain and crew. After anchoring, the crew began to prepare for

the passengers to go snorkeling. The main engines were secured, but the yacht's two generators remained in operation.

Between 1700 and 1730, the mate detected an unfamiliar smell in the main cabin, and he immediately proceeded to the engine room. Around the same time, the captain noticed smoke coming out of the port engine room vents and also ran down to the engine room. Both the captain and mate saw smoke, which they described as smelling like burning plastic and like the insulation from wires burning, coming from the starboard generator. The captain was able to reach inside the engine room and secure both generators via their cutoff switches to either side of the door. He discharged two fire extinguishers into the space, with no effect. The captain then deployed the yacht's fixed fire-extinguishing system into the engine room, notified the Coast Guard of the fire, and evacuated the passengers and crew from the yacht. *La Dolce Vita* burned through the night until the next morning when it settled to the bottom.

The captain's and mate's descriptions of the smoke and flames suggest that the fire may have originated in the electric generator end of the starboard genset enclosure. Per the generator's manual, it was dangerous to operate the generator for extended periods in an area of high humidity. It is possible that the engine room ventilation system, which drew air through vents (fitted with louvered moisture eliminators) in the side of the hull about 4.5 feet above the waterline, could have led to high humidity in the space. The generator manual also recommended inspections and maintenance to keep the unit free of oil, dust, and moisture. However, the vessel owners did not have documentation of any maintenance to the generator since its installation, so it is possible that loose, moist, or dusty connections went undetected.

Although the captain activated the vessel's fixed fire-extinguishing system, the vessel continued to burn. Because the system worked by discharging a gas into the engine room, it required the closure of all doors and hatches before releasing the extinguishing agent. However, the only means to start or stop the engine room's intake and exhaust fans was located within the space, and the fans remained running until the captain secured the electrical generators. Further, the engine room vents did not have dampers to close off natural ventilation to the space. With no effective way to close all the openings (in this case the vents) before the release of the fire suppressant into the engine room, it is likely the air movement generated by the fire's draft introduced a continuous supply of oxygen into the engine room to feed the fire and hindered the fire-suppression gas from effectively stopping the fire. Under the Cayman Islands Shipping Registry, a vessel of *La Dolce Vita's* size certified for commercial use would have been required to meet certain regulatory requirements, including having a way to remotely stop the engine room's intake and exhaust fans and the capability to close off natural ventilation to the space.

THE PROBABLE CAUSE of the engine room fire aboard the yacht *La Dolce Vita* was an undetermined electrical source within the sound enclosure for the starboard generator. Contributing to the severity of the fire and total loss of the vessel was the inability to secure ventilation to the engine room, which reduced the effectiveness of the yacht's fire extinguishing system and allowed the fire to spread beyond the engine room.



Figure 80. After-fire remains of *La Dolce Vita* before salvage operations. SOURCE: COAST GUARD

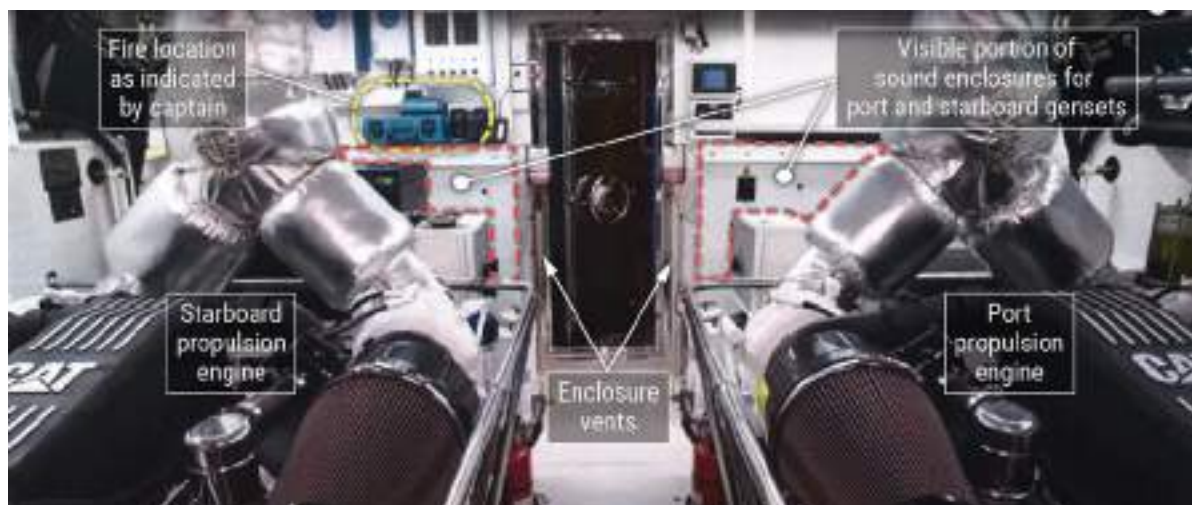


Figure 81. View of *King Baby* (later renamed *La Dolce Vita*) engine room space looking aft toward the engine room door, 2009. BACKGROUND SOURCE: CAYMAN ISLANDS SHIPPING REGISTRY

LESSON LEARNED: Securing Ventilation During Engine Room Fires

Fixed fire-extinguishing systems in machinery and other hazardous spaces require a minimum concentration of extinguishing agent to either halt the chemical reaction producing the fire, displace the oxygen feeding the fire, or effect a combination of both. To ensure the effectiveness of the system and prevent the reintroduction of oxygen to the space, vessel designers and owners should ensure that the ventilation, both natural and forced draft, can be completely and remotely secured to all fire-protected spaces, and that all machinery within these same fire-protected spaces can be remotely stopped from outside the space where the machinery is situated.

VESSEL GROUP

TOWING/BARGE

Engine Room Fire aboard Towing Vessel *Mary Lynn*

Upper Mississippi River, mile 176,
near St. Louis, Missouri

CASUALTY DATE

May 18, 2021

ACCIDENT ID

DCA21FM028

REPORT NUMBER

MIR-22-17

ISSUED

May 17, 2022



Figure 82. Above: *Mary Lynn* underway at 0652 on May 18, 2021, about a minute before the fire broke out. Below: *Mary Lynn* at 0652:40 (left) when the first open flame, circled in yellow, was visible on the second deck port side exhaust stack, and at 0652:45 (right).

SOURCE: AMERICAN RIVER TRANSPORTATION COMPANY



Figure 83. *Mary Lynn*'s port side, postcasualty, with some of the plastic window coverings remaining over the engine room windows. SOURCE: COAST GUARD

On May 18, 2021, about 0653 local time, the towing vessel *Mary Lynn* was pushing two barges, transiting upbound near mile 176 on the Upper Mississippi River near St. Louis, Missouri, when a fire broke out in the engine room. A nearby Good Samaritan towing vessel and a St. Louis Fire Department fire boat helped put out the fire, which was extinguished at 0810. There were no injuries or pollution reported. Damage to the *Mary Lynn* was estimated at over \$700,000.

On the morning of the fire, the *Mary Lynn* was to take on fuel, lube oil, and potable water at a fleeting area. The chief engineer awoke about 0300 to begin preparations, which included removal of water from the fuel storage tanks. He was interrupted by the fuel delivery barge arrived about 2.5 hours earlier than expected, so the chief engineer secured the return and suction valves for the tank he was dewatering and went on to prepare for the transfer. Although he thought the no. 2 port and starboard fuel storage tank return valves were open, he did not physically verify their position, and thus, he inadvertently left all return valves to the fuel storage tanks from the fuel day tank overflow line closed.

After the transfer was completed, the *Mary Lynn* got underway, but the starboard main engine failed to meet the ordered rpm, and the captain brought the

tow back to the fleeting area. The chief engineer found that there was no fuel pressure to the starboard main engine and troubleshot the issue, which included him opening the no. 3 fuel storage tank suction valves and starting one of the fuel transfer pumps, which had been turned off during fueling and had not been restarted. He informed the captain that the problem had been resolved and they could get underway again, so the captain proceeded upriver. Meanwhile, with the fuel transfer pump operating, the fuel day tank level began to rise. About 0652, the chief engineer was working in the engine room and heard a "pow" sound; he saw that a sight glass had blown off the forward end of the main port engine, followed by a fuel spray that ignited. Not able to isolate the fuel supply line valve to the engine, he evacuated the engine room that was rapidly filling with smoke.

Because the fuel day tank did not have its own independent atmospheric vent, tank venting was dependent on the four fuel storage tanks' vents via the overflow line, return header, and opened fuel return valves. Since the chief engineer had not opened any of the four storage tanks' return valves during or after the fueling process, the day tank essentially became unvented while the engines were running and consuming fuel. Once the day tank filled, the

operating positive displacement transfer pump began overpressurizing the entire main engine fuel system.

The pressure increase caused the weakest part in the system, the fuel supply bypass sight glass bowl on the port main engine spinon fuel filter assembly, to fail, causing atomized fuel to spray and ignite. The design of the *Mary Lynn's* fuel system allowed for the potential pressurization of the day tank to exceed atmospheric pressure if a crewmember secured valves on other tanks. Had the *Mary Lynn's* day tank been fitted with its own vent line, even with the fuel return lines inadvertently left closed, the overpressurization of the return line would have not occurred.

To prevent combustible liquids, such as marine diesel fuel, from contacting hot piping and machinery components, regulations require that such components be insulated. Investigators found a section of exhaust header with no thermal protection. The nearby cylinder test valves were also uninsulated. The investigation determined that the fire likely originated where these uninsulated components were located.

The chief engineer was likely affected by acute fatigue. He reported receiving less than 5 hours of sleep in the 24 hours preceding the fire. Additionally, given that he carried out refueling preparations during a time he normally slept, and during a circadian low period, once the fuel barge arrived earlier than expected, this disrupted the sequential nature of the tasks that he was to perform. The effects of fatigue likely impacted the chief engineer's attention, memory, and performance when returning from the interruption.

LESSON LEARNED: Tank Ventilation

Subchapter M regulations for towing vessels require vessels built after 2000 to have vents for each fuel tank. Regulations for vessels ranging from small passenger vessels to cargo ships require that fuel tanks be independently vented from the highest point of the tank to atmosphere on a weather deck. Tank ventilation is important to ensure a valve line up error does not lead to the overpressurization of or vacuum in a fuel tank. Operators should be aware of their fuel tank ventilation system arrangements. On vessels without independent fuel day tank ventilation, it is critical to ensure proper valve position during transfer and operation of the fuel system.

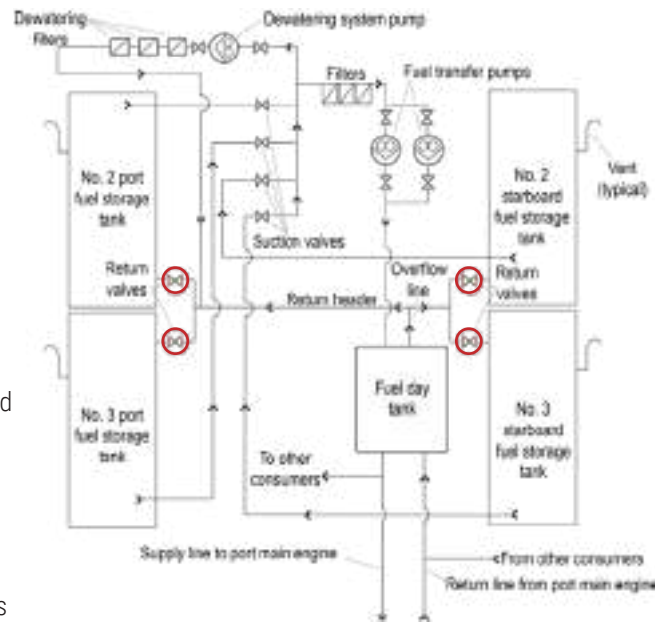


Figure 84. Fuel piping diagram for the *Mary Lynn*. Fuel return valves, circled in red, were inadvertently left closed when a fuel transfer pump was started and the no. 3 starboard suction valve was opened.

THE PROBABLE CAUSE of the engine room fire on board the towing vessel *Mary Lynn* was the overpressurization of the fuel day tank (which did not have an independent vent) and a main engine fuel return system when the fatigued chief engineer inadvertently left the day tank overflow valves to the storage tanks closed, which ultimately led to ignition of spraying diesel fuel from a main engine's fuel system onto an uninsulated engine component.

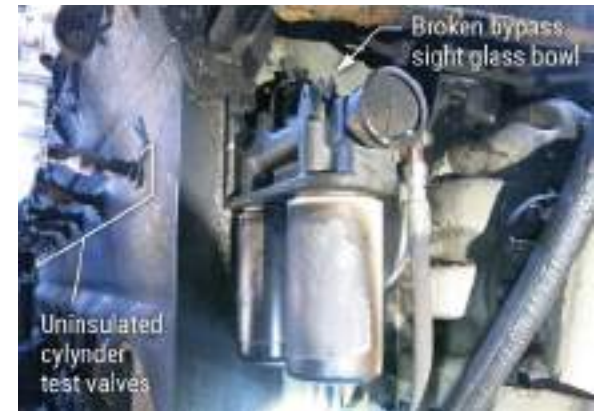
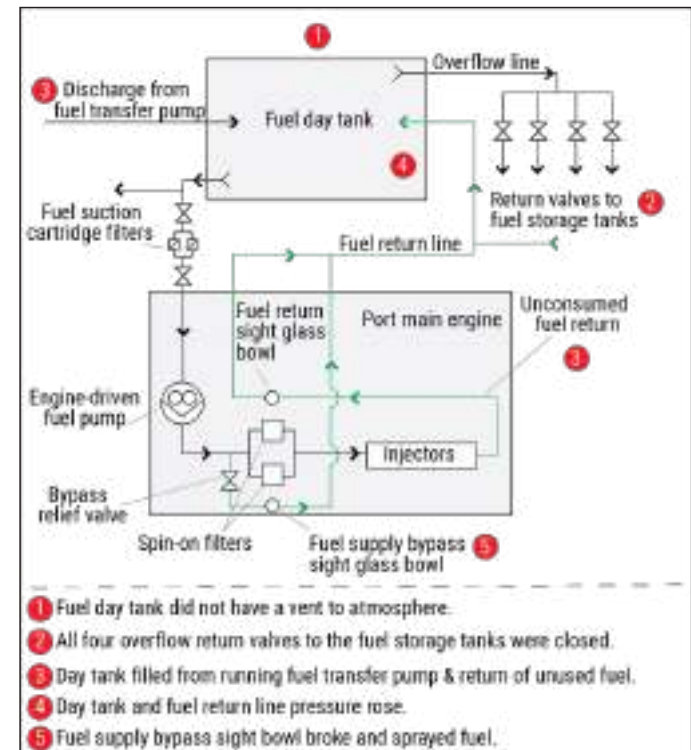


Figure 85. Inboard side of the port main engine showing the uninsulated cylinder test valves and their proximity to the broken sight glass bowl.

Figure 86. Simple main engine fuel supply/return system diagram for the *Mary Lynn* and sequence of events leading to the casualty.



VESSEL GROUP

TOWING/BARGE

Engine Room Fire aboard Towing Vessel *Miss Dorothy*

Lower Mississippi River, mile 249, near Baton Rouge,
Louisiana

CASUALTY DATE

March 17, 2021

ACCIDENT ID

DCA21FM018

REPORT NUMBER

MAB-22-05

ISSUED

February 18, 2022



Figure 87. *Miss Dorothy* operating on the Mississippi River in 2018. SOURCE: WARREN UNDERWOOD, MARINETRAFFIC.COM

Figure 88. Starboard side of the *Miss Dorothy* during firefighting efforts from a Good Samaritan vessel.

SOURCE: WESTERN RIVERS BOAT MANAGEMENT INC.



Figure 89. East Baton Rouge Sheriff's Office and ExxonMobil fire boats alongside the burned-out *Miss Dorothy* after the fire had been extinguished. SOURCE: WESTERN RIVERS BOAT MANAGEMENT INC.

On March 17, 2021, about 0045 local time, the towing vessel *Miss Dorothy* was pushing 14 barges upbound on the Lower Mississippi River, about 20 miles north of Baton Rouge, Louisiana, near mile 249, when a fire broke out in the engine room. The eight crewmembers aboard briefly attempted to fight the fire but were unsuccessful and evacuated to the barges. They were rescued by a Good Samaritan vessel, which then secured the tow against the bank. The fire was extinguished several hours later by first responders and the crew aboard the Good Samaritan vessel. No pollution or injuries were reported. Damage to the vessel was estimated at \$2.4 million.

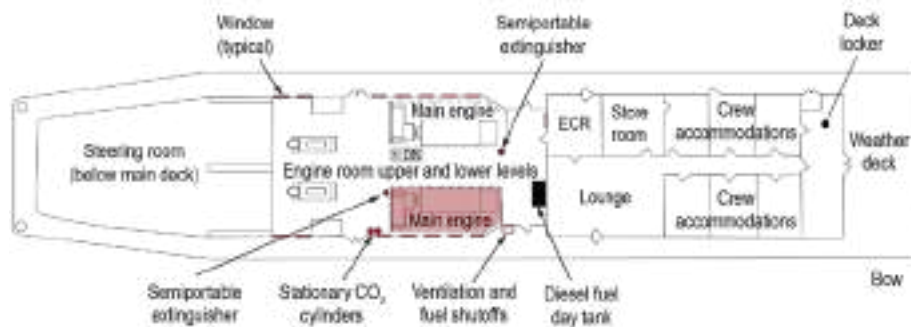
The *Miss Dorothy* was traveling about 5.5 knots and 800 engine rpm when fire alarms sounded throughout the vessel. Within 30 seconds of the alarm sounding, the pilot could see smoke that "grew in intensity very quickly" coming from the engine room, and he immediately activated the general alarm.

The rapid growth and spread of the fire was indicative of a fuel oil fire. The engine was running on ultra-low sulfur diesel, a highly combustible liquid with a standard

flashpoint of 140°F and an average autoignition temperature of 428°F. To prevent combustible liquids, such as diesel fuel, from contacting piping and machinery components that exceed temperatures of 428°F, regulations require that such engine components be insulated. However, the exhaust header leading from the engine's individual cylinder heads to the exhaust manifold—which were subject to temperatures often higher than 600°F—near the suspected origin of the fire were uninsulated. Therefore, it is likely that the uninsulated exhaust header acted as an ignition point for spraying diesel fuel.

To fight the fire, the crew used handheld extinguishers and water hoses, but these did little to suppress the well-established diesel fuel fire. The vessel's two semiportable extinguishers and two stationary CO₂ cylinders fitted with a hose reel were inaccessible due to their location in the engine room. The crew secured the engine room's mechanical ventilation, but this action was ultimately futile due to the uncontrolled amounts of oxygen being drawn in through open engine room doors and open or broken windows.

