SAFER SEAS DIGEST 2018

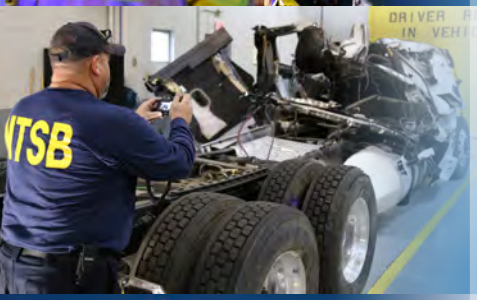
LESSONS LEARNED FROM MARINE ACCIDENT INVESTIGATIONS

NTSB National Transportation Safety Board

NTSB/SPC-19-01

AVIATION

RAILROAD



HIGHWAY

MARINE

PIPELINE

MAKING

TRANSPORTATION

SAFER

TOGETHER

NTSB | National Transportation Safety Board

MISSION

THE NATIONAL TRANSPORTATION SAFETY BOARD (NTSB) IS AN INDEPENDENT FEDERAL AGENCY CHARGED BY CONGRESS WITH INVESTIGATING EVERY CIVIL AVIATION ACCIDENT IN THE UNITED STATES AND SIGNIFICANT ACCIDENTS IN OTHER MODES OF TRANSPORTATION — MARINE, RAILROAD, HIGHWAY, AND PIPELINE.

THE NTSB DETERMINES THE PROBABLE CAUSE OF THE ACCIDENTS AND ISSUES SAFETY RECOMMENDATIONS AIMED AT PREVENTING FUTURE ACCIDENTS. IN ADDITION, THE NTSB CARRIES OUT SPECIAL STUDIES CONCERNING TRANSPORTATION SAFETY AND COORDINATES THE RESOURCES OF THE FEDERAL GOVERNMENT AND OTHER ORGANIZATIONS TO PROVIDE ASSISTANCE TO VICTIMS AND THEIR FAMILY MEMBERS IMPACTED BY MAJOR TRANSPORTATION DISASTERS.

SAFER SEAS DIGEST 2018

LESSONS LEARNED FROM MARINE ACCIDENT INVESTIGATIONS

Figure 1. NTSB investigators prepare to enter and survey the fire-damaged *Caribbean Fantasy* in San Juan, Puerto Rico.

A MESSAGE FROM THE CHAIRMAN

The 30 marine accidents included in *Safer Seas Digest 2018* involved contact with fixed objects, breakaways, sinkings, collisions, fires, floodings, groundings, and other vessel damage. The vessels ranged from personal crafts to oceangoing passenger ships and vehicle carriers.

The accidents recounted here resulted in numerous injuries and significant property damage, and worst of all, the loss of nine crewmembers and passengers. While reading through these accidents, I was struck more than once by how many of them could have become even greater tragedies.

But I was also struck by what an effective teacher experience can be, if we choose to learn the lessons of accidents. The "Lessons Learned" section at the end of this publication should be of interest to mariners and management alike.

The safety issues examined in the 2018 edition of *Safer Seas* include:

- High-water/high-current conditions
- Watertight integrity
- Training for emergencies
- Remote emergency shutdowns
- Ice accumulation
- Reporting issues
- Cooling water chemistry
- Threaded fasteners and components
- Mooring in strong winds
- Identifying navigation hazards
- Fixed ventillation openings
- Recognizing metal fatigue in propeller shafting
- Precautions while unloading catch
- Alernative emergency communications in Alaska region

This publication's immediate predecessor, *Safer Seas Digest 2017*, included sweeping recommended changes to marine safety that will reverberate for years to come after the seminal sinking of the cargo vessel *El Faro*. While the investigations recapped here in *Safer Seas Digest 2018* drew less public notice, the lessons that can be learned, and the improvements that can be implemented, are likewise impressive.

The US Coast Guard is integral to the NTSB's marine investigations. Our relationship is an outstanding example of government collaboration focused on saving lives and improving safety. Every accident presented in this report was supported in a variety of ways by the men and women of the Coast Guard, and my sincerest thanks go out to every one of them who assisted us this year. The Coast Guard units that worked with the NTSB in these accidents are listed on page 76.

With every investigation we conduct, the lessons that we learn can prevent future losses—when marine stakeholders at all levels of the industry apply these lessons. I hope that *Safer Seas Digest 2018* provides the marine industry with essential information to better understand the safety issues confronting it as well as the NTSB safety recommendations that can address those issues.

Sincerely,

Robert L. Sumwalt, III
Chairman

Vessels covered in this digest, listed by group

VESSEL GROUP	NAME	VESSEL TYPE	ACCIDENT TYPE
CARGO	*Alliance St. Louis*	Vehicle carrier	Fire/Explosion
	Helsinki Bridge	Containership	Allision
	Honor	Vehicle carrier	Fire/Explosion
	Mia S	Bulk carrier	Allision
	Nenita	Bulk carrier	Grounding
FISHING	*Ambition*	Fish tender	Flooding
	Ben & Casey	Fishing	Flooding
	Destination	Fishing	Capsizing/Listing
	Lady Demaris	Fishing	Flooding
	Langley Douglas	Fishing	Capsizing
	Southern Bell	Fishing	Grounding
	St. Dominick	Fishing	Grounding
GOVERNMENT	*CG 29113*	Response boat–small	Allision
OFFSHORE SUPPLY	(none)	–	–
PASSENGER	*Caribbean Fantasy*	Ro/Pax	Fire/Explosion
	Island Lady	Small passenger vessel	Fire/Explosion
RECREATIONAL	*Best Revenge 5*	Sailing	Fire/Explosion
	Vanguard Sailboat	Sailing	Allision
TANKER	*Aframax River*	Crude oil tanker	Allision

VESSEL GROUP	NAME	VESSEL TYPE	ACCIDENT TYPE
TOWING/BARGE	*Atlantic Raider*	Towing	Flooding
	Cooperative Venture	Towing	Allision
	Eric Haney	Towing	Grounding
	George King	Towing	Fire/Explosion
	Gracie Claire	Towing	Capsizing
	J.W. Herron	Towing	Fire/Explosion
	James H Hunter	Towing	Allision
	Marguerite L. Terral	Towing	Allision
	Ricky Robinson	Towing	Capsizing
	Savage Ingenuity	Towing	Flooding
	Steve Plummer	Towing	Allision
	Todd Brown	Towing	Collision
	Troy McKinney	Crane barge	Contact

ABBREVIATIONS

AB	able-bodied seaman
AIS	automatic identification system
CO_2	carbon dioxide
ECR	engine control room
ECS	electronic charting system
EOT	engine order telegraph
EPIRB	emergency position-indicating radio beacon
hp	horsepower
ISM Code	International Safety Management Code
MES	marine evacuation system
MF	medium frequency
MGO	marine gas oil
mph	miles per hour
NOAA	National Oceanic and Atmospheric Administration
NTSB	National Transportation Safety Board
OEM	original equipment manufacturer
SAR	search and rescue
SCBA	self-contained breathing apparatus
SMS	safety management system
rpm	revolutions per minute
Ro/Ro	roll-on/roll-off
Ro/Pax	Ro/Ro passenger vessel
VDR	voyage data recorder
VHF	very high frequency

SAFER SEAS DIGEST 2018

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- **RECREATIONAL**
- **TANKER**
- **TOWING/BARGE**

VESSEL GROUP **TANKER**

Allision of Tanker *Aframax River* with Mooring Dolphins and Subsequent Fire in Waterway

LOCATION
HOUSTON SHIP CHANNEL
NEAR DEER PARK, TEXAS

ACCIDENT DATE	REPORT NUMBER
SEPTEMBER 6, 2016	**MAB1806**
ACCIDENT ID	ISSUED
DCA16FM055	**FEBRUARY 22, 2018**

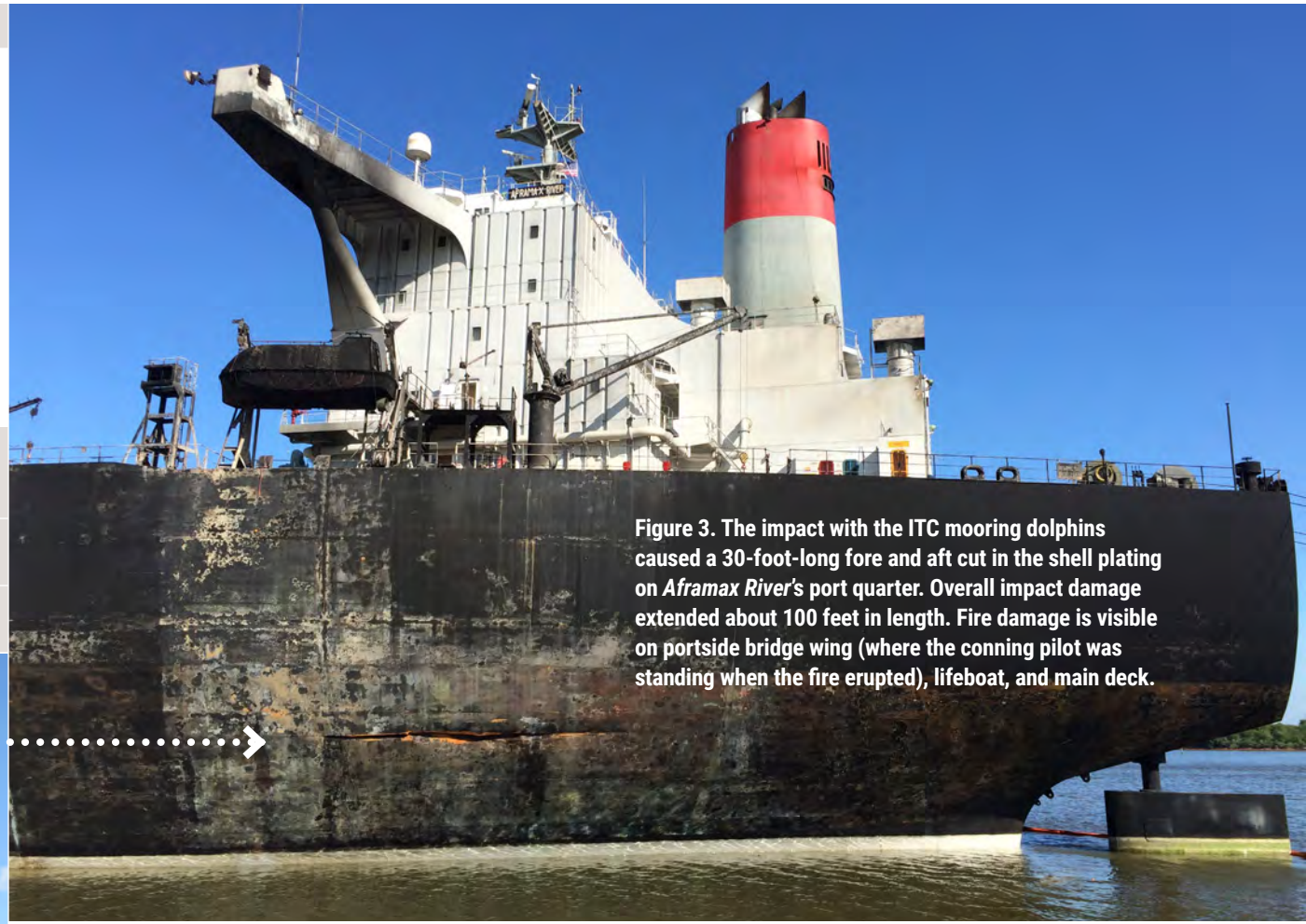


Figure 3. The impact with the ITC mooring dolphins caused a 30-foot-long fore and aft cut in the shell plating on *Aframax River*'s port quarter. Overall impact damage extended about 100 feet in length. Fire damage is visible on portside bridge wing (where the conning pilot was standing when the fire erupted), lifeboat, and main deck.

On September 6, 2016, about 0005, the tanker *Aframax River* allided with two mooring dolphins in the Houston Ship Channel near Deer Park, Texas. The allision punctured the ship's hull plating, and about 88,000 gallons of low-sulfur marine gas oil spilled into the water. The oil ignited and burned for about 45 minutes. The two onboard pilots sustained minor burns, and the property damage exceeded $1.5 million.

At 2306 on the evening before the accident, the two pilots had boarded the fully ballasted *Aframax River* at the Houston Fuel Oil dock in preparation for taking the ship outbound to sea. At 2336, the conning pilot ordered the mooring lines let go. At 2342, with the tugboat *Jess Newton* made up alongside the tanker's port quarter and the tugboat *Gasparilla* alongside its port bow, the *Aframax River* was pulled away from the dock.

Figure 2. Dolphin no. 78B with damaged upper edge at the point of impact.

At 2359, the conning pilot ordered dead-slow-astern propulsion (30 rpm). The third officer acknowledged the engine order and used the engine order telegraph (EOT) to initiate the astern propulsion; he observed the ship's rpm indicator reach 30 rpm and confirmed the completion of the order to the bridge team.

At 0002 on September 6, the second engineer in the engine control room (ECR) called the bridge to report that the ECR's rpm indicator was showing 80 rpm even though the ECR's EOT showed the bridge command input of dead slow astern—which should have been only 30 rpm. The third officer replied that the bridge rpm indicator was also showing 80 rpm, and he informed the bridge team of this fact as well. On hearing this information, the conning pilot immediately ordered "all stop." The third officer acknowledged the order and placed the EOT in the stop position, but the rpm indicator still showed 80 rpm and the vessel's astern movement increased. At 0003, to counteract the ship's astern speed, the conning pilot ordered dead slow ahead, but the astern movement continued. At 0004, the conning pilot ordered slow-ahead propulsion, then half ahead, and then full ahead, but the ship's astern movement was not slowing, and the engine was not responding.

The conning pilot also issued commands to the two harbor tugboats to help reduce the tanker's astern movement, but they had little success. Realizing that there was imminent risk of striking the nearby docks or any of the four tankers moored at the Intercontinental Terminals Company (ITC) facility, the conning pilot ordered the tugboats to use all available means to counter the ship's astern movement. The ***Aframax River*** was now moving at about 3.5 knots in an astern direction.

The conning pilot ordered both anchors released. At 0005, the chief engineer took control of the main engine and pressed the emergency stop button in the ECR; he told investigators that once he did so, the engine tachometer started to decrease from 80 rpm.

Figure 4. *Aframax River* after the allision with dolphin no. 78B. Tugboat *David B* is in the foreground rendering assistance.
IMAGE COURTESY OF ITC CITY DOCK SECURITY VIDEO

At the same time, the port side of the ***Aframax River*** struck ITC mooring dolphin no. 78A at 3.2 knots. Within seconds of the impact, the tanker's port quarter struck ITC dolphin no. 78B. The second allision tore an approximately 30-foot-long opening on the ship's port quarter hull near the no. 2 fuel oil tank. Marine gas oil (MGO) immediately began pouring out of the hull opening. As the tanker continued aft, its hull plating was further cut and deformed inward by contact with the mooring dolphins. The friction and the cutting of the hull plating generated heat, which ignited the MGO and triggered a large fire with thick, black bellowing smoke that engulfed the ship's port quarter and the adjacent main deck, all the way up past the port bridge wing.

The fire on the water's surface extended to the bow of harbor tugboat ***Jess Newton***, which was secured to the tanker's port quarter. The tugboat's deckhand closed all doors and activated the fire sprinkler system. The heat of the fire melted and parted the line at the ship's chock. The ***Jess Newton*** crew repositioned the tugboat just forward of the ***Aframax River***'s superstructure and applied full-ahead propulsion to move the tanker farther from the ITC terminal.

The ship's crewmembers donned their firefighting gear and reported to their four assigned fire stations. As an additional fire-fighting measure, the chief officer pressed up the no. 1 port and starboard ballast tanks that were already 90-percent full. Consequently, ballast water started to flow out onto and down the main deck, providing a 15- to 18-inch-deep water blanket that ran aft across the entire cargo deck and overboard.

At 0009, the tugboat ***David B*** arrived on scene and was positioned just forward of the ***Aframax River***'s starboard-side superstructure. Several other tugboats and fire boats also eventually arrived and assisted. Despite the serious danger to life and property, the vessels remained alongside the ***Aframax River***, maneuvering the disabled ship away from the other tankers and adjacent chemical facilities. Crews battled the flames and eventually extinguished the fire about 0118.

According to the manufacturer of the main propulsion engine control systems, the actuator system on the ***Aframax River***'s main engine governor experienced a momentary abnormality. Investigators believe that the abnormality likely resulted from an electrical and/or mechanical failure of the system, which led to loss of engine control while the vessel was engaged in astern propulsion.

The NTSB determined that the probable cause of the *Aframax River*'s allision with mooring dolphins and the subsequent fire in the waterway was a momentary abnormality of the tanker's main engine governor actuator system in responding to command inputs from the bridge.

VESSEL GROUPS **GOVERNMENT** **RECREATIONAL**

Towing by Coast Guard Response Boat *CG 29113* of Vanguard Sailboat, Resulting in Loss of Propulsion and Allision with Highway 11 Bridge

LOCATION
LAKE PONTCHARTRAIN, LOUISIANA

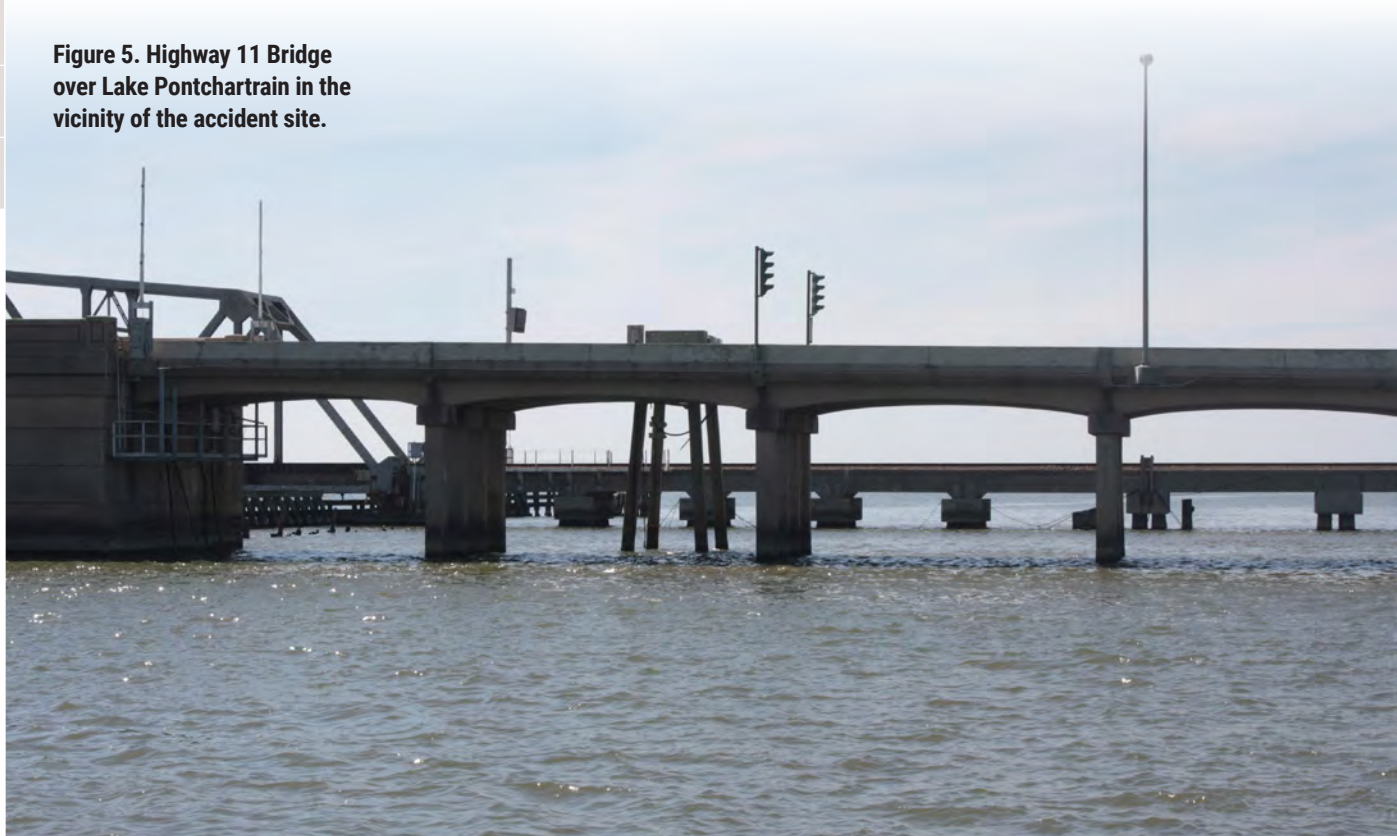
ACCIDENT DATE	REPORT NUMBER
MAY 3, 2017	**MAB1812**
ACCIDENT ID	ADOPTED
DCA17PM012	**MAY 22, 2018**

On May 3, 2017, about 1832, the US Coast Guard response boat ***CG 29113*** allided with the Highway 11 Bridge while responding to a non-distress search-and-rescue case involving an adrift sailboat in Lake Pontchartrain, Louisiana. The accident caused a minor injury to one of the four Coast Guard crewmembers and damage estimated at $337,000 to the ***CG 29113***. The sailboat, valued at $20,000, eventually sank.

At 1515 on the day of the accident, Coast Guard Sector New Orleans received a call from the St. Tammany Parish Sheriff's Office reporting that a 32-foot-long dilapidated sailboat with no one on board was adrift in the area near the Highway 11 Bridge in Lake Pontchartrain. The day before, the owner had inadvertently grounded the sailboat on a nearby sandbar and, late that evening, abandoned the vessel after reportedly securing it with two anchors. The sailboat had subsequently become dislodged and, on the day of the accident, authorities could not reach the owner to retrieve the sailboat. Sector New Orleans directed Coast Guard Station New Orleans to launch a vessel to assess the situation and, if safe to do so, tow the vessel to keep it from striking the bridge or, in general, presenting a hazard to navigation.

Figure 6. A Coast Guard response boat similar to the *CG 29113*. PHOTO BY COAST GUARD

Figure 5. Highway 11 Bridge over Lake Pontchartrain in the vicinity of the accident site.



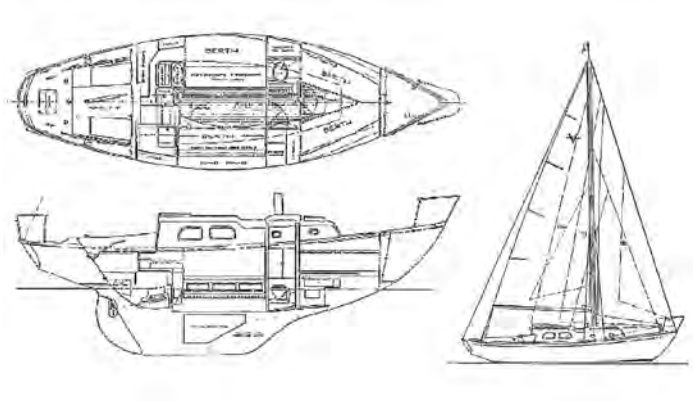


Figure 7. Drawings of a 1966 Pearson Vanguard 32 sailboat. IMAGE BY PEARSON

Accordingly, Station New Orleans launched the 29-foot-long response boat-small *CG 29113* with four crewmembers aboard—a coxswain, two boatswain's mates, and a seaman. At 1729, the crew located the sailboat, which had drifted up against the Highway 11 Bridge. The crew, with shoreside consent and approval, decided to tow the sailboat from the scene.

Because of the sailboat's position against the bridge and because the jib sail covered the forward bitt, the Coast Guard crewmembers were unable to tow the sailboat in a standard configuration from its bow. Instead, they attached a bridle to two bitts on the sailboat's stern to tow the vessel in a stern-to-stern configuration.

About this time, the weather began to deteriorate due to strong thunderstorms in the area. A small craft advisory had been issued that morning, but the conditions were not expected to deteriorate significantly until later that evening. However, during the tow, the winds were gusting up to 39 mph, and the waves reached 4–6 feet. The crew observed waves washing over the sailboat's stern, which by design was already low to the waterline, and the vessel started taking on water.

The crew then tried to reconfigure the tow, but in the course of doing so, the sailboat began to sink in the high waves. In addition, its mast broke and struck the *CG 29113*'s taffrail (a handrail around the deck area at the stern of the Coast Guard boat). While dodging the falling mast, the crew tossed the detached bridle lines into the water and also tried to manuever the *CG 29113* away from the sailboat to avoid a collision. About that same time, the *CG 29113* lost engine power and propulsion. After the crewmembers tried unsuccessfully to restart the engines, they saw that the bridle lines were fouled in the propellers and they tried to clear them.

Meanwhile, the waves and the strong current caused the *CG 29113* to drift into the Highway 11 Bridge, alliding with the bridge's fendering system and concrete pilings. The initial impact was on the *CG 29113*'s starboard side. The vessel then drifted under the bridge, and its port side struck the pilings. Eventually, the crewmembers were able to restart the port engine and maneuvered the *CG 29113* to a safe area northeast of the bridge. Once away from the bridge, the crew managed to also restart the starboard engine and proceeded to the nearest ramp. The sailboat ultimately sank.

The Coast Guard's decision to attempt a tow was reasonable, as the sailboat had drifted up against a highway bridge, presented a general hazard to navigation, and may potentially have been leaking fuel. The sailboat's position against the bridge did not allow for a standard towing configuration, and the onset of thunderstorms produced increasing winds and waves that further complicated the tow.

The NTSB determined that the probable cause of the towing accident involving Coast Guard response boat *CG 29113* and an adrift Vanguard sailboat was the challenging circumstances during a stern-to-stern tow in deteriorating weather conditions, which fouled the *CG 29113*'s propellers and caused a loss of propulsion. Contributing to the accident was the dilapidated state of the sailboat, which complicated the attempt to tow the vessel, which subsequently sank.

Figure 8. Starboard-side damage to the *CG 29113*.

VESSEL GROUP **TOWING/BARGE**

Allision of *Cooperative Venture* Tow with St. Paul Union Pacific Rail Bridge

LOCATION
UPPER MISSISSIPPI RIVER
MILE 835.7; NEAR ST. PAUL, MINNESOTA

ACCIDENT DATE	REPORT NUMBER
OCTOBER 26, 2017	**MAB1823**
ACCIDENT ID	ISSUED
DCA18FM003	**OCTOBER 18, 2018**

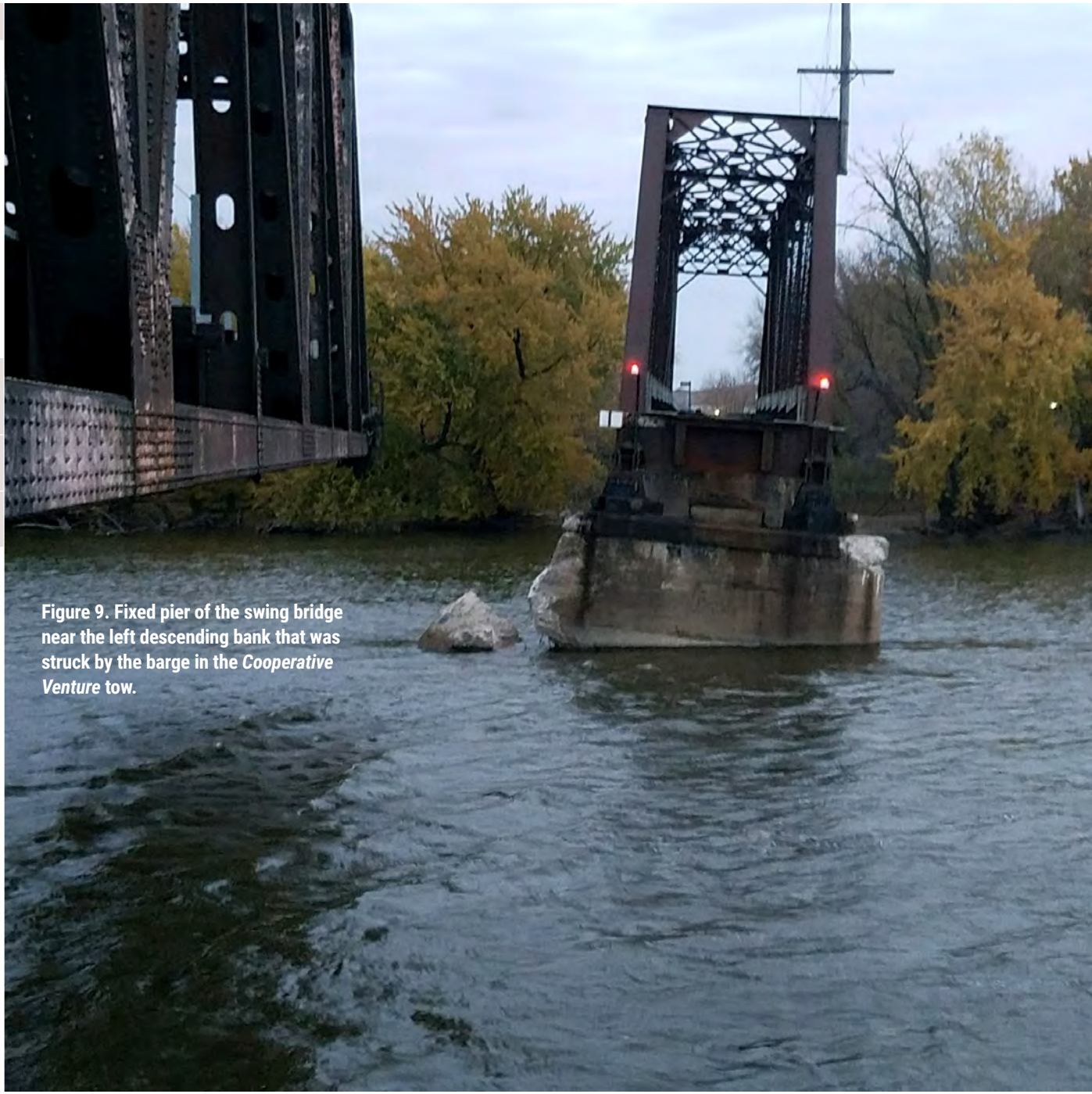


Figure 9. Fixed pier of the swing bridge near the left descending bank that was struck by the barge in the *Cooperative Venture* tow.

