

Safer Seas 2014

LESSONS LEARNED FROM MARINE
ACCIDENT INVESTIGATIONS



NATIONAL TRANSPORTATION
SAFETY BOARD

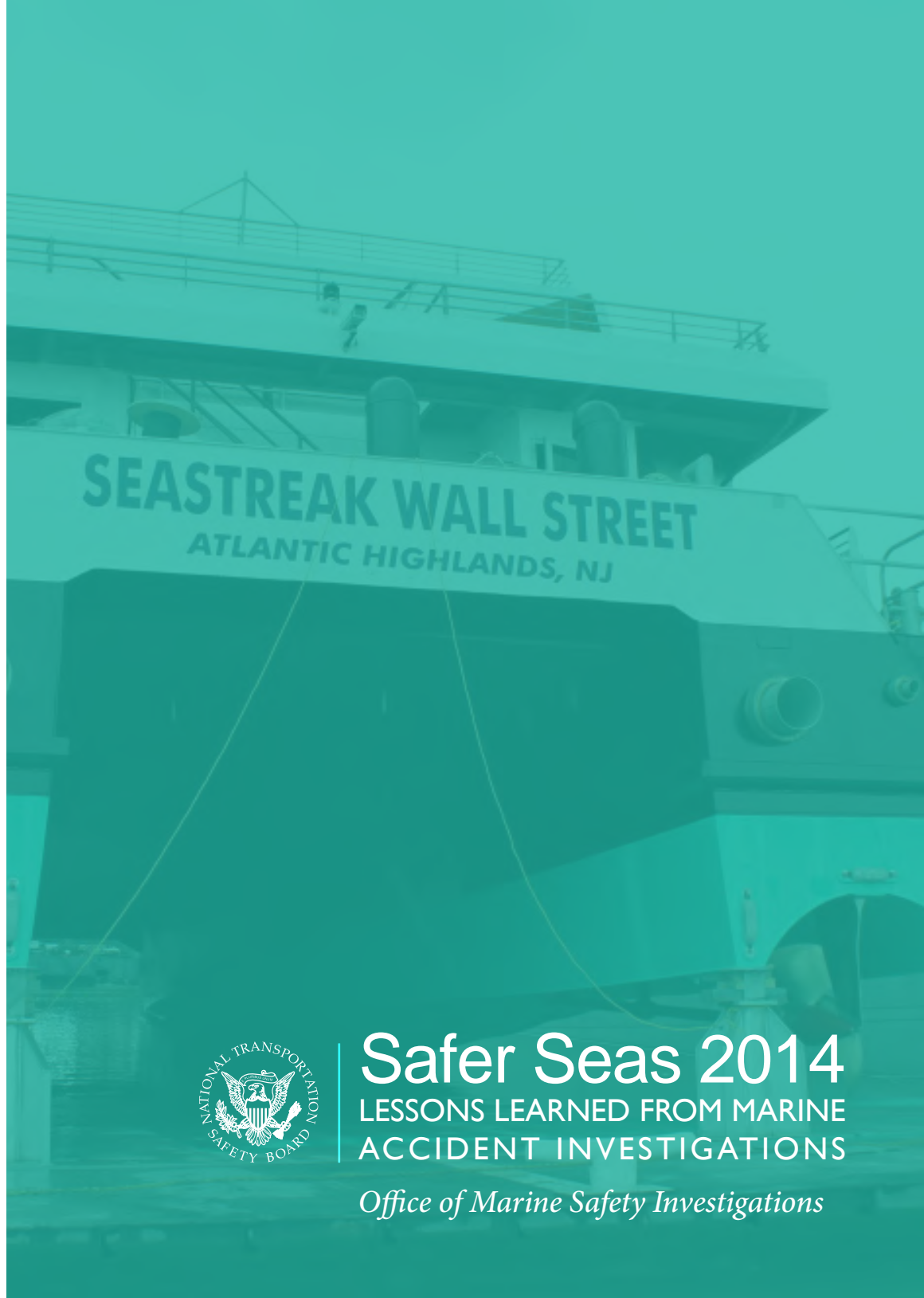


NATIONAL TRANSPORTATION
SAFETY BOARD

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*lessons learned from marine
accident investigations*





Safer Seas 2014

LESSONS LEARNED FROM MARINE
ACCIDENT INVESTIGATIONS

Office of Marine Safety Investigations

MISSION

The National Transportation Safety Board is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant 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.

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Christopher Hart
NTSB Chairman

MESSAGE FROM THE NTSB CHAIRMAN

The National Transportation Safety Board investigates accidents in all modes of transportation, determines probable causes, and makes safety recommendations as appropriate. In marine transportation, NTSB investigators work closely with our US Coast Guard counterparts to gather facts and evidence at the scene of an accident. NTSB then analyzes the information and publishes accident investigation reports so that mariners and others know the circumstances of an accident and can discuss ways to avoid recurrences.

Last year, the NTSB published Safer Seas 2013, a “one-stop shop” where mariners and others could review concise summaries of a full year’s accident investigations. Since then, we have heard that Safer Seas 2013 is used in crew training and safety meetings both on board and shoreside.

Safer Seas 2014 compiles our accident investigations for the year just completed. It represents our continuing commitment to sharing the lessons that we learn through our investigations. A great number of marine accidents can be prevented when crews know and respond to safety issues early and when crews work together effectively in the event of a crisis.

In one notable difference from our 2013 version of this booklet, we have listed a summary of safety issues from our investigations that we hope facilitates safety discussions; you will find this summary at the end of Safer Seas 2014, following the accident reports.

We hope that Safer Seas 2014 continues to help those in the marine industry discuss and address the safety issues of their own vessels and operations.