Figure 90. *Miss Dorothy* main deck layout. The area where the fire was discovered is highlighted in red.



THE PROBABLE CAUSE of the engine room fire aboard the towing vessel *Miss Dorothy* was the ignition of spraying diesel fuel from a main engine's fuel system onto an uninsulated section of the engine's exhaust system. Contributing to the severity of the fire and damage to the vessel was the inability to effectively secure ventilation to the space and fuel to the affected engine.

The chief engineer said the emergency fuel oil shutoff for the port main engine was too hot to pull but he was able to pull the shutoff for the starboard main engine. However, after the fire, investigators discovered that the shutoff valves located on the fuel oil day tank remained open and the wires leading to the remote activation pull station were severed and partly consumed by fire. Because these valves remained open, fuel oil would have remained available to the engines so long as the integrity of the fuel supply system was maintained and the engine-driven fuel pumps remained operational.

In the area of the starboard main engine, investigators found a 0.5-inch fuel return line that had a joint that had de-brazed and separated. Temperatures exceeding 1,200°F would have been required to de-braze it and would have only been present in a well-established fire. Therefore, the return line likely separated because of the fire and the fuel likely came from another undetermined pressurized source (near the forward end of the engine) capable of spraying or atomizing fuel, such as a faulty flange connection, gauge line, pressure gauge, or pump seal. If the engine continued to operate after the fire, the de-brazed joint would have caused fuel to leak from the joint while the engine was running, which likely contributed considerably to the severity of the fire. Additionally, throughout the fire, up until the point when the electrical system ceased to operate, the automatic electric fuel oil transfer pump would have continued to fill the 500-gallon diesel fuel day tank when the low-level switch was activated. This perpetual supply of fuel would have contributed to the size and duration of the fire.

Without an effective means to isolate the diesel fuel feeding the fire, secure the ventilation supplying oxygen to the fire, or fight the fire using onboard equipment, the crew were forced to evacuate the vessel onto the tow's barges as the fire grew.



Figure 91. Starboard main engine before (left) and after (right) the fire, with the uninsulated section of exhaust header indicated. BACKGROUND SOURCE: WESTERN RIVERS BOAT MANAGEMENT INC.

LESSON LEARNED: Towing Vessel Engine Exhaust Component Insulation

Engine rooms contain multiple fuel sources, making the spaces especially vulnerable to rapidly spreading fires. Regulations for towing vessels state that "piping and machinery components that exceed 220°C (428°F), including fittings, flanges, valves, exhaust manifolds, and turbochargers, must be insulated." Uninsulated engine exhaust surfaces can provide an ignition source for flammable liquids that can easily develop into fires that are difficult to contain. Towing vessel owners and operators, Coast Guard marine inspectors, and third-party organization towing vessel examiners should be aware of these dangers and fire risks and should regularly and thoroughly inspect equipment to ensure that measures are in place to prevent flammable liquids from coming into contact with hot surfaces.

VESSEL GROUP

FISHING

Fire aboard Fishing Vessel *Nobska*

Georges Bank, about 80 miles off Cape Cod,
Massachusetts

CASUALTY DATE

April 30, 2021

ACCIDENT ID

DCA21FM027

REPORT NUMBER

MIR-22-13

ISSUED

April 14, 2022

Figure 92. *Nobska* before the casualty.

SOURCE: BHF NOBSKA



Figure 93. Photo taken from the Coast Guard HC-144 aircraft at 1827 shows the bow of the *Nobska* on fire before the rescue. The deployed liferaft appears on the left. SOURCE: COAST GUARD

On April 30, 2021, about 1810 local time, a fire erupted aboard the fishing vessel *Nobska* while the five-member crew was ground fishing in Georges Bank, about 80 miles east of Cape Cod, Massachusetts. The fire started in the engine room and quickly engulfed the vessel. When attempts to extinguish the fire proved unsuccessful, the crew prepared to abandon ship and activated the vessel's EPIRB. A Coast Guard helicopter rescued the crew from the stern of the fishing vessel. Neither injury nor pollution was reported. The *Nobska*, valued at an estimated \$2.4 million, was declared a total constructive loss.

On April 30, about 1100, the *Nobska* was trawling Georges Bank at 5 knots with the main engines ahead when the crew saw a fire on the lagging of the main

engine exhaust pipe. They used two of the eight portable B2 dry chemical extinguishers on board to extinguish the fire.

The crew discovered that the fire was the result of the failure of a deck winch's hydraulic hose located near the bottom of the pipe/hose tunnel that ran vertically from the overhead in the engine room up to the wheelhouse. The leak of hydraulic fluid from the 0.25 inch-diameter hose had sprayed onto the exhaust pipe lagging of the main diesel engine, 2 feet away, until it was soaked with enough fluid to cause it to ignite from the heat developed by the engine's exhaust gases.

Following the fire, they removed the oil-soaked lagging from the exhaust pipe, cleaned the oil from area around the engine, and replaced the failed hydraulic hose with a hose from the outrigger hydraulic system.



Figure 94. Left to right: Post-fire damage of (1) the engine room, where the crew removed the lagging from the exhaust pipe, as indicated by the dashed line; and (2) the wheelhouse, where the captain observed black smoke emanating from under the deck winch-control console. Damaged pipe/hose tunnel, as identified by dashed rectangles, looking up from the engine room (3), and down onto the deck winch-control console location (4).

After an operational test of the deck winches about 1300, the crew hauled in the net, which was still being towed. The captain initially planned to return to the vessel's home port but changed his mind and decided to continue fishing. The net was then redeployed.

About 1700, as the captain saw black smoke emanating from under the wheelhouse console. He stepped out of the wheelhouse to alert the crew of the fire. Within moments, the entire wheelhouse area was engulfed in flames, which quickly spread to the forward section of the vessel. The crew attempted to extinguish the second fire using handheld B2 extinguishers and a grenade-type fire extinguisher but were unsuccessful. Realizing the fire was out of control, the captain and crew prepared to abandon the vessel. Due to the fire in the wheelhouse, the captain was unable to broadcast a mayday call on VHF radio. The crew activated the EPIRB at 1709, donned their immersion suits, deployed the liferaft from the stern, and tied the liferaft's painter to the vessel.

The Coast Guard District One Command Center in Boston received the EPIRB notification and launched a Coast Guard HC-144 aircraft and an MH-60T helicopter, which arrived on scene at 1825 and 1828, respectively, and hoisted the *Nobska's* five crewmembers to safety.

The fire pattern and vessel damage indicated that the second fire had also started within the engine room. The lagging remained removed from the main engine exhaust because of the earlier fire, and therefore no

insulation provided protection in the event hydraulic fluid or diesel fuel contacted the hot exhaust pipe's surface. The second fire likely was the result of another hydraulic hose leak caused by the heat from the first fire damaging other hoses inside the tunnel, or the removal and replacement of the first failed hose could have inadvertently caused damage to the hose being installed or to the other hydraulic hoses bundled together within the tunnel. The damage to the hoses from either the first fire or the replacement of the hydraulic hose may not have been apparent to the crew, but increased the likelihood of their failure, which could have caused hydraulic fluid to spray within the engine room.

As an uninspected commercial fishing vessel, the construction of the pipe/hose tunnel on the *Nobska* was not subject to any structural fire-protection regulations, as required for the construction of Coast Guard-inspected vessels. Had the tunnel opening on the *Nobska* been sealed and its surrounding structure insulated with fire-retardant materials, the fire would not have been able to rapidly spread, and damage may have been contained to the engine room.

THE PROBABLE CAUSE of the fire aboard the fishing vessel *Nobska* was a failure of a hydraulic hose within the engine room that allowed hydraulic fluid to spray onto a hot surface, likely the exposed main engine exhaust pipe. Contributing to the failure of the hydraulic hose was possible heat damage from a fire that occurred earlier in the day.

LESSON LEARNED: Structural Fire Protection

The pipe/hose tunnel on board the *Nobska*, which extended from the engine room up two decks to the wheelhouse, did not have any insulation, pipe/cable fire stops, or other barriers to prevent the passage of smoke, heat, and fire—known as structural fire protection. This type of unprotected vertical tunnel has the potential to provide a pathway for a fire to spread quickly outside of the space of origination. Vessel owners and operators should identify such openings between decks and ensure they are structurally fire protected to prevent the spread of a fire.

VESSEL GROUP

CARGO, GENERAL

Engine Room Fire aboard Containership *President Eisenhower*

Santa Barbara Channel, near Santa Barbara, California

CASUALTY DATE

April 28, 2021

ACCIDENT ID

DCA21FM026

REPORT NUMBER

MIR-22-15

ISSUED

May 10, 2022



Figure 95. *President Eisenhower* operating near San Francisco, California, in 2019.

SOURCE: SAN FRANCISCO BAR PILOTS, MARINETRAFFIC.COM



Figure 96. Top to bottom: CCTV screen captures of the main engine showing fuel spray in the area around the no. 5 cylinder the moment the fire started, and the progression (*time stamps are 4 hours ahead*). SOURCE: APL MARITIME

On April 28, 2021, about 0154 local time, the containership *President Eisenhower* was transiting westbound through the Santa Barbara Channel, about 17 miles southwest of Santa Barbara, California, when the vessel experienced an engine room fire. The crew fought the fire using fire hoses and a fixed water mist system, before using the engine room's fixed carbon dioxide fire-extinguishing system, which extinguished the fire. As a result of the fire, the vessel lost propulsion and drifted for several hours before being towed to the Port of Los Angeles. No pollution or injuries among the 22 crewmembers were reported. Damage to the vessel was estimated at \$8.22 million.

On April 27 at 1900, the partially loaded *President Eisenhower* departed the Port of Los Angeles en route to Oakland, California. At midnight, the containership was about 6 miles south of Port Hueneme, California, underway in the northwest-bound traffic lane of the Santa Barbara Channel at a speed of 17.5 knots with the main engine operating at 68 rpm.

CCTV footage showed that about 0124, on April 28, ultra-low sulfur diesel fuel began spraying in the area around the main engine's no. 5 cylinder. The engine room was unattended at the time, and the leaking fuel went unnoticed. The *President Eisenhower* did not have CCTV video analytic technology integrated into the existing system to identify fuel mist in real time and alert the crew.

A postcasualty examination of the vessel showed that a compression fitting on the end of a newly installed section of fuel return tubing had disconnected, causing the fuel oil to spray. The postcasualty examination revealed that the compression fitting's sealing ferrule was not sufficiently swaged to the steel tubing, likely due to incorrect tightening of the compression fitting, or the ferrule was mounted incorrectly—in essence, the pipe was not fully inserted through the ferrule at tightening.

Investigators found that an exhaust valve compensator flange on the no. 5 cylinder—which was subject to internal engine exhaust temperatures greater than 428°F (often as high as 600°F)—near the disconnected fuel return tubing end was exposed and not insulated (as was required by SOLAS regulations). Therefore, it is likely that the unshielded and uninsulated exhaust valve compensator flange acted as an ignition source for the spraying diesel fuel.

About 0154, an AB on watch noticed smoke coming from an open engine room hatch, and the vessel's fire-detection and alarm system activated. Within 10 minutes, the crewmembers were fully mustered, and the fire teams had run out fire hoses and started boundary cooling. The crew had the foresight to quickly close the upper deck engine room hatch, and they coordinated and activated fuel oil shutoffs and ventilation shutdowns to subdue the fire by limiting oxygen and fuel to the space. The captain clearly

communicated with the Coast Guard and vessel management ashore so a coordinated emergency response could be quickly arranged. The fire teams made two controlled entries into the engine room and identified the fire as being too large to be fought using fire hoses. Further, they released the fixed CO₂ system in a controlled manner, continuously monitoring the space, ensuring that all ventilation sources to the engine room remained secured, conducting boundary cooling, and allowing the CO₂ to function as designed. The crew's response to the fire was timely and effective, and their activation of the ship's fixed CO₂ system to extinguish the fire was such that a specialized marine firefighter concluded it "was just textbook perfect."

Under guidance and with assistance from the marine firefighting team, the crew slowly began naturally ventilating the space by opening vents and hatches to clear the volatile organic compounds. By the morning of April 29, the engine room was deemed safe for entry.

THE PROBABLE CAUSE of the engine room fire aboard the containership *President Eisenhower* was a crewmember insufficiently swaging a compression fitting ferrule during the installation of fuel oil return tubing for a main engine's cylinder, allowing an end of the tubing to disconnect and spray fuel oil onto a nearby unshielded and uninsulated cylinder exhaust component.

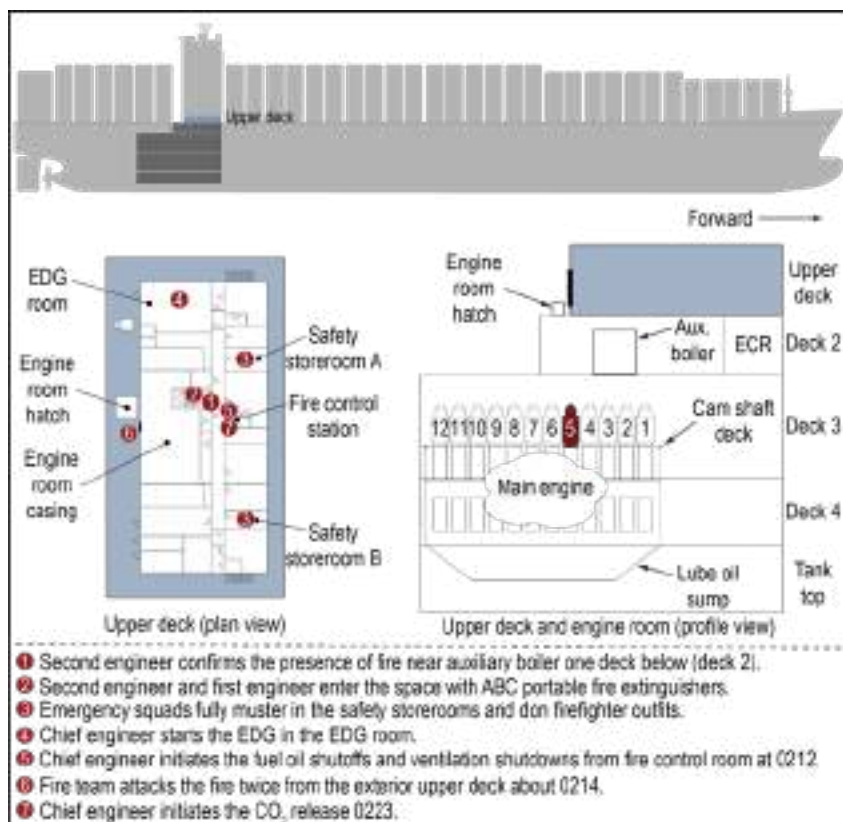


Figure 97. Profile view of the *President Eisenhower* (top). Plan view of the upper deck showing the sequence of events during the fire (left). Profile of the upper deck and engine room decks with the origin of fire highlighted (right).

LESSONS LEARNED

Rapid Oil Leak Detection

Rapid oil leak-detection systems are a valuable tool that can be used to prevent fire in machinery spaces. Video analytic technology is designed to use standard CCTV video to detect fuel mist and spray in real time and alert the crew before any ignition and fire. This technology is supported by class societies as an acceptable method for identifying leaks and can be integrated with existing CCTV systems. Had this technology been in use aboard the *President Eisenhower*, the spraying fuel oil may have been detected well before the fire developed.

Containing Engine Room Fires

The crew of the *President Eisenhower* effectively contained the spread of a main engine room fire by removing fuel and oxygen sources, cooling boundaries, and communicating effectively. These efforts show the importance of realistic scenario-based training, including engine room emergencies, which involve shutting down machinery, fuel oil, lube oil, and ventilation systems, as well as boundary monitoring, to quickly contain and suppress engine room fires, which can spread to other spaces and/or cause a loss of propulsion and electrical power.



Figure 98. Cylinder no. 5 and the disconnected, newly installed fuel oil return tubing (inset).

VESSEL GROUP

CARGO, DRY BULK

Engine Room Fire aboard Bulk Carrier *Roger Blough*

Sturgeon Bay; Sturgeon Bay, Wisconsin

CASUALTY DATE

February 1, 2021

ACCIDENT ID

DCA21FM015

REPORT NUMBER

MIR-22-19

ISSUED

August 17, 2022

Figure 99. Stern of the *Roger Blough* during firefighting efforts. SOURCE: COAST GUARD



On February 1, 2021, about 0131 local time, a fire started in the engine room on the *Roger Blough* during the dry bulk carrier's winter layup at the Fincantieri Bay Shipbuilding facility on Sturgeon Bay, Wisconsin. The cargo-unloading conveyor belts subsequently ignited, causing extensive damage throughout the aft section of the vessel. The shipkeeper on board departed the vessel without injury. Firefighters extinguished the fire later that afternoon. No pollution was reported. Damage to the *Roger Blough* exceeded \$100 million.

With no crew aboard during layup, a laker typically has a shipkeeper assigned for the winter to manage shipyard work, monitor the vessel, and notify the vessel operator of conditions that could potentially damage the vessel. Two shipkeepers lived aboard the *Roger Blough*, typically working an 8-hour day and allowed to depart as needed. The *Roger Blough* had a fixed carbon dioxide fire-extinguishing system to suppress fires in the engine room; the system was disconnected during winter layup due to the risk of an accidental discharge with workers in the space. One semiportable and six portable fire extinguishers were in the engine room.

As a safety measure during layup, the vessel operator had installed temporarily in the engine room a wireless monitoring and notification system comprised of two smoke detectors, air blower pressure indicators for the sea chest, and bilge-level indicators. Engine room equipment, such as the vessel's diesel oil-fired hot air furnace, was not connected to the temporary monitoring system. An alarm panel for the temporary system was mounted in a passageway on the ship's spar deck, port side, in the accommodation spaces near the crew's staterooms (it did not ring throughout the vessel). Upon detection, the system would activate an audible/visual alarm locally at the panel and notify three designated cell phone contacts via a text message. Another temporary system of smoke detectors was in the crew's accommodation spaces, including individual staterooms, and sounded locally; it was not connected to the monitoring system.

On January 31, shipkeeper no. 1 departed the vessel at 0900 to attend a weeklong training session. Shipkeeper no. 2, who was living in the bosun's room on the starboard side of the spar deck in the aft house, departed the vessel at 1900; after returning, he went to bed around 2200.

