

NTSB | National
Transportation
Safety Board

SAFER SEAS DIGEST

Lessons Learned from Marine Accident Investigations | **2017**

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.





Figure 1: NTSB investigators about to board *El Yunque* (sister ship of *El Faro*) while it's docked at Jacksonville.



A message from the Chairman

The forty-one marine accidents included in *Safer Seas Digest 2017* involved allisions, capsizings, collisions, fires, explosions, flooding, groundings, and equipment damage. The vessels ranged from small passenger vessels, to barges and towboats, to cruise ships and ocean-going cargo vessels.

Tragically, some of these accidents also resulted in loss of life, injuries, and significant property damage. Reading about them can provide a deeper understanding of how these events occur and how they might be prevented. Each has its own unique story to tell and can serve to provide guidance toward safer voyages in the future.

The issues examined in *Safer Seas Digest 2017* include:

- Watertight Integrity
- Heavy-Weather Operations
- Fatigue
- Bridge Resource Management
- Cell Phones and Distraction
- Anchoring in High Water and Strong Currents
- Preventive Maintenance
- Safety Management Systems
- Monitoring Rudder Order Response
- Vessel Abandonment
- VHF Reception

The completion of our investigation of the October 2015 sinking of the cargo vessel *El Faro* was a watershed moment for marine safety. The final report numbers 300 pages, and the associated accident docket contains tens of thousands of pages, including the longest transcript of any audio recording device undertaken by the NTSB. The three missions to document the wreckage and recover the voyage data recorder were unprecedented for us as well. The complexity of the *El Faro* investigation and our desire for the marine industry to fully appreciate the importance of our findings and recommendations compelled us to develop a 16-page illustrated publication and a companion video. The section about *El Faro* in *Safer Seas Digest 2017* features infographics and information excerpted from the illustrated publication.

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 US Coast Guard, and my sincerest thanks go out to every one of them who assisted us this year.

With every investigation we conduct, the lessons learned can prevent such losses in the future—when marine stakeholders at all levels of the industry apply these lessons. I hope that *Safer Seas Digest 2017* provides the marine industry with essential and actionable information to address the safety issues confronting it.

Sincerely,

A handwritten signature in blue ink that reads "Robert L. Sumwalt, III". The signature is written in a cursive style with a horizontal line under the name.

Robert L. Sumwalt, III
Chairman

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Abbreviations

AB	able-bodied seaman	GPS	global positioning system
ABS	American Bureau of Shipping	IMTT	International Matex Tank Terminals
ABS	anti-lock braking system	NHC	National Hurricane Center
AIS	automatic identification system	SCC	sector command center
BRM	bridge resource management	SMS	safety management system
CO ₂	carbon dioxide	SUV	sport utility vehicle
EPIRB	emergency position indicating radio beacon	VDR	voyage data recorder
GMDSS	Global Maritime Distress and Safety System	VHF	very high frequency
		VTS	vessel traffic service

Vessels covered in this digest, listed by group and accident type

VESSEL GROUP	NAME	VESSEL TYPE	ACCIDENT TYPE
CARGO	<i>Aris T</i>	Bulk carrier	Allision/collision
Bulk carrier Containership General cargo Heavy lift Multi-purpose Lake freighter Roll-on/roll-off (Ro/Ro) Ro/Ro-Containership (Ro/Con)	<i>Asia Zircon II</i>	Bulk carrier	Hull/machinery/ equipment damage
	<i>Courage</i>	Ro/Ro	Fire/explosion
	<i>El Faro</i>	Ro/Con	Flooding
	<i>Manizales</i>	General cargo	Collision
	<i>Ocean Freedom</i>	Heavy lift	Collision
	<i>Roger Blough</i>	Bulk carrier; lake freighter	Grounding/ stranding
	<i>Sparna</i>	Bulk carrier	Grounding/ stranding
	<i>Star of Abu Dhabi</i>	Bulk carrier	Allision
	<i>Yangtze Ambition</i>	Bulk carrier	Collision
	<i>Zen Noh Grain Pegasus</i>	Bulk carrier	Collision
FISHING	<i>Alaska Juris</i>	Fish processing	Flooding
Fishing Fish tender Fish-processing	<i>American Eagle</i>	Fishing	Fire/explosion
	<i>Capt David</i>	Fishing	Flooding
	<i>Capt Kevin</i>	Fishing	Flooding
	<i>Exito</i>	Fish tender	Flooding
	<i>Lady Gertrude</i>	Fishing	Flooding
	<i>Lydia & Maya</i>	Fishing	Capsizing
	<i>Orin C</i>	Fishing	Flooding
	<i>Raffaello</i>	Fishing	Fire/explosion
GOVERNMENT	<i>Tampa</i>	Coast Guard Cutter	Collision
Coast Guard, Navy, NOAA, USACE	<i>Thetis</i>	Coast Guard Cutter	Collision
OFFSHORE SUPPLY	<i>Hammerhead</i>	Dive support	Flooding
Offshore supply Passenger/crew Liftboat			

VESSEL GROUP	NAME	VESSEL TYPE	ACCIDENT TYPE
PASSENGER	<i>Adventure Hornblower</i>	Small passenger vessel	Allision
Cruise ship Ferry Small passenger vessel Diving	<i>Carnival Liberty</i>	Cruise ship	Fire/explosion
	<i>Carnival Pride</i>	Cruise ship	Allision
	<i>Celebrity Infinity</i>	Cruise ship	Allision
	<i>Maximus</i>	Small passenger vessel	Flooding
	<i>Spirit of Kona</i>	Small passenger vessel	Grounding/ stranding
	<i>Tahoe Queen</i>	Small passenger vessel	Fire/explosion
RECREATIONAL	(none)	—	—
TANKER	<i>Nordbay</i>	Self-propelled tank vessel	Allision
Self-propelled tank vessel			
TOWING/BARGE	<i>Amy Frances</i>	Towing	Allision
Towing Tugboat Barge	<i>Cerro Santiago</i>	Tugboat	Collision
	<i>Crimson Gem</i>	Towing	Collision
	<i>Jaxon Aaron</i>	Towing	Fire/explosion
	<i>Kodiak</i>	Towing	Allision
	<i>Matachin</i>	Towing	Collision
	<i>Michael G Morris</i>	Towing	Allision
	<i>Nathan E Stewart</i>	Articulated tug and barge	Grounding/ stranding
	<i>Peter F Gellatly</i>	Towing	Allision
	<i>Ricky J LeBoeuf</i>	Towing	Capsizing
	<i>Specialist</i>	Towing	Collision
	<i>Spence</i>	Towing	Collision
	<i>The Admiral</i>	Towing	Collision
	<i>Thomas Dann</i>	Towing	Fire/explosion

VESSEL GROUP: **PASSENGER**

Allision of Passenger Vessel *Adventure Hornblower* with San Diego Seawall

ACCIDENT LOCATION

SAN DIEGO BAY, CALIFORNIA

ACCIDENT DATE

MARCH 31, 2016

REPORT NUMBER

MAB1729

ACCIDENT ID

DCA16FM035

DATE ISSUED

AUGUST 25, 2017



Figure 2: Passenger vessel *Adventure Hornblower* after alliding with the San Diego seawall.

PHOTO BY COAST GUARD

LESSONS

Adherence to Manufacturer's Recommended Maintenance Procedures and Intervals

This accident illustrates the potential safety hazards of failing to follow the equipment manufacturer's recommended maintenance procedures and schedules. Without necessary maintenance, equipment cannot be relied on to perform as designed. Mariners should review manufacturer manuals and guidance on a regular basis to ensure conformance with recommended maintenance plans.

Access to Vessel Controls and Distraction

Vessel controls that are located outside the bridge/wheelhouse and are accessible to non-crewmembers present the opportunity for tampering and may lead to the distraction of the operator. Owners and operators should designate a perimeter around these stations and ensure the area is secured when in operation.

Remote Propulsion Control Systems

Current technology allows vessels to be constructed and fitted with automated instrumentation and alarms that alert the

operator in the event of critical failure; however, they are not required by regulation. The negative consequences of an undetected loss of propulsion control are elevated for passenger vessels because they carry more people on board, often transit in confined waterways, and dock frequently. Owners and operators are encouraged to install instrumentation that provides a positive indication of propulsion thrust direction and/or a deviation alarm at bridge/wheelhouse and remote propulsion control stations. Such indications/alerts increase the likelihood of early detection of improper propulsion response, thereby allowing the operator time to take effective corrective action.

On the afternoon of March 31, 2016, the passenger vessel *Adventure Hornblower* was attempting to dock at the Navy Pier in downtown San Diego, California, following a whale-watching excursion. As the vessel made its approach to the pier, its bow unexpectedly swung to starboard and allided with the pier's passenger embarkation dock. The *Adventure Hornblower* then accelerated forward until it struck the seawall at the foot of the pier. Eight passengers sustained minor injuries in the accident. The allision caused nearly \$1.06 million in damage to the vessel, pier, and seawall.

The *Adventure Hornblower* propulsion consisted of twin engines driving their respective propellers through a mechanical transmission. As the vessel approached the pier at about 1245, the captain prepared for docking by first slowing the vessel and then moved vessel control from the wheelhouse to the starboard wing station. She made her normal approach to the dock by "bumping" the throttles forward and then moving them back to neutral, and at some point during the approach, the port transmission did not respond to the command to return to neutral, but stayed in the forward position. When the captain then moved the port throttle to the astern position, the transmission remained in forward.

The wing station had no indicator to show the position of the transmission, and thus the captain did not know if it was in ahead, neutral, or astern. Similarly, there was no "wrong way" indicator that would have alerted the captain when the port transmission did not respond to the astern command. Because the vessel did not move in reverse when the captain ordered astern propulsion, she increased the throttle, thinking that she did not have enough power for the maneuver. However, with the transmission stuck in the ahead position, this order had the opposite of the intended effect. The *Adventure Hornblower* surged forward and the bow swung into the pier, striking the embarkation dock at 1255. The vessel then bounced away from the pier and continued moving forward.

As the *Adventure Hornblower* moved forward, the captain put both throttles in the full-astern position, still unaware that the port engine was engaged in the ahead position. Because the vessel's propellers operated more efficiently in forward than in reverse, the starboard engine was overpowered by the port engine, and the vessel began to accelerate ahead toward the seawall at the foot of the pier until it hit the seawall.

Investigators learned that, since November 2015, the vessel's port main engine transmission had been leaking hydraulic oil, requiring replenishment of 1.5–2 gallons of oil each day. A new gasket kit to correct the leak was received in January 2016 but had not yet been installed when the accident occurred. In February 2016, pans were placed under the equipment to collect the leaking oil. Although this was a widely known maintenance issue, it was not regularly noted in the daily engineering checklists, including the checklist left for the captain to review on the morning of the accident.

Investigators also learned that the *Adventure Hornblower's* transmissions had not received longterm maintenance every 5 years, or 4,000-6,000 hours, as recommended by the manufacturer. When the accident occurred, the port and starboard transmissions had more than 66,000 operating hours each, yet the owner provided no evidence that the longterm maintenance had been conducted in the life of the vessel.

Maneuvering commands from the wheelhouse and wing station were transmitted electrically to a control module in the engine room, which then sent command signals to the main engines and transmissions. Transmission signals were routed to an electric-motor-driven actuator, called a servo-actuator. The servo-actuator was linked to the transmission's control unit selector lever via a mechanical linkage. Investigators believe

that during the *Adventure Hornblower's* approach to the pier, a fault occurred between the port transmission's servo-actuator, its mechanical linkage, and its control unit, most likely due to neglected maintenance of the transmission and control system.

■ The NTSB determined that the probable cause of the allision of the *Adventure Hornblower* with the Navy Pier and the downtown San Diego seawall was a failure of the port transmission to disengage from the forward propulsion position due to the operating company's lack of adherence to the transmission manufacturer's recommended periodic maintenance schedule and the lack of routine maintenance and upkeep of the propulsion system's equipment. Contributing to the accident was the lack of instrumentation to provide positive indication of thrust direction or an alarm to indicate the propulsion control system was not responding properly to the captain's commands.

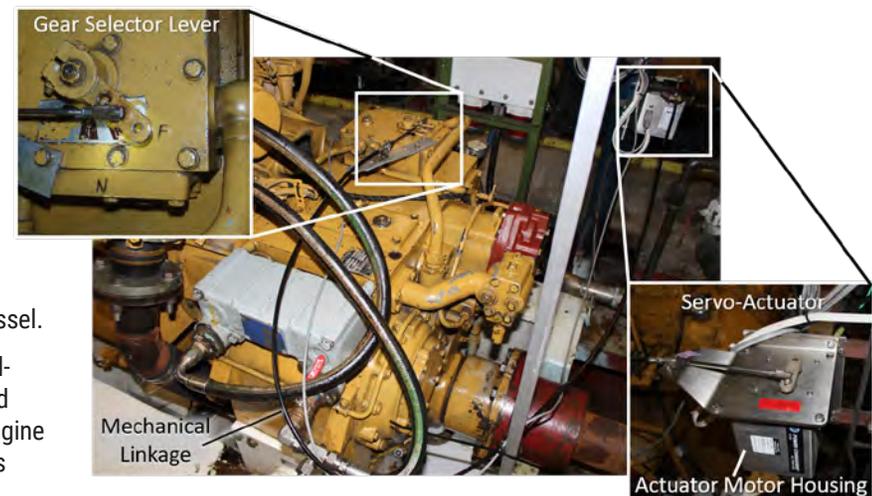


Figure 3: Port ZF marine transmission with close-up of the gear selector lever for the mechanical control unit in the forward position as found immediately after the accident. Also shown is a close-up of the Twin Disc control system servo-actuator.

PHOTOS BY COAST GUARD & NTSB

VESSEL GROUP: TOWING/BARGE

Allision of *Amy Frances* Tow with Natchez–Vidalia Highway 84 Bridge

ACCIDENT LOCATION

NATCHEZ, MISSISSIPPILOWER MISSISSIPPI RIVER AT MILE
MARKER 363.3

ACCIDENT DATE

01/21/2016

REPORT NUMBER

MAB1715

ACCIDENT ID

DCA16FM020

DATE ISSUED

05/15/2017

Figure 4: *Amy Frances* under way after the accident.

PHOTO BY COAST GUARD



At 1247 on January 21, 2016, the towing vessel *Amy Frances* was pushing a flotilla of six barges downbound on the Lower Mississippi River near Natchez, Mississippi, when the port lead barge allided with the center pier of the Natchez–Vidalia Highway 84 Bridge. The allision breached a forward cargo tank on the barge, resulting in the release of 24,654 gallons of catalytic cracked clarified oil into the river. The estimated damage exceeded \$542,000. No one was injured in the accident.

The evening before the accident, the vessel's owner/operator instructed the *Amy Frances*' captain to moor for the night because high-water conditions present at that time restricting nighttime transits. The next morning the *Amy Frances* got under way about 1136 with a credentialed crewmember (also called "pilot" on inland waterways) operating the vessel. The pilot told investigators that, during the approach toward the bridge, he found that the tow was setting to the left, so he decided to take the left channel under the bridge rather than the right channel as originally planned.

However, when the *Amy Frances* was about 0.5 mile from the bridge, the tow was setting toward the center pier. The pilot tried to back the vessel at full astern, but, about 1247, barge *MM46* at the head of the flotilla struck the right side of the center pier at a speed of about 9.4 mph. Five of the six barges broke away from the *Amy Frances*; they were later recovered with the assistance of other towing vessels in the area.

At the time of the allision, a Coast Guard safety advisory warning mariners about the "extreme high-water" conditions on the Lower Mississippi River was in effect. The advisory noted "hazardous conditions associated with strong currents" with the river above flood stage (Vicksburg gauge at 49.6 feet; flood stage for this gauge was 43 feet). It advised that downbound wheelman should have recent experience in handling current conditions. The accident pilot later told investigators that he had never transited through he accident area downbound when the river was above flood stage.



Figure 5: Close-up of damage to barge *MM-46*.

PHOTO BY US COAST GUARD

The owner/operator's navigation program did not account for the pilot's experience during "high-river" stages nor did it mention the use of an additional pilot to assist. Investigators believe that if the captain or another pilot had been in the wheelhouse together with the accident pilot to observe the vessel's electronic charting system, they would have noticed that the vessel's earlier set toward the left had decreased and that the tow would no longer pass safely through the left channel.

■ The NTSB determined that the probable cause of the allision of the *Amy Frances* tow with the Natchez–Vidalia Highway 84 Bridge was the pilot's failure to properly compensate for the current in the vicinity of the bridge while proceeding downbound under high-water conditions, and the captain's failure to recognize the pilot's inexperience with these conditions and assist the pilot with the maneuver.

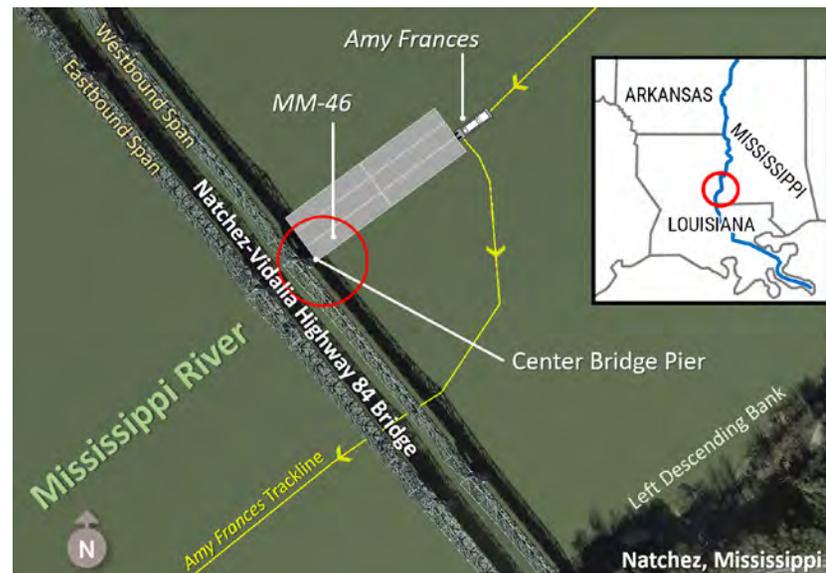


Figure 6: Satellite image of the accident site overlaid with a graphical depiction of *Amy Frances* tow and automatic identification system (AIS) track data. BACKGROUND BY GOOGLE EARTH PRO

VESSEL GROUP: PASSENGER

Allision of Passenger Vessel *Carnival Pride* with Pier and Passenger Walkway

ACCIDENT LOCATION

BALTIMORE HARBOR, MARYLAND
CRUISE MARYLAND TERMINAL, SOUTH
LOCUST POINT

ACCIDENT DATE
05/08/2016

REPORT NUMBER
MAB1706

ACCIDENT ID
DCA16FM038

DATE ISSUED
02/28/2017

02/2016 8:01:38.533



Figure 7: The elevated passenger embarkation walkway, in the midst of falling to the ground and crushing three vehicles, after it was impacted by *Carnival Pride's* observation and mooring platform.

SCREEN CAPTURE PROVIDED BY US COAST GUARD

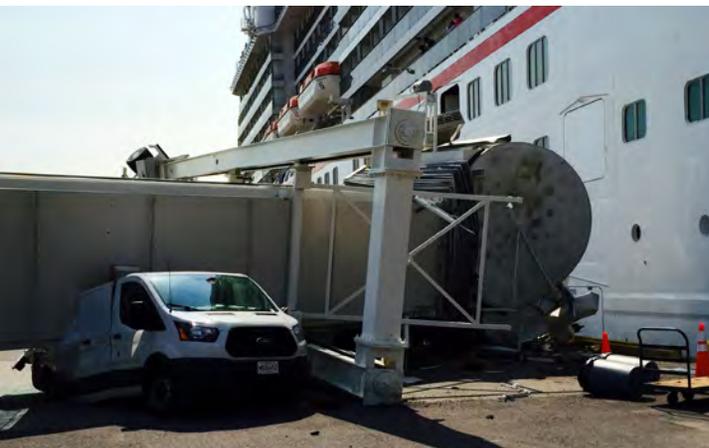


Figure 8: *Carnival Pride* at the Cruise Maryland Terminal berth following the accident. PHOTO BY COAST GUARD

On the morning of May 8, 2016, at 0800 local time, the cruise ship *Carnival Pride* was attempting to dock in Baltimore, Maryland, when its bow struck the pier, fendering, and an elevated passenger embarkation walkway on shore. The allision caused nearly \$2.1 million in damage. The walkway was destroyed, three vehicles that were under it during the collapse were damaged, and the vessel sustained minor damage. No one was injured and no pollution was reported.

The *Carnival Pride* was returning to Baltimore from a 7-day round trip cruise to Florida and the Bahamas. As the ship approached the terminal to dock, the onboard Maryland pilot transferred navigational control to the *Carnival Pride's* second-in-command, the staff captain. Following the changeover, the pilot assumed an advisory role instead of giving direct orders for the helm and engines. The staff captain had previous experience, under the master's supervision, operating the controls during berthing maneuvers.

Figure 9: Below, elevated passenger embarkation walkway lying on its side on top of dockyard vehicles following the allision. At right, *Carnival Pride's* damaged retractable observation and mooring platform. PHOTOS BY COAST GUARD



The vessel's main propulsion and steering (helm) was provided by two stern azimuthing (rotating) propeller pods; supplemented during maneuvering with three bow thrusters. All could be operated independently or together via an integrated joystick. Control of the propulsion and the helm was shifted from the bridge's center console to the starboard bridge wing console. With a push of a button, the staff captain accepted control at the starboard console, which was in joystick mode. The joystick tested and operated normally.

The pier heading at the terminal was 284 degrees, yet, when the bow of the *Carnival Pride* was about half a ship's length away from the dock, the vessel was on a heading of 307 degrees and making a speed of 5.3 knots. About that time, the pilot cautioned the staff captain to slow down.

To control the vessel's rate of closure with the dock, the staff captain tried to transfer from joystick to manual control at the starboard console in order to gain

more direct control of propulsion. Despite repeated attempts, the staff captain's efforts to transfer control to the manual levers were unsuccessful.

As the distance to the dock continued to decrease, the master took the conn from the staff captain and shifted control back to the center console, regaining full control of the ship's azipods and bow thrusters. He then applied full thrust away from the berth and slowed the ship's forward progress, but not before the bulbous bow struck the fendering and under-pier support columns. As the ship continued moving forward, its flared bow and starboard-side retractable observation and mooring platform struck an elevated passenger embarkation walkway. The walkway collapsed onto three vehicles parked on the pier.

The staff captain allowed the *Carnival Pride* to approach the pier too fast and at an angle too steep because he misjudged the power available in the joystick mode for correcting maneuvers. In the seconds it took him to realize that the joystick control would not be enough to slow the ship, he lost valuable time in shifting to manual control. In his haste to shift control, he was unable to assume manual control at the starboard console, an event the staff captain could not explain. The vessel's operating company was not able to replicate the failed transfer of control from the joystick mode to the manual mode during testing on subsequent voyages. Thus, the company was unable to determine a cause other than possible human error.

■ The NTSB determined that the probable cause of the *Carnival Pride's* allision with the pier and elevated passenger embarkation walkway was the staff captain's errors during the docking maneuver—approaching the pier with excessive speed and at too steep of an angle—and the master's insufficient oversight during the maneuver.



VESSEL GROUP: PASSENGER

Allision of Cruise Ship *Celebrity Infinity* with Dock

ACCIDENT LOCATION

KETCHIKAN, ALASKA

KETCHIKAN HARBOR CRUISE PORT, BERTH 3

ACCIDENT DATE

06/03/2016

REPORT NUMBER

MAB1736

ACCIDENT ID

DCA16FM042

DATE ISSUED

11/14/2017



Figure 10: Postaccident photo of *Celebrity Infinity* docked at damaged berth 3, Ketchikan, Alaska.

PHOTO BY COAST GUARD

About 1400 Alaska daylight time on June 3, 2016, the cruise ship *Celebrity Infinity* allided with its arrival berth in Ketchikan, Alaska. No one was injured and no pollution occurred, but the ship and the berth sustained about \$1.15 million in damage.

The cruise ship was on a one-week voyage and had departed Juneau, Alaska the evening before the accident. Prior to arrival in Ketchikan, weather information had warned of gale-force- to strong gale-force wind conditions on the day of the accident, and the bridge team was aware of the situation. The master stated that he spoke to the fleet captain the morning of the accident about the expected high winds in Ketchikan and that the fleet captain told him it was his decision whether to dock or not. The master did not try to arrange for a tugboat to assist the ship with docking and stated he had never heard of tugboats being available in Ketchikan (they were). An Alaska pilot was also on the bridge, being compulsory for navigation in Alaskan waters. However, *Celebrity Cruises* SMS stated that the master or staff captain must perform dockings. At 1302, the pilot radioed a pilot departing the berth the *Celebrity Infinity* was to berth at and learned the wind was a steady 25 knots with gusts to 35 knots. Neither the master nor the onboard Alaska pilot attended a pre-arrival briefing on the ship's navigation bridge at 1326, and the four people who did attend—staff captain (who had navigational control during the docking), first officer, safety officer, and third officer—were not recorded on the ship's VDR as discussing the weather conditions.

The pilot told investigators that he did talk to the master about the expected winds and that the master assured him they could dock in the prevailing conditions, just that they would come in a bit faster and wider than normal due to the wind. The pilot also said that he told the master that tugboats were available, but the master said, "unless the winds were very strong, 30–40 [knots], they would have no problem holding the ship" and that he (the master) had docked the vessel in wind gusts up to 50 knots.

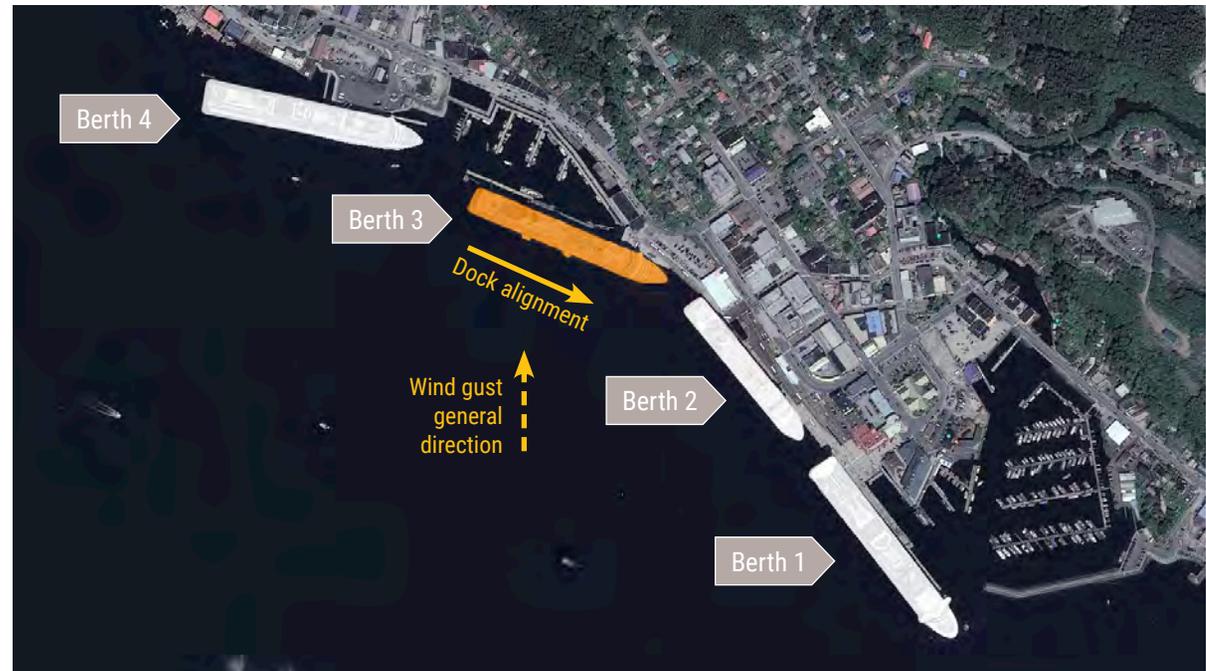


Figure 11: Ketchikan harbor with overlaid approximate positions of cruise ships at cruise vessel berths. The orange ship shows the approximate position of *Celebrity Infinity* at berth 3.

BACKGROUND BY GOOGLE EARTH

Further, the staff captain told investigators that he discussed with the master the expected wind for docking; however, it is unclear if the two of them discussed the docking with the pilot, as nothing was heard on the VDR.

When the vessel was about 4 tenths of a mile from the dock, the conn changed from the pilot to the staff captain. The master told investigators that, when approaching the dock, the *Celebrity Infinity* was drifting considerably, and he ordered the starboard anchor dropped at 1353. Doing so slowed the motion of the ship's bow toward the dock, but the stern then moved more rapidly toward the dock and eventually allided with it. The impact opened a 9-inch-diameter hole on the vessel's port side, about 12 feet above the waterline, and deflected several structural members.

The berth sustained extensive damage to catwalks and structural members. Recorded wind speeds from the vessel's VDR showed gusts around 40 knots.

Senior bridge and engineering personnel told investigators there were no problems with the nautical, bridge, or propulsion equipment at the time of the accident, and the bridge logbook indicated that all regulatory and company required equipment was "tested and found in good working order."

■ The NTSB determined that the probable cause of the *Celebrity Infinity*'s allision with the dock was the master's failure to plan, monitor, and execute a safe docking evolution.

VESSEL GROUP: TOWING/BARGE

Allision of *Kodiak* Tow with North Landing Bridge

ACCIDENT LOCATION

CHESAPEAKE, VIRGINIA

NORTH LANDING RIVER AT MILE MARKER
20.2, INTRACOASTAL WATERWAY

ACCIDENT DATE

03/01/2016

REPORT NUMBER

MAB1716

ACCIDENT ID

DCA16FM028

DATE ISSUED

05/15/2017

Figure 12: Tugboat *Kodiak* under way.

PHOTO COURTESY OF INTRACOASTAL MARINE, INC.



On March 1, 2016, about 0322 local time, the open barge *SJ-199* being pushed by the tugboat *Kodiak* allided with the North Landing Bridge at mile marker 20.2 in Chesapeake, Virginia. Just before the allision, the tow had run over a mooring dolphin on the north side of the river 750 yards from the bridge. Although the vessel incurred no damage, the barge and the bridge sustained an estimated total of \$275,000 in damage. No pollution or injuries were reported.

With a crew of four, the tow was en route from Edenton, North Carolina, to Baltimore, Maryland, via several inland waterways: Albemarle Sound, North River, Currituck Sound, and North Landing River. About 1.6 miles south of the North Landing Bridge, the narrow waterway bends 72 degrees to the west and then 15 degrees to the north for the final half-mile approach to the bridge. The mate was the only person in the wheelhouse; a deckhand was in the engine room, and the captain and a second deckhand were asleep.