Allision of Bulk Carrier *Herbert C. Jackson* with the Jefferson Avenue Bridge Near Detroit, Michigan

Vessel Identification

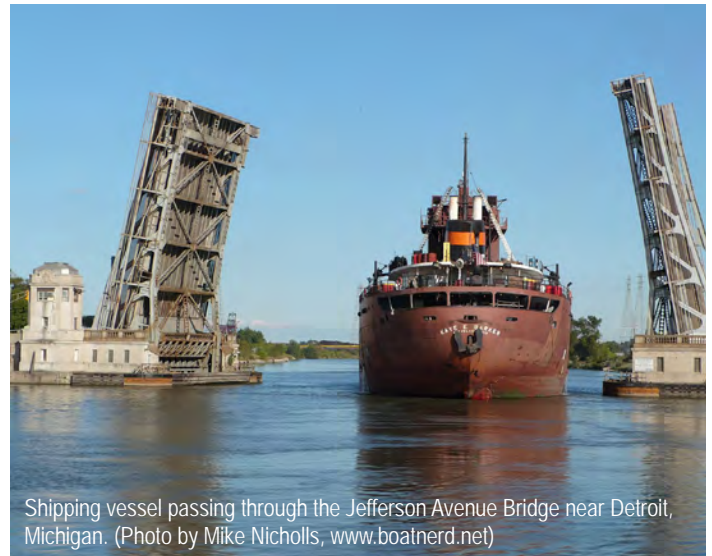
Port of registry	Philadelphia, PA
Construction	Steel
Persons on board	24

The bulk carrier *Herbert C. Jackson* was cleared for passage through the Jefferson Avenue Bridge over the Rouge River, 6 miles southwest of Detroit, Michigan. As the vessel passed through the span, the bridge tender, who was legally intoxicated at the time, lowered the drawbridge, striking the bulk carrier's bow about 0212 on May 12, 2013. Damage to the vessel was estimated at \$5,000. The bridge, a registered historic structure, was extensively damaged and expected to remain closed until 2015 for repair and restoration. No one was injured.

The *Herbert C. Jackson* was en route to deliver a load of taconite pellets to the Severstal ore processing terminal in Dearborn, Michigan. As the vessel approached the bridge, the master slowed and sounded one long and one short blast of the ship's whistle to notify the bridge tender of the approach and request a bridge opening. While waiting, the master brought the vessel to a near-complete stop.

The master stated that he then saw the bridge quickly lower in front of the vessel about 0211, and he immediately set the engine full astern. He ordered the mates on the bow and stern to drop anchors, and the stern anchor was deployed. The master recognized impact was imminent and sounded the general alarm. Crewmembers quickly left the bow area before deploying the bow anchor.

A minute later, about 0212, the bridge struck the vessel's bow. The stern anchor was retrieved, and the master backed the vessel away from the bridge,



Shipping vessel passing through the Jefferson Avenue Bridge near Detroit, Michigan. (Photo by Mike Nicholls, www.boatnerd.net)

anchored, and reported the accident to the United States Coast Guard.

The bridge control system and all of the vessel's equipment were determined to be working properly at the time of the accident.

Rouge River police officers responding to the accident observed that the bridge tender appeared to be intoxicated and transported her to a nearby hospital for drug and alcohol testing under county regulations before Coast Guard investigators arrived. The bridge tender's blood alcohol level was found to exceed the legal limit. She had been employed by the Wayne County Road Commission for 17 years, 8 years as a bridge operator, with no record of prior issues, counseling, or warnings. The bridge tender accepted full responsibility for the accident and her employment was terminated following a Wayne County Road Commission disciplinary hearing.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the allision of the *Herbert C. Jackson* with the Jefferson Avenue Bridge was the intoxicated bridge tender's closing of the drawbridge as the vessel began its transit through the open bridge span.

Capsizing and Sinking of the Fishing Vessel *Advantage*

Vessel Identification

Damage	Vessel: \$1.3 million Cargo: \$40,800
Fatalities	1 crewmember died in hospital, 1 presumed dead
Environmental damage	3,453 gallons of diesel fuel lost with vessel
Crew complement	4

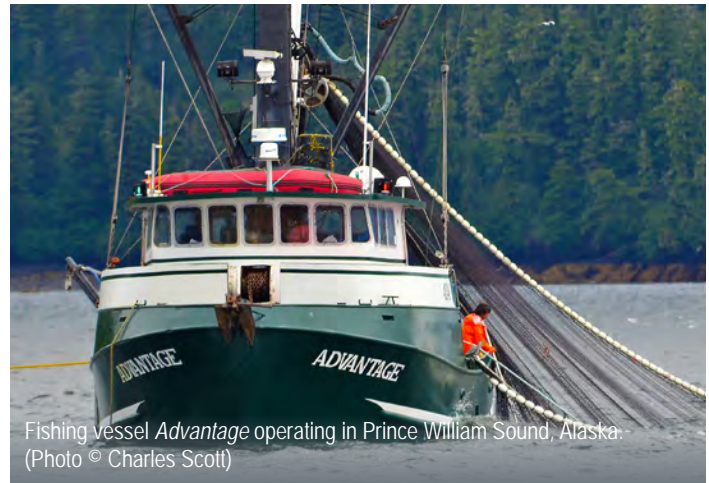
The uninspected fishing vessel *Advantage* was on a routine transit from Kodiak harbor, Alaska, to fishing grounds off the southern coast of Kodiak Island with a load of empty cod pots when it sank about 14 nautical miles southwest of Cape Barnabas at 0030 on August 31, 2012.

A Coast Guard rescue helicopter retrieved three of the four crewmembers. One was never found and was presumed dead, and the vessel's captain later died. About 3,453 gallons of diesel fuel were on board the vessel when it sank.

The *Advantage* departed Kodiak harbor about 1600 on August 30. Local weather at the time was light rain with breaks in the clouds, 4 to 5 miles visibility. The transit to the Black Point fishing grounds was about 100 nautical miles, expected to take 8 to 9 hours. Statements by a deckhand and the vessel's owner reported the departure was "normal."

That evening, a deckhand was woken by the vessel taking a sharp heel to port. He saw water on the deck as he ran from the forecabin aft to the galley and shouted to the other deckhands, "There's water coming in the door, grab your survival suit." In the dark forecabin with seawater pouring in, the crew did not have sufficient time to locate and don their survival suits.