On February 1, at 0131, the monitoring and notification system recorded an alarm indicating there was smoke in the engine room. In the next minute, the system notified the designated contacts: the shipyard's gate guard, shipkeeper no. 1 (who was not on the vessel), and the cell phone for the *Roger Blough* (located in the chief engineer's office). The gate guard noted the alarm and proceeded to the vessel to investigate.

About 0138, shipkeeper no. 2 woke to the sound of the smoke detector alarm inside his stateroom and discovered his stateroom was filled with thick, black smoke. He then proceeded to the exterior, where he saw the responding shipyard's gate guard. Due to the heavy smoke, the shipkeeper, who had no firefighting-protection equipment, did not attempt to reenter the *Roger Blough* but instead disembarked the vessel via the gangway. The gate guard, having observed the smoke on board emanating from the aft house of the vessel, contacted the Sturgeon Bay Fire Department.

The first units from the fire department arrived at 0143 to fight the fire, which was starting to expand into the galley on the poop deck. Upon assessing the fire, firefighters determined it had traveled through the port and starboard conveyor belt trunks that passed through the engine room and up to the poop deck, to the aft cargo-unloading booms on the spar deck below, and throughout the engine room on the lower deck. The fire was extinguished later that day at 1300. It did not spread to any of the neighboring vessels.

THE PROBABLE CAUSE of the engine room fire aboard the bulk carrier *Roger Blough* was likely the repeated removal and reinstallation of the furnace's burner that led to the failure of its mounting coupling, resulting in the operating burner dropping to the bottom of its enclosure and fracturing its fuel supply line, which allowed diesel fuel to ignite. Contributing to the casualty was the absence of a fire-activated automatic fuel oil shutoff valve on the fuel oil inlet piping before the burner, which would have stopped the fuel feeding the fire shortly after it started and limited the spread of the fire.

Figure 100. Simple profile of the *Roger Blough* showing the conveyor belt system.



Figure 101. *Roger Blough* underway before the fire. SOURCE: COAST GUARD



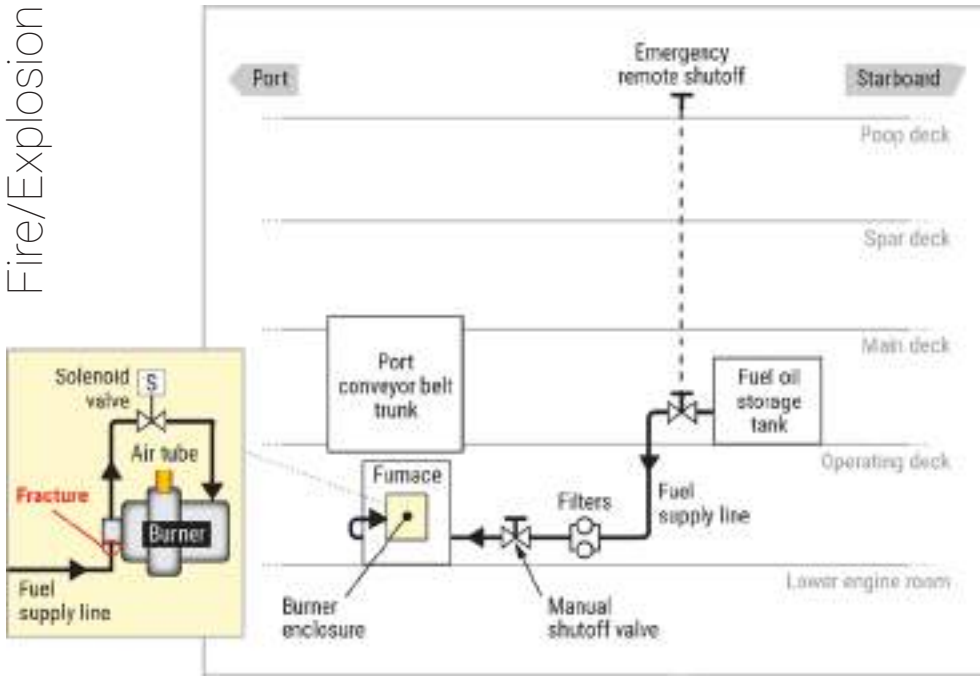


Figure 102. Simple section view of the *Roger Blough's* engine room with arrangement of the furnace's fuel supply (not to scale).

Figure 103. Diagram showing the 65-pound burner assembly within the enclosure as mounted on the furnace on board the *Roger Blough*.

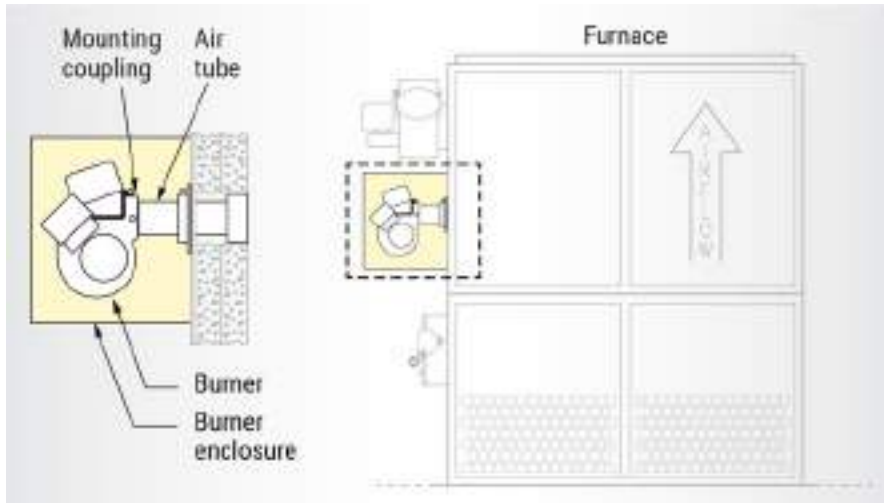


Figure 104. Left to right: Fire-damaged furnace and conveyor belt within the conveyor belt trunk above the furnace. SOURCE: COAST GUARD

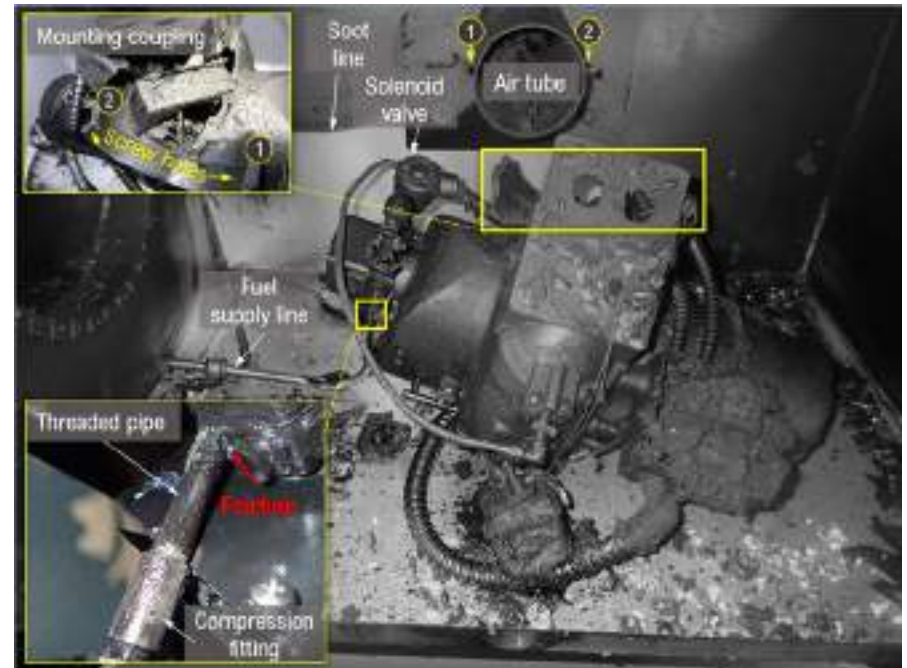


Figure 105. The fire-damaged burner detached from the air tube, lying on the bottom of the enclosure. Photo shows the fractured mounting coupling (top inset, interior view) and the fracture point where the fuel supply pipe threaded into the burner assembly (bottom inset). SOURCE: COAST GUARD

SAFETY ISSUES

◆ **Lack of a fire-activated valve on the fuel oil piping to the burner on the furnace in the engine room.** The fire originated at the burner inside the diesel oil-fired furnace, which had been installed in the engine room to heat the space during the winter (to prevent piping and equipment from freezing). The 65-pound burner assembly, typically used in furnaces for heating shoreside buildings, was mounted onto the furnace's air tube with an aluminum coupling. Among the fire damage and debris, investigators found the burner assembly detached from the air tube and resting on the bottom of the burner enclosure. The fuel supply line to the burner was also found fractured. It is likely that, when the mounting coupling fractured, the furnace's burner assembly became detached from the air tube and fell, which likely bent and fractured the fuel supply line to the burner, thereby allowing fuel to spray onto the operating burner and ignite within the enclosure. The National Fire Protection Association recommends that burner assemblies like the type installed on the *Roger Blough* have a fire-activated quick-closing valve on the inlet fuel oil piping next to the burner. When installed, this type of valve has a thermally activated mechanism that shuts the valve in the presence of fire to stop further flow of fuel to the burner. Had the burner assembly on the *Roger Blough* been fitted with a fire-activated quick-closing valve on its inlet fuel oil piping, the fuel feeding the furnace fire would have been stopped and thus the fire likely would not have spread so rapidly.



Figure 106. Burner assembly with pedestal support.

SOURCE: CARLIN
COMBUSTION
TECHNOLOGY

◆ **The lack of regulations governing furnace installation and operation on board certain vessels.**

There are no regulations regarding winter layup procedures for commercial vessels operating in the Great Lakes. According to a survey administered by US Coast Guard Sector Lake Michigan following the casualty, about 12 of the 37 commercial vessels operating on the Great Lakes use diesel oil-fired furnaces during the layup period. The lack of regulations or classification standards related to diesel oil-fired air heating furnace construction, installation, safety shutdowns, and system alarms poses a risk to life and property if the equipment is not installed and maintained to standards similar to those in place for other oil-fired equipment.

◆ **Inadequate notification to onboard personnel of a fire.** When the fire erupted at nighttime, the wireless monitoring and notification system temporarily installed for the engine room during the layup period activated the alarm panel in the crew's accommodation spaces and then notified the designated contacts cell phones. Shipkeeper no. 2, the only person on board (and who was not listed as a designated contact—shipkeeper no. 1 was), was awakened 7 minutes later by the alarm from the smoke detector inside his stateroom as it filled with smoke. He departed the vessel without injury as the fire was spreading throughout its engine room and aft house. If the shipkeeper on board had been listed among the designated contacts to receive alerts, he likely would have been awakened earlier and thus may have had an opportunity to shut off the fuel and extinguish the fire before it spread through the vessel.

SAFETY RECOMMENDATIONS

As a result of its investigation into this casualty, the NTSB issued one new safety recommendation each to the Coast Guard, the American Bureau of Shipping, and Key Lakes Inc.

We found that the lack of Coast Guard regulations or classification standards related to diesel oil-fired air heating furnace construction, installation, safety shutdowns, and system alarms poses a risk to life and property if the equipment is not installed and maintained to standards similar to those in place for other oil-fired equipment. As a result, we **recommended** that the Coast Guard develop regulations and guidance for diesel oil-fired air-heating furnaces on board Coast Guard-inspected commercial vessels that address plan review, installation, operational inspection, system shutdowns, and alarm notifications. We also **recommended** that ABS develop classification standards for diesel oil-fired air-heating furnaces on board ABS-classed commercial vessels that address plan review, installation, operational inspection, system shutdowns, and alarm notifications.

We also found that although he escaped the vessel without injury, if the shipkeeper on board had been listed among the designated contacts to receive alerts from the temporary monitoring and notification system installed on the vessel for winter layup, he likely would have been awakened earlier and thus may have had an opportunity to shut off the fuel and extinguish the fire before it spread through the vessel. As a result, we **recommended** that the owner of the *Roger Blough*, Key Lakes Inc., ensure that the designated contacts list includes each shipkeeper living and working on a vessel during layup.

VESSEL GROUP

TOWING/BARGE

Flooding and Sinking of Towing Vessel *Proassist III*

Caribbean Sea, near Puerto Yabucoa, Puerto Rico

CASUALTY DATE

December 24, 2020

ACCIDENT ID

DCA21FM011

REPORT NUMBER

MIR-22-12

ISSUED

April 6, 2022

Figure 107. *Proassist III* before the sinking.

SOURCE: PROASSIST III INCORPORATED

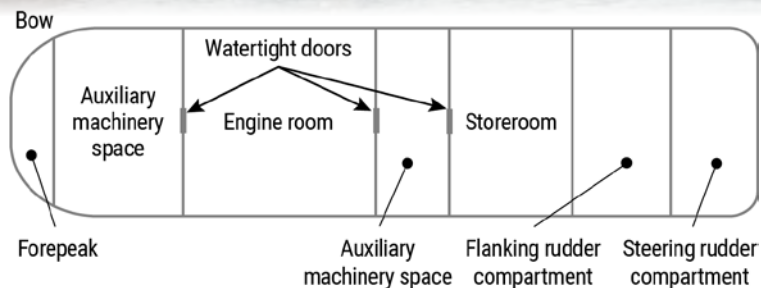


Figure 108. Compartments of the *Proassist III*, with approximate door locations (*not to scale*). SOURCE: DRAWINGS AND STATEMENTS BY *PROASSIST III* DECKHANDS

On December 24, 2020, about 1742 local time, the towing vessel *Proassist III* was transiting the Caribbean Sea, 3 miles off the coast, near Puerto Yabucoa, Puerto Rico, when its stern compartments began flooding. The three crewmembers aboard attempted to pump out the water but were unsuccessful and subsequently abandoned the vessel. They were rescued by a responding Good Samaritan vessel, and the *Proassist III* later sank about 0.25 miles from shore. No injuries were reported. An oil sheen was visible after the vessel sank. The vessel was later recovered but was considered a constructive total loss valued at \$968,000.

On December 24, about 1420, the *Proassist III* departed Laguna de las Mareas, Guayama, en route to Puerto Yabucoa. About 30 minutes after departing, the weather conditions worsened because of squalls that produced strong and gusty winds and seas of 5–6 feet. The captain stated that the *Proassist III* pitched and rolled in following waves.

About 2.5 hours after departing, the crew noticed the vessel was down by the stern. They removed the flush access hatch to the flanking rudder compartment and found about 3 feet of water. A postcasualty examination of the vessel showed that portions of the transverse bulkhead between the flanking and steering rudder compartments were missing, and, therefore, the water that was found in the flanking rudder compartment would have also been in the steering rudder compartment at an equal level. Based on the approximate size of the two compartments, the volume of water accumulated in the spaces would have totaled roughly 36,500 gallons. Calculated from when the weather worsened, the average flooding rate would have been 304 gallons per minute.

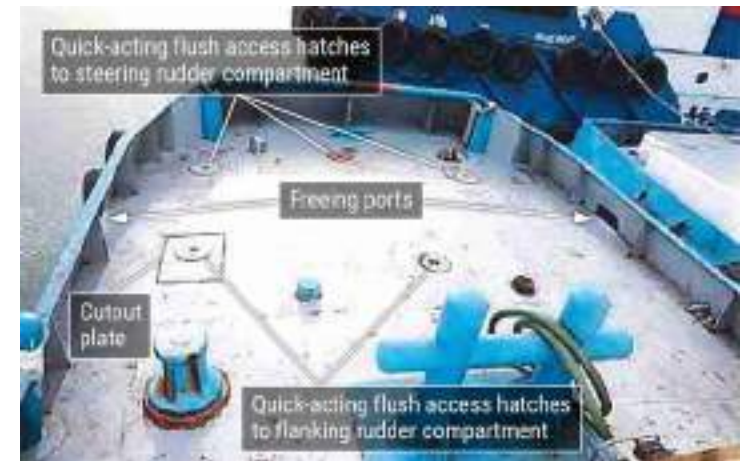


Figure 109. Main deck at the stern of the *Proassist III*.

BACKGROUND SOURCE: COAST GUARD

Investigators found no structural hull defects that could have allowed for significant flooding; thus, the only other explanation would have been if a cover for one of the five aft main deck flush hatches were not in place. The crew told investigators that all deck hatches were closed when the vessel departed, but given the rate of flooding observed, at least one was likely not closed. With a reported 4–6 inches of water on deck, an open hatch would have allowed a significant amount of water to flood into the compartments below.

An emergency portable pump, rated at 250 gallons per minute, was deployed into the flanking rudder compartment through the hatch near the centerline of the vessel to dewater the compartment. The pump stopped working shortly after starting, when a wave struck it. About 30–40 minutes later, the flanking rudder and steering rudder compartments were completely filled. Even before the compartments filled, progressive flooding would have occurred through openings (found during the postcasualty examination) in the vessel's watertight bulkheads separating the engine room, auxiliary machinery space, storeroom, and flanking rudder compartments, including cutouts for a pipe to run through those spaces. As the vessel progressively flooded, its freeboard would have decreased, resulting in more water on deck and higher flood rates through

unsecured or open aft deck hatches. Eventually, water would have reached the deckhouse, where it would have also begun downflooding through the weathertight doors on the port and starboard sides, which were found open during a postcasualty underwater survey (even if the doors had been closed, they would not have been sealed tightly, since they were missing gaskets or in disrepair).

The captain radioed the Coast Guard, then used a cell phone to call the owner of the *Proassist III*. A 15-foot-long Good Samaritan fishing vessel rescued the crew. The *Proassist III* sank by the stern and came to rest upright in 30 feet of water about 450 yards (0.25 miles) off the coast near Puerto Yabucoa.

The postcasualty examination also showed lack of gaskets and securing mechanisms for the deck hatches. The watertight and structural integrity deficiencies identified showed that the vessel was not adequately maintained. Additionally, after the casualty, hull and deck integrity issues were identified on three of the *Proassist III* owner's other vessels,

indicating that the company did not have an effective maintenance program. An effective maintenance and hull inspection program would have proactively sought to minimize the wastage of steel on the *Proassist III* (and other company vessels) and made any corrosion issues easier to identify and flag for repair. Given the demonstrated lack of overall hull and watertight integrity, the owner did not maintain his vessels that had not yet been issued a Coast Guard certificate of inspection in a suitable condition for offshore service.

THE PROBABLE CAUSE of the sinking of the towing vessel *Proassist III* was unsecured or open aft deck hatches, which resulted in the flooding of the vessel's aft compartments from water on deck and progressive flooding to other compartments through openings in watertight bulkheads. Contributing to the flooding of the vessel was the owner's lack of an effective hull inspection and maintenance program.