While moving through the bends at a speed of about 4–6 mph, the tow struck and knocked down a mooring dolphin near the NuStar Energy terminal dock. The mate

Figure 13: Barge *SJ-199* docked at the repair yard.


Figure 14: Damage to the southside fender of the North Landing Bridge.

tried to slow the speed by placing the *Kodiak*'s engines in neutral while lining up the tow for the transit through the 80-foot-wide horizontal opening of the North Landing Bridge. However, during the approach, the port side of the *SJ199* struck the south side of the bridge's fender system at about 1.7 mph.

The accident voyage entailed several first-time experiences for the mate. It was the first time he was in charge of a towboat watch after receiving his credentials in March 2015 as deck officer/mate (pilot) for towing vessels upon near coastal waters. He had not served on board any vessel since October 2014 until he was employed by Intracoastal Marine, Inc. in January 2016. At the time of the accident, he had been with the company for 2 months and had been on board the *Kodiak* for only 2 days. The transit was also his first trip through the Intracoastal Waterway. Moreover, the voyage on the North Landing River was the first time the mate transited a narrow waterway through bridges.

■ The NTSB determined that the probable cause of the allision of the *Kodiak* tow with the North Landing Bridge was the mate's inability to safely navigate the vessel due to his inexperience in conning tows through narrow waterways.

VESSEL GROUP: TOWING/BARGE

Allision of *Michael G Morris* Tow with Thebes Railroad Bridge

ACCIDENT LOCATION

THEBES, ILLINOIS

UPPER MISSISSIPPI RIVER AT MILE MARKER 43.7

ACCIDENT DATE

04/06/2016

REPORT NUMBER

MAB1723

ACCIDENT ID

DCA16FM036

DATE ISSUED

06/30/2017

Figure 15: Towing vessel *Michael G Morris*.

PHOTO COURTESY OF AEP



On April 6, 2016, about 0343 central daylight time, the towing vessel *Michael G Morris*, pushing 30 barges loaded with grain, allided with the Thebes Railroad Bridge at mile marker 43.7 on the Upper Mississippi River in Thebes, Illinois. The vessel and the bridge were undamaged, but all the barges broke away from the tow and 16 of them sustained a combined total of \$850,000 in damage. No one was injured nor was any pollution reported.

The *Michael G Morris* tow was en route from St. Louis, Missouri, to Cairo, Illinois, when the accident occurred. The 30 loaded grain barges were arranged six across and five deep, making the entire tow (vessel and barges) 1,180 feet long and 210 feet wide. Heading downbound to the Thebes Railroad Bridge, the tow had to complete a large turn of about 113 degrees to maneuver through a bend in the river. Following that large turn was a second bend in the river, only 0.3 mile from the bridge, that required about a 35-degree turn. In addition, the current that day was strong at 3–4 knots.

About 0336, proceeding at a speed of 10.7 mph, the pilot, as intended, began to line up the bow of the tow with the left side bridge pier of the 651-foot-wide channel span, which he planned to steer through. The pilot told investigators that as the tow came out of the second turn and approached the bridge, he tried to come right in the river to line up for the passage, but the head of the tow continued to the left. At 0343, the third barge on the port side of the tow struck the left bridge pier. The tow broke apart, with some barges hitting the bridge piers. All 30 barges drifted downstream; 28 of them stranded between mile markers 44 and 31. Two sank, were removed, and were declared total losses. Fourteen other barges sustained hull insets and punctures; some took on water.

Even with a wide horizontal clearance, the Thebes Railroad Bridge is more difficult to transit than others because of the increased risk associated with the approach that includes two bends. The operator told investigators he had transited the bridge previously, but that the accident voyage was his first time doing so navigating the *Michael G Morris*. Further, high water produced fast currents that increased the risk of allision while navigating a tow under the bridge.

■ The NTSB determined that the probable cause of the allision of the *Michael G Morris* tow with the Thebes Railroad Bridge was the pilot not correctly accounting for the river current in the bend just above the bridge, resulting in his late and insufficient use of rudder while making the turn.

Figure 16: Sunken barge that broke away from the *Michael G Morris*.

PHOTO BY COAST GUARD



VESSEL GROUP: **TANKER**

Allision of Tanker *Nordbay* with Docks and Water Intakes

ACCIDENT LOCATION

NEW ORLEANS, LOUISIANA
LOWER MISSISSIPPI RIVER AT MILE
MARKERS 104 AND 94

ACCIDENT DATE
02/02/2016REPORT NUMBER
MAB1730ACCIDENT ID
DCA16FM023DATE ISSUED
08/25/2017

Figure 17: Nordbay under way.

PHOTO BY REEDEREI NORD GROUP

LESSONS

Distractions Operations

Postaccident communications and notifications should never interfere with the safe operation of a vessel that is still under way. Control of the vessel and attention to the safe handling of the ship must be maintained at all times until the ship is safely anchored or moored. The presence of a pilot does not exempt the master and bridge team from their duty to safely navigate the ship.

In addition to the high-river conditions and strong following current, the wind also had an effect on the *Nordbay*. The ship was in ballast with a freeboard greater than the draft and a 12-foot trim by the stern, and thus the hull had less “grip” on the water. While in the two large bends, the *Nordbay* was turning into the wind with a heading and direction that put the wind on the starboard side of the ship, thus setting the vessel deeper into the left descending bank and reducing the rate of turn. By the pilot’s account, the stern was “falling into the bend and the bow was not climbing out.” Both the master and the pilot stated that they were aware of the wind and river conditions for the downbound transit but they did not discuss the effect of these conditions on the ship. By the account of the master and the pilot, both considered the risk of getting under way in those conditions acceptable and determined that no additional measures were needed to mitigate the risk.

■ The NTSB determined that the probable cause of the *Nordbay*’s allisions with water intakes and docks was the pilot and the master not adequately assessing the risks of handling the ballasted vessel during high-river conditions with strong following currents while turning into the wind. Contributing was the bridge team’s poor situational awareness of the vessel’s position in the waterway. Contributing to the second allision was the master’s distraction from his duties while making a phone call.

At 2213 on February 2, 2016, the tanker *Nordbay* allided with a dock and water intakes on the Lower Mississippi River in New Orleans, Louisiana. Less than an hour later, as the ship was headed toward an anchorage, it allided with a wharf. No one was injured and no pollution was reported; however, the *Nordbay* and the impacted shoreside structures sustained an estimated \$6.4 million in total damage.

At the time of the accident, the *Nordbay* was outbound for sea after discharging its cargo of crude oil. The following river current was strong and the winds 15 to 25 knots. At 2205, as the pilot ordered increasing starboard rudder and ship began rounding a large turn in the river at the Nine-Mile Point, the onboard pilot asked for more engine rpm to prevent the ship from setting into the bend. The propulsion slow-speed diesel engine’s rpm increased, yet the rate of turn and forward speed decreased, and, at 2213, the *Nordbay* struck a shoreside dock and water intakes.

Because of the allision, the pilot and VTS determined that the ship would proceed to an anchorage downriver. On the way there, the ship had to transit through another large turn, this time at Algiers Point. The pilot notified the pilot association’s office via cell phone of the accident and arranged for another pilot to board the vessel near the anchorage. The master also used the ship’s cell phone to inform the shipping company of the accident. The pilot ordered full-ahead speed on the engine to prepare for the turn at Algiers Point; the master was still on the phone with the shipping company when the pilot initiated the turn.



Figure 18: *Nordbay*’s damaged propeller.

PHOTO BY DNV-GL

Once again, the rate of turn was insufficient and the ship was setting into the bend. At 2304, the pilot asked the master, “Can we get more rpm?” The master ended the phone call with the shipping company and asked the pilot how many rpm he wanted, to which the pilot replied, “Emergency . . . As much as you can give me!” The master called the engine control room stating he needed emergency rpm; he also moved the propulsion levers to full-ahead sea speed. He then asked the pilot what was happening, to which the pilot replied that they were being pushed down into the bend. About 2306, the *Nordbay* allided with a shoreside wooden pier.

VESSEL GROUP: TOWING/BARGE

Allision of *Peter F Gellatly* Tow with IMTT Bayonne Pier A

ACCIDENT LOCATION

BAYONNE, NEW JERSEY
NEW YORK HARBOR, KILL VAN KULL
WATERWAY AT IMTT BAYONNE PIER A

ACCIDENT DATE

08/01/2015

REPORT NUMBER

MAB1718

ACCIDENT ID

DCA15LM030

DATE ISSUED

06/06/2017



Figure 19: Damaged pipelines leading to loading arms on IMTT Bayonne Pier A.

LESSONS

Management Plays the Key Role in the Safety Management System

The NTSB has investigated numerous accidents across all modes of transportation where a safety management system (SMS) or similar program could have prevented injuries, loss of life, or material damage. As a result, the NTSB has recommended that marine, aviation, railroad, and highway organizations establish safety management programs.

The key to a functional SMS is a systematic way to identify hazards and control risks while maintaining assurance that these risk controls are effective. The major components to an SMS include the following:

- **Safety policy** – management’s commitment to continually improve safety; the policy defines the methods, processes, and organizational structure needed to meet safety goals.
- **Safety risk management** – the determination of the need for, and adequacy of, new or revised risk controls based on the assessment of acceptable risk.
- **Safety assurance** – management’s system of internal evaluation intended to assure the execution of safety-related measures and to make certain that employees understand their roles.
- **Safety promotion** – the organization’s promotion of safety as a core value using practices that support a sound safety culture.

On August 1, 2015, at 2147 local time, the tank barge *Double Skin 501*, being pushed by the uninspected towing vessel *Peter F Gellatly*, allided with Pier A at IMTT in Bayonne, New Jersey, as the captain attempted to dock the tow at a nearby pier. Damage to the barge, pier, and an adjacent ship, the *Isola Bianca*, totaled an estimated \$2.7 million. The allision also damaged pipelines on the pier, resulting in the discharge of 630 gallons of fuel oil into the waterway. No one was injured.

About 2121, the tow got under way from International Matex Tank Terminals (IMTT) Constable Hook (New Jersey) bound for IMTT Bayonne. The distance between the terminals was less than a mile and a half. As the tow approached the Bayonne facility, it failed to slow down. The captain had placed both engines in astern propulsion and did not realize that the starboard engine was still engaged in the forward position. Although the engine’s control unit had shown a problem earlier that evening (the indicator light oscillated between forward and astern propulsion), the captain and the engineer thought that the issue had since resolved itself.

Despite evasive measures, including having the accompanying assist tugboat *Houma* push on *Double Skin 501*’s port bow to slow the forward motion, at 2147 the tow allided with a mooring catwalk and Pier A at the IMTT facility. The force of the allision caused pipelines on the pier to rupture, and one pipeline discharged 630 gallons of fuel oil into the water. At 2150, the *Peter F Gellatly* captain shut down the vessel’s engines, stopping the movement of the tow.

The engineer did not communicate his findings once he stopped troubleshooting, and the captain did not follow up with him.

The *Peter F Gellatly*’s SMS stated, “Towing Vessel Masters have the authority to stop any work that they reasonably believe may cause a serious accident.” In accordance with this procedure, the captain had the authority to stop operating the vessel when the starboard engine did not respond properly earlier, but he was not familiar with the SMS. He told investigators that he did not always notify the dispatcher of mechanical issues and was unaware of a policy or procedure describing when he should.

■ The NTSB determined that the probable cause of the allision of the *Peter F Gellatly* tow with IMTT Bayonne Pier A was the captain and the engineer’s poor communication, their inadequate assessment of the hazardous condition posed by the starboard engine control malfunction, and the captain’s decision to continue operations without ensuring that the malfunction had been adequately corrected. Contributing to the accident was the crew’s unfamiliarity with the provisions of the company’s SMS that addressed actions in response to hazardous conditions.

After the accident, technicians examined the *Peter F Gellatly*’s control systems and found loose wires on the electronic selector valve solenoid on the starboard marine gear unit. The company concluded that the loose wires caused a mechanical failure of the shift solenoid.

The captain and the engineer had indications that the starboard engine was not operating as designed; however, both crewmembers assumed that the problem was resolved, and they took no further action to verify the operability of the system.



Figure 20: Towing vessel *Peter F Gellatly*. PHOTO BY MR. JOHN SKELSON

VESSEL GROUP: **CARGO**

Allision of Bulk Carrier *Star of Abu Dhabi* with Louisiana Sugar Refinery Unloading Dock

ACCIDENT LOCATION

GRAMERCY, LOUISIANALOWER MISSISSIPPI RIVER AT MILE
MARKER 146.1ACCIDENT DATE
03/25/2016REPORT NUMBER
MAB1709ACCIDENT ID
DCA16FM032DATE ISSUED
04/13/2017

Figure 21: *Star of Abu Dhabi* after the accident, with missing port anchor. PHOTO BY COAST GUARD

In the early morning on March 25, 2016, the bulk carrier *Star of Abu Dhabi* was anchored using two anchors on the Lower Mississippi River near Gramercy, Louisiana. About 0230, the vessel's port anchor chain parted and the starboard anchor began to drag. As the *Star of Abu Dhabi* moved with the current, it allided with a Louisiana Sugar Refinery unloading dock and continued to drift downstream. The vessel's propulsion engine was started, allowing the crew to bring the bulk carrier under control. The *Star of Abu Dhabi* sustained \$232,210 in damage to its hull above the waterline; the dock's damage totaled \$4.6 million. No injuries or pollution resulted from the accident.

The water level of the Mississippi River had been on the rise, and on March 21, the river crested at less than 2 feet below flood stage. Anticipating strong currents, the Coast Guard had required that "unless moored to a shore side facility or mooring buoys, all deep draft vessels must have three means to hold position. An example would be two fully operational anchors and the propulsion system in standby."

The fully-loaded bulk carrier had anchored in the Lower Grandview Anchorage the prior evening, and at 2154 the master issued a standard "finished with engines" order; informing the engine room that the vessel had completed maneuvering and that the engine and associated equipment could be shut down. The local pilot who was on board at the time did not specifically comment on the engine's readiness but did instruct the master to maintain a good anchor watch and to contact VTS if there were any problems such as dragging anchors. The pilot then departed the vessel shortly after 2200.

Sometime between 0228 and 0230 on March 25, the port anchor chain parted and the bulk carrier began dragging the starboard anchor. As the ship drifted downriver, its speed over ground increased, eventually reaching 3.9 knots. The master directed the engine crew to bring the slow-speed diesel propulsion engine on line, however this normally takes several minutes.



Figure 22: Damaged sugar unloading dock. PHOTO BY COAST GUARD

About 0240, the bulk carrier's starboard side allided with the Louisiana Sugar Refinery unloading dock.

After the allision, the *Star of Abu Dhabi* continued to drift in the current. Finally, at 0247, the propulsion engine responded to a dead-slow-ahead command, and the vessel was brought under control about 0.1 mile from the Veterans Memorial Bridge.

When the vessel had anchored on March 24, the pilot had directed that each anchor be dropped with four shots of chain (about 385 feet) in the water. The crew correctly did so, but then dropped the starboard anchor with four shots *on deck* (about 345 feet). The scope of the port anchor chain was therefore longer than the starboard chain. Use of a second anchor was intended to minimize the back and forth motion of the bow, and the scope should have been adjusted to equalize tension on both anchors. A jerking motion or shock load can break a chain, whereas a constant load is less likely to cause a break. Given the longer scope of chain and the current's effect on the port bow, the port anchor chain was likely taking the majority of the strain.

The chief engineer told investigators that if the engine had been ordered to be in standby mode after anchoring (as opposed to shut down, which it was leading up to the accident), a licensed engineering officer would have been stationed in the engine room and the engine would have been available for immediate use.

■ The NTSB determined that the probable cause of the allision of the *Star of Abu Dhabi* with the Louisiana Sugar Refinery unloading dock was the failure of the master to ensure the ship's propulsion engine was ready to maneuver while the vessel was anchored in a river with high-water conditions.

VESSEL GROUP: **FISHING**

Capsizing and Sinking of Fishing Vessel *Lydia & Maya*

ACCIDENT LOCATION

BAR HARBOR, MAINE

JORDAN BASIN, GULF OF MAINE

ACCIDENT DATE

08/17/2016

REPORT NUMBER

MAB1717

ACCIDENT ID

DCA16FM053

DATE ISSUED

05/25/2017



Figure 23: *Lydia & Maya* before the sinking.

PHOTO BY COAST GUARD

LESSONS

Precautions After Completing Fishing Operations

Fishing vessel operators should ensure that suspended loads are not left unattended but are lowered to the deck and properly secured before transiting. Operators should also ensure that all scuppers (freeing ports) in the bulwarks are kept clear for rapid draining of water on deck. A deck filled with water creates an undesirable free surface effect, while the weight of the additional water increases the height of the vessel's center of gravity and decreases its freeboard, consequently reducing the vessel's overall stability.

Although post-casualty alcohol testing was not conducted on the crewmembers due to the elapsed time from the accident, they were tested for drugs the morning after the rescue. Two of them tested positive for marijuana. Interview summaries also revealed that the crewmembers were working in a sleep-deprived state; some of them reported having as little as 3 hours of sleep throughout the 3 days of fishing operations. The combination of sleep debt, physical workload and potential drug use likely affected their ability to maintain situational awareness.

■ The NTSB determined that the probable cause of the capsizing and sinking of the fishing vessel *Lydia & Maya* was the uncontrolled drop of a suspended load onto the deck resulting in a sudden shift of weight that severely compromised the vessel's stability. Contributing to the sinking was the combination of the crewmembers' sleep debt, physical workload, and potential drug use that likely affected their ability to recognize the hazards created by the suspended load on the main boom and the blocked scuppers on the aft deck.

Figure 24: Stern of *Lydia & Maya*.

PHOTO BY OWNER

On August 17, 2016, about midnight local time, the fishing vessel *Lydia & Maya* was returning from fishing grounds in the Gulf of Maine to its home port of Boston, Massachusetts, when the vessel capsized. All four crewmembers abandoned ship into a liferaft and were later recovered by a Coast Guard helicopter. The vessel, which was partially submerged when abandoned, subsequently sank in 540 feet of water with about 3,500 gallons of fuel on board. No injuries were reported, but an oil sheen was observed after the accident. The vessel was valued at an estimated \$600,000.

The vessel had a main boom to lift the nets, two outriggers, and winch-driven net reels for stern-trawling operations. Fish were dumped from the nets into check pens on the aft deck, separated and then dropped down into the fish holds. The crew typically placed steel plates over the aft-deck scuppers to keep the fish from washing overboard while being separated.

About 2130 that evening, the final "haul back" was complete and all catch and nets were back aboard for the return trip from the fishing grounds. Winds were 23 knots, gusting to 27 knots and swells were 8 feet. The outriggers were left in their deployed (horizontal) positions, while about 2,500 pounds of fish remained on deck in check pens on the starboard side. Also left in place was the last catch, about 7,000 pounds in the net, suspended by the main boom above the aft deck between the net reels. At least two of the eight steel covers were kept on the scuppers aft of the fish pen. Meanwhile, the crewmembers took a break to rest and eat dinner, with plans to return to the deck later to sort and pack the catch remaining in the net.

Some time between 2200 and midnight, while the crew was still resting and the last catch was left suspended in the net, the deckhand steering the vessel observed that it started to list to starboard. He then heard a loud noise and found the starboard quarter of the vessel was submerged up to the rail, and that the starboard outrigger was underwater. Additionally, the main boom had snapped and was swinging.

The deckhand immediately notified the captain, who instructed him to awaken the other crewmembers. At that time the vessel's starboard list was severe, the sleep-deprived stern was completely submerged and flooding of the galley was underway. Before heading to the wheelhouse, a deckhand tried to remove the plates covering the aft scuppers but was unsuccessful.

The captain then transmitted distress calls announcing that the vessel "was going down" due to an ingress of water; immediately afterwards, the crew donned survival suits, abandoned the vessel to a liferaft and activated the EPIRB. The captain estimated that 10 minutes had elapsed between the time he was notified and the time the crew abandoned ship. At 2050 all four were aboard a Coast Guard helicopter from Air Station Cape Cod.



VESSEL GROUP: TOWING/BARGE

Capsizing and Sinking of Towing Vessel *Ricky J Leboeuf*

ACCIDENT LOCATION

CHANNELVIEW, TEXAS

SAN JACINTO RIVER, KIRBY INLAND

MARINE FLEETING AREA

ACCIDENT DATE

04/19/2016

REPORT NUMBER

MAB1704

ACCIDENT ID

DCA16FM037

DATE ISSUED

01/23/2017



Figure 25: Ricky J. LeBoeuf.

PHOTO BY D&S MARINE SERVICES, LLC

About 0752 local time on April 19, 2016, the towing vessel *Ricky J Leboeuf* capsized and later sank while its crew tried to remove a barge from a fleeting area in the San Jacinto River near Channelview, Texas. Four of the five crewmembers survived, but one deckhand died. The vessel sustained an estimated \$900,000 in damage, rendering it a constructive total loss. Nearly 100 gallons of diesel oil, lubricating oil, and other contaminants were released into the river when the vessel sank.

During the month of April, the San Jacinto River was at an unusually high water level due to rainfall, and the Coast Guard had warned mariners about the risks associated with vessel operations, including increased river current velocity. The *Ricky J Leboeuf's* operating company also issued advisories, which included restrictions on "downstreaming," a maneuver in which a towing vessel moves with the river current to approach and land on another object such as a barge or a dock. Downstreaming is used in barge fleets to remove barges from the upstream end of a tier of barges. As a towing

vessel approaches a barge, the vessel must face the barge squarely; that is, the flat bow of the towing vessel must be parallel to the flat bow or stern of the barge as they meet up. If the towing vessel meets the barge at an angle with a strong-enough current, the towing vessel may be turned sideways and become pinned against the barge. Water may rise up onto the deck and enter the vessel through open doors, windows, hatches, and ventilation systems, thus causing rapid downflooding, capsizing, and sinking.

The *Ricky J Leboeuf* was en route to pick up two tank barges from a fleet area when the accident occurred. Despite the company's instruction not to downstream, at 0750, the *Ricky J Leboeuf* approached the fleet area using the downstreaming maneuver. The relief captain, who was operating the vessel, tried to pivot the *Ricky J Leboeuf* to square it up on the barge; however, the current was at an angle to the vessel's stern, causing the vessel to pivot to starboard. As the *Ricky J Leboeuf* turned to starboard, its portside hull-fendering impacted the sterns of several stationary barges.

At 0752, the force of the river current acting on the *Ricky J Leboeuf's* starboard-side hull, combined with the force applied above the water line on the vessel's port side from its contact with the barges, caused the vessel to heel to starboard. Water then rapidly entered the vessel through two open doors on the main deck, flooding the hull. Consequently, the vessel rolled onto its starboard side and partially submerged, with just a small portion of its port bow remaining above water.

All crewmembers except for the deckhand moved to the port bow, which was still above water, and were eventually rescued by another towing vessel. The deckhand, who had been forward on the main deck, was last seen trying to swim toward the bow. The *Ricky J Leboeuf* ultimately sank completely.

The operating company's SMS stated that downstreaming during certain river conditions was prohibited without permission from the company port captain and required vessel crews to seek assistance from other towing vessels when performing the maneuver. Additionally, the SMS required that all watertight doors, hatches, and other openings be properly secured before attempting the maneuver. According to interviews with other crewmembers, the relief captain was fully aware of the company's restrictions on downstreaming in the prevailing conditions, yet he decided to downstream despite the risks and without consulting the vessel's captain or the company port captain.

■ The NTSB determined that the probable cause of the capsizing and sinking of the towing vessel *Ricky J Leboeuf* was the relief captain's ill-advised decision to perform a downstreaming maneuver in high-water conditions without implementing the operating company's risk mitigation strategies or other safeguards.

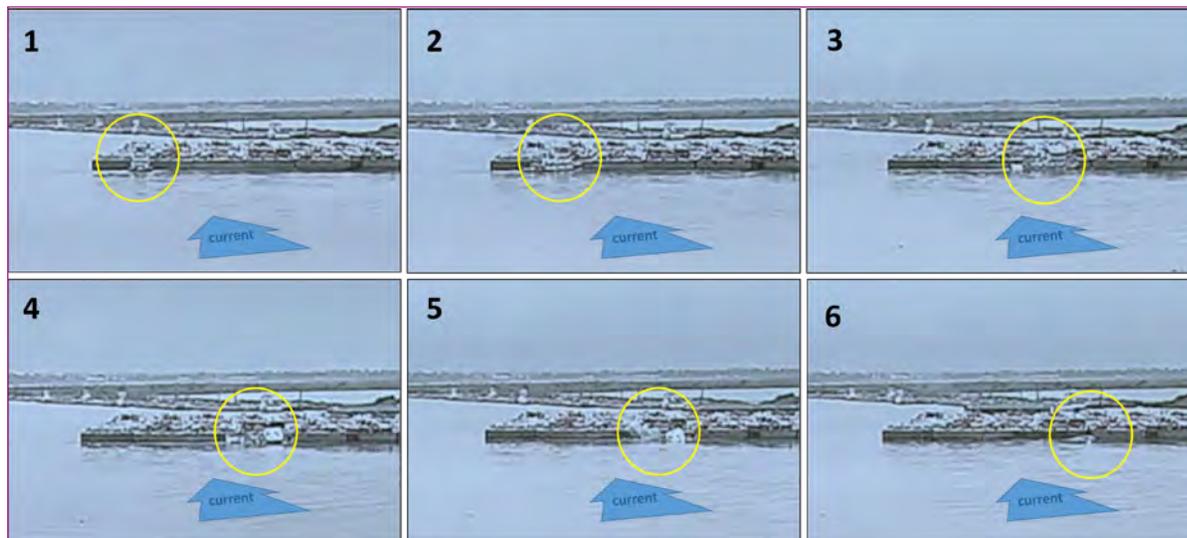


Figure 26: Still-images from video of the capsizing and sinking. IMAGES BY HARRIS COUNTY SHERIFF DEPT.

VESSEL GROUPS: TOWING/BARGE GOVERNMENT

Collision of Tugboat *Cerro Santiago* with US Coast Guard Cutter *Tampa*

ACCIDENT LOCATION
MIRAFLORES LAKE,
PANAMA CANAL, PANAMA

ACCIDENT DATE REPORT NUMBER
04/18/2017 MAB1737

ACCIDENT ID DATE ADOPTED
DCA17PM011 11/20/2017



Figure 27: Damaged stern on cutter *Tampa*.

At 0029 local time on April 18, 2017, while transiting in the Panama Canal, the tugboat *Cerro Santiago* collided with the US Coast Guard cutter *Tampa* in Miraflores Lake, Panama. Although the tugboat was not damaged, the cutter sustained \$170,018 in damage to the stern as well as to various systems in the steering gear room. No one was injured, nor was any pollution reported.

After conducting operations in the Pacific Ocean, the cutter *Tampa* was to transit northbound in the Panama Canal on its way to the Atlantic Ocean. At 2118 the Panama Canal pilot arrived onboard and the cutter got under way a few minutes later.

Under the rules and regulations of the Panama Canal Authority, a pilot on board a vessel assumes control of the navigation, rather than serving in an advisory capacity as compulsory state pilots do in the United States. Vessel traffic in the canal is managed by the ACP's Marine Traffic Control Center, whose efforts contribute to the prevention of collisions similar to Vessel Traffic Service in the United States.

The tug *Cerro Santiago* was assigned to assist a southbound tanker through the Pedro Miguel and the Miraflores Locks located on each end of the Miraflores Lake. At 0015 the *Cerro Santiago* entered the lake after departing the Pedro Miguel Locks and positioned herself ahead of the tanker (making 3.4 knots). About the same time, the *Tampa* entered the lake after exiting the Miraflores Locks, following a northbound containership making 1.4 knots.

The vessels met in the middle of the lake. After initially passing safely down the starboard side of the *Tampa*, the *Cerro Santiago* suddenly rotated to starboard and began heading towards the *Tampa*. At 0029, the *Cerro Santiago* struck the cutter's starboard stern.



Figure 28: Tugboat *Cerro Santiago*.

No navigation or engineering issues were identified with either vessel and the *Cerro Santiago* master later admitted to falling asleep due to fatigue. On the night of the accident, after completing his seventh consecutive 8-hour workday (at midnight), the master was still operating the *Cerro Santiago*, on overtime, while awaiting his relief to arrive when the collision occurred about 8.5 hours into his watch.

■ The NTSB determined that the probable cause of the collision between the tugboat *Cerro Santiago* and the US Coast Guard cutter *Tampa* was the failure of the master of the *Cerro Santiago* to maintain a vigilant watch due to fatigue.

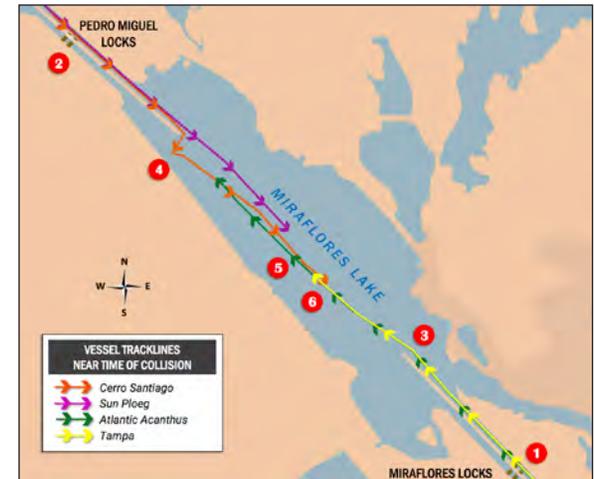


Figure 29: Vessel movements before the collision.

1. 0014 (April 18): The northbound vessel *Tampa* exits the Miraflores Locks, transiting astern of the *Atlantic Acanthus*.
2. 0015: The southbound vessels *Cerro Santiago* and *Sun Ploeg* begin to exit the Pedro Miguel Locks.
3. 0020: The *Tampa* shifts to the west side of the channel to begin lining up for entrance into the west lane of the Pedro Miguel Locks.
4. 0023: The *Cerro Santiago* navigates to a position ahead of the *Sun Ploeg* to clear the approach for the *Atlantic Acanthus*.
5. 0026: The *Cerro Santiago*, traveling stern first, passes on the starboard side of the *Atlantic Acanthus*.
6. 0029: After turning from its southerly course and proceeding toward the *Tampa*, the *Cerro Santiago* contacts the stern of the cutter to starboard.

VESSEL GROUPS: **CARGO**

Collision between Cargo Vessel *Manizales* and Bulk Carrier *Zen-Noh Grain Pegasus*

ACCIDENT LOCATION

HESTER, LOUISIANABELMONT ANCHORAGE, MISSISSIPPI RIVER,
MILE MARKER 153

ACCIDENT DATE

01/17/2016

REPORT NUMBER

MAB1703

ACCIDENT ID

DCA16FM018

DATE ISSUED

01/05/2017

Figure 30: Zen-Noh Grain Pegasus bow with missing anchor.