About 0230 on October 26, 2017, the towing vessel ***Cooperative Venture***, with a crew of 10, was pushing 12 barges downbound on the Mississippi River near St. Paul, Minnesota. As the vessel approached the St. Paul Union Pacific Rail Bridge at mile 835.7, the lead barge on the port side struck a fixed pier of the swing bridge. There were no reported injuries or pollution. Damages to the bridge and barge were estimated at $800,000 and $153,000, respectively.

About 0200 on the day of the accident, the ***Cooperative Venture*** departed the Upper River Services fleet at mile 838.9 pushing 12 loaded barges full of soybeans. The tow was configured three barges across by four deep. As the tow left the fleeting area, the pilot called the bridge tender of the St. Paul Union Pacific Rail Bridge, located 3.2 miles downriver, to report that the ***Cooperative Venture*** would be passing through the area and to request that the swing bridge be opened. The bridge typically took about a minute to open. The ***Cooperative Venture*** pilot also requested the assistance of an additional towboat to guide the head of the tow through the bridge. He told investigators that using assist vessels when navigating a tow through the rail bridge was not a requirement but a "suggested practice" by other pilots. About a mile above the bridge, the 800-horsepower fleet towboat ***White Rock*** met the ***Cooperative Venture*** and faced up (connected) to the center lead barge to assist the tow with passage through the bridge.

As the ***Cooperative Venture*** pilot approached the bridge, he sought the advice of the ***White Rock*** captain about how to navigate the span. The captain advised him to stay to the red buoy side of the channel, near the left descending bank, because the current was stronger on the other bank. Yet, at about 0223, the ***Cooperative Venture***'s electronic charting system recording indicates that the pilot positioned the vessel's stern closer to the green buoys, near the right descending bank. At an estimated 2 mph, the following current along the right descending bank, where the towboat was situated, was moving faster than in the river closer to the left descending bank, where the head of the tow was positioned.

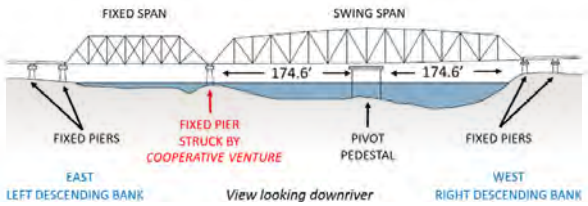


Figure 10. St. Paul Union Pacific Rail Bridge in closed position, as approached by *Cooperative Venture*.
SOURCE: US ARMY CORPS OF ENGINEERS

Figures 11 and 12. Damage from allision: (above) raked bow of port lead barge, *ART 35157*; (below) downstream view of the swing bridge's fixed pier near the left descending bank that was struck by the barge.

While transiting along the right descending bank, the pilot made several heading changes to align the vessel with the opening of the left span to pass through the bridge. As the tow approached the span, the pilot of the ***Cooperative Venture*** increased the vessel's speed from 3 to 4 mph and steered to starboard to increase the turn rate of the head of the tow. To help pivot the tow away from the bridge pier, the captain of the ***White Rock***, which was still faced up to the center lead barge, placed his throttles to full ahead and turned his rudders hard to starboard. The pilot, nonetheless, was unable to properly navigate the ***Cooperative Venture*** tow, and at 0230, the bow of the lead barge on the port side, ***ART 35157***, allided with the east fixed pier of the swing bridge, puncturing the barge's bow and damaging the concrete pier.

In a postaccident interview, the pilot stated that he had been through the St. Paul Union Pacific Rail Bridge about 8 times as a deckhand and a steersman, but only once as a pilot prior to the accident. For the accident voyage, the vessel operator assigned a pilot who had navigated through the St. Paul Union Pacific Rail Bridge only once as a pilot. Although the pilot had worked on towboats for many years, he had limited experience operating in this position and had only a week of formal maritime training. Furthermore, the pilot sought the advice of the ***White Rock*** captain just before approaching the bridge, demonstrating his lack of certainty for maneuvering the tow through the span.

The NTSB determined that the probable cause of the allision of the towing vessel *Cooperative Venture* with the St. Paul Union Pacific Rail Bridge was the operating company's assignment of an inexperienced pilot who incorrectly positioned the tow prior to maneuvering through a turn with a following current when approaching the bridge span.

VESSEL GROUP **CARGO**

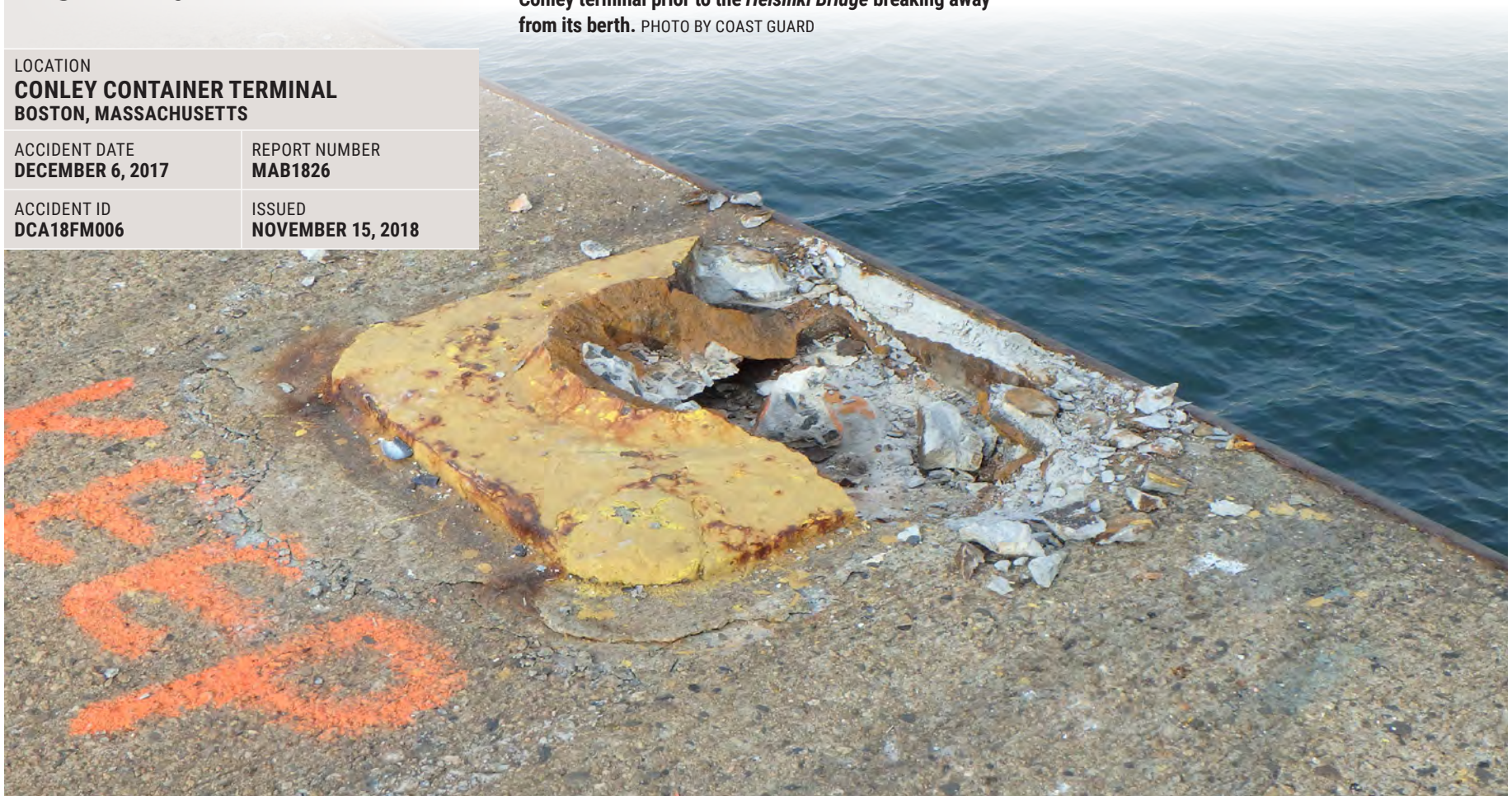
Breakaway of Containership *Helsinki Bridge* and Subsequent Allision with Black Falcon Cruise Terminal

LOCATION
CONLEY CONTAINER TERMINAL
BOSTON, MASSACHUSETTS

ACCIDENT DATE	REPORT NUMBER
DECEMBER 6, 2017	**MAB1826**
ACCIDENT ID	ISSUED
DCA18FM006	**NOVEMBER 15, 2018**

On December 6, 2017, at 0003, the containership *Helsinki Bridge* was moored at the Paul W. Conley Container Terminal in Boston, Massachusetts. While the vessel was engaged in cargo operations during a period of moderate-to-high winds, a mooring bollard to which five of the vessel's head lines were secured failed. As a result of the bollard failure, the wind caused the vessel to drift away from the terminal and the remaining nine mooring lines to part. The vessel's bow then swung across the channel and struck the Raymond L. Flynn Black Falcon Cruise Terminal pier. There were no reports of pollution and no injuries. The damage was estimated at $570,000 for the vessel and $40,500 for both terminals.

Figure 13. Remaining base of bollard that failed at the Conley terminal prior to the *Helsinki Bridge* breaking away from its berth. PHOTO BY COAST GUARD



The morning before the accident, the *Helsinki Bridge* had docked port side to berths 11 and 12 at the terminal. The two berths had bollards spaced every 50 feet that were load-rated for a mix of 40 to 125 tons.

The docking pilot and the master had discussed that winds in the area were expected to exceed gusts of 40 knots and agreed that, given the forecast, a total of 14 mooring lines were needed, including 5 headlines and 5 stern lines. This mooring arrangement exceeded the docking pilot's usual recommendation of 12 mooring lines.

During the docking, the chief mate, who was on the bow, instructed the line handlers to place the first two head lines on a bollard just forward of the bow,

which was rated at 40 tons. The chief mate then directed the line handlers to place the next two head lines on the next bollard forward of the bow beyond where construction crews had placed a temporary fence. However, the line handlers were informed by the construction crew and Massport personnel that they were not allowed to use any bollards beyond the temporary fence. The next two head lines were therefore placed on the same bollard as the first two. A fifth head line was added to the same bollard.

Later that night, the forecasted high winds arrived. At 0003, the winds caused the bollard to which the five head lines were secured to be torn off its base. The ***Helsinki Bridge*** began to drift away from the container terminal in a northerly direction. In just a few minutes, the remaining seven lines also parted, in succession from forward to aft, as the ship continued to be blown out into the channel to almost a 45-degree angle from its berth. After learning of the breakaway, the master ordered all deckhands to their respective mooring stations. He also ordered the crew to walk out the starboard anchor to "one shackle above the water." The ship continued to swing, and at 0006, its bulbous bow struck the Black Falcon pier.

The master of the ***Helsinki Bridge*** was responsible for ensuring that the vessel was safely and securely moored upon its arrival and during cargo operations at the terminal. If he had any reservations about the berth or the safety of his vessel while moored there, he could have made arrangements to shift the vessel. The master stated that he did not consider shifting the vessel aft at the terminal to adjust the mooring arrangement because the mooring location was decided by the port authority.

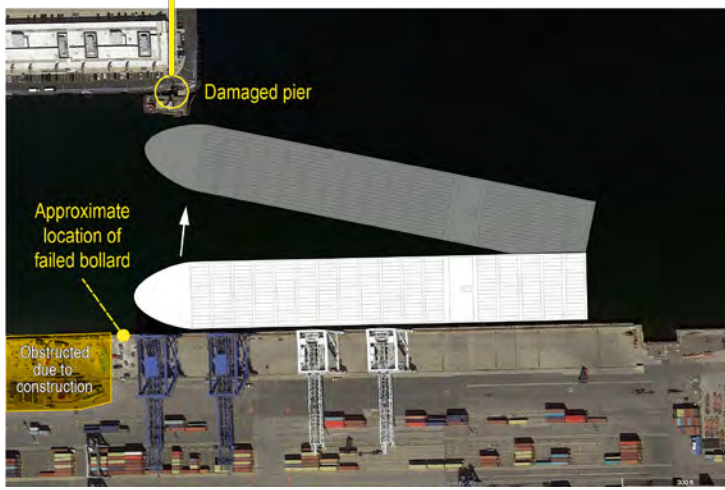
Although the master was not responsible for knowing the condition or load rating of the bollards, he was aware that all five head lines had been placed on one bollard. If the berthing arrangement did not meet the master's satisfaction, it was still his responsibility to take some mitigating action, especially considering the onset of forecasted winds. Such action could have included dropping an offshore anchor underfoot, bringing the bow thrusters online, or calling for tug assistance.

Figure 14. Preaccident photo of *Helsinki Bridge* under way. PHOTO BY MATTHIAS BOERSCHKE AT WWW.VESSELTRACKER.COM

Massport was responsible for furnishing a berth suitable for the vessel, with unobstructed access to a sufficient number of mooring bollards. Having known prior to the containership's arrival the particulars of the vessel, as well as the issues concerning the ongoing construction at the pier, Massport could have consulted with the vessel's representatives and explored whether suitable or alternative mooring arrangements were necessary.

The NTSB determined that the probable cause of the breakaway of the containership *Helsinki Bridge* and subsequent allision with the Black Falcon Cruise Terminal was the failure of Massachusetts Port Authority to provide suitable berthing arrangements during ongoing construction at the Conley Container Terminal, which resulted in the overloading and failure of a single mooring bollard. Contributing to the accident was the lack of preparation by the vessel's master, who was aware of the less than suitable mooring arrangements and the deteriorating weather forecast but took no mitigating action to address the situation.

PHOTO BY COAST GUARD



Figures 15 and 16. Above, damage to Black Falcon pier; below, approximate location and scale view of *Helsinki Bridge* alongside Conley Terminal and vessel's drift after breakaway. Also shown are area of terminal under construction and damaged pier at Black Falcon Terminal. (Satellite image shows a work barge engaged in repair of pier.) BACKGROUND FROM GOOGLE EARTH

VESSEL GROUP **TOWING/BARGE**

Allision of *James H Hunter* Tow with Dock and Fire Boat

LOCATION
CUMBERLAND RIVER
MILE 191.1; NASHVILLE, TENNESSEE

ACCIDENT DATE	REPORT NUMBER
JUNE 6, 2017	**MAB1817**
ACCIDENT ID	ISSUED
DCA17FM015	**JULY 12, 2018**

Figure 17. *James H Hunter* after the accident in the Cumberland River.

About 2250 on June 6, 2017, the towing vessel *James H Hunter* was pushing three loaded barges upstream in the Cumberland River through the city of Nashville, Tennessee, when two barges broke from the tow; hit the bank; and then allided with a floating dock underneath a pedestrian bridge, a fire boat moored at the dock, and a bridge pier. The fire boat broke free of its moorings as the barges pushed the dock downriver. There were no injuries or reports of pollution. The fire boat sustained damage in the form of dents and scrapes to its hull, and the dock sustained damage estimated at $300,000. Damage to the barges was reported to be superficial.

Figure 19. Strands on wire rigging that was recovered by investigators indicated that the wires had fractured while in tension.

About 2200 on the accident date, the *James H Hunter* departed the Cherokee Marine Terminal at mile 189.5 and proceeded upstream to drop off three barges at the PBM fleeting facility at mile 192.8. The barges, carrying cargo of gravel and sand, were arranged in a single string with the *James H Hunter* faced up to barge *PBM 403*, barge *PB 2013* in the middle, and barge *PBM 141* at the head of the tow. *PBM 403* was connected to *PB 2013* by a steel fore-and-aft wire arrangement (the steering coupling) on both the port and starboard sides. The use of single coupling arrangements could have been due to the short distance between the Cherokee Marine Terminal and the PBM fleeting facility. The Cumberland River was at a high-water stage with the water level at the Nashville Cumberland River (NAST1) gage, located at mile 191.1, at about 26 feet; the captain of the *James H Hunter* estimated the current to be about 5 mph.

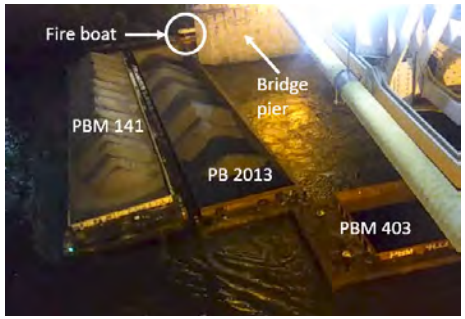


Figure 18. The three barges, fire boat, and pedestrian bridge pier about 2254.
IMAGE TAKEN FROM WITNESS VIDEO

About 2242, the pilot of the *James H Hunter* arrived in the wheelhouse to relieve the captain for his scheduled watch. The captain recalled being relieved from watch about the same time as they passed the towing vessel *Charlie Everhart* and the *Spirit* barge, which were secured along the left descending bank, about 2247. He noted that the head of the tow might have been going under the John Seigenthaler Pedestrian Bridge at the time. After being relieved, the captain remained in the wheelhouse with the pilot.

The pilot took the conn of the *James H Hunter* and reduced the speed to pass the *Charlie Everhart* and the *Spirit* barge. Upstream from the bridge and ahead of the tow, there was a bend in the river to the left (port). About 2249, the head of the tow started to fall off (to starboard) as it neared the bend. The pilot counteracted the movement by putting the steering rudders to port. He did not recall how much rudder was used, and there were no systems on board that recorded this operator input. However, the captain stated that "the pilot steered a little hard" and that overcorrecting while operating in high water moving at about 5 mph put too much stress on the coupling. Seconds later, the pilot and the captain noticed that the port steering coupling between *PBM 403* (the face-up barge) and *PB 2013* (the middle barge) parted. The captain immediately notified the deck crew by radio that the barges were coming loose and put the vessel in astern propulsion; it was stopped about 2251. The pilot notified nearby vessels of the breakaway barges by VHF radio.

PBM 403 was under the bridge still connected to the *James H Hunter*, which was on the downriver side of the bridge. *PBM 403* and *PB 2013* were connected only by the starboard steering coupling as the barges headed toward the left descending bank and a floating dock on that side of the bank. *PB 2013* and *PBM 141* (the head barge) contacted the bank and the starboard coupling between them broke, leaving them connected only by the port coupling. *PB 2013* and *PBM 141* ended up perpendicular to the bank and began to top over on each other after contacting the bank. Then, about 2252, the two barges struck the dock and the port side of a fire boat moored there, knocking the dock and the fire boat loose before drifting and striking the upriver pier of the bridge on the left descending bank.

The NTSB determined that the probable cause of the allision of the *James H Hunter* tow with the dock and fire boat was the practice of using single barge couplings in high-water conditions, which resulted in the parting of a steering coupling after rudder input to counteract the strong current.

PRECAUTIONS TO CONSIDER DURING HIGH-WATER CONDITIONS

In high-water conditions, which often include strong currents, precautions should be taken to mitigate the risk of losing the tow. Examples of mitigating measures include doubling up on couplings and/or reducing the length of the tow.

VESSEL GROUP **TOWING/BARGE**

Allision of *Marguerite L. Terral* Tow with Krotz Springs Railroad Bridge

LOCATION
ATCHAFALAYA RIVER
MILE 41.5; KROTZ SPRINGS, LOUISIANA

ACCIDENT DATE	REPORT NUMBER
JUNE 9, 2017	**MAB1805**
ACCIDENT ID	ISSUED
DCA17FM017	**FEBRUARY 1, 2018**

Figure 20. Marked by a red X, the site where the *Marguerite L. Terral* tow allided with a pier of the railroad bridge on the Atchafalaya River in Krotz Springs, Louisiana.
BACKGROUND BY GOOGLE EARTH PRO

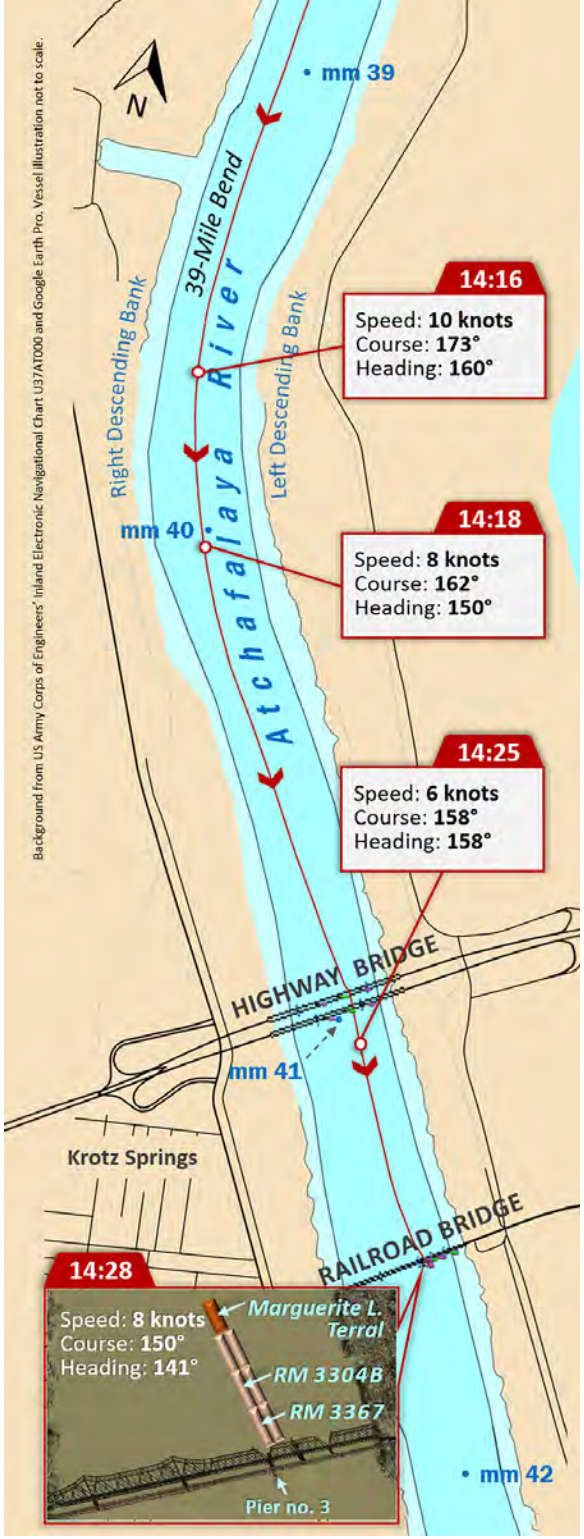
Figure 21. *Marguerite L. Terral* under way before the accident.
PHOTO COURTESY OF TERRAL RIVER SERVICE

On June 9, 2017, the towing vessel ***Marguerite L. Terral*** was pushing a flotilla of six cargo barges downbound on the Atchafalaya River in Krotz Springs, Louisiana, 35 miles west of Baton Rouge. At 1428, the starboard lead barge in the tow, ***RM 3367***, and the barge immediately aft, ***RM 3304B***, contacted a pier of the Union Pacific Railroad Bridge at mile 41.5. The allision resulted in damage to both barges and the bridge, totaling more than $4 million in repairs. There were no reports of pollution or injuries associated with this accident.

The Union Pacific Railroad Bridge—also known as the the Krotz Springs Railroad Bridge—was a swing bridge that opened by rotating horizontally on a central axis, or pivot pedestal, in line with the navigational channel. At 1340 on the accident day, the ***Marguerite L. Terral*** pilot had contacted the bridge tender via the vessel's cell phone to request that the bridge's drawspan be opened at his estimated time of arrival at 1420. The bridge tender told the pilot, "Come on down, and we'll have it open for you."

Once the phone call ended, the bridge tender contacted Union Pacific's engineering department to obtain permission to open the drawspan. Permission was given to the bridge tender and train traffic was halted from 1347 to 1445. The tender then departed his station house to begin a visual inspection of the rail and bridge. While on the bridge, he was met by two Union Pacific supervisors who had arrived unannounced to conduct an observation and performance assessment of the bridge tender.

At 1416, after maneuvering the ***Marguerite L. Terral*** around an area of the river known as the "Thirty-Nine Mile Bend," the pilot acquired a line of sight on the Krotz Springs Railroad Bridge downriver. He noticed that the bridge, however, was still closed. Consequently, he attempted to contact the bridge tender twice using the vessel's VHF radio, but both radio callouts went unanswered. The pilot then positioned the head of the tow toward the left descending bank of the river in an effort to offset the current's lateral force, which was setting the tow toward the right descending bank.



At 1417, the pilot attempted to contact the bridge using the vessel's cell phone, but while the phone was ringing he received a response via VHF radio from the bridge tender. The tender, who had still been performing the pre-opening examination of the bridge, contacted the vessel after visually observing the ***Marguerite L. Terral*** and its tow round the bend.

During the radio communication, the bridge tender told the pilot that he would need "five minutes" to open the drawspan. The pilot did not express any concerns to the bridge tender regarding the time needed to open the bridge; as he stated to investigators, he felt he had enough "point" (the position of the head of the flotilla in relation to the current) to counter the impact of the current on the bow of the tow.

When the drawspan was opened approximately three quarters of the way and rotating, the pilot put both main diesel engine throttles to full ahead in an attempt to pass through the opening and "outrun" the westerly set of the river current. Nonetheless, at 1428, the aft starboard side of barge ***RM 3367*** and the bow of the barge next in the tow string, ***RM 3304B***, allided with pier no. 3, the landing pier to the west of the drawspan.

The NTSB determined that the probable cause of the allision of the *Marguerite L. Terral* tow with the Krotz Springs Railroad Bridge was the bridge tender's delay in providing a timely opening of the drawspan, as requested, due to distraction by his other duties. Contributing to the accident was the pilot's failure to properly compensate for the current during the approach to the bridge.

Figure 22. Chart depicting vessel speed and position in the minutes leading up to the acccident.

VESSEL GROUP **CARGO**

Allision of Bulk Carrier *Mia S* with Nashville Avenue Wharf

LOCATION
LOWER MISSISSIPPI RIVER
NEAR MILE 101; NEW ORLEANS, LOUISIANA

ACCIDENT DATE	REPORT NUMBER
AUGUST 18, 2017	**MAB1822**
ACCIDENT ID	ISSUED
DCA17FM023	**OCTOBER 16, 2018**

Figure 23. Damage to the Nashville Avenue Wharf where the bulk carrier left an impression of its bow.

On August 18, 2017, about 1920, the Antigua and Barbuda-flagged bulk carrier ***Mia S*** was traveling downbound on the Mississippi River near New Orleans, Louisiana, experiencing intermittent engine slowdowns. As the fully loaded vessel began to enter a bend of the river at Six-Mile Point near mile 101, its propulsion engine program restricted the engine to dead slow ahead. Within minutes, the vessel allided with the Nashville Avenue Wharf, damaging its bow and the wharf. No pollution or injuries among the 19 crewmembers were reported. Damage to the ***Mia S*** and the Nashville Avenue Wharf each amounted to an estimated $1 million.

At 1705 on the day of the accident, the fully laden ***Mia S*** got under way with a pilot onboard for an outbound transit of the river. After releasing all lines, the pilot ordered dead slow ahead and then slow ahead. At 1713, the engine order telegraph log showed an engine "safety slowdown," and alarms sounded regarding the vessel's main propulsion engine. These engine safety slowdown alarms were the first of several that the vessel experienced intermittently on the bridge and in the engine room. The slowdown feature of the engine's automated system was designed to protect the engine from damage.

Figure 24. Bow damage sustained by the *Mia S*.

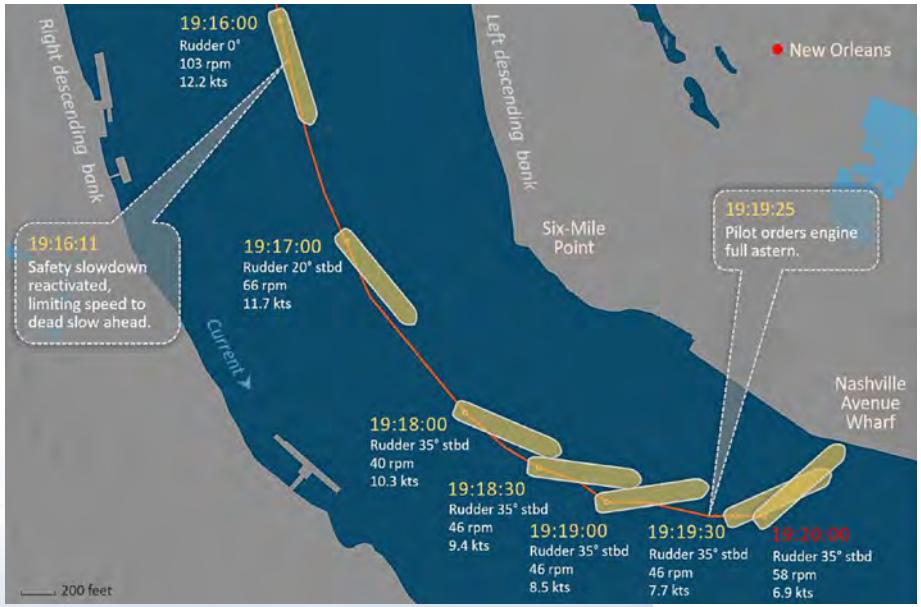


Figure 25. Trackline of the *Mia S* over the last 4 minutes leading up to the accident shows changes in the vessel's heading and speed over ground following an engine slowdown.
BACKGROUND FROM GOOGLE MAPS

As the alarms sounded, the engineers attempted to restore the engine's full maneuvering capabilities. The chief engineer later told investigators that a fuel pump for one of the six engine cylinders was not providing fuel. Over the next 20 minutes, the slowdown alarm was acknowledged by the master each time it activated. An engine order of full ahead was recorded at 1729, but as the engine's speed increased to 100 rpm, another safety slowdown occurred. In slowdown mode, the engine was limited to dead slow ahead, which was 5 knots at 45 rpm.

Because of the frequent reductions in engine rpm, the pilot requested tug assistance via radio. At 1804, as the harbor tug ***Ervin Cooper*** approached the ***Mia S***, the ***Mia S*** pilot told the tug's captain not to attach any lines but to accompany the vessel downriver in case he needed assistance.