LESSON LEARNED: Effective Hull Inspection and Maintenance

Over the past 5 years, the NTSB has investigated five casualties involving towing vessels whose weather decks and openings were in poor condition—leading to flooding and subsequent sinking. To protect vessels and the environment, it is good marine practice for owners to conduct regular oversight and maintenance of hulls, including between drydock periods, regardless of inspection requirements. An effective maintenance and hull inspection program should proactively address potential steel wastage, identify hull and watertight integrity deficiencies, and ensure corrosion issues are repaired in a timely manner by permanent means.

Figure 110. Portside forward quick-closing weathertight door on the main deck.

BACKGROUND SOURCE: JORGE OLLER REYES

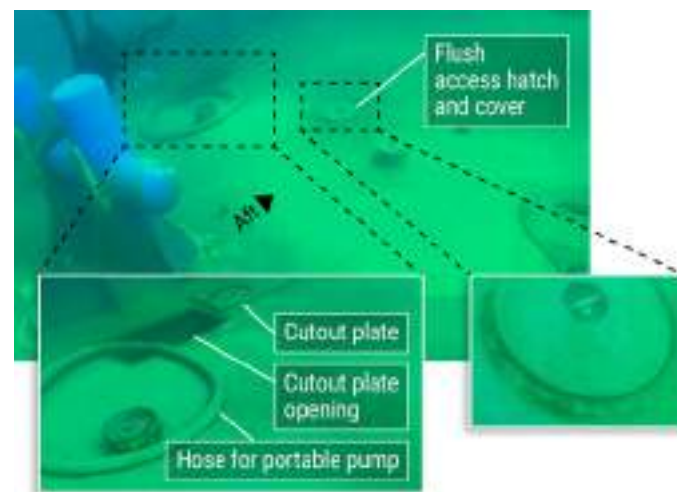
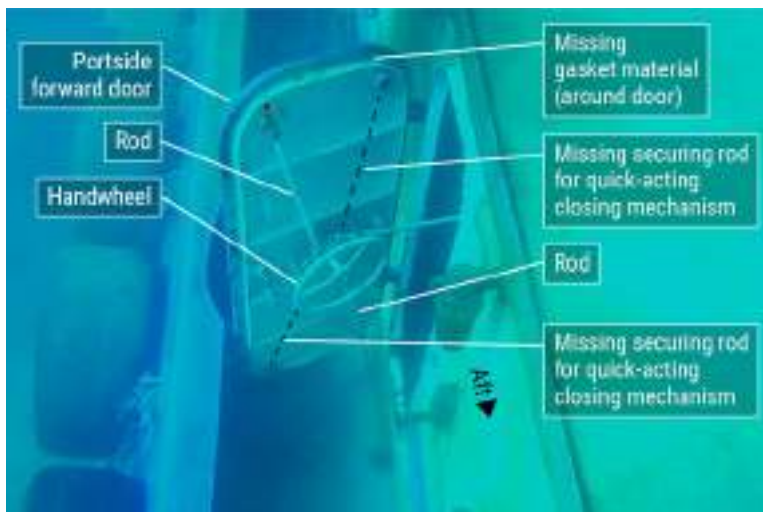
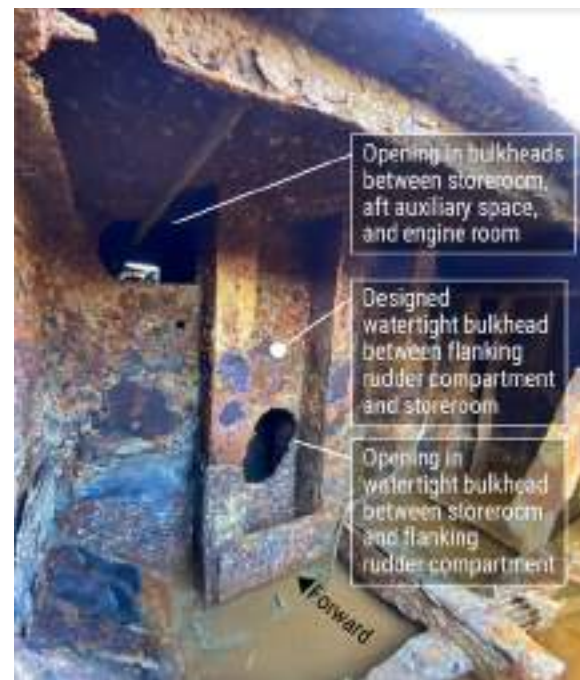


Figure 111. Starboard-side cutout plate with missing quick-acting flush access hatch cover (left close-up) and unseated center quick-acting flush access hatch cover to flanking rudder compartment (right close-up).

BACKGROUND SOURCE: JORGE OLLER REYES

Figure 112. Flanking rudder compartment after recovery. Openings in bulkhead shown are also typical of other bulkheads below the main deck separating compartments. BACKGROUND SOURCE: COAST GUARD



VESSEL GROUP

CARGO, LIQUID BULK

Grounding of Tanker *Bow Tribute* and Subsequent Contact with River Intake Fender Systems

Lower Mississippi River, near mile 104,
New Orleans, Louisiana

CASUALTY DATE
March 16, 2021

ACCIDENT ID
DCA21FM019

REPORT NUMBER
MIR-22-11

ISSUED
March 31, 2022



Figure 113. *Bow Tribute* moored alongside a dock after the casualty.

Figure 114. *Below, left to right:* Postcasualty damage to the *Bow Tribute's* portside aft hull and propeller.

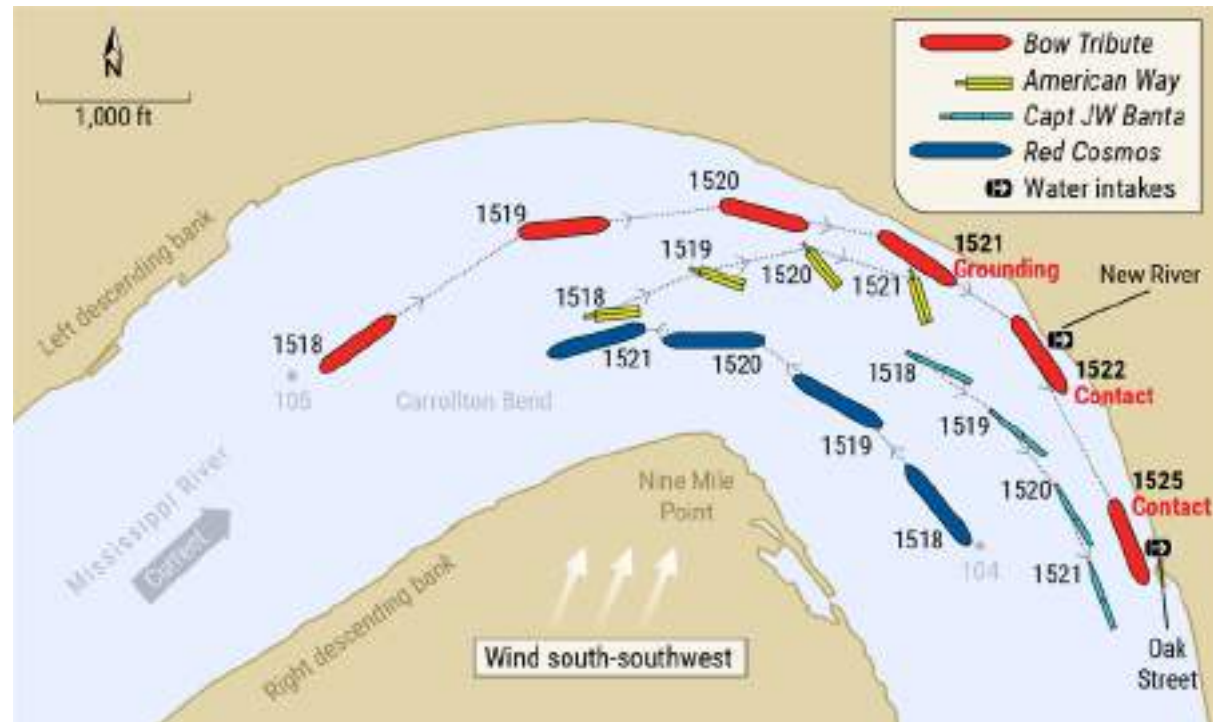


Figure 115. Positions of the *Bow Tribute*, *American Way*, *Capt JW Banta*, and *Red Cosmos* (approximate scale) in the Carrollton Bend in the minutes leading up to the casualty, based on automatic identification system data. The *Bow Tribute's* subsequent contact at the two river intakes is also identified.

On March 16, 2021, about 1522 local time, the tanker *Bow Tribute* was transiting downbound on the Lower Mississippi River in New Orleans, Louisiana. While attempting to overtake a two-barge tow in a river bend, the vessel grounded on the left descending bank near mile 104 and subsequently struck the fender systems protecting two river intakes owned by the city's sewerage and water board. No pollution or injuries were reported. Estimated damage to the vessel (\$986,400) and the fender systems (\$926,100) totaled \$1,912,500.

About 0906 on the morning of the grounding, after discharging cargo at a facility in Baton Rouge at mile 203.8, the *Bow Tribute* got underway downbound during high-river conditions with a following current. Sometime after 1235 and below mile 150, the master

went below to rest in his cabin, leaving the second officer and the helmsman on watch together with the pilot and a pilot observer.

Ahead of the *Bow Tribute* was the towing vessel *American Way*, pushing two empty hopper barges breasted side by side, also traveling downbound in the following current. At 1502, while the tanker was at mile 109 and the *American Way* was about 1.7 miles ahead, the *Bow Tribute's* pilot hailed the pilot on the *American Way* by radio to communicate that the tanker was astern of the tow and would likely overtake them at Nine Mile Point (Carrollton Bend). Considering the speed of the tanker and the large course alterations both downbound vessels had to make to round Nine Mile Point with a following current amid other traffic, the bend presented an increased risk.



Figure 116. CCTV footage looking upriver at 1521 shows the *Bow Tribute* near the left descending bank with the *American Way* by the tanker's starboard bow. (Timestamp is 1 hour 11 minutes behind the actual time.) SOURCE: CROSBY DREDGING

The *Bow Tribute's* pilot did not clearly communicate where the *American Way* was to be overtaken. He expected each vessel would keep to its section of the 1,800-foot-wide river bend—the 368-foot-long *American Way* tow in the center and the 599-foot-long *Bow Tribute* on the left descending bank. However, this expectation left a narrow margin of safety for him to respond to any unexpected problems or upbound traffic. The pilot of the *American Way* agreed to the *Bow Tribute* overtaking the tow, but he assumed he was to be overtaken after the bend. He did not request clarification as to where the pilot on the *Bow Tribute* intended to overtake him.

While rounding Nine Mile Point, *American Way* tow began to slide into the path of the overtaking *Bow Tribute*, which was close behind. The tow's slide was likely caused by the combined effect of the estimated 3.5-knot following

current and the wind pressure on the starboard side of the tow's empty barge from gusts up to 24 knots. The *American Way's* pilot, who was alone in the wheelhouse as the tow began to slide, did not communicate to either to the *Bow Tribute* or surrounding vessels over the radio. He could not maintain the tow's position in the center of the river, nor power or steer it out of the slide in sufficient time to allow adequate space for the fast-approaching tanker, which was traveling about double the speed of the *American Way*.

The pilot on the *Bow Tribute* issued a series of helm orders, followed by multiple soundings of the ship's whistle. He announced over the radio that the tanker was "colliding at Nine Mile" and requested harbor tug assistance. Continuing to give multiple rudder orders, he ordered the engine to full astern to maneuver the *Bow Tribute* clear of the *American Way*.

Figure 117. CCTV footage looking downriver at 1522:26 shows the *Bow Tribute* when it struck the spud barge protecting the New River water intake pipes.

SOURCE: CROSBY DREDGING



Figure 118. Left to right: Damage to the river intake fender systems: arrow shows damage to the spud barge at New River; damaged catwalk and dolphin piles at Oak Street.

SOURCE: COAST GUARD (RIGHT PHOTO)



At 1521:45, the stern of the *Bow Tribute* momentarily grounded on the left descending bank before it continued along the bank. Seconds later, at 1522:26, the port side of the *Bow Tribute* struck a spud barge, which was part of a fender system to protect the river intake pipes, moored at mile 104.1. After being struck, the barge broke free from its spuds and moorings and drifted downriver. At 1522:38, the pilot ordered the starboard anchor let go. At 1525, as the *Bow Tribute* slowed in the bend with its starboard anchor paying out, the tanker struck another protective spud barge for another set of river intake pipes, located at mile 103.8.

THE PROBABLE CAUSE of the grounding of the tanker *Bow Tribute* and its subsequent contact with the river intake fender systems was the pilot's decision to overtake a tow in a large river bend occupied by multiple vessels during high-river conditions with a strong following current. Contributing to the grounding was the ineffective communication between the pilot of the *Bow Tribute* and the pilot of the towing vessel *American Way* regarding where the overtaking maneuver would occur.

VESSEL GROUP

PASSENGER

Grounding of Passenger Ferry *Commodore*

**Bushwick Inlet, East River
Brooklyn, New York**

CASUALTY DATE

June 5, 2021

ACCIDENT ID

DCA21FM029

REPORT NUMBER

MIR-22-25

ISSUED

October 4, 2022

Figure 119. *Commodore* underway before the casualty, approaching the East 35th Street New York City Ferry Terminal. SOURCE: SEASTREAK

On June 5, 2021, about 1608 local time, the high-speed catamaran passenger ferry *Commodore* was transiting northbound on the East River near Bushwick Inlet off Brooklyn, New York, when the vessel lost primary steering and speed control to both of its port hull water jets and then grounded. One minor injury was reported among the 7 crewmembers and 107 passengers on board. The vessel was later refloated and drydocked for repair. No pollution was reported. Damage to the vessel was estimated at \$2.5 million.

While transiting at full speed, the *Commodore's* water jet alarm panel actuated, indicating that a control failure had occurred in the catamaran's two jet systems in the port hull. At the same time, the touchscreen control system display that processed control inputs for the port water jets and engines went blank. The captain first focused on the touchscreen, believing it had temporarily lost communication and would reconnect. He pulled both thrust levers back to the zero position, attempting to slow the vessel. The starboard hull's two water jets slowed, but the two port water jets remained full ahead, resulting in the vessel immediately turning to starboard. The captain then attempted to stop the vessel by reversing thrust direction for all water jets. The starboard-hull jets responded, providing reverse thrust, but the port-hull jets remained at full ahead, slowing the

vessel but also increasing its rate of turn to starboard. Next, to regain control, the captain put the vessel's throttle and steering control into another primary control mode and pulled the joystick backward. The starboard engines reduced rpm, but the port engines remained at full ahead. The captain then transferred propulsion and steering control to the port wing station, but he received the same nonresponse and quickly transferred control back to the main control station. The *Commodore* continued to turn and slow as it entered the relatively narrow opening to Bushwick Inlet and grounded in shallow water about 1 minute, 52 seconds after the first alarm.

Figure 120. *Commodore's* position, speed, and heading in the minutes up to the grounding (from AIS). BACKGROUND SOURCE: GOOGLE EARTH

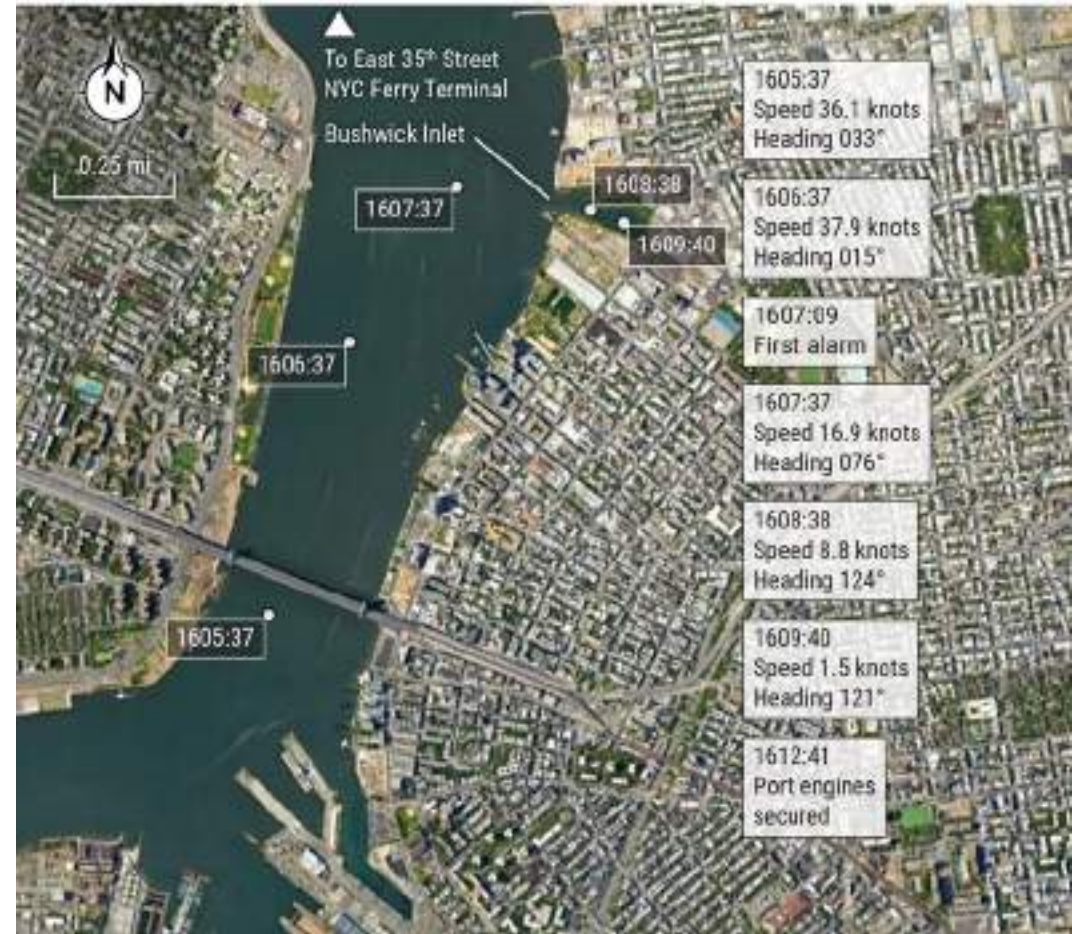




Figure 121. *Commodore's* main control station during postcasualty examination. Above: main A display screen's reboot failure (left) and the red failure log tab, red triangle over the port inner water jet icon, and the failure management pop-up screen on the main B display screen (right). Below: main control station's hand controls and water jet display screens.