PHOTO BY COAST GUARD



On January 17, 2016, about 1631, the cargo vessel *Manizales* collided with the bulk carrier *Zen-Noh Grain Pegasus* on the Mississippi River at mile marker 153, near Hester, Louisiana. Before the collision, the *Manizales* had anchored in the Belmont Anchorage, an area about 1.1 miles long and 300 feet wide, just upriver from the *Zen-Noh Grain Pegasus*. Within 30 minutes of dropping both of its anchors, the cargo vessel's anchors dragged. The *Manizales* drifted downriver toward the bulk carrier and became entangled in the larger ship's port and starboard anchor chains. The *Manizales* incurred more than \$2.2 million in damage from the collision, and the *Zen-Noh Grain Pegasus* lost its starboard anchor. No pollution or injuries were reported.

The *Manizales* was transiting downriver with a pilot in control, when he prepared to anchor on the left descending bank. Early 2016 was a period of high water on that section of the Mississippi River, with the increased water volume resulting in a corresponding increase in the river current. Consequently, the pilot anchored the vessel as close to the left bank as he could to avoid the main stream of the current. An integrated tug and barge was anchored upstream of the *Manizales's* intended position, and two ships were anchored downstream. The *Zen-Noh Grain Pegasus* was immediately downstream of the *Manizales*.

About 17 minutes after anchoring the *Manizales*, the pilot noted that the anchor chains had become taut. At this time, the stern of the *Manizales* was about 500 feet from the bow of the *Zen-Noh Grain Pegasus*. Just as the pilot was about to disembark the *Manizales*, at 1628, the *Manizales's* bow swung into the river. By the time the pilot returned to the bridge, the ship was almost perpendicular to the river. At 1629, the pilot ordered the rudder to starboard and the engine to half-ahead speed. However, the pilot told investigators that the engine was not in standby and therefore not available for several minutes to provide the ordered propulsion power. Conversely, the vessel's chief officer stated that the engine was operating and that he saw propeller wash before the collision. Investigators could not conclusively



Figure 31: *Manizales* drifting down the port side of the anchored *Zen-Noh Grain Pegasus*.

PHOTO BY ZEN-NOH GRAIN PEGASUS CHIEF MATE

determine the actual status of the engine at the time of the accident. Regardless, the ship was not able to overcome the force of the river current as its anchors dragged.

The propeller of the drifting *Manizales* eventually caught the starboard anchor chain of the *Zen-Noh Grain Pegasus*. The entanglement pulled the *Manizales's* propeller shaft outward 6 inches, damaging its reduction gears. Moments later, the *Zen-Noh Grain Pegasus's* port chain caught and wrapped around the *Manizales's* stern crane, holding the vessel in place as the current pivoted the *Manizales* around the bow of the bulk carrier. At some point as the ships collided, the bridge wing of the *Manizales* was torn off.

By 1643, the *Zen-Noh Grain Pegasus's* engine was on line, and the bulk carrier began to maneuver under power. The pilot on the *Manizales* told investigators that the bulk carrier was coming ahead, pulling the *Manizales* and causing it to list. After receiving a call from the *Manizales* pilot on VHF radio, the *Zen-Noh Grain Pegasus* master moved his rudder from port to midship and used the engine to prevent the ship from swinging out into the main river channel.

LESSONS

Anchoring in High-Water Conditions

As this accident illustrates and historical information confirms, the risk of dragging anchor is substantially increased during periods of high water and strong currents. Mariners should adhere to Coast Guard advisories and pilot association guidance for the prevailing conditions and be able to respond effectively to an anchor-dragging situation. Mariners should consider measures such as increasing the scope of anchor chains, stationing navigation and engineering watches, keeping propulsion and steering systems at the ready, and retaining a pilot on board.

About 1 to 2 minutes later, the *Manizales* came free of the anchor chain when its crane broke from the deck. Once released from the chain, the *Manizales* floated free and drifted down the port side of the *Zen-Noh Grain Pegasus*. The vessel continued to drift downriver until it was corralled by five towing vessels.

Eleven days before the accident, on January 6, the Coast Guard Captain of the Port for New Orleans had issued a Marine Safety Information Bulletin to address the hazards to anchored vessels, requiring vessels to not only use two anchors but to also keep their propulsion systems on standby.

After the collision, the New Orleans-Baton Rouge Pilots Association, which manages the movement of self-propelled commercial vessels when their pilots are on board (including when and where to anchor), decided to limit occupancy in the Belmont Anchorage to one vessel during high-water conditions. Had this strategy been in place when the *Manizales* anchored, the collision would not have occurred.

■ The NTSB determined that the probable cause of the collision between the *Manizales* and the *Zen-Noh Grain Pegasus* was the decision by the New Orleans-Baton Rouge Pilots Association to assign the *Manizales* to the Belmont Anchorage during high-water conditions with three other vessels already anchored in the area.

VESSEL GROUPS: TOWING/BARGE GOVERNMENT

Collision of *Matachin* Tow with US Coast Guard Cutter *Thetis*

ACCIDENT LOCATION

LAS CASCADAS REACH,
PANAMA CANAL, PANAMA

ACCIDENT DATE

06/02/2016

REPORT NUMBER

MAB1722

ACCIDENT ID

DCA16PM041

DATE ADOPTED

06/28/2017

Figure 32: The damaged stern of cutter *Thetis*.

PHOTO BY COAST GUARD



On June 2, 2016, about 0111 local time, the dump scow barge 123 being pushed by the towing vessel *Matachin* collided with the US Coast Guard cutter *Thetis* in Las Cascadas Reach, Panama Canal. Although the *Matachin* and its tow were undamaged, the *Thetis* sustained an estimated \$1.2 million in damage to the hull and deck plate aft, as well as to various systems in the steering gear room. No one was injured, nor was any pollution reported.

Both vessels were southbound in the Panama Canal at the time of the accident, the *Matachin* behind the *Thetis*. Sometime between 0105 and 0106, the *Thetis* commanding officer identified the *Matachin* as an AIS contact among many other AIS contacts in the area. Because the *Matachin* was not visible by eye from the cutter at the time, the commanding officer focused on the vessel activity forward of the *Thetis*.

Simultaneously, aboard the *Matachin*, the master and the chief engineer were in the wheelhouse talking. Neither of them was aware of the *Thetis* despite having an operational radar, clear forward visibility, AIS (*Thetis* was broadcasting), and an illuminated stern light aboard the *Thetis*.

At 0110, the *Thetis* executive officer stepped onto the port bridge wing and visually observed the port and starboard navigation lights on what was later identified as the *Matachin* and barge 123. The tow was approaching from the port stern at a speed that the executive officer determined was much faster than that of the *Thetis*'s. He returned to the navigation bridge, where he asked the onboard compulsory pilot, "Is this guy overtaking us?" According to the executive officer, the pilot responded not verbally but with a look of surprise. The executive officer then asked, "Are you talking to this guy?" Once again, the pilot gave no verbal response; instead, he followed the executive officer and the commanding officer quickly out onto the port bridge wing.

The pilot on the *Thetis* ordered full speed ahead and the executive officer ordered a starboard rudder command to try to move the *Thetis* out of the way; however, at 0111, the starboard bow of barge 123 struck the port stern of the *Thetis*.

A significant portion of the cutter's aft port quarter could not be monitored by the lookout from his assigned location just above the navigation bridge, without his moving to the port side to see around obstructing structures. Neither the *Thetis* lookout, nor other crewmembers assigned to electronically monitor traffic in the area had detected the towing vessel and the barge. The *Matachin*'s AIS was active and its transmissions were being received by the *Thetis*.

■ The NTSB determined that the probable cause of the collision between the *Matachin* tow and the US Coast Guard cutter *Thetis* was the failure of the master of the *Matachin* to maintain a proper lookout and use radar to detect the vessel traffic ahead to avoid a collision. Contributing to the collision was the failure of the pilot and the navigational crew on board the *Thetis* to maintain a proper lookout.

Figure 33: Towing vessel *Matachin*, pushing a barge.

PHOTO BY PANAMA CANAL AUTHORITY



LESSONS

Bridge Team Management

The presence of a pilot on board does not relieve bridge team members of their responsibilities for the safe navigation of the ship. The master and the officer of the watch must collaborate closely with the pilot to maintain an accurate check of the ship's position and movement. In addition, they must not hesitate to challenge or, if necessary, take appropriate action to prevent a collision, a grounding, or an allision.

The pilot and the bridge team should share the same mental model for the passage and fully understand the planned tasks and maneuvers. Communications should be open and, where circumstances permit, involve discussion of the intended maneuver or any deviations from the plan.

whistle. Aware of the impending collision, he announced on VHF radio that there was an "emergency on the north bank." The crew on two tugboats tending the barges, having heard the whistle and radio calls, maneuvered clear of the *Ocean Freedom*. Just before 2226, the *Ocean Freedom's* bow struck *Kirby 28044*, the outermost of the three moored tank barges, at about 8 knots' speed. A tugboat crewmember who was on board *Kirby 28044* fell while trying to escape the collision, suffering a broken left rib and knee injury.

The command error resulting in the course alteration toward the barges may have stemmed from the pilot's point of reference. The forward location of the wheelhouse was not typical of the cargo vessels that the pilot was more accustomed to navigating in the Port of Corpus Christi. Also, at the time the pilot issued the incorrect helm order he and the master were looking aft, in the opposite direction of the vessel's movement (they were outside on the port bridge wing, ensuring that the *Ocean Freedom* cleared the moored naval ship).

■ The NTSB determined that the probable cause of the collision of the *Ocean Freedom* with the moored tank barges was the pilot's rudder order in a direction opposite of which he intended. Contributing to the accident was the failure of the bridge team to identify the risk of collision and take appropriate action.

VESSEL GROUPS: **CARGO** TOWING/BARGE

Collision of Cargo Vessel *Ocean Freedom* with Tank Barges

ACCIDENT LOCATION
CORPUS CHRISTI, TEXAS
PORT OF CORPUS CHRISTI

ACCIDENT DATE: 10/29/2015
REPORT NUMBER: MAB1722

ACCIDENT ID: DCA16FM003
DATE ISSUED: 04/20/2017

Figure 34: Impaled by the bow of the *Ocean Freedom*, the starboard bow of the *Kirby 28044* is lodged just above the vessel's bulbous bow.

PHOTO BY COAST GUARD



On the night of October 29, 2015, at 2226 local time, the cargo vessel *Ocean Freedom* collided with a fleet of moored empty tank barges while entering the Port of Corpus Christi, Texas. One crewmember, who was working on one of the barges, suffered non-life-threatening injuries. Although no environmental damage was reported, the *Ocean Freedom* and the three tank barges sustained structural damage estimated at \$750,000.

The *Ocean Freedom*, carrying steel pipes, got under way from an offshore anchorage about 1942. As it headed inbound, the compulsory pilot noted that the ship was "a little bit to handle," requiring "a lot of rudder" to bring it to the next course line. He informed the master and bridge team members that ships like the *Ocean Freedom* (ships whose wheelhouses were located at the bow rather than at the stern) were "specialty ships" not common in the Port of Corpus Christi. He asked them to let him know if he was oversteering or if they saw anything out of the ordinary about his handling of the ship.

On the way to the assigned berth, the pilot met an outbound ship starboard to starboard in accordance to their meeting arrangement. This arrangement led to the *Ocean Freedom* being positioned closer to the south bank of the channel, near a moored naval ship. While trying to maneuver the stern of the *Ocean Freedom* away from the naval ship, the pilot accidentally ordered a hard-to-starboard rudder input, which was intended to be hard to port. As a result, the ship's heading changed rapidly toward the opposite side of the channel. At 2225, the master shouted orders of "Midships! Hard left! Full thruster to port!" and the ship's propulsion was placed in emergency astern.

As the *Ocean Freedom* moved across the approximately 800-foot-wide channel at about 9 knots directly toward a fleet of tank barges moored to the north bank, the pilot ordered the sounding of five short blasts on the ship's

Figure 35: Cargo vessel *Ocean Freedom*. PHOTO BY RICK COMEAU



VESSEL GROUP: TOWING/BARGE

Collision and Subsequent Sinking of Towing Vessel *Specialist*

ACCIDENT LOCATION

TARRYTOWN, NEW YORK
HUDSON RIVER AT TAPPAN ZEE BRIDGE,
PIER 31

ACCIDENT DATE

03/12/2016

REPORT NUMBER

MAB1714

ACCIDENT ID

DCA16FM033

DATE ISSUED

05/11/2017



Figure 36: Towing vessel *Specialist* after being raised from the river bottom.

PHOTO BY US COAST GUARD

About 0500 eastern standard time on March 12, 2016, the towing vessel *Specialist*, southbound on the Hudson River and towing a tower crane barge with two other tugboats, struck a spudded / moored construction barge alongside a concrete pier at the new Tappan Zee Bridge construction site near Tarrytown, New York. The *Specialist* subsequently sank, resulting in the deaths of three crewmembers.

The *Specialist* with four crewmembers on board, was towing the 297-foot-long, 90-foot-wide tower crane barge *Weeks 533* from Albany to Staten Island, New York. The crane was the largest floating revolving heavy lift crane on the east coast and was taller than the wheelhouses of the tows pushing it, obstructing their visibility. On the morning of March 11, another tugboat—the *Realist*, operated by the same company as the *Specialist*—was contracted to assist the *Specialist* as the weather conditions were deteriorating and the company was concerned about the progress of the tow. During the previous several hours, the *Specialist* had encountered high winds and currents, which resulted in the tug and barge having difficulty maneuvering and being spun around. The *Realist* departed Staten Island and, at 1720 on March 11, joined the *Specialist* tow on the Hudson River. The *Specialist* was positioned on the starboard quarter of the crane barge, and the *Realist* was positioned on the barge's stern. About 2000, another company's tugboat, the *Trevor*, arrived with four crewmembers and was positioned on the port quarter of the barge.

Together, the three tugboats—with the *Realist* as the lead tugboat—began pushing the barge southbound at about 5 knots. The crews of the *Realist* and the *Specialist* communicated with one another throughout the evening on VHF radio. At some time between 0030 and 0100 on March 12, the captain of the *Specialist* left his vessel for unknown reasons, crossed the deck of the barge, and assumed the helm of the *Realist* in the upper wheelhouse. The *Specialist* mate was left to navigate the vessel. The weather had subsided, with clear conditions and winds about 5 knots.



Figure 37: The *Specialist* (left), moments after colliding with a work barge at the Tappan Zee Bridge.

PHOTO BY WITNESS

As the *Weeks 533* flotilla approached the Tappan Zee Bridge construction area, where other work barges/ platforms were positioned in the Hudson River, the flotilla speed was about 8 knots with a following current estimated at 2 to 3.5 knots. Initially, the *Specialist* mate indicated to the other tugboats that the tow had enough clearance to get around the construction barge. Later he radioed the flotilla that they did not have enough room to transit past the barges. He said to the other tugboat operators, "It's looking tight, go left . . . go hard left." Before the flotilla could maneuver away from the construction barges, the *Specialist* struck a stationary work barge, causing significant damage to the tugboat above the waterline.

The *Specialist*'s mate, who had been at the helm jumped onto the construction barge after the collision. The current pushed the *Specialist* into the raked bow of the construction barge and began pushing the tugboat under water. The mate returned to the *Specialist* to help a deckhand who was shouting for help and trapped inside. The *Specialist* took on water through open doors and rapidly sank with the mate and two deckhands aboard. After the vessel sank, workers from the construction barge saw the mate in the water, being swept away by the current. They threw life rings toward him, but he was

unresponsive. A nearby rescue boat recovered the mate about 100 yards from the accident site and rushed him to shore; attempts to revive him were unsuccessful.

Through interviews of relatives communicating with *Specialist*'s crewmembers, investigators learned that leading up to the accident there were times when three of the four crewmembers were sleeping at once, leaving the captain alone in the wheelhouse, and that the entire crew had been awake the night before the accident due to the weather conditions.

According to crew statements and other evidence, crewmembers aboard the *Specialist* and the *Realist* had likely not received more than 4–5 hours of uninterrupted sleep in at least the 3 days leading up to the accident. In addition to extended wakefulness or chronic sleep restriction, the crew was dealing with adverse weather conditions, strong waterway currents, and restricted visibility, which increased their overall workload and the demands on their attention, thus compounding the effects of fatigue.

■ The NTSB determined that the probable cause of the collision and sinking of the *Specialist* was inadequate manning, resulting in fatigued crewmembers navigating three tugboats with obstructed visibility due to the size of the crane on the barge they were towing and the location of the tugboats alongside the barge.

VESSEL GROUPS: TOWING/BARGE CARGO

Collision of *Crimson Gem* Tow with Bulk Carrier *Yangtze Ambition*

ACCIDENT LOCATION

AMA, LOUISIANA
LOWER MISSISSIPPI RIVER,
MILE MARKER 117.1

ACCIDENT DATE

01/28/2016

REPORT NUMBER

MAB1702

ACCIDENT ID

DCA16FM021

DATE ISSUED

01/05/2017



Figure 38: Barge ART 35184 wedged under the dock after the *Crimson Gem* tow collided with the bulk carrier *Yangtze Ambition*. PHOTO BY COAST GUARD

On January 28, 2016, at 0430 local time, the towing vessel *Crimson Gem* was pushing 20 barges downbound during high-water conditions on the Lower Mississippi River in Ama, Louisiana, when two of its barges collided with the bulk carrier *Yangtze Ambition* docked at the bottom of a river bend. Damage to the vessel and the barges, including a third barge that made contact with the dock, totaled an estimated \$575,000. No one was injured nor was any pollution reported.

At the time of the accident, the nearest river gage at Carrollton measured 16.1 feet, which was near flood stage, and the current may have been as high as 6.7 mph. Because of the high-water conditions, the Coast Guard had advised downbound vessels to “consider restricting to daylight transits only” until the gage dropped below 16 feet. The *Crimson Gem*, however, was underway at night when the accident occurred. The 20 barges of *Crimson Gem* tow were four across and five deep, resulting in a tow about 1,185 feet long and 140 feet wide. The tow operator did comply with Coast Guard Sector New Orleans published procedures on reducing tow size in high-water; towing 20 instead of the usual 35 barges.



Figure 39: Bulk carrier *Yangtze Ambition*.

PHOTO BY COAST GUARD



Figure 40: Towing vessel *Crimson Gem* with the remaining barges following the collision. PHOTO BY COAST GUARD

With a following current, the tow was traveling at 9.3 mph (speed over ground) at 0424. The pilot put the *Crimson Gem*'s engines full astern, reducing its speed to less than 1 mph by 0426, in preparation for arriving at its destination about a mile ahead on the river's left descending bank. The *Yangtze Ambition* was docked on the opposite bank (right descending), less than one-half mile before its destination, near the bottom of a tight bend in the river. The pilot told investigators that as he maneuvered through the bend, the current was pushing him sideways until the tow collided with the *Yangtze Ambition*. The starboard two barges at the head of the tow were damaged when they struck the bulbous bow of the *Yangtze Ambition*. The barge on the starboard corner became wedged under the dock in front of the bulk carrier and broke free from the tow. The inboard starboard barge, though damaged in the collision, remained with the *Crimson Gem* tow. The two lead barges on the port side broke away from the tow and were later recovered. Additionally, the aft-most barge on the starboard side of the tow was damaged when the aft portion of the tow swung into the dock.

The *Crimson Gem* pilot told investigators that he should have slowed (backed) down sooner than he did. By slowing down sooner, he would have better positioned the tow to account for the slide effect of the current in the 67-degree river bend. Consequently, he could have kept the tow farther away from the right descending bank and the *Yangtze Ambition*. The pilot also said he would have not slowed down at all in that area had it not been for his destination located less than a mile away. Backing down in the current reduced his ability to control the tow.

■ The NTSB determined that the probable cause of the collision of the *Crimson Gem* tow with the moored bulk carrier *Yangtze Ambition* was the *Crimson Gem* pilot's ineffective maneuvering for the prevailing current in a river bend.

VESSEL GROUPS: **CARGO** TOWING/BARGE

Collision of Bulk Carrier *Aris T* with Tank Barge *WTC 3019*, Towing Vessel *Pedernales*, and Shoreside Structures

ACCIDENT LOCATION

NORCO, LOUISIANA
LOWER MISSISSIPPI RIVER,
MILE MARKER 125.2

ACCIDENT DATE

01/31/2016

REPORT NUMBER

MAB1701

ACCIDENT ID

DCA16FM022

DATE ISSUED

01/04/2017



Figure 41: Postaccident image of the *Aris T* anchored on the Mississippi River at Grand View Reach Anchorage, mm 147.0, near Gramercy, Louisiana. PHOTO BY COAST GUARD

On January 31, 2016, at 1953 local time, the bulk carrier *Aris T* collided with a moored tank barge, moored towing vessel, and two shoreside structures on the Mississippi River in Norco, Louisiana. Also damaged during the collision were one additional shoreside structure, another towing vessel, and two other tank barges, bringing the total damage cost to more than \$60 million. No pollution resulted from the accident; however, two dock workers reported minor injuries.

At the time of the accident, the river was experiencing high water. The *Aris T* was heading upriver to a grain facility at speeds ranging from 8.7 to 9.7 knots. Downbound on the river were two towing vessels, the *Elizabeth M. Robinson* and the *Loretta G. Cenac*, each pushing three loaded tank barges at a speed of about 8.4 knots. The captain on the *Loretta G. Cenac* decided to try to overtake the *Elizabeth M. Robinson* on its port side and the two operators coordinated their intentions with the pilot on the upbound *Aris T*. However, during the overtaking event, the captain on the *Loretta G. Cenac* radioed the pilot on the *Aris T*, stating that he had decided to abort the overtaking and drop back behind the *Elizabeth M. Robinson* again.

After initially radioing to say that there was “plenty of room,” the pilot on the *Aris T* asked the captain of the *Loretta G. Cenac* if he was “backing on it,” meaning applying astern propulsion to facilitate that tow’s dropping back behind the *Elizabeth M. Robinson* again. The captain replied no and that he was “just trying to hold” the other tow, which was about 20 feet to his right. At no point during the oncoming approach did the pilot on the *Aris T* reduce his vessel’s forward speed.

About a minute before the accident, the pilot on the *Aris T* issued rudder orders to try to increase the distance between the bulk carrier and the *Loretta G. Cenac* tow. At 1953, at a speed of about 8 knots, the aft starboard quarter of the *Aris T* struck an empty tank barge, *WTC 3019*, on the river bank. The tank barge was moored next to another empty tank barge,

LESSONS

Cell Phone Use

Using cellular telephones and other wireless electronic devices has been demonstrated to be visually, manually, and cognitively distracting.* Talking on cell phones can have serious consequences in safety-critical situations, and sending or reading text messages is potentially even more distracting than talking because texting requires visual attention to the display screen of the device.

Cell phone use has been a factor in accidents in all transportation modes. In the marine industry, the NTSB has previously recommended that the Coast Guard—

Regulate and enforce the restriction on nonoperational use of cell phones and other wireless electronic devices by on-duty crewmembers in safety-critical positions so that such use does not adversely affect vessel operational safety. (Safety Recommendation M-11-3; Status: Open—

* For research information, see the US Department of Transportation’s website on distracted driving at www.distracted.gov (visited October 25, 2016).

Unacceptable Response. The Coast Guard did not implement the recommendation.)

and

Until [the Coast Guard] can develop regulations governing nonoperational use of cell phones and other wireless electronic devices by on-duty crewmembers in safety-critical positions, continue [its] outreach program of information and education to the maritime industry on this issue. (Safety Recommendation M-11-4; Status: Open—Acceptable Response. The Coast Guard agreed to promulgate information about cell phone distraction.)

The status of regulations notwithstanding, it is important for shipping companies and pilot associations to establish protocols regarding cell phone use and to make sure that their personnel are following them.

both of which were connected to a towing vessel moored at a dock. Both tank barges, the towing vessel, and the dock sustained damage.

The pilot ordered the engine stopped and the port anchor released. The speed had dropped to just under 7 knots when the *Aris T* struck two berths at a Shell Motiva facility. The bulk carrier, still moving upriver but at a decreased speed of about 3.3 knots, then struck the underway towing vessel *Pedernales*, which was pushed into a moored tank barge at the Shell Motiva facility. The tank barge was then pressed into the facility structure. The *Pedernales*, the tank barge, and the facility structure all sustained damage.

Established inland navigation rules state that downbound power-driven vessels with a following current, such as the two tows, have the right of way over power-driven vessel that are upbound in the river, such as the *Aris T*. The *Aris T* pilot had the opportunity as early as 1940 to identify the traffic situation developing upriver and assess the need for action. However, investigators found no evidence that the pilot and *Aris T* bridge team discussed the situation or that the pilot attempted to contact either towing vessel at that time. A speed reduction aboard the *Aris*

T, if applied early enough, would have allowed the pilot to further assess the situation and to take action necessary for safe passage.

The captain on the *Loretta G. Cenac* acknowledged that leading up to the accident he was on the phone, including during the time during his first VHF radio conversation with the pilot on the *Aris T* to discuss meeting arrangements. Therefore, he was likely distracted and inattentive to monitoring the vessel’s radar and electronic chart, which would likely raised his awareness of the dangerous traffic situation that was developing. The company policy prohibiting the use of cell phones on watch, which was to be enforced by the captain himself, was clearly not successfully implemented.

■ The NTSB determined that the probable cause of the collision of bulk carrier *Aris T* with tank barge *WTC 3019*, towing vessel *Pedernales*, and shoreside structures was the failure of the pilot on the *Aris T* to take early and effective action to mitigate the risk presented by the developing upriver traffic situation, and the distraction of the captain on the *Loretta G. Cenac* from safety-critical navigational functions as a result of his cell phone use.

VESSEL GROUP: **FISHING**

Fire aboard Fishing Vessel *American Eagle*

ACCIDENT LOCATION

AMERICAN SAMOA

SOUTH PACIFIC OCEAN, ABOUT 790 MILES
NORTHEAST OF AMERICAN SAMOA

ACCIDENT DATE

02/10/2016

REPORT NUMBER

MAB1731

ACCIDENT ID

DCA16FM025

DATE ISSUED

08/31/2017



Figure 42: *American Eagle* abandoned and listing to port. PHOTO BY AMERICAN EAGLE CREW

About 0710 local time on February 10, 2016, a fire broke out near several oxygen and acetylene cylinders aboard the commercial fishing vessel *American Eagle* while it was transiting to tuna fishing grounds in the South Pacific Ocean. Crewmembers fought the fire but were unable to extinguish it, and the vessel began to list. The crew abandoned the vessel into its skiffs and liferafts, leaving the vessel adrift without electrical power. Several hours later, after the fire had significantly diminished, a few crewmembers reboarded the vessel, extinguished the remnants of the fire, and corrected the list using pumps dropped from a US Coast Guard aircraft. The following day they restarted the vessel's main engines and generators and transited to Pago Pago, American Samoa. Damage was estimated between \$500,000 and \$1 million. No environmental damage or injuries were reported.

Earlier on the morning of the fire, crewmembers were cutting bolts off a seawater valve flange using an oxygen-acetylene torch. They connected the torch via a dual-gas hose to the oxygen and acetylene cylinders stored one deck above. About 0710, when turning on the valves of the nozzle and lighting the torch, they saw black smoke coming out of the torch and, moments later, out of the cylinder storage area. The crew fought the fire with portable extinguishers and fire hoses but were driven back by the intense heat and smoke.

At some point during the emergency, the *American Eagle* suddenly listed to port as water was likely accumulating from firefighting efforts and was not being pumped overboard. About the same time, smoke from the fire increased significantly. At 1010, the captain ordered abandon ship. The crew launched and boarded four lifeboats and two inflatable liferafts, and they activated the EPIRB.

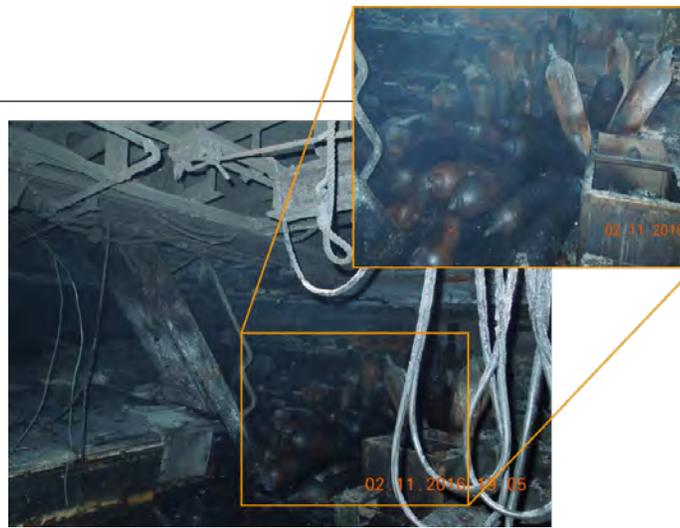


Figure 43: Oxygen and acetylene bottles post-fire on the starboard side of the wet deck aft of the ladder, with close-up of bottles without safety caps. Bottles were displaced from their storage location forward of the ladder. PHOTO BY AMERICAN EAGLE CREW

The crew drifted near the location of the abandoned *American Eagle* until a fishing-vessel supply-ship arrived on scene about 5 hours later. By this time, the smoke rising from the *American Eagle* had diminished, and the captain and an emergency crew re-boarded the vessel. Once on board, they recommenced the firefighting efforts with equipment and crew assistance from the supply-ship. The fire was extinguished at 1630.

The fuel source for the fire was determined to be acetylene gas. The hose that connected the cylinders to the torch was in poor condition (cracking, bending wear, several holes, and a 6-inch electrical tape repair at a hose separation). Investigators learned that the area where the cylinders were stowed was a regular smoking stop for the crew; a waste bucket for discarded cigarette butts was located adjacent to the cylinders. Cinders from the waste bucket were a potential ignition source, but the ignition source could not be definitively determined. Investigators discovered that over 25 oxygen and acetylene cylinders were stored together, they were not secured in a suitable rack and that none of the cylinders had safety caps to protect the valves atop from damage.



Figure 44: Oxygen and acetylene bottles on deck post-fire. Arrow shows a hole at the melted pressure-relief fusible plug location on one of the bottles. PHOTO BY COAST GUARD

Because the crew hailed from seven different countries, they did not share a common language. The *American Eagle* employed a single translator for everyone on board. The lack of a common language raised concern about whether the vessel's crew, and crews of other vessels like the *American Eagle* operating under similar circumstances, could properly train for and respond to emergencies.

■ The NTSB determined that the probable cause of the fire on board fishing vessel *American Eagle* was the ignition from an undetermined source of acetylene gas mixed with oxygen, most likely leaking from a degraded hose connected to cylinders stored in a working space below decks. Contributing to the severity of the fire were the numerous acetylene and oxygen cylinders improperly stowed near the fire, which provided additional fuel and oxygen to the fire. Contributing to the extent of the damage on board the vessel was the lack of a common language between all crewmembers, which hampered firefighting efforts.