About 1850, the chief engineer informed the master that the issue with the fuel pump was resolved and thereby full speed could be attained. Based on that report, the pilot ordered full ahead at 1857. The vessel attained a speed of almost 13 knots at 103 rpm, and the engine order telegraph log recorded that the vessel maintained the speed and rpm until 1916.

At 1916, the engine's automated alarm system warned of high exhaust temperatures, and seconds later, the slowdown feature again activated and limited the rpm. The slowing speed reduced the rudder's effectiveness in the following current. Despite the pilot's order of hard to starboard at 19:17:30, the vessel's heading swung to port. The pilot ordered the crew to put a line on the ***Ervin Cooper***, but he countermanded that order and told the tug's captain to "get out of here." The pilot then ordered the crew to let go the port anchor. At 19:19:25, he also ordered full astern to slow the vessel, just after ordering the sounding of the danger signal. However, at 19:20:06, the ***Mia S*** allided with the Nashville Avenue Wharf.

According to the chief engineer, when engine exhaust temperatures on any two cylinders reached a differential greater than 50°C, the control system would automatically protect the engine through a safety slowdown by reducing the engine's rpm to dead slow ahead. The chief engineer told investigators that the exhaust temperature for the no. 2 main diesel engine cylinder did not rise when the engine began operation at the start of the voyage, which indicated that the fuel injection system for that cylinder was not operating properly. He said the non-return valve for the fuel pump "remained stuck, not injecting fuel [into the cylinder]" and that attempts were made to unstick the valve, but the fixes were temporary as the problem persisted.

During the accident voyage, after about 2 hours of the engineers' troubleshooting the frequent safety slowdowns, the chief engineer informed the master that the no. 2 cylinder was operating properly. However, in his report, the chief engineer did not convey the potential for recurring engine slowdowns in view of the previous 2 hours of temporary fixes and failures. Based on his conversation with the chief engineer, the master determined that the fuel pump issue had been resolved. The master likely believed that the engine would perform as expected, thus permitting the vessel to travel at a higher speed.

The NTSB determined that the probable cause of the allision of the bulk carrier *Mia S* with the Nashville Avenue Wharf was the chief engineer's poor communication to the master regarding the potential for additional protective engine slowdowns at orders above dead slow ahead, and the master and pilot's decision to proceed at full ahead, which resulted in a reduction in engine speed and subsequent loss of maneuverability while navigating through a sharp river bend.

VESSEL GROUP **TOWING/BARGE**

Allision of *Steve Plummer* Tow with CSX Railroad Bridge

LOCATION
CUMBERLAND RIVER
MILE 190.4; NASHVILLE, TENNESSEE

ACCIDENT DATE	REPORT NUMBER
MARCH 11, 2017	**MAB1809**
ACCIDENT ID	ISSUED
DCA17FM009	**MAY 1, 2018**

On March 11, 2017, at 1120, the towing vessel ***Steve Plummer*** was pushing three loaded barges on the Cumberland River in Nashville, Tennessee. As the tow passed beneath the CSX Railroad Bridge at mile 190.4, the second and third barges allided with the bridge's upstream guard pier. No injuries or pollution resulted from the accident; however, the two barges sustained damage and the guard pier was destroyed in the allision.

At 1022 on the morning of the accident, the 50-foot-long ***Steve Plummer***, with three crewmembers on board, got under way from the Pine Bluff Materials fleeting area at Cumberland River mile 184, pushing ahead three loaded open sand barges in a single tow-string. The tow, 590 feet long by 35 feet wide, was on a routine upstream transit to the Pine Bluff Materials sand yard at mile 192.5.

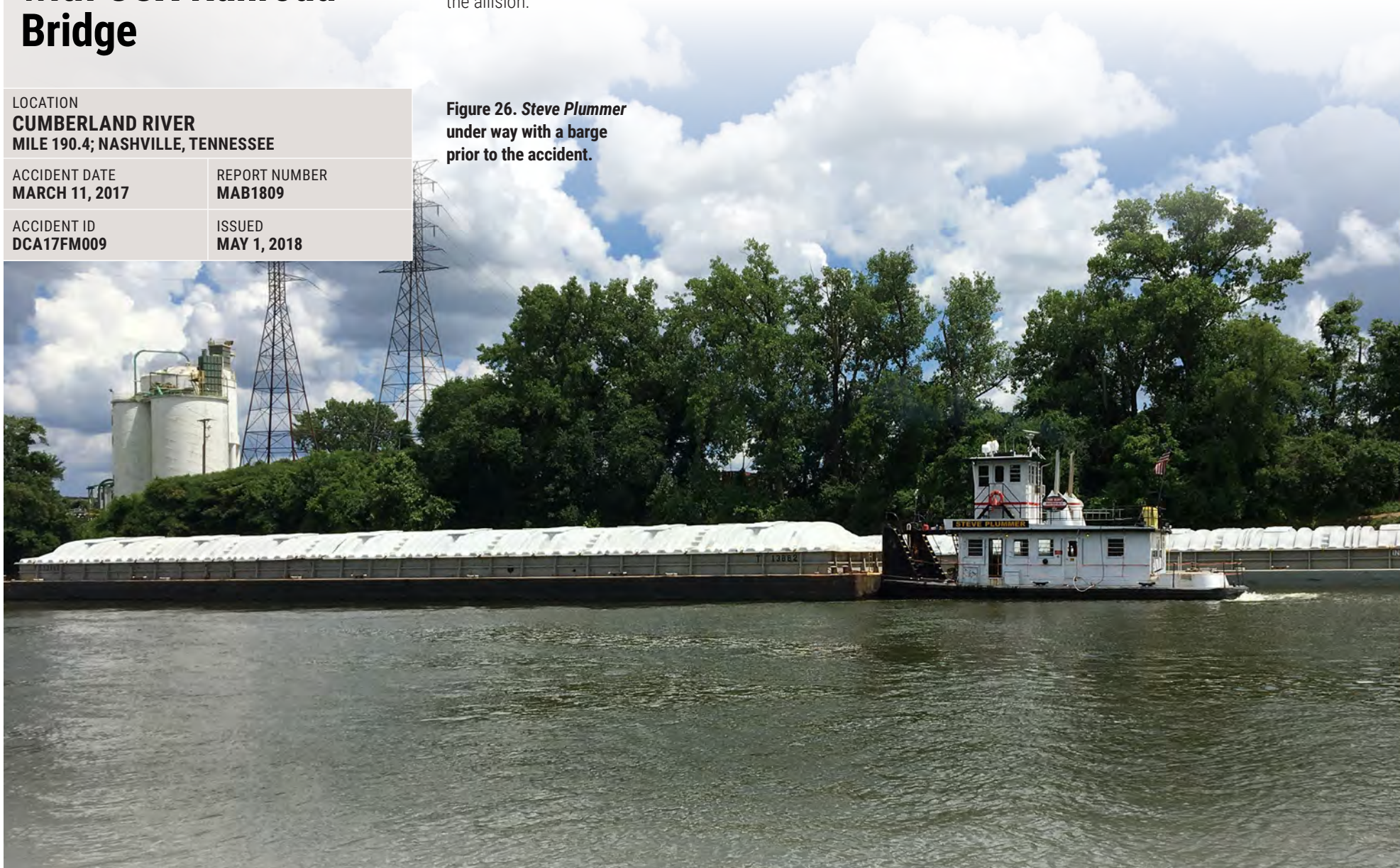


Figure 26. *Steve Plummer* under way with a barge prior to the accident.

At 1110, the ***Steve Plummer*** tow approached the CSX Railroad Bridge at mile 190.4. The swing span was centered on a pivot pier, and vessels could transit on either side with 116 feet of horizontal clearance. The bridge also had two guard piers to protect the swing span when in open position: one guard pier was located 134 feet upstream of the pivot pier; the other, 134 feet downstream of it. Each guard pier was 28 feet wide and constructed with concrete and stone blocks.

As the ***Steve Plummer*** tow approached the bridge, the pilot positioned the tow to transit through the opening near the right descending bank; however, he noticed that the tow was being set toward the middle of the river. He then tried to correct for the set by increasing the vessel's speed and adjusting the rudders. The lead barge in the string successfully passed beneath the bridge span and then the upstream guard pier. However, at 1120, the second barge allided with the guard pier and caused pieces of stone to break off and fall onto the barge deck and into the river. The pilot sounded the general alarm, reversed the throttles, and shifted the rudders to prevent the third barge from hitting the guard pier and to keep the forward barges from wrapping around it, but to no avail. The third barge's stern struck the upstream guard pier, causing it to collapse into the river. The wire lines connecting the barges parted, and the barges drifted with the current, becoming pinned against the bridge.

The ***Steve Plummer*** pilot radioed for assistance and, at 1145, reported the accident to the Coast Guard, who informed the bridge owner, CSX. About 1150, CSX stopped rail traffic to the bridge, and the towing vessels ***Traci K*** and ***James Hunter*** arrived on scene to help recover the three barges. CSX later opened the bridge to rail traffic with a speed restriction until divers had surveyed the main bridge structure.

Investigators researched industry and Coast Guard guidance for installed towing vessel horsepower (hp) requirements per typical loaded river barge. Industry discussion varied from 175 to 240 hp per 2,000-ton barge in normal-to-medium high-river conditions, using an experienced operator. The Coast Guard's Towing Vessel Center of Expertise stated that there are no regulatory vessel horsepower-to-barge requirements or guidance, but both Coast Guard and industry have widely used 250 hp per loaded barge as "best practice" on inland rivers. Based on these horsepower-to-barge ratios, the 700-hp ***Steve Plummer*** pushing three barges (carrying a total of 3,934 tons of cargo) was within the industry norm for an experienced operator.

The ***Steve Plummer*** pilot said that on the day of the accident, the current was swift at 3 mph and his 3.5-mph speed was the maximum forward speed that the tow could make. The ***Steve Plummer*** tow had little additional power and thus limited maneuvering ability when passing through the bridge's span.

The company stated that the number of barges the ***Steve Plummer*** towed depended on the river conditions, weather, the area of transit, and the pilot's level of comfort. The ***Steve Plummer*** could tow four barges during slack-water conditions, typically towed three barges during normal river conditions, and towed one or two barges during high-water conditions. The company stated that it left the decision on barge numbers to the individual tow pilots.

Figure 27. The undamaged *Steve Plummer* under way after the accident.

The NTSB determined that the probable cause of the *Steve Plummer* tow's allision with the CSX Railroad Bridge was the pilot's decision to tow three loaded barges during rising river conditions with swift currents, which overwhelmed his ability to maneuver the tow through the bridge.

Figure 28. Barges from the *Steve Plummer* tow pinned against the upstream side of the CSX Railroad Bridge.
PHOTO BY COAST GUARD

VESSEL GROUP **FISHING**

Capsizing and Sinking of Fishing Vessel *Destination*

LOCATION
BERING SEA
2.6 MILES NORTHWEST OF ST. GEORGE ISLAND, ALASKA

ACCIDENT DATE	REPORT NUMBER
FEBRUARY 11, 2017	**MAB1814**
ACCIDENT ID	ADOPTED
DCA17FM006	**JUNE 20, 2018**

Figure 29. Crab pots that the *Destination* was carrying during its stopover at Dutch Harbor.
PHOTO COURTESY OF *OCEAN ROVER* CREWMEMBER

About 0610 on February 11, 2017, while transiting from Dutch Harbor to St. Paul Island, Alaska, to deliver bait and to fish for crab, the fishing vessel ***Destination*** capsized 2.6 miles northwest of St. George Island, Alaska, and sank several minutes later. No mayday call was received. However, a signal from the vessel's emergency position-indicating radio beacon (EPIRB) alerted the US Coast Guard to the sinking. During search and rescue efforts, debris and an oil sheen were sighted, but none of the six crewmembers aboard were found and were thereby presumed to be dead. The value of the vessel was estimated at $2.5 million.

On February 9 at 2315, the ***Destination*** departed Dutch Harbor en route to St. Paul Island with 200 crab traps and several pallets of bait on deck. Automatic identification system (AIS) data showed that the vessel's course over ground was 325 degrees toward St. Paul Island at a speed of about 8 knots after leaving Dutch Harbor.

On February 11 at 0500, the ***Destination*** approached the southwestern side of St. George Island, which lay along the route between Dutch Harbor and St. Paul Island. According to AIS data, the fishing vessel continued its course at 7.8 to 9 knots, placing the western side of the island about 2.5 miles off its starboard side. At 0555, the ***Destination*** passed Dalnoi Point, the northwestern tip of the island, shortly after adjusting its course to

Figure 30. *Destination* under way.

340 degrees for the voyage to St. Paul Island. The winds and seas were 23 knots and 8.4 feet high from the northeast on the starboard beam, nearly at a right angle to the vessel.

At 0610, just after leaving the protection of the lee of St. George Island, the ***Destination***'s heading began to change dramatically. Over the next 3 minutes, the vessel's heading pivoted drastically 256 degrees to starboard as its speed dropped below 2 knots while traveling north 0.2 miles. During this time, the ***Destination*** likely capsized shortly before sinking. At 0613, the ***Destination***'s EPIRB transmitted its initial satellite distress alert. A minute later, at 0614, the vessel's AIS stopped transmitting.

Prior to the ***Destination***'s sailing from Dutch Harbor, the National Weather Service forecast office in Anchorage, Alaska, issued marine forecasts that included wind speed, wave heights, and freezing spray warnings. The marine forecast issued on February 9 at 0345 for the area where the vessel would be transiting on the morning of February 10 warned of heavy freezing spray. The forecast issued on February 9 at 1515 and effective through February 10 also predicted heavy freezing spray. Sea spray icing is a serious hazard to marine vessels because the ice accumulates over exposed decks and exterior surfaces of a vessel, thereby adding weight that affects the stability of the vessel.

Figure 31. Ice coverage of the fishing vessel *Polar Sea*, which was transiting near the accident site.

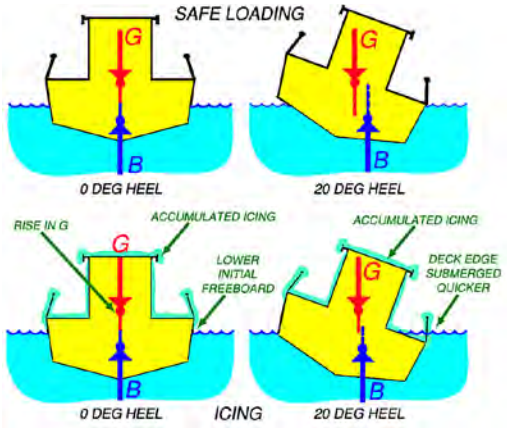


Figure 32. A diagram from the Coast Guard's guide on vessel stability illustrates the negative effect of icing.

Due to prolonged icing conditions, the ***Destination*** likely capsized in the relatively larger seas and stronger winds as it left the lee of St. George Island. The vessel sailed with 200 crab traps, which provided both interior and exterior surface area for ice to accumulate in the freezing spray. An analysis by the Coast Guard Marine Safety Center revealed that added weight high on the vessel from icing left it with a lower freeboard and decreased righting arm (lower stability) and ultimately vulnerable in the severe conditions.

Captains from other fishing vessels who were interviewed as part of the investigation indicated that they often reduced the number of crab traps they carried when icing conditions were forecasted. However, despite the NWS forecasts of heavy freezing sea spray during the accident voyage, the captain of the ***Destination*** did not reduce the number of traps carried by his vessel.

Members of the fishing industry stated that opilio crab was hard to find that season, which meant crews had to spend more time to harvest their quota. Furthermore, sea ice in late February can shut down St. Paul Island harbor, either slowing deliveries or halting them altogether. These factors would have weighed on the captain's decision-making during the transit to St. Paul Island.

During his last-known communication on the evening before the sinking, the ***Destination***'s captain expressed concern about failing to meet the delivery deadline to St. Paul Island. According to the owner, the captain never missed a delivery date in his 23-year history of operating the vessel. The ***Destination***'s captain, therefore, may have determined that time was running out to deliver his crab to St. Paul Island and may have ultimately placed pressure on himself to maintain his perfect record.

The NTSB determined that the probable cause of the capsizing and sinking of the fishing vessel *Destination* was the captain's decision to proceed during heavy freezing spray conditions without ensuring the vessel had a margin of stability to withstand an accumulation of ice or without taking sufficient mitigating action to avoid or limit the effects of icing.

Figure 33. NTSB Safety Alert SA-074 addresses the risks of ice accumulation and provides solutions for mariners.

VESSEL GROUP **TOWING/BARGE**

Capsizing and Sinking of Towing Vessel *Gracie Claire*

LOCATION
TIGER PASS
NEAR MILE 10 OF LOWER MISSISSIPI RIVER; VENICE, LOUISIANA

ACCIDENT DATE	REPORT NUMBER
AUGUST 23, 2017	**MAB1819**
ACCIDENT ID	ISSUED
DCA17FM025	**AUGUST 13, 2018**

On August 23, 2017, at 0756, the towing vessel ***Gracie Claire*** was moored in Tiger Pass, 1.3 miles southwest of the Lower Mississippi River, near mile 10, in Venice, Louisiana. While taking on fuel and water, the towboat began to slowly list to starboard. After the wake of a passing crewboat washed onto the ***Gracie Claire***'s stern, the list increased. In a short period of time, water entered an open door to the engine room and flooded the space. The towboat sank partially, its bow being held above the water by the lines connected to the dock. All three crewmembers escaped to the dock without injury. Approximately 1,100 gallons of diesel fuel were discharged into the waterway. Damage to the ***Gracie Claire*** was estimated at $565,000.

Figure 34. *Gracie Claire* awaiting salvage.

Figure 35. Screenshots of the *Gracie Claire*, from video captured by the southwest view of the dock's camera, starting a minute after loading began and continuing through the sinking.
VIDEO COURTESY OF JOHN W. STONE OIL DISTRIBUTOR

About 0740 on the accident date, the ***Gracie Claire*** arrived at the fuel dock of John W. Stone Oil Distributor in Tiger Pass, an outlet from the Lower Mississippi River to the Gulf of Mexico. The captain moored the towboat bow-in, perpendicular to the seawall. Soon afterward, using the starboard-side fill pipes, the captain began loading the fuel tank forward of the deckhouse while the deckhand filled the water tank aft of the deckhouse. At the time, an estimated current of 1 to 2 knots was acting on the starboard side of the vessel.

The ***Gracie Claire*** began listing to starboard as fuel was loaded through the starboard fill pipe at a rate of 140 to 150 gallons per minute. The new load was in addition to the estimated 1,200 gallons of fuel already in the tank. According to the captain, listing to one side during fuel-loading was not uncommon. He told investigators that the ***Gracie Claire*** would often list to angles that submerged the deck edge. When the ***Gracie Claire*** listed to one side during refueling, his practice was to stop fueling and then resume filling the tank on the opposite side to bring the towboat to an even keel because he believed that there were two separate fuel tanks, one on the starboard side and one on the port side. In fact, there was only one fuel tank with a swash bulkhead on the centerline of the vessel that allowed fuel to flow from one side of the tank to the other.

At 0755, video footage showed a crewboat passing astern of the ***Gracie Claire,*** and its wake washed onto the starboard side of the towboat's stern. The towboat then slowly rolled to starboard, and water eventually began flowing over the sill of the open engine room door on the starboard side. The ***Gracie Claire*** continued to roll until it was almost completely submerged at 0802. The mooring lines held the bow above the water's surface.

Following the accident, a 1-inch diameter hole was found in the bottom of the rudder compartment. The hole was likely present before fuel was loaded onto the towboat, and thus the compartment was likely flooded to near full. The lost buoyancy from the water in the compartment would have resulted in the towboat having less freeboard.

Moored perpendicular to the seawall, the ***Gracie Claire*** was subjected to a heeling moment caused by the river current. When the captain and deckhand began loading fuel and water through the starboard fill pipes, the vessel already had a starboard list. Although the fuel and water tanks ran the full breadth of the hull, the centerline swash bulkheads would have contained the loaded liquids on the starboard side of the tanks until they reached the height of the 24-inch openings above the tank's bottom. Because the liquids would have filled only the starboard side of their respective tanks, the vessel began listing further to starboard.

The captain decided to shift fuel-filling to the port side of the tank to counter the starboard list. He believed that a reduction in the list would occur because the fuel being loaded would accumulate on the port side, or high side, of the tank. However, with the vessel already listing to starboard, once the fuel reached the holes in the swash bulkhead on the port side of the fuel tank, the added fuel would shift by spilling over to the starboard side through the swash bulkhead openings, therefore exacerbating the starboard list. At the same time, the floodwater in the rudder compartment and in the water tank would also shift further to starboard.

The crewboat that passed astern added to the heeling forces on the starboard side. First, the displaced water of the passing vessel pushed the side of the hull below the waterline. Second, as the waves from the crewboat's wake washed over the bulwark and onto the main deck of the towboat, they added weight on the starboard side of the main deck. With the starboard deck edge submerged, the ***Gracie Claire*** would have rolled more easily. Once the vessel reached a heel angle that allowed water to reach above the 20-inch coaming of the open door leading to the engine room, the vessel down-flooded and rapidly sank.

The NTSB determined that the probable cause of the capsizing and sinking of the *Gracie Claire* was the towing vessel's decreased stability and freeboard due to undetected flooding through a hull leak in the rudder compartment, which made the vessel susceptible to the adverse effects of boarding water from the wake of a passing vessel.

Figure 36. *Gracie Claire* moored for repair following the sinking. PHOTO COURTESY OF TRIPLE S MARINE

VESSEL GROUP **FISHING**

Capsizing and Sinking of Fishing Vessel *Langley Douglas*

LOCATION
ATLANTIC OCEAN
60 MILES EAST OF CAPE CHARLES, VIRGINIA

ACCIDENT DATE	REPORT NUMBER
SEPTEMBER 11, 2017	**MAB1820**
ACCIDENT ID	ISSUED
DCA17FM027	**AUGUST 30, 2018**

On the morning of September 11, 2017, the commercial fishing vessel ***Langley Douglas*** developed a port list, capsized, and sank 60 miles east of Cape Charles, Virginia. A Coast Guard helicopter rescued the five people on board. No injuries or pollution were reported. The ***Langley Douglas*** was valued at $1.95 million.

The day before the sinking, the ***Langley Douglas*** departed Hampton, Virginia, to fish for squid. After exiting the Chesapeake Bay and heading into the Atlantic Ocean, the crew extended the trawler's outriggers and lowered the port and starboard paravanes into the water. Paravanes are designed to ease the rolling motion of vessels by creating a constant downward force.

The following morning, the crew deployed the vessel's trawling gear and net. At 0910, the captain ordered the crew to haul in the net and prepare the main deck and hog pen area to receive the catch. The crew also placed scupper plates in front of the port and starboard freeing ports to prevent catch from going overboard. As the net approached the stern, the crew noticed a 25-foot-long basking shark stuck in it. The first mate stated that he knew the catch was large and heavy because the hydraulic winches were "a bit under pressure," but the crewmembers brought the entire catch on board and emptied the net into the centerline hog pen. They estimated that the total catch weighed about 35,000 pounds (the shark about 10,000 pounds).

Figure 37. *Langley Douglas* with its outriggers extended and paravanes stowed at the end of the outriggers. PHOTO COURTESY OF STEVEN COLLINGWOOD

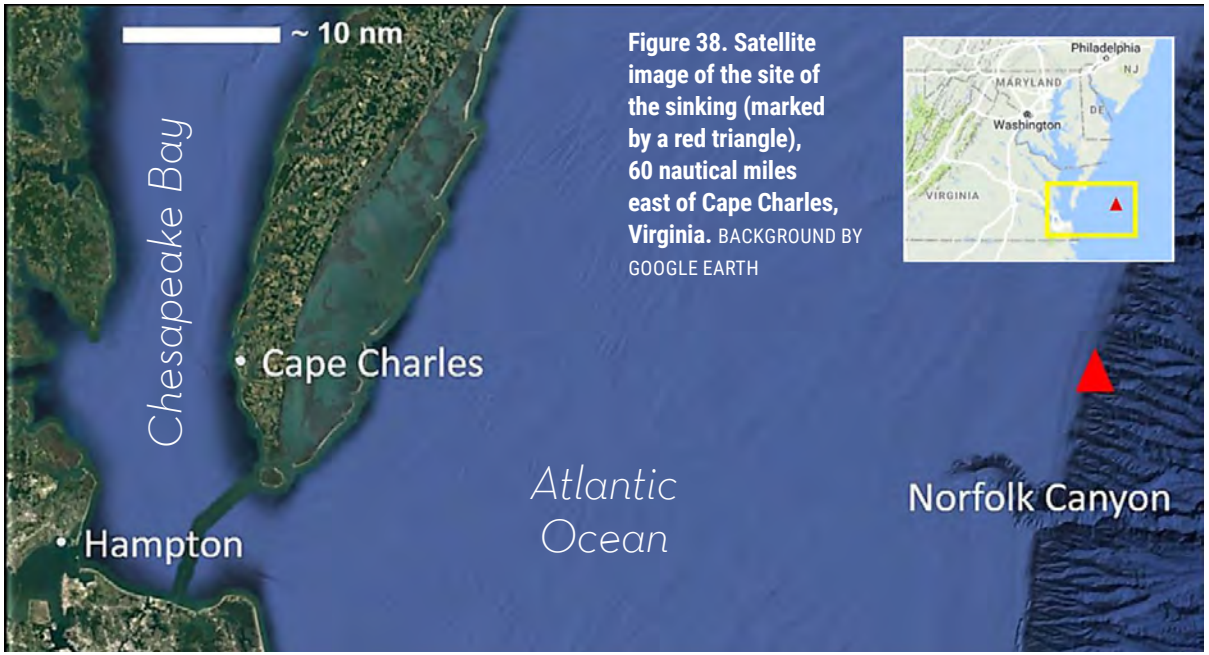


Figure 38. Satellite image of the site of the sinking (marked by a red triangle), 60 nautical miles east of Cape Charles, Virginia. BACKGROUND BY GOOGLE EARTH

The crew planned to remove the shark from the vessel using the centerline boom. However, after the crew discharged the shark and squid into the hog pen, the squid started to overflow the pen and spill out onto the port side of the deck, and the vessel immediately developed a port list. In addition, the vessel was beam to the 6- to 8-foot seas and taking waves over its port quarter, which the crew said further increased the list.

Normally, the crew would open fish hatches on both the port and starboard side to distribute the squid evenly into the fish holds. Instead, to try to counter the port list, the captain ordered the crew to open the hatches to the two forward starboard fish holds and commence sweeping (with brooms) the squid from the pen into those holds. Two deckhands started to carry out the captain's order, but the vessel continued to take seas over its port quarter, heeling the vessel further to port with each passing wave.

Totes, bins, boards, and gear on the back deck began to shift to port, and the vessel listed about 10–20 degrees. The port quarter of the vessel was submerged as waves continued to break over the bulwark. The near 20-degree port list caused the body of the shark to shift to the port side of the hog pen and about 2,500 pounds of squid to slide toward the stern and collect against the aft portside bulwark, blocking the freeing ports and preventing release of trapped seawater on deck.

The captain raised the vessel's portside paravane out of the water, altered course to port, and gave full throttle to try to counter the list, but to no avail. The captain then instructed the crew to come up from the main deck as he proceeded to grab immersion suits that were stored in the wheelhouse. He instructed the crewmembers to don their suits; however, the rough seas and continuously increasing port list made it difficult for the crew to don the suits on board.

As the ***Langley Douglas*** continued taking seas over the port side, the shark rolled out of the hog pen and slid toward the portside bulwark. Eventually, the vessel listed 45–60 degrees and then rolled completely onto its port side (80–90 degrees by the captain's account). Seawater entered the vessel through downflooding points on deck and in the wheelhouse, and shortly thereafter, the vessel began to sink by its stern. The bow of the ***Langley Douglas*** remained above water for about 20 minutes before disappearing from view. The crew, who had entered the water as the vessel capsized, was picked up by a Coast Guard helicopter that had deployed to the scene.

The captain and crew knew that the catch was very large. They still chose to empty the entire catch on board, which exceeded the capacity of the hog pen, overflowed the pen, and caused a large weight-shift to port.

The NTSB determined that the probable cause of the capsizing and sinking of fishing vessel *Langley Douglas* was the captain's decision to unload a large catch that overflowed the pen and spilled out on deck, which—coupled with trapped water on deck due to blocked freeing ports and shifting of liquids in partially filled tanks—caused the vessel to roll to port and downflood.

Figure 39. Langley Douglas' main deck during a previous voyage, with about 18,000–20,000 pounds of squid in the hog pen. PHOTO BY CREWMEMBER

PRECAUTIONS WHEN UNLOADING CATCH

Fishing vessel operators are reminded to avoid unloading large catches that exceed the pen height and can result in spillover and cargo on deck. Catch sliding around on deck has an adverse effect on vessel stability. Additionally, freeing ports (scuppers) in the bulwarks should be kept clear for rapid draining of water on deck. A deck filled with water creates an undesirable free-surface effect. The weight of the additional water also increases the height of the vessel's center of gravity and decreases its freeboard, consequently reducing the vessel's overall stability.

VESSEL GROUP **TOWING/BARGE**

Capsizing and Sinking of Towing Vessel *Ricky Robinson*

LOCATION
LOWER MISSISSIPPI RIVER
MILE 732.8; NEAR MEMPHIS, TENNESSEE

ACCIDENT DATE	REPORT NUMBER
DECEMBER 8, 2017	**MAB1827**
ACCIDENT ID	ISSUED
DCA18FM007	**DECEMBER 19, 2018**

On December 8, 2017, about 1126, the towing vessel ***Ricky Robinson*** capsized and sank on the Lower Mississippi River at mile 732.8 near Memphis, Tennessee, with two crewmembers on board, after the vessel began taking on water. The pilot made a distress call just before the sinking; neither crewmember was found during the search and rescue operations that followed. Approximately 200 gallons of diesel oil were released into the river. Damage to the ***Ricky Robinson*** was estimated at $1.5 million.

On the morning of the accident, the ***Ricky Robinson*** was traveling upbound on the river against a current estimated at 3–4 mph in a "lightboat" condition—that is, not pushing any barges. About 1125, the vessel's course changed dramatically to starboard. The pilot of the towing vessel ***Betsy Ross*** said that sometime between 1120 and 1130 he overheard a distress call from the ***Ricky Robinson*** on VHF radio indicating, "We're going down."