BACKGROUND SOURCE: COAST GUARD



required that, as part of vessel start-up, operators check that no system warnings or alarms were indicated in the display panels. The crew made several transits on the day of the casualty, but they did not identify or report the active failures. Had crewmembers done so, the company may have attempted to troubleshoot or taken the vessel out of service until the SD card problem was resolved. An effective SMS would have ensured personnel could identify and address critical system alarms.

The captain believed that the touchscreen would reconnect and restore steering and propulsion control. Had the captain or mate understood that the alarms indicated the loss of primary control for the port engines and water jets, they would have realized that attempting to reconnect the primary control system via the touchscreen would not work.

Although the company's SMS contained potential responses for loss of control, it did not clearly list steps for operators to follow in a time-critical loss of propulsion and steering control emergency. With a high-speed ferry operating in congested waters, a quick operator response time is required. Following the casualty, the company updated their SMS emergency procedures for loss of propulsion and steering control, directing the operator to make a single attempt to reconnect the water jets, then shift to back-up control, then use the emergency-stop buttons to stop the engines.

THE PROBABLE CAUSE of the grounding of the passenger ferry *Commodore* was the loss of the primary control system for the catamaran's port water jets and propulsion engines due to a flaw in the system manufacturer's software causing a memory card failure. Contributing to the casualty was the company's lack of clear safety management system procedures for primary control system failure and ineffective oversight of crew training on failure modes for loss of propulsion and steering control, resulting in the captain not identifying the nature of the loss of control and either engaging back-up control or using emergency engine shutdowns to stop the vessel.

The control system manufacturer concluded that a software problem led to a failed SD card for the touchscreen, causing a reboot failure, meaning that the touchscreen went blank and could not restart. This also resulted in the loss of the primary controls (thrust lever, joystick, and steering tiller) for the port hull's engines and water jets. The manufacturer later issued a service letter mandating that vessels with the same touch control system software receive an update.

The investigation found that the control system displays showed active failures for several days before the casualty. The vessel operating company's SMS

LESSON LEARNED: Training for Loss of Propulsion and Steering

The loss of propulsion and steering control while transiting in channels or maneuvering near immediate hazards (grounding, traffic, objects), when response time is critical, demands crewmembers act quickly to mitigate potential casualties. Safety management systems should identify potential failure modes and specific responses. Effective company training on the loss of propulsion and steering controls builds crew confidence and proficiency and improves a crew's ability to respond during an actual emergency. Training should include requirements for the practical demonstration of loss of control procedures and use of emergency back-up systems. Vessel owners and operators should continuously evaluate training programs to ensure effectiveness of drills and implement changes to improve safety management system procedures.

VESSEL GROUP

TOWING/BARGE

Grounding of Towing Vessel *Marquette Warrior*

Lower Mississippi River, mile 538
Greenville, Mississippi

CASUALTY DATE

November 21, 2021

ACCIDENT ID

DCA22FM005

REPORT NUMBER

MIR-22-28

ISSUED

November 3, 2022



Figure 122. One of the *Marquette Warrior*'s barges that grounded and partially sank following the casualty.

SOURCE: MARQUETTE TRANSPORTATION COMPANY



Figure 123. *Marquette Warrior* underway before the casualty. SOURCE: WARREN UNDERWOOD, MARINETRAFFIC.COM

On November 21, 2021, about 1210 local time, the towing vessel *Marquette Warrior*, with nine crewmembers, was pushing 35 loaded dry cargo barges downbound on the Lower Mississippi River near Greenville, Mississippi, when the online electrical generator failed and the vessel subsequently lost steering. Several barges grounded on the riverbank, and four barges were damaged, including a hopper barge that partially sank. No pollution or injuries were reported. Damage to the vessel, barges, and cargo was estimated at \$1,242,500.

At 1150 on November 21, the tow entered the Leland Dikes section of the river. Aided by the 4–5 mph river current, the *Marquette Warrior* was traveling about 10 mph. About 1200, the engineer observed flickering lights and a ground fault indication on the main electrical switchboard. He attempted to identify and isolate any equipment causing the fault. Unsuccessful, the engineer then contacted the pilot in the wheelhouse to request he stop the vessel so the engineer could troubleshoot. Given the tow's size, speed, and location, the pilot said that it would be another 25–30 minutes before he could safely push the tow in on a bank. The engineer suspected there was an issue with the online (port) electrical generator set (genset) and the vessel needed to stop so he could switch online gensets (both gensets could not be on the electrical bus together).

About 1205, the pilot noticed that he had lost steering control. He sounded the general alarm and ordered astern propulsion to slow the vessel's speed. Hearing that they had lost steering, the engineer switched online gensets—even though the vessel was not stopped. Within 3 minutes, the vessel regained 3-phase electrical power and steering. However, the swift current and limited maneuverability of the large tow prevented the pilot from avoiding grounding while navigating a turn.

Following the grounding, the port genset's alternator was inspected by the towboat company's engineers and then a repair facility that had recently refurbished the unit. It was found that a ring terminal connection for one of the alternator's winding leads was burnt and had failed, causing the alternator to lose one of its phases—this would subsequently cause the towboat's steering pump motors (and all other 3-phase equipment) to stop due to a lack of available torque. Electricians also discovered arcing metal residue on three terminal block posts and a severed wiring harness. This indicated that the wiring harness had been lying across, rubbing against, and eventually arcing to the terminal block posts for a prolonged period. The way the alternator failed would have caused fluctuations in the alternator output voltage and amperage, and the vessel likely would have experienced flickering lights.

Because the alternator only had 675 hours (about 28 days) of operating time since being refurbished, it is unlikely that the genset's winding terminal connection that was burnt and damaged had become loose.

Recent preventive maintenance performed by the vessel's engineer required removing the genset alternator's cover panel to inspect all wires and connections for wire fray, chaffing, and loose connections. Electricians' analysis of the alternator following the casualty indicated that the most likely cause of the failure was rubbing or chaffing of the sensing wiring harness, which led to arcing between terminal block posts, heat buildup, insulation failure, and eventual winding ring terminal failure. Because the onboard engineer did not notice damage within the terminal box or to the sensing wiring harness during his inspection, it is likely the chaffing of the wiring harness took place over the 72 hours the genset ran between the November 7 maintenance inspection and the casualty on November 21. While the wiring harness could have shifted onto the terminal posts due to vessel vibrations, it is more likely that the wiring harness was inadvertently displaced during the vessel engineer's preventive maintenance inspection and went unnoticed during his reinstallation of the cover panel.

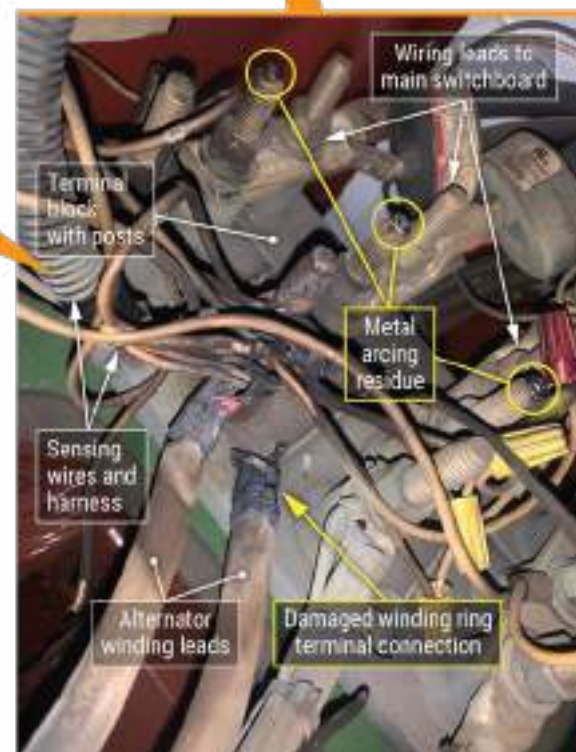
THE PROBABLE CAUSE of the grounding of the towing vessel *Marquette Warrior* was a loss of steering, likely due to a wiring harness within an electrical generator that was improperly positioned during a maintenance inspection, resulting in the harness contacting the terminal posts, eventually causing the loss of 3-phase electrical power to the steering pump motors.

Figure 124. Right: Port alternator with side cover removed, after being taken from the *Marquette Warrior* postcasualty. The control box (with cover removed) is mounted on the top panel.

BACKGROUND SOURCE: WARDEN ELECTRIC

Figure 125. Below: Close-up of port alternator terminal block showing damaged connection and metal arcing residue accumulated on terminal block posts. Detail shows the severed wiring harness.

BACKGROUND SOURCE: MARQUETTE TRANSPORTATION COMPANY



LESSON LEARNED: Electrical Equipment Maintenance

Proper operation and maintenance of electrical equipment is required to avoid damage to vessel-critical systems and prevent potentially serious crew injuries, particularly for electrical systems with high and medium voltage and equipment with uninsulated and exposed components. Electrical equipment should be installed, serviced, and maintained by qualified personnel familiar with the construction and operation of the equipment and the hazards involved.

VESSEL GROUP

FISHING

Grounding and Sinking of Fishing Vessel *Sage Catherine Lane*

St. Marys Entrance, near Cumberland Island, Georgia

CASUALTY DATE

June 9, 2021

ACCIDENT ID

DCA21FM030

REPORT NUMBER

MIR-22-14

ISSUED

May 10, 2022

Figure 126. *Sage Catherine Lane*, under previous name and ownership, before the casualty.

SOURCE: COAST GUARD



On June 9, 2021, about 0915 local time, the fishing vessel *Sage Catherine Lane* was transiting outbound on the St. Marys River, south of Cumberland Island, Georgia, when the vessel grounded on the north jetty of the St. Marys Entrance and, shortly afterward, began to flood. The crew of three abandoned the vessel and were rescued by the crew of a nearby Good Samaritan vessel. The *Sage Catherine Lane* later sank; about 2,300 gallons of fuel, engine oil, and hydraulic oil were on board, with roughly 800 gallons recovered. A sheen was observed following the breakup of the vessel, 3 days later. One minor injury to a crewmember was reported. Loss of the vessel was estimated at \$1 million.

The *Sage Catherine Lane* crew consisted of a captain, who had 30 years of experience on fishing vessels, and two crewmembers, who were skilled fishermen and had joined the vessel a month before the casualty.

At 0800 on the morning of the grounding, the crew of the *Sage Catherine Lane* left the anchorage in Cumberland Sound and began transiting outbound on the St. Marys River to engage in shrimping offshore. About 0900, the captain maneuvered the vessel outside of the navigation channel and continued on an easterly course between the red buoys and the northern jetty, due to high traffic within the channel. The captain, who was alone in the wheelhouse, set the vessel's autopilot to maintain the vessel's heading out of the inlet to open water as the vessel started passing the jetty. The vessel was transiting at a speed of 9 knots. He answered a cell phone call and then proceeded down to his bunk room. About 0915, he felt the vessel turn abruptly to port. The captain returned to the wheelhouse to investigate, and he saw that the vessel was heading toward the northern jetty. He attempted to turn away from the jetty, and put the vessel's engine in reverse, but the *Sage Catherine Lane* struck the jetty and grounded before his actions could sufficiently turn or stop the vessel.

Figure 127. *Sage Catherine Lane* aground on the St. Marys Entrance north jetty. SOURCE: COAST GUARD





Figure 128. Estimated path of the *Sage Catherine Lane* and the casualty location on the north jetty of the St. Marys Entrance, as indicated by a red X.

BACKGROUND SOURCE: NOAA CHART

The captain and crew donned life jackets and abandoned the vessel, and the crew of a Good Samaritan vessel rescued them from the water. The vessel remained on the jetty for 2 days, and then it broke apart and sank following a thunderstorm on the third day.

The vessel autopilot's reliability was brought into question while transiting 2 days before the casualty, when the captain was unable to disengage it and gain control of the helm. Following that incident, the captain examined the autopilot system and found problems with the rudder angle indicator and rudder angle sensor at the rudder post. He straightened the bent rudder angle indicator lever and secured in place the loose rudder angle sensor that provided the autopilot with the rudder position with zip ties.

The vessel's reported sharp turn to port (about 90°) while on autopilot before grounding indicated that the autopilot system had failed. The sudden sharp turn likely resulted from the helm/autopilot receiving a signal that the vessel was far from its programmed heading and required significant rudder correction to return to the original heading. Based on the information provided to investigators (due to the sinking,

a postcasualty exam was not possible), this sudden change could have been caused by the loosening or detachment of the autopilot rudder angle sensor, which resulted in the transmission of incorrect rudder position data to the autopilot that subsequently commanded a large port rudder angle.

Navigating in channels and harbors requires quicker reaction times due to traffic, currents encountered, and frequent course changes. It also requires more rudder due to slower speeds. Therefore, autopilot use

is often discouraged or prohibited in restricted waters. Because the *Sage Catherine Lane* was operating outside the channel and closer to the northern jetty, there was little time to gain control of the vessel when the autopilot failed. However, the captain was not in the wheelhouse—he had left it unattended to go below. Leaving the wheelhouse unattended is imprudent, especially when navigating areas like the St. Marys Entrance, which included a narrow navigation channel, two jetties, and vessel traffic. Had the captain stayed in the wheelhouse after engaging the autopilot, he would have been able to respond and take control of the vessel after the autopilot system failed.

THE PROBABLE CAUSE of the grounding of the fishing vessel *Sage Catherine Lane* was the captain's decision to leave the wheelhouse unattended as the vessel transited the St. Marys Entrance on autopilot, leaving insufficient time to respond when the autopilot failed and caused the vessel to go off the set course.

LESSON LEARNED: Safe Navigation with Autopilot

Autopilot use does not relieve the operator of responsibility to conduct a proper navigation watch. Use of autopilot should not be a justification for an operator to leave the wheelhouse or bridge unattended in confined waters. Navigating in channels and harbors requires quicker reaction times due to traffic, currents encountered, and frequent course changes, and more rudder due to slower speeds. Therefore, autopilot use is often discouraged or prohibited in a harbor entrance or narrow channel.



Figure 129. Left to right: *Sage Catherine Lane* following the grounding on the jetty, and after being broken apart on the jetty 3 days later.

SOURCE: COAST GUARD

VESSEL GROUP

FISHING

Grounding of Fishing Tender Barge **SM-3**

Nushagak Bay, near Ekuik, Alaska

CASUALTY DATE

August 30, 2020

ACCIDENT ID

DCA20FM027

REPORT NUMBER

MIR-22-03

ISSUED

February 15, 2022

Figure 130. *SM-3* under tow before the grounding.

SOURCE: NORTHLINE SEAFOODS

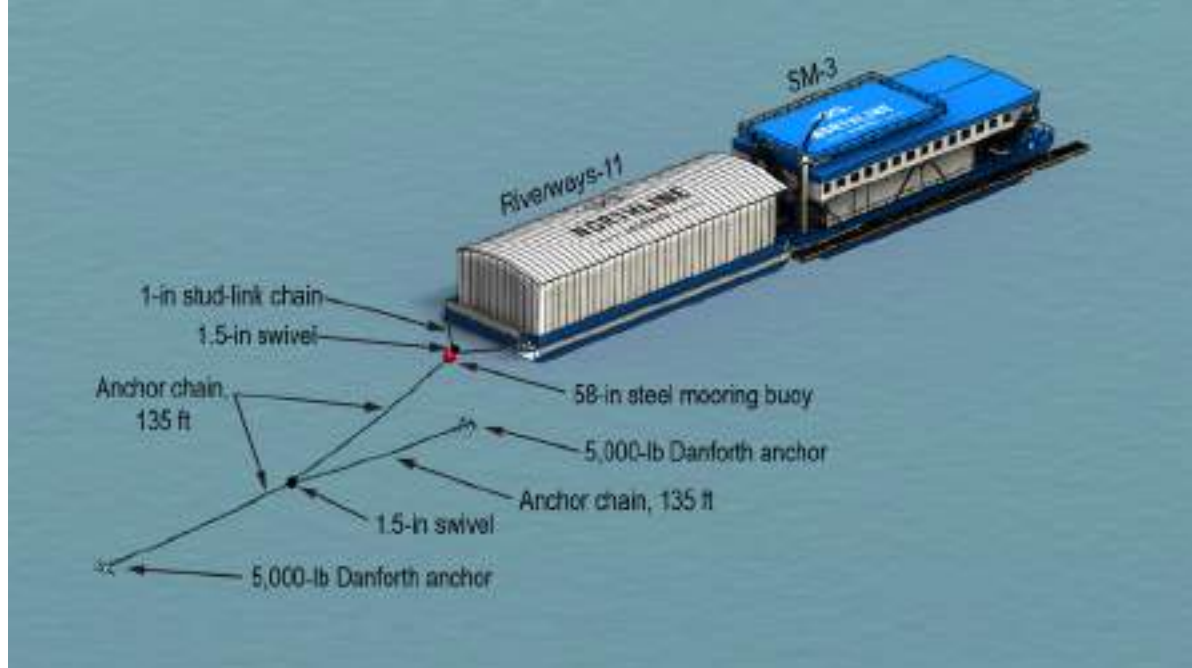


Figure 131. *SM-3* and *Riverways-11* anchoring arrangement at the beginning of the season (*not to scale*).

BACKGROUND SOURCE: NORTHLINE SEAFOODS

On August 30, 2020, about 2200 local time, the fishing tender barge *SM-3* was anchored and riding out a storm with a crew of six in Nushagak Bay, 5 miles south of Ekuik, Alaska, when the barge broke free from the buoy and began drifting. The crew deployed two emergency anchors, but the barge continued to drift and grounded on the beach. The following morning, the crew evacuated the vessel and were picked up by locals. There was a 3-mile debris field on the beach. No injuries were reported. The barge was later salvaged. Damage to the vessel was estimated at \$4.5 million.

The *SM-3* was positioned in Nushagak Bay for the summer salmon season, along with its two support vessels: the 150-foot-long cargo holding barge *Riverways-11* and the 70-foot-long workboat *Sea Mount*. With the assistance of a tugboat, the *SM-3* was anchored (along with the *Riverways-11*) using its mooring and ground tackle system. The *SM-3* and the *Riverways-11* were connected bow-to-bow with lines.

Once fishing operations were completed, about August 25, a 3-day window of good weather was

needed to move the *SM-3* and its holding barge, *Riverways-11*, to their winter layup locations. However, a rapidly developing storm was forecasted to hit the area where the barge was anchored about August 29–30, leaving the crew limited time to prepare and move both barges. Since there were not enough resources available to prepare and tow both barges to their separate layup locations, management determined only one barge could be moved to its winter layup location before the storm arrived. Given that the *SM-3* would be moved to Naknek, which was a longer journey and would have involved exposing the barge to the storm's winds from the south-southwest, management decided to instead move the *Riverways-11* to Dillingham and have the *SM-3* remain anchored (using the barge's ground tackle system) and wait out the storm.