VESSEL GROUP: PASSENGER

Engine Room Fire Aboard Cruise Ship *Carnival Liberty*

ACCIDENT LOCATION

CHARLOTTE AMALIE,
ST. THOMAS, US VIRGIN
ISLANDS

ACCIDENT DATE
09/07/2015

REPORT NUMBER
MAB1721

ACCIDENT ID
DCA15FM035

DATE ADOPTED
06/21/2017



Figure 45: Carnival Liberty.

PHOTO BY CARNIVAL CORPORATION

On September 7, 2015, about 1133 local time, a fire broke out in the aft engine room aboard the cruise ship *Carnival Liberty*. At the time, the vessel was alongside the dock in the Port of Charlotte Amalie, St. Thomas, US Virgin Islands. The master ordered any remaining onboard passengers to evacuate to the dock. The crew used the ship's water mist- and CO₂ firefighting systems to extinguish the fire. No one was injured, nor was any environmental damage reported. Fire damage to the ship was estimated at \$1.725 million.

The vessel arrived in Charlotte Amalie about 0700, for its first port of call on a scheduled 7-day cruise. The arrival was uneventful and after the vessel was berthed, diesel generators no. 3 and no. 4 were powering the vessel (the vessel had two engine rooms, with 3 diesel engine-driven generators each). The diesel generators supplied power to both electric-propulsion motors and ship's services. By 0740 the fuel supplying the engines was switched from heavy fuel oil to low-sulfur marine gas oil.

About 1130, numerous alarms for the no. 4 generator activated in the engine control room, including oil leak detection and low fuel oil inlet pressure. About the same time several fire alarms for the vessel's two engine rooms activated on the bridge, including a flame detector above the no. 4 diesel generator. Moments later, the high-pressure water mist fire-suppression system (HI-FOG) attempted automatically to activate, but could not as the system was intentionally set to manual (due to hotwork in the forward engine room that might have activated the system).

Crewmembers in the engine room heard an explosion and saw a large fire at the no. 4 diesel generator. The crew radioed the bridge to alert them of the fire and the bridge requested the control room to put the HI-FOG system back in automatic. The HI-FOG system was activated both locally and from a control panel in the engine control room. It was later determined that they then proceeded to manually activate the HI-FOG system locally and it was later determined that "total



Figure 46: Images from the ship's closed-circuit television of DG 4 from forward looking aft. The red box on the left image highlights the first visual sign of open flame. The right image shows the same area less than 1 second later.

flooding" of both engine rooms was selected. The HI-FOG fire-suppression system was designed to only operate at full pressure for total flooding in one engine room at a time. The resulting lower pressure made the water mist less effective in extinguishing the fire. At 1145 a role call to ensure all personnel were out of the engine rooms was conducted and CO₂ was released into the engine room. However, a CO₂ directional valve did not operate properly and crewmember had to enter the CO₂ room and open it manually. Following the successful release at 1148, the master sounded the general alarm and the passengers that were still on board the vessel were evacuated to the pier. By 1614 the fire was declared extinguished.

Postaccident examination of the no. 4 diesel engine revealed that one cylinder's high-pressure fuel pump had a loosely connected flange. The instruction manual for the ship's diesel generators did not list specific torque values for the bolts that connected to the fuel supply inlet flanges but did list torque values for the bolts' dimensions and strength class. The manual recommended that torque-measuring tools be used

when tightening screws and bolts; however, it was unclear whether the crew had done so when conducting maintenance on the diesel generators.

■ The NTSB determined that the probable cause of the engine room fire aboard the *Carnival Liberty* was loosened bolts, likely resulting from improper tightening during prior maintenance and vibration of the piping over time, on a fuel supply inlet flange on diesel generator 4, which triggered an uncontrolled fuel spray from the inlet flange onto a hot surface on the diesel generator.

VESSEL GROUP: **CARGO**

Fire aboard Vehicle Carrier *Courage*

ACCIDENT LOCATION

UNITED KINGDOM NORTH SEA
IN THE APPROACHES TO THE ENGLISH
CHANNEL

ACCIDENT DATE

06/02/2015

REPORT NUMBER

MAB1724

ACCIDENT ID

DCA15RM024

DATE ISSUED

06/29/2017



Figure 47: *Courage* just after the accident, with scorch marks on the starboard aft side as a result of the fire.

PHOTO BY COAST GUARD

About 2215 local time on June 2, 2015, the vehicle carrier *Courage* was transiting from Bremerhaven, Germany, to Southampton, United Kingdom, when a fire broke out in the cargo hold. The accident resulted in extensive damage to the vessel's hold as well as its cargo of vehicles and household goods. As a result of the damage, estimated at \$100 million total, the vessel owners scrapped the vessel.

The roll-on roll-off (Ro/Ro) *Courage* carried cars and trucks between various ports in the United States and Europe. The ship's 12 cargo decks were connected by ramps. On the accident voyage the vessel carried a cargo of new production vehicles, military vehicles, personally owned vehicles, and household goods shipments. The cargo spaces were protected from fire by smoke detectors and a low-pressure CO₂ system divided into four zones.

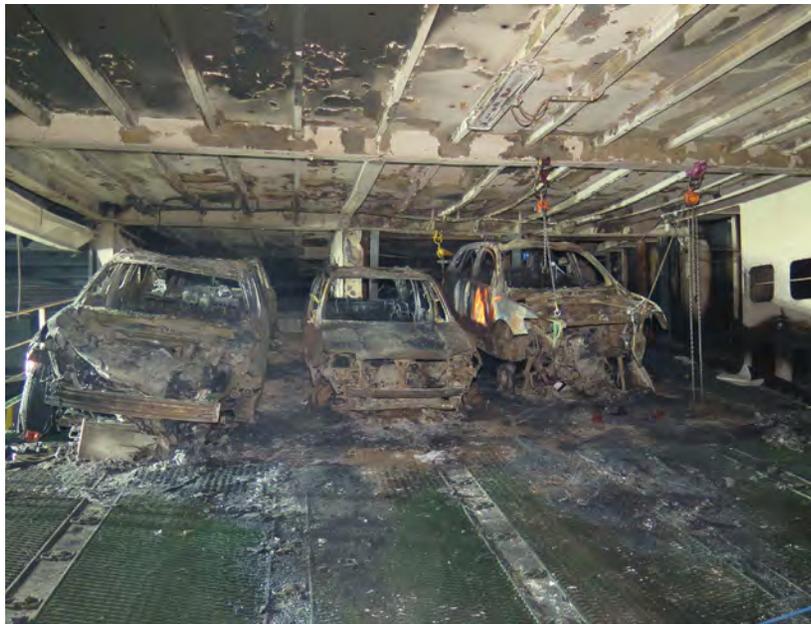


Figure 48: Damaged ramp and destroyed vehicles near the origin of the fire.
PHOTO BY COAST GUARD

After departing Bremerhaven, the vessel began experiencing 34-40 knot winds and about 24-foot seas in the North Sea. About 2215 a smoke alarm on the bridge activated for deck 10 aft, and the third mate instructed the AB to investigate. Positioned on an aft deck access ladderway at deck 12, the AB saw heavy smoke coming up from the decks below. He radioed the bridge, and the mate rang the general alarm and called the master. All crewmembers reported to their muster stations and those assigned to fire teams began preparing to fight the fire. The smoke was reported to change from gray to black and paint bubbling was observed on the weather decks above the fire. Due to the intensity of the smoke, the fire teams did not engage below deck 12, but closed the watertight door from the weather deck to the ladderway and retreated to begin boundary cooling while the master ordered CO₂ released to the affected zone.

The chief engineer released the CO₂ at 2250. The master stated that the smoke intensified for a short period before stopping completely. The crew continued boundary cooling and monitored space temperatures through the next morning.

The master notified Dover (UK) Coast Guard via VHF radio of the emergency, and was eventually instructed to continue to Southampton, where the vessel remained anchored offshore until permitted to enter port.

Fire investigators hired by the vessel owner and working with the US Coast Guard examined the affected spaces and found that the greatest fire damage was located on an aft starboard-side ramp between decks 8 and 10. Vehicles on this



Figure 49: Exterior damage to *Courage* starboard side in the vicinity of the fire. PHOTO BY COAST GUARD

ramp were completely destroyed by fire, and there was also substantial damage to the ramps above this area. The destroyed vehicles included a personally-owned 2002 Ford Escape SUV. Model years 2001 through 2004 Ford Escapes were the subject of recalls in 2007 and 2010 due to non-crash-related fires or thermal events in the vehicles' engine compartments. Brake fluid leaking from the master cylinder reservoir cap had been reported to enter the vehicles' ABS wiring harness electrical connectors, causing short-circuits, melting, and fires. The Ford Escape that was destroyed by the fire in the *Courage* cargo hold had not been serviced to replace the faulty parts that were the subject of the Ford recalls.

Fire investigators examined the Ford Escape's ABS module, which had significant localized damage consistent with electrical arcing/shorting in the module and not from external exposure to a fire.

■ The NTSB determined that the probable cause of the fire on the vehicle carrier *Courage* was electrical arcing in the ABS module of a vehicle carried on board.

VESSEL GROUP: TOWING/BARGE

Fire aboard Towing Vessel *Jaxon Aaron*

ACCIDENT LOCATION

MEMPHIS, TENNESSEE
LOWER MISSISSIPPI RIVER,
MILE MARKER 770

ACCIDENT DATE

08/13/2016

REPORT NUMBER

MAB1719

ACCIDENT ID

DCA16FM050

DATE ISSUED

06/07/2017



Figure 50: Towing vessel *Jaxon Aaron* before the fire.

PHOTO BY WESTERN RIVERS BOAT MANAGEMENT

About 1140 local time on August 13, 2016, a fire erupted in the engine room aboard the towing vessel *Jaxon Aaron* while it was pushing a flotilla of 16 barges upbound on the Lower Mississippi River near mile marker 770, about 24 miles north of Memphis, Tennessee. The fire spread from the engine room into the accommodation area and wheelhouse, causing an estimated \$10.2 million in damage to the interior spaces. All nine crewmembers evacuated the vessel safely to the barge flotilla. No pollution was reported.

About 1140, the tow was moving at 4.1 knots when a fire alarm sounded in the *Jaxon Aaron* wheelhouse, and the pilot saw smoke coming from the port side of the engine room. He alerted the mate and sounded the general alarm. Within an estimated 2–5 minutes, the vessel experienced a total loss of electrical power and steering control. In response, the pilot took both main diesel engines out of gear and radioed for assistance. The crew abandoned the *Jaxon Aaron* to the barges and then attempted to fight the fire on the tow with portable fire pumps. The towing vessels *Miss Allie* and *Joe Ellis* responded and by 1300 joined the firefighting efforts. The Coast Guard arrived on scene at 1609 with the assistance of the towing vessel *Amy Ross*. However, at 1634 the firefighting efforts were suspended due to safety concerns and the fire burned itself out later that evening.

Shortly after the fire was reported, the chief engineer had tried to manually release CO₂ to the engine room from the semi-portable B-V fire extinguishing systems located on both the port and starboardside entrances to the engine room but did not see or hear any fire extinguishing agent being released. A post-fire examination indicated that the plunger valves on each bottle bank, which would release the CO₂ into the flexible hose, had not been activated. However, even if those valves had been activated, the discharge horn on each hose had a manual trigger mechanism that would



Figure 51: *Jaxon Aaron* on the river bank during the firefighting effort.

PHOTO BY JOE ELLIS CREWMEMBER

have to be pressed by the user and directed at the fire. He mistakenly believed it was a fixed halon firefighting system, when in fact it was a semi-portable and would have required him to attack the fire manually. New Subchapter M regulations require that crewmembers on all towing vessels be trained and proficient in firefighting techniques as well as in the use of installed fire extinguishing appliances.

The cause of the fire was determined to be a catastrophic failure of components of the no. 15 power assembly or “power pack” on the 16-cylinder EMD 16-645-E7 port main diesel engine. The engine was designed to allow replacement of the cylinder head assembly, cylinder liner, piston, piston rings, and piston rod without removing the entire engine. These parts were pre-assembled into a power pack unit, which then could be removed or installed during a maintenance period. The engine had approximately 9,100 hours of service since the last replacement.

The common bulkhead between the aft portion of the accommodation space and the forward portion of the engine room did not provide any significant structural fire protection. Therefore, the heat and flame migrated into the accommodations spaces, whose furnishings and wood materials served as a fuel source supporting a significant and rapid growth of the fire.

■ The NTSB determined that the probable cause of the fire aboard the towing vessel *Jaxon Aaron* was the failure of the power assembly components on the port main diesel engine’s no. 15 cylinder. Contributing to the extent of the fire damage was the substantial use of combustible materials in the interior spaces and the chief engineer’s unfamiliarity with the firefighting equipment.

VESSEL GROUP: **FISHING**

Fire aboard Commercial Fishing Vessel *Raffaello*

ACCIDENT LOCATION

AMERICAN SAMOA

PAGO PAGO HARBOR, SATALA SHIPYARD

ACCIDENT DATE

01/17/2016

REPORT NUMBER

MAB1713

ACCIDENT ID

DCA16FM019

DATE ISSUED

05/05/2017

**Figure 52: Raffaello under way.**

PHOTO BY FISHING COMPANY RAFFELLO

On January 17, 2016, at 2310 local time, a fire broke out on board the fishing vessel *Raffaello* while it was moored to the fishing vessel *Judibana* in Pago Pago Harbor, American Samoa. The fire started in the captain's stateroom just forward of the machinery space exhaust trunk and was extinguished the next morning by the crews from both vessels along with shoreside firefighters. One of the 17 crewmembers on the *Raffaello* suffered minor burns while fighting the fire. Damage to the vessel was estimated at \$2 million.

On January 13, after offloading its last catch of tuna the *Raffaello* moored with its starboard generator supplying the vessels electrical power. An evening watchman noticed embers falling down from the vessel's exhaust trunk in the engine room. He called 911 to inform the local fire department and alerted the rest of the crew, who together with crew from the *Judibana* began fighting the fire with a hose charged from the vessel's fire main pump and another from a portable fire pump. The fire spread to accommodation spaces and at 0010 the local fire department arrived and fought the fire onboard the vessel, extinguishing it by 0235.

Investigators determined that the fire's ignition source was a 15-inch uninsulated section of the starboard generator exhaust pipe at the top of the exhaust trunk. About 2.5 inches away from the uninsulated exhaust trunk were charred 2-inch-by-4-inch wooden studs and

0.25-inch plywood sheathing used for a partition of the master cabin bathroom. Investigators concluded that radiant heat traveled uninhibited to the wooden partition, heating and charring the wood until it ignited. Based on testimony, the exhaust lagging on the starboard generator was changed annually. However, investigators did not find any records or other evidence verifying that the task was accomplished each year or any evidence indicating why the insulation was missing.

■ The NTSB determined that the probable cause of the fire aboard the commercial fishing vessel *Raffaello* was the lack of insulation on the starboard generator exhaust gas pipe, resulting in the ignition of combustible material in close proximity.



Figure 53: An investigator measures the distance between the wooden studs and the exhaust pipe of Raffaello's starboard generator, on which a 15-inch section of insulation is missing at the top. PHOTO BY COAST GUARD

VESSEL GROUP: PASSENGER

Fire aboard Passenger Vessel *Tahoe Queen*

ACCIDENT LOCATION

LAKE TAHOE, NEVADA
ZEPHYR COVE

ACCIDENT DATE
08/16/2016

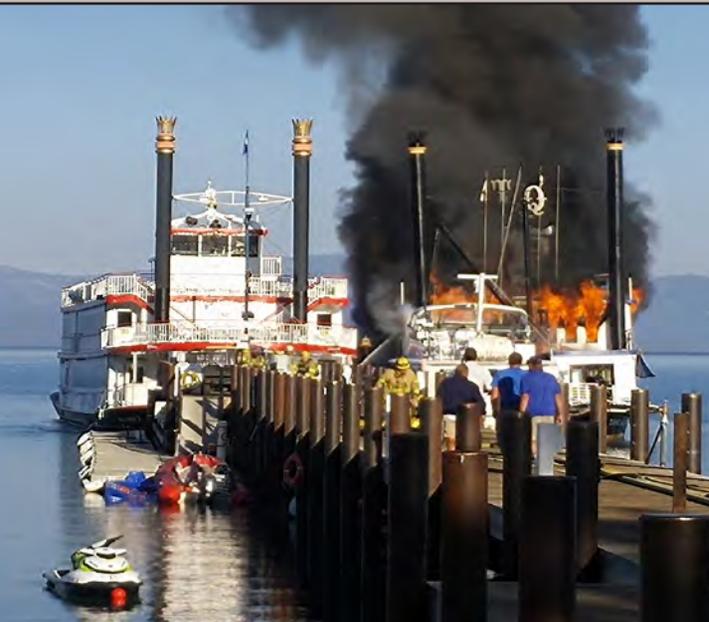
REPORT NUMBER
MAB1734

ACCIDENT ID
DCA16FM054

DATE ISSUED
11/06/2017

Figure 54: Paddlewheeler *Tahoe Queen* on fire.

PHOTO BY WITNESS



About 0730 on August 16, 2016, a fire broke out on the *Tahoe Queen*, a paddlewheel passenger vessel, which was out of service at its home dock in Zephyr Cove, Nevada. Two onboard workers suffered minor injuries but were released from medical care the same day. The *Tahoe Queen* was a constructive total loss, valued at \$4.8 million.

The *Tahoe Queen* was undergoing maintenance (such as welding and painting) by contractors on the day of the fire. The fire began while welding (hotwork) was being conducted on a deck plate seam of an exposed weather deck. The owner of the contracting company told investigators that a fire watch was typically stationed near the hotwork area with a fire extinguisher or hose, but on the day of the accident, no fire watch was posted. Combustible material—such as lifejackets, painting supplies, and storage containers for flammable liquids—were kept in an accommodation space directly below the deck where seam was being welded. Sparks and hot slag from the welding ignited either the combustible material, a flammable vapor layer, or both. The fire was then fueled by the combustible materials in the space and aboard the vessel.

Statements from contractors indicated that, on several occasions, they expressed their concerns about the proximity of stored paints and chemicals to the hotwork areas; rags containing chemicals and solvents that were hung to dry on deck; and the heavy paint fumes from the open paint thinners, lacquers, and so on. According to the contractor who was welding when the fire broke out, the welders had been complaining that the painting contractors were “painting while we were working” and that they asked the fleet manager (of the operating company, who oversaw the project and also managed the company’s other vessels) to have the painters move their supplies from the hotwork area. In response, the fleet manager had reportedly responded, “I know it’s not right, but we have to work through it.” The owner of the contracting company told investigators that he also expressed safety concerns to the fleet manager several times about painting operations being conducted near



Figure 55: Fire aboard *Tahoe Queen*. PHOTO BY WITNESS

hotwork. Despite several verbal safety concerns, there was no evidence or record of a work stoppage to formally reassess the overall safety on board. In addition, daily safety meetings were reportedly held during the work project, but this meeting did not occur on the day of the fire.

Postaccident, investigators found a 20-inch by 9-inch rectangular penetration that had been cut into the wheelhouse for installing an air-conditioning duct. This modification was not indicated in any of the vessel’s approved plans nor was the Coast Guard informed of it. Further, there were no closing devices such as dampers in the ductwork to maintain structural fire protection. The lack of dampers and closing devices allowed the fire to communicate naturally upward and toward the wheelhouse.

■ The NTSB determined that the probable cause of the fire aboard passenger vessel *Tahoe Queen* was the operating company’s poor oversight of its contractors’ adherence to hot-work safety policies.

VESSEL GROUP: TOWING/BARGE

Fire aboard Towing Vessel *Thomas Dann*

ACCIDENT LOCATION

ST. AUGUSTINE, FLORIDA
ATLANTIC OCEAN

ACCIDENT DATE
07/22/2016

REPORT NUMBER
MAB1728

ACCIDENT ID
DCA16FM048

DATE ISSUED
08/10/2017



Figure 56: The fire-damaged *Thomas Dann*.

PHOTO BY COAST GUARD

On July 22, 2016, at 1700 eastern daylight time, a fire broke out in the upper engine room aboard the towing vessel *Thomas Dann* while it was transiting in the Atlantic Ocean about 9 nautical miles east of St. Augustine, Florida. No one was injured nor was any pollution reported; however, the *Thomas Dann* was extensively damaged and declared a constructive total loss, valued at \$2.5 million.

The *Thomas Dann* was towing a barge loaded with cement from Brooklyn, New York, to Cape Canaveral, Florida. The barge was towed behind the vessel on an approximately 1,300-foot-long tow line.

A fire alarm for the upper engine room activated at 1700 and moments later a deckhand saw smoke. The crew attempted to enter the engine room and investigate the fire but found it inaccessible. The crew stated that they did not attempt to fight the fire because of quickly it grew in heat and intensity. The fire spread to the accommodation spaces and shortly after the vessel lost propulsion. The crew tried to shut the vents to the engine room, but because of the raging fire only the starboard vent could be closed. The crew decided to abandon the vessel in an inflatable liferaft. They maneuvered away from the *Thomas Dann*, escaping the extreme heat and explosions occurring aboard. The crewmembers were picked up by a nearby sport-fishing vessel and taken to a Coast Guard station. No one was injured.

The greatest fire damage was to the central portion of the upper engine room. A drum of waste oil and extra hoses for the fire pump had been stored there, providing combustible material to fuel the fire. An electrical fuse box located in the central portion of the upper engine room bore evidence of electrical arcing at its aft side. There was also evidence of electrical arcing to wiring in this area. As a result of the heat damage, the source of those wires could not be traced. Arc mapping of all electrical wiring, which is a systematic evaluation of fire-damaged electrical circuits, further indicated that the electrical fuse box was the general area of origin.

■ The NTSB determined that the probable cause of the fire aboard towing vessel *Thomas Dann* was an ignition originating near an electrical fuse box in the upper engine room. Contributing to the intensity of the fire was the presence of combustible materials in the upper engine room.

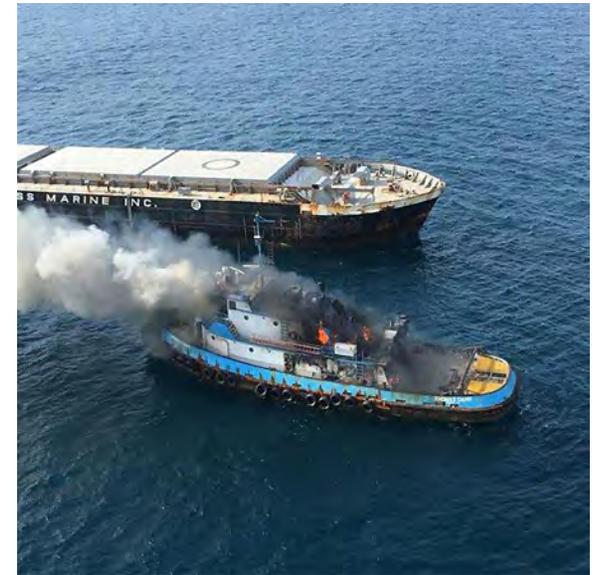


Figure 57: *Thomas Dann* ablaze and abandoned near the barge it was transporting. PHOTO BY DAYTONA FIRE DEPARTMENT

VESSEL GROUP: TOWING/BARGE

Engine Explosion and Fire aboard Towing Vessel *The Admiral*

ACCIDENT LOCATION

INGLESIDE, TEXAS

LA QUINTA CHANNEL, MILE MARKER 544

ACCIDENT DATE

07/14/2016

REPORT NUMBER

MAB1735

ACCIDENT ID

DCA16FM044

DATE ISSUED

11/14/2017

**Figure 58: *The Admiral*
at the accident site
after the fire.**



On July 14, 2016, the towing vessel *The Admiral* was moored alongside barges in the La Quinta Channel, Gulf Intracoastal Waterway, near Ingleside, Texas. About 1635, the vessel's starboard main engine oversped and then exploded, causing a fire in the engine room. Two crewmembers who were in the engine room at the time of the explosion were severely burned; one subsequently died. Damage to the vessel was estimated at \$300,000. No pollution was reported.

The Admiral was built in 1958 and was in layup about 3 years before recommencing operations in June 2016. The twin-screwed towboat had 12-cylinder, 2-cycle diesel main engines manufactured by EMD. The engines were overhauled and converted from 567C to 645E engines in 2003- the last record of an overhaul. The vessel was working at a channel side construction site, moving and monitoring a fleet of hopper barges. The company's operation manual for the main engines stated that during extended delays, "engines should be restarted every 24 hours and brought to operating temperature to check equipment." Therefore, while *The Admiral* was standing by the barges (not under way), the engineers typically ran the engines at idle speed (325 rpm) for about 2 hours each day to come up to temperature. On the morning of the accident, the first engineer started the main engines about 0500 and shut them down a few hours later. He then restarted the engines about 1100 after the superintendent of the construction project asked to have *The Admiral* ready for possible maneuvering operations.

The first engineer was relieved by the second engineer soon after the engines were restarted. Later that afternoon, the second engineer noticed an unusual sound, which he described as "ticking," coming from the starboard main engine while at idle speed. He was not sure of the significance of the ticking sound and decided to wait until the off-duty first engineer, who had more experience with this type of engine, woke up. The two then discussed the situation and proceeded to the engine room.



Figure 59: Damaged starboard engine aboard *The Admiral* after the fire.

After the two engineers walked around the starboard engine, the first engineer tried to stop the engine by pushing the emergency stop button on top of the governor. However, after initially slowing down, the engine rapidly accelerated and the pilot saw 2,452 rpm on the wheelhouse tachometer. The first engineer subsequently tried to stop the fuel supply to the engine by pushing the fuel rack lever, but this made no difference in the engine speed. The second engineer ran up the ladderwell to close the emergency fuel supply valve on the main deck outside the engine room. While he was on the ladderwell, an explosion erupted from the engine. The force of the explosion blew several of the airbox covers off the engine and set the engine room ablaze.

The second engineer, burned and apparently in shock, stumbled and yelled for other crewmembers to get the first engineer. Another crewmember crawled his way to the first engineer, who was about halfway up the ladderwell, and pulled him out of engine room. The injured crewmembers were transported ashore by boat and taken to the local hospital for treatment. The first engineer later died from his injuries.

The fire was extinguished about an hour and a half after it broke out, after a deckhand shut off the fuel supply at the emergency fuel shutoff station and the crew fought the fire through the engine room doors and windows using portable pumps and firefighting equipment from a nearby towing vessel.

Postaccident inspection of the damaged engine found a fuel injector stuck in full-open position, and a fuel rack arm was in off position. A forensic engineer later concluded that the engine had been in a runaway condition and likely used its own lubricating oil as an uncontrolled fuel source for combustion. The forensic engineer determined that the ticking sound likely was a sticking hydraulic lash adjuster, which functioned to maintain the timing of the opening and closing of the exhaust valves on the cylinder head. The engineer's report concluded that a misfiring cylinder, with pressurized exhaust gases and combustion products entering the airbox, could have caused the lubricating oil in the airbox to reach a combination of pressure and temperature necessary for an explosion to occur.

■ The NTSB determined that the probable cause of the engine explosion and resulting fire aboard the towing vessel *The Admiral* was a misfiring cylinder that ignited lubricating oil in the sump of the engine.

VESSEL GROUP: **OFFSHORE SUPPLY**

Flooding of Dive Support Vessel *Hammerhead*

ACCIDENT LOCATION

GALVESTON, TEXAS
NEWPORT MARINE TERMINALACCIDENT DATE
03/07/2016REPORT NUMBER
MAB1720ACCIDENT ID
DCA16FM030DATE ISSUED
06/09/2017**Figure 60: *Hammerhead* after the flooding.**

PHOTO BY COAST GUARD

**Figure 61: Coast Guard investigators examining the
Hammerhead after the accident.**

PHOTO BY COAST GUARD



LESSONS

Oversight and Maintenance of Vessel Hulls

To protect vessels and the environment, it is good marine practice for owners to conduct regular oversight and maintenance of hulls, even during layup periods. Oversight should include monitoring the hull thickness, maintaining sufficient marine coatings, and using cathodic protection systems.

- The NTSB determined that the probable cause of the engine room flooding of the dive support vessel *Hammerhead* was the localized corrosion of an aging hull structure resulting from the operating company's lack of oversight and maintenance in preserving the hull's metal plating with an adequate marine coating and cathodic protection system.

On March 7, 2016, at 1000 local time, the dive support vessel *Hammerhead* was discovered partially flooded with an increased aft trim while moored alongside the pier at the Newport Marine Terminal in Galveston, Texas. At the time, the vessel, built in 1972, had been in layup and idle for 15 months. No pollution was reported. Damage to the vessel was estimated at \$900,000.

The *Hammerhead* operated in a fleet of subsea construction support vessels. However, the vessel was inactive and docked at its operator's facility for over 15 months. That morning, an employee of the operating company was making security rounds and noticed that the vessel was sitting lower in the water than normal. On boarding the vessel, he discovered that the engine room was partially flooded and estimated that the water depth in the forward end of the engine room was 34 inches above the deck plates. He did not find progressive flooding into other compartments. He then notified the operator, the Coast Guard and the Texas General Land Office of the vessels condition.

As a precautionary measure, a containment boom was placed around the vessel before conducting salvage and dewatering operations. Flood water was removed using hydraulic submersible pumps. After the vessel was pumped near dry, a 0.25-inch-by-0.50-inch hole was found in the steel hull plating on the bottom of the vessel beneath the engine room. To stem the flow of water and create a temporary patch/repair, workers wrapped a flathead screwdriver in rags and inserted it in the hole, sealed it with an underwater epoxy compound, and finally overlaid it with five 100-pound bags of cement mix.

The vessel's cathodic protection system, normally used in conjunction with marine coating, consisted of zinc plates mounted to the underside of the hull, rudders, and tail shaft strut bearings. Although the zinc plates were in fair condition, no secondary corrosion control method was in place to protect the hull, such as an impressed current, an electrochlorination/hypo-

chlorite prevention, or a shaft earthing system. Marine growth had flourished on the idle vessel, blocking and narrowing cooling water intake piping. Clusters of barnacles, mollusks, algae, and sea hair were found on and around the tail shafts, propellers, and rudders. The operating company did not have written procedures for periodic inspections or continuous monitoring of the vessel during layup; therefore, no preservative measures, log reports, or checklists were completed during that time. The vessel was also not equipped with a bilge alarm system that could be monitored from ashore.

Figure 62: At left, the hole found near frame 31 of the bottom plating. At right, the screwdriver placed in the hole as a temporary repair. PHOTO BY COAST GUARD



VESSEL GROUP: **FISHING**

Flooding and Sinking of Fishing Vessel *Alaska Juris*

ACCIDENT LOCATION

BERING SEA, ALASKA

ABOUT 160 NAUTICAL MILES WEST OF ADAK

ACCIDENT DATE

07/26/2016

REPORT NUMBER

MAB1726

ACCIDENT ID

DCA16FM047

DATE ISSUED

07/24/2017

Figure 63: Alaska Juris, abandoned on the day of the sinking.