The vessel sank about 15 minutes later. After about 5 minutes in the water, the crewmembers boarded the vessel's inflatable dinghy. Coast Guard personnel received a signal from the vessel's water-activated EPIRB



Fishing vessel *Advantage* operating in Prince William Sound, Alaska.
(Photo © Charles Scott)

and dispatched an MH-60 Jayhawk helicopter to the scene, arriving 20 to 30 minutes after the crewmembers boarded the dinghy. The Coast Guard search-and-rescue effort for the missing third deckhand was suspended at 2040 on August 31.

The *Advantage* was not required to meet Coast Guard inspection regulations, but the owner voluntarily participated in the Coast Guard's commercial fishing vessel safety examination program. Crew statements indicate the *Advantage* sank after an unexpected, large heel to port, which resulted in immediate downflooding into living spaces and rapid capsizing. Given that winds were light and seas moderate at 3 to 4 feet, a loss of vessel stability may have caused the initial severe heeling.

The surviving deckhands stated they were unsure why this occurred. Leaking hatch covers are a potential cause of water ingress on fishing vessels; however, according to the owner's statement, the owner and crew checked hatches at the Kodiak fuel dock.

The vessel's load of cod pots was similar to the safe load specified in the vessel's stability booklet, although the Coast Guard did not require that the book be kept current. After the *Advantage* sank, however, no postaccident stability analysis was performed.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the capsizing and sinking of the fishing vessel *Advantage* was a severe heel to port, followed by immediate downflooding. The reason for the vessel's loss of stability could not be determined.

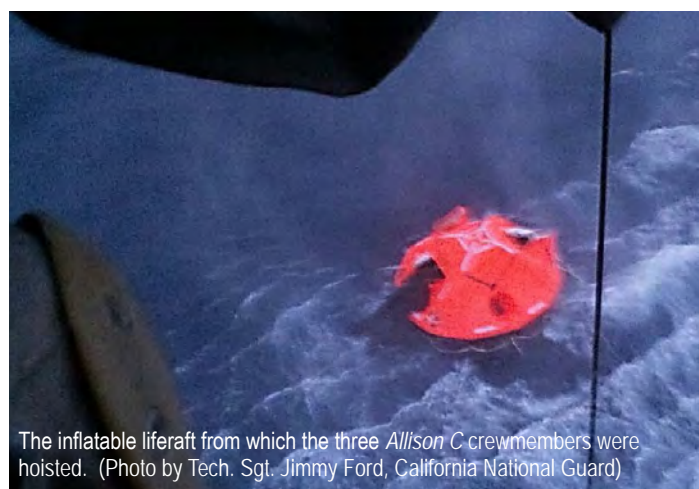
Sinking of Fishing Vessel *Allison C*

Vessel Identification

Port of registry	San Diego, California
Flag	United States
Persons on board	3
Injuries/fatalities	None

On September 20, 2012, about 2030 Pacific daylight time, the commercial fishing vessel *Allison C* sank about 125 nautical miles west-southwest of Point Piedras Blancas, California, after the engine room flooded. The three crewmembers and their cat were rescued without injury. The value of the *Allison C* and its cargo was estimated to be \$277,000.

Several hours earlier that day, a high-water alarm alerted the crew to flooding in the engine room. Initially, the crew could not identify the source of the incoming water but eventually found a golf-ball-sized hole in the hull underneath the engine transmission. Efforts to patch the hole were unsuccessful, including an attempt by the captain to dive underneath the hull in scuba gear. When the water level in the engine room reached 2 feet, the crew placed a distress call. The Coast Guard dispatched a C130 aircraft, which airdropped three pumps, an inflatable liferaft, and handheld radios to the *Allison C* crew.



The inflatable liferaft from which the three *Allison C* crewmembers were hoisted. (Photo by Tech. Sgt. Jimmy Ford, California National Guard)



The *Allison C* before the accident. (Photo provided by John S. Bateman)

The crewmembers were unable to keep up with the flooding, and about 1830, they donned survival suits, deployed the liferaft, and evacuated the *Allison C*.

The California National Guard's 129th Rescue Wing launched a helicopter and a low-level air refueler from Moffett Federal Airfield near San Francisco. About 2000, the three *Allison C* crewmembers were hoisted to safety by the helicopter crew. No one was injured. The Coast Guard determined that salvage efforts for the *Allison C* would be unproductive, and the vessel sank about 2030, shortly after the units left the scene.

No evidence indicated that the condition of the vessel or the performance of the crew contributed to the sinking. The weather and environmental conditions were moderate and the search and rescue response was timely and appropriate.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the sinking of the *Allison C* was a loss of hull integrity from a leak in the engine room, which led to uncontrollable flooding.

Engine Room Fire On Board Fishing Vessel *Arctic Storm*

Vessel Identification

Port of registry	Seattle, Washington
Flag	United States
Persons on board	120
Injuries/fatalities	None

On the afternoon of May 20, 2013, a fire broke out in the engine room of the fishing vessel *Arctic Storm* as it was under way processing fish in the Pacific Ocean, about 46 nautical miles west of Aberdeen, Washington. The crew extinguished the fire, and no one was injured; however, the damage to the vessel totaled \$5 million.

About 1505, the chief engineer noticed a fire in the engine room at about the same time that the captain heard the main engine's fire alarm activate on the bridge. The captain sounded the vessel's general alarm and radioed other vessels in the area for assistance. The Coast Guard also heard this callout. Because the *Arctic Storm* was conducting operations that included smaller fishing vessels working nearby, several of those vessels responded.

The captain remotely shut down the engine room's ventilation system and closed its watertight doors to contain the fire. The chief engineer and his personnel also ensured that the engine room's power panel emergency stops, ventilation emergency stops, and remote quick-closing valves for the fuel oil storage tanks all were activated.

The crew initially fought the fire using portable extinguishers, which seemed successful at first, but the fire quickly reflashed when the crew stopped applying CO₂. The crew also staged fire hoses at the engine room entrance and tried using the forward fire pump. However, no water was available through the pump, because the crew had earlier shut off the main generator due to the fire, and in doing so, the vessel lost electrical power and so did the fire pump.