On August 30, the wind picked up in the afternoon as predicted. Recorded observations showed sustained winds from the south-southwest over 30 knots for about 7 hours, with maximum sustained winds at 41 knots at 1630 and wind gusts over 50 knots for about 3.5 hours (from 1630–2156). The person in charge estimated seas in the area were 8–10 feet.

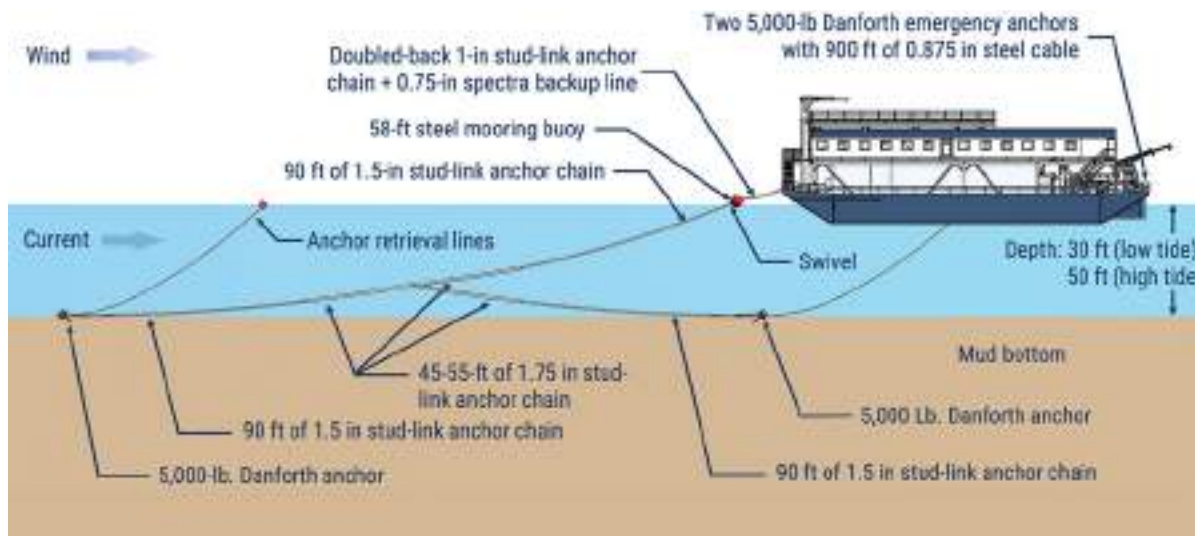


Figure 132. *SM-3* ground tackle system at the time of the casualty when the water depth was about 40 feet.

BACKGROUND SOURCE: NORTHLINE SEAFOODS

During the storm, about 2300, the mooring buoy's topside padeye separated from the buoy (and the ground tackle system), causing the *SM-3* to drift. The crew released the two emergency anchors on board, but the vessel continued to drift, eventually grounding on a beach about 2 miles east of the location where it had anchored. The crew took shelter on the lower deck until about 0700 the following morning, when they abandoned the *SM-3* directly on to the beach.

A postcasualty examination of the buoy showed that a 1.25-inch-wide fatigue crack had formed at the padeye's fillet weld, moving across nearly two-thirds of the weld before failing abruptly and tearing the cap plate it was welded to. Investigators were unable to determine whether the fatigue crack existed before the storm or developed because of it. If the crack was preexisting, it contributed to the failure of the buoy in the storm; if it was not preexisting, the forces on the buoy during the storm resulted in the fatigue crack and complete separation of the padeye and adjoining shell material from the buoy.

It is possible that the mooring buoy failed due to a problem with the design of either the buoy itself or the ground tackle system as a whole. There was no indication that either of the primary anchors dragged,

so scope—the ratio of anchor chain to water depth—was likely not a factor. Therefore, the effect of the storm on the barge resulted in forces that exceeded the capability of the weakest link in the ground tackle system's components—in this case, the mooring buoy.

The lowest known general rating for a component in the ground tackle system was the breaking strength of the swivel, about 143,000 pounds. Requests to the supplier for exact design and manufacturing specifications for the mooring buoy went unanswered. Investigators were therefore unable to determine if the capability of the buoy was exceeded, or if there was a design flaw or manufacturing error.

THE PROBABLE CAUSE of the grounding of the fishing tender barge *SM-3* was a fatigue crack in one of the mooring buoy's padeye welds, which resulted in the padeye separating from the buoy's spherical steel plating, causing the barge to break free from its buoy and anchors and drift ashore during a storm.



Figure 133. *SM-3* after the grounding.

SOURCE: ALASKA MARINE SURVEYORS



Figure 134. Left to right: *SM-3* mooring buoy: failed weld (with three shackles) that separated from buoy; damaged top with padeye missing; and undamaged bottom padeye. SOURCES ALASKA MARINE SURVEYORS AND NORTHLINE SEAFOODS

LESSON LEARNED:

Ground Tackle System Design

In addition to fitting mooring chains of sufficient length to provide adequate scope for anchorages, mariners must consider the strength of each component of a ground tackle system and should reference marine standards for design. Bending loads can be significantly higher than straight-line pull. The working load limit of each component should be equal to or greater than the ground tackle system's maximum calculated load to avoid weak points in the system.

VESSEL GROUP

FISHING

Grounding and Sinking of Fishing Vessel *Tenacious*

Wells Passage, Prince William Sound, Alaska

CASUALTY DATE

July 24, 2021

ACCIDENT ID

DCA21FM033

REPORT NUMBER

MIR-22-02

ISSUED

January 25, 2022

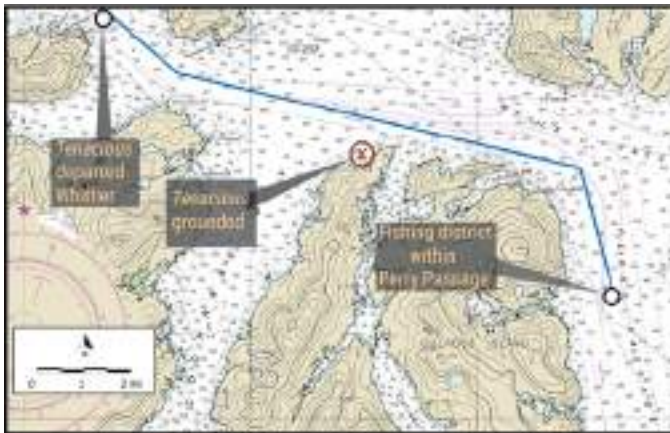


Figure 135. Extract of NOAA chart 16705. An estimation of the intended route is shown in blue, and the grounding location marked by a red X. Soundings are in fathoms.

BACKGROUND SOURCE: NOAA



Figure 136. *Tenacious* underway before the casualty. SOURCE: ZIMMERMAN FISHERIES LLC

On July 24, 2021, about 0326 local time, the fishing vessel *Tenacious* grounded at the entrance to Wells Passage, 14 miles east of Whittier, Alaska, while transiting to fishing grounds in Prince William Sound. All five crewmembers abandoned the vessel and were rescued by a Good Samaritan vessel. The *Tenacious* later sank. Two thousand gallons of diesel fuel were on board and not recovered. One minor injury was reported. Loss of the vessel and fishing gear totaled an estimated \$660,000.

The Alaska Department of Fish and Game scheduled “openers,” days when vessels were permitted to fish, and announced an opener (for salmon) within Prince William Sound for July 24 from 0600 to 2000.

Tenacious arrived in Whittier late on July 22 to resolve issues with its skiff in time for the July 24 opener. After unsuccessful repairs, on July 23, three crewmembers (including the owner, who was a deckhand training to operate the vessel) traveled to and from Seward by car (a 4-hour trip) to borrow another skiff, returning about 2300.

Tenacious left Whittier between 0100 and 0130 on July 24 for the 3.5-hour trip to the fishing grounds. Had they successfully repaired their skiff, they would have sailed earlier and anchored overnight, instead of arriving just in time for the opener. The captain took the wheelhouse watch while the crew slept. According to the deckhand, the whole crew was running off “not too much sleep,” to which the captain echoed, stating, “everybody was pretty well tired.” While motoring on autopilot, the *Tenacious* struck rocks. The captain later told investigators he fell asleep.

The captain and crew awoke upon contact. The captain attempted to back off the rocks, and the vessel moved in circles. The engine room was flooding through penetrations in the forward bulkhead, but it was unable to be pumped out because flooding started from behind a live electrical panel.

Meanwhile, the bunkroom was also flooding and a distress call was made at 0326 on VHF radio channel 16. With the vessel now stopped, the crew boarded the skiff. After a second distress call, the captain joined them.

The captain had been awake 19.5 hours at the time of the casualty. He had not slept well the previous days due to a pinched nerve. The casualty occurred in darkness, during a circadian low period, when the body has a stronger desire to sleep, typically between 0300 and 0500. It is likely he was impaired by acute fatigue and a chronic sleep debt.

The prospect theory of human decision-making proposes that humans are more likely to accept risk when they perceive guaranteed future losses. The captain likely framed missing the July 24 opener as a guaranteed loss of earnings from the catch. His risk tolerance was higher, resulting in the decision to get underway later than planned, during normal sleep hours, while fatigued. With no quota, the *Tenacious* crew was limited only by its ability to participate in the openers, scheduled based on dates and locations where fish populations were plentiful. Thus, there was economic pressure for fishery participants to join in all openers to accrue as much catch as possible.

Two safety tools available to the captain were not used. *Tenacious* had a chart plotter that included a cross track error alarm, which alerted the wheelhouse operator when the vessel departed a set distance off its planned track. *Tenacious* also had a bridge watch alarm, designed to alarm at set intervals to ensure the operator has not fallen asleep. Either alarm could have alerted the captain in time to prevent the grounding.

The vessel was holed below the waterline in the bunkroom. Water entered the engine room via penetrations in the non-watertight bulkhead between the bunkroom and engine room. With one fish hold already full of water, much of the hull volume was flooded, and the vessel sank—as its reserve buoyancy was overcome.

Vessels are designed with watertight bulkheads to prevent progressive flooding between compartments when portions of the hull are compromised. Had the bulkhead between the bunkroom and the engine room been watertight, it would have contained the flooding to the bunkroom. However, the *Tenacious* was not required by regulations to have watertight bulkheads.

Despite the rapid progressive flooding and sinking, the crew made appropriate distress calls, safely abandoned the vessel, and were assisted by Good Samaritan vessels. The EPIRB did not activate after the vessel sank, and with no PLBs for crewmembers on board, their location for search and rescue relied solely on timely mayday calls.

THE PROBABLE CAUSE of the grounding of the fishing vessel *Tenacious* was the captain's decision to get under way while fatigued. Contributing to the casualty was the decision not to use the navigation system's cross track error alarm and to operate with a non-functioning bridge watch alarm.

LESSONS LEARNED:

Fatigue

In this casualty, and as the NTSB has previously noted in numerous commercial fishing vessel casualties, crew fatigue is a significant causal factor. Owners/operators should ensure that crewmembers receive enough rest to adequately perform duties.

Watch Alarm

A watch alarm, when used as intended, is an effective tool that can help ensure that a crewmember remains awake and vigilant while on duty. However, a watch alarm is not a substitute for the management and mitigation of fatigue. Owners/operators of vessels equipped with a watch alarm should establish procedures for its operation and use, especially when only one crewmember is responsible for navigation and lookout.

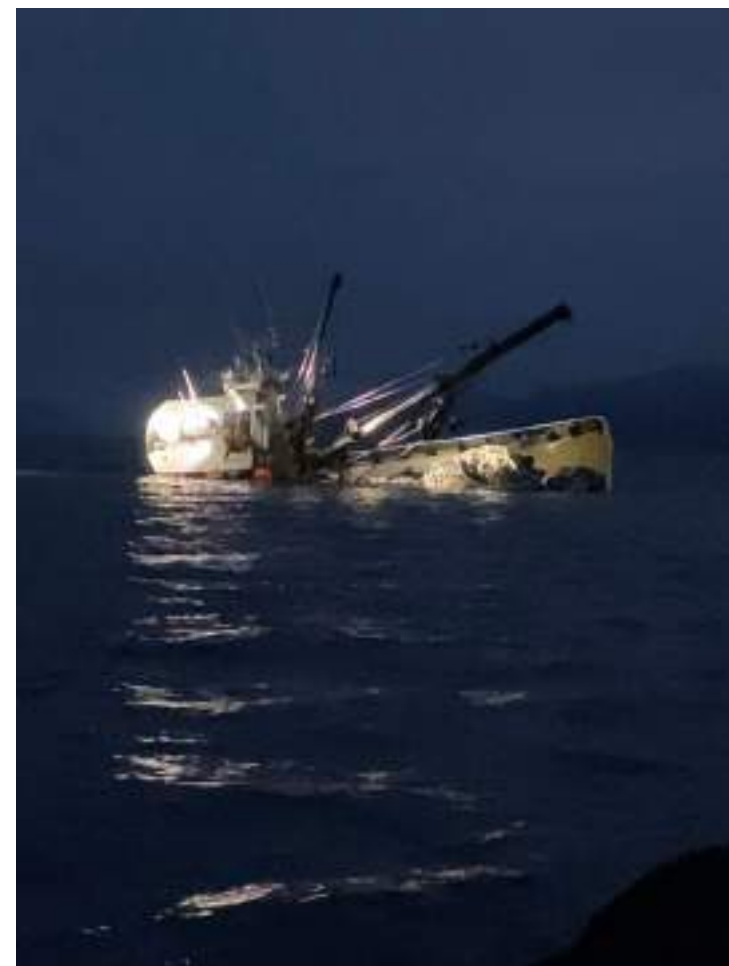


Figure 137. *Tenacious*, sinking by the bow, about 0345 on July 24. SOURCE: LUCAS BROCKMAN

VESSEL GROUP

PASSENGER

Diesel Generator Engine Failure aboard Ferry *Wenatchee*

Puget Sound near Seattle, Washington

CASUALTY DATE

April 22, 2021

ACCIDENT ID

DCA21FM025

REPORT NUMBER

MIR-22-06

ISSUED

March 2, 2022

Figure 138. Ejected components from the no. 3 main engine. BACKGROUND SOURCE: COAST GUARD



Figure 139. *Wenatchee* underway before the casualty. SOURCE: WASHINGTON STATE FERRIES

On April 22, 2021, about 1330 local time, the no. 3 main engine aboard the passenger and car ferry *Wenatchee* suffered a mechanical failure during a sea trial in Puget Sound near Bainbridge Island, Washington. The failure led to the ejection of components from the engine and resulted in a fire in the no. 2 engine room. The crew isolated the space, and the fire self-extinguished before it could spread throughout the vessel. There were 13 crewmembers aboard and no passengers. No injuries or pollution were reported. Damage to the *Wenatchee* was estimated at \$3,790,000.

In November 2020, the *Wenatchee* was taken out of service for maintenance. The 16-cylinder nos. 2 and 3 diesel engines, upon reaching operating-hour maintenance requirements, were overhauled by factory-trained technicians in accordance with manufacturer's guidelines. In February 2021, vessel crews conducted initial dockside engine break-ins. None of the engines were run again until the vessel made departure preparations for a sea trial in April.

On April 22, the *Wenatchee* departed the Washington State Ferry Eagle Harbor Maintenance Facility, with all

four engines and drive motors running, for a 1-day sea trial to verify functionality of all engineering systems. During the sea trial, the no. 3 main engine, located in the no. 2 engine room, experienced a catastrophic failure after operating about 5 hours and being sequentially loaded up to 100% per the manufacturer's recommendations. Cylinder components were ejected from the crankcase, and hot pressurized crankcase gas was released and ignited, further igniting nearby equipment, and causing heat and smoke damage in the no. 2 engine room.

To isolate the no. 2 engine room from oxygen and fuel, crewmembers closed all watertight doors, stopped ventilation fans, closed ventilation fan dampers, and closed all fuel valves from tanks feeding the no. 2 engine room. Three deck crewmembers donned firefighting gear and reported to the car deck to monitor boundaries. Two engine crewmembers also donned firefighting gear, verified all hatches and doors were closed in the fidley, and monitored the boundaries for heat. Crewmembers estimated that isolation of no. 2 engine room took about 2–3 minutes.



Figure 140. No. 1 engine room diesel engines as seen from the engineering operating station; center walkway of the no. 2 engine room is through the open door in the background. SOURCE: WASHINGTON STATE FERRIES

Engineers shut down the two propulsion motors in the no. 2 engine room, isolated the switchboard, and shifted the entire vessel's electrical load and controls to the no. 1 engine room. One drive motor and one main engine remained online for limited propulsion. Firefighting water was not used, as fire teams reported boundaries to be cool to the touch, and other crewmembers observed the smoke to be dissipating as the fire extinguished itself. Based on this, engineers determined it was unnecessary to discharge the vessel's fixed CO₂ fire-extinguishing system.

The crew's timely and effective response limited damage and prevented injuries. They extinguished the fire without putting crewmembers at risk by having to enter the space. Additionally, the crew switched electrical and propulsion systems to the unaffected engine room no. 1 and maintained the vessel's ability to maneuver.

An independent forensic analysis determined the root cause of the engine failure was an inadequately torqued bolt on the nos. 6 and 14 cylinder's fork and blade (connecting rods) lower basket assembly. The bolt unfastened while the engine was running, disrupted lubrication in this section of the crankshaft, and resulted in extremely high temperatures, which led to disassembly of the connecting rods and lower connecting basket assembly. After the broken engine parts were struck by rotating components in the engine, they were ejected from the crankcase through an inspection port.

Based on the condition of the bolt, engineers determined that the nut had backed off (unfastened) while the engine was running. These nuts were required to be torqued to 75 foot-pounds during assembly using a torque wrench connected to a special extension tool that rotated the nut via a socket. Under magnification, engineers inspected the condition of the grooves on the lower basket nuts. Flattening was observed on properly torqued exemplar nuts but was not seen on the recovered nut that had unfastened from the no. 3 engine's lower basket assembly, indicating the nut had not been properly torqued.

LESSONS LEARNED:

Tightening of Fasteners

The NTSB has investigated several recent casualties that likely were caused by a failure to tighten fasteners on marine engines to the manufacturer's recommended torque settings. Undertorquing a fastener may cause excess vibration or allow the fastener to come loose, while overtightening may lead to failure of the fastener or the machinery component being secured. When installing fasteners, personnel should use a calibrated torque wrench, follow the manufacturer's recommended tightening guide and torque values, and verify that all required torque requirements have been completed.