On hearing the call, the pilot got the ***Betsy Ross*** under way to respond. About 1130, a dispatcher with Economy Boat Store reported that she received a call from the ***Ricky Robinson*** stating, "This is the ***Ricky Robinson***. We are in distress. We are one mile down from you and taking on water. Please send someone."

Economy Boat employees boarded a company vessel to assist the distressed vessel. About 4 minutes later, they arrived at the ***Ricky Robinson***'s last reported position, but they never saw the vessel. US Coast Guard, state, and local vessels and aircraft, as well as other Good Samaritan vessels, responded and searched for the vessel and crew, but there was no sign of either.

About a week after the accident, the vessel was brought to the surface and dewatered. A witness who last saw the ***Ricky Robinson*** reported seeing both of the towing vessel's engine room doors open prior to the accident.

Figure 40. Towing vessel *Ricky Robinson* before the accident.
PHOTO COURTESY OF WEPFER MARINE

Figure 41. *Ricky Robinson* post-salvage. Two inset photos show (at left) both aft voids missing hatch covers, with a yellow square highlighting where the submersible pump was found, and (at right) the open starboard engine room door that was tied off to the stairs.

When the vessel was salvaged about a week after the accident, only the starboard-side door was found open; it had been tied back with a rope to the stairs. The port- and starboard-side hatches for the aftermost and forward stern voids were also found open, and all were missing their covers (four covers total).

According to two crewmembers who had operated the vessel on the shift prior to the accident, water accumulation in the forward stern void resulted in the vessel listing to starboard, although the source of the water intrusion was unknown. To reduce the list, the off-going deckhand pumped the void two to three times per shift. The most recent pumping occurred when the crew changed, which was about 5 hours before the sinking. Based on the historical rate of flooding, the void would have contained enough water to cause a starboard list at the time of the accident.

When operating in a lightboat condition, towboats can be at risk of taking water over the bow and thereby introducing water onto the main deck. While the *Ricky Robinson* traveled into a current of 3 to 4 mph at a speed of approximately 6 mph, or nearly 10 mph, the vessel likely took water over the bow. Water then could travel back to the stern, where it could downflood into the tanks and voids through any open or unsecured hatches.

The vessel's sudden starboard turn was likely the pilot's attempt to beach the flooding vessel. The turn would have induced a turning heel to port, causing the floodwater in the voids to shift from starboard to port and result in a greater heel to the port side. Considering that the water in both stern voids would have substantially reduced the vessel's aft freeboard, and the turning forces would have caused the deck edge to submerge, additional water likely boarded the aft deck and downflooded into the stern voids, increasing the rate of filling to the voids. As the vessel heeled to a larger angle, water would have also downflooded through the open port engine room door, rapidly flooding the engine room.

The operating company's walkthrough inspection checklist required the pilot to ensure that the hatches (not the doors) were sealed at the beginning of each shift. However, former crewmembers stated that the vessel was operated customarily with watertight hatches and engine room doors open despite the company's checklist. A company operations representative stated that he was not aware of any problems regarding water accumulation into the forward stern void around the time of the accident. However, the magnitude of the problem was such that the void required pumping two to three times per shift. Because of the recurring water ingress, the watertight hatch covers had to be kept open to access the void, thus leaving the towboat vulnerable to the introduction of water while under way.

The NTSB determined that the probable cause of the sinking of the towing vessel *Ricky Robinson* was the pilot's decision to proceed with unsecured deck hatches at a speed that resulted in water on deck and flooding of the aft voids. Contributing to the sinking was the company's inadequate oversight to ensure that crews kept hatches closed while the vessel was under way and that ongoing watertight issues with the voids were addressed.

REPORTING ISSUES

Maintenance issues and other conditions affecting the safe operation of a vessel should be promptly reported to the operating company. Reporting systems should provide specific guidance regarding critical equipment, hull integrity, and operational safety. A robust reporting system should also include procedures for company oversight to ensure that crews are reporting issues and that the operating company is tracking and promptly addressing them.

VESSEL GROUP **TOWING/BARGE**

Collision and Sinking of Towing Vessel *Todd Brown*

LOCATION
LOWER MISSISSIPPI RIVER
MILE 940; NEAR COLUMBUS, KENTUCKY

ACCIDENT DATE	REPORT NUMBER
APRIL 17, 2017	**MAB1811**
ACCIDENT ID	ISSUED
DCA17FM010	**MAY 10, 2018**

About 1530 on April 17, 2017, as the crew on board the *Todd Brown* was attempting to maneuver a string of barges from a barge fleet on the right descending bank of the Lower Mississippi River near mile 940, about 4 miles from Columbus, Kentucky, the uninspected towing vessel collided with the lead barges moored downriver and sank. Before the sinking, all six crewmembers abandoned the vessel by climbing aboard the barges without reported injury. Approximately 100 gallons of diesel fuel were released during salvage operations but later recovered. Damage to the vessel was estimated at $1.5 million.

Based in Columbus, the *Todd Brown* was used as a fleet towboat on the Lower Mississippi River to move barges around fleeting areas. These areas were geographic locations, each identified by a number, where a group of barges, or fleets, were moored and later assembled to comprise a tow. The vessel owner had 23 fleeting areas on the right descending bank (west side) of the Mississippi River.

In April 2017, the Mississippi River was rising to a historically high level due to excessive runoff from melting snow and recent rainstorms. As a result of the rising river, the current had also increased, reaching an estimated 8 mph by the time the accident occurred.

With the high water and increased current, debris such as tree trunks, limbs, and other litter collected from the shorelines and drifted downstream. A substantial amount of debris accumulated at the heads of the moored barge fleets due to the bends in the river. The accumulating debris led to an increased strain on the moorings, thus elevating the risk of the wires parting.

Figure 42. *Todd Brown* in drydock with damaged wheelhouse post-salvage.

In order to remove the debris, or "drift," from the moored barges, fleet towboats such as the ***Todd Brown*** would perform "de-drifting" operations: maneuvered by one or more towboats, barges would be uncoupled from the remainder of the fleet and repositioned to allow the river current to flush the debris from their upstream end.

In the afternoon on April 17, the ***Todd Brown*** and another towboat—the ***Ot Adkins***—planned to move a string of 4 empty barges from a fleet of 20 moored barges into the river to de-drift the accumulated debris from the head of the barge string.

The pilot of the ***Todd Brown*** faced up his towboat to the aft end of the string, while the ***Ot Adkins*** was positioned along the starboard side of the lead barge. The pilot of the ***Todd Brown*** then began to maneuver his towboat to reposition the head of the barge string into the river. As the head of the barge string moved out into the river, a larger area of the barge string's profile was exposed to the current. Despite having its engines at full ahead, the ***Todd Brown***, along with the string of four barges, began moving astern.

To reduce the astern motion of the barge string, the pilot of the ***Todd Brown*** requested that the crewmembers of the ***Ot Adkins*** attach a line from their vessel to one of the barges and push the string back toward the shoreline and away from the stronger current. However, as the current continued to overwhelm both towboats, the pilot directed a crewmember on board the ***Todd Brown*** to unface (disconnect) their towboat from the barge string. Once it was unfaced, the pilot maneuvered his vessel to the port side of the drifting barge string, toward the more shallow west bank of the river. Consequently, the ***Todd Brown*** became trapped behind the moving string of barges and collided with the lead barges of a barge fleet about 250 feet downriver.

The barge string pinned the ***Todd Brown***'s port side against the bow of one of the lead barges in the fleet and the force of the river current pushed it under the barge's angled bow rake, causing the ***Todd Brown*** to list to starboard. After the pilot sounded the general alarm, the crew abandoned the vessel by climbing onto the moored barges. Swamped with water, the ***Todd Brown*** sank at about 1530 and came to rest in about 35 feet of water.

The NTSB determined that the probable cause of the collision and sinking of the uninspected towing vessel *Todd Brown* was the pilot's underestimation of the effect of the river current on the barge string being maneuvered during a de-drifting operation.

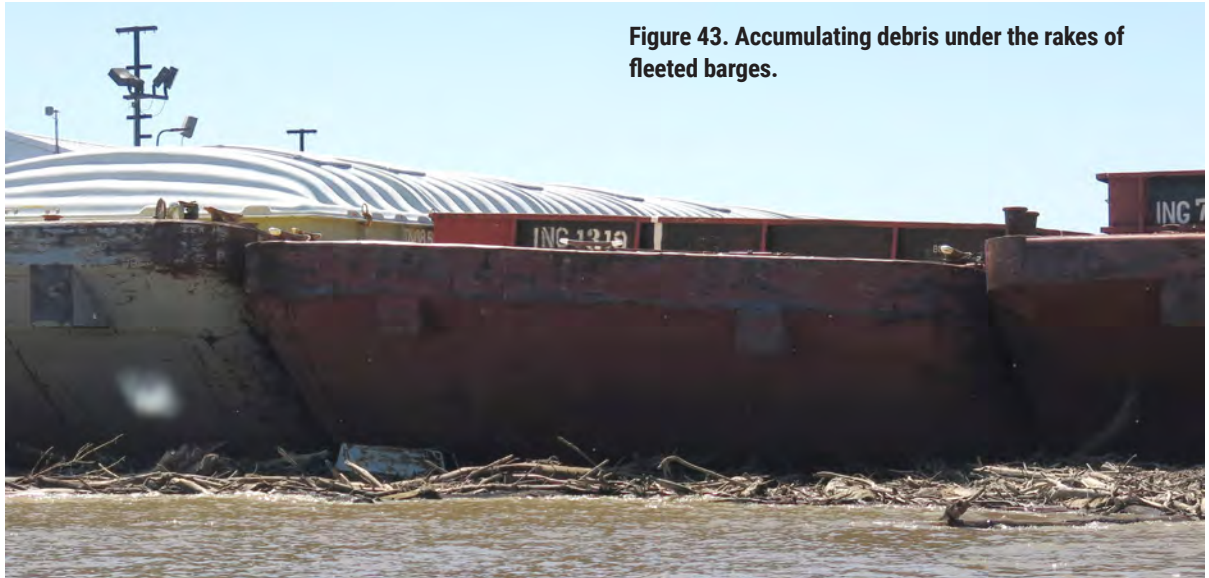
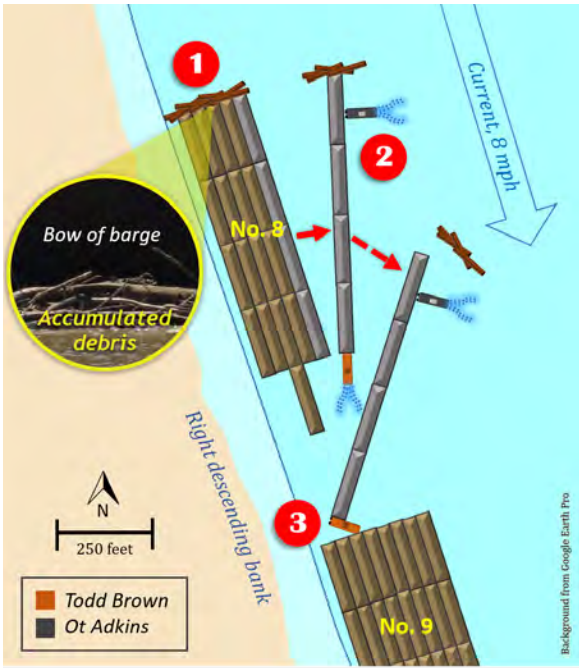


Figure 43. Accumulating debris under the rakes of fleeted barges.

Figure 44. *Todd Brown* refloated after salvage.



1. Original configuration of barges.
2. Intended maneuver with string of barges to allow river current to flush debris from lead barge.*
3. Position of *Todd Brown* after the current overpowered the towing vessels.*

**Approximate position of vessels and barge string.*

VESSEL GROUP **TOWING/BARGE**

Contact of Crane Barge *Troy McKinney* with Overhead Power Lines

LOCATION
HARVEY CANAL
HARVEY, LOUISIANA

ACCIDENT DATE	REPORT NUMBER
JUNE 7, 2017	**MAB1810**
ACCIDENT ID	ISSUED
DCA17FM016	**MAY 2, 2018**

Figure 45. *Troy McKinney*'s crane resting against power lines. PHOTO BY COAST GUARD

On the evening of June 7, 2017, the unmanned crane barge ***Troy McKinney*** broke free from its mooring and struck overhead power lines crossing the Harvey Canal in Harvey, Louisiana. No pollution or injuries were reported. Damage to the crane barge was negligible, but damage to the power lines totaled about $440,000.

The ***Troy McKinney*** was used in heavy lift and salvage operations. An A-frame crane sat atop the barge and, when raised to the maximum height listed on its load chart, the boom tip reached about about 136 feet above the water. When not in use, the crane boom could be lowered to reduce its overall height. The barge was typically moved to different locations by a towboat.

On the morning of May 17, the tugboat ***Tuscaloosa*** moved the barge to a facility located on the east bank of the Harvey Canal, about 3.6 miles south of where the canal meets the Mississippi River. At the berth, the ***Tuscaloosa*** crew and shipyard personnel tied up the ***Troy McKinney*** with three mooring lines to the shore and two mooring lines to another barge north of the ***Troy McKinney***. At some time on May 21, the other barge was moved, and the ***Troy McKinney*** was left with the three lines to shore.

About half a mile south of the mooring facility, high-voltage power cables crossed the canal. The cables had a charted vertical clearance of 124 feet.

On June 1, the president of McKinney Salvage and Heavy Lift—the company that owned the ***Troy McKinney***—boarded the barge and raised the crane boom so that photos could be taken with it in the topped position and so that shipyard personnel could paint otherwise inaccessible areas of the crane. Also while aboard, the president added another mooring line to shore, in addition to the three lines already placed on May 17.

According to automatic identification system (AIS) data, on June 7, about 2005, the towboat ***Gail Cecilia***, pushing ahead the tank barge ***Gonsoulin 127***, passed the ***Troy McKinney*** at a speed of about 4.8 knots. The tow was moving from north to south, and the draft of the ***Gonsoulin 127*** was 9 feet 6 inches. A video taken from a towboat moored about three-tenths of a mile away showed that, shortly after the ***Gail Cecilia*** tow passed, the ***Troy McKinney*** started to break away from the berth. The ***Troy McKinney***'s stern moved away from the berth first and then, about a minute and a half later, the rest of the barge moved off the berth and drifted south.

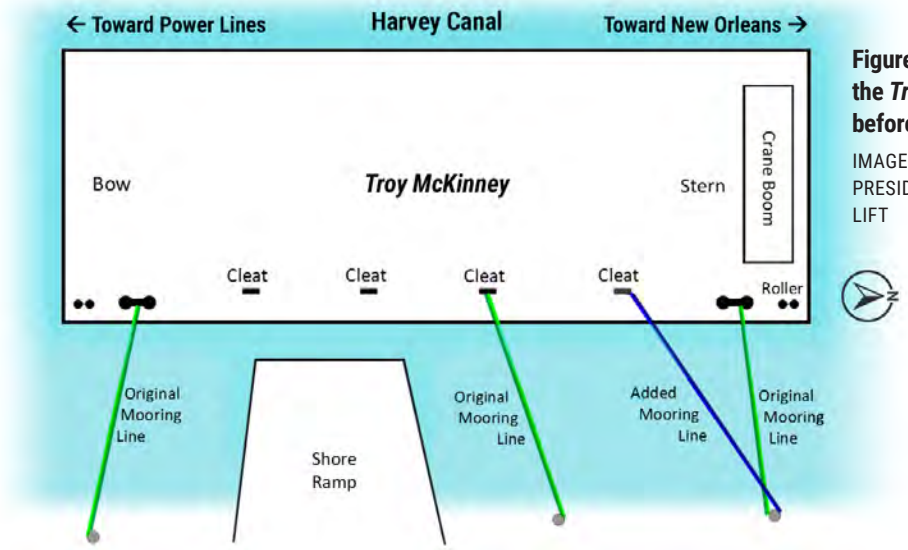


Figure 46. Mooring line arrangement for the *Troy McKinney* on June 1 (six days before the accident).

IMAGE BASED ON ORIGINAL DRAWING BY THE PRESIDENT OF McKINNEY SALVAGE AND HEAVY LIFT

Figure 47. *Troy McKinney*, with the A-frame boom mounted on the barge's stern.

PHOTO BY McKINNEY SALVAGE AND HEAVY LIFT

About 16 minutes later, the video showed flashes in the direction of the barge and the power lines.

Forward and aft movement of a moored vessel is best prevented by forward- and aft-leading lines. Investigators believe that the ***Troy McKinney***'s mooring lines were led from vessel to shore at an angle insufficient to prevent the barge from moving forward as the ***Gail Cecilia*** tow passed.

The NTSB determined that the probable cause of crane barge *Troy McKinney* striking and damaging overhead power lines was its insufficient mooring arrangement, which did not prevent the barge from excessive movement and breaking away.

VESSEL GROUP **CARGO**

Fire aboard Vehicle Carrier *Alliance St. Louis*

LOCATION
GULF OF MEXICO
ABOUT 190 MILES SOUTH OF NEW ORLEANS, LOUISIANA

ACCIDENT DATE	REPORT NUMBER
JANUARY 16, 2017	**MAB1808**
ACCIDENT ID	ISSUED
DCA17FM005	**MARCH 29, 2018**

On January 16, 2017, at 0252, the vehicle carrier *Alliance St. Louis* was under way from Port Arthur, Texas, to Jacksonville, Florida, when a pipe plug on the fuel pump for the main engine's no. 6 cylinder came loose, resulting in fuel spray onto the engine's hot exhaust gas pipe manifold. The atomized fuel quickly ignited. The fire was contained to the main engine room and extinguished by the CO_2 fixed fire-suppression system. No injuries were reported; property damage exceeded $3.75 million.

Early in the morning on January 16, the *Alliance St. Louis* main engine's low fuel oil inlet pressure alarm sounded; shortly thereafter, the vessel's fire-detection system activated, alerting the bridge crew to a fire in the incinerator space and main engine room. Seconds later, the ship lost main electrical services. The emergency diesel generator automatically started and came online, providing power to essential equipment.

The bridge crew activated the general alarm on the bridge and crewmembers reported to their emergency stations. The chief mate and the chief engineer went to investigate the spaces in question, while two fire teams prepared the firefighting gear. Crewmembers closed the engine room ventilation dampers and control stops to prevent the spread of smoke and reduce the supply of oxygen. They also shut the fuel and lube oil quick-closing valves to cut off potential fuel sources to the fire.

Figure 48. *Alliance St. Louis* pierside in Port Arthur, Texas, undergoing repair after the fire.

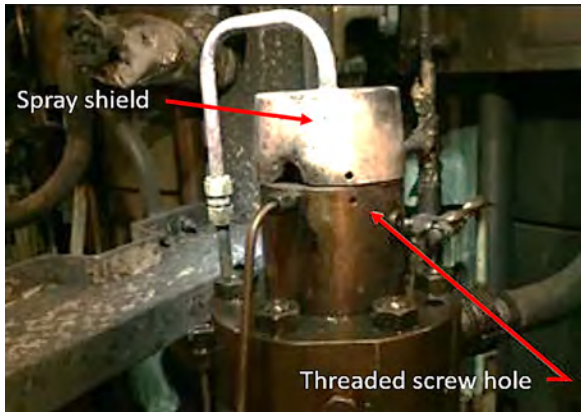


Figure 49. Inboard view of the no. 6 cylinder fuel pump and top cover postaccident, with the spray shield slightly elevated to illustrate alignment of fastener holes.

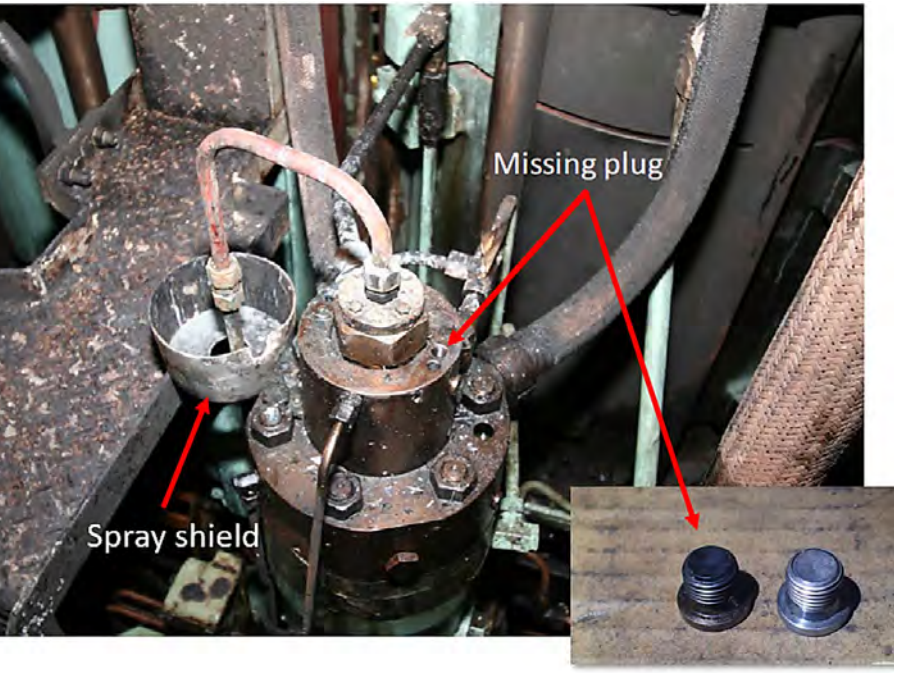


Figure 50. Fuel pump housing and top cover for the no. 6 cylinder, with missing pipe plug. The lower-right image shows the dislodged pipe plug (left) next to a new unused plug.

The chief engineer tried to activate the hyper-mist fixed fire-suppression system in the area of the fire, but the control panel had no power. He then made his way aft to the steering gear room (where the hyper-mist high-pressure pump and actuating valves were located) to try to start the system locally, but the system was also without power.

The master, in discussion with the chief mate and the chief engineer, decided to extinguish the fire using the engine room's fixed CO_2 fire-suppression system. The chief mate fully accounted for the crew outside of the emergency gear locker and, at 0335, the master authorized releasing CO_2 into the engine room. CO_2 was released again at 0424 and 0444, after which the engine room temperatures decreased and then stabilized. The crew continued to monitor the fire boundaries, taking bulkhead and deck temperatures with a non-contact infrared gun-style thermometer, and had hoses prepared if needed.

Postaccident, investigators examined the vessel's slow-speed diesel engine. The no. 6 cylinder's head/injector area was suspected as the fuel source for the fire due to extensive damage in the area. Examination of this area revealed that an aft pipe plug from the cylinder's fuel pump top cover was missing. The missing pipe plug would have provided a path for fuel to spray out of the top cover. It is likely that a sudden and intense fire ensued when fuel spraying from the fuel pump contacted an unprotected hot exhaust gas pipe.

Several engineering crewmembers stated that as part of an overhaul and as a standard practice on board, they removed pipe plugs on the fuel pump top cover to clean and inspect oil passages. When reinstalling the pipe plugs, the crew would usually tighten the pipe plugs by "feel."

The manufacturer's procedures did not mention the pipe plugs, but the instruction manual did list standards for tightening torques in the general tool section. Per the manual, the aft pipe plug on the no. 6 cylinder fuel pump top cover should have been torqued to 50–60 newton meters. The pipe plug was likely not sufficiently torqued into the top cover during the last inspection.

Spray shields are used to prevent fuel from contacting hot surfaces and other sources of ignition. The top covers of the fuel pumps on the *Alliance St. Louis*' engine were designed with spray shields, and there were openings for screwing the spray shields to the top covers. However, none of the ship's spray shields were screwed to their top covers. The spray shield on the no. 6 cylinder's top cover was found hanging off the air pipe next to the pump housing during the postaccident inspection. It was likely knocked off the top cover by the pipe plug and spraying fuel because it was not properly secured with two screws.

The NTSB determined that the probable cause of the engine room fire aboard the *Alliance St. Louis* was improper tightening of a pipe plug on the top cover of the no. 6 cylinder fuel pump housing, which resulted in a high-pressure release of marine gas oil. Contributing to the fire was the improper attachment of a fuel spray shield to the top cover, which allowed fuel to spray directly onto the cylinder's hot exhaust pipe and ignite.

VESSEL GROUP **RECREATIONAL**

Fire aboard Sailing Vessel *Best Revenge 5*

LOCATION
FALMOUTH INNER HARBOR
FALMOUTH, MASSACHUSETTS

ACCIDENT DATE	REPORT NUMBER
JULY 11, 2017	**MAB1816**
ACCIDENT ID	ISSUED
DCA17FM021	**JUNE 28, 2018**

At about 0130 on July 11, 2017, the uninspected sailing vessel ***Best Revenge 5*** caught fire while docked at a marina in Falmouth, Massachusetts. The vessel's two crewmembers escaped the burning vessel and attempted to fight the fire but could not contain it; local firefighters later extinguished it. One crewmember sustained second- and third-degree burns to the arms, hands, and feet. An oil sheen was observed in the immediate vicinity of the vessel after the fire but was contained by a floating boom. Damage to the ***Best Revenge 5*** (which was declared a constructive total loss), to a vessel docked next to it, and to the pier totaled an estimated $1,508,000.

Figure 51. *Best Revenge 5* prior to the accident.
PHOTO COURTESY OF SAILING DIRECTIONS®

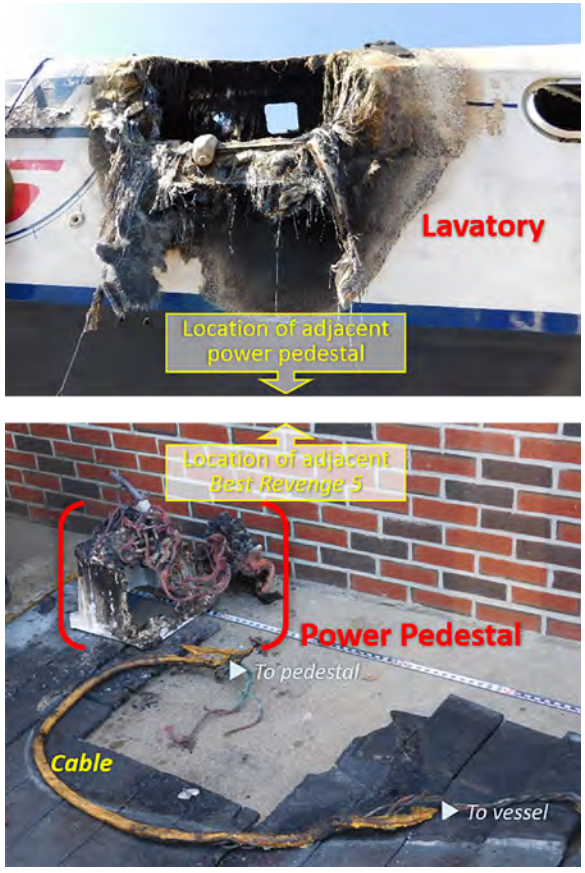
In June 2017, while the ***Best Revenge 5*** was in Bermuda, it had been struck by lightning, which damaged several navigational components. No other damage was found when the captain examined the vessel, including an inspection of the grounding plates below the hull, and the damaged navigation equipment was replaced by a technician soon afterward.

On the night of the accident, while docked in Falmouth, Massachusetts, the vessel was connected to external electrical power through a pair of cables fed from shore power pedestals on the pier to the aft port side. About 0130, the captain awoke to the smell of smoke. The captain went to investigate, climbing through a hatch above the stateroom and out onto the forward weather deck. Looking aft through windows into the vessel's salon, he saw that the space was full of smoke and that there was "a red glow towards the lower part of the port side of the salon." He returned to the stateroom and woke up the first mate, instructing her to evacuate the vessel. After re-exiting through the hatch, the captain was neither able to reach the gangway aft due to the fire, nor able to jump down onto the pier due to the distance, so he dove into the water from the bow and swam to the pier.

The first mate exited the stateroom aft to the salon, which was engulfed in smoke. She continued aft with her hands extended in front of her until she reached the salon's aft sliding glass door. After opening the door, she continued to the gangway and then down onto the pier. The first mate ran to a nearby vessel to wake up the owner and tell him to call the fire department. She then proceeded back toward the ***Best Revenge 5***.

As the first mate approached the catamaran, she could see that the exterior of the boat was burning near one of the electrical power pedestals on the pier. The pedestal itself, she said, was "smoldering, burning, and charred." At that point, she grabbed a garden hose and began spraying fresh water on the fire; however, the flames continued to spread toward the stern. About this time, a portlight that was above the area of the flames fell inward into the fire and the hole in the port side of the ***Best Revenge 5*** began to widen.

Figure 52. *Best Revenge 5* on fire at the dock. PHOTO COURTESY OF SATELLITE NEWS SERVICE



Figures 53 and 54. At top, the hole resulting from the fire on the port side at the aft guest lavatory. At bottom, the shore power pedestal, cable, and portions of the dock planking where the pedestal caught fire, which was re-created for examination.

The fire continued to grow, and the captain determined that the risk to remain on the pier was too great. Therefore, both crewmembers retreated toward the shore. The Falmouth Fire Rescue Department arrived by 0148 to find the catamaran "fully involved." Firefighting efforts eventually included assistance from other fire departments nearby. The fire was reported extinguished at 0647.

A third-party contractor who conducted a postaccident examination of the ***Best Revenge 5*** could not conclusively determine whether the fire started on the vessel or at the shore power pedestal on the dock, but the examination report noted that equipment and conductors on the catamaran that may have been affected by the lightning strike in Bermuda were "located in the general origin area of the fire."

Figure 55. *Best Revenge 5* partially submerged at dock postaccident. PHOTO BY COAST GUARD

Considering the size of the fire that would have been required to ignite the adjacent vessel, the burn pattern around the pedestal, and asymmetric pedestal remains, along with witness statements, it is less likely that the fire damage to the dock and pedestal was the result of a fire originating within the pedestal but rather more likely from the radiant heat from a fire located on the vessel.

The NTSB determined that the probable cause of the fire aboard the uninspected sailing vessel *Best Revenge 5* and on its pier was an electrical fault in an accommodation space on the vessel.