The *Arctic Storm* during the fire emergency. (Photo by the United States Coast Guard)

Finally, the captain and the chief engineer decided to release the vessel's fixed fire suppression system in the engine room, which was effective in controlling the fire. However, about 30 minutes after releasing the system, the captain saw smoke exiting through the engine room ventilation outlets, indicating the fire was still not completely extinguished and had in fact begun regaining strength. At this time, about 1730, he decided to evacuate nonessential crewmembers from the *Arctic Storm* to the assisting vessels (76 persons were evacuated; 42 remained on board the *Arctic Storm*).

Responding vessels provided support equipment, including two portable diesel-powered fire pumps, which the crew set up to supply water to the vessel's fire main system. The firefighting team reentered the engine room and noted fires in the overhead as well as in the fish meal plant, located forward of the engine room. After making several reentries, the crew was able to extinguish all remaining fires and cool down the area using fire hoses and portable extinguishers.

About 0530 the next morning, a responding tugboat began towing the *Arctic Storm* to Aberdeen, where the vessels arrived about 2245.

After the fire was extinguished, the chief engineer found a vent valve lying atop one of the engine's attached pumps. He determined that the valve was associated with the fuel oil piping system located on the engine's

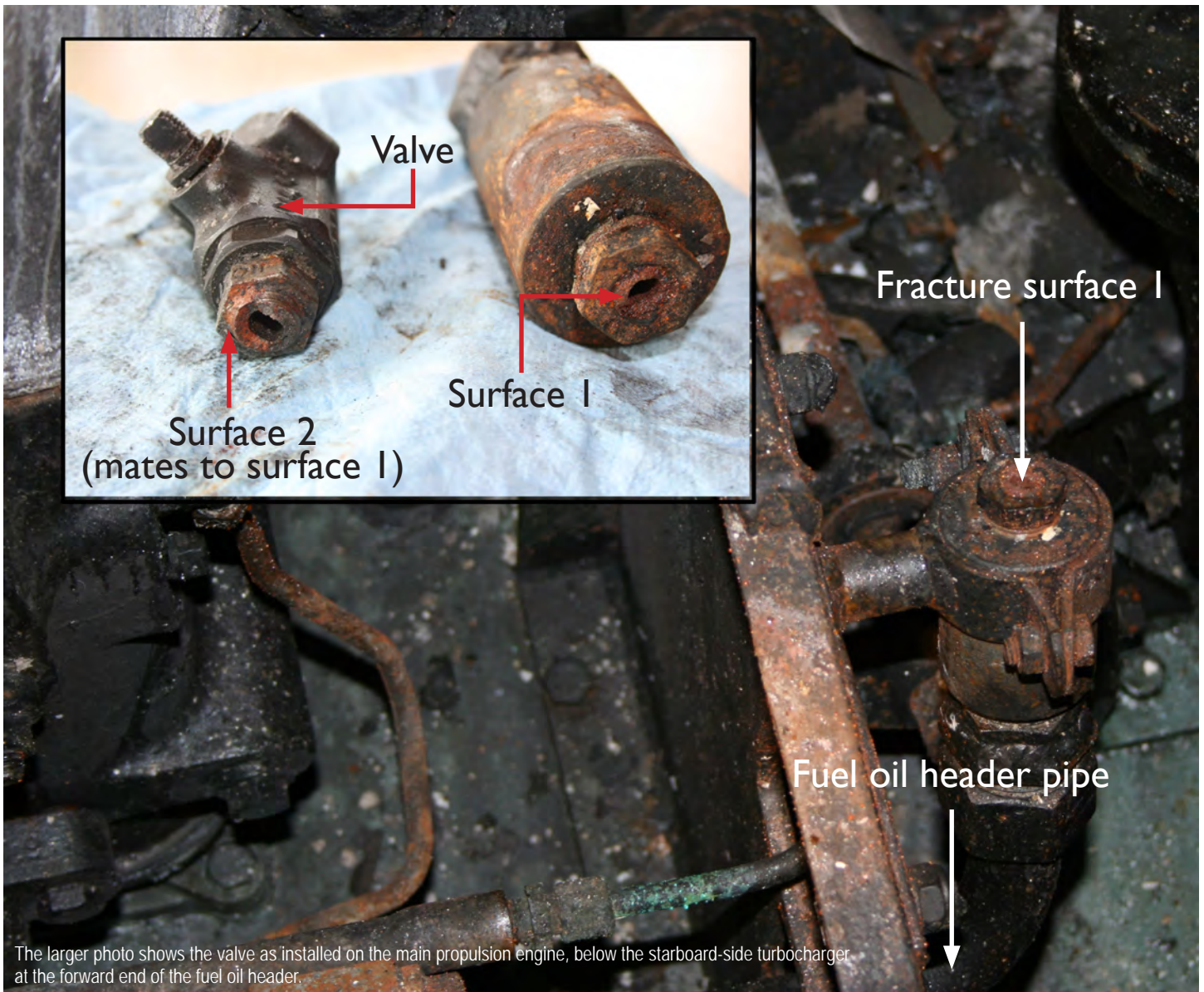
starboard-side fuel oil header near the starboard-side turbocharger. The valve had become detached from the fuel oil piping system as a result of a fracture at its threaded connection fitting. The quarter-inch, 2,000-psi valve had been installed at an elevated position at the forward end of the fuel oil piping system, and it was used to vent air from the system as needed. After the accident, the crew pressure-tested the fuel oil piping system and found no abnormal leaks or openings other than at the vent valve connection.

At the request of the vessel’s insurers, a forensic engineering firm metallurgically examined the fracture surface of the valve fitting. The analysis report indicated

that the fracture resulted from “ductile overload with a torsional component.” The analysis report also found that the appearance of the fracture indicated that “the fitting fractured due to a single load, such as an impact, that caused it to separate.”

Probable Cause

The National Transportation Safety Board determines that the probable cause of the fire on board fishing vessel *Arctic Storm* was a fractured fitting on a fuel oil vent valve, located on the main propulsion engine, which resulted in fuel oil spraying onto a hot engine surface and igniting.