Containing Engine Room Fires

Engine rooms contain multiple fuel sources as well as mechanical ventilation, making the spaces especially vulnerable to rapidly spreading fires. The crew of the *Wenatchee* effectively contained the spread of a fire by removing fuel and oxygen sources. Vessel crews should familiarize themselves and train frequently on machinery, fuel oil, lube oil, and ventilation shutoff systems to quickly act to contain and suppress engine room fires before they can spread to other spaces and/or cause a loss of propulsion and electrical power.

Figure 141. Damaged lower basket bolts, washers, and nuts from no. 3 engine's nos. 6 and 14 connecting rod and piston pair. SOURCE: WASHINGTON STATE FERRIES



THE PROBABLE CAUSE of the mechanical failure of the no. 3 main engine aboard the passenger vessel *Wenatchee* was a connecting rod assembly that came loose and separated from the crankshaft due to insufficient tightening (torquing) of a lower basket bolt during the recent engine overhaul.

Lessons Learned



The marine casualty investigations completed in 2022 illustrate the decisions, actions, and inaction taken by operators and crews that led to often familiar, and sometimes deadly, casualties. By considering the lessons learned in each, it is our hope that mariners can make changes to prevent future casualties.

We learned new lessons in containing engine room fires and in fire prevention. For example, as a result of the investigation of the engine room fire aboard the bulk carrier *Roger Blough*, we recommended that the US Coast Guard develop regulations and guidance and that ship classification societies develop standards for diesel oil-fired air-heating furnaces on ships operating on the Great Lakes.

We saw again how fatigue makes its influence felt in marine casualties, and how maintenance and repair issues, such as engine repairs and hull condition, can become factors. And, regardless of the cause of the casualty, we saw once again the vital importance of personal locator device technology for aiding search and rescue operations.

In response to the tragic sinking of the *Emmy Rose*, for example, along with issuing new recommendations enhancing Coast Guard inspections, we reiterated our recommendation that the Coast Guard require personal locator beacons (PLBs)—a recommendation we also reiterated in the capsizing of the liftboat *SEACOR Power*, in which 13 lives were lost. This capsizing also illustrated that many lessons can be learned in one marine casualty, as we issued other new recommendations touching on effective communication and vessel stability.

As you review these lessons learned, think about how each issue manifested into a safety problem and how you can work to avoid a similar situation in your operations. We hope that this section helps you view the casualties in this digest from the standpoint of preventing commonly encountered hazards.

Our aim is that that with these lessons learned, you avoid learning the same lessons the hard way in the course of your operations.

As you review these lessons learned, think about how each issue manifested into a safety problem and how you can work to avoid a similar situation.

Containing Engine Room Fires

Engine rooms contain multiple fuel sources and mechanical ventilation, making them especially vulnerable to fires that rapidly spread. Their often-small confines and the location of fire equipment within necessitate a quick and effective response. Vessel crews may effectively contain engine room fires by securing the space's ventilation and machinery fuel shutoffs, using installed fixed fire-extinguishing systems, stopping machinery, cooling boundaries, and communicating effectively.

The fuel oil-fed fire that grew rapidly in the *Roger Blough's* engine room may have been contained if a furnace had been fitted with a fire-activated quick-closing valve on the fuel oil pipe to its burner, as recommended by the National Fire Protection Association for shoreside building installations.

Effective crew responses helped contain engine room fires in the *President Eisenhower* and *Wenatchee* casualties. An inability to contain fires contributed to the *La Dolce Vita*, *Roger Blough*, and *Capt Kirby Dupuis* casualties.



Fire Prevention

Vessel owners, operators, and crews can prevent or mitigate the risk of fire in engine room spaces by paying close attention to potential heat or ignition sources, and preparing and protecting the spaces accordingly. Engine exhaust surfaces should be insulated to prevent ignition of flammable liquids or combustibles, and decks and the openings between them should be structurally fire protected to prevent the spread of fire.

Supervisory personnel should evaluate hot work areas to ensure affected spaces are prepared and protected for planned hot work in accordance with regulatory guidelines, company policies, and marine chemist certificates. Additionally, crewmembers and personnel involved in hot work should be able to identify fire hazards and take action to remove or mitigate risks.

Tank ventilation is important to ensure a valve line-up error does not lead to the overpressurization of or vacuum in vessel tanks. Operators should be aware of their fuel tank ventilation system arrangements to ensure proper valve position during transfer and operation of the fuel system.

Vessel owners and operators can now install rapid oil leak-detection systems to detect fuel mist and spray in real time and alert crews before a fire ignites. Ineffective fire prevention was a factor in the *Miss Dorothy*, *Nobska*, *Aleutian Falcon*, *Mary Lynn*, and *President Eisenhower* casualties.

Importance of Personal Locator Technology

Personal locator technology, such as a PLB or SEND, provides SAR operations with an accurate, continuously updated location for each individual carrying it. In an emergency rescue situation, such technology can reduce or eliminate SAR errors by providing GPS coordinates of survivors, enhancing their chances of survival. Vessel owners and operators can enhance the safety of crews by equipping vessels and crews with these technologies to supplement a vessel's EPIRB.

The use of personal locator technology resulted in the successful rescue of the *Blue Dragon* crew.

Had the crews of the *Emmy Rose* and *SEACOR Power* carried personal locator technology and been able to activate it, their chances of rescue would have been enhanced.



Vessel Stability

A properly designed, loaded, and operated vessel should possess sufficient stability to return to its upright position after exposure to a disturbing force within its designed limits, such as from waves or wind. Regulatory stability criteria set a minimum standard for vessels, and crews must ensure their vessels are loaded and operated in accordance with this standard. When vessels do not meet stability criteria, they do not have the margin of safety intended by the regulations, and when they are exposed to conditions that exceed their operational limits, they become more susceptible to a loss of stability.

A failure to meet regulatory stability criteria left the *Emmy Rose* more susceptible to capsizing.

Exposure to severe winds exceeding the vessel's operational limits resulted in the *SEACOR Power's* loss of stability.

Fatigue

Fatigue impacts all aspects of human performance. Inadequate sleep risks operators falling asleep at the wheel and can also lead to poor decision making and reaction time. To prevent fatigue, vessel owners and operators must practice effective fatigue management by monitoring watch schedules to ensure crewmembers receive adequate rest. Additionally, crewmembers should use fatigue mitigation tools, such as wheelhouse watch alarms.

Fatigue was a factor in the *Tenacious*, *Mary Lynn*, and *Ava Claire* casualties.



Proper Installation, Operation, and Maintenance of Electrical Equipment

Substandard installation of electrical equipment and outfitting is a common cause of electrical fires. Proper operation and maintenance of electrical equipment is required to avoid damage to vessel critical systems and prevent crew injuries. Vessel operators should ensure electrical systems and equipment are adequately designed, installed, and maintained by qualified personnel in accordance with established marine standards.

Improper installation and maintenance of electrical equipment was a factor in the *Marquette Warrior* and *Blue Dragon* casualties.



Sound Navigation Practice—Avoiding Overreliance on a Single Data Source

The safety of a vessel and its crew while underway depends on the crew's awareness of the vessel's position. The inability to recognize the fallibility of technology, such as an ECDIS or autopilot, can result in operator overreliance and overconfidence, degrading sound navigation practices and affecting situational awareness. Vessel operators and crews can avoid overreliance on a single data source by cross-checking information with available bridge resources, including electronic and paper charts, radar, visual aids to navigation, and lookouts, and they should communicate identified risks with fellow watchstanders.

Charted sailing lines in rivers are developed under considerations of channel depth, current patterns, and any other known obstructions to navigation. Mariners should use up-to-date charted sailing lines, along with their own experience and assessment of the existing circumstances, for a safe and successful transit.

A lack of awareness of the vessel's position was a factor in the *Ocean Princess*, *Baxter Southern*, and *Utopia IV/Tropic Breeze* casualties.

Lack of awareness of current charted sailing lines was a factor in the *Kevin Michael* casualty.

Ineffective use of autopilot was a factor in the *Sage Catherine Lane* casualty.

Response to Loss of Steering and Propulsion

Failures in steering control systems and loss of propulsion pose a significant risk to vessels, especially when maneuvering near immediate hazards, making response time critical. Vessel owners and operators should identify potential failure modes, develop quick response procedures and train crews in specific scenarios to ensure they maintain proficiency in responding to a loss of steering or propulsion.

The lack of specific procedures and training to address a loss of steering and propulsion were factors in the *Jalma Topic* and *Commodore* casualties.



Effective Communication

Effective, early communication is critical—not only between crewmembers on board a vessel, but also between vessel operators and organizations that alert them to hazardous situations.

Poor communication between a vessel operator and bridge operator was a factor in the *Robert Cenac* casualty.

An alert system that was not configured to notify the onboard shipkeeper of a fire was a factor in the *Roger Blough* casualty.

Mooring System Arrangements

Mariners should fit mooring chains of sufficient length to provide adequate scope for anchorages and consider the strength of each component of a ground tackle system, referencing marine standards for design. Bending loads can be significantly higher than straight-line pull. The working load limit of each component should be equal to or greater than the ground tackle system's maximum calculated load to avoid weak points in the system.

A ground tackle system arrangement was a factor in the *SM-3* casualty.

Engine Repairs

Vessel operators should ensure their crews are equipped with the resources and training needed to execute timely and thorough maintenance and repair on engines. Several casualties were likely caused by a failure to tighten fasteners on marine engines to the manufacturer's recommended torque settings. When installing fasteners, personnel should use a calibrated torque wrench, follow the manufacturer's recommended tightening guide and torque values, and verify the completion of all required torque requirements.

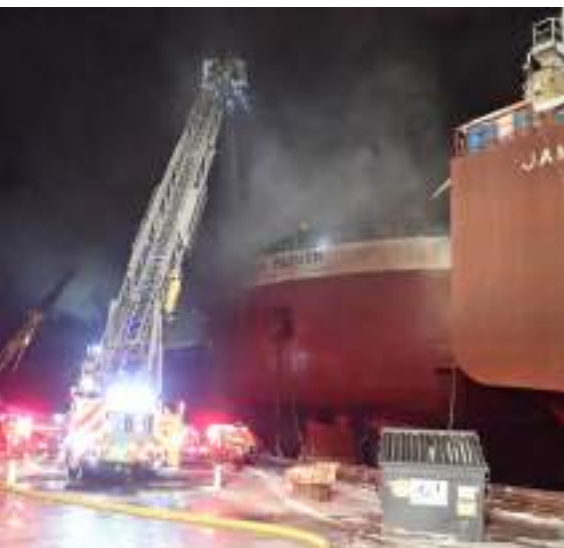
On vessels with slow-speed diesel propulsion engines, starting and stopping main engines is a critical function for effective maneuverability. Slow-speed engine pneumatic starting and control systems—in particular, air actuating valves within the systems—were the cause of casualties. If the root cause of an engine operating issue cannot be determined, the chief engineer and vessel owner/operator should have a diesel technician further evaluate and determine the cause of the malfunction. Vessel reliability depends on the complete resolution of equipment malfunctions and abnormalities when they occur.

Timely and correct engine repairs were a factor in the *Riverside* and *Wenatchee* casualties.

Hull Condition

Towing vessels with weather decks and openings in poor condition increase the risk of flooding and sinking. It is good marine practice for owners to conduct regular oversight and maintenance of hulls, including between drydock periods. An effective maintenance and hull inspection program should proactively address potential steel wastage, identify hull and watertight integrity deficiencies, and ensure corrosion issues are quickly addressed.

Hull condition was a factor in the *Proassist III* casualty.



“This annual publication has highlighted the lessons learned from hundreds of NTSB marine casualty investigations with one goal in mind: to inspire meaningful safety change on our waterways.” — NTSB Chair Jennifer Homendy

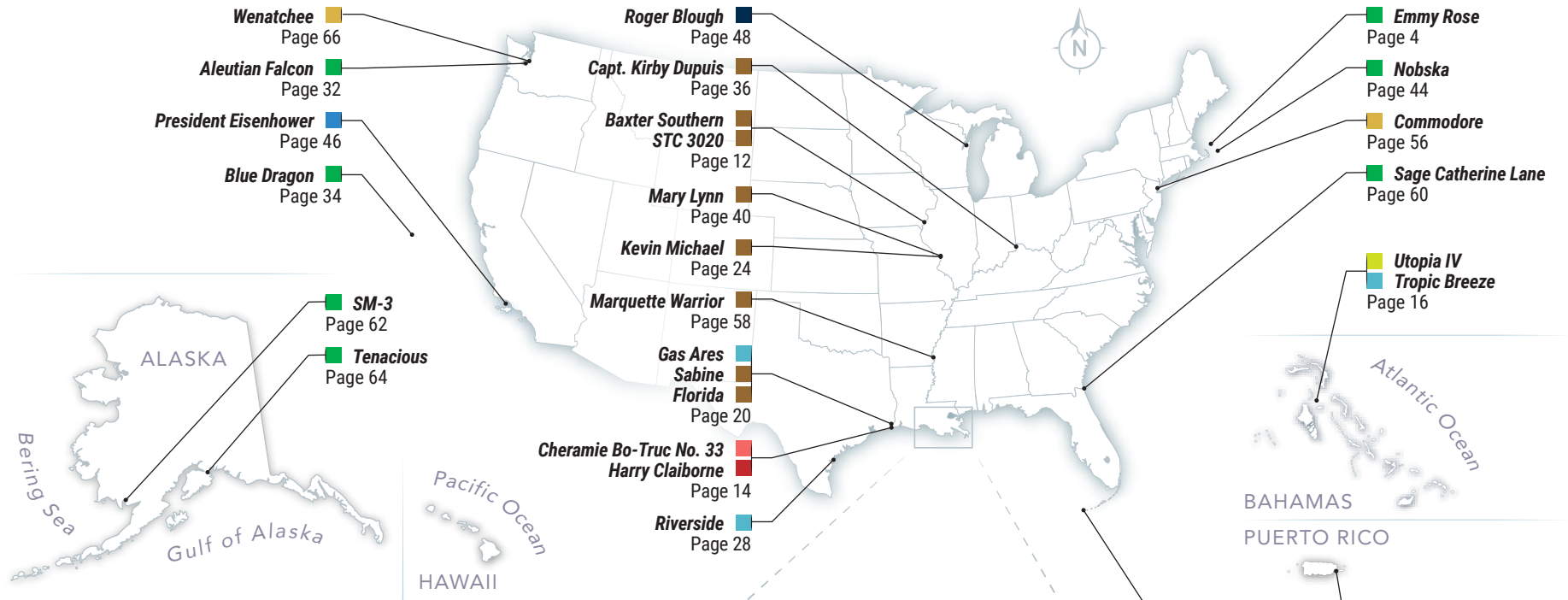
Table of Vessel Particulars by Vessel Group

REPORT NUMBER	VESSEL NAME	VESSEL TYPE	FLAG	LENGTH	BEAM/WIDTH	DRAFT	PERSONS ON BOARD	PAGE
CARGO, DRY BULK								
MIR-22-23	<i>Jalma Topic</i>	Bulk carrier	Liberia	623.3 ft (190.0 m)	105.8 ft (32.2 m)	24.3 ft (7.4 m)	20	22
MIR-22-18	<i>Ocean Princess</i>	Bulk carrier	Hong Kong	623.4 ft (190.0 m)	105.8 ft (32.2 m)	16.7 ft (5.1 m)	24	26
MIR-22-19	<i>Roger Blough</i>	Bulk carrier	United States	858.0 ft (261.5 m)	105.1 ft (32.0 m)	27.9 ft (8.5 m)	1	48
CARGO, GENERAL								
MIR-22-15	<i>President Eisenhower</i>	Containership	United States	983.9 ft (299.9 m)	140.2 ft (42.8 m)	41.5 ft (12.7 m)	22	46
CARGO, LIQUID BULK								
MIR-22-11	<i>Bow Tribute</i>	Tanker	Norway	599.3 ft (182.7 m)	105.8 ft (32.2 m)	28.5 ft (8.7 m)	29	54
MIR-22-27	<i>Gas Ares</i>	Liquefied petroleum gas carrier	Panama	754.6 ft (230.0 m)	105.8 ft (32.2 m)	26.9 ft (8.2 m)	24	20
MIR-22-07	<i>Riverside</i>	Oil tanker	Malta	819.9 ft (249.9 m)	144.5 ft (44.0 m)	43.0 ft (13.1 m)	23	28
MIR-22-29	<i>Tropic Breeze</i>	Tank vessel	Belize	159.8 ft (48.7 m)	26.2 ft (8.0 m)	7.5 ft (2.3 m)	7	16
COMBATANT/MILITARY								
MIR-22-04	<i>Harry Claiborne</i>	US Coast Guard Cutter	United States	175.0 ft (53.3 m)	36.0 ft (11.0 m)	8.5 ft (2.6 m)	24	14
FISHING								
MIR-22-10	<i>Aleutian Falcon</i>	Fish processor	United States	233.0 ft (71.0 m)	39.4 ft (12.0 m)	11.0 ft (3.4 m)	None	32
MIR-22-20	<i>Blue Dragon</i>	Fishing vessel	United States	85.2 ft (26.0 m)	25.0 ft (7.6 m)	11.2 ft (3.4 m)	7	34
MIR-22-21	<i>Emmy Rose</i>	Fishing vessel	United States	82.0 ft (25.0 m)	22.9 ft (7.0 m)	9.1 ft (2.8 m) est.	4	4
MIR-22-13	<i>Nobska</i>	Fishing vessel	United States	99.8 ft (30.4 m)	25.3 ft (7.7 m)	13.6 ft (4.1 m)	5	44
MIR-22-14	<i>Sage Catherine Lane</i>	Fishing vessel	United States	78.7 ft (24.0 m)	20.4 ft (6.2 m)	7.0 ft (2.1 m)	3	60
MIR-22-03	<i>SM-3</i>	Fishing tender barge	United States	150.0 ft (45.7 m)	42.0 ft (12.8 m)	6.0 ft (1.8 m) est.	6	62
MIR-22-02	<i>Tenacious</i>	Fishing vessel	United States	50.5 ft (15.4 m)	15.8 ft (4.8 m)	6.0 ft (1.8 m)	5	64
OFFSHORE								
MIR-22-04	<i>Cheremie Bo-Truc No. 33</i>	Offshore supply vessel	United States	168.4 ft (51.4 m)	38.0 ft (10.0 m)	11.0 ft (3.4 m)	5	14
MIR-22-26	<i>SEACOR Power</i>	Liftboat	United States	166.5 ft (50.7 m)	103.0 ft (31.4 m)	9.3 ft (2.8 m)	19	8