VESSEL GROUP **PASSENGER**

Fire aboard Roll-on/Roll-off Passenger Vessel *Caribbean Fantasy*

LOCATION
ATLANTIC OCEAN
2 MILES NORTHWEST OF SAN JUAN, PUERTO RICO

ACCIDENT DATE	REPORT NUMBER
AUGUST 17, 2016	**MAR1801**
ACCIDENT ID	ADOPTED
DCA16FM052	**JUNE 5, 2018**

About 0725 on August 17, 2016, a fire broke out in the main engine room of the roll-on/roll-off passenger vessel ***Caribbean Fantasy***. The fire could not be contained, so the ship was abandoned. US Coast Guard and other first responder vessels and aircraft, along with Good Samaritan vessels, helped transport all 511 passengers and crew to the port of San Juan, Puerto Rico. The burning vessel drifted in the wind and grounded on the sandy bottom outside the port. Three days later, the vessel was towed into the harbor, where shore-based firefighters extinguished the last of the fire. The accident resulted in an estimated $20 million in damage to the ***Caribbean Fantasy***, which was eventually scrapped in lieu of repairs.

On the morning of the accident, the ***Caribbean Fantasy*** was approaching the pilot station at the entrance to San Juan after an overnight voyage from Santo Domingo, Dominican Republic. About 0720, engineering watchstanders discovered a fuel leak on the vessel's port main engine. Soon after, the pressurized fuel spraying from the leak flashed to a fire. The NTSB would later determine that the leak originated at a blank flange in the fuel supply piping. The flange contained gasket material that was not suited for use with diesel fuel, the blanking plate did not meet the manufacturer's specifications, and spray tape had been improperly installed on flanges throughout the fuel system.

Figure 56. *Caribbean Fantasy* during the final stage of abandonment.
PHOTO BY COAST GUARD

Figure 57. A harbor tug cooling the starboard side of the *Caribbean Fantasy*. PHOTO BY COAST GUARD

The fire spread quickly, and the chief engineer activated the ***Caribbean Fantasy***'s water-mist fixed firefighting system. However, the water-mist had little effect on the fire, and watchstanders were forced to evacuate the engine room and engine control room (ECR). After the chief engineer evacuated the ECR, he activated a pneumatic valve, which should have closed fuel and lube oil quick-closing valves and ventilation dampers in the engineering spaces. Postaccident, the NTSB determined that the quick-closing valves had been intentionally blocked open prior to the casualty, providing a source of fuel to the fire. Furthermore, the NTSB found that the ventilation dampers had failed to operate as designed, which allowed air to continue to feed the fire.

About 0727, the bridge team, who had been informed of the fire by ECR watchstanders, made a coded announcement over the ship's public address system informing the crew and activating the vessel's firefighting teams. The firefighting teams initially staged in garage A, a vehicle deck forward of the engine room, and attempted to access the engine room. They were driven back by heat and smoke, and were forced to retreat to garage B, one deck above. The heat and smoke soon spread to garage B, and the fire team staging area was moved again to garage C, a deck above garage B. From garage C, the emergency team leader directed a fire squad to conduct boundary cooling one deck below in garage B. However, according to fire squad members who were interviewed after the accident, their fire hoses were never charged. During postaccident examination, the NTSB determined that the fire boundary between the engine room and garage B failed due to the fire's extreme heat and flames.

The vessel's crew prepared to activate the CO_2 fixed firefighting system for the engine room; however, the order to activate the system was delayed for several minutes while the crew attempted to account for all personnel that had been in the space. Upon confirming that the engine room was evacuated, the master gave the order to release CO_2. There was no indication that the CO_2 had any effect on the fire.

Concerned about the smoke in the garages, the master

Figure 58. Postaccident photo of *Caribbean Fantasy*'s quick-closing valve for the starboard heavy fuel oil storage tank that was blocked open with a bolt and nut.

directed the activation of the ship's drencher system for garage B. Crewmembers activated the drencher system valves for garages A and B, and some of the valves for garage C. The drencher systems were secured 20 minutes later after the ship began to develop a list.

About 0745, the master ordered a PA system announcement to inform the passengers of the situation on board. An announcement was first made in English, using a prewritten script, informing the passengers of the fire and directing them to follow the instructions of the crew. Immediately following this announcement, an announcement was made in Spanish, which was the language of most of the passengers. That announcement followed a different pre-written script which stated that the fire was not under control and, "it has been decide [*sic*] to abandon the vessel." It further directed all crewmembers to

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

Coast Guard Sector San Juan had been monitoring VHF radio traffic and contacted the ***Caribbean Fantasy*** after hearing a radio broadcast from the ship stating that it was "not under command." The passenger vessel's crewmembers informed the Coast Guard about the fire, their intention to evacuate passengers, and their need for assistance. In response, Sector San Juan dispatched Coast Guard small boats to proceed to the scene. Additionally, a Coast Guard fast response cutter was deployed to the accident location to act as the on-scene commander. Having heard the radio traffic, first responder, towing, and other Good Samaritan vessels also began moving from the harbor out to the ***Caribbean Fantasy***'s location.

Over the next 45 minutes, the ***Caribbean Fantasy*** loaded and lowered its lifeboats. The boats were filled or partially filled with passengers, along with designated crewmembers from the ship. Once the lifeboats were in the water, however, none of the boat crews could disconnect the hooks that attached the boats to the davit cables from the ship. Prior to the accident voyage, the hooks had been replaced with new hooks, and the crew had not been trained on how to operate them. The crews in lifeboats no. 1 and no. 2 eventually freed their boats from the hooks using a dangerous manual release procedure. Lifeboat no. 2 then proceeded into San Juan and disembarked its passengers. Lifeboat no. 1 began taking on water and its engine failed to start, so passengers were transferred to Good Samaritan vessels. The crew on lifeboat no. 3 was never able to detach the release hooks, and the vessel was raised out of the water to prevent waves from smashing it against the side of the ship. As it was being raised, the winch motor on the davit failed due to overload (it was not designed to lift a fully loaded boat), leaving the boat hanging 6 feet above the water. Passengers were eventually transferred one-by-one to a Coast Guard aids-to-navigation boat.

Remaining passengers on board the ***Caribbean Fantasy*** were required to evacuate using the ship's marine evacuation systems (MESs). The MESs were installed on either side of the ship and included inflatable slides

Figure 59. Automatic identification system (AIS) track of the *Caribbean Fantasy* and timeline of events.
BACKGROUND BY GOOGLE EARTH

Figure 60. *Caribbean Fantasy*'s marine evacuation system deployed on the starboard side. PHOTO BY COAST GUARD

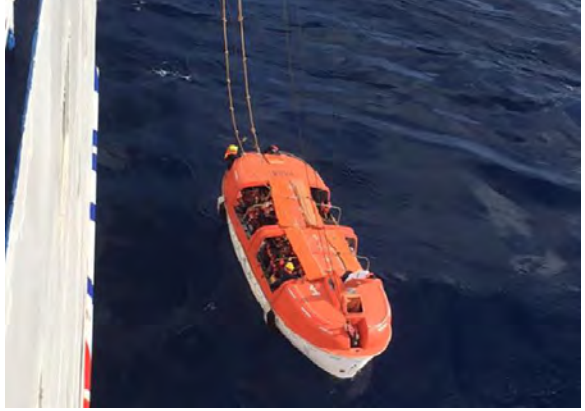


Figure 61. Lifeboat no. 1 in the water and unable to open the release hooks, about 0825. PHOTO BY A *CARIBBEAN FANTASY* PASSENGER

that, when deployed, terminated at floating platforms on the water. As designed, passengers were to slide down the slide to the platform and then board liferafts that had been launched from the ship. The master intended to use the port MES for the evacuation because it was on the leeward side of the vessel, but the slide was not deployed and rigged properly, making it unusable. Flames and smoke emanating from the port side prevented any further action with this MES.

Passengers were then directed to the starboard MES; however, the starboard MES was also not deployed as designed. The slide was kinked in the middle of the chute, with an extreme angle at the top of the slide and a flat angle at the bottom. Several passengers who used the slide suffered injuries due to the kink in the slide. A Coast Guard vessel eventually rigged a line to the floating platform of the MES to pull the slide out straighter and prevent further injuries. The NTSB determined that the failure to deploy the port and starboard MESs was the result of inadequate training of the crew.

The loading of liferafts from the MES platform was delayed as the crew struggled to pull the rafts, which had been prematurely launched and inflated, alongside the platform. Coast Guard small boats assisted by pulling the liferafts over to the platform.

While the evacuation was ongoing, the ***Caribbean Fantasy*** had drifted in the wind and waves toward shore. The crewmembers of the ***Caribbean Fantasy*** dropped the vessel's starboard anchor when they became aware of the danger, but about 1021 it was too late to prevent the ship from grounding on a soft sand and shell bottom.

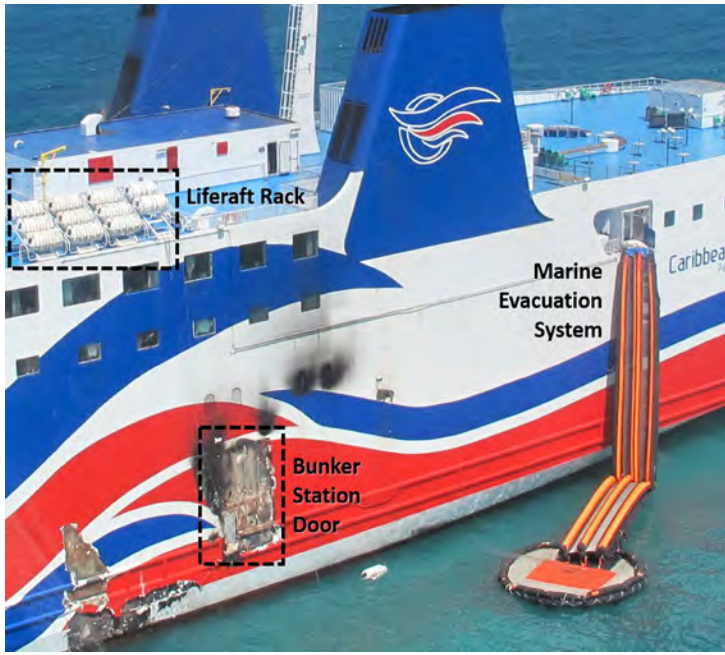
On shore, Coast Guard Sector San Juan activated its mass rescue plan, coordinating with federal and local authorities as well as other emergency responders. The various organizations established an incident command post and reception facility at San Juan's Pier 6 to manage the response. A triage station was also set up to assess each passenger's medical condition. When passengers began arriving ashore, emergency medical services transport units took individuals needing treatment beyond first aid to one of nine medical facilities in the area.

The evacuation continued with Coast Guard and other first responder helicopters also assisting the waterborne effort. All passengers and crew were off the ship at 1224. Shore-based firefighters who had boarded the ship by helicopter were evacuated just before 1300. The vessel continued to burn where it had grounded. It remained there for 3 days until it was towed into the port of San Juan, and the last of the fire was extinguished by shore-based firefighters.

Although Baja Ferries, the owner of the ***Caribbean Fantasy,*** had a safety management system (SMS) that met the objectives of the International Safety Management (ISM) Code, the NTSB concluded that the company had failed to successfully implement the SMS, both ashore and on board the passenger vessel. The ***Caribbean Fantasy*** had a history of safety-related issues prior to the accident, having been detained three times in the previous 3 years by port state-control authorities. During its investigation, the NTSB found poor maintenance practices and inadequate training were prevalent. The NTSB noted that these issues had been documented by the vessel's flag state and classification society before the accident, but insufficient corrective actions had been taken.

Figure 62. Port side of the *Caribbean Fantasy* on the day after the accident. Note the angle of the MES and the single liferaft container floating in the water.

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



VESSEL GROUP **TOWING/BARGE**

Engine Room Fire aboard Towing Vessel *George King*

LOCATION
LOWER MISSISSIPPI RIVER
MILE 393.6; NEAR ST. JOSEPH, LOUISIANA

ACCIDENT DATE	REPORT NUMBER
JANUARY 24, 2018	**MAR1825**
ACCIDENT ID	ISSUED
DCA18FM012	**NOVEMBER 7, 2018**

Figure 63. *George King* under way prior to the fire.

Figure 64. *George King* still burning on the day after the fire started. PHOTO BY COAST GUARD

About 2041 on January 24, 2018, the towing vessel ***George King*** was pushing 30 empty barges upbound on the Lower Mississippi River at mile 393.6 when a fire began in the engine room and quickly spread. The crew abandoned the vessel after unsuccessfully trying to extinguish the fire. No pollution or injuries were reported. The estimated property damage exceeded $500,000.

On the evening of the accident, the captain, who was at the helm in the wheelhouse, had observed a flash that originated from behind him as he faced forward. When he turned around, he saw flames coming from the port exhaust stack. He sounded the general alarm and notified the crew by radio that a fire was in progress in the engine room.

Upon hearing the general alarm, the chief engineer went to the muster station in the galley, where he met the other crewmembers. Two teams were assembled to fight the fire. One fire team went to the port side and deployed a fire hose, while the second team went to the starboard side to start the fire pump and deploy another fire hose. Due to the intensity of the fire, the teams were unable to enter the space to spray water directly at the source. Consequently, the teams sprayed water through open windows, which they stated was ineffective against the fire.

Upon hearing reports that the firefighting efforts were not effective, the captain directed the chief engineer to activate the emergency fuel oil shutoff valve, which he did. The engines and the generator stopped shortly thereafter.

The ***George King***'s electrically driven fire pump stopped when the generator shut down, and thus the fire hoses lost water pressure. Therefore, the captain directed that the vessel's halon fixed firefighting system be activated to extinguish the fire. The chief engineer tried to reach the port halon activation station located on the aft section of the house. However, flames erupting from the broken engine room windows and open double doors prevented him from proceeding down the port side toward the activation station.

At the same time, the second fire team proceeded down the starboard side of the vessel, closing the engine room windows to ensure that the halon, when released, was contained within the engine room. After all of the starboard-side windows were closed, the team met the chief engineer, who asked them if "they got it." They answered, "Yes." The chief engineer's question was intended to confirm that they had activated the halon system side, but the crewmembers thought he was asking them if they had closed the windows. In the confusion, the halon system was never activated.

After directing the halon system to be activated, the captain ordered the vessel's crew to abandon ship to the barges to wait for assistance.

During a postaccident examination of the port main engine, investigators discovered that the entire lube oil strainer housing, located just forward of the engine and constructed of aluminum, had been melted away. Because the lube oil system was a pressurized system, a small leak in the strainer's housing or at the covers for the strainers could have caused escaping oil to atomize. Atomized oil is susceptible to ignition if there is a viable heat source located nearby, and there were a number of hot surfaces within the ***George King***'s engine room. It is likely that atomized lube oil spraying from the port strainer was ignited after making contact with a hot surface near the strainer housing, which progressed into a continuous burning fire after an initial flashover.

The crew did not activate the halon system; however, had the system been activated, its effectiveness would have been limited because the portside doors to the engine room were open and several engine room windows were broken. In addition, engine room inlet and exhaust vents were fitted with fixed louvers that were not able to be closed. These openings would have allowed a significant amount of the discharging halon to escape the space instead of being contained in volume large enough to extinguish the fire. Additionally, these openings allowed for continued air draft to the fire, allowing it to spread.

The NTSB determined that the probable cause of the engine room fire aboard the towing vessel *George King* was the ignition of oil spraying from the pressurized lube oil strainer on the port main diesel engine. Contributing to the severity of the fire was the fixed-open engine room ventilation system and the inability of the crew to close all engine room windows and doors, which allowed the fire to spread and would have limited the effectiveness of the halon fixed firefighting system had it been activated.

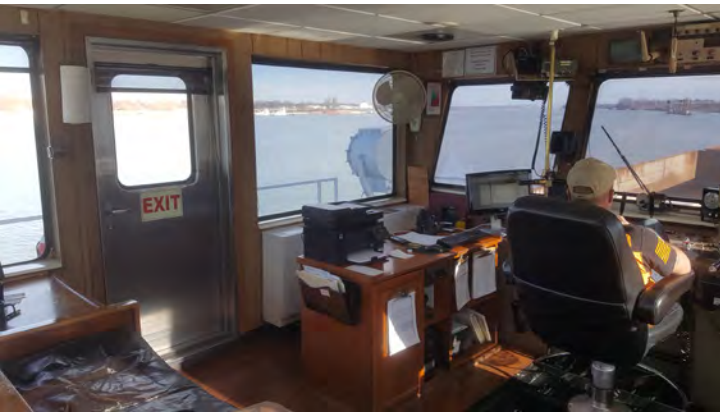


Figure 65. *George King*'s wheelhouse before the fire.

Figure 66. Charred remains of the wheelhouse.

Figure 67. Another view of the burning vessel the morning after the fire.

VESSEL GROUP **CARGO**

Fire aboard Vehicle Carrier *Honor*

LOCATION
ENGLISH CHANNEL
ABOUT 55 MILES SOUTHWEST OF THE ISLE OF WIGHT, UNITED KINGDOM

ACCIDENT DATE	REPORT NUMBER
FEBRUARY 24, 2017	**MAB1807**
ACCIDENT ID	ISSUED
DCA17RM007	**MARCH 6, 2018**

About 0300 on February 24, 2017, the US-flagged roll-on/roll-off (ro-ro) vehicle carrier ***Honor*** was en route from Southampton, England, to Baltimore, Maryland, when a fire broke out in the upper vehicle deck. The fire was extinguished by the crew using the vessel's CO_2 fixed firefighting system. One injury was attributed to the firefighting efforts. The accident resulted in extensive damage to the ***Honor***'s hold as well to its cargo of about 5,000 vehicles, amounting to more than $700,000. No pollution resulted from the accident.

The ***Honor*** had 13 vehicle decks connected throughout by ramps. The upper deck, which was aft of the ***Honor***'s crew accommodation spaces, was known as the "garage deck" and used for car stowage. The vehicle decks were protected by a low-pressure CO_2 single-tank fixed firefighting system.

About 2030 on February 23, the ***Honor*** departed the dock after conducting cargo operations at Southampton, United Kingdom. The vessel then entered the English Channel and made its way westbound toward the Off Casquets Traffic Separation Scheme north of Cherbourg, France.

About 0302 the next day, a pre-warning alarm on the fire detection panel sounded on the bridge. The alarm indicated that the problem was on the garage deck, so the second mate who was on watch sent an able-bodied seaman (AB) aft to investigate. While the AB was on his way to the garage, the pre-warning alarm became a full alarm. The AB opened the door and inspected the space, radioing back to the second mate that there was smoke in the garage. A few seconds later, the AB reported that there was also fire, which the second mate relayed to the master and chief mate.

Figure 68. *Honor* under way prior to the accident.
PHOTO COURTESY OF ERWIN WILLEMSE

The master instructed the chief mate to start donning firefighting equipment, and then the master proceeded to the bridge. Once on the bridge, the master instructed the second mate to sound the general alarm. The master then began reducing the vessel's speed while maneuvering the ship to the north, out of the traffic scheme and away from vessel traffic.

The chief mate, after twice attempting to enter the space, reported to the master that the space was inaccessible due to thick black smoke. At 0325, the chief mate reported visible flames outside the garage, both on the deck above and at the aft end of the space. The crew had run out at least four firefighting hoses and commenced spraying water on the outside bulkheads and overhead of the garage for boundary cooling and to knock down the visible flames. By 0328, all the ventilation to the area had been secured and confirmed closed.

The master prepared to give the order to release the CO_2 into the space, while the crew continued to boundary cool the area. Another round of checks was made about the perimeter to ensure all ventilation was secured, and, at 0336, a muster was taken to confirm that no one was in the affected space or any space where the CO_2 would be discharged. At 0339, the master instructed the chief engineer to release CO_2.

After the release, the chief mate, the third mate, and an oiler inspected the surrounding areas for visible smoke, hot spots, or other signs of fire, while the rest of the crew continued to actively monitor and cool the adjacent bulkheads and decks. When external signs indicated that the fire was out, the chief mate and chief engineer donned self-contained breathing apparatuses (SCBAs) and protective equipment and then inspected the affected areas. They used a thermal imaging device to further ensure that the fire was out.

Fire investigators examined the affected spaces and identified the likely origin to be on the garage deck. There was substantial damage to the space and several of the vehicles on this deck were destroyed by fire. Investigators further determined that the likely cause of the fire was a fault in the starter motor solenoid in one of the personally owned vehicles in shipment. Preliminary testing of this scenario confirmed that a fault within the solenoid could cause ignition of the insulation and covering on the adjacent wiring.

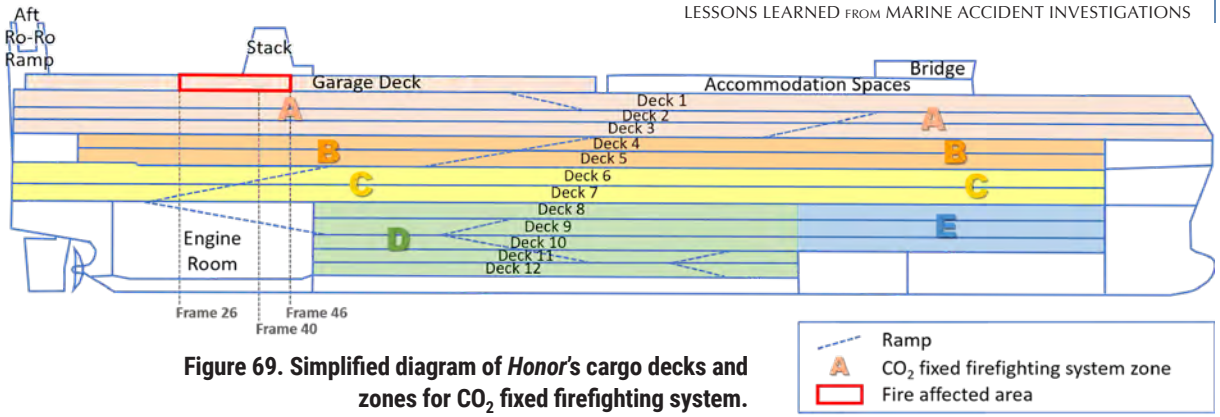


Figure 69. Simplified diagram of *Honor*'s cargo decks and zones for CO_2 fixed firefighting system.

Figure 70. Damaged cars on the garage deck.

Figures 71 and 72. Above, damage to the top deck above the garage. Below, exterior bulkhead on the port side of the garage while looking aft.

The NTSB determined that the probable cause of the fire on board the vehicle carrier *Honor* was a fault in the starter motor solenoid in one of the personally owned vehicles being transported in the vessel's cargo space.

VESSEL GROUP **PASSENGER**

Fire aboard Small Passenger Vessel *Island Lady*

LOCATION
PITHLACHASCOTEE RIVER
NEAR PORT RICHEY, FLORIDA

ACCIDENT DATE	REPORT NUMBER
JANUARY 14, 2018	**MAR1802**
ACCIDENT ID	ADOPTED
DCA18FM010	**DECEMBER 11, 2018**

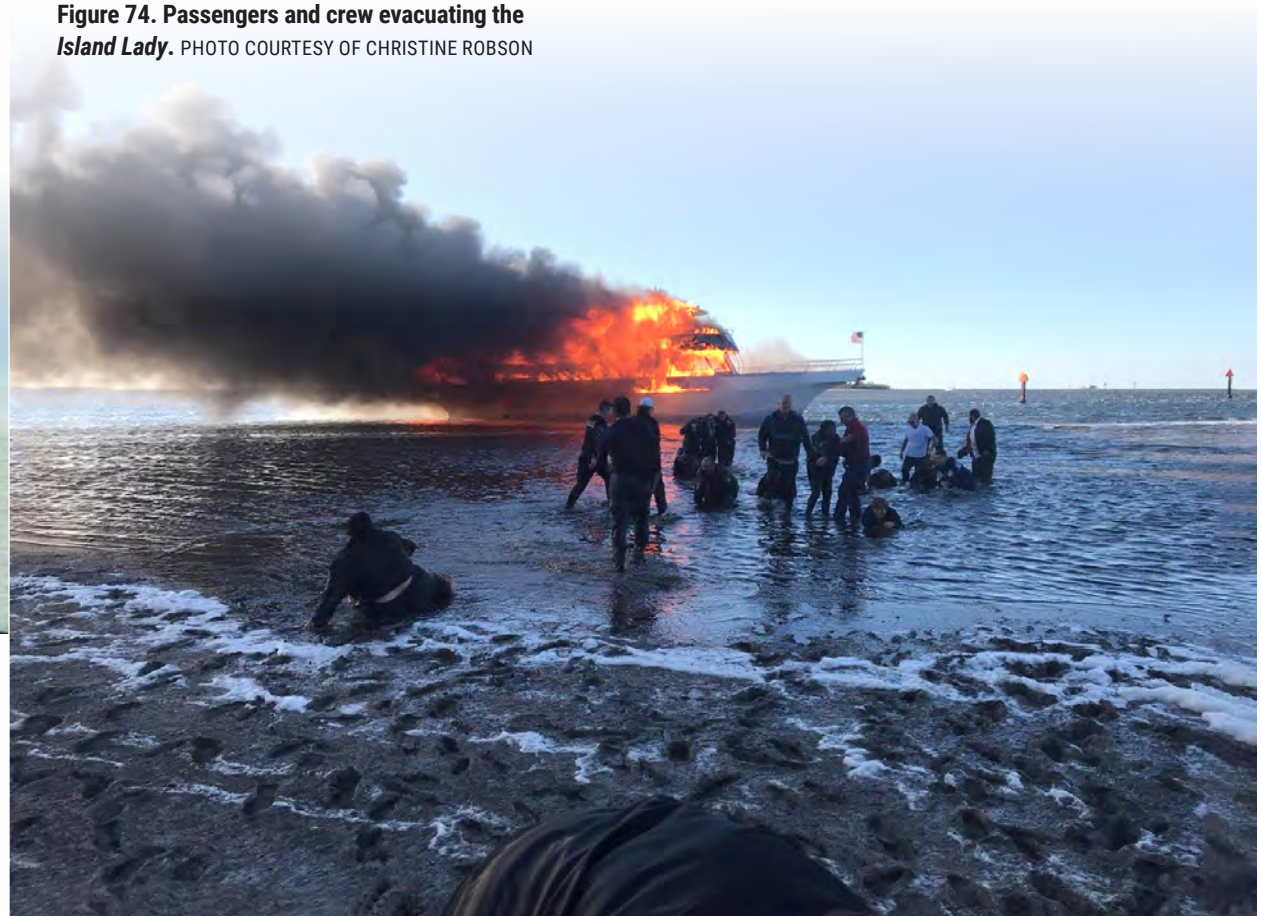
Figure 73. *Island Lady* before the accident.
PHOTO COURTESY OF PREVIOUS OWNER

About 1600 on January 14, 2018, a fire broke out in an unmanned space on the small passenger vessel ***Island Lady*** near Port Richey, Florida, during a scheduled transit to a casino boat located about 9 miles offshore in the Gulf of Mexico. After receiving a high-temperature alarm on the port engine, the captain turned the ***Island Lady*** around to return to the dock. During the return trip, smoke began filling the lazarette, main deck, and engine room. The captain deliberately beached the vessel in shallow water near shore to evacuate the passengers. All 53 crewmembers, employees, and passengers evacuated the vessel by entering the water and wading/crawling ashore. Fifteen people were injured and transported to local hospitals; one passenger died in the hospital several hours after the fire. The ***Island Lady***, valued at $450,000, was declared a constructive total loss.

During the voyage, the captain received the high-temperature alarm for the port engine's jacket-water system. He did not shut down the engine but instead left it idling. Doing so allowed the overheating engine to continue to generate excessive heat, which in turn affected the exhaust tubes and ignited their surrounding structures. The vessel owner had not provided specific guidance to its vessel captains about how to respond to high-temperature alarms.

Although federal regulations require small passenger vessels to have fire-detection and -suppression systems in spaces containing propulsion machinery (such as engine rooms), the regulations do not require such systems in unmanned spaces with engine exhaust tubing. The fire on board the ***Island Lady*** most likely started in the lazarette—an unmanned space aft of the engine room—through which the exhaust tubes led

Figure 74. Passengers and crew evacuating the *Island Lady*. PHOTO COURTESY OF CHRISTINE ROBSON



toward the vessel's stern. Because there was no fire in the engine room initially, activating the vessel's fixed fire-suppression system for that space would have served no purpose; further, activation would have caused the vessel to needlessly lose all available propulsion during the emergency.

Although the owner, Tropical Breeze Casino Cruz, stated that it implemented a preventive maintenance program after a previous fire on board a company vessel (the ***Express Shuttle II***) in response to an NTSB safety recommendation, the quality of the program was insufficient. The Coast Guard does not require small passenger vessels to have preventive maintenance programs and, importantly, even when such programs are voluntarily in place (such as in this case), the Coast Guard provides no enforcement oversight.

The investigation revealed that the ***Island Lady*** crewmembers lacked sufficient understanding of firefighting principles and that their training drills were infrequent or not completed. In addition, records pertaining to crew training drills and daily maintenance checklists were kept only on board the vessel and were lost in the fire; no duplicate records were kept ashore.

Counter to regulations, the ***Island Lady***'s fuel tanks were equipped with plastic hoses used as fuel-level indicators; further, the system did not have automatic shutoff valves. As a result, during the fire the plastic material melted and the release of diesel fuel exacerbated the fire.

The NTSB determined that the probable cause of the fire on board small passenger vessel *Island Lady* was Tropical Breeze Casino Cruz's ineffective preventive maintenance program and insufficient guidance regarding the response to engine high-temperature conditions, which resulted in the captain's continued operation of an engine that was overheating due to a cooling water pump failure, leading to ignition of the exhaust tubing and surrounding structure. Contributing to the spread of the fire was the lack of fire detection in the vessel's lazarette, which was not required by regulations and which allowed the fire to take hold unbeknownst to the crew.

Figure 75. *Island Lady* engulfed in flames.
PHOTO COURTESY OF COUNTY SHERIFF'S OFFICE

Figure 76. Sunken remains of the *Island Lady*.