The larger photo shows the valve as installed on the main propulsion engine, below the starboard-side turbocharger at the forward end of the fuel oil header.

Sinking of Fishing Vessel *Long Shot*

Vessel Identification

Port of registry	Panama City, Florida
Flag	United States
Persons on board	5
Injuries/fatalities	None

On November 15, 2013, the commercial fishing vessel *Long Shot* was returning in heavy seas from a 2-week fishing trip when its main diesel engine and electric generator engine failed. Boarding seas hit the stern, an aft compartment flooded, and the crew was evacuated by the Coast Guard. The vessel eventually sank; its value was \$150,000.

As the *Long Shot* was on its return voyage on the 9th day of the trip, a leak was discovered in the lazarette compartment, the aftmost compartment in the boat, which contained steering gear and the rudder post. This post was attached to the rudder at its lower end and penetrated the hull through a packing gland at its upper end. The leak increased in severity, and on the morning of November 14, about 2 feet of water had accumulated in the lazarette. The crew was continuously pumping water out of the lazarette as the *Long Shot* continued toward port.

About 0130 the next morning, November 15, the captain noticed that the engines seemed to be losing power. He also noticed that the main engine's fuel supply filter/water separator contained an unusually large amount of water. In addition, the fuel level seemed lower than expected, but he could not determine where the missing fuel had gone. The captain shut off the main engine and began to drain water from the separator and change the filters. But before he could finish with the filters, the vessel lost electrical power. The seas were now 10 to 12 feet, and the captain's and the first mate's attempts to restore power had limited success. During the morning, the weather worsened and the *Long Shot* began taking water over the stern and into the lazarette.



The *Long Shot* under way several months before the accident voyage. The lazarette cover and the ice hold cover on the aft deck of the vessel are indicated. (Photo by W I T Fisheries)

The Coast Guard was notified about 1335, and shortly thereafter launched two helicopters from New Orleans. About 1900, one of the helicopters rescued three of the five persons on board the *Long Shot* and took them to a nearby mobile offshore drilling unit, the *Thunder Horse*. The captain and the first mate had intended to stay on board the *Long Shot* and continue the effort to save the vessel, but as nightfall approached without much progress, they requested evacuation. About 2030, the captain and the first mate were hoisted to safety by a Coast Guard helicopter and taken to the *Thunder Horse* as well.

The *Long Shot* eventually sank, but the exact time and location of the sinking are unknown.

The vessel owner told investigators that he purchased the 30-year-old *Long Shot* in February 2008, after which time the vessel was brought up to his standard of repair. In October 2008, the vessel's lazarette flooded as a result of holes in the bottom hull plate of the compartment. The lazarette bottom was repaired by installing doubler plates over the entire stern of the vessel to an area just beyond the fish hold. The owner stated that the thickness of other areas of the hull was examined, and any thinned areas were similarly repaired with doubler plates. Repairs completed at that time also included increasing the size of the rudder (for better handling) and renewing the propeller shaft and rudder post bearings.

In May 2011, an electrical fire broke out in the bow area below the main deck, which led the crew to abandon the vessel because of smoke in the living area. Post-fire repairs included wholesale replacement of the interior of the crew spaces. In addition, the wheelhouse navigation equipment and wiring was replaced.

The *Long Shot* was last hauled out in October 2012, at which time any thin areas of the hull plate were repaired with doubler plates. During that shipyard period, the rudder and propeller shaft bearings were replaced, and new packing was installed in both glands.

During a fishing trip in April 2013, with the owner acting as the captain, water was found in the fuel oil system. According to a deckhand, who was later the captain of the vessel when it sank, the water in

the fuel had caused stoppage of the main propulsion engine similar to what he experienced on the accident voyage. The owner stated that, in connection with the April 2013 trip, holes were found and repaired in a plumbing discharge pipe that passed through one of the fuel tanks.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the sinking of fishing vessel *Long Shot* was water contamination of its fuel oil storage tanks, which led to failure of the propulsion and electrical generator engines and flooding of the lazarette compartment in heavy seas. Contributing to the sinking was excessive water leakage at the rudder post packing gland, which led to the initial flooding of the lazarette compartment.



The *Long Shot* under way several months before the accident. (Photo by W I T Fisheries)

Foundering of the Fishing Vessel *Moonlight Maid*

Vessel Identification

Port of registry	Valdez, Alaska
Flag	United States
Construction	Wood
Persons on board	4

The wooden-hulled uninspected fishing vessel *Moonlight Maid* was transiting to Kodiak, Alaska, in heavy seas when the vessel sprung a plank and began flooding on September 20, 2012. The vessel's bilge pumps were unable to keep up with the rate of flooding, so the crew of four made a Mayday call, donned survival suits, and abandoned ship into a life raft as the boat foundered. All were later hoisted to safety by a United States Coast Guard helicopter. The sinking resulted in an estimated loss of \$400,000.

The *Moonlight Maid* departed Seward about 1000 hours on the morning of September 20 to travel 175 nautical miles through the Gulf of Alaska to Kodiak, where the vessel was to be inspected by canneries in preparation for off-season contract work. The crew consisted of the owner, who acted as master, and three deckhands.

As the boat left Seward and the more sheltered waters of Resurrection Bay, rough weather and seas lay ahead in the Gulf of Alaska. For the 18 hours before the accident, a weather buoy 50 miles east of the accident site reported significant wave heights, up to 12.5 feet, and southeast winds between 9 and 22 knots with wind gusts as high as 27 knots.

At 1700, with the vessel east of Seal Rocks off Kodiak Island, Alaska, the master had the watch crewmember take the wheel so he could check the engine room. He discovered a "fair amount of water" in the tool room, a space forward of the engine room. The master put both bilge pumps online and said the situation was then "ok." When he returned to the wheelhouse through the engine room, he noticed that a 3- to 4-foot section of



Fishing vessel *Moonlight Maid* docked in Whittier, Alaska, in March 2011.
(Photo © Clayton M. Paddock)

hull planking in way of the port rub rail was missing, and another section 10 to 12 feet long was loose.