PHOTO BY COAST GUARD

**LESSONS****Fishing Vessel Safety**

Operators of fishing vessels should consider the following procedures while at sea to ensure the safety of their crewmembers as well as the safe operation of their vessels:

Watertight integrity

- Close all watertight doors while at sea. Check and perform maintenance to ensure doors are properly sealed.
- Maintain watertight integrity of all bulkhead penetrations.

Bilge system, sea chest valve operation, and engine space dewatering

- Establish procedures for testing bilge alarms on a routine basis and maintain logs of these tests.
- Maintain bilge piping and pumps in good working order.
- Ensure that sea chest valve handwheels and reachrods can be accessed easily and operate properly.

Dewatering equipment and training

- Ensure that portable dewatering pumps have sufficient capacity with appropriate lengths of suction and discharge hoses to dewater all spaces.
- Train dewatering teams on a routine basis.

Vessel stability

- Ensure that captains, mates, and engineers are familiar with all aspects of their vessel's stability (intact and damage) for all operations.

Abandonment

- Update liferaft assignment sheets after crew changes.
- Ensure that crewmembers have access to properly sized immersion or exposure suits.
- Train crewmembers on proper use of all lifesaving and survival gear, including ladders, liferafts, and sea painters (lines).

On July 26, 2016, about 1130 local time, a crewmember on the fishing vessel *Alaska Juris* discovered flooding in the engine room while under way in the Bering Sea, about 160 miles west of Adak, Alaska. Shortly afterward, the rapid ingress of water caused the main engine and generators to shut down, resulting in a loss of propulsion and electrical power. No one attempted to dewater the vessel, which sank later that day. All 46 persons on board abandoned ship into liferafts and were rescued without injury. The *Alaska Juris*, which was carrying about 87,000 gallons of diesel fuel, had an estimated value of \$4.3 million.

The *Alaska Juris* was built in 1975 as a tuna seiner and converted about a decade later to a trawler and processing vessel. At its last drydock examination in 2014, the Coast Guard discovered more than 50 mechanical couplings used as temporary repairs on vital engine room piping. Although most of these repairs had been addressed, witness interviews confirmed that a number of the couplings were still in place at the time of the accident.

On the morning of the accident, while the *Alaska Juris* was under way toward a fishing ground, a technician making a round of the upper engine room noticed what he perceived was steam coming from an area around the main engine. Realizing this was not normal, he went below to investigate the source. When he reached the bottom of the ladder, he discovered a cascade of water raining down from the overhead onto the engine near the main reduction gear. The interaction of water with the hot surfaces of the engine machinery was generating the steam.

According to the technician, water was also “spurt-ing up” from under deck plates and displacing them. No bilge alarm had sounded, although based on the description and height of the flood water, at least four bilge alarms should have activated throughout the lower engine room.



Figure 64: Two of *Alaska Juris*'s liferafts with a total of 28 crewmembers aboard. A third liferaft with the other 18 crewmembers had drifted away after being deployed from the starboard side of the vessel.

PHOTO COURTESY OF BULK CARRIER *SPAR CANIS*

The chief engineer and captain were notified. They described the flooding similarly; the captain told investigators that the shaft coupling by the reduction gear was “throwing up” seawater into the overhead, where it then fell back down onto the deck plates. By the time they decided to start the bilge pumps manually and to slow or stop the vessel, the flooding had caused the engine and generators to shut down and, consequently, the vessel lost propulsion and electrical power. In the engine room, the water continued rising, and emergency lighting and handheld flashlights were the only illumination available. Some of the crewmembers tried to connect and start the portable emergency pump, but the captain and the chief engineer told them to stand down because of the large volume of water (about 2 feet above the deck within 30 minutes of notification of the flooding). The captain sent a distress signal via GMDSS. In addition, at 1134, the Coast Guard received notification that the vessel's EPIRB had been activated.

The captain instructed the personnel on board to prepare for abandoning the vessel. Everyone mustered on deck outside the bridge, donned immersion suits, and launched three inflatable liferafts. The abandonment was aided by unusually calm weather for the Bering Sea at that time of year.

The Coast Guard launched assets and also coordinated its response with nearby fishing vessels and two merchant vessels. Ultimately, the *Alaska Juris* personnel boarded the fishing vessels *Ocean Peace* and *Sea Fisher* and were taken to Adak. The next day, a Coast Guard C130 flew over the area and was unable to locate the *Alaska Juris*, spotting only an oil sheen. The vessel presumably sank in 11,100 feet of water.

The captain and the chief engineer both stated they ensured that all watertight doors were closed before exiting the engine room for the last time (The assistant engineer and other witnesses testified that the doors often were kept open while the vessel was at sea.) A previous flooding analysis showed the vessel would not sink with only the engine room flooded. Because the vessel sank, flooding must have progressed beyond the engine room. If the watertight doors were indeed closed, it is possible that they were no longer watertight, or that bulkhead penetrations allowed flooding into other compartments.

■ The NTSB determined that the probable cause of the sinking of the fishing vessel *Alaska Juris* was a lack of watertight integrity, which failed to contain flooding in the engine room.

VESSEL GROUP: **CARGO**

Sinking of the US Cargo Vessel *El Faro*

ACCIDENT LOCATION

ATLANTIC OCEAN
NORTHEAST OF ACKLINS AND CROOKED ISLAND, BAHAMAS

ACCIDENT DATE
10/01/2015

ACCIDENT ID
DCA16MM001

REPORT NUMBER
MAR1701

DATE ADOPTED
12/12/2017

ILLUSTRATED
DIGEST
SPC1801

DATE ISSUED
05/24/2018

Figure 65: *El Faro* under way.

PHOTO: CAPTAIN WILLIAM HOEY



On Thursday, October 1, 2015, about 07:15 a.m. eastern daylight time, the US Coast Guard received distress alerts from the 790-foot-long roll-on/roll-off container (Ro/Con) ship *El Faro*. The US-flagged ship, owned by Sea Star Line, LLC, and operated by TOTE Services (TOTE), was 36 nautical miles northeast of Acklins and Crooked Islands, Bahamas, and close to the eye of Hurricane Joaquin. The ship was en route from Jacksonville, Florida, to San Juan, Puerto Rico, with a cargo of containers and vehicles. Just minutes before the distress alerts, the *El Faro* master had called TOTE's designated person ashore and reported that the ship was experiencing some flooding. He said the crew had controlled the ingress of water but the ship was listing 10 to 15 degrees and had lost propulsion. The Coast Guard and TOTE were unable to reestablish communication with the ship. Twenty-eight US crew members and five Polish workers were on board.

The Accident

September 29

On the evening of September 29, 2015, the US-flagged cargo ship *El Faro* cast off from Jacksonville, Florida, bound for San Juan, Puerto Rico, with crew of 33 and a cargo of vehicles and shipping containers. The vessel was operated by TOTE Services, Inc. (TOTE), which, until 2 weeks before the accident, was known as Sea Star Line, LLC. Hundreds of miles southeast, Tropical Storm Joaquin moved toward the Bahamas. At the time of the ship's departure, *El Faro*'s captain was aware of the weather and planned to remain south of the storm. Before meeting the storm, the vessel's speed was about 20 knots.

- ¹ *El Faro*'s voyage data recorder (VDR) captured both conversations and parametric data. However, only the voice of the person speaking on the bridge was captured in a two-way conversation with another person who was not on the bridge.
- ² Sat-C is short for Inmarsat Satellite's channel C. The Sat-C terminal provided timely weather information from the National Weather Service (NWS), including the National Hurricane Center (NHC).
- ³ The BVS vendor could also send e-mail updates, which provided current tropical cyclone information, if a user specifically requested them. During the accident voyage, however, *El Faro*'s captain did not request any.
- ⁴ The captain and crew expected to encounter winds of about this strength (later, they refer to "45-knot winds") as a product of both the expected intensity of the storm and their expected position relative to it.



September 30

On September 30, 2015, at about 0600, the captain and chief mate discussed the storm's route, referring to one of the ship's onboard weather programs, Bon Voyage System (BVS).¹ BVS files were sent to the captain's e-mail address. However, tropical cyclone information in the BVS files (when sent) typically lagged what was found in other weather sources by 6 hours. In addition, there was another lag until the captain downloaded each file. Another source of weather information, Sat-C, delivered text broadcasts of National Hurricane Center (NHC) weather products to the vessel's bridge.² The captain favored BVS throughout the voyage, seemingly not considering the latency associated with the tropical cyclone information contained in the BVS files.³

At 0624, the captain shifted *El Faro*'s course slightly southward. At 0625, the Sat-C terminal received an urgent high seas forecast for Tropical Storm Joaquin of maximum sustained winds of 75 knots (hurricane strength) with gusts to 90 knots within 24 hours.

The captain and the chief mate discussed that any further course change would be drastic and wasn't warranted "for a 40-knot wind."⁴

At 0711, the captain was heard on the voyage data recorder (VDR) saying, “Needless to say, we’ll be watching the weather deteriorate today.” A few minutes later, he indicated his doubts that the ship’s anemometer⁵ was working properly.

At 0739, the NHC announced in an intermediate advisory that Joaquin had become a hurricane; however, intermediate advisories weren’t broadcast via Sat-C and were not available via e-mailed BVS files.

Although the captain discussed alternate routes through the Northwest Providence Channel and the Old Bahama

Channel, he did not choose these routes.⁶ Throughout the day, crewmembers were directed to prepare the vessel for rough weather.

At 1943, the third mate arrived on the bridge for the watch change and said, “I just hope it’s not worse than what this [BVS] is saying because . . . Weather Underground . . . they’re saying it’s—more like 85—not 50 . . . wind.” At 2305, he made the first of two calls to the captain. On his second call, the third mate suggested diverting to the south, but the captain did not authorize a course change. Later, the third mate told

the able seaman on watch that the captain thought they would be south of the storm. The second mate arrived for the 0000 watch at 2345.

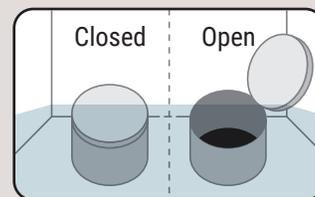
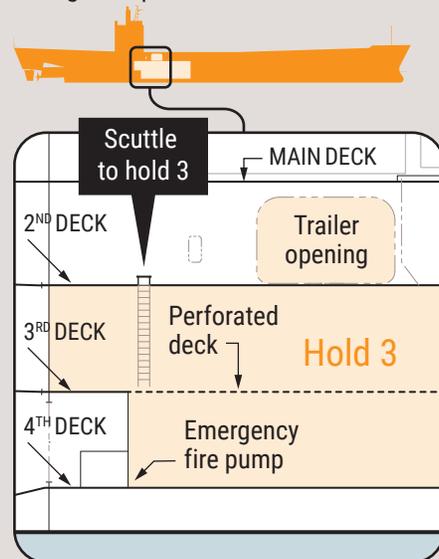
October 1

At 0120 on October 1, after hearing satellite radio reports of the strengthening hurricane, the second mate also called the captain and suggested that they change to a more southerly route at 0200 instead of the earlier-planned east-southeasterly route. Again, the captain did not authorize the change. Instead, he directed her to “run it,” which meant resume the earlier-planned route.

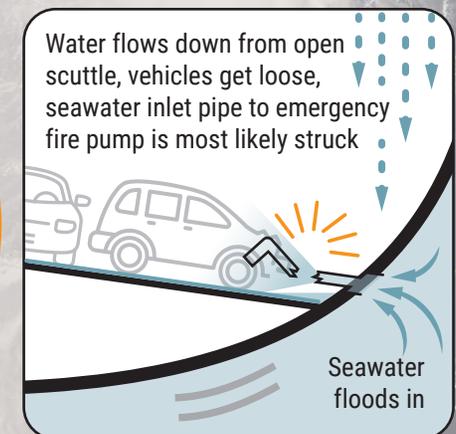
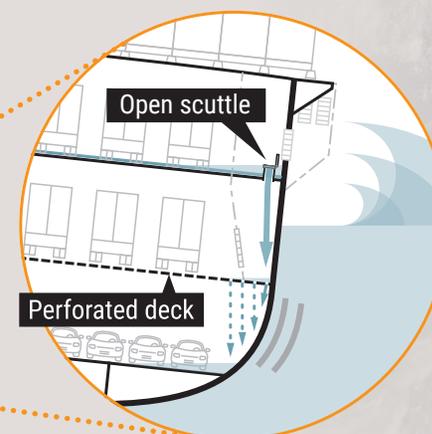
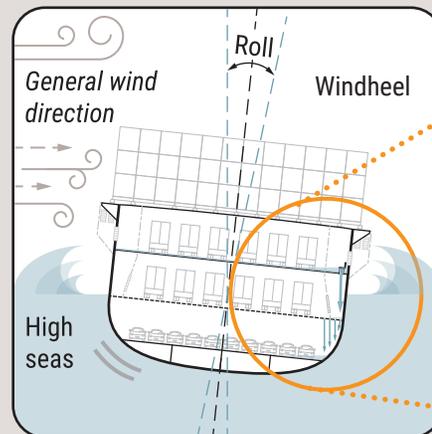
5 An anemometer provides wind speed and direction. Over 99 percent of the anemometer data samples captured on *El Faro*’s VDR during the accident voyage indicated a relative wind direction of between 180° and 193°.
6 Although he did not divert to the Old Bahama Channel, the captain did arrange with personnel ashore to make the return trip via the Old Bahama Channel.

How the water got in

El Faro’s partially enclosed second deck had a number of scuttles that had to be closed and fastened (“dogged”). Flooding began through an open scuttle.



Once the deck became wet in hold 3, automobiles were more likely to break free of their lashings. An automobile likely struck the intake piping leading to the emergency fire pump. Seawater piping to the emergency fire pump in cargo hold 3 was inadequately protected from such impact.



With a severe breach of the intake piping, water would have flowed into hold 3 under seawater head pressure. Bilge pumps could not keep up with flooding through the fire main.

As the ship’s permanent angle to the sea (sustained list) increased past 15 degrees, the high seas would have allowed water to enter the hull through ventilation openings.

Sinking of the US Cargo Vessel *El Faro* – continued

As the seas became higher and the winds intensified, *El Faro's* speed slowly decreased. At 0340, the second mate adjusted course to steer further to the north to compensate for the wind pushing the ship to the south, and the second engineer began "blowing tubes."⁷ The ship was heeling to starboard from the increasing wind on its port side, a condition called windheel. The vessel's speed was about 16.8 knots at 0340. It dropped sharply thereafter.

When the chief mate's watch began at 0345, the second mate told him that the engineers were blowing tubes. The chief mate adjusted course to nearly due east, further into the wind. The vessel's speed was now about 13.8 knots. At 0409, the captain arrived on the bridge, shortly thereafter telling the chief mate that the only way to correct the starboard list was to transfer water to the port side ramp tank.⁸

At 0440, the chief mate called the captain over the electric telephone. He said, "The chief engineer just called . . . something about the list and oil levels." He might have tried to gauge the list with a clinometer ("can't even see the [level/bubble]").⁹

At 0443, the captain said to put the vessel into hand steering so it could be steered into the wind to try "to take the list off." The chief mate turned the vessel northward to 65°. The captain took the conn and ordered a further change to 50° (farther into the wind). The vessel's speed dropped to 7.5 knots.

At 0445, the captain downloaded a BVS weather file that was available at 2304 the night before. Its position and forecast information for Joaquin was consistent with an NHC advisory delivered to the ship via Sat-C almost 12 hours before.

Less than 2 minutes later, *El Faro's* Sat-C terminal received an NHC advisory with up-to-date position, wind speed, and storm track information. At 0503, the

captain, comparing the updated Sat-C weather information with his most recent download of BVS, said he was getting "conflicting reports as to where the center of the storm is." At that time, another BVS weather file became available, but the captain did not download it until an hour later (0609). Beginning at 0510, the captain and the riding gang supervisor—an off-duty chief engineer—discussed the extent of the starboard list, and the captain asked how the list was affecting "operations as far as lube oil(s)."

At 0514, shortly after the captain said their speed was maintaining at 11 knots, he turned the ship into the wind again. By 0518, the vessel's speed had dropped to 5.8 knots. It was now moving with a pronounced starboard list; in hurricane-force wind, rain, and waves; with zero visibility and an untrustworthy anemometer.

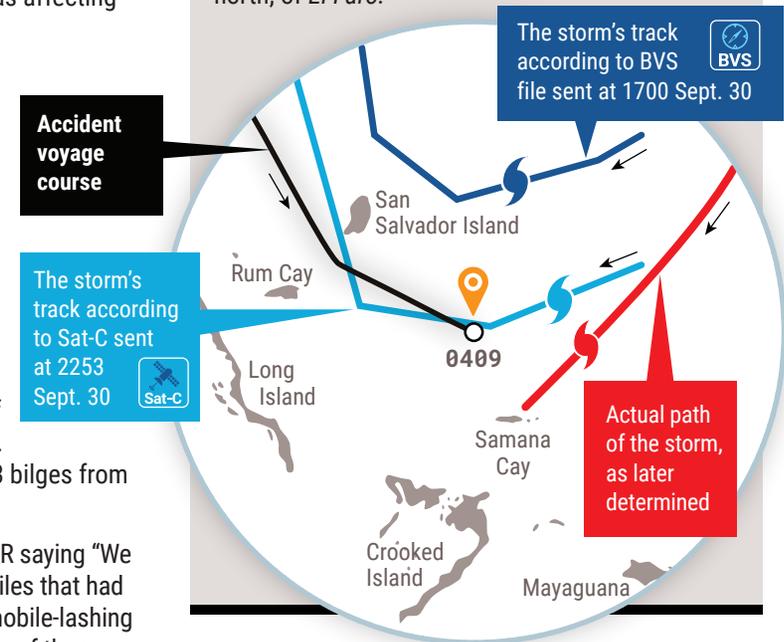
At 0543, the captain received a call from the chief engineer that there was a problem in cargo hold 3. He told the chief mate to go to the hold and start pumping. The crew continuously pumped the hold 3 bilges from this point onward.

At 0544, the captain was heard on the VDR saying "We got cars loose," likely referring to automobiles that had broken free from their lashings. The automobile-lashing arrangement did not meet the requirements of the vessel's approved cargo-securing manual, making automobiles more likely to shift in heavy weather.

The crew found that a scuttle (small watertight hatch) on the second deck, starboard side, was open and seawater on deck was flowing over it and down into cargo hold 3. The ship's list to starboard was causing seawater to pool near the scuttle located on the starboard side. The captain told an engineer to begin transferring

Snapshot: Where was Joaquin?

At 0409 the captain returned to the bridge. He discussed the weather with the crew, apparently relying on the BVS file sent at 1700 the evening before. The captain thought they were on the "back side" of the storm, meaning the less dangerous quadrant. In reality, the storm was east, not north, of *El Faro*.



ballast water from the starboard ramp tank to the port ramp tank.

At 0554, the captain ordered a turn to port to put the wind on the ship's starboard side, thereby generating a port list so the crew could better investigate the source of the flooding in cargo hold 3. This was also the most aggressive of several turns that followed the first conversation about oil levels at about 0440.

⁷ Using high-pressure steam to remove soot from the boiler tubes. During this process, a steam-powered ship like *El Faro* would temporarily lose some propulsion power, and therefore a few knots.

⁸ The ramp tanks were intended to counter the effects of loading or unloading cargo in port. They could correct a list of about 3°.

⁹ On the VDR transcript, uncertain phrases, words, or partial words are placed inside parentheses. Here, parentheses within parentheses are rendered as brackets.

El Faro's final maneuvers

El Faro's captain and crew turned the vessel's bow into the wind several times. Then, at 0554, the captain ordered a turn to port to get the wind on the ship's starboard side, generating a port list. A few minutes later, *El Faro* lost propulsion (see Loss of lube oil suction, below).

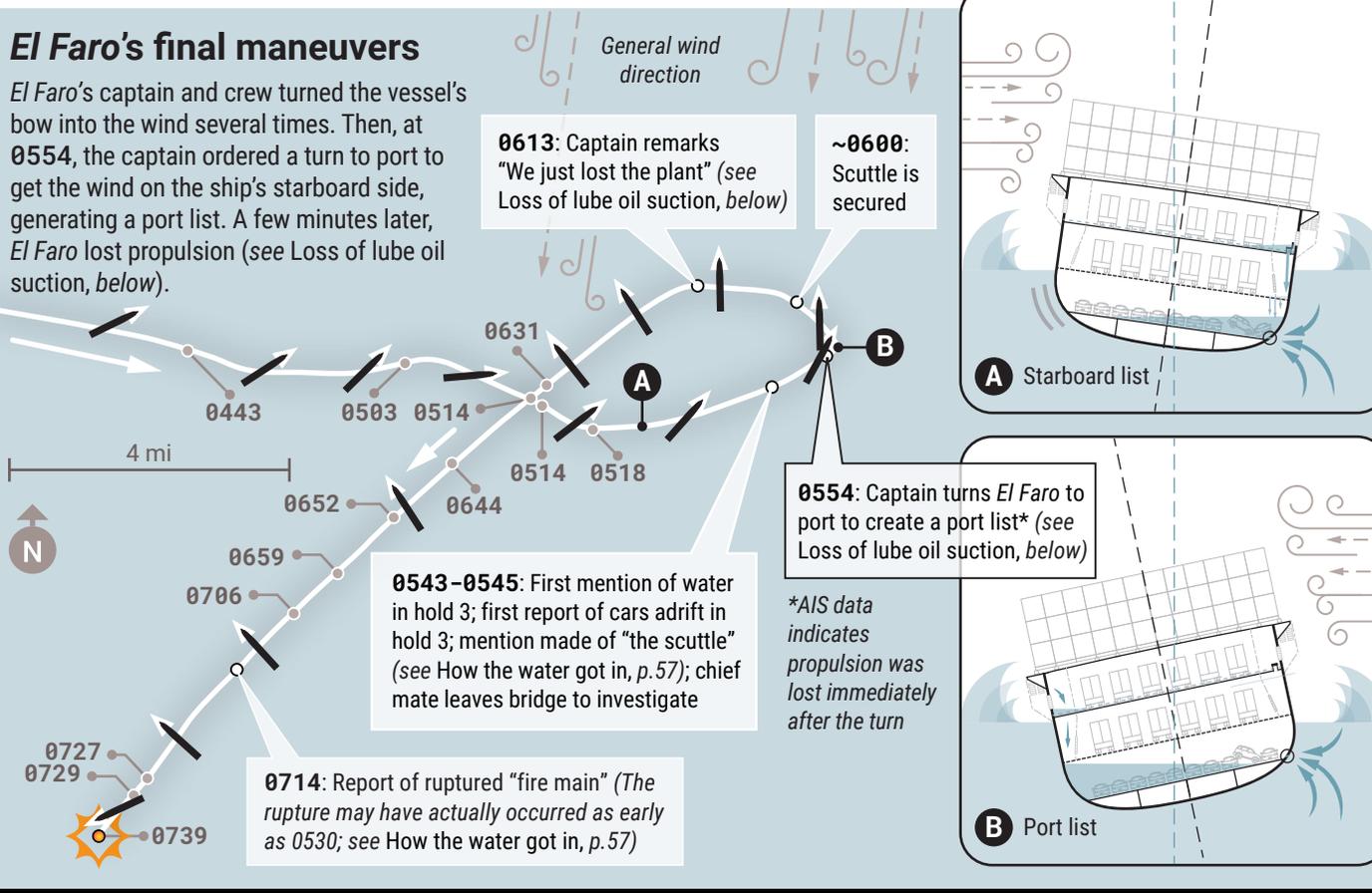
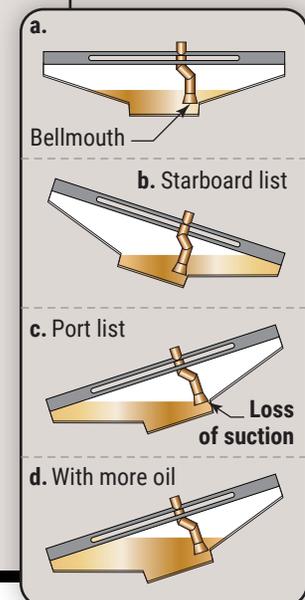


Figure 66: Second deck scuttle to hold 2A, similar to hold 3 scuttle

PHOTO: HERBERT ENGINEERING



Detail of oil sump and bellmouth



Loss of lube oil suction

Because the bellmouth (intake) for the main propulsion engine lube oil pump was located toward the starboard side, it mattered whether the ship was listing to port or starboard. (The trim of the ship also affected the oil suction; forward trim was worse). It also mattered how much lube oil was in the sump (see Detail of oil sump and bellmouth, at right).

Log books indicated no more than 26 inches of oil in the sump in the months before the accident (a). With this oil level, the bellmouth would not take in air (lose suction) with an 18-degree list to starboard (b), but would lose suction with an equivalent list to port (c). With 32 inches of oil in the sump, the bellmouth would continue to take in oil with the same 18-degree list to port (d) allowing normal functioning.

The loss of lube oil pressure would have triggered a protective device, the low lube oil pressure switch, which would have shut off the flow of steam to the main engine. (However, steam continued to flow to turbogenerators for lights and other systems.) To reset the switch, lube oil pressure would have to be restored. Without propulsion, *El Faro* could not maneuver and was at the mercy of the storm.

Sinking of the US Cargo Vessel *El Faro* – continued

Shortly after the turn to port, the chief mate reported that they had secured the scuttle on the starboard side of the second deck. The vessel was now listing to port and its speed was 2.8 knots.

At 0602, the second mate said she heard alarms sound in the engine room. At 0609, the captain downloaded the BVS weather file, which was sent at 0502, whose information about the hurricane (position, forecast track, and intensity) was consistent with an NHC advisory the ship had received via SAT-C about 7 hours before. He ordered the engineers to transfer bilge water back to the starboard ramp tank, saying “I’m not liking this list.”

Cargo hold 3 continued to take on water and the ship continued to lose speed, despite continuous bilge pumping efforts by the crew.

At 0613, the captain said he thought that the vessel had lost propulsion.

At 0616, the engine room called. Although the conversation from the engine room was not recorded on the VDR, the captain asked, “so . . . is there any chance of gettin’ it back online?” It is likely that a suction pipe leading to the lube oil service pump had taken in air instead of oil (see Loss of lube oil suction, p. 59). The port list, coupled with the vessel’s motion, resulted in a loss of oil pressure that caused the main engine to shut down.¹⁰ Once propulsion was permanently lost, *El Faro* was pushed sideways by the wind and waves.

At 0631, the captain said he wanted “everybody up.” He had the second mate compose, but not send, a distress message.

By 0644, *El Faro*’s bow was pointed not into the wind, but perpendicular to it. Minutes later, the captain mentioned “significant” flooding in hold 3, but said that he did not intend to abandon ship, saying there was “no need to ring the general alarm yet.”

At 0659 the captain called a designated person (DP) ashore and left a message. Seven minutes later,

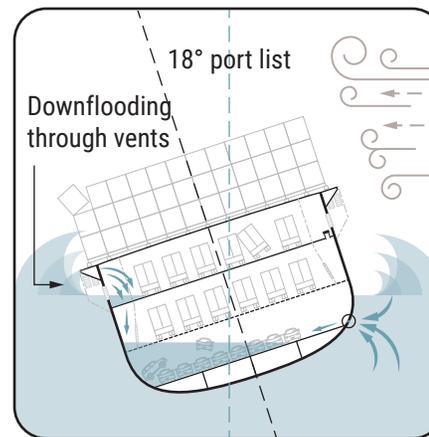


Figure 67: *El Faro* computer rendering in static surface water showing list to port of 18° with departure trim 5.8 feet by the stern due to flooding of hold 3, estimated at 20% and windheel.

ILLUSTRATION: USCG MARINE SAFETY CENTER

the captain was connected to the DP and reported a marine emergency. When the call ended at 0712, the captain had the second mate send the distress message.

The increasingly large induced list to port from wind and increasing flood water levels in hold 3, combined with the vessel’s rolling in the storm seas, likely caused seawater to enter cargo hold ventilation openings in the hull. It was possible to close these openings, but they were left open during the event; they were not considered downflooding points in any available guidance documents. Seawater poured into hold 3 and then into hold 2A and 2. At 0714, the chief mate told the captain that the chief engineer had said that, “something hit the fire main, got it ruptured, hard” (see How the water got in, p. 57).



One or more of the vehicles in hold 3 had likely struck the emergency fire pump, or “fire main” piping, at the starboard side of hold 3. The inlet piping to the fire main system was designed to supply seawater to the suction side of the emergency fire pump. With a severe breach, seawater would have flowed into hold 3 at a rate that would inevitably overwhelm the capabilities of *El Faro*’s bilge pumps. It is likely that the piping was breached earlier than 0714, based on the continued flooding of hold 3 after the scuttle was secured and the hold was being dewatered by bilge pumps. (Vehicles had likely been adrift at least as early as 0544, when the captain reported “cars loose.”)

Rather than mustering the entire crew, the captain and a few officers continued efforts to diagnose the problem, though they made no reference to consulting a damage control plan or booklet. Finally, at 0727, the captain ordered ringing of the general alarm. A minute later, the chief mate advised the captain over the radio that the crew was mustering on the starboard side, and at 0729, the captain ordered the crew to abandon ship. He ordered the liferafts thrown overboard at 0731 and told everyone to get into their rafts and stay together.

The recording ended at 0739.

About 3 minutes after *El Faro*’s VDR stopped recording, a reconnaissance aircraft estimated a 10-second average surface wind speed of 117 knots about 21 nautical miles south of *El Faro*’s last known position. At

0800, Joaquin’s center was estimated to be about 22 nautical miles south-southeast of *El Faro*’s last known position, according to an NHC post-storm assessment.

¹⁰ A shutdown device stopped the main engine from running without lube oil, by design. However, the ship’s boilers and electrical generators continued to operate, and the ship had electrical power.