VESSEL GROUP **TOWING/BARGE**

Engine Room Fire aboard Towing Vessel *J.W. Herron*

LOCATION
BIG BAYOU CANOT
TWELVEMILE ISLAND; NEAR MOBILE, ALABAMA

ACCIDENT DATE	REPORT NUMBER
DECEMBER 13, 2017	**MAR1828**
ACCIDENT ID	ISSUED
DCA18FM008	**DECEMBER 20, 2018**

About 1340 on December 13, 2017, the towing vessel ***J.W. Herron*** was shifting barges on Big Bayou Canot near Twelvemile Island, approximately 8 miles north of Mobile, Alabama, when a fire began in the lower engine room and quickly spread. After the crew of three partially secured the engines and fuel supply, heavy smoke and fire prevented them from attempting to extinguish the fire, forcing an immediate evacuation of the vessel to the barges. No pollution or injuries were reported. The estimated damage to the vessel was $1.5 million.

The ***J.W. Herron*** was a twin-propeller towing vessel powered by two EMD 645 twelve-cylinder diesel engines producing 3,000 total horsepower. The transmission on each engine was a Falk LST-type consisting of a reduction gear with an integral pneumatically operated clutch.

In the early afternoon on the accident date, the ***J.W. Herron*** was pushing a barge tow into the river bank with both engine throttles set ahead at an idle speed of approximately 345 rpm. Noticing that the tow was not moving toward the bank as expected, the captain increased the throttle of both engines to approximately 500 rpm. He then looked aft and saw no propeller wash from the starboard side.

About 1340, a deckhand and the engineer who were on one of the barges noticed "dark black" smoke emanating from the area of the stack fan outlet on the port side and then from the portside engine room door (winds in the area were blowing from starboard to port). The deckhand and engineer returned to the ***J.W. Herron*** where, according to the engineer, they found the engine room filled with black smoke.

The captain stated that all four engine room windows and the double doors on the main deck on both the port and starboard sides of the engine room were open. He pulled the remote emergency fuel shutoffs for the starboard generator and starboard propulsion engine, which were located above the forwardmost engine room window. However, after he proceeded around the forward side of the wheelhouse, he was unable to reach

Figure 77. *J.W. Herron* docked post-fire.

the shutdowns for the port generator and propulsion engine due to the smoke.

While the deckhand and engineer left the ***J. W. Herron*** to attend to another small towing vessel that was assisting, the captain called the company and prepared to call the Coast Guard, before being forced from the vessel by smoke and fire around 1349. Two local fire department vessels arrived on scene around 1510 and fought the fire with water cannons until the flames were extinguished.

The captain suspected that the initiating event was a slipping clutch, as evidenced by the loss of propulsion on the starboard engine before the fire. A forensic fire report completed after the accident indicated that the fire was hottest near the aft portion of the starboard engine. According to the report, the likely initiating event was the heat of the slipping clutch or a hot engine surface that ignited lube oil from a ruptured hose on a vacuum canister located above the clutch. Investigators also found that copper tubing with flare fittings that carried pressurized lube oil to the engine blowers ran in the same area as the vacuum canister hoses above the clutches and therefore could have been a potential fuel source. The engineer stated that the flare fittings had wept in the past from engine vibration. Because the crew was not able to reach the emergency engine shutdown, lube oil pressurized from a running engine would have fed the fire until the sump emptied or the engine stopped.

Figure 78. *J.W. Herron* under way prior to the fire.
PHOTO BY DRAYE, MARINETRAFFIC.COM

Had the crew been able to reach the port engine shutdowns, additional diesel fuel in the day tank would not have been available to fuel the fire. In addition, the engine room supply and exhaust fans remained in operation during the fire because they were controlled from the engine room and therefore could not be shut down. Nevertheless, if they had been secured, the engine room inlet and exhaust vents would still not have been able to be shut because they were fitted with fixed louvers. The inability to secure all ventilation allowed for a continued oxygen supply to the fire, hastening its growth and spread.

The NTSB determined that the probable cause of the engine room fire aboard the towing vessel *J.W. Herron* was leaking lube oil from a propulsion diesel engine hose or tubing fitting that was ignited off an exposed hot engine surface or slipping clutch. Contributing to the severity of the fire was the location of the emergency engine shutdowns and fuel supply shutoffs near the exterior engine room doors, which proved to be inaccessible. Contributing to the spread of the fire was the inability to secure ventilation to the engine room.

ACCESSING REMOTE ENGINE ROOM SHUTDOWNS

The location of remote emergency shutdowns to the engine room—quick-closing valves for fuel and lube oil systems, remote stops for ventilation fans, and engine stops—as well as fire pump start controls may not be accessible during a fire. Therefore, the accessibility of these shutdowns and controls should be evaluated during fire-response planning. Alternative remote emergency shutdown locations, such as the wheelhouse, should be considered for redundancy.

Figure 79. Fire damage of the engine room's upper level (looking forward).

VESSEL GROUP **FISHING**

Flooding and Sinking of Fishing Vessel *Ambition*

LOCATION
BERING SEA
19 NAUTICAL MILES NORTH-NORTHEAST OF FALSE PASS, ALASKA

ACCIDENT DATE	REPORT NUMBER
JULY 23, 2016	**MAB1804**
ACCIDENT ID	ISSUED
DCA16FM045	**JANUARY 30, 2018**

On July 23, 2016, the fishing vessel ***Ambition*** sank while transiting in the Bering Sea near the northern entrance to False Pass off the Alaska Peninsula. The five crewmembers donned immersions suits and abandoned the vessel into the water and onto a Good Samaritan vessel. The crew suffered no injuries. Most of the fuel oil on board was later recovered by salvors, but a light oil sheen was observed in the area in the days immediately following the sinking. The vessel was declared a total loss with an estimated value of $700,000.

The ***Ambition*** was originally built as a drum seiner. However, when it was bought by its last owner/captain in 2013, it was modified to be a fish tender, a vessel that meets at sea with fishing boats that have reached full capacity, onloads the fish, and then transports the catch to the nearest fish-processing plant. Previous owners had modified the vessel's wheelhouse and aft deck bulwarks and added a circular net guard—a frame around the propeller and rudder to protect the crew during fishing.

On July 22, the ***Ambition*** onloaded salmon from a fishing vessel in Port Moller, Alaska, filling both fish holds. After waiting for an optimal tide, the ***Ambition*** departed about 2300 bound for a fish-processing plant in King Cove, Alaska.

For the next 17 hours, the vessel transited uneventfully in Bristol Bay and the Bering Sea, along the north coast of the Alaska Peninsula. Sometime after 1600 on July 23, the captain, who was in the wheelhouse, noticed that the vessel was "sluggish." At the same time, he noted that the stern was sitting about 5 inches too low in the water. The engineer told investigators that at 1700 the crew checked the ***Ambition*** and found that the engine room and tool room were free of water and the fish holds were not slack. While the crew was checking spaces, the lazarette bilge high-water alarm began sounding intermittently in the wheelhouse.

The captain and the engineer went aft to check the lazarette. By the time they reached the access to the space, the bilge alarm was sounding continuously and waves were breaking over the stern of the vessel. The engineer told investigators that they found the hatch

Figure 80. Partially submerged *Ambition* as seen from *Star Watcher*'s deck.
PHOTO COURTESY OF M. POTTER

securely dogged. The captain said that when they opened the hatch, there was more water in the space than they could pump out. The captain and the engineer closed and dogged the hatch and proceeded back to the wheelhouse.

The crew rigged a portable bilge pump in preparation for taking a suction through the lazarette's hatch, but the *Ambition*'s aft deck soon became awash under a foot of water. The crewmembers realized they could not keep up with the flooding, so about 1826, the captain broadcast a Mayday call over the VHF radio. The fishing vessels *Star Watcher* and *Time Bandit* heard the broadcast. The *Star Watcher* began heading toward the scene, while the *Time Bandit* relayed the radio distress call to the US Coast Guard via MF radio. In response, the Coast Guard launched a helicopter and a fixed-wing aircraft.

Figure 81. Starboard aft quarter of the *Ambition* prior to sinking. Arrow identifies part of the net guard installed to protect the propeller and rudder.
PHOTO BY COAST GUARD

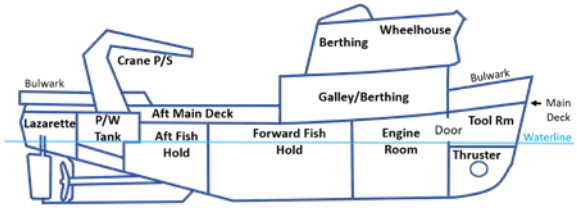


Figure 82. Simplified profile of *Ambition*.
BASED ON ORIGINAL CONSTRUCTION GENERAL ARRANGEMENTS DRAWINGS AND CAPTAIN'S DESCRIPTION OF VESSEL LAYOUT

On the *Ambition*, the captain broadcast another Mayday call via VHF radio, but the Coast Guard did not receive his message. (The fish-processing company's fleet coordinator stated that VHF radio coverage was typically limited to 2–3 miles in range—6 miles maximum—in the Aleutian Islands fishing grounds.) About 1842, aware that the Coast Guard was not receiving the Mayday calls, a crewmember activated the emergency "SOS" function on a portable satellite communication device. "Within seconds," according to the crewmember, a duty officer located at a commercial emergency response coordination center responded via text. The crewmember informed the coordination center via text that the vessel was taking on water. At 1847, the duty officer notified Coast Guard Sector Anchorage of the *Ambition*'s location and lazarette flooding. The Coast Guard advised the duty officer that it was working a response to that vessel. At 1851, the coordination center duty officer called the *Ambition*'s fish-processing company contact. Following the call, the company contact notified the Coast Guard, providing specific crew information and an accurate vessel position as received from the satellite device.

The captain of the *Ambition* instructed the crewmembers to don their immersion suits, then ordered them to abandon the vessel. After entering the water, they swam toward the arriving *Star Watcher*, whose crew used a life ring to assist them aboard.

After the abandonment, the *Ambition* continued to slowly sink. It was last sighted at 2209 by a Coast Guard fixed-wing aircraft. Two attempts were made to salvage the vessel, but neither were successful. Salvage reports did not indicate the location of the hull breach that caused the flooding.

A postaccident overflight photograph showed struts and bars that were part of the propeller net guard modification. The vertical strut was fixed to the underwater portion of the hull plate beneath the lazarette at the transom. If the guard had contacted the ground, drifting debris (such as a log), or other objects, the weld points where the struts were attached to the hull may have been subject to cracking. Such cracking could have been the source of flooding during the accident voyage. Although the crew did not report a grounding or contact with an object, forces working on the guard over time may have also been transmitted and concentrated to the point of attachment to the hull.

The NTSB determined that the probable cause of the sinking of the fishing vessel *Ambition* was the flooding of the lazarette from a breach in the steel hull.

ALTERNATE EMERGENCY COMMUNICATION SYSTEMS IN ALASKA REGION

Vessel owners, operators, and crewmembers should be aware of the limitations of VHF radio reception in the Aleutian region. In addition to VHF radios, mariners should have alternate means of immediately alerting Coast Guard search and rescue (SAR) centers, such as satellite phones, other satellite communication devices, or marine medium-frequency (MF)/high-frequency (HF) radios. Captains and vessel owners should ensure that crewmembers are knowledgeable and proficient in the use of the designated alternate communication devices, and contact information for the SAR center should be posted in the wheelhouse and in crew common areas. In the case of satellite communication devices with SOS functionality, designated emergency contacts ashore should know critical information such as the vessel's intended route, the vessel's operations, and the number of persons on board.

VESSEL GROUP **TOWING/BARGE**

Flooding of Towing Vessel *Atlantic Raider*

LOCATION
BLOUNT ISLAND CHANNEL
ST. JOHNS RIVER, JACKSONVILLE, FLORIDA

ACCIDENT DATE	REPORT NUMBER
OCTOBER 28, 2016	**MAR1802**
ACCIDENT ID	ISSUED
DCA17FM002	**JANUARY 18, 2018**

On October 28, 2016, at 1530, the towing vessel ***Atlantic Raider*** was in the Blount Island Channel of the St. Johns River near Jacksonville, Florida, when it suddenly listed to port. Efforts to correct the list were ineffective; the list increased, water began to flood into the engine room, and the crew chose to intentionally ground the vessel. All three crewmembers disembarked safely. An oil sheen could be seen extending from the vessel. The damage was estimated between $800,000 and $1.2 million.

On the morning of the accident, the ***Atlantic Raider*** loaded 10,000 gallons of fuel and topped off its potable water tank at the NuStar Energy Terminal near Talleyrand, Florida. The vessel then got under way about 1030 for its dredge-assist jobsite in the Blount Island Channel, about 8 miles down the St. Johns River.

About 1530, while at its staging area as the crew was preparing to lay pipe for dredging, the ***Atlantic Raider*** began listing to port. The captain told investigators that the source of the list was not known. He and the deckhand went to the engine room, observed no sign of flooding there, started the main engines, and tried to correct the list by shifting fuel, without success. Water covered the stern and eventually began to flood the lower engine room through an open door on the vessel's port side, aft on the maindeck. The crew then closed the door, took in mooring lines from a raft of dredge pipe, and maneuvered the ***Atlantic Raider*** into nearby shallow water to prevent it from sinking in the middle of the navigable waterway. The port list increased as the crew turned the vessel to starboard in the direction of the west side of the channel.

At 1545, the crew intentionally grounded the ***Atlantic Raider*** outside of the channel. The captain told investigators that the vessel rolled to port about 45 degrees as it grounded and came to rest down by the port quarter. Water continued to flood through open portholes on the port and starboard sides of the main deck. In a short period of time, the engine room and most of the main deck were fully submerged. The other vessels in the staging area, the ***Lady Theo*** and the ***Free State***, came to aid the ***Atlantic Raider***. All three crewmembers were able to disembark safely from the vessel without injuries.

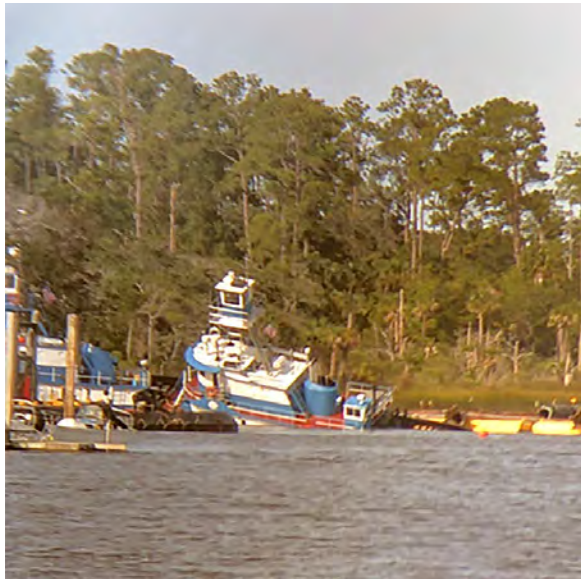


Figure 83. *Atlantic Raider* aground on the shallows of the west side of the Blount Island Channel. Note that the port quarter is under water up to the lower wheelhouse deck.
PHOTO BY COAST GUARD

On November 30, the ***Atlantic Raider*** was put into drydock. A horizontal hull fracture 9.5 inches long and 0.5 inches wide was found on the vessel's stern at a weld seam, about 10.5 feet above the keel. The vessel's rudder compartment was on the inboard side of the stern hull fracture. A 1-inch hole and two pinholes were also discovered on the corroded bulkhead leading into fuel tank no. 4. The captain and the owner's representative stated that they did not know of the fracture until after the accident.

The last maintenance of the ***Atlantic Raider***'s hull before the accident was a 2-month drydock period that ended in December 2014. Applicable work included repairing two holes in the forepeak tank, high-pressure washing and painting the hull, and replacing all 44 zinc anodes (to help prevent hull corrosion).

Figure 84. Stern hull fracture discovered in drydock.
PHOTO COURTESY OF
A. P. BOUDREAUX, SURVEYOR

According to a company representative, the ***Atlantic Raider*** did not normally have 26,000 gallons of fuel on board as it did the morning of the accident. At that condition, the draft of the vessel would have been deeper than normal—about 10.5 feet—putting the hull fracture at the waterline. Water likely entered the rudder compartment through the hull fracture and increased the draft by the stern, which would have caused the flooding rate to increase. About 5 hours later, the vessel began to sink by the port quarter.

The NTSB determined that the probable cause of the flooding of the *Atlantic Raider* was a stern hull fracture that allowed ingress of water into the rudder compartment and caused the vessel to sink by the port quarter. Contributing to the accident was flooding through an open door to the engine room.

VESSEL GROUP **FISHING**

Flooding and Sinking of Fishing Vessel *Ben & Casey*

LOCATION
GULF OF MEXICO
ABOUT 6 MILES EAST OF SOUTH PADRE ISLAND, TEXAS

ACCIDENT DATE	REPORT NUMBER
OCTOBER 30, 2017	**MAB1824**
ACCIDENT ID	ISSUED
DCA18FM004	**NOVEMBER 1, 2018**

About 2215 on October 30, 2017, the trawler ***Ben & Casey*** sank in the Gulf of Mexico about 6 miles off South Padre Island, Texas. The vessel was outbound to fishing grounds when it lost propulsion and seawater flooded into its freezer hold. The crew broadcast a distress call, and responding US Coast Guard personnel assisted the crew in dewatering the vessel. They were unable to control the flooding, so the crew of four boarded a Coast Guard vessel. A Good Samaritan vessel then attempted to tow the ***Ben & Casey***, but water ingress increased. The towline was cut, and the trawler sank soon after. No one was injured during the accident; no pollution was reported. The ***Ben & Casey***, valued at $191,000, was lost.

The ***Ben & Casey*** had a single diesel engine for propulsion. A 4-inch diameter propeller shaft was coupled to the main propulsion engine via a reduction gear in the engine room. From the reduction gear, the shaft ran aft through a non-watertight bulkhead to a "shaftway" that was located beneath the freezer hold. The shaftway could be accessed from the freezer hold by removing floor panels at the bottom of the hold. The shaft ran the length of the shaftway, then penetrated the hull through a watertight seal. The shaft terminated at the propeller, which was located just forward of the vessel's single rudder.

On the accident date, the ***Ben & Casey*** departed Brownsville, Texas, to trawl for shrimp off the coast of Texas. When the vessel was about 6 miles off shore on the outbound voyage, the crew heard a loud noise from below. The captain told investigators that at the same time, the main engine rpm quickly rose from 1,400 to 1,800, the vessel lost propulsion thrust, and a bilge high-water alarm sounded on the bridge. The captain and a rigman went to the engine room and freezer hold to investigate. In the freezer hold, they found about 6 inches of water above the deck. Lifting the shaftway access floor panels, they found water entering the hold at the aft end of the shaftway, near the shaft packing seal.

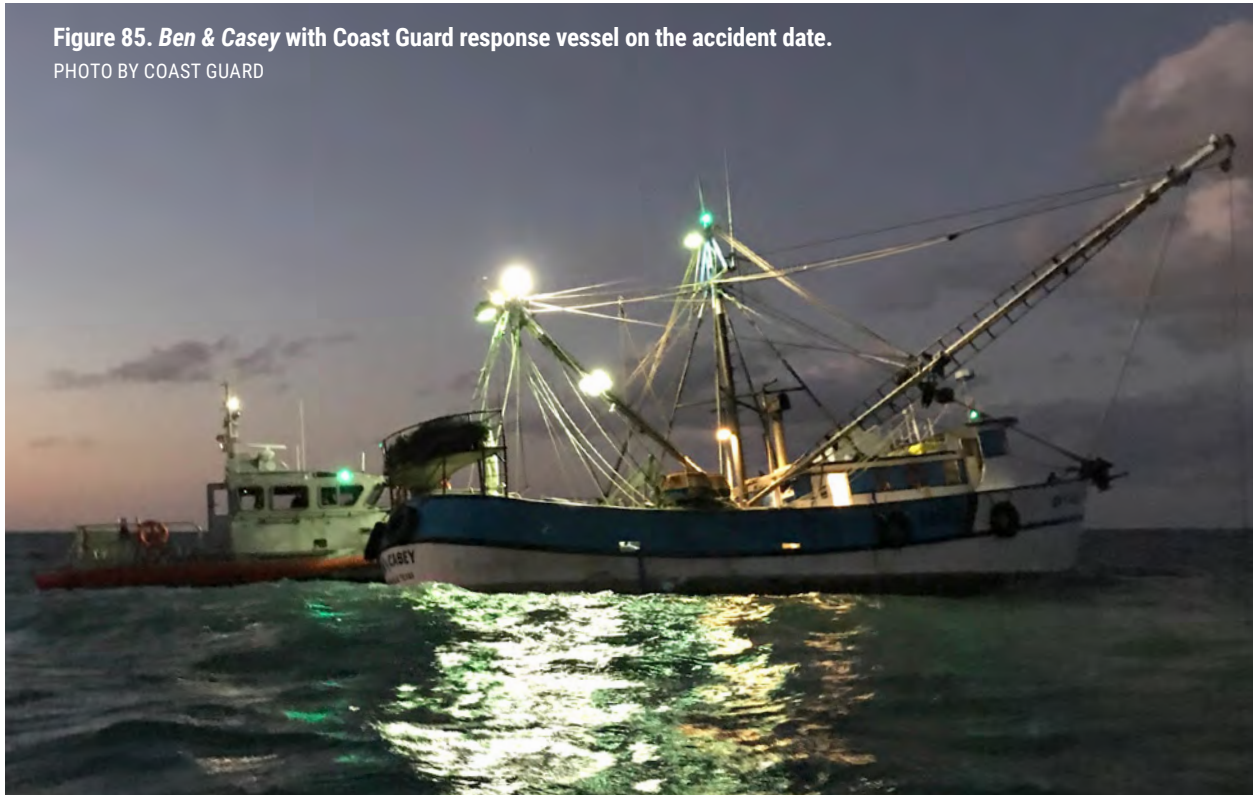


Figure 85. *Ben & Casey* with Coast Guard response vessel on the accident date.
PHOTO BY COAST GUARD

Figure 86. Shaftway of *Jake M*, a vessel with identical shafting to *Ben & Casey*, as viewed from the freezer hold while facing aft.

The captain turned on both of the vessel's electric bilge pumps. Although the pumps appeared to be working, the water level continued to rise in the freezer hold. Realizing that the flooding could not be controlled, the captain returned to the wheelhouse to make a distress call over VHF radio.

The Coast Guard cutter ***Alligator*** and a small boat from Coast Guard Station South Padre Island responded to the call, arriving on scene at 1850. Upon arrival, Coast Guard crewmembers from the small boat transferred two dewatering pumps to the trawler. The pumps were set up and started, but the captain told investigators that they could not get the pumps to take suction. Three Coast Guard crewmembers eventually boarded the trawler to assist with the pumps, but the pumps had become clogged with debris, and further efforts to gain suction were unsuccessful. With the water rising, the ***Ben & Casey*** and Coast Guard crewmembers were evacuated.

At 2015, crewmembers from the ***Alligator*** boarded the ***Ben & Casey*** with a peri-jet eductor to make a second attempt at dewatering the vessel. Shortly thereafter, a Good Samaritan vessel arrived on scene and passed a tow line to the ***Ben & Casey***. Once the line was secured between the two vessels, the Good Samaritan vessel began to tow the stricken trawler toward port. However, when the tow commenced, flooding increased in the ***Ben & Casey***. Ten to fifteen minutes later, the towline was cut, and the ***Alligator*** crewmembers disembarked the vessel. The trawler developed a severe list to port, then began to founder by the stern. At 2215, the vessel was fully submerged.

The loss of propulsion and the immediate increase in engine rpm reported by the captain just after the crew heard the loud noise suggested that the propeller shaft on the ***Ben & Casey*** sheared. Once the shaft completely sheared, it is likely that either the weight of the propeller caused the shaft to partially back out of the stern tube or that excessive movement of the shaft in the stern tube seal allowed water to enter the hull.

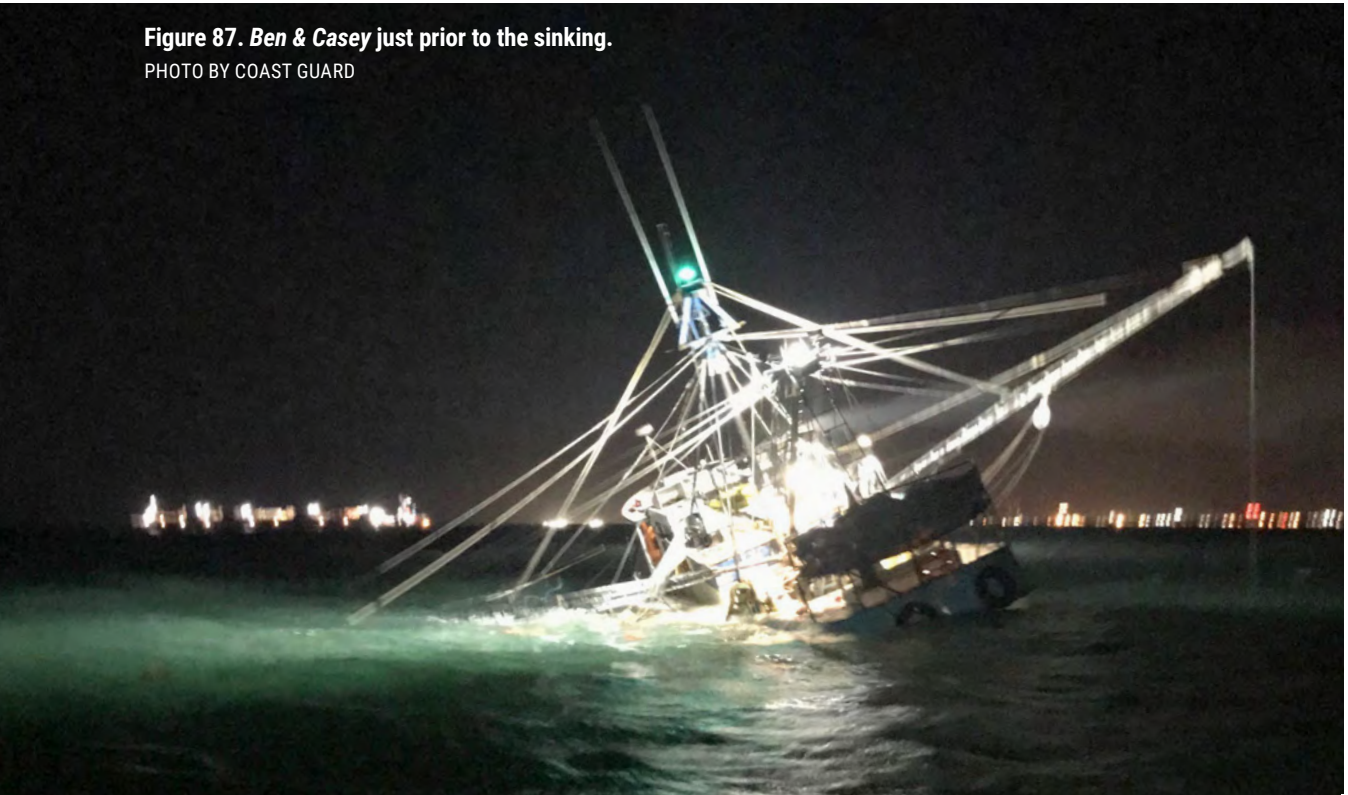


Figure 87. *Ben & Casey* just prior to the sinking.
PHOTO BY COAST GUARD

The NTSB determined that the probable cause of the flooding and sinking of the fishing vessel *Ben & Casey* was a sheared propeller shaft that allowed water ingress into the hull through the shaft seal.

RECOGNIZING METAL FATIGUE IN PROPELLER SHAFTING

This accident is similar to the sinking of the fishing vessel *Lady Gertrude* on August 15, 2016. In the *Lady Gertrude* accident, investigators determined that the propeller shaft had sheared near the shaft seal. The resulting opening allowed water ingress that exceeded the vessel's bilge pumping capacity. Vessel owners and operators should be aware of the limitations of visual inspections in determining the condition of shafting and should consider the use of periodic non-destructive testing as a tool to identify metal fatigue.

VESSEL GROUP **TOWING/BARGE**

Flooding and Sinking of Towing Vessel *Eric Haney*

LOCATION
UPPER MISSISSIPPI RIVER
MILE 13.4; NEAR CAIRO, ILLINOIS

ACCIDENT DATE	REPORT NUMBER
JULY 8, 2017	**MAB1815**
ACCIDENT ID	ISSUED
DCA17FM020	**JUNE 21, 2018**

At 2342 on July 8, 2017, the uninspected towing vessel ***Eric Haney*** ran aground on a submerged portion of an erosion-control dike while pushing 15 empty barges upriver at mile 13.4 on the Upper Mississippi River near Cairo, Illinois. All crewmembers climbed aboard one of the empty barges without any reported injuries. The towboat and barges were freed by the current, drifted downriver, and were pushed into the opposite bank by another towboat at mile 9.7. The barges broke free, and the ***Eric Haney*** partially sank. Minimal oil sheening was observed after the sinking. Damage to the vessel was estimated at $4.3 million.

About 0830 on July 8, the ***Eric Haney*** departed Paducah, Kentucky, with nine crewmembers and one empty barge. Later that day, the towing vessel stopped at a fleeting area in Cairo to build a tow of 15 empty barges with a configuration of 5 barges long by 3 barges wide, with the ***Eric Haney*** faced up (connected) behind. The tow then got under way again, bound for St. Louis, Missouri. The towboat's draft was 9.5 feet, and the empty barges' drafts were each about 1.5 feet.

At 2329, the pilot was in control of the towing vessel as it proceeded along the left descending bank of the river. The pilot had maneuvered the tow over to the left bank to allow downbound vessels to pass, and over the next several minutes, he discussed passing arrangements with the operator of the passenger vessel ***Queen of the Mississippi***. The vessels were expected to meet at the top of the Greenleaf Bend at mile 14.1. The ***Eric Haney*** pilot continued to transit along the left descending bank.

Along the left descending bank of the river between miles 13 and 14 in the bend, five partially submerged erosion-control dikes constructed of rock and stone protruded from the shoreline. The pilot had set the ***Eric Haney***'s electronic charting system (ECS) at a 3-mile scale; however, as he stated in a postaccident interview, he did not see the dikes on the display.