A watch crewmember later saw the water level was still rising and a bilge pump had stopped working. The crew reset a tripped breaker, and water levels again began to decrease, but by 1930, the water from the engine room was high enough to spill directly into the tool room and down the port side shell of the engine room near the battery banks.

About 2030, the master determined the engine room was becoming unsafe and the pumping would not succeed. He told the crew to don survival suits, get flares and the survival bag, retrieve personal gear, and ready the life raft. At 2101, the master made a Mayday call and later reported that the vessel was sinking.

The crew boarded the 10-person life raft, taking with them a handheld VHF radio and the vessel's emergency position indicating radio beacon (EPIRB), which they activated when they were away from the vessel.

Coast Guard Sector Anchorage coordinated with Air Station Kodiak, and a helicopter crew located all four *Moonlight Maid* crewmembers in their life raft 50 minutes after the Mayday call. They were later reported to be in good condition with no injuries. The effective search and rescue can be partially attributed to the crew's successful planning and execution of vessel abandonment in an emergency.

The *Moonlight Maid*, valued at \$400,000, was not salvaged. The vessel was carrying about 2,500 gallons of diesel fuel when it sank, but the Coast Guard saw no evidence of pollution.

The vessel owner voluntarily participated in the Coast Guard's commercial fishing vessel safety examination program. The last safety exam was conducted in March 2011 and was current at the time of the foundering.

According to the shipwright, repairs performed in September 2012 focused on the owner's request to "prevent water from leaking into the engine room" and did not address the shipwright's "most serious recommendations" from his 2011 assessment. The shipwright felt this work done in 2012 would successfully stop the leaks, but he said he explained to the owner that the repairs "in no way addressed the structural needs we had discussed in 2011." The

owner's statement to the Coast Guard did not address structural issues.

During the repair work, evidence was found of severely rotted deck beams that supported planking. This rot may have extended to the adjacent hull frames, which would have compromised the frames to which the rub rail and hull planking were fastened. The Coast Guard investigation report for this accident also found the port rub rail was attached to planking and structural members that needed replacement.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the foundering of the wooden-hulled fishing vessel *Moonlight Maid* was the detachment of portside hull planking in heavy weather, which resulted in uncontrolled flooding. Contributing to the hull failure was inadequate maintenance of the aging wooden vessel.



Fishing vessel *Moonlight Maid*.

Sinking of Oceanographic Research Vessel *Seaprobe*

Vessel Identification

Port of registry	Galveston, Texas
Flag	United States
Persons on board	12
Injuries/fatalities	1 serious, 2 minor

On January 18, 2013, about 0315 central standard time, the oceanographic research vessel *Seaprobe* sank about 130 nautical miles south-southeast of Mobile, Alabama. All 12 crewmembers evacuated to inflatable liferafts and were rescued by the Coast Guard. Three crewmembers sustained injuries.

The *Seaprobe* had been conducting work off the coast of South America and was en route to Morgan City, Louisiana, when the crew noted seawater ingress in the vicinity where the starboard engine exhaust pipe exited through the engine room overhead. The crew made temporary repairs including fastening thin sheets of metal to the starboard-side exhaust trunk where the original metal had thinned or disappeared due to corrosion. The exhaust trunk housed exhaust pipes from machinery in the engine room and ran forward horizontally above the deck to the stack.

To better address the flooding, the captain diverted the *Seaprobe* to the Gulf Marine Repair (GMR) shipyard in Tampa, Florida. The GMR shipyard personnel used doubler plates to temporarily repair the starboard engine and generator exhaust pipes housed within the exhaust trunk. The bottom plate of the exhaust trunk was removed to gain access, and the plate was not put back or replaced. The port engineer, who was a representative of the vessel owner and present at the shipyard during the repair work, told investigators that he did not direct the shipyard personnel to replace the bottom plate because he wanted to allow for further examination during the vessel's next scheduled drydock.



The *Seaprobe* before the sinking. (Photo Source: Baynews9.com)

He and the shipyard personnel agreed to, in the interim, install doubler plate over six freeing ports located close to the bottomless exhaust trunk to protect it from seawater contact.

The *Seaprobe* left Tampa on January 16, 2013, and continued toward Morgan City. About a day later, during the west-northwest transit across the Gulf of Mexico, the *Seaprobe* experienced north winds at 26 knots, with gusts up to 34 knots, and seas of 15 feet. Seawater collected on deck, caused in part by the six freeing ports that had been closed. The water made its way into the open bottom of the exhaust trunk and downflooded into the engine room. About 0200 the next morning, January 18, with the *Seaprobe* listing to starboard and almost 3 feet of water in the engine room, the crew contacted the Coast Guard for assistance, and then evacuated into inflatable liferafts. Two Coast Guard helicopters airlifted the 12 crewmembers to safety. Two crewmembers had minor injuries; a third crewmember had sustained a bone fracture.