REPORT NUMBER	VESSEL NAME	VESSEL TYPE	FLAG	LENGTH	BEAM/WIDTH	DRAFT	PERSONS ON BOARD	PAGE
PASSENGER								
MIR-22-25	Commodore	Ferry	United States	137.3 ft (41.8 m)	39.4 ft (12.0 m)	5.2 ft (1.6 m)	114	56
MIR-22-06	Wenatchee	Ferry	United States	460.2 ft (140.3 m)	90.0 ft (27.4 m)	17.3 ft (5.3 m)	13	66
TOWING/BARGE								
MIR-22-09	Ava Claire	Towing vessel	United States	84.0 ft (25.6 m)	20.0 ft (6.1 m)	8.5 ft (2.6 m)	4	18
MIR-22-22	Baxter Southern	Towing vessel	United States	120.0 ft (36.6 m)	35.0 ft (10.7 m)	7.0 ft (2.1 m)	8	12
MIR-22-24	Capt. Kirby Dupuis	Towing vessel	United States	120.0 ft (36.6 m)	35.0 ft (10.7 m)	11.6 ft (3.5 m)	6	36
MIR-22-27	Florida	Tractor tug	United States	80.0 ft (24.4 m)	32.0 ft (9.8 m)	11.0 ft (3.4 m)	4	20
MIR-22-09	HFL 437, HFL 439	Tank barges (Ava Claire tow)	United States	297.5 ft (90.7 m)	54.0 ft (16.5 m)	10.0 ft (3.0 m)	0	18
MIR-22-08	Kevin Michael	Towing vessel	United States	167.0 ft (50.9 m)	42.0 ft (12.8 m)	10.0 ft (3.0 m)	9	24
MIR-22-28	Marquette Warrior	Towing vessel	United States	166.0 ft (50.6 m)	45.0 ft (13.7 m)	9.6 ft (2.9 m)	9	58
MIR-22-17	Mary Lynn	Towing vessel	United States	141.0 ft (43.0 m)	35.0 ft (10.7 m)	8.5 ft (2.6 m)	6	40
MIR-22-05	Miss Dorothy	Towing vessel	United States	155.8 ft (47.5 m)	36.1 ft (11.0 m)	10.8 ft (3.3 m)	8	42
MIR-22-12	Proassist III	Towing vessel	United States	111.3 ft (33.9 m)	27.5 ft (8.4 m)	8.0 ft (2.4 m)	3	52
MIR-22-01	Robert Cenac	Towing vessel	United States	56.5 ft (17.2 m)	6.0 ft (1.8 m)	28.0 ft (8.5 m)	4	30
MIR-22-27	Sabine	Tractor tug	United States	96.0 ft (29.3 m)	34.0 ft (10.4 m)	12.0 ft (3.7 m)	4	20
MIR-22-01	SH 238	Barge (Robert Cenac tow)	United States	195.0 ft (59.4 m)	35.0 ft (10.7 m)	2.0 ft (0.6 m)	0	30
MIR-22-22	STC 3020	Tank barge (Baxter Southern tow)	United States	297.5 ft (90.7 m)	54.0 ft (16.5 m)	1.6 ft (0.5 m)	0	12
YACHT/BOAT								
MIR-22-16	La Dolce Vita	Yacht	Cayman Islands	100.0 ft (30.5 m)	20.0 ft (6.1 m)	5.7 ft (1.7 m)	6	38
MIR-22-29	Utopia IV	Yacht	United States	205.4 ft (62.6 m)	35.4 ft (10.8 m)	16.7 ft (5.1 m)	20	16

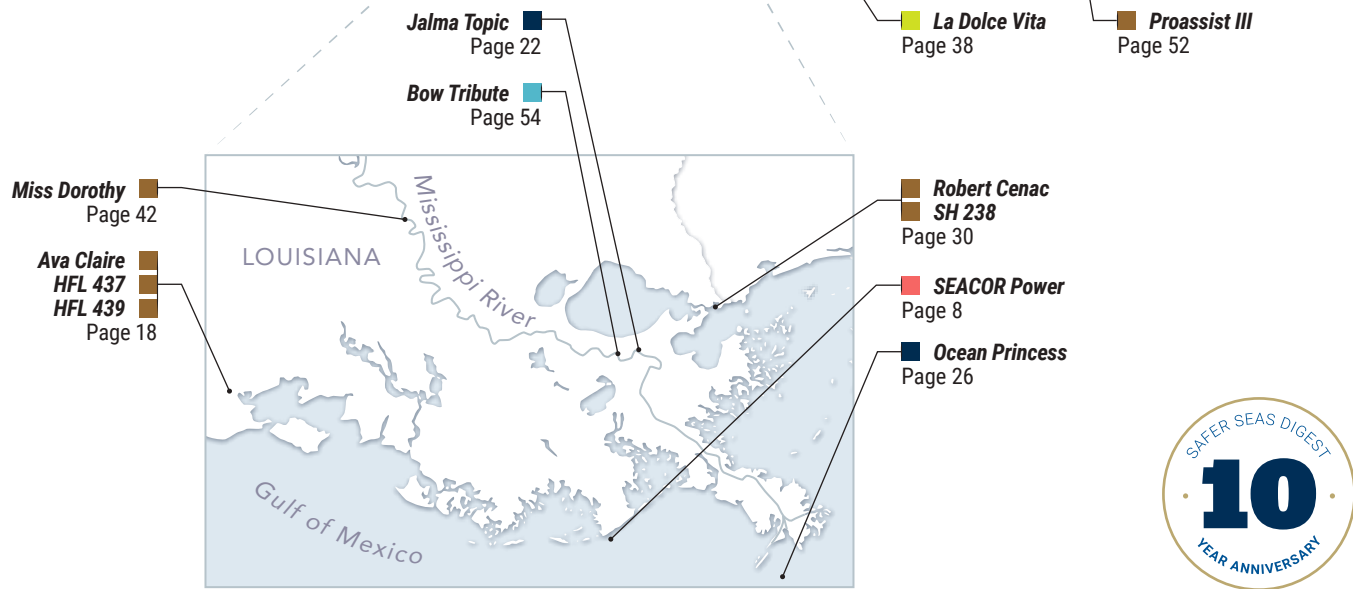
Table of Casualties and Location Map

VESSEL NAME	VESSEL GROUP AND TYPE	CASUALTY LOCATION	COORDINATES	PAGE
CAPSIZING/LISTING				
<i>Emmy Rose</i>	Fishing vessel	Atlantic Ocean, 27 miles northeast of Provincetown, Massachusetts	42°19.1351' N, 69°37.8461' W	4
<i>SEACOR Power</i>	Liftboat	Gulf of Mexico, 7 miles off coast of Port Fourchon, Louisiana	29°00.39' N, 90°11.85' W	8
COLLISION				
<i>Baxter Southern – STC 3020 / BNSF coal train</i>	Towing vessel – Tow's lead barge / Train cars	Upper Mississippi River, mile 372, near Galland, Iowa	40°30.4' N, 91°22.4' W	12
<i>Cheremie Bo-Truc No. 33 / Harry Claiborne</i>	Offshore supply vessel / US Coast Guard Cutter	Sabine Pass, Port Arthur, Texas	29°41.36' N, 93°50.33' W	14
<i>Utopia IV / Tropic Breeze</i>	Private yacht / Tank vessel	Northeast Providence Channel, 20 miles northwest of Nassau, Bahamas	25°17.48' N, 77°37.98' W	16
CONTACT				
<i>Ava Claire – HFL 437, HFL 439</i>	Towing vessel – Tank barges	Leland Bowman Lock, Gulf Intracoastal Waterway, mile 163W, near Intracoastal City, Louisiana	29°47.19' N, 92°12.49' W	18
<i>Gas Ares / Sabine / Florida</i>	Liquefied petroleum gas carrier / Tractor tugs	Motiva Port Neches Terminal, Neches River, Port Neches, Texas	29°59.57' N, 93°56.38' W	20
<i>Jalma Topic</i>	Bulk carrier	Lower Mississippi River, mile 93.5, New Orleans, Louisiana	29°57.34' N, 90°02.42' W	22
<i>Kevin Michael</i>	Towing vessel	Upper Mississippi River, mile 201.1, Alton, Illinois	38°52.30' N, 90°09.46' W	24
<i>Ocean Princess</i>	Bulk carrier	Gulf of Mexico, South Pass Block 83, near Pilottown, Louisiana	28°47.10' N, 89°14.53' W	26
<i>Riverside</i>	Oil Tanker	Corpus Christi Channel, Ingleside, Texas	27°49'6.9" N, 97°12'31.6" W	28
<i>Robert Cenac – SH 238</i>	Towing vessel – Tow's barge	Lake Borgne, near Slidell, Louisiana	30°09.28' N, 89°37.79' W	30
FIRE/EXPLOSION				
<i>Aleutian Falcon</i>	Fish processor	Pier 25, Tacoma Harbor, near Tacoma, Washington	47°17.05' N, 122°24.7' W	32
<i>Blue Dragon</i>	Fishing vessel	North Pacific Ocean, 350 miles offshore of Monterey, California	36°21.80' N, 128°18.70' W	34
<i>Capt. Kirby Dupuis</i>	Towing vessel	Ohio River, mile 501, near Belleview, Kentucky	39°00.44' N, 84°51.06' W	36
<i>La Dolce Vita</i>	Private yacht	Gulf of Mexico, 1 mile off Marquesas Key, 17 miles from Key West, Florida	24°36.94' N, 82°07.43' W	38
<i>Mary Lynn</i>	Towing vessel	Upper Mississippi River, mile 176, near St. Louis, Missouri	8°34.83' N, 90°13.06' W	40
<i>Miss Dorothy</i>	Towing vessel	Lower Mississippi River, mile 249, near Baton Rouge, Louisiana	30°34.33' N, 91°18.35' W	42
<i>Nobska</i>	Fishing vessel	Georges Bank, about 80 miles off Cape Cod Massachusetts	41°45.0' N, 68°15.0' W	44
<i>President Eisenhower</i>	Containership	Santa Barbara Channel, near Santa Barbara, California	34°14.5' N, 119°58.7' W	46
<i>Roger Blough</i>	Bulk carrier	Sturgeon Bay, Wisconsin	44°50.58' N, 87°23.13' W	48
FLOODING/HULL FAILURE				
<i>Proassist III</i>	Towing vessel	Caribbean Sea, near Puerto Yabucoa, Puerto Rico	18°01.14' N, 65°49.61' W	52
GROUNDING/STRANDING				
<i>Bow Tribute</i>	Tanker	Lower Mississippi River, near mile 104, New Orleans, Louisiana	29°57.39' N, 90°8.48' W	54
<i>Commodore</i>	Ferry	Bushwick Inlet, East River, Brooklyn, New York	40°43.48' N, 73°57.52' W	56
<i>Marquette Warrior</i>	Towing vessel	Lower Mississippi River, mile 538, Greenville, Mississippi	33°22.33' N, 91°06.68' W	58
<i>Sage Catherine Lane</i>	Fishing vessel	St. Marys Entrance, near Cumberland Island, Georgia	30°42.97' N, 81°25.11' W	60
<i>SM-3</i>	Fishing tender barge	Nushagak Bay, near Ekuak, Alaska	58°45.9' N, 158°27.5' W	62
<i>Tenacious</i>	Fishing vessel	Wells Passage, Prince William Sound, Alaska	60°45.74' N, 148°14.76' W	64
MACHINERY DAMAGE				
<i>Wenatchee</i>	Ferry	Puget Sound, near Seattle, Washington	47°40.460' N, 122°28.540' W	66



VESSEL GROUP KEY

- Cargo, Dry Bulk
- Cargo, General
- Cargo, Liquid Bulk
- Combatant/Military
- Fishing
- Offshore
- Passenger
- Towing/Barge
- Yacht/Boat



Acknowledgment

For each marine accident 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:



Figure 142. NTSB and Coast Guard personnel aboard Coast Guard Cutter *Sycamore* conducting ROV operations to survey the sunken *Emmy Rose*. SOURCE: COAST GUARD

REPORT NUMBER	VESSEL NAME	UNIT
MIR-22-10	<i>Aleutian Falcon</i>	Coast Guard Sector Puget Sound
MIR-22-09	<i>Ava Claire</i>	Coast Guard Marine Safety Detachment Lafayette
MIR-22-22	<i>Baxter Southern</i>	Coast Guard Marine Safety Detachment Quad Cities
MIR-22-20	<i>Blue Dragon</i>	Coast Guard Sector San Francisco
MIR-22-11	<i>Bow Tribute</i>	Coast Guard Sector New Orleans
MIR-22-24	<i>Capt. Kirby Dupuis</i>	Coast Guard Marine Safety Detachment Cincinnati
MIR-22-04	<i>Cheramie Bo-Truc No. 33 / Harry Claiborne</i>	Coast Guard Marine Safety Unit Port Arthur
MIR-22-25	<i>Commodore</i>	Coast Guard Sector New York
MIR-22-21	<i>Emmy Rose</i>	Coast Guard District 1 Formal Investigation Team
MIR-22-27	<i>Gas Ares</i>	Coast Guard Marine Safety Detachment Port Arthur
MIR-22-23	<i>Jalma Topic</i>	Coast Guard Sector New Orleans
MIR-22-08	<i>Kevin Michael</i>	Coast Guard Sector Upper Mississippi River
MIR-22-16	<i>La Dolce Vita</i>	Coast Guard Sector Key West
MIR-22-28	<i>Marquette Warrior</i>	Coast Guard Marine Safety Detachment Vicksburg
MIR-22-17	<i>Mary Lynn</i>	Coast Guard Sector Upper Mississippi River
MIR-22-05	<i>Miss Dorothy</i>	Coast Guard Marine Safety Unit Baton Rouge
MIR-22-13	<i>Nobska</i>	Coast Guard Marine Safety Detachment New Bedford
MIR-22-18	<i>Ocean Princess</i>	Coast Guard Sector New Orleans
MIR-22-15	<i>President Eisenhower</i>	Coast Guard Sector Los Angeles/Long Beach
MIR-22-12	<i>Proassist III</i>	Coast Guard Sector San Juan
MIR-22-07	<i>Riverside</i>	Coast Guard Sector Corpus Christi
MIR-22-01	<i>Robert Cenac</i>	Coast Guard Sector New Orleans
MIR-22-19	<i>Roger Blough</i>	Coast Guard Sector Lake Michigan
MIR-22-14	<i>Sage Catherine Lane</i>	Coast Guard Sector Jacksonville
MIR-22-26	<i>SEACOR Power</i>	Coast Guard Marine Board of Investigation
MIR-22-03	<i>SM-3</i>	Coast Guard Sector Anchorage
MIR-22-02	<i>Tenacious</i>	Coast Guard Marine Safety Unit Valdez
MIR-22-29	<i>Utopia IV / Tropic Breeze</i>	Coast Guard Sector Miami
MIR-22-06	<i>Wenatchee</i>	Coast Guard Sector Puget Sound

Who Has the Lead: USCG or NTSB?



In a memorandum of understanding signed June 17, 2021, the NTSB and the US 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 Chair and the Coast Guard Commandant, or their designees, will determine which agency will lead the investigation.

The NTSB may lead the investigation of major marine casualties, defined in the memorandum of understanding as involving another transportation mode; 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.



Figure 144. NTSB, Coast Guard, and Woods Hole Institute staff, and *Emmy Rose* owner aboard Coast Guard vessel *Sycamore* en route to *Emmy Rose* location discussing ROV dive operations. SOURCE: COAST GUARD

Figure 143. Coast Guard personnel inspecting the *Cheremie Bo-Truc* No. 33.



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NTSB Office of Marine Safety

The Office of Marine Safety investigates and determines the probable cause of major marine casualties in US territorial waters, major marine casualties involving US-flagged vessels worldwide, and accidents involving both US public (federal) and nonpublic vessels in the same casualty. In addition, the office investigates select catastrophic marine accidents and events of a recurring nature.

The Coast Guard conducts preliminary investigations of all marine accidents and notifies the NTSB when an event qualifies as a major marine casualty, which includes any one of the following:

- 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 US Coast Guard and concurred with by the NTSB chair, to life, property, or the environment by hazardous materials.

After investigating each major marine casualty, the Office of Marine Safety identifies safety issues and issues an investigation report, 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.

The office is also responsible for the overall management of the NTSB's international marine safety program. Under the International Maritime Organization Code of International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident, the office participates with the US Coast Guard as a substantially interested State in investigations of serious marine casualties involving foreign-flagged vessels in international waters. For example, the NTSB often participates in casualty investigations that involve foreign-flagged cruise ships with US citizens on board. Accidents involving foreign-flagged vessels accounted for 29 percent of NTSB marine casualty investigations over the past 5 years.

The Office of Marine Safety also actively participates in US-based and international groups to improve marine investigations and promote maritime safety. This includes—

- reviewing US position papers related to marine casualty investigation.
- participation at International Maritime Organization meetings.
- tracking developments in marine casualty investigation and prevention.
- cooperation with other marine casualty investigation organizations worldwide.

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.

Figure 145. NTSB investigator Derek Johnston examines the main diesel engine during the *Capt. Kirby Dupuis* investigation.

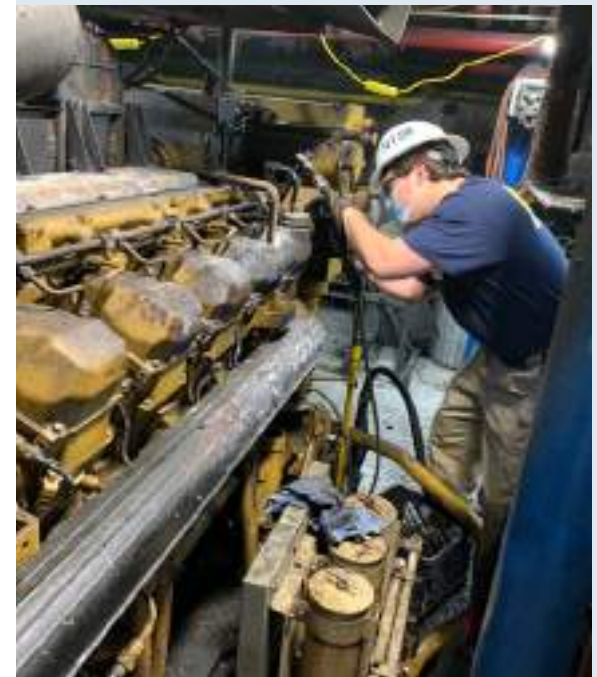




Figure 146. NTSB investigator Marcel Muise inspecting the *SEACOR Power*'s leg post-casualty.



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