Figure 88. *Eric Haney* before the accident.
PHOTO BY COAST GUARD

As the ***Eric Haney*** proceeded upriver along the left descending bank at about 6 mph, the pilot felt the boat strike something and stop abruptly. He stopped the engines and then put them in reverse, but the vessel would not move. The captain came to the wheelhouse and stated that he thought the vessel was on a dike. When the captain zoomed in the view on the ECS display, the dikes appeared larger on the screen.

After determining that the towboat was taking on water in the forward hold, the pilot contacted nearby vessels to inform them of the ingress of water and made a distress call to the Coast Guard. Crewmembers started pumps to remove the water, but the pumps could not keep up with the incoming flow. All crewmembers boarded one of the barges, which were still attached to the ***Eric Haney.*** A few minutes later, the current freed the ***Eric Haney*** and its barges from the dike, and they began to drift downriver. About an hour and a half later, a towboat came alongside the drifting ***Eric Haney*** and barges. After the crew of the ***Eric Haney*** climbed onto the assisting towboat, the other vessel pushed the sinking ***Eric Haney*** into the right descending bank near mile 9. The vessel continued to take on water and partially sank, but the bridge and part of the stern remained above the waterline. The barges broke free and were later recovered.

The pilot of the ***Eric Haney*** was dealing with several issues as he approached Greenleaf Bend: the reduced speed of his tow, an opposing current, the approaching traffic, an upcoming bend in the river, and shallow water. The pilot stated that he was concerned that his speed was being affected (reduced) by the opposing current, which could possibly preclude him from reaching the next light to await oncoming vessels. The pilot also told investigators that due to the opposing current, he brought the head of the tow toward the left descending bank to avoid being "set out" into the stronger current. He indicated that "the "***Queen*** [***of the Mississippi***] was on my mind, getting up there." The pilot recalled that he was not aware that the dikes were located in the bend and that if he had known, he would have steered into the center of the river to avoid them.

The NTSB determined that the probable cause of the grounding and subsequent sinking of the *Eric Haney* was the pilot's failure to identify a charted navigation hazard (erosion-control dike) during towing operations.

Figure 89. *Eric Haney* after the sinking.

VESSEL GROUP **FISHING**

Flooding and Sinking of Fishing Vessel *Lady Damaris*

LOCATION
GULF OF MEXICO
ABOUT 32 MILES SOUTHEAST OF GALVESTON, TEXAS

ACCIDENT DATE	REPORT NUMBER
JUNE 22, 2017	**MAB1818**
ACCIDENT ID	ISSUED
DCA17FM019	**JULY 27, 2018**

Figure 90. *Lady Damaris* and arriving Coast Guard helicopter carrying a rescue swimmer and portable pump.
PHOTO BY COAST GUARD

About 1140 on June 22, 2017, the shrimp trawler ***Lady Damaris*** sank in the Gulf of Mexico en route to Galveston, Texas. The day prior, the crew had discovered a hole in the hull, which they were unable to effectively plug. As water flooded the trawler's engine room and freezer hold, the bilge pumps failed. The crew broadcast a distress call, and the Coast Guard responded. US Coast Guard personnel assisted the ***Lady Damaris***'s crew in attempting to dewater the vessel, but they were unable to keep up with the flooding. The vessel was abandoned and sank soon thereafter. No one was injured during the accident. About 5,000 gallons of diesel fuel and lube oil were released into the water. The ***Lady Damaris*** and its catch of bagged shrimp, valued at $210,000, were lost.

On June 8, 2017, the ***Lady Damaris*** departed its homeport of Brownsville, Texas, to trawl for shrimp off the coast of Louisiana. The vessel arrived at the fishing grounds on June 10, and for the next 8 days the crew hauled in about 6,000 pounds of catch. During the entire voyage, the vessel had been taking on water in the engine room at a slow rate, which required the crew to pump out the water about every 2 days.

On June 19, the weather deteriorated as several storm systems that would eventually converge to form tropical storm Cindy moved into the Gulf of Mexico. The ***Lady Damaris*** sought shelter in Port Fourchon, Louisiana, but due to a lack of dock space, the vessel was not able to enter the port. The captain therefore made the decision to anchor and ride out the storm offshore near Port Fourchon.

Between 0200 and 0400 on June 20, the ***Lady Damaris***'s anchor line parted in the high winds and seas. Consequently, the captain decided to head west toward Galveston, Texas, in an attempt to escape the storm. At 2300 on June 20, Cindy became a tropical storm. As the trawler headed west through the following day, the winds and seas increased.

Late on June 20 or early on June 21, the water ingress into the engine room began to increase, forcing the crew to pump out the engine room more frequently—about every 2 hours. On the evening of June 21, they shut down the engine and began to search for the leak. At 0100 on June 22, they found water coming through a crack in the cement and foam insulation that lined the freezer hold as well as a 3-inch-diameter hole in the

hull underneath the cement and insulation. To slow the leak, the crew plugged the hole using the handle end of a claw hammer and rags. Water leaking into the vessel entered the engine room through a 2.5-inch drain pipe from the freezer hold.

The crew told investigators that they were initially able to control the flooding, but the pounding of the waves further opened the hole in the hull. The water in the engine room and freezer hold rose, and the pumps began to malfunction. The crew stuffed more wood and rags into the hole, restarted the vessel's propulsion engine, and continued toward Galveston.

About 0903 on June 22, the ***Lady Damaris*** was approximately 32 miles southeast of Galveston, and its engine compartment was flooded about 30 percent. Unable to stop the flooding, the crew broadcast a distress call over VHF radio. Coast Guard Sector Galveston responded by dispatching a helicopter and small boat to proceed to the scene.

About 0925, the vessel lost propulsion, electrical power, and the last working bilge pump. At 1009, the Coast Guard helicopter arrived on scene, and a rescue swimmer was lowered to the stricken vessel, along with a portable pump. Once on board, the rescue swimmer rigged the pump to take suction from the engine room. About a half hour later, Coast Guard small boat ***CG 45630*** arrived on scene and a crewmember was transferred to the ***Lady Damaris*** together with a second pump. The two pumps could not keep up with the water coming into the ***Lady Damaris***, so another crewmember and a third pump were transferred to the trawler.

The three pumps together still could not keep up with the flooding, and at 1121, the senior Coast Guard crewmember on board the ***Lady Damaris*** determined that the vessel was no longer safe. The ***Lady Damaris*** crew and the Coast Guard crew and equipment were transferred to the ***CG 45630***. About 15 minutes after the transfer, the ***Lady Damaris*** rolled on its starboard side and sank.

The ***Lady Damaris*** had been taking on water since it departed its homeport 14 days before the accident. The crew knew that there was a leak somewhere in the hull, which required them to regularly pump out the bilges. However, instead of immediately returning to port to locate the leak (or leaks) and conduct necessary repairs, the captain elected to continue on the voyage.

Figure 91. *Lady Damaris* about 1049 on the morning of the accident. PHOTO BY COAST GUARD

The NTSB determined that the probable cause of the flooding and sinking of the fishing vessel *Lady Damaris* was the captain's decision to continue to operate with a known hull leak.

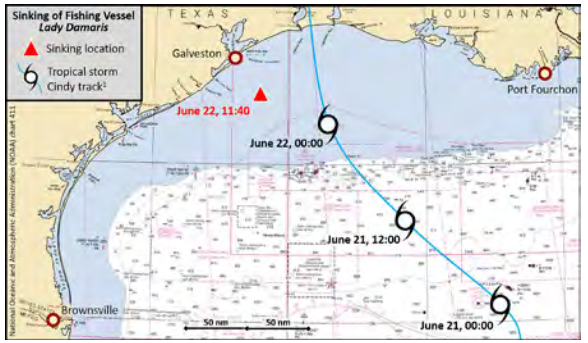


Figure 92. Nautical chart of the Gulf of Mexico showing the accident location and track of tropical storm Cindy.
NOAA CHART 411

Figure 93. Portside outrigger of sunken *Lady Damaris* about 1206 on the day of the accident.
PHOTO BY COAST GUARD

VESSEL GROUP **TOWING/BARGE**

Flooding and Sinking of Towing Vessel *Savage Ingenuity*

LOCATION
GULF INTRACOASTAL WATERWAY
NEAR MILE 245; SULPHUR, LOUISIANA

ACCIDENT DATE	REPORT NUMBER
SEPTEMBER 5, 2017	**MAB1821**
ACCIDENT ID	ISSUED
DCA17FM026	**AUGUST 31, 2018**

At about 0035 on September 5, 2017, the crew of the towing vessel ***Savage Ingenuity*** was maneuvering two empty tank barges in the Gulf Intracoastal Waterway near mile 245 in Sulphur, Louisiana. While the tow's starboard side was almost perpendicular to the current, the vessel heeled to starboard and flooded. The towboat sank partially, its bow being held above the water by the head line connected to the barges. All five crewmembers escaped to the barges without injury. Approximately 11,800 gallons of diesel oil were released into the waterway. Damage to the ***Savage Ingenuity*** was estimated at $1.35 million.

About 2330 the day before, the ***Savage Ingenuity*** had received orders to move two empty tank barges from the fleeting facility where the vessels were moored to a refinery approximately 6 miles away. The tank barges were arranged two across with the head of each barge facing west. To reach the refinery, the tow had to be turned around to head east in the waterway. At the time, the current near the accident location was flowing easterly at an estimated 4–6 knots, and thus the relief captain of the ***Savage Ingenuity*** requested assistance with the maneuver from the towing vessel ***Alfred P Cenac III***.

About midnight on September 5, the ***Savage Ingenuity*** was faced up to the barges in preparation for the turning maneuver. When the ***Alfred P Cenac III*** arrived, the two towing vessels worked together to pull the barges off the bank. Once the tow cleared the bank, the operators on the two towing vessels planned to have the ***Savage Ingenuity*** push the head of the tow into the south bank, after which they would use the bank to help pivot the tow around. This maneuver would temporarily place the towboat and barges perpendicular to the strong current.

According to the pilot on the ***Alfred P Cenac III***, about halfway through the maneuver he noticed that the ***Savage Ingenuity*** started to list to starboard. He backed off from pushing the port barge and began moving

Figure 94. Aft view of *Savage Ingenuity* shows water up to the second deck on the starboard side of the towboat.
PHOTO BY COAST GUARD

to the opposite side of the barges with the intent of pushing the tow toward the safety of the south bank.

When the ***Savage Ingenuity*** began listing to starboard, the relief captain also stopped pushing on the barges and slackened the face wires by using the winch controls in the pilothouse, hoping that the vessel would return to an even keel. He told investigators that shortly thereafter the engines shut down and he heard the bilge alarm sound from the engine room. The relief captain then activated the general alarm to alert the crew of the emergency. The captain, who was awakened by the vessel's list, instructed the crew to escape from the vessel onto the barges. All five crewmembers safely evacuated before the ***Savage Ingenuity*** partially sank to the second deck, with its bow held up by the head line.

When interviewed, the pilot of the ***Alfred P Cenac III*** stated that he saw the engine room doors of the ***Savage Ingenuity*** were open at the time of the sinking. Further, the captain of the ***Savage Ingenuity*** stated that he observed water flooding into the engine room. The tow was being maneuvered about perpendicular to the strong eastbound current at the time it began heeling. Given the vessel's low freeboard, water washed onto the main deck, reaching the sill of the open engine room door, and downflooded into the engine room. The flooding overwhelmed the towboat's reserve buoyancy, causing the vessel to sink.

According to the company's standard operating procedures, while the vessel is operating as a light boat (without any barges in tow), "all hatches…on the weather deck shall remain in the closed position." Because the ***Savage Ingenuity*** was faced up to the barges at the time, this procedure did not technically apply. There was no procedure in place at the time of the accident for management of watertight integrity. After the accident, the company updated the standard operating procedure, requiring that all hatches, doors, and portholes on the weather deck remain in a closed position when the vessel was under way.

Figure 95. Salvage of the *Savage Ingenuity*.

The NTSB determined that the probable cause of the flooding and sinking of the towing vessel *Savage Ingenuity* was the absence of company procedures requiring the closure of weather deck doors at all times while the vessel was under way, which resulted in rapid downflooding into the engine room when the vessel heeled while perpendicular to a strong current with the head of its tow pushed into a river bank.

Figure 96. *Savage Ingenuity* and the two empty tank barges postaccident. PHOTO BY COAST GUARD

Figure 97. *Savage Ingenuity* under way without barges.
PHOTO COURTESY OF SAVAGE INLAND MARINE

VESSEL GROUP **CARGO**

Grounding of Bulk Carrier *Nenita*

LOCATION
COLUMBIA RIVER
NAVIGATION MARKER "23," THREE TREE POINT, WELCH ISLAND REACH; NEAR SKAMOKAWA, WASHINGTON

ACCIDENT DATE	REPORT NUMBER
NOVEMBER 19, 2016	**MAB1801**
ACCIDENT ID	ISSUED
DCA17FM003	**JANUARY 4, 2018**

On November 19, 2016, the bulk carrier ***Nenita*** was outbound on the Columbia River when the vessel suffered an engine failure that impacted its ability to maneuver. The vessel subsequently ran aground at Three Tree Point on the Washington State side of the river, damaging its bulbous bow and hull. The damage was estimated at $4 million. There were no injuries or reported pollution as a result of the accident.

The ***Nenita*** had begun the transit of the river late the night before the accident with a Columbia River pilot at the conn. The first few hours of the voyage were uneventful, but about 0232, after feeling a reduction in vibration, the pilot asked the master, "Hey, what happened to our engine?" The voyage data recorder (VDR) showed a drop in speed from about 90 to 48 rpm while the engine order telegraph was still in the "Nav Full" ahead position.

Figure 98. *Nenita* undergoing temporary repairs in Longview, Washington, following the accident.

Soon after, the VDR captured audio of the master talking on the ship's phone to the chief engineer and watch engineer. The conversation between the master and the engineering personnel was not conducted in English, and thus the pilot could not understand the discussion. A minute and a half into the phone call with the chief engineer, the master told the pilot about a "leaking pipe on the main engine. …They are fixing it." During the next 10 minutes, the phone conversation between the master and engineering personnel continued in their native language. The pilot asked several times, "What's going on with the engine?" and stated, "I need some rpms."

At 0235, the ***Nenita***'s engine rpm decreased further to 25. As the ship slowed, the pilot asked the master with increasing urgency about the status of the engine, the availability of more engine rpm, and the ability of the engine to go astern. He made clear to the master that the lack of engine response was putting the vessel at risk of running aground. The master did not respond back to the pilot.

The ***Nenita*** continued to decrease in speed, with the pilot ordering increasingly large helm orders to port and starboard to maintain the vessel in the center of the channel. However, steerageway was eventually lost, and the vessel began to drift to starboard. At 0246, the ***Nenita*** ran aground at Three Tree Point.

The ***Nenita***'s loss of speed in the Columbia River occurred because of a fracture of the no. 3 cylinder cooling jacket cover on the vessel's main propulsion engine. Cooling water escaped from the fractured cooling jacket, which caused the cylinder water outlet temperature to rise. This temperature rise initiated an automated slowdown of the engine, a function designed to protect the engine from damage due to the loss of cooling water. The reduced speed resulted in reduced maneuverability. Steering was greatly affected, and despite the pilot's use of heavy rudder orders to maintain course, he was unable to keep the ship in the channel.

In January 2014, the engine manufacturer issued a service letter indicating that most cases of cracked cooling jackets were related to insufficient cooling

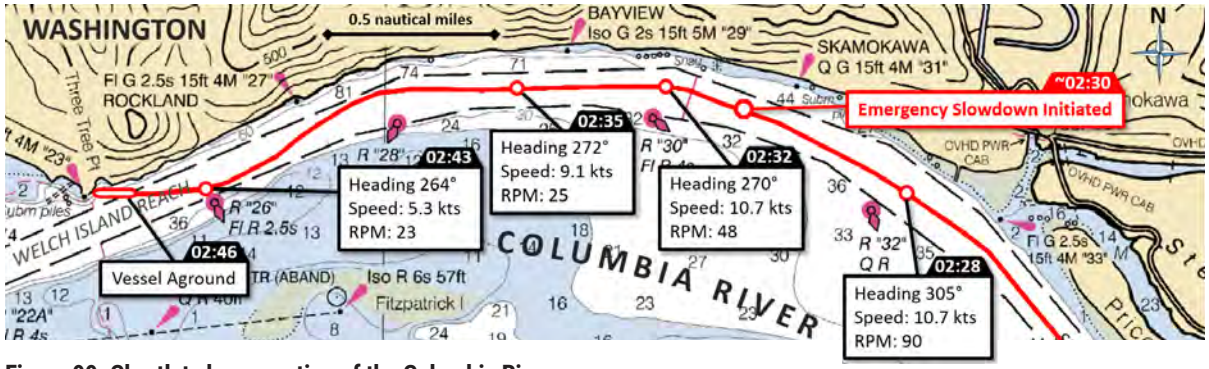


Figure 99. Chartlet shows portion of the Columbia River where *Nenita* was transiting when the engine casualty occurred and the vessel eventually grounded.
NOAA CHART 18523

water maintenance. Investigators reviewed cooling water treatment service reports completed prior to and after the accident to determine if the cooling water was treated in accordance with the original equipment manufacturer's (OEM's) specifications, rules, and recommendations. Investigators discovered several reports with elevated chloride levels and low corrosion inhibitor. Cooling water chemical testing conducted on board by the third assistant engineer indicated similar low levels of corrosion inhibitor.

The engine manufacturer's service letter also discussed the securing of the cooling jacket to the cylinder cover by four specially machined bolts. Investigators verified that the four bolts removed from the failed jacket water cover on the *Nenita* were produced by the OEM. One of the four bolts had damaged threads, an indication of a cross-threaded condition. Also, investigators noted that the bolts used to replace the four removed bolts were a slightly different design; they were the same diameter and thread length, but the unthreaded shoulder length was 2 millimeters longer. The difference in length is a potential design modification to provide additional radial expansion of the cooling jacket.

The correct tension or pre-load applied to a bolt is critical to the reliability of the bolted joint assembly, but the condition of three of the four bolts removed from the cylinder no. 3 cooling jacket indicated improper or excessive torque. The unthreaded shoulders near the threads expanded outward, an indication of compressive stress resulting in the deformation of the base of the shoulder.

Figure 100. Cracked cooling jacket on main engine no. 3 cylinder, postaccident. Arrow identifies one of four hex head securing bolts for the jacket cover.
PHOTO BY COAST GUARD

The NTSB determined that the probable cause of the grounding of the bulk carrier *Nenita* was the failure of a main engine cylinder cooling jacket that initiated an automatic reduction in engine speed, resulting in the eventual loss of steerageway. Contributing to the accident was the lack of information relayed from shipboard personnel to the pilot about the status of the main engine, which prevented him from taking effective corrective action following the engine casualty.

WATER CHEMISTRY

Maintaining proper water chemistry in engine cooling water systems reduces corrosion, scale, and the formation of deposits, which ensures effective cooling (heat transfer) to satisfy the system's operating requirements. Mariners should conduct testing per the manufacturer's recommended schedule, ensure levels of treatment are correct, and maintain water quality within specified limits. Insufficient cooling water maintenance may result in increased corrosion, clogging of cooling water passages, or, ultimately, the failure of equipment.

TIGHTENING OF FASTENERS

Over the last 2 years, the NTSB has investigated three separate accidents that may have been caused by a failure to tighten fasteners on marine engines to the manufacturer's recommended torque settings. Undertorqueing a fastener may cause excess vibration or allow the fastener to come loose, while overtorqueing may lead to failure of the fastener or the machinery component being secured. When installing fasteners, mariners should use a calibrated torque wrench and follow the manufacturer's recommended tightening guide and torque values.

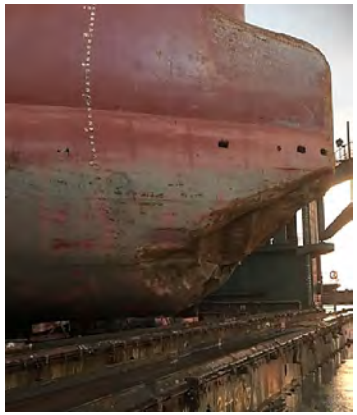


Figure 101. Damage to *Nenita*'s bulbous bow, starboard side.
PHOTO BY SPRING MARINE BULK, S.A.

VESSEL GROUP **FISHING**

Grounding and Sinking of Fishing Vessel *Southern Bell*

LOCATION
GULF OF MEXICO
EAST OF SABINE PASS JETTY CHANNEL, TEXAS

ACCIDENT DATE	REPORT NUMBER
OCTOBER 13, 2017	**MAB1813**
ACCIDENT ID	ISSUED
DCA18FM001	**JUNE 4, 2018**

On October 13, 2017, at 0705, the uninspected fishing vessel ***Southern Bell*** grounded outside of the east jetty for the entrance to the Sabine Pass Channel, an outlet for the Sabine and Neches Rivers into the Gulf of Mexico. The vessel heeled over on its port side and began flooding through open doors to the engine room and accommodation space before sinking. The captain and two crewmembers entered the water and were rescued by a Good Samaritan vessel nearby without suffering any injuries. A light oil sheen and debris were later observed. The vessel, valued at an estimated $519,000, was determined to be unsalvageable.

About 1430 on October 12, the day before the accident, the vessel departed the dock at the Dustin Gulf Seafood facility in Sabine Pass, Texas, with the captain, who was the owner and operator, and two crewmembers. The ***Southern Bell*** traveled southbound, approximately 95 miles offshore, to an area in the Gulf of Mexico known as the South Sabine Point lightering zone, where the crewmembers prepared to begin trawling for shrimp. However, approximately 15 minutes after they deployed the fishing gear, about 0100 on October 13, the bridle parted. (The bridle was a steel cable used to connect the net's trawl doors to the vessel's main pulling cable.) In response, the captain decided to return to Sabine Pass for repair of the equipment and, at 0120, began the inbound transit.

At 0640, the ***Southern Bell*** was proceeding on a course of 353 degrees at a speed of 8.3 knots just west of the Outer Bar Channel leading to Sabine Pass. Over the next several minutes, its speed remained constant, but its course deviated to 008 degrees, which would take the vessel across the channel. The ***Southern Bell***'s track, which could have potentially developed into a crossing situation with a risk of collision, raised the concern of the pilots and bridge team on the ***Hyundai Principia***, as the 970-foot-long liquefied natural gas carrier was proceeding southbound in a reach of the Sabine Pass Channel known as the Jetty Channel. The lead pilot ordered the speed of the ***Hyundai Principia*** to be reduced slightly; consequently, the vessel slowed from 9.7 to 8.8 knots and widened the closest point of approach between the two vessels.

At 0648, the ***Southern Bell*** crossed the Outer Bar Channel ahead of the ***Hyundai Principia***. Over the next several minutes, the ***Southern Bell*** maintained a course in a northerly direction ranging from 359 to 010 degrees at a speed of 8.2 knots. The vessel continued, proceeding in a northeasterly direction, to the east of the jetties that bounded the entrance to Sabine Pass. At 0658, the vessel began slowly turning to port. Its course swung to 288 degrees until, at 0705, the vessel grounded on the rocks outside the Sabine Pass east jetty.

After the grounding, crewmembers discovered water flooding into the engine room. The vessel continued to take on water until, according to video footage captured by Vessel Traffic Service Port Arthur, the ***Southern Bell*** heeled over on the port side and then sank at 0729. The captain and two crewmembers entered the water and were later recovered by a Good Samaritan vessel.

Figure 102. *Southern Bell* moored; location and date unknown. PHOTO COURTESY OF PHUONG HUYNH

The captain stated that the ***Southern Bell*** experienced a steering problem as it was approaching the entrance to the port. He departed the wheelhouse and proceeded to the lazarette to troubleshoot the issue, leaving the wheelhouse unmanned. When he entered the compartment and examined the vessel's mechanical chain-and-wire steering system, he discovered that a connection in the chain link had failed. He decided to return to the wheelhouse but then noticed that the vessel was heading toward the rock jetty. Before the captain could reach the wheelhouse to shift the vessel's transmission into neutral, the ***Southern Bell*** was "on the rocks" of the jetty, he said. Based on his estimation, he was out of the wheelhouse for about 5 minutes. However, no explanation was offered for why the captain left the ***Southern Bell***'s transmission in gear when he departed the wheelhouse.

Leaving the wheelhouse without calling one of the other crewmembers to keep lookout was a poor decision. Moreover, leaving the transmission in forward gear only compounded the situation, considering the vessel's approach to the Sabine Pass Channel.

The NTSB determined that the probable cause of the grounding and subsequent sinking of the *Southern Bell* was the captain's decision to leave the wheelhouse unattended while still making way as the vessel approached the entrance channel to Sabine Pass.

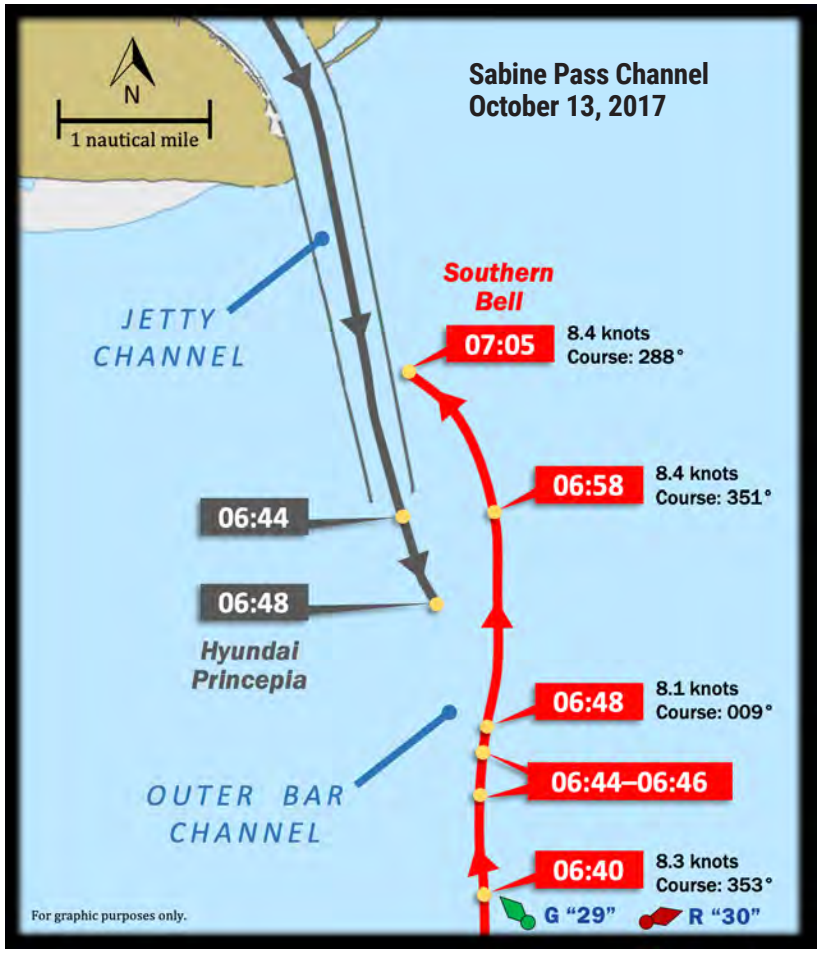


Figure 103. A map of the Sabine Pass Channel includes the tracklines of the *Southern Bell* and *Hyundai Principia* for the last half hour leading up to the accident. Key events are time-stamped as follows:

06:40
Southern Bell transits just west of buoys G "29" and R "30"

06:44–06:46
Concerned about *Southern Bell*'s track, *Hyundai Principia* pilot attempts several times to contact vessel via VHF radio but receives no response

06:48
Southern Bell crosses Outer Bar Channel 0.57 miles ahead of *Hyundai Principia*

06:58
Southern Bell begins turning slowly to port

07:05
Southern Bell grounds on outside of east jetty

VESSEL GROUP **FISHING**

Grounding of Fishing Vessel *St. Dominick*

LOCATION
PUMICESTONE BAY
NORTHWEST SIDE OF UNALASKA ISLAND, ALASKA

ACCIDENT DATE	REPORT NUMBER
MARCH 6, 2017	**MAB1803**
ACCIDENT ID	ISSUED
DCA17FM008	**JANUARY 18, 2018**

Figure 104. *St. Dominick* at Dutch Harbor, Alaska, postaccident. PHOTO BY COAST GUARD

On March 6, 2017, about 0009, the uninspected commercial fishing vessel ***St. Dominick*** grounded in Pumicestone Bay, Alaska. The engine room flooded within 10–20 minutes of the grounding, and the four crewmembers abandoned the vessel a short time later. None of them were injured, and no pollution was reported. The vessel, valued at $1.1 million, was deemed a constructive total loss.

Leading up to the accident, the ***St. Dominick*** had been fishing for cod in the waters around Unalaska and Umnak islands. For vessels 58 feet or less, the 2017 cod season ran from February 9 to April 8. There was no quota for the number of fish caught by a particular boat; rather, the quota was based on the entire number of fish caught in that area of Alaskan waters. This type of season is known as "derby" fishing because fishing vessels attempt to catch as many fish as possible within time or subdistrict quota limitations.

The ***St. Dominick*** typically fished the entire cod fishing season. During this 8-week period, the vessel and crew would fish, bring the catch to a tender vessel to offload, and return to the fishing grounds to start the cycle over again. A roundtrip tender-to-tender cycle was about 48 hours. According to statements obtained from the captain and crew, the 48-hour fishing cycle consisted of about a 4-hour trip from the tender to the fishing area, 36 hours of fishing, a return trip to the tender, and a few hours to offload the fish. While on the fishing grounds, the crew normally fished from about 2 or 3 in the morning to about midnight. While fishing, the crew baited, lowered, retrieved, and emptied the fish pots. This took about 4–5 hours. The crew then took about a 1.5-hour break before continuing to bait, lower, retrieve, and empty fish pots.

During the 2- to 3-hour break that began at midnight, the deckhands slept. The captain remained in the wheelhouse during the break and usually maneuvered the vessel, sometimes sleeping in the helm chair for 1–2 hours. After completing the 36-hour fishing period, the captain piloted the vessel to the tender and the deckhands slept. The captain slept while the vessel was alongside the tender and the deckhands were offloading the catch as well as during the trip back out to the fishing grounds. According to the captain, he slept about 4–6 hours per 48-hour fishing cycle.