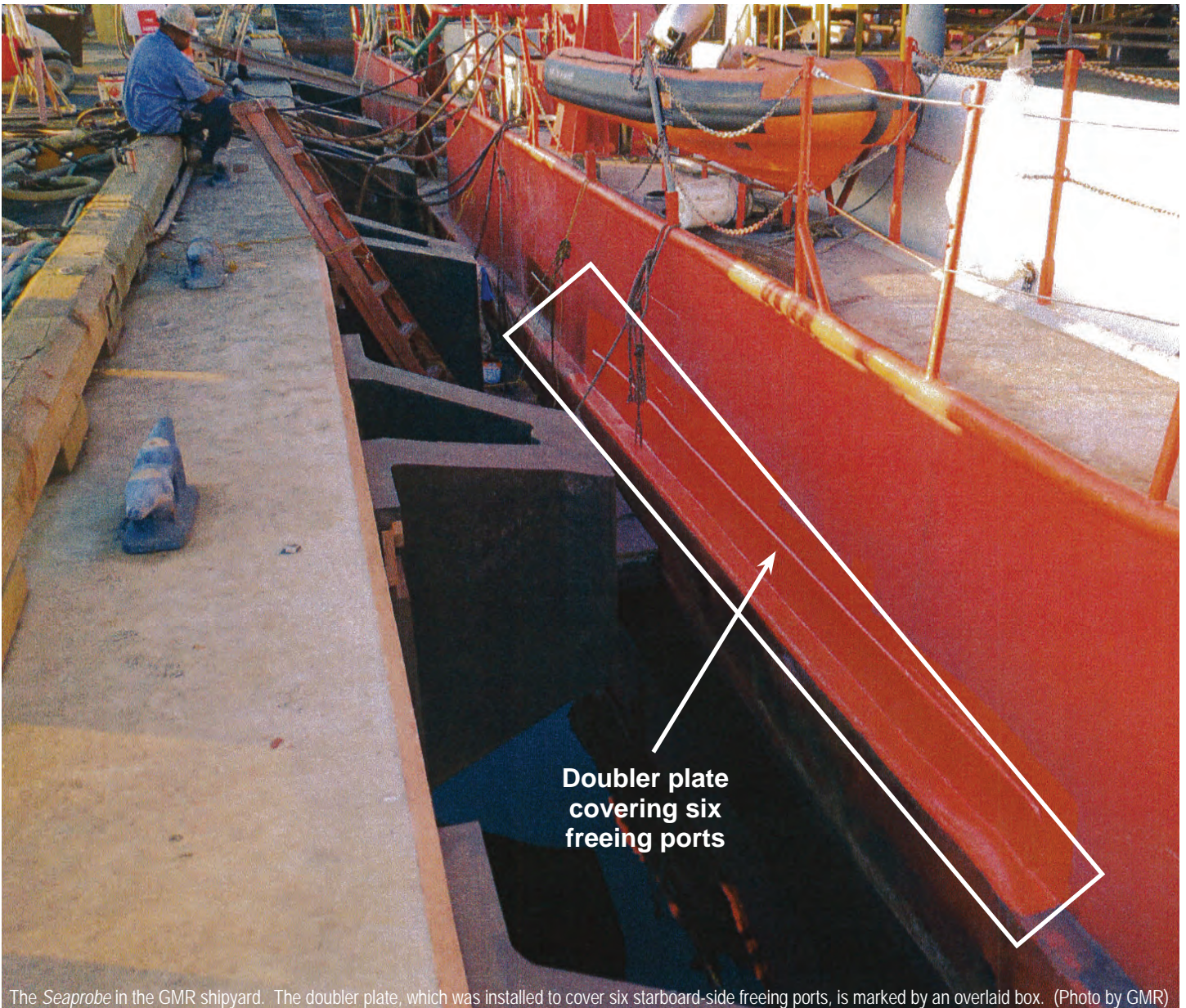
According to the load line regulations in 46 *Code of Federal Regulations* Part 42, the vessel owner should have informed the *Seaprobe*'s classification society—the American Bureau of Shipping (ABS)—before closing the six freeing ports and departing port without repairing

the bottom of the exhaust trunk. Load line certificates may be canceled due to conditions such as closed freeing ports and worn-out exhaust trunks. In addition, the *Seaprobe* owner's failure to discuss the worn-out exhaust trunk and the closing of the freeing ports with ABS meets the definition of nonconformity under the vessel's safety management system.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the flooding and subsequent sinking of the *Seaprobe* was the decision of the vessel

owner to delay making permanent repairs to the starboard-side exhaust trunk and covering six of the vessel's freeing ports, leaving the *Seaprobe* susceptible to downflooding from boarding seas. Contributing to the accident was the owner's failure to comply with the vessel's safety management system and mandatory load line regulations.



The *Seaprobe* in the GMR shipyard. The doubler plate, which was installed to cover six starboard-side freeing ports, is marked by an overlaid box. (Photo by GMR)

Sinking of Offshore Supply Vessel *Ricky B*

Vessel Identification

Port of registry	New Iberia, Louisiana
Flag	United States
Persons on board	3
Injuries/fatalities	None

On May 30, 2013, at 0702 central daylight time, the offshore supply vessel *Ricky B* sank in the Gulf of Mexico while being towed. The three crewmembers had already evacuated to a good samaritan vessel, and no one was injured. The *Ricky B* was later refloated; its damage was estimated to be \$520,000.

Two days before the sinking, while the vessel was conducting supply runs to various platforms off the Louisiana coast, the crew discovered a leak in the engine room, emanating from a damaged starboard shaft seal packing. They disengaged the starboard engine and attempted a field repair while tied up to a nearby platform. They managed to tighten the four nuts that secured the packing gland faceplate to the through-hull penetration. This action slowed the ingress of water to a rate that the crew believed was within the capacity of the vessel's bilge pump, and the vessel continued with its intended supply runs.

About 1030 on May 29, the vessel departed for its home port in Louisiana, still using only the port engine. The master stated that he checked the water level in the engine room every half hour and that the bilge pump was able to keep the water below the deck plates. About 1045, the mate took over the watch and, some time later, for unknown reasons, decided to engage the starboard engine, which then in turn rotated the propeller shaft. This exacerbated the flooding, and even the addition of a ballast pump was unsuccessful in adequately dewatering the engine room. Shortly thereafter, the crew radioed a distress call, which was



The *Ricky B*. (Photo provided by Louisiana Marine Operators)

received by the nearby vessel *Miss Monica*, to which the crew evacuated about 1400.

Early the following morning, about 0215 on May 30, the towing vessel *Delta Force* began towing the still partially afloat *Ricky B* toward shore. However, less than 5 hours later, at 0702, the *Ricky B* completely submerged and sank in about 50 feet of water some 24 nautical miles south of Marsh Island.

The *Ricky B* was refloated about 2.5 weeks later, when it was discovered that three of the four nuts that secured the packing gland faceplate to the shaft sealing system were loose. In addition, the faceplate was offset 3–4 inches, allowing water to ingress freely into the vessel.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the sinking of the *Ricky B* was the crew's failure to adequately assess the severity of the flooding rate through the starboard shaft seal gland and take prudent action to mitigate the situation.