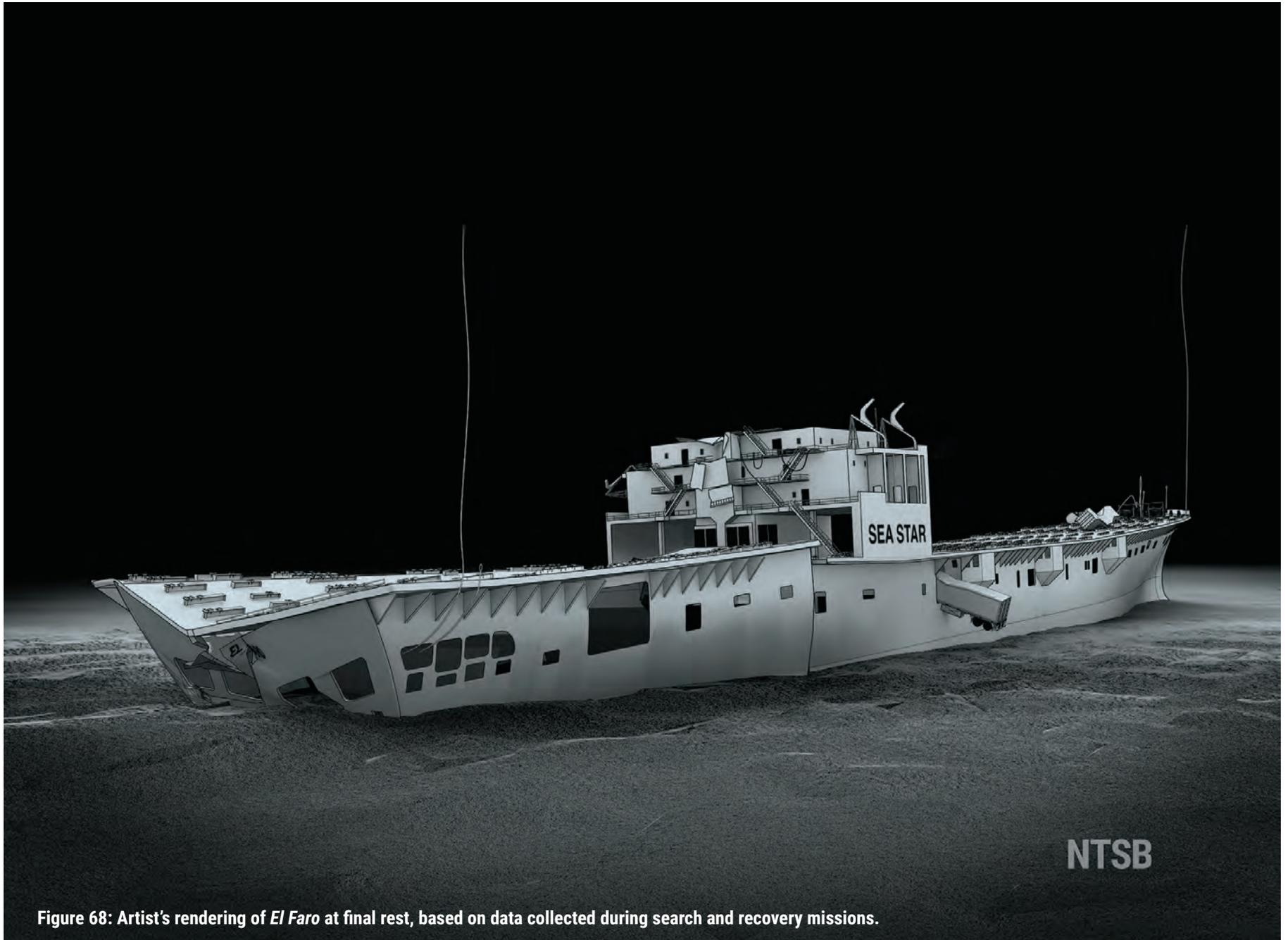


Figure 68: Artist's rendering of *El Faro* at final rest, based on data collected during search and recovery missions.

Sinking of the US Cargo Vessel *El Faro* – continued

Safety Issues

The NTSB investigated many issues to find out what happened, why it happened, and what needs to be done to prevent it from happening again.

Captain's actions

From early in the voyage, the captain made decisions that put his vessel and crew at risk, including making only minor course corrections to avoid Joaquin; relying on outdated weather sources; declining to change course or return to the bridge, even after receiving three calls from deck officers when he was not on the bridge; and introducing a port heel to shift water on the weather deck from starboard to port.

Use of noncurrent weather information

The captain continually referred to hours-old weather information from BVS. The watchstanders on the bridge were routinely getting more current information from the Sat-C terminal and from programs on satellite radio and The Weather Channel.

Late decision to muster the crew

After *El Faro* lost propulsion, the captain continued to voice his expectation that main propulsion would be restored. Although the captain did say he wanted “everybody up” at 0631, the general alarm didn’t ring until 0727, and the captain did not muster the crew until 0728.

Ineffective bridge resource management

Two members of the bridge team suggested or hinted that they disagreed with the captain’s decisions, but the captain disregarded their concerns. For their part, the bridge crew deferred to the captain’s authority and experience, rather than acting more assertively. Regardless, when the crew did voice concerns, the captain chose not to listen. The suggestions of not only one but



Figure 69: *El Faro*'s bridge

two of his officers should have prompted him to at least return to the bridge and review the weather information.

Although bridge resource management (BRM) stresses assertiveness, traditional maritime culture emphasizes the captain’s authority onboard and responsibility for the vessel. TOTE had not effectively implemented BRM, which involves modernizing centu-

ries-old roles and including the bridge team in discussions pertaining to the safe navigation of the vessel.

Inadequate company oversight

TOTE regarded captains as the primary nautical experts. According to one TOTE executive, “There is no one in the company that formally provides oversight for nautical.” Lack of training in BRM was one area in which company oversight failed. The company also failed to formally train crewmembers to use BVS, or on the damage-control module of a cargo-loading program called CargoMax. In addition, TOTE failed to track the vessel’s position relative to the storm and support the captain during the accident voyage.

Company's safety management system

The company’s safety management system did not provide the officers and crew with the necessary procedures to ensure safe passage, watertight integrity, heavy-weather preparations, and emergency response during heavy-weather conditions.

Flooding in cargo holds

Water initially flooded into the cargo holds through an open scuttle. This lowered deck friction coefficients and likely contributed to loose vehicles in hold 3, which likely damaged the emergency fire pump piping in the hold, allow-

ing seawater to flood the hold faster than the bilge pumps could remove it. The continued hold flooding and increasing list in heavy seas allowed seawater to downflood through the cargo hold ventilation system (see How the water got in, p. 57).

Loss of propulsion

The sequence of events leading to the ship’s loss of propulsion began with a sustained starboard list from beam winds and later flooding of a cargo hold. The captain acted to shift the starboard heel to a port heel. The port heel, in combination with momentary roll, likely allowed air into the lube oil system’s pump, which triggered a shutdown of the main propulsion engine (see Loss of lube oil suction, p. 59).

Downflooding through ventilation closures

El Faro's certificate of inspection required that cargo hold ventilation closures be kept open at sea when the vessel was transporting vehicles with fuel tanks. In rough weather with a threat of downflooding, it was critical that crewmembers understood that such closures must be secured to prevent flooding (see How the water got in, p. 57).

Need for damage control plan

There is no evidence on the VDR that the captain or crew consulted a plan or procedure for damage control during the heeling, propulsion loss, and flooding sequence. Investigators determined that the vessel had no damage control plan or booklet.

Lack of suitable survival craft

El Faro carried only open (not modern, enclosed) lifeboats. In addition, by the time the crew was abandoning ship, the severe weather, combined with *El Faro*'s list, made it unlikely that the side-mounted lifeboats could be boarded or launched.



Figure 70: *El Faro*'s starboard lifeboat on arrival at Coast Guard Air Station Miami.

Recommendations

We issued 10 early safety recommendations, followed later by 53 more recommendations in our accident report. Some of the results that these recommendations are intended to bring about are summarized here. To read the full findings and recommendations, see the report (MAR-1701) at www.nts.gov.

- Better tropical cyclone forecasting, storm advisories, and weather dissemination systems to improve the accessibility and quality of forecasts and advisories for planners and mariners
- Engines and other critical machinery that work at greater angles of inclination (i.e., despite more listing)
- Lifeboats that can be launched at still greater angles of inclination, so that they can be launched even if engines or other machinery fail
- Enclosed, not open, lifeboats
- Protected seawater supply piping in cargo holds
- Remote open/close indicators for watertight doors and hatches
- Guidance that actions intended to correct a list can be dangerous with cargo adrift
- Class-approved damage-control plans/booklets onboard all vessels, regardless of build date
- Review of the inspection program and improved oversight for vessel inspections
- Lifesaving appliances updated at least every 20 years
- Personal locator beacons for crewmembers
- Better VDRs and VDR testing
- Weather reporting by ships to global authorities every 6 hours at fixed times, using the automatic identification system
- Appropriate and recurrent BRM and meteorology training for all deck officers
- Improved processes, procedures, documentation, training, and shoreside support at TOTE
- External audit of TOTE's safety management system
- Functioning weather instruments on TOTE ships
- Heavy-weather procedures on TOTE ships that address oil levels in critical machinery

Recipients

In many cases, we issued companion recommendations to more than one entity with a single result in mind. In other cases, such as recommendations to TOTE, the hoped-for results were narrower and could be achieved by a single recipient. The recommendation recipients are:

- US Coast Guard
- Federal Communications Commission
- National Oceanic and Atmospheric Administration
- International Association of Classification Societies
- American Bureau of Shipping
- Furuno Electric Company, Ltd.
- TOTE Services, Inc.



Figure 71: Exemplar enclosed freefall lifeboat in launch position on a slipway

Special Report

Tropical Cyclone Information for Mariners

REPORT NUMBER
MSR1702

DATE ADOPTED
06/20/2017

This safety recommendation report was developed to enhance weather forecasting and distribution to mariners (containing no probable cause). The report concluded that critical tropical cyclone information issued by the National Weather Service (NWS) is not always available to mariners via well-established broadcast methods. The report suggested that modifying the way the NWS develops certain tropical cyclone forecasts and advisories could help mariners at sea better understand and respond to tropical cyclones. Further, the report referred to factual data on the official forecasts for several recent tropical cyclones, which indicated that a new emphasis on improving hurricane forecasts was warranted. The report issued a total of ten recommendations: seven to the NWS, two to the National Oceanic and Atmospheric Administration, and one to the Coast Guard.



Figure 72: NHC tropical cyclone track forecast cone and watches/warnings issued for Hurricane Joaquin at 0800 EDT on September 30, 2015.

VESSEL GROUP: **FISHING**

Sinking of Motor Vessel *Exito*

ACCIDENT LOCATION

BERING SEA4 MILES NORTH OF CAPE KALEKTA,
UNALASKA ISLAND

ACCIDENT DATE

12/06/2016

REPORT NUMBER

MAB1740

ACCIDENT ID

DCA17FM004

DATE ISSUED

12/15/2017



Figure 73: *Exito* in Dutch Harbor, March 2006.

PHOTO BY COAST GUARD

LESSONS

VHF Radio Reception 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 communication devices. If satellite communication is used as the designated alternate communication device, the number for the SAR center should be posted in the wheelhouse and in crew common areas and be known by crewmembers onboard. For any type of installed marine distress and alerting system, the captain and owner should ensure crewmembers are capable of using the system.

Safety Briefing for Non-Crewmembers

Prior to departure on a voyage, non-crewmembers should be given a complete safety briefing that includes actions to be taken during emergencies such as fire, flooding, or abandon ship, along with instructions on egress routes and survival equipment such as liferafts and immersion suits. During the safety briefing, immersion suits should be donned to ensure proper fit and familiarity with instructions.

Maintenance of Hull and Watertight Bulkheads

For the safety of a vessel and all on board, the hull and watertight bulkheads must be maintained and any deficiencies must be appropriately repaired. Known issues with watertight integrity and wastage need to be addressed by permanent means.

■ The NTSB determined that the probable cause of the sinking of the motor vessel *Exito* was progressive flooding from an undetermined location. Contributing to the loss of life was the carriage of personnel on board, other than crewmembers, who were inadequately prepared and equipped for an emergency.

On December 6, 2016, about 2140 local time, the motor vessel *Exito* sank while transiting from Dutch Harbor to Akutan, Alaska with five persons onboard. During the transit, the vessel began listing to starboard. Unable to determine the source of the list as it progressively increased, the captain ordered the deckhand and three contractors who were also on board to don immersion suits and abandon the vessel. The captain, deckhand, and one contractor evacuated to a liferaft, but the other two contractors were unable to escape the *Exito* before it sank. The survivors were recovered shortly afterwards by a good Samaritan vessel. About 2,000 gallons of diesel fuel, and twelve 55gallon drums of antifreeze were released into the sea when the *Exito* sank. The vessel was valued at about \$310,000.

Built in 1956 as an oil field service vessel, the steel-hulled *Exito* was converted to a crab fishing vessel in the late 1980's. In 2004 the vessel began operation as a live-aboard and fish plant wastewater-handling vessel. At the time of the accident the *Exito* was under charter to a fish processing company to haul wastewater from a plant on Akutan Island to an offshore mixing zone. However, on the accident voyage the *Exito* was tasked by its charterer with picking up cargo in Dutch Harbor and transporting three contractors.

The vessel departed Dutch Harbor about 1850 and encountered progressively increasing seas up to about 10 feet. Sometime after 2100, the vessel rolled and held a 2–3-degree starboard list. Eventually, pallets of cargo on the vessel's main deck broke free and began to shift. The captain aligned pumps in the engine room to discharge all water over the side, including cargo tanks, double bottoms and ballast water. When he returned to the wheelhouse, he witnessed two successive waves hit the forecastle and starboard-side railing, leaving much of the main deck under water. At that point, the captain sounded the general alarm.

The captain made a distress call on VHF radio and called the company owner who in turn contacted Coast Guard Sector Anchorage command center



Figure 74: *Exito* in Dutch Harbor, March 2006.

PHOTO BY COAST GUARD

(SCC Anchorage). The phone call from the company owner was the first notification that SCC Anchorage had of the *Exito*'s situation; the Coast Guard had no VHF reception coverage in the accident area and had not received the distress radio call.

The five people on board began donning immersion suits, but the contractors who did not have maritime training had difficulty. The captain had to assist one of them, managing to get the suit's hood on but only getting the zipper closed to the middle of his chest. This contractor reportedly said, "I can't do this."

The captain instructed the deckhand to prepare the liferaft for launching, but the deckhand could not launch the raft by himself, so the captain exited the wheelhouse to help him. He then returned to the wheelhouse, where he and one of the contractors tried to assist another contractor out the door. However, each time they tried to push him out, this contractor braced himself with his hands at the doorway and resisted exit.

Shortly after the liferaft was launched, the *Exito* sank. The captain, the deckhand, and one of the contractors swam to the liferaft, boarded it, and were rescued by the fishing vessel *Afognak Strait* about an hour later. Several Coast Guard units as well as three fishing vessels searched for the remaining two contractors; however, they were never located.

VESSEL GROUP: **FISHING**

Sinking of Fishing Vessel *Lady Gertrude*

ACCIDENT LOCATION

POINT PLEASANT, NEW JERSEY
ATLANTIC OCEAN ABOUT 40 NAUTICAL
MILES EAST-SOUTHEAST OF POINT
PLEASANT

ACCIDENT DATE

08/15/2016

REPORT NUMBER

MAB1739

ACCIDENT ID

DCA16FM051

DATE ISSUED

11/27/2017

Figure 75: *Lady Gertrude* before the accident.

PHOTO BY THE OWNER



On August 15, 2016, about 0150 local time, the fishing vessel *Lady Gertrude* began flooding through its propulsion shaft stern tube while preparing to dredge for scallops. The crewmembers abandoned ship and were rescued by a good Samaritan vessel before Coast Guard search-and-rescue assets arrived. The vessel sank at 0453. No one was injured. A light oil sheen was observed. The *Lady Gertrude* was valued at \$400,000.

The *Lady Gertrude* got under way from Point Pleasant Beach, New Jersey the day before the sinking with a captain and two deckhands aboard. About 0100 on August 15, the vessel arrived at the fishing grounds 40 nautical miles offshore. As the crew prepared the vessels gear the captain moved the engine throttles forward and noticed that the engine rpm responded normally but that the vessel did not accelerate. He then opened the fish hold and saw that the vessel's propeller shaft had fractured—the shaft was turning but was about 2 feet short of the stern tube stuffing box. Seawater in the hold was already above the shaft and was flooding through the 5-inch stern tube “like a fire hydrant.”

The captain radioed the Coast Guard, activated the VHF distress button, and energized the EPIRB. A nearby fishing vessel (*Maizey James*), a Coast Guard cutter, and helicopters from the New York Police Department and the Coast Guard converged on the *Lady Gertrude's* position.

By 0234, the flooding in the fish hold had reached about 6 feet, and the captain ordered abandon ship. The three crewmembers entered the vessel's inflatable liferaft and were picked up by the *Maizey James* crew at 0246. When notified that the crewmembers were safe, the responding Coast Guard and police assets departed the area. At 0453, with its decks awash and listing to port, the *Lady Gertrude* rolled to port and sank stern first.



Figure 76: Pre-accident image of *Lady Gertrude* under way. PHOTO BY THE OWNER

The vessel was fitted with four transverse bulkheads below decks. The forward-most bulkhead was watertight, but the bulkheads separating the engine room, fish hold, and lazarette were not.

A video of the wreck, shot by a diver the day after the sinking in 180 feet of water, showed that the propeller had shifted aft and was jammed against the rudder. The diver did not note any other apparent breaches to the hull.

■ The NTSB determined that the probable cause of the sinking of the

Lady Gertrude was the fracture of the propeller shaft forward of the stern tube stuffing box, resulting in uncontrollable flooding of the vessel's fish hold and progressive flooding through non-watertight bulkheads of the engine room and lazarette.



Figure 77: *Lady Gertrude* on the ocean floor. The propeller shaft has backed out of the stern tube and the shaft locking nut is jammed against the balanced rudder. PHOTO BY DEPTH CHARGE MARINE

VESSEL GROUP: PASSENGER

Flooding and Sinking of Small Passenger Vessel *Maximus*

ACCIDENT LOCATION
TURTLE BAY, MEXICO

ACCIDENT DATE
05/12/2016

REPORT NUMBER
MAB1733

ACCIDENT ID
DCA16FM039

DATE ISSUED
10/03/2017

Figure 78: *Maximus* in port.

PHOTO BY MAXIMUS SPORTFISHING



On the evening of May 12, 2016, the small passenger vessel *Maximus* began taking on water while under way near Turtle Bay, Mexico. The four crewmembers could not stop the flooding and abandoned ship into a liferaft, from which a good Samaritan vessel rescued them. No injuries or pollution were reported.



Figure 79: *Maximus* and its liferaft.

PHOTO BY CREWMEMBER ON GOOD SAMARITAN VESSEL

The *Maximus* was valued at \$575,000.

The *Maximus* was on a transit from Puerto Vallarta, Mexico, to San Diego, California, with no passengers and four crewmembers on board. The vessel stopped in Cabo San Lucas, Mexico to avoid heavy weather and resumed its voyage on the evening of May 10. While the captain was below deck eating dinner, he noticed the flooding, which had already reached 3 feet high in a forward compartment. Although the *Maximus* had high-level bilge alarms installed, they did not activate.

The crew used bilge pumps, a portable electric fuel-transfer pump, and bailing with buckets to control the flooding. At one point during the emergency, the mate donned a snorkel mask and jumped overboard, attempting to survey the underside of the hull. However, the ocean waves were pounding against the hull, and poor water clarity prevented him from effectively surveying below the waterline. As he made his way toward the bow on the starboard side, he discovered a “softball-size” section of the hull missing at the wooden spray rail by the waterline. As the mate described it, “a V-shaped piece was missing, a chunk [of the hull] was gone.”

The captain attempted to contact the US Coast Guard on marine single-sideband (SSB) radio without success. He then used a satellite phone to contact his spouse, who relayed the vessel's coordinates to the Coast Guard; at 1727, Coast Guard Sector San Diego received her call.

After trying unsuccessfully for more than an hour and a

half to stop the flooding, the crew launched a liferaft, boarded it alongside the vessel and activated the EPIRB. A Coast Guard helicopter arrived on scene about 1925. About 10 minutes later a good Samaritan vessel (*Shannon Dann*) who had heard the captain hailing the Coast Guard arrived and picked up the crew.

The *Maximus* had undergone hull repair about a year before sinking, after a Coast Guard inspection identified several deficiencies, including dry-rotted wood in several areas of its laminated wood hull and repair of a watertight bulkhead. During reinspection the deficiencies were noted as corrected.

■ The NTSB determined that the probable cause of the flooding and sinking of the vessel *Maximus* was a hull breach near the waterline from an unknown cause. Contributing to the accident was the ineffectiveness of the installed high-level bilge alarm system to alert the crew to water accumulating in the hull.

VESSEL GROUP: **FISHING**

Sinking of Commercial Fishing Vessel *Orin C*

ACCIDENT LOCATION

CAPE ANN, MASSACHUSETTS

ACCIDENT DATE

12/03/2015

REPORT NUMBER

MAB1705

ACCIDENT ID

DCA16PM008

DATE ADOPTED

02/15/2017



Figure 80: *Orin C*, taken the day the vessel departed Gloucester, Massachusetts, on December 1, 2015. PHOTO BY M. RING

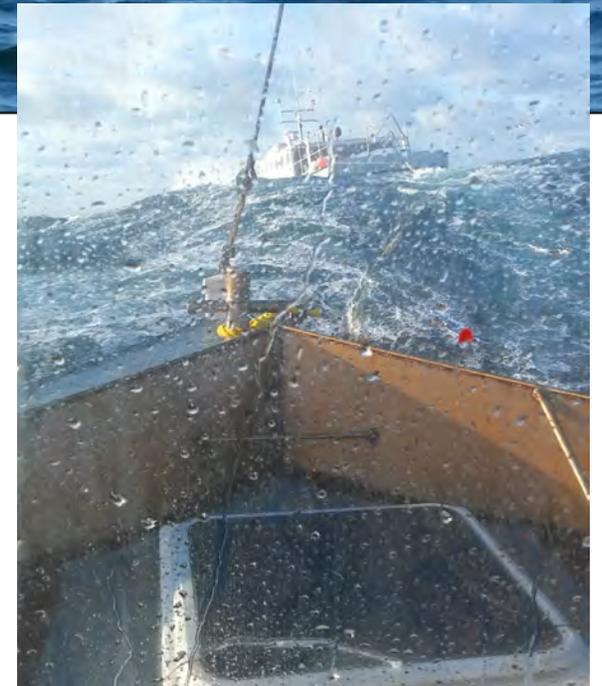


Figure 81: Photo taken from the *Orin C*, while being towed by the *Foxy Lady*, moments before the *Orin C* was hit by the wave that caused damage.

On December 3, 2015, at 2018 local time, the fishing vessel *Orin C* sank in the Atlantic Ocean about 13 miles east of Cape Ann, Massachusetts. All three crewmembers abandoned the vessel just before the sinking and were rescued by the Coast Guard motor lifeboat 47259. However, the captain of the *Orin C* became unconscious in the water before a Coast Guard crewman pulled him to the lifeboat. When examined aboard the motor lifeboat, the captain had no pulse. In response, Coast Guard crewmembers performed CPR, but he could not be revived. No one else was injured and no pollution resulted. The *Orin C* sank in about 300 feet of water and was not salvaged.

Earlier that day, the *Orin C* was fishing 34 miles offshore when the crew had discovered water in the main engine lubricating oil about 0800. The captain determined that the engine could not be operated, so he requested assistance from another fishing vessel, the *Foxy Lady*, which arrived at the *Orin C*'s location about 1100. By then, weather conditions had deteriorated and winds were about 20–25 knots and wave heights to 4–5 feet.

The *Foxy Lady* made up a tow line of about 200 feet to the *Orin C*, and commenced towing at about 4 to 4.5 knots. Weather conditions continued to worsen, with winds increasing to 25–30 knots and wave heights to 8–10 feet. At 1447, the *Orin C* was hit by a large wave that parted the tow line, damaged the overhead and visor of the wheelhouse, and broke out two forward windows. A crewmember, who estimated the wave to be about 15 feet high, also recalled hearing a “loud snap” and “creak” that sounded like the wood hull of the boat “coming unglued.” Crewmembers later concluded that the vessel must have “blown a plank” when impacted by the 15-foot wave.

The 4-inch nylon towline used, although suitable for towing, was not an ideal length—too short—for the sea conditions and the vessel being towed. The *Foxy Lady* captain commented that the wooden-hulled *Orin C* was heavier than his fiberglass boat and the type of line was all they had for the tow. The line parted several times



Figure 81: Photo of the *Orin C* taken at 1324 from the aft deck of the *Foxy Lady*. PHOTO BY *FOXY LADY* CAPTAIN

and would get shorter each time it parted and had to be repaired. Eventually, they were forced to use a 2-inch line because nothing else was available. The *Orin C* had only mooring lines on board and no lines for towing.

At 1459, the *Orin C* captain radioed the *Foxy Lady* captain stating that he thought he was taking on water. This information was also relayed to Coast Guard Sector Boston, who dispatched a response boat to assist.

Just as it was getting dark, the Coast Guard motor lifeboat 47259 arrived on scene. The Coast Guard crew passed an emergency dewatering pump to the *Orin C* crew, which was activated in the engine room, and took over the tow from the *Foxy Lady*—using an 800-foot Coast Guard towline from the Coast Guard vessel. By 1810 the tow recommenced in 10-foot seas and winds above 30 knots. About a half hour later, the *Orin C* captain informed the 47259 crew that the pump no longer had suction. The Coast Guard conveyed instructions for troubleshooting the pump, but the crew was unable to regain suction.

At 1949, the *Orin C* captain radioed that he had about a foot of water in the galley and expressed concern. Ten minutes later, he radioed that he was getting nervous, and shortly thereafter, his crew donned their immersion suits preparing to abandon the vessel.

The Coast Guard instructed the *Orin C* crew that each person should enter the water one at a time so that

they could be recovered individually. All crewmembers were wearing survival suits and entered the water from the vessel's stern. The first crewmember swam to the motor lifeboat, about 30 feet away and was picked up. The second crewmember and the captain were waiting for their turn to enter the water when the *Orin C* sank from under them, forcing both into the water. The second crewmember swam toward the motor lifeboat and was retrieved. The captain swam briefly, but then his movements ceased. A Coast Guard crewmember entered the water and swam to the captain and took hold of him. Both were pulled back to the motor lifeboat with a lifeline.

Once the captain was on board, the Coast Guard crew determined that he was not breathing and had no pulse. As the vessel headed toward shore, the crew performed CPR for more than an hour, but the captain did not survive. A Coast Guard rescue helicopter with an emergency medical technician-trained rescue swimmer was sent to assist but was unable to put the rescue swimmer on the lifeboat due to the sea conditions.

■ The NTSB determined that the probable cause of the sinking of the *Orin C* was the structural failure of the disabled vessel's wooden hull and subsequent flooding of the vessel while being towed in adverse conditions.

Figure 82: Motor lifeboat 47259 in Gloucester Harbor.



VESSEL GROUP: TOWING/BARGE

Sinking of Towing Vessel *Spence*

ACCIDENT LOCATION

CARIBBEAN SEAABOUT 115 NAUTICAL MILES NORTH OF
CARTAGENA, COLOMBIA

ACCIDENT DATE

12/14/2015

REPORT NUMBER

MAB1707

ACCIDENT ID

DCA16FM011

DATE ISSUED

03/24/2017



Figure 83: Towing vessel *Spence* under way in April 2015. PHOTO BY JOINT TASK FORCE GUANTANAMO PUBLIC AFFAIRS

On December 14, 2015, about 115 nm north of Cartagena, Colombia, the towing vessel *Spence* listed severely after taking on water. The list increased despite efforts by the crew to correct it. Consequently, the captain activated the vessel's EPIRB, and the crew climbed onto the barge that the *Spence* was towing. The towing vessel sank shortly thereafter. US Coast Guard District 7 received the EPIRB alert and directed the Coast Guard cutter *Decisive* to the scene. On arrival, the *Decisive* rescued the four crewmembers from the drifting barge. Three crewmembers sustained non-life-threatening injuries. The property damage to the vessel was estimated at \$1.5 million.

From September to December 2015, the *Spence* and the barge *Guantanamo Bay Express* completed a shipyard period involving extensive repairs at a shipyard in Cartagena. At the start of the period, 42 required hull, deck, tank and engineering repairs were identified for the vessel. On October 2, an ABS surveyor identified an additional 29 required work items, including steel repairs for wasted side-shell plating and tank structure.

Near the end of the repair period, the crew—a captain, a mate, an engineer, and a deckhand—arrived to prepare the *Spence* for a scheduled sea trial followed by a transit with the barge to Guantanamo Bay, Cuba. The vessel began fueling on December 8, but fueling had to be stopped because oil started leaking through the port fuel tank covers. The sea trial was canceled until the gaskets for the fuel tank covers were repaired. Following the repairs, a satisfactory sea trial was conducted on December 10.

The ABS surveyor returned on December 11 and identified additional deficiencies to the weathertight closures stackmounted machinery room ventilators, weathertight doors in the wheelhouse, and all portholes. The ABS-identified discrepancies were corrected the next day. On December 13, the *Spence* was made up to the *Guantanamo Bay Express* and departed Colombia en route to Cuba.

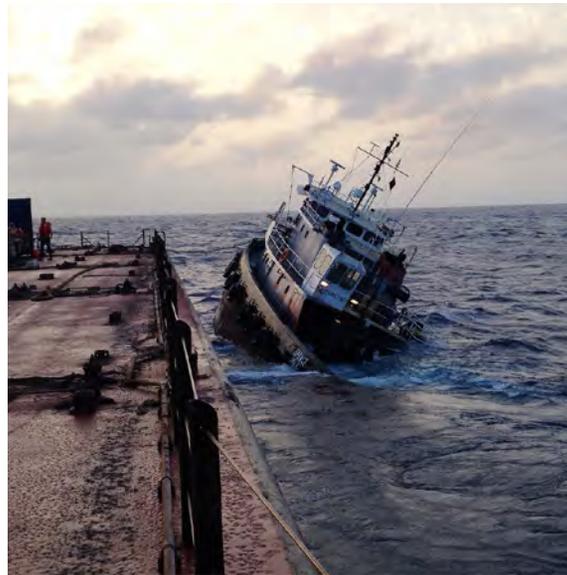


Figure 84: *Spence* shortly before sinking, after crewmembers had abandoned ship.

PHOTO BY SPENCE CREWMEMBER

The mate told investigators that at 1545, December 14, the *Spence* suddenly listed 25 degrees to starboard, prompting him to sound the general alarm. The crew mustered in the wheelhouse and saw that half of the stern was under water. The engineer and deckhand went to the engine room to investigate, while the mate made Mayday calls. The mate received no response to the distress calls due to no vessels being in the area, so the captain called the vessel's owner to report the situation and the vessel's position.

According to the engineer, the engine room appeared normal; the bilges were dry, the fuel tanks and potable water tank were not leaking, the main engine and generator were running normally, and the rudder hydraulic pump was running. The crew concluded that one of the aft compartments—either a void space or the rudder equipment room—had flooded, possibly where the stern tube or the rudder stock penetrated the hull. The engineer began transferring fuel from starboard to port, but this did not correct the list.

As the list continued to increase, the captain told the crew to prepare to abandon ship. He then activated the EPIRB while the mate maneuvered the towing vessel alongside the barge. All four crewmembers boarded the barge. About 1730, the *Spence* sank.