Figure 105. *St. Dominick* aground. PHOTO BY COAST GUARD

On the accident voyage's 48-hour fishing cycle, the ***St. Dominick*** left the tender ***Kona Kai*** on March 4, transited to the fishing grounds, and fished until about 0200 on the morning of March 5. The crew then took a 2- to 3-hour break while the vessel was at anchor. The captain believes that during this period he slept in the helm chair for 1–1.5 hours. About 0430, he resumed operating the vessel, and, about 0530, the crew resumed fishing.

Fishing continued until about 2100. The crew then went below to eat and sleep while the captain navigated the ***St. Dominick*** from a position off Cape Idak on Umnak Island toward the ***Kona Kai***, which was anchored near the head of Pumicestone Bay. According to the captain, the ***St. Dominick***'s watch alarm was normally set to sound at 10-minute intervals while transiting further away from land, and set to alarm at 3-minute intervals when the vessel was within 3 miles of land. However, on this trip, he did not change the interval from 10 to 3 minutes because he "felt pretty good."

Somewhere between the fishing area and the grounding site, the captain set the auto-pilot (which kept the vessel on a heading) and fell asleep. Pumicestone Bay predominantly trends to the east when proceeding from sea but contains an S-turn about 4 miles from the entrance. With the captain asleep, the ***St. Dominick*** failed to negotiate this turn and, while making a speed of about 7 knots, grounded on the southern shore of the bay. According to the captain and a deckhand, the watch alarm sounded sometime after the vessel grounded. The captain said that resetting the bridge watch alarm to 3 minutes, as was normal practice when the vessel was operating near land, could have prevented the accident.

As found in other NTSB investigations, open-access, derby-style fishing encourages crews to work longer hours to increase the vessel's portion of the overall quota set by state regulators. The ***St. Dominick*** captain and one of the deckhands stated that the rules for the cod fishery in which the vessel operated promoted around-the-clock operations and contributed to inadequate rest.

The NTSB determined that the probable cause of the grounding of the *St. Dominick* was the captain's failure to monitor the vessel's track as a result of his fatigue due to an accumulated sleep deficit. Contributing to the accident was the nature of the derby-style fishing that the *St. Dominick* was engaged in and the captain's failure to properly set the bridge watch alarm.

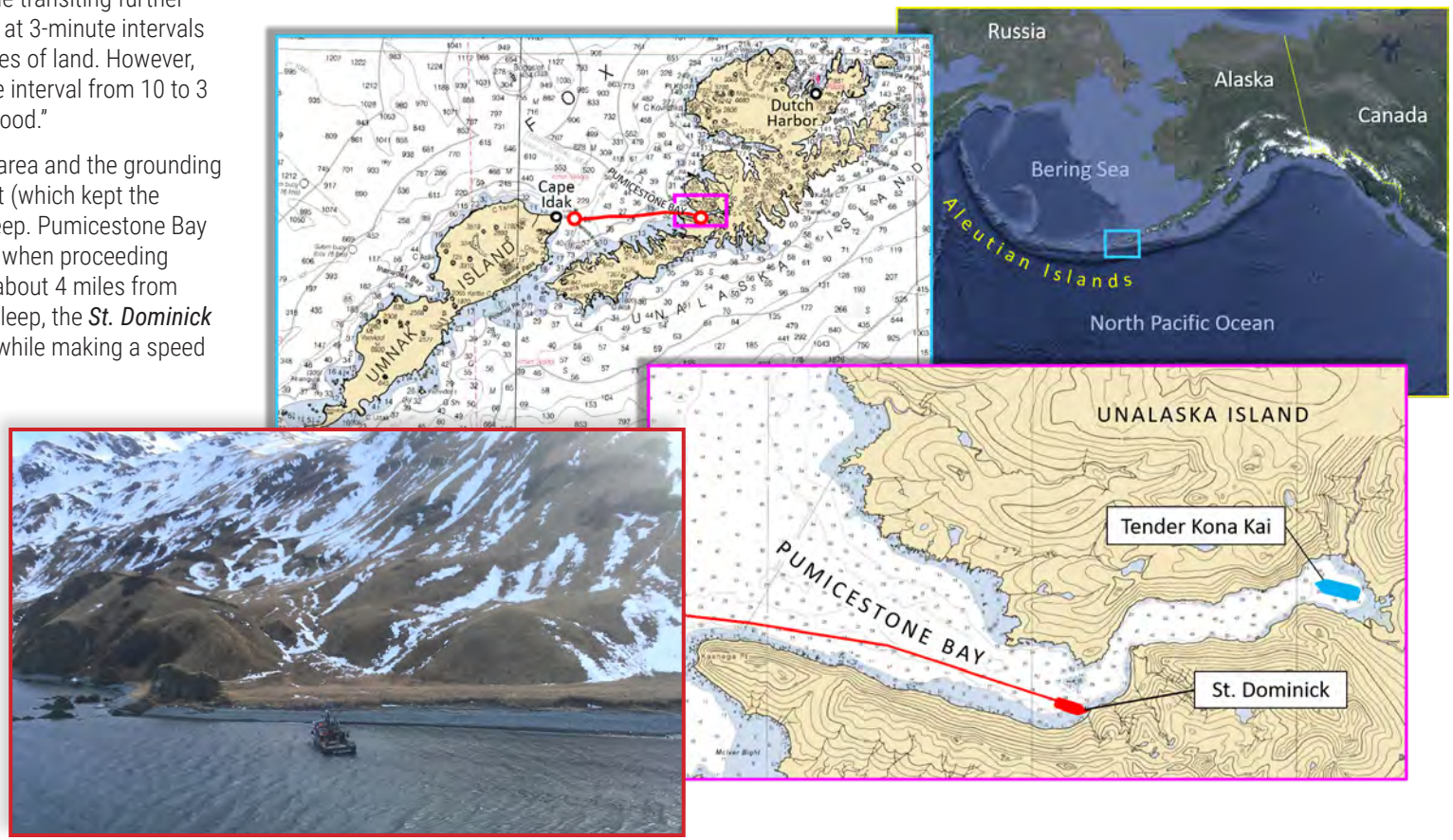


Figure 106. Track of the *St. Dominick* from fishing grounds off Cape Idak to grounding location in Pumicestone Bay.
CHARTS BY NOAA [16011, 16515]; LOCATION DATA FROM NOAA FISHERIES TRACKING; SATELLITE IMAGE BY GOOGLE EARTH PRO; PHOTO BY COAST GUARD

LESSONS LEARNED

The lessons learned in this year's investigations touched on some accident lessons that were discussed in *Safer Seas Digest 2017* but also presented additional issues worth focusing on. Remote engine shutoffs and quick-closing valves, high-water/high-current conditions, and training for emergencies—to name a few—were safety issues in need of attention in the year just concluded.

The NTSB continues to make safety recommendations based on the lessons learned from marine accidents. However, awareness on the part of vessel owners, operators, and crews can provide actionable information to address safety issues affecting their vessels and operations.

High-Water/High-Current Conditions

The leading cause of accidents in the 2018 reporting year involved towing vessels that were operating during challenging high-water/high-current conditions in inland waters. When these conditions exist, additional precautions should be taken to mitigate the risks of flooding, capsizing, losing control of the vessel and tow, and tow breakaways. Examples of mitigation measures include restricting downstreaming operations, using more experienced personnel to maneuver tows through chokepoints such as bridge passages and sharp bends, doubling up on tow couplings, and reducing the length of the tow.

High-water and/or strong currents were factors in the *Marguerite L. Terral*, *Steve Plummer*, *Todd Brown*, *James H Hunter*, *Savage Ingenuity*, *Cooperative Venture*, and *Ricky Robinson* accidents.

Watertight Integrity

Despite watertight integrity being a fundamental principal of safe operations on water, the failure to maintain it continues to be a common cause of accidents, topping the list of causes in the 2017 reporting year and ranking number two this reporting year. An unexplained list or reduced freeboard should be investigated immediately, and sources of water ingress should be reported and repaired before operations continue. Watertight doors, hatches, and other accesses should remain closed while under way and should be properly maintained. Especially for inland towing vessels with low freeboard, main deck doors and accesses should remain closed while under way, particularly when operating in lightboat or strong current conditions.

Loss of watertight integrity was a factor in the *Atlantic Raider*, *Ambition*, *Lady Damaris*, *Gracie Claire*, *Ben & Casey*, and *Ricky Robinson* accidents.

Training for Emergencies

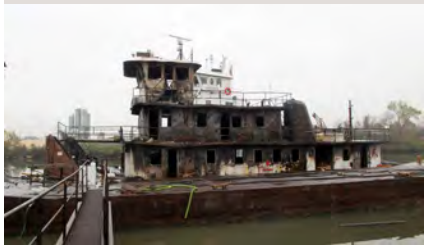
An actual emergency is a poor time to discover that training and drills have been ineffective. All crewmembers should be familiar with and able to employ the firefighting and lifesaving appliances on board a vessel. This knowledge is critically important on passenger vessels, where a large number of people are reliant on the crew to keep them safe from harm. Crewmembers should be trained as soon as possible upon reporting aboard and at regular intervals thereafter. Realistic, hands-on drills should be conducted frequently. When new lifesaving or firefighting equipment is installed, all crewmembers should be familiarized and trained on the new equipment.

Ineffective firefighting training and lifesaving equipment training were factors in the *Caribbean Fantasy* and *Island Lady* accidents. The quick actions of the crew on board the *Honor* minimized damage and prevented fire from spreading throughout the vessel.

Remote Emergency Shutdowns

The location of remote emergency shutdowns to the engine room—quick-closing valves for fuel and lube oil systems, remote stops for ventilation fans, and engine stops—as well as fire pump start controls may not be accessible during a fire. Therefore, during fire-response planning, alternative remote emergency shutdown locations, such as the wheelhouse, should be considered for redundancy. Remote shutdowns and quick-closing valves should be tested regularly to ensure proper operation. Under no circumstances should they be blocked open or otherwise rendered inoperable.

The inability to access remote engine room shutdowns was a factor in the *J.W. Herron* accident. Quick-closing valves that were blocked open were a factor in the *Caribbean Fantasy* accident. The remote shutdown and closure of ventilation in cargo spaces minimized damage in the *Honor* accident.



Ice Accumulation

Icing can dangerously degrade a vessel's stability. During freezing spray conditions, consider decreasing the amount of gear above the main deck, covering deck loads with tarps to shed water, lessening exposure to high winds and seas, developing de-icing procedures, and outfitting the vessel with de-icing equipment. Mariners should have an understanding of their vessel's stability information and the impact of added weight from icing. For more information on these recommendations, see NTSB Safety Alert 074 – Ice Accumulation, (https://www.ntsb.gov/safety/safety-alerts/Documents/SA-074.pdf).

Icing was a factor in the *Destination* accident.

Reporting Issues

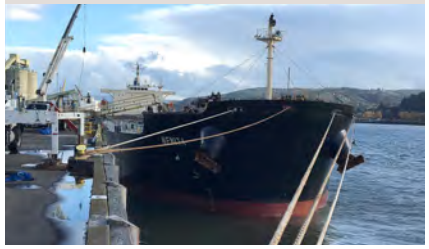
Maintenance issues and other conditions affecting the safe operation of a vessel should be promptly and clearly reported, both internally to the master and critical watchstanders, as well as externally to the operating company. Crewmembers should ensure that the master is fully advised on the operational or safety impact of a casualty. Reporting systems should provide specific guidance regarding critical equipment, hull integrity, and operational safety. A robust reporting system should also include procedures for company oversight to ensure that crews are reporting issues and that the operating company is tracking and promptly addressing them.

Lapses in reporting were factors in the *Mia S* and *Ricky Robinson* accidents.

Cooling Water Chemistry

Maintaining proper water chemistry in engine cooling water systems reduces corrosion, scale, and the formation of deposits, which ensures effective cooling (heat transfer) to satisfy the system's operating requirements. Mariners should conduct testing per the manufacturer's recommended schedule, ensure levels of treatment are correct, and maintain water quality within specified limits. Insufficient cooling water maintenance may result in increased corrosion, clogging of cooling water passages, or, ultimately, the failure of equipment.

Improper cooling water chemistry may have been a factor in the *Nenita* accident.



Threaded Fasteners and Components

Failure to tighten fasteners on diesel engines to the manufacturer's recommended torque settings was the cause of numerous accidents the NTSB has investigated over the past several years. Undertorqueing a fastener may cause excess vibration or allow the fastener to come loose, while overtorqueing may lead to failure of the fastener or the machinery component being secured. When installing fasteners, mariners should use a calibrated torque wrench and follow the manufacturer's recommended tightening guide and torque values.

Improperly torqued fasteners and components were factors in the *Nenita* and *Alliance St. Louis* accidents.

Mooring in Strong Winds

Even with modern mooring equipment such as synthetic lines and self-tensioning winches, strong winds can overpower standard pier mooring arrangements, particularly for vessels with a large sail area. When high winds are forecasted, mariners should take precautions such as increasing the number of lines and mooring points, dropping the anchor, or ordering tugboat support. If the mooring arrangements at the pier are inadequate, the master may consider moving the vessel to another pier or an anchorage until winds subside.

Inadequate mooring arrangements were factors in the *Troy McKinney* and *Helsinki Bridge* accidents.

Identifying Navigation Hazards

Mariners using electronic chart systems (ECSs) should be aware that aids to navigation, hazards, and other map features may not be represented on the displays at certain range scales. Mariners should use appropriate range scales for their route on ECS displays to identify potential hazards while navigating.

A navigation hazard that did not appear on a selected large range scale was a factor in the *Eric Haney* accident.

"WITH EVERY INVESTIGATION WE CONDUCT, THE LESSONS THAT WE LEARN CAN PREVENT FUTURE LOSSES—WHEN MARINE STAKEHOLDERS AT ALL LEVELS OF THE INDUSTRY APPLY THESE LESSONS." ROBERT SUMWALT, NTSB CHAIRMAN

Fixed Ventilation Openings

One of the initial actions in combating a fire on board a vessel is to stop fans and close off ventilation to the affected space. These actions increase the effectiveness of firefighting agents while preventing fresh air from supplying the fire. Ventilation shutdown is particularly important in engineering spaces, where a ready supply of fuel makes firefighting difficult if the flames are not extinguished quickly. Vessels that have fixed-open ventilation accesses give the crew limited ability to control and extinguish a fire, even with installed firefighting systems. Naval architects are encouraged to include engine room ventilation fan shutdowns and vent closures on all vessel designs, and operators should review ventilation system shutdown procedures on exisiting vessels.

Fixed-open ventilation systems were factors in the *George King* and *J.W. Herron* accidents.

Recognizing Metal Fatigue in Propeller Shafting

Shearing of the propeller shaft can be a catastrophic casualty to a vessel. If the sheared shaft backs out of the stern tube, the resulting opening may allow water ingress that exceeds the vessel's bilge pumping capacity. Vessel owners and operators should be aware of the limitations of visual inspections in determining the condition of shafting and should consider the use of periodic non-destructive testing as a tool to identify metal fatigue.

Metal fatigue in the propeller shaft was likely a factor in the *Ben & Casey* accident.

Precautions when Unloading Catch

Fishing vessel operators are reminded to avoid unloading large catches that exceed the pen height and can result in spillover and cargo on deck. Catch sliding around on deck has an adverse effect on vessel stability. Additionally, freeing ports (scuppers) in the bulwarks should be kept clear for rapid draining of water on deck. A deck filled with water creates an undesirable free-surface effect. The weight of the additional water also increases the height of the vessel's center of gravity and decreases its freeboard, consequently reducing overall stability.

An overflowing large catch was a factor in the *Langley Douglas* accident.

Alternate Emergency Communication Systems in Alaska Region

Vessel owners, operators, and crewmembers should be aware of the limitations of VHF radio reception in the Aleutian region and other remote areas. In addition to VHF radios, mariners should have alternate means of immediately alerting Coast Guard search and rescue (SAR) centers, such as satellite phones, other satellite communication devices, or marine medium-frequency (MF)/high-frequency (HF) radios. Captains and vessel owners should ensure that crewmembers are knowledgeable and proficient in the use of the designated alternate communication devices, and contact information for the SAR center should be posted in the wheelhouse and in crew common areas. In the case of satellite communication devices with SOS functionality, designated emergency contacts ashore should know critical information such as the vessel's intended route, the vessel's operations, and the number of persons on board.

An alternate communications system (a portable satellite communication device) was critical to the safe rescue of the crew of the fishing vessel *Ambition*.

VESSEL PARTICULARS

Vessel	Flag	Type	Length	Draft	Beam/Width	Persons on Board	Page Number
Aframax River	Panama	Crude oil tanker	810 ft (246.8 m)	28.2 ft (8.6 m)	137.8 ft (42 m)	27	6
Alliance St. Louis	United States	Roll-on/roll-off vehicle carrier	635.8 ft (193.8 m)	29.8 ft (9.1 m)	105.6 ft (32.2 m)	20	34
Ambition	United States	Fish tender	75 ft (22.9 m)	11 ft (3.4 m)	22 ft (6.7 m)	5	54
Atlantic Raider	United States	Towing vessel	70.5 ft (24.4 m)	9 ft (2.7 m)	24.2 ft (7.4 m)	3	50
Ben & Casey	United States	Fishing vessel	68 ft (20.7 m)	12 ft (3.7 m)	20 ft (6.1 m)	4	52
Best Revenge 5	British Virgin Islands	Sailing vessel	58 ft (17.7 m)	6 ft (1.8 m)	30 ft (9.1 m)	2	36
Caribbean Fantasy	Panama	Roll-on/roll off passenger vessel	613.9 ft (187.1 m)	22 ft (6.7 m)	88.7 ft (27 m)	511	38
CG 29113	United States	Response boat–small	29.4 ft (33 m)	2.75 ft (1.8 m)	8.41 ft (6.3 m)	4	8
Cooperative Venture	United States	Towing vessel	168 ft (51.2 m)	9 ft (2.7 m)	40 ft (12.2 m)	10	10
Destination	United States	Fishing vessel	110 ft (33.5 m)	13 ft (4 m)	32.2 ft (9.8 m)	6	22
Eric Haney	United States	Towing vessel	157.5 ft (48 m)	9.5 ft (2.9 m)	40 ft (12.2 m)	9	60
George King	United States	Towing vessel	138 ft (42.1 m)	11 ft (3.4 m)	44 ft (13.4 m)	9	42
Gracie Claire	United States	Towing vessel	45.1 ft (13.7 m)	6.6 ft (2 m)	21 ft (6.4 m)	3	26
Helsinki Bridge	Panama	Containership	1,097 ft (334.6 m)	34 ft (10.5 m)	150 ft (45.6 m)	34	12
Honor	United States	Roll-on/roll-off vehicle carrier	623.5 ft (190.1 m)	33.4 ft (10.2 m)	105.8 ft (32.3 m)	21	44
Island Lady	United States	Small passenger vessel	72 ft (22 m)	4.5 ft (1.4 m)	21 ft (6.4 m)	53	46

Vessel	Flag	Type	Length	Draft	Beam/Width	Persons on Board	Page Number
J.W. Herron	United States	Towing vessel	88 ft (26.8 m)	9.1 ft (2.8 m)	34 ft (10.4 m)	3	48
James H Hunter	United States	Towing vessel	124 ft (37.8 m)	10.6 ft (3.2m)	34 ft (10.4 m)	9	14
Lady Damaris	United States	Fishing vessel	64.6 ft (19.7 m)	11.3 ft (3.4 m)	20.1 ft (6.1 m)	4	56
Langley Douglas	United States	Fishing vessel	79.9 ft (18.2 m)	12.9 ft (1.5 m)	24.5 ft (6.1 m)	5	28
Marguerite L. Terral	United States	Towing vessel	98.9 ft (30.1 m)	10.2 ft (3.1 m)	32 ft (9.7 m)	6	16
Mia S	Antigua and Barbuda	Bulk carrier	623.3 ft (189 m)	40.9 ft (12.5)	105.8 ft (32.3 m)	19	18
Nenita	United States	Bulk carrier	738.1 ft (225 m)	42.8 ft (19.8 m)	105.5 ft (32.2 m)	25	62
Ricky Robinson	United States	Towing vessel	66.5 ft (20.3 m)	8.3 ft (2.5 m)	24 ft (7.3 m)	2	24
Savage Ingenuity	United States	Towing vessel	68 ft (20.7 m)	9.5 ft (2.9 m)	28 ft (8.5 m)	5	58
Southern Bell	United States	Fishing vessel	74.1 ft (22.6 m)	11.2 ft (3.4 m)	22 ft (6.7 m)	3	64
St. Dominick	United States	Fishing vessel	58 ft (17.7 m)	11.2 ft (3.4 m)	22.1 ft (6.7 m)	4	66
Steve Plummer	United States	Towing vessel	50 ft (15.2 m)	6.6 ft (2 m)	23 ft (7 m)	3	20
Todd Brown	United States	Towing vessel	74.5 ft (22.7 m)	9.7 ft (3 m)	28 ft (8.5 m)	6	30
Troy McKinney	United States	Crane barge	192 ft (58.5 m)	14 ft (4.3 m)	70 ft (21.3 m)	0	32
Vanguard Sailboat	United States	Sailing vessel	32.8 ft (9.1 m)	4.5 ft (1.3 m)	9.25 ft (3.3 m)	0	8

VESSEL GROUP KEY: **CARGO** **FISHING** **GOVERNMENT** **OFFSHORE SUPPLY** **PASSENGER** **RECREATIONAL** **TANKER** **TOWING/BARGE**

Accident Locations

VESSEL GROUPS

CARGO
Bulk carrier
Containership
Vehicle carrier

FISHING
Fishing
Fish tender

GOVERNMENT
Coast Guard

OFFSHORE SUPPLY
(none)

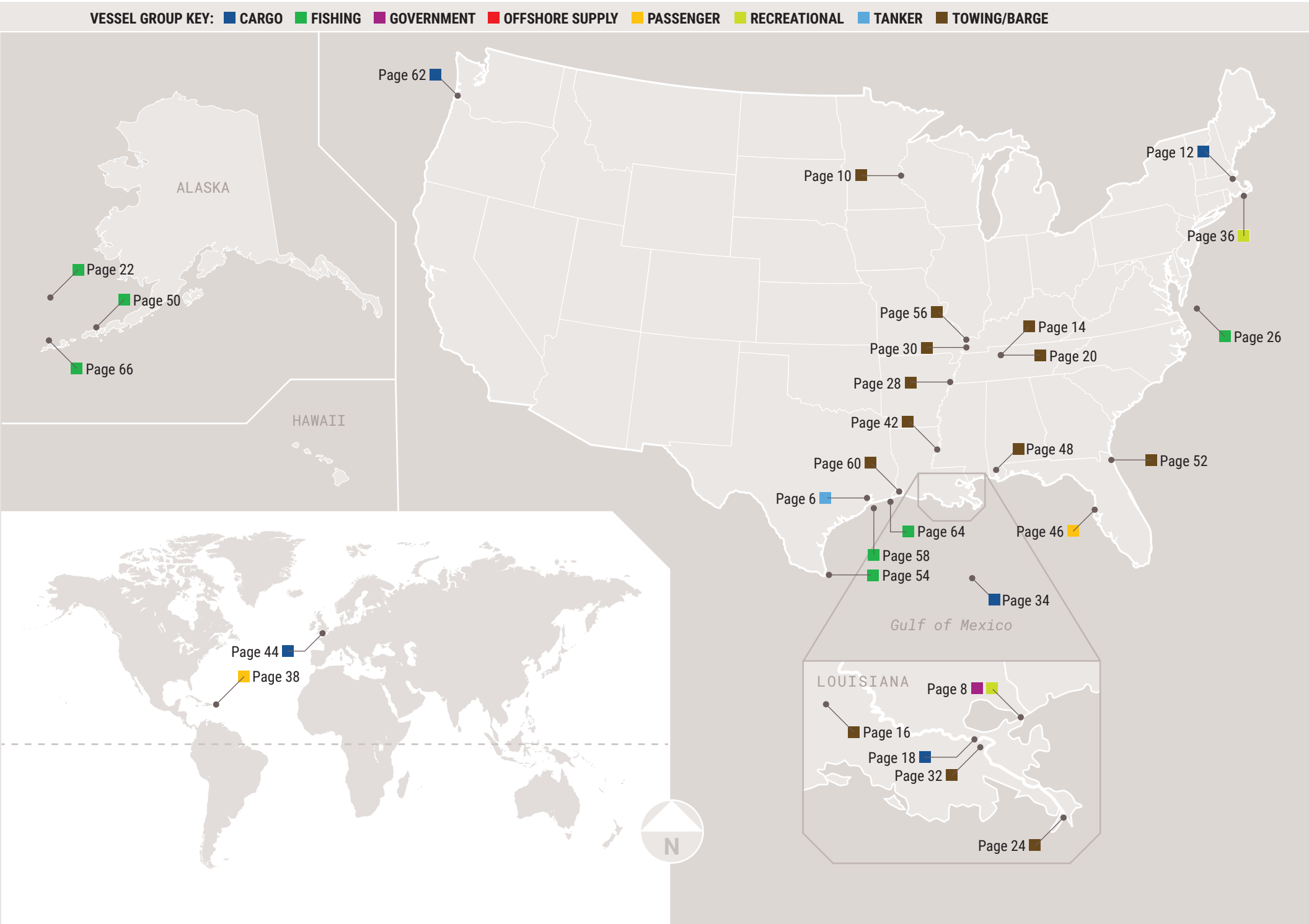
PASSENGER
Ro/Ro passenger vessel (Ro/Pax)
Small passenger vessel

RECREATIONAL
Sailing

TANKER
Crude oil tanker

TOWING/BARGE
Crane barge
Towing

NTSB SAFER SEAS DIGEST 2018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ACKNOWLEDGMENTS

NTSB SAFER SEAS DIGEST 2018

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

ACCIDENT VESSEL	COAST GUARD UNIT
Aframax River	Coast Guard Sector Houston/Galveston
Alliance St. Louis	Coast Guard Marine Safety Unit Port Arthur
Ambition	Coast Guard Sector Anchorage
Atlantic Raider	Coast Guard Sector Jacksonville
Ben & Casey	Coast Guard Marine Safety Detachment Brownsville
Best Revenge 5	Coast Guard Sector Southeastern New England
Caribbean Fantasy	Coast Guard Sector San Juan and Coast Guard Seventh District
CG 29113 / Vanguard Sailboat	Coast Guard Sector New Orleans
Cooperative Venture	Coast Guard Marine Safety Detachment St. Paul
Destination	Coast Guard counterparts from Marine Board of Investigation and National Center of Expertise
Eric Haney	Coast Guard Marine Safety Unit Paducah
George King	Coast Guard Marine Safety Detachment Vicksburg
Gracie Claire	Coast Guard Sector New Orleans
Helsinki Bridge	Coast Guard Sector Boston
Honor	Coast Guard Activities Europe
Island Lady	Coast Guard Sector St. Petersburg
J.W. Herron	Coast Guard Sector Mobile
James H Hunter	Coast Guard Marine Safety Detachment Nashville
Lady Damaris	Coast Guard Marine Safety Unit Texas City and Marine Safety Detachment Brownsville
Langley Douglas	Coast Guard Sector Hampton Roads
Marguerite L. Terral	Coast Guard Marine Safety Unit Baton Rouge
Mia S	Coast Guard Sector New Orleans
Nenita	Coast Guard Marine Safety Unit Portland, Oregon
Ricky Robinson	Coast Guard Sector Lower Mississippi River
Savage Ingenuity	Coast Guard Marine Safety Unit Lake Charles
Southern Bell	Coast Guard Marine Safety Unit Port Arthur
St. Dominick	Coast Guard Marine Safety Detachment Dutch Harbor
Steve Plummer	Coast Guard Marine Safety Detachment Nashville
Todd Brown	Coast Guard Marine Safety Unit Paducah
Troy McKinney	Coast Guard Sector New Orleans

WHO HAS THE LEAD: USCG OR NTSB?

Figure 107. Coast Guard personnel engaged in the evacuation of passengers of the *Caribbean Fantasy* that caught fire near San Juan, Puerto Rico (see page 38).
PHOTO BY COAST GUARD

In a memorandum of understanding (MOU) signed December 18, 2008, the NTSB and the US Coast Guard (USCG) agreed that when both agencies investigate a marine casualty, one agency will serve as the lead federal agency for the investigation. The NTSB Chairman and the Coast Guard Commandant, or their designees, will determine which agency will lead the investigation. The NTSB may lead the investigation of "significant marine casualties," defined in the MOU as a loss of three or more lives on a commercial passenger vessel; loss of life or serious injury to 12 or more persons on any commercial vessel; loss of a mechanically propelled commercial vessel of 1,600 or more gross tons; loss of life involving a highway, bridge, railroad, or other shore side structure; serious threat, as determined by the NTSB Chairman and the Coast Guard Commandant, or their designees, to life, property, or the environment by hazardous materials; and significant safety issues, as determined by the NTSB Chairman and the Coast Guard Commandant, or their designees, relating to Coast Guard marine safety functions. ■

TABLE OF FIGURES

OFFICE OF MARINE SAFETY

The NTSB Office of Marine Safety (MS) investigates major marine casualties on or under the territorial waters of the United States, including accidents involving US-flagged merchant vessels worldwide and those involving both US public and nonpublic vessels in the same casualty. In addition, the office investigates selected catastrophic marine accidents or those of a recurring nature.

The US Coast Guard (USCG) conducts preliminary investigations of all marine accidents and notifies the NTSB if an accident qualifies as a major marine casualty, which is defined as resulting in at least 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 as $500,000 or more.
- Serious threat (as determined by the USCG Commandant and concurred in by the chairman) to life, property, or the environment due to hazardous materials.

MS investigates and determines the probable cause of all major marine casualties. For select major marine casualties, the office launches a full investigative team and presents the investigative product to the Board. In all other major marine casualties, MS launches marine investigators to the scene to gather sufficient factual information to develop a marine accident brief report. Most of these brief investigation reports are adopted by the MS director through delegated authority; the remainder are adopted by the Board, including public-nonpublic marine casualties.

Figure 108. NTSB marine accident investigator examines one of the *Caribbean Fantasy*'s lifeboats.

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