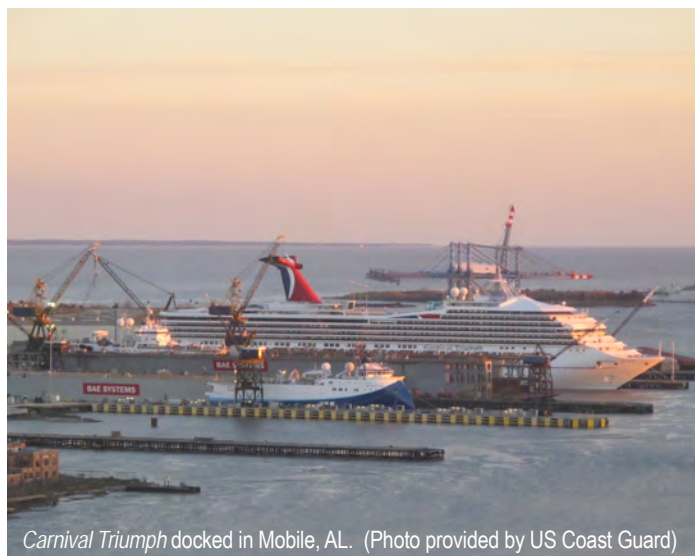
Bollard Failure Causing Breakaway of Cruise Ship *Carnival Triumph* from its Moorings and Subsequent Collision with *Dredge Wheeler* and Towing Vessel *Noon Wednesday*

Vessel Identification

Port of registry	<i>Carnival Triumph</i> : Nassau, Bahamas; <i>Wheeler</i> : Not documented; <i>Noon Wednesday</i> : Mobile, Alabama
Flag	<i>Carnival Triumph</i> : Bahamas; <i>Wheeler</i> and <i>Noon Wednesday</i> : United States
Persons on board	<i>Carnival Triumph</i> : 810 (ship was wet-docked for fire repairs); <i>Wheeler</i> : 20 (vessel was wet-docked for engine replacement); <i>Noon Wednesday</i> : 4
Injuries/fatalities	1 fatality, 1 injury (both shipyard employees)

On April 3, 2013, about 1328 central daylight time, the moored cruise ship *Carnival Triumph* broke away from its moorings and drifted across the Mobile River after a bollard failure at the pier. The ship subsequently collided with both a moored dredge, *Wheeler*, and a towing vessel, *Noon Wednesday*, that was responding to the breakaway. One shipyard employee died in the accident; another was injured. The total damage amount was nearly \$3 million.

The *Carnival Triumph* had been in Mobile for about 2 weeks to undergo repair of fire damage the ship sustained while at sea. The vessel was moored port-side-to at the BAE Systems shipyard, using a total of 20 high-strength mooring lines—10 forward and 10 aft, each set affixed to four bollards forward and aft on the pier. About 1328 on April 3, a passing storm front generated unexpectedly high wind gusts, including one



Carnival Triumph docked in Mobile, AL. (Photo provided by US Coast Guard)

at 65 mph. The force of the wind caused the stern of the ship to swing away from the pier, straining the aft mooring lines. Three of the four aft bollards parted from their mounts on the pier, one stern winch on the ship paid off its line under strain, and another mooring line parted, setting the stern of the ship adrift. The forward lines were now also under strain. One of the forward bollards also parted from its mount on the pier (the fourth bollard to fail), two forward mooring lines paid out off the winch, and two others parted. The *Carnival Triumph* began drifting across the Mobile River.

The master made an urgent broadcast for assistance; about 2 minutes later, the onsite towing vessel *Noon Wednesday* took position on the cruise ship’s starboard side and pushed against the hull, but was unable to stop the drift. The master ordered both anchors dropped, which slowed the drift somewhat. However, moments later, the *Carnival Triumph*’s bow collided with the dredge *Wheeler*, moored on the other side of the river. The *Noon Wednesday* became pinned between the hulls of the cruise ship and the dredge.

No one on board the vessels was injured in the accident. However, during the breakaway, two shipyard employees fell into the water. One was rescued with injuries; the other worker died.

About 3 years before the accident, an engineering firm had assessed the condition of the pier as “poor.” The condition of the mooring hardware, such as

Bollard Failure Causing Breakaway of Cruise Ship *Carnival Triumph* from its Moorings, and Subsequent Collision with *Dredge Wheeler* and Towing Vessel *Noon Wednesday*

bollards, was rated “serious,” and the report indicated further analysis was needed to determine the pier’s mooring capacity, especially in heavy weather mooring conditions. However, BAE Systems did not perform any further engineering analysis of the hardware and did not discuss the condition of the pier with *Carnival Triumph* personnel before the accident.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the breakaway of the *Carnival Triumph* from its moorings and the subsequent collision with the dredge *Wheeler* and the towing vessel *Noon Wednesday* was the successive failure of multiple mooring bollards, which were known by BAE Systems to be in poor condition with an undetermined mooring load capability.



Carnival Triumph.

Allision of the Passenger Ferry *Seastreak Wall Street* with Pier 11/Wall Street

Vessel Identification

Flag	United States
Damage	Ferry: \$166,200 Pier: \$333,349
Injuries	79 passengers, 1 crewmember
Crew complement	5

The *Seastreak Wall Street*, a high-speed passenger ferry serving commuters traveling between New Jersey and New York City, struck a Manhattan pier at about 12 knots on the morning of January 9, 2013. Of the 331 people on board, 79 passengers and 1 crewmember were injured, 4 of them seriously, in the third significant ferry accident to occur in the New York Harbor area in 10 years.

The captain began his approach about 700 yards from Pier 11/Wall Street on the East River, intending to reduce speed and transfer control from the center bridge control station to the starboard station about 90 seconds before reaching the pier. Although this was a routine procedure, the vessel did not respond as the captain expected, and he was unable to remain in control of the ferry before impact. The investigation found no indication of mechanical failure.

Investigators concluded that the captain was mistaken about the operating mode of the controllable pitch propulsion system as he approached the pier. When in “combinator” mode, moving the order levers astern would slow the vessel. In “backup” mode, however, with the propeller pitch still in the forward position, this same command caused an unexpected acceleration ahead.

When the accident occurred, the *Seastreak