On receiving the EPIRB signal, the Coast Guard diverted the Coast Guard cutter *Decisive* to the EPIRB's broadcast position. A commercial containership, a Colombian Air Force surveillance aircraft, and the Colombian Navy Ship ARC *Punta Espada* also responded. About 0830 the next morning, December 15, the crew was transferred onto the *Decisive* via the cutter's rescue boat.

■ The NTSB determined that the probable cause of the sinking of the towing vessel *Spence* was gradual flooding from an unknown point of ingress into the aft void space followed by downflooding to the engine room.

VESSEL GROUP: **FISHING**

Flooding and Sinking of Fishing Vessel *Capt. David*

ACCIDENT LOCATION

OREGON INLET, NORTH CAROLINA

ACCIDENT DATE

02/15/2016

REPORT NUMBER

MAB1712

ACCIDENT ID

DCA16PM026

DATE ADOPTED

04/25/2017

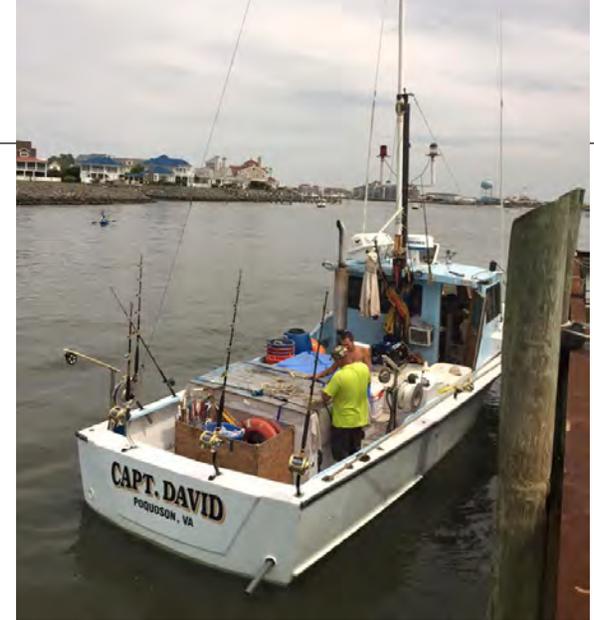


Figure 85: Bow and stern views of the *Capt. David* prior to the accident

PHOTOS BY CAPT. DAVID OWNER

On February 15, 2016, about 1440, the fishing vessel *Capt. David* became disabled and began flooding about 40 miles off Oregon Inlet, North Carolina, while attempting to assist another disabled fishing vessel in developing gale conditions. The Coast Guard responded by dispatching a shore-based motor lifeboat to assist both fishing vessels. The Navy dock landing ship *USS Carter Hall* was operating nearby the stricken vessels and launched its small boat to provide assistance as well. When the Navy boat arrived at the *Capt. David's* location, physical contact occurred between the vessels and flooding increased on the *Capt. David*. At the urging of the Navy crew, the fishing vessel's crew abandoned their vessel into the Navy boat about 1615. The fishing vessel later sank, likely the next morning. The crew of the other disabled fishing vessel declined rescue by the Navy boat and the vessel was towed back to Oregon Inlet by the Coast Guard motor lifeboat several hours later. No one was injured and no pollution was reported.

In the early afternoon, the *Capt. David* was about 20 miles offshore, heading inbound due to increasingly heavy weather, for which the National Weather Service had predicted seas building to 7 feet and winds increasing to 25–30 knots. Conditions were expected to worsen into the night, and a small craft advisory was in effect for the evening.

At 1330 the vessel it was fishing in company with, the *Miss Kaylee*, radioed to report an engine failure- leaving it adrift in the Gulf Stream. The *Miss Kaylee* was about 18 miles away to the northeast, so the *Capt. David* turned around and headed back offshore toward its location.

After the two vessels met, the *Capt. David* took the *Miss Kaylee* under tow. However, about 1440, the tow line parted and the *Capt. David's* throttle cable became disconnected from the engine. The crew opened the engine box to investigate the problem and found water entering the bilge from a leaking engine-mounted heat exchanger. To stop the leak, the captain shut the sea-water inlet valve, but he was forced to stop the engine to avoid overheating it. The captain told investigators



Figure 86: USS Carter Hall (LSD-50) under way.

PHOTO BY MC2 CORBIN J. SHEA, US NAVY



Figure 87: Navy 11MPL small boat being launched from Carter Hall, about 1530, prior to transiting to stricken fishing vessels Capt. David and Miss Kaylee.

PHOTO BY USS CARTER HALL CREW

that he then started the two battery-powered bilge pumps and used a portable generator to charge his two installed batteries. Both fishing vessels were now adrift.

About 1443, the captain of the *Miss Kaylee* radioed the Coast Guard to request assistance. Navy ship USS *Carter Hall* was operating near the fishing vessels and its crew notified the Coast Guard that the ship was responding. The *Carter Hall* established communications with the *Capt. David* and the *Miss Kaylee* and learned that both fishing vessels were taking on water, pumping bilges, and were dead in the water.

LESSONS

Heavy Weather

Mariners should exercise caution when heavy weather is forecasted, particularly while operating small and/or single-engine vessels. Increasing winds and sea states can precede storm fronts, and an emergency during these conditions risks endangering the crew and rescue response personnel. When heavy weather is predicted, mariners should consider delaying getting under way or an early return to port once under way. Additionally, it is prudent to carry a tow line suited for the size and displacement of the vessel.

The *Carter Hall* launched its motor patrol launch (PL) to assist the stricken fishing vessels, reaching the *Capt. David* first, just before 1600. The *Capt. David* captain told the PL boat officer that the Coast Guard was coming out to tow the vessel; alternatively, he wanted the PL to tow it. The boat officer stated that “nobody” was coming out to tow the *Capt. David*; the 11-meter-long PL could not tow it and was there only to take the crew aboard and return to the *Carter Hall*. After talking with the captain, the boat officer believed that the *Capt. David* was taking on water at a rate beyond its pumping capacity and that the fishing vessel and its crew were in imminent danger. Conversely, the *Capt. David* captain and a deckhand told investigators that the flooding was under control.

While the PL and the *Capt. David* were engaged, the Navy boat’s bow contacted the *Capt. David* at least three times. According to the PL coxswain, the contact was “normal boat-to-boat” contact and not sufficient to cause damage. The remaining PL crew described contact and scrapes, but no major damage. However, all three members of the *Capt. David* crew told investigators that the initial contact by the PL’s bow was forceful enough to crack a forward window on the fishing boat’s port side. They said that the final contact, between the bow of the PL and the stern of the *Capt. David*, resulted in immediate and substantial flooding. On evaluating the flooding, the captain decided to abandon his vessel.

Safety During Personnel Transfers at Sea

Prior to transferring from the *Capt. David* to the Navy boat, the fishing boat crew did not don personal flotation devices (PFDs), nor were they instructed to do so by the Navy boat crew. During the transfer, a crewmember mistimed his jump and nearly fell into the water. Based on the rough conditions and cold water, recovery of the crewmember in the water would have been difficult. Subsequent to the accident, the Navy group commander reviewed shipboard guidance to ensure procedures include donning PFDs prior to at-sea boat transfers. Even in the best conditions, individuals transferring between vessels at sea should always wear PFDs.

After the three fishermen were aboard the PL, the Navy boat moved to the *Miss Kaylee*. The *Miss Kaylee* crew, however, refused to abandon their vessel. The PL boat officer said that he was eventually given permission to return to the *Carter Hall*. Later that night, the *Miss Kaylee* was towed into Oregon Inlet by a Coast Guard 47-foot-long motor lifeboat and by early the next morning the *Capt. David* likely sank.

Before departing, the captain of the fishing vessel was aware of the forecast for increasing seas and waves (gale conditions), as well as a small craft advisory from a developing frontal system. His decision to fish and transit up to the onset of severe weather left little room for error.

■ The NTSB determined that the probable cause of the flooding and sinking of fishing vessel *Capt. David* was an engine cooling water leak that disabled the vessel during a forecasted small craft advisory and developing gale conditions.

VESSEL GROUP: **FISHING**

Sinking of Fishing Vessel *Capt. Kevin*

ACCIDENT LOCATION

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

ACCIDENT DATE

07/11/2016

REPORT NUMBER

MAB1732

ACCIDENT ID

DCA16FM043

DATE ISSUED

08/31/2017

At 0400 on July 11, 2016, the fishing vessel *Capt. Kevin* sank in shallow water along the western Sabine Pass jetty near the state border between Texas and Louisiana. The three crewmembers abandoned ship into the water, with one suffering minor injuries. Diesel fuel and other contaminants leaked from the vessel until it was raised and removed. The property damage was estimated at \$139,500.

The *Capt. Kevin* was outbound from the Sabine Pass Jetty Channel about 0315, returning to its homeport of Houston, Texas, with 2,000 pounds of shrimp. A crewmember heard what sounded like water entering the vessel. After opening a watertight hatch and discovering the source of flooding (in the forepeak), the crew did not close the same watertight hatch while they checked other spaces for flooding. The open hatch was below the waterline, and after filling the forepeak seawater progressively flooded the engine room and other compartments. The captain decided to ground the vessel in

shallow water before it sank but, in the process, struck the bow on the jetty rocks, which damaged the bow and increased the rate of flooding. The three crewmembers jumped into the water without donning life jackets, grabbing only the vessel's life ring. The captain and one of the deckhands climbed onto the jetty rocks to await rescue (the captain had radioed the Coast Guard for help). The other deckhand hung onto the life ring in the water and ingested diesel fuel leaking from the vessel. A responding Coast Guard rescue boat retrieved the three crewmembers about half an hour after the sinking; the injured crewmember was taken to a hospital.

The captain had made temporary soft-patch repairs to a damaged section of the fiberglass hull on the starboard side of the bow that extended below the waterline. He made the repairs using a store-bought fiberglass repair kit while the vessel was in the water. The section was 2 feet by 4 feet and located on the integral forepeak tank. The captain believed that, about 0300 on the morning of the sinking, the temporary fiberglass patch failed and the vessel began taking on water in the forepeak.

■ The NTSB determined that the probable cause of the sinking of the *Capt. Kevin* was (1) an inadequate and temporary hull repair that failed, allowing flooding of the vessel's interior spaces, and (2) the crew not securing the watertight hatch to the forepeak that would have contained the flooding to the forepeak tank.



Figure 88: The recovery of *Capt. Kevin* by derrick barge *Mr. Two Hooks*.

PHOTO BY COAST GUARD

VESSEL GROUP: TOWING/BARGE

Grounding of Articulated Tug and Barge *Nathan E Stewart/DBL 55*

ACCIDENT LOCATION

BELLA BELLA, BRITISH COLUMBIA, CANADA
 EDGE REEF, OFF ATHLONE ISLAND IN SEAFORTH CHANNEL

ACCIDENT DATE: 10/13/2016
 REPORT NUMBER: MAB1738

ACCIDENT ID: DCA17RM001
 DATE ISSUED: 01/21/2017

Figure 89: *Nathan E Stewart* postaccident.

PHOTO BY COAST GUARD



On October 13, 2016, at 0108 local time, the articulated tug and barge (ATB) *Nathan E Stewart/DBL 55* ran aground on Edge Reef off Athlone Island in the Seaforth Channel near Bella Bella, British Columbia, Canada. At the time of the accident, the *Nathan E Stewart* was en route to the Port of Vancouver, Canada, with the empty *DBL 55*. None of the crewmembers were injured, but environmental damage occurred when about 29,000 gallons of fuel and lube oil were released. Damage to the vessel and barge was estimated at \$12 million.

The *Nathan E Stewart* routinely transited from petroleum facilities in the state of Washington and Vancouver, British Columbia, with the double-hull *DBL 55* or one of the company's other tank barges loaded with refined petroleum products to be delivered to various ports in Alaska. At 2110 on October 11th the vessel departed Ketchikan and began its southbound transit to Vancouver by way of the Inside Passage (via the approved voyage plan). The second mate was on watch in the wheelhouse. He had been working shifts of 6 hours on, 6 hours off (including overnight work) while the ATB was unloading in port, but once under way, his schedule shifted to 4 hours on, 8 hours off.

On October 12th at 2300, the 2nd mate relieved the captain of the watch— an hour earlier than his scheduled rotation time at 2400. Shortly before 0100, while making about 9 knots with the autopilot engaged, the ATB missed a turn at its next waypoint. About the same time, a tankerman on watch tried to radio the second mate but received no response. Moments later, the tankerman felt a “shuddering,” as the ATB ran aground. The *Nathan E Stewart* suffered extensive bottom damage, flooding and later sank. The *DBL 55* had significant plating dam-



Figure 90: *Nathan E Stewart*, shortly after being hoisted by a crane. PHOTO BY KIRBY OFFSHORE MARINE

age from its bow to its stern—but none of its inner cargo tanks were compromised.

The second mate later admitted that he had fallen asleep. He said he was not taking any prescription medications, never been diagnosed with any sleep-related disorders, and felt that he was adequately rested during the 3 days preceding the accident. He said that on the underway watch rotation he would normally sleep from the time he

completed his early morning watch at 0400 until 1115, and then again for a second period of rest around 1900 before awakening to assume the 2400–0400 watch. It is unknown whether frequent variation between the two watch-rotation schedules affected his circadian rhythm. He had, however, awakened and relieved the captain earlier than usual on the night of the accident and lost an hour of sleep during his second rest period.

The company SMS required an additional watchstander in the wheelhouse when under way in pilotage waters (where the ATB was transiting at the time), but no evidence indicates that a second watchstander was ever present in the wheelhouse with the second mate.

In addition, the ATB's electronic chart system had an alarm function, which, if activated, would have sounded an alarm if the vessel went off-course. The second mate, who had the navigational watch, did not activate this function.

■ The NTSB determined that the probable cause of the grounding of the articulated tug and barge *Nathan E Stewart/DBL 55* was the second mate falling asleep while on watch. Contributing to the grounding was the ineffective implementation of the company's safety management system procedures for watchstanding.

VESSEL GROUP: **CARGO**

Grounding of Freighter *Roger Blough*

ACCIDENT LOCATION

SAULT SAINTE MARIE,
ONTARIO CANADA
GROS CAP REEFS

ACCIDENT DATE
05/27/2016

REPORT NUMBER
MAB1725

ACCIDENT ID
DCA16FM040

DATE ISSUED
07/06/2017

Figure 91: *Roger Blough* aground on Gros Cap Reefs.

PHOTO BY COAST GUARD



At 1312 local time on May 27, 2016, the lake freighter (laker) *Roger Blough* ran aground near the Gros Cap Reefs Light off Sault Sainte Marie, Ontario, Canada. The grounding occurred as the vessel entered the Birch Point Course section of the St. Marys River federal navigation channel from Whitefish Bay in eastern Lake Superior. No one was injured and no pollution was reported. The vessel sustained \$4.5 million in damage to its hull and cargo system.

The *Roger Blough* was downbound in Lake Superior with a cargo of taconite iron ore pellets. By late morning, the vessel was approaching the St. Marys River at the eastern end of the lake. Near the entrance to the river, the Gros Cap Reefs Light marked shoal water to the north of the navigation channel.

At 1138, the second mate on watch aboard the *Roger Blough* radioed VTS St. Marys River to make a mandatory position report. VTS advised him that downbound tugboat *Anglian Lady* was towing a stricken laker about 10 miles ahead of the *Roger Blough* and about 4.9 miles from Gros Cap Reefs Light. Because the *Roger Blough* was making full “sea speed” of about 14.5 mph and the *Anglian Lady* tow was making only about 5 mph, the *Roger Blough* second mate hailed the *Anglian Lady* master and proposed to overtake the tow. The two vessels confirmed overtaking arrangements at 1232.

The *Roger Blough* master had told the mate to reduce speed to about 13.5 mph when the vessel was 2 miles north of Gros Cap Reefs Light and down to about 11.5 mph when abreast of the light. The second mate later acknowledged that despite these instructions, he did not slow the ship.

At 1310, the *Roger Blough*'s centerline was on the outer edge of the left side of the channel, with its port side outside the channel and its speed began to slow. About 1312, the vessel passed over a charted 30-foot depth curve near the Gros Cap Reefs and hit bottom. The *Roger Blough*'s heading shifted about 8 degrees to port as the vessel continued to move forward for another 2 minutes, dragging the hull an additional ship length



Figure 92: *Roger Blough* aground near the Gros Cap Reefs Light. The distance to the light was 240 yards.

PHOTO BY COAST GUARD

over the reef's bedrock until the vessel came to rest.

A postaccident playback of the *Roger Blough*'s charting system showed that the vessel was straddling the edge of the channel as it approached Gros Cap Reefs, but the second mate told investigators that he was looking out the bridge windows and was not monitoring the track on the electronic chart.

The vessel's departure drafts were 27 feet 10 inches forward and 28 feet aft. Given that the *Roger Blough* was transiting at full speed in shallow water, it is likely that the effect of squat—an increase in the overall draft of a vessel when transiting at high speed through shallow water—exacerbated the existing dangerous situation presented by the vessel's straddling the channel boundary near the charted 30-foot depth curve near Gros Cap Reefs.

Two watchstanders were on duty at VTS St. Marys River on the day of the accident, and they told investigators that they were not aware that the *Roger Blough* was in danger until the crew reported that it had run aground. Had the watchstanders effectively monitored the vessel's track, they likely would have noticed that the *Roger Blough* was operating at the edge of the channel and approaching the shallow water near Gros Cap Reefs.

■ The NTSB determined that the probable cause of the grounding of the lake freighter *Roger Blough* was the second mate's failure to use all navigational resources to determine the ship's position as it approached shallow water near Gros Cap Reefs. Contributing to the accident was inadequate monitoring of the vessel by VTS St. Marys River.

LESSONS

Monitoring Rudder Order Response

Bridge team members should always monitor the helmsman's response to a rudder order for correct angle and direction of movement. If an error is detected, or if there is confusion about the order given, a correction or clarification should follow. The presence of a pilot on the bridge does not relieve the other bridge team members of their duty to actively monitor the vessel's position.

where barges from a nearby paper mill would load wood chips (wake reduction decreased the risk of damage to the barges and facility).

The pilot ordered speed changes and rudder commands as *Sparna* transited past the dock. At one point, as the pilot was issuing rudder orders to the helmsman, the helmsman erroneously applied port rudder instead of starboard. No one on the bridge noticed the helmsman's error; therefore, the ship continued turning toward the dock (on the ship's left side). The pilot shouted, "Hard to starboard! Hard to starboard!" and ordered full-ahead speed. The rudder angle began to correct; however, the boatswain who was positioned on the bow as lookout radioed the bridge that the *Sparna's* port side was only 1 meter away from one of the barges at the Georgia Pacific dock. The *Sparna's* bow started to turn away from the barge, and the pilot ordered midship and hard to port to keep the aft port side of the ship clear of the barge. However, at 2337, the VDR recorded a series of bangs and vibration noise, as the ship struck a charted shallow rock just off the wood chip dock. About a minute later, the boatswain radioed the bridge that the ship was "going down forward." Indeed, as the *Sparna* met and passed the *Yasa Gulten* at 2341, the *Sparna* began to list to port. Subsequent damage assessment revealed breaches several feet in length and height to both a ballast tank and the forepeak tank.

■ The NTSB determined that the probable cause of the grounding of bulk carrier *Sparna* was the failure of the pilot and the bridge team to monitor the helmsman's response to the pilot's rudder orders.

VESSEL GROUP: **CARGO**

Grounding of Bulk Carrier *Sparna*

ACCIDENT LOCATION

PORTLAND, OREGON

WAUNA CHANNEL, COLUMBIA RIVER,
ABOUT 50 MILES NORTHWEST OF PORTLAND

ACCIDENT DATE

03/20/2016

REPORT NUMBER

MAB1708

ACCIDENT ID

DCA16FM032

DATE ISSUED

04/10/2017

Figure 93: *Sparna* after the accident.

PHOTO BY COAST GUARD



Just before midnight on March 20, 2016, the outbound bulk carrier *Sparna* departed the navigation channel on the Columbia River and struck a rocky shallow area. No one was injured and no pollution resulted, but the grounding caused damage and flooding to the vessel's forward tanks. Damage to the *Sparna* was estimated at more than \$500,000; a nearby dock sustained about \$60,000 in damage.

A pilot with the local Columbia River Pilots Association was on board the *Sparna* for the outbound transit. About 4 hours into the voyage toward sea, the *Sparna* pilot radioed the pilot on an inbound bulk carrier, the *Yasa Gulten*, regarding plans for their upcoming starboard-to-starboard meeting in the Wauna Channel section of the Columbia River. Although the pilot explained his plan to the pilot on the *Yasa Gulten*, he did not explain it to the bridge team on his vessel, nor did they ask him about it. Shortly thereafter, at 2330, the pilot on the *Sparna* requested an engine rpm reduction from 96 rpm to 80 rpm. Again, he did not inform the *Sparna* bridge team why he decreased speed. He later told investigators that it was customary to minimize wake in that area because on the Oregon side of the channel was a dock



Figure 94: Rocks inside one of the ballast tanks.

PHOTO BY DONJON-SMIT, LLC

VESSEL GROUP: PASSENGER

Grounding and Subsequent Breakup of Small Passenger Vessel *Spirit of Kona*

ACCIDENT LOCATION

KAILUA BAY, HAWAII

ACCIDENT DATE

07/24/2016

REPORT NUMBER

MAB1727

ACCIDENT ID

DCA16FM046

DATE ISSUED

08/10/2017



Figure 95: *Spirit of Kona*.

PHOTO BY HAWAIIACTIVITIES.COM

About 0220 on July 24, 2016, in tropical storm conditions, the small passenger vessel *Spirit of Kona* broke loose from its mooring in Kailua Bay on the island of Hawaii. The vessel subsequently grounded on lava rocks, broke apart during continuous wave action, and sank. No one was on board, nor was anyone injured; however, the fuel and lube oil tanks ruptured and spilled about 275 gallons of oil into the sea and onto the rocks. The *Spirit of Kona* was a constructive total loss, valued at an estimated \$1.1 million.

The *Spirit of Kona* was a small US Coast Guard-inspected commercial passenger vessel that provided short-duration tours near Kailua-Kona. The vessel had operated since it was built in 2007, however, at the time of the accident it had been moored and inactive for 9 months.

About two days before the accident, the Island of Hawaii was placed under a tropical storm warning in advance of Tropical Storm Darby. The vice president of the vessel's operating company told investigators that, he checked on the vessel ahead of the storm, making sure that hatches were secured and mooring lines in good conditions. However, he took no additional precautions, such as setting anchor(s) or adding lines or anti-chafing wrap. Nobody remained onboard.

Once the storm hit, the crew of another vessel saw the *Spirit of Kona* break free. Due to the weather conditions and rate of drift of the *Spirit of Kona*, the crew of that vessel were unable to recover it. They tried to contact the vice president to no avail and then contacted the Coast Guard. Local police notified the vice president of the company.

Other vessels were moored in Kailua Bay on the night of the storm. According to the Coast Guard, the *Spirit of Kona* was the only vessel that broke loose from its mooring.

■ The NTSB determined that the probable cause of the grounding and subsequent breakup of the *Spirit of Kona* was the failure of the vessel's mooring equipment in tropical storm conditions. Contributing to the *Spirit of Kona* breaking free from its mooring was the failure of Blue Sea Cruises to take additional precautions to secure the vessel in advance of an oncoming tropical storm.



Figure 96: Wreckage of the *Spirit of Kona*.

PHOTO BY COAST GUARD

LESSONS

Maintenance of Lifting Gear

- Inspection, maintenance, and management of wire ropes are essential to the prevention of accidents.
- A deteriorated wire rope directly affects the ability to safely and reliably handle loads up to the rated capacity of the crane.
- Crane operators, signalmen, riggers, safety observers, and crewmembers should adhere to manufacturer operating guidelines, design limitations, safety precautions, and inspection and maintenance procedures.

Crane Operations

Workers participating in crane operations should ensure that they remain in a safe area during a hoist. Entering the drop zone while the hoist is in progress puts them at risk.

VESSEL GROUP: **CARGO**

Equipment Failure on Bulk Carrier *Asia Zircon II*

ACCIDENT LOCATION
GALVESTON, TEXAS
 PIER 34, PORT OF GALVESTON

ACCIDENT DATE: **07/08/2015** REPORT NUMBER: **MAB1710**

ACCIDENT ID: **DCA15LM026** DATE ISSUED: **04/20/2017**

Figure 97: *Asia Zircon II* at berth in 2016.

PHOTO BY FARID MERNISSI



On July 8, 2015, at 0857 local time, the bulk carrier *Asia Zircon II* was offloading a cargo of wind turbine towers in the Port of Galveston, Texas, when the lifting wire rope for one of the ship’s deck cranes parted while hoisting a tower section out of the cargo hold. The wire failure caused the tower to fall back into the hold, damaging the tower and other tower sections still in there. Two of the five longshoremen inside the cargo hold suffered non-life-threatening injuries. No pollution was reported. Damage was estimated to exceed \$1.5 million.

The *Asia Zircon II* had 84 wind turbine tower sections on board and cargo hold no. 4 held 10 base sections weighing 66 metric tons each. The longshoremen were offloading these base sections when a “popping” sound occurred. Recognizing that the sound meant a wire rope splitting, a foreman shouted to the longshoremen in the cargo hold to “hit the deck!” Because the longshoremen were between sections of the tower bases, which absorbed the impact from the falling cargo, they were protected. Numerous items of debris were ejected from the tower base sections as a result of the impact and the compression forces from the falling section. The debris was mostly broken pieces of metal, sheered nuts and bolts, parts of the towers’ footings, and securing structures. One of the longshoremen in the cargo hold reported that he was hit by the flying debris; another said he was injured while taking cover. Both injuries were minor.

Postaccident examination found that the incident was precipitated by the failure of the wire rope from the vessel’s crane no. 4. Pieces of the failed wire rope and the cargo slings used in the lift revealed, in part, that the four sections of the failed wire rope (from the drum, the free end, the failure end, and the shackle end) showed signs of inadequate lubrication; the lubricant was not distributed down into the inner wire surfaces. The lack of lubrication caused excessive wear on the wire contact surfaces, particularly those not near the surface where the lubricant was applied. Cracks propagated out from the areas of excessive wear into the individual wire

strands, creating stress concentrations and gradually reducing the load capacity of the rope.

The ship company’s SMS detailed maintenance and inspection procedures for crane wires, requiring pre-operation checks of lifting equipment before arrival in port. Investigators were informed that these checks were conducted before arrival in port at about the same time as wirerope greasing was ordered, but no documentation identified which equipment and components were checked. The SMS manual also highlighted, “When lubricating crane wires, it is necessary to remove old grease and residue to inspect the strands, with particular attention to those areas of any wire which are not visible. . . . [It is] completely unsatisfactory to lubricate merely the [immediately visible and accessible] parts of the wire.”

■ The NTSB determined that the probable cause of the failure of the lifting wire rope of crane no. 4 on the bulk carrier *Asia Zircon II* was inadequate lubrication due to ineffective maintenance resulting in excessive wear of the wire rope.

Special Report

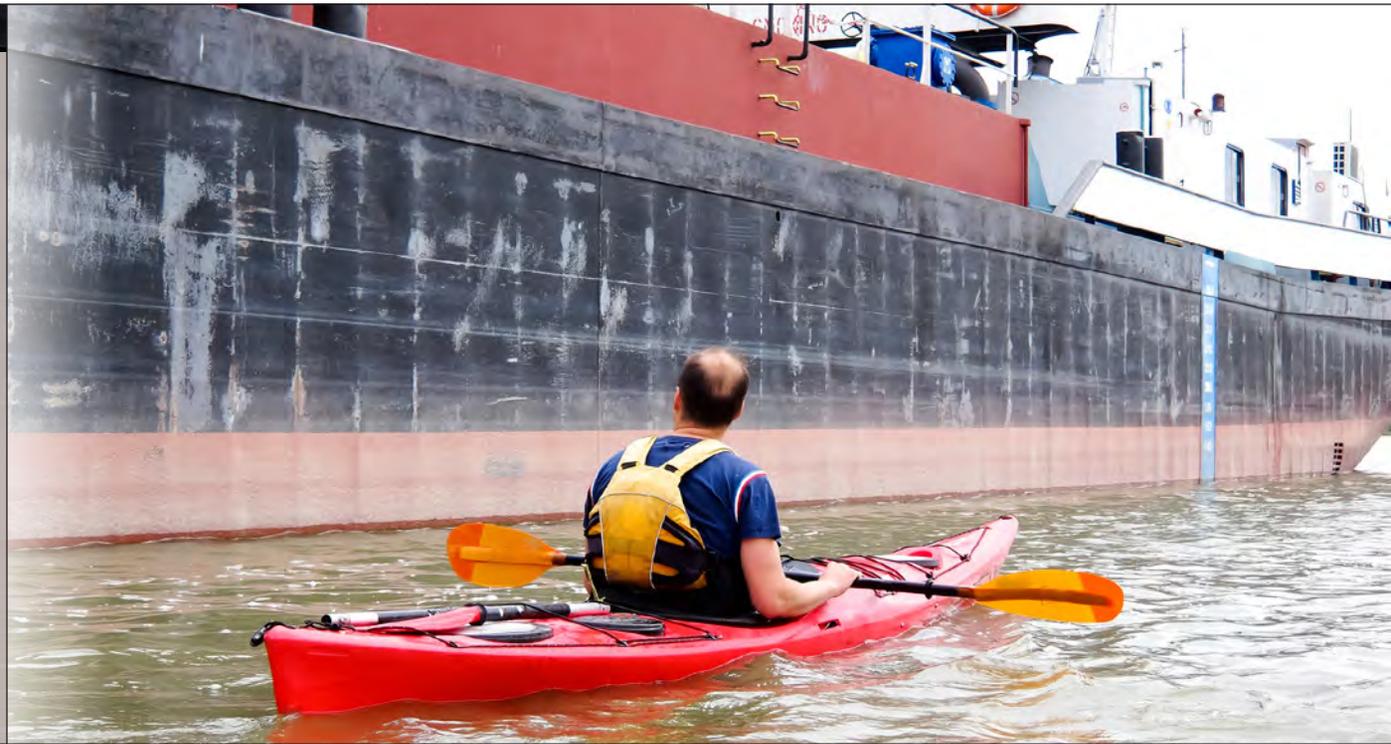
Shared
Waterways
SafetyACCIDENT LOCATION
MULTIPLEACCIDENT DATE
MULTIPLEACCIDENT ID
DCA15SS003REPORT NUMBER
MSR1701DATE ADOPTED
01/25/2017

Figure 98: Kayaks pass commercial barge on Chicago River.

PHOTO BY LARRY DOSTAL



On August 30, 2016, a group of eight kayakers set off from a dock in New York City for a guided tour along the Hudson River. As the tour passed the New York Waterways ferry piers, a commercial ferry backed out of its berth, then turned west to head toward New Jersey. The kayak tour guide attempted to signal the ferry by waving his arms, but because of sun glare the ferry captain did not see the paddlers in time to avoid colliding with them. Three kayakers were injured in the collision.

The accident illustrated the dangers of recreational and commercial vessels operating on our nation's waterways, and several stakeholders had previously discussed with NTSB their concerns rising from an increase in encounters between these types of vessels. The NTSB sought to better understand the scope of the issue and determine the extent to which the safety of our nation's waterways is impacted. In January 2017, the NTSB released *Shared Waterways*, which provided the NTSB's findings from this investigation as well as recommendations to improve safety.

In examining shared waterway safety, investigators reviewed relevant literature, examined recent Coast Guard data on collisions between recreational and commercial vessels, and visited major ports—Chicago, Illinois; San Diego, Los Angeles/Long Beach, and San Francisco, California; and Portland, Oregon—where they interviewed various waterway users. Additionally, investigators explored the issue with stakeholders in Memphis and Nashville, Tennessee, and Louisville, Kentucky. NTSB investigators also met with Coast Guard representatives directly tasked with waterways management and accident prevention, along with Coast Guard headquarters personnel involved in policy development regarding recreational vessel and waterway oversight.

LESSONS

Shared Waterways

During the development of this report, the NTSB learned of best practices in each port that have applicability across the entire marine transportation system. These included:

- **Chicago** kayak rental companies outfitted their group tour guides with radios to allow them to communicate with commercial operators directly, as needed. Rental craft were also well-marked with information that allows other vessels to identify the nature of the tour groups or the rental company names.
- **San Francisco** HSC stakeholders developed informational stickers about basic marine safety that were given to kayak rental facilities to affix to rental kayaks.
- **Portland** HSC stakeholders developed “Operation Make Way” to inform local fishermen of the need to avoid the shipping channel and areas in which commercial vessels operate, and one of the marine pilot associations in the area voluntarily bought commercial air time on local radio stations to inform boaters of the hazards of encroaching on shipping lanes.
- **San Diego** HSC stakeholders published a waterway management guide targeting recreational vessel operators and proposed that sections of the bay be set aside only for personal watercraft use during certain times of the day.
- **Nashville** local officials posted signs on the Cumberland River at multiple access points where kayak rental companies routinely launch. These signs warned operators of the risk presented by commercial vessels. Additionally, commercial operators sounded their vessels’ horns before navigating blind bends in the downtown area to warn paddlers of their approach.

During the port visits, investigators observed sightseeing tours from the wheelhouses of commercial vessels in Chicago, San Diego, and San Francisco to discern firsthand the nature and severity of commercial and recreational vessel interactions. Vessel observations were conducted at peak times when vessel traffic was considered to be the highest. In addition to sightseeing vessels, investigators rode aboard a pilot vessel in the port of Long Beach and aboard a San Diego Harbor Police boat escorting a large passenger vessel.

Although each port was unique, the results of the visits, stakeholder interviews, and observation rides were similar, with the exception of Chicago. Both commercial and recreational vessel operators in each port stressed the need for recreational vessel operators to be familiar with basic navigation rules. They also expressed concern for the safety implications of the continued proliferation of kayaks, canoes, and stand-up paddleboards. Outside of Chicago, operators, crewmembers, and other stakeholders generally believed that waterways were sufficiently large or that their layouts were such that the interaction of recreational vessels with commercial vessels could be safely managed. Chicago, in contrast to other ports, had unique risks involving interactions between recreational and commercial vessels because of the limited area in which vessels can maneuver, particularly in the Chicago River.

The NTSB found that, despite often competing objectives, in almost all cases port stakeholders work cooperatively to enhance waterway safety. Cooperation is needed because shared waterway safety issues are a function of geography, vessel types, predominant weather, and other local factors. Local stakeholders working cooperatively are in the best position to address local issues through mutual respect and a shared commitment to safety. Because of changes in waterway use over time, this engagement is most effective if done at regular intervals. Once strategies to mitigate risk have been developed, they need to be shared among the stakeholders—both in and between the ports and waterways.

■ As a result of this investigation, the NTSB concluded that harbor safety committees—local associations of maritime stakeholders who meet to discuss and develop local solutions to waterway safety issues—can substantively improve safety between commercial and recreational vessels if risks are regularly identified, practices are developed and implemented to mitigate these risks, and these practices are shared with stakeholders and other harbor safety committees. The NTSB also concluded that all recreational vessel operators need to attain a minimum level of boating safety education to mitigate the various risks associated with the type of vessel being operated. The NTSB recommended that the Coast Guard renew its efforts to seek legislative authority to require recreational boaters to obtain this safety education. Finally, the NTSB recommended that *A Guide to Multiple Use Waterway Management*, a publication produced by the National Water Safety Council and the National Association of State Boating Law Administrators last revised in 2004, should be reviewed and updated at regular intervals.



Lessons Learned

Figure 99: NTSB investigators on *El Yunque* (sister ship to *El Faro*) while it's docked at Jacksonville.

This year's edition of *Lessons Learned* could arguably be titled *Lessons Relearned*, as many of the issues noted in 2017 accident reports were recurring topics. Issues such as fatigue, poor bridge resource management, and distraction are not new and deserve reemphasis.

The NTSB continues to make safety recommendations focusing on these issues, but the real action to address them must come from vessel owners, operators, and crews.



Watertight Integrity

The failure to maintain watertight integrity was the number one cause of vessel losses during the 2017 reporting year. To protect personnel, vessels, and the environment, it is good marine practice for owners to conduct regular oversight and maintenance of hulls and watertight bulkheads, even during layup periods. Oversight should include monitoring the hull thickness, maintaining sufficient marine coatings, and using cathodic protection systems. Known issues with watertight integrity and wastage need to be repaired using permanent means. Bilge piping and pumps should be in good working order and alarms should be tested regularly. Watertight doors should be checked and maintained to ensure they are properly sealed when closed. While under way, all watertight doors should be closed at all times.

■ Loss of watertight integrity was a factor in the *Alaska Juris*, *Capt. David*, *Capt. Kevin*, *El Faro*, *Exito*, *Hammerhead*, *Lady Gertrude*, *Lydia & Maya*, *Maximus*, *Orin C*, and *Spence* accidents.



Heavy-Weather Operations

Mariners should always exercise caution when heavy weather is forecast. Although adverse conditions are a particular concern for small vessels, large vessels are not immune to the effects of Mother Nature. Increasing winds and sea states can precede the actual storm fronts, and an emergency during these conditions risks endangering the crew and rescue response personnel. When dangerous conditions are predicted, mariners should consider delaying getting under way, returning to port early, or altering the vessel's route. If heavy weather cannot be avoided, special care must be taken to ensure cargo remains secured and watertight integrity is maintained.

■ Heavy weather was a factor in the *Capt. David*, *Celebrity Infinity*, *El Faro*, *Orin C*, and *Spirit of Kona* accidents.



Fatigue

Despite wide-ranging research and well-publicized information about the dangers of excessive sleep-loss, fatigue continues to be a leading cause of accidents in all modes of transportation. In marine transportation, this is particularly true in high-tempo sectors such as the fishing industry, but it is not limited to this sector. Fatigue impacts responsiveness, decision-making ability, judgment, and productivity. It puts mariners in danger. Crewmembers should recognize the effects of fatigue and get adequate rest. Vessel owners and operators should adopt policies to mitigate the effects of fatigue and provide a sufficient complement of crew to allow for required rest. Fatigue is not a badge of honor; it is a recipe for disaster.

■ Fatigue was a factor in the *Cerro Santiago/Tampa*, *Lydia & Maya*, *Nathan E Stewart/DBL 55*, and *Specialist* accidents.

Lessons Learned – continued**Bridge Resource Management**

Bridge resource management (BRM) is the use of all available resources to safely operate the vessel. This includes equipment, such as radar and charting systems, and input and feedback from all watchstanders. Visual cues alone are often not enough to ensure that a vessel is clear of danger. Wind and other weather conditions, as well as hidden dangers such as shoal water, can present challenges that are not readily apparent. The collective vigilance of the watchteam mitigates the weaknesses or oversight of any one watchteam member.

■ Failure to use available electronic equipment to aid visual navigation was a factor in the ***Matachin/Thetis*** and ***Roger Blough*** accidents. A failure of oversight, a failure to respond to watchteam inputs, and/or a failure to use watchteam members to aid in navigation were contributing factors in the ***Amy Frances, El Faro,*** and ***Carnival Pride*** accidents.

The presence of a pilot on board does not relieve bridge team members of their responsibilities for the safe navigation of the ship. The master and the officer of the watch must collaborate closely with the pilot to maintain an accurate check of the ship's position

and movement. In addition, they must not hesitate to challenge or, if necessary, take appropriate action to prevent a collision, a grounding, or an allision. Communications should be open and, where circumstances permit, involve discussion of the intended maneuver or any deviations from the plan.

■ Inadequate bridge resource management during piloting situations was a factor in the ***Matachin/Thetis, Nordbay, Ocean Freedom,*** and ***Sparna*** accidents

**Cell Phones and Distraction**

Using cell phones and other portable electronic devices has been demonstrated to be visually, manually, and cognitively distracting. Talking on cell phones can have serious consequences in safety-critical situations, and texting can be even more distracting because it requires visual attention to the display screen of the device. Control of the vessel and attention to the safe handling of the ship must be maintained at all times until the ship is safely anchored or moored. Cell phone use has been a factor in accidents in all transportation modes.

■ Distraction due to cell phone use was a factor in the ***Aris T*** and ***Nordbay*** accidents.

**Anchoring in High Water and Strong Currents**

The risk of dragging or losing an anchor is substantially increased in rivers and channels during periods of high water and strong currents. Mariners should adhere to Coast Guard advisories and pilot association guidance for the prevailing conditions and be able to respond effectively to an anchor-dragging situation. Mariners should consider measures such as increasing the scope of anchor chains, stationing navigation and engineering watches, keeping propulsion and steering systems at the ready, and retaining a pilot on board.

■ Anchor-dragging in high water and strong currents was a factor in the ***Manizales/Zen-Noh Grain Pegasus*** and ***Star of Abu Dhabi*** accidents.

**Preventive Maintenance**

Without necessary preventive maintenance, equipment cannot be relied on to perform as designed and may fail during critical operations. Mariners should review the manufacturer's manuals and guidance on a regular basis to ensure conformance with recommended maintenance plans. Maintenance should be carried out in accordance with manufacturer's instructions and with the appropriate tools. Additionally, owners and operators should ensure that personnel performing maintenance are adequately trained and qualified for the work.

■ A failure to perform maintenance in accordance with manufacturer's periodicity and procedures using qualified personnel and proper tools was a factor in the ***Adventure Hornblower, Asia Zircon, Carnival Liberty,*** and ***The Admiral*** accidents.



Safety Management Systems

The NTSB has investigated numerous accidents across all modes of transportation where a properly implemented safety management system (SMS) could have prevented injuries, loss of life, or material damage. An effective SMS has a company safety policy, a risk management program, a safety assurance system, and a safety promotion program. The safety policy is management's commitment to continually improve safety. The risk management program determines the need for, and adequacy of, new or revised risk controls based on the assessment of acceptable risk. Safety assurance is management's system of internal evaluation intended to assure the execution of safety-related measures and to make certain that employees understand their roles. The safety promotion program advances the principal of safety as an organizational core value using practices that support a sound safety culture.

■ An inadequate or poorly implemented safety management system was a factor in the *El Faro*, *Nathan E Stewart/DBL 55*, and *Peter F Gellatly* accidents.



Monitoring Rudder Order Response

Bridge team members should always monitor the helmsman's response to rudder orders for correct angle and direction of movement. If an error is detected or if there is confusion about the order given, a correction or clarification should follow. The presence of a pilot on the bridge does not relieve the other bridge team members of their duty to actively monitor the vessel's position.

■ An incorrect response to a rudder order and the pilot and bridge team's failure to recognize the error in a timely manner were factors in the *Sparna* accident.



Vessel Abandonment

In the event that personnel must abandon a vessel in an emergency, both passengers and crew must have sufficient information, training, and equipment so that they can survive until rescue. Lifeboat and liferaft assignments must be updated after crew changes. Crewmembers must be trained on the proper use of all lifesaving and survival gear on board. Non-crewmembers should be given a complete safety briefing prior to departure that includes actions to be taken during emergencies. Where applicable, personnel should have access to properly sized immersion or exposure suits. During training or safety briefings, immersion suits should be donned to ensure proper fit and familiarity with instructions.

■ Inadequate preparation for abandonment was a factor in the *Alaska Juris* and *Exito* accidents.



VHF Reception

Mariners that operate offshore or in remote waters should be aware of ship-to-shore VHF coverage limitations and have an alternate means to contact search and rescue centers, such as satellite communication. Crewmembers should be familiar with and able to use all of the vessels installed marine distress and alerting systems.

■ The inability to raise CG rescuers with VHF or single side-band radios was a factor in the *Maximus* and *Exito* accidents.

Vessel Particulars

Vessel	Flag	Type	Length	Draft	Beam/Width	Persons on Board	Page Number
Adventure Hornblower	United States	Small passenger vessel	142.8 ft (43.5 m)	10.5 ft (3.2 m)	33.0 ft (10.1 m)	149	6
Alaska Juris	United States	Fish-processing vessel	218.2 ft (153.4 m)	25.9 ft (7.6 m)	42 ft (20.4 m)	46	54
American Eagle	United States	Fishing vessel	292.4 ft (89.2 m)	22.2 ft (6.75 m)	47 ft (14.3 m)	44	38
Amy Frances	United States	Towing vessel	140 ft (42.7 m)	9.6 ft (2.9 m)	38 ft (11.6 m)	7	8
Aris T	Greece	Bulk carrier	753 ft (229.5 m)	37 ft (11.2 m)	121 ft (36.9 m)	21	36
Asia Zircon II	Singapore	Bulk carrier	623 ft (189.9 m)	41.3 ft (12.6 m)	106 ft (32.3 m)	21	79
Capt. David	United States	Fishing vessel	36 ft (11 m)	4.5 ft (1.4 m)	10 ft (3.1 m)	3	72
Capt. Kevin	United States	Fishing vessel	68.8 ft (21 m)	Unknown	22.1 ft (6.7 m)	3	74
Carnival Liberty	Panama	Cruise ship	951.8 ft (290.2 m)	27.3 ft (8.3 m)	143 ft (43.6 m)	Unknown	40
Carnival Pride	Panama	Cruise ship	960 ft (292.5 m)	29 ft (8.8 m)	105.6 ft (32 m)	3,362	10
Celebrity Infinity	Malta	Cruise ship	863.3 ft (263.2 m)	27.3 ft (8.3 m)	105.7 ft (32.2 m)	3,131	12
Cerro Santiago	Panama	Towing vessel	94.8 ft (28.9 m)	20.3 ft (6.2 m)	44.3 ft (13.5 m)	5	26
Courage	United States	Ro/Ro	652.9 ft (199 m)	38.1 ft (11.6 m)	105.8 ft (32.3 m)	24	42
Crimson Gem	United States	Towing vessel	195 ft (59.4 m)	10 ft (3 m)	54 ft (16.5 m)	10	34
El Faro	United States	Ro/Con	790.8 ft (241 m)	29.7 ft (9.1 m)	105 ft (32 m)	33	56
Exito	United States	Fish-tender vessel	117.4 ft (35.8 m)	7.9 ft (2.4 m)	36.8 ft (11.2 m)	5	64
Hammerhead	United States	Offshore supply vessel (dive support)	163.3 ft (49.8 m)	14 ft (4.3 m)	38 ft (11.6 m)	0	52
Jaxon Aaron	United States	Towing vessel	129.5 ft (39.5 m)	10 ft (3.3 m)	42 ft (12.8 m)	9	44
Kodiak	United States	Towing vessel	63 ft (19.2 m)	8 ft (2.4 m)	24 ft (7.3 m)	4	14
Lady Gertrude	United States	Fishing vessel	64.8 ft (19.8 m)	10.3 ft (3.1 m)	22 ft (6.7 m)	3	66
Lydia & Maya	United States	Fishing vessel	71.5 ft (21.8 m)	10.9 ft (3.3 m)	20.5 ft (6.2 m)	4	22
Manizales	Portugal	General cargo	389.7 ft (118.8 m)	25.8 ft (7.9 m)	50.2 ft (15.3 m)	12	28

Vessel	Flag	Type	Length	Draft	Beam/Width	Persons on Board	Page Number
<i>Matachin</i>	Panama	Towing vessel	93.5 ft (28.5 m)	12.5 ft (3.8 m)	40.6 ft (12.4 m)	7	30
<i>Maximus</i>	United States	Small passenger vessel	59.8 ft (18.2 m)	4.8 ft (1.5 m)	20 ft (6.1 m)	4	67
<i>Michael G Morris</i>	United States	Towing vessel	170.1 ft (51.8 m)	9.8 ft (3 m)	48 ft (14.6 m)	8	15
<i>Nathan E Stewart</i>	United States	Articulated tug and barge	95.3 ft (29 m)	12 ft (3.6 m)	32 ft (9.7 m)	7	75
<i>Nordbay</i>	Cyprus	Tanker	817 ft (249 m)	30.2 ft (9.2 m)	144 ft (44 m)	24	16
<i>Ocean Freedom</i>	United States	Heavy lift vessel	504.6 ft (153.5 m)	23 ft (7.1 m)	76.1 ft (23.2 m)	16	31
<i>Orin C</i>	United States	Fishing vessel	51.5 ft (15.1 m)	5.1 ft (1.6 m)	16.1 ft (4.9 m)	3	68
<i>Peter F Gellatly</i>	United States	Towing vessel	94.8 ft (28.9 m)	14.5 ft (4.4 m)	34 ft (10.4 m)	5	18
<i>Raffaello</i>	United States	Fishing vessel	174.2 ft (53.1 m)	19.5 ft (5.9 m)	40 ft (12.2 m)	17	46
<i>Ricky J LeBoeuf</i>	United States	Towing vessel	67 ft (20.4 m)	8 ft (2.4 m)	24 ft (7.3 m)	17	24
<i>Roger Blough</i>	United States	Freighter	858 ft (261.5 m)	27.9 ft (8.5 m)	105 ft (32 m)	24	76
<i>Sparna</i>	Panama	Bulk carrier	623.3 ft (189.9 m)	39.3 ft (12 m)	105.8 ft (32.3 m)	20	77
<i>Specialist</i>	United States	Towing vessel	84 ft (25.6 m)	9.2 ft (2.8 m)	26 ft (7.9 m)	4	32
<i>Spence</i>	United States	Towing vessel	90.7 ft (27.7 m)	9.8 ft (3 m)	26 ft (7.9 m)	4	70
<i>Spirit of Kona</i>	United States	Small passenger vessel	70 ft (21.3 m)	8 ft (2.4 m)	28 ft (8.5 m)	0	78
<i>Star of Abu Dhabi</i>	Panama	Bulk carrier	737.9 ft (224.9 m)	41.6 ft (12.7 m)	105.6 ft (32 m)	21	20
<i>Tahoe Queen</i>	United States	Small passenger vessel	119 ft (36.3 m)	6.4 ft (2 m)	30 ft (9.1 m)	5	47
<i>Tampa</i>	United States	Coast Guard cutter	270 ft (82 m)	14.5 ft (4.4 m)	38 ft (12 m)	118	26
<i>The Admiral</i>	United States	Towing vessel	112.5 ft (34.3 m)	8.2 ft (2.5 m)	34 ft (10.4 m)	6	50
<i>Thetis</i>	United States	Coast Guard cutter	270 ft (82 m)	14.5 ft (4.4 m)	32 ft (12 m)	90	30
<i>Thomas Dann</i>	United States	Towing vessel	105 ft (32 m)	12.8 ft (3.9 m)	30 ft (9.1 m)	6	48
<i>Yangtze Ambition</i>	Hong Kong	Bulk carrier	590.2 ft (180 m)	24.3 ft (7.4 m)	93.3 ft (28.4 m)	22	34
<i>Zen Noh Grain Pegasus</i>	Panama	Bulk carrier	623.1 ft (189.9 m)	22.2 ft (6.8 m)	105.8 ft (32.2 m)	22	28

Accident Locations

Accident Type	Vessel	Location	Page Number
Allision	Cruise Ship Adventure Hornblower	San Diego, California	6
	Towing Vessel Amy Frances	Natchez, Mississippi	8
	Cruise Ship Carnival Pride	Baltimore, Maryland	10
	Cruise Ship Celebrity Infinity	Ketchikan, Alaska	12
	Towing Vessel Kodiak	Intracoastal Waterway, Chesapeake, Virginia	14
	Towing Vessel Michael G Morris	Thebes, Illinois	15
	Tanker Nordbay	New Orleans, Louisiana	16
	Towing Vessel Peter F Gellatly	Bayonne, New Jersey	18
	Bulk Carrier Star of Abu Dhabi	Gramercy, Louisiana	20
Capsizing/ Listing	Fishing Vessel Lydia & Maya	Gulf of Maine, south-southeast of Bar Harbor, Maine	22
	Towing Vessel Ricky J Leboeuf	Channelview, Texas	24
Collision	Tugboat Cerro Santiago / Coast Guard Cutter Tampa	Panama Canal	26
	General Cargo Vessel Manizales / Bulk Carrier Zen-Noh Grain Pegasus	Near Hester, Louisiana	28
	Towing Vessel Matachin / Coast Guard Cutter Thetis	Las Cascadas Reach, Panama Canal	30
	Heavy Lift Vessel Ocean Freedom / Tank Barges	Corpus Christi, Texas	31
	Towing Vessel Specialist	Tarrytown, New York	32
	Towing Vessel Crimson Gem / Bulk Carrier Yangtze Ambition	Ama, Louisiana	34
	Bulk Carrier Aris T / Tank Barge WTC 3019 / Towing Vessel Pedernales	Norco, Louisiana	36
Fire/Explosion	Fishing Vessel American Eagle	South Pacific Ocean northeast of American Samoa	38
	Cruise Ship Carnival Liberty	Charlotte Amalie, St. Thomas, US Virgin Islands	40
	Ro/Ro Vessel Courage	North Sea in the approaches to the English Channel	42
	Towing Vessel Jaxon Aaron	Memphis, Tennessee	44
	Fishing Vessel Raffaello	Pago Pago Harbor, American Samoa	46
	Small Passenger Vessel Tahoe Queen	Lake Tahoe, Nevada	47
	Towing Vessel Thomas Dann	St. Augustine, Florida	48
	Towing Vessel The Admiral	Ingleside, Texas	50
Flooding	Dive Support Vessel Hammerhead	Galveston, Texas	52
	Fish Processing Vessel Alaska Juris	Bering Sea west of Adak, Alaska	54
	Ro/Con Vessel El Faro	Crooked Island, Bahamas	56
	Fish Tender Exito	Bering Sea north of Cape Kalekta, Unalaska, Alaska	64
	Fishing Vessel Lady Gertrude	Point Pleasant, New Jersey	66
	Small Passenger Vessel Maximus	Turtle Bay, Mexico	67
	Fishing Vessel Orin C	Cape Ann, Massachusetts	68
	Towing Vessel Spence	Cartagena, Colombia	70
	Fishing Vessel Capt. David	East of Oregon Inlet, North Carolina	72
	Fishing Vessel Capt. Kevin	Sabine Pass Jetty Channel, Texas	74
Grounding/ Stranding	Articulated Tug and Barge Nathan E Stewart/DBL 55	Bella Bella, British Columbia, Canada	75
	Freighter Roger Blough	Sault Sainte Marie, Ontario, Canada	76
	Bulk Carrier Sparna	Wauna Channel, Columbia River	77
	Small Passenger Vessel Spirit of Kona	Kailua Bay, Hawaii	78
Hull/Machinery/ Equipment Damage	Bulk Carrier Asia Zircon II	Port of Galveston, Texas	79

VESSEL GROUPS

CARGO

Bulk carrier
Containership
General cargo
Heavy lift
Multi-purpose
Lake freighter
Roll-on/roll-off (Ro/Ro)
Ro/Ro-Containership (Ro/Con)

FISHING

Fishing
Fish tender
Fish-processing

GOVERNMENT

Coast Guard
Navy
USACE
NOAA

OFFSHORE SUPPLY

Offshore supply
Passenger/crew
Liftboat

PASSENGER

Cruise ship
Ferry
Small passenger vessel
Diving

RECREATIONAL

(None)

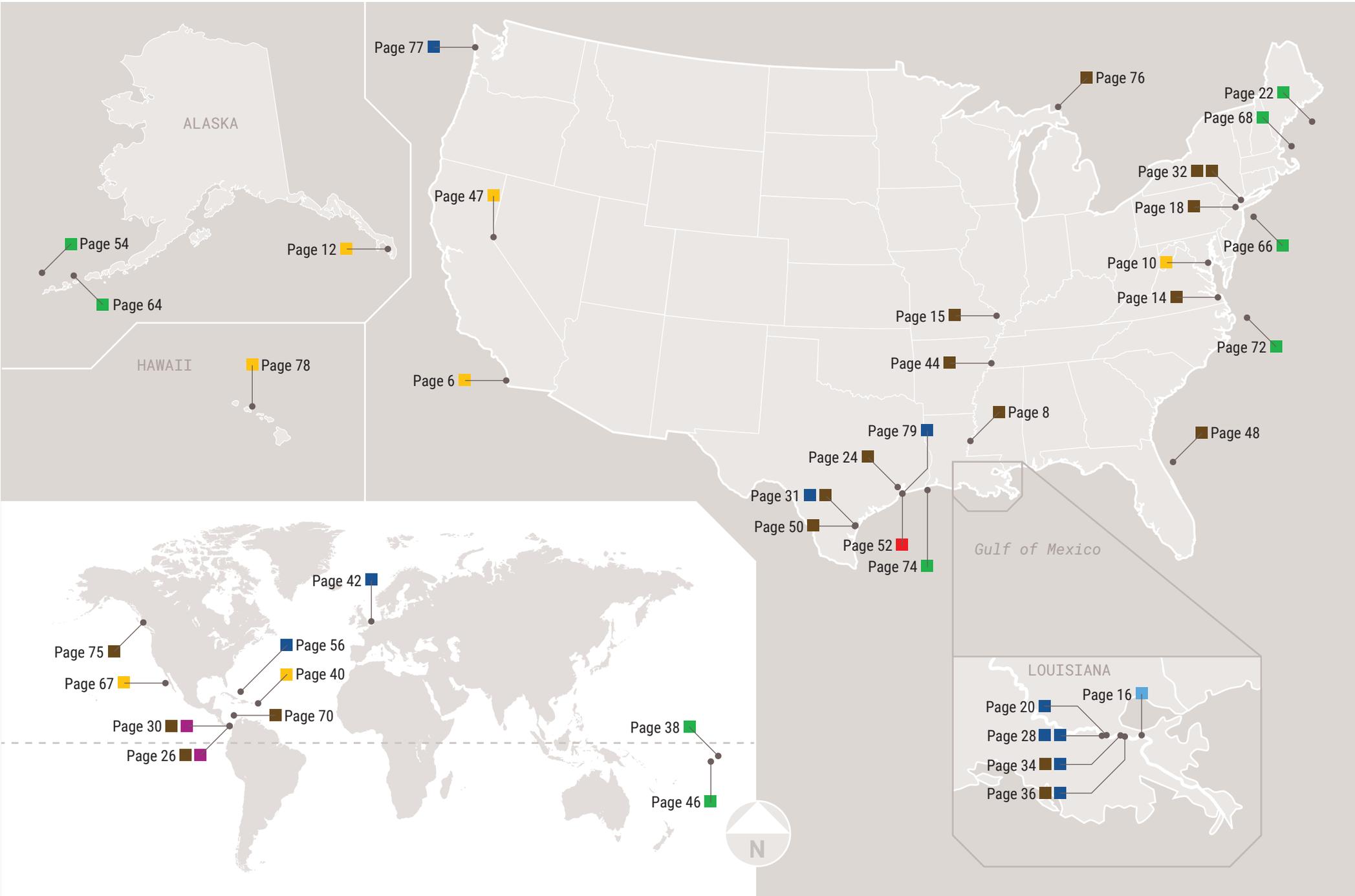
TANKER

Self-propelled tank vessels

TOWING/BARGE

Towing
Tugboat
Barge

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



Acknowledgments

For each marine accident the NTSB investigated, investigators from the Office of Marine Safety worked closely with the following Coast Guard units:

ACCIDENT VESSEL

COAST GUARD UNIT

Adventure Hornblower Sector San Diego

Alaska Juris District 17, Sector Anchorage, and Training Center Yorktown

American Eagle Sector Honolulu

Amy Frances Marine Safety Detachment Vicksburg

Aris T Sector New Orleans

Asia Zircon II Marine Safety Unit Texas City

Capt. David Sector North Carolina

Capt. Kevin Marine Safety Unit Port Arthur

Carnival Liberty Marine Safety Unit St. Thomas

Carnival Pride Sector Maryland-National Capital Region

Celebrity Infinity Marine Safety Detachment Ketchikan

Cerro Santiago / USCG Cutter Tampa Investigations National Center of Expertise

Courage Activities Europe

Crimson Gem / Yangtze Ambition Sector New Orleans

El Faro Sector Jacksonville, Marine Board Investigation, Marine Safety Center

Exito Sector Anchorage; Marine Safety Unit Dutch Harbor

Hammerhead Marine Safety Unit Texas City

Jaxon Aaron Sector Lower Mississippi River

Kodiak Sector Hampton Roads

Lady Gertrude Sector New York

Lydia & Maya Sector Northern New England

Manizales / Zen Noh Grain Pegasus Sector New Orleans

Matachin / Thetis National Center of Expertise (New Orleans) and First District

Maximus Sector San Diego

Michael G Morris Marine Safety Unit Paducah

Nathan E Stewart Sector Puget Sound

Nordbay Sector New Orleans

Ocean Freedom Sector Corpus Christi

Orin C Sector Boston and Station Gloucester

Peter F Gellatly Sector New York

Raffaello Marine Safety Detachment American Samoa, Investigations National Center of Expertise (New Orleans), and Sector Honolulu

Ricky J LeBoeuf Sector Houston/Galveston

Roger Blough Sector Sault Sainte Marie

Sparna Marine Safety Unit Portland

Specialist Sector New York

Spence Sector Jacksonville; Marine Safety Center, Washington, DC

Spirit of Kona Marine Safety Detachment Hawaii

Star of Abu Dhabi Sector New Orleans

Tahoe Queen Sector San Francisco

The Admiral Sector Corpus Christi

Thomas Dann Sector Jacksonville



Who has the lead: USCG or NTSB?

In a memorandum of understanding (MOU) signed December 18, 2008, the NTSB and the US Coast Guard agreed that when both agencies investigate a marine casualty, one agency will serve as the lead federal agency for the investigation. The NTSB 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. ■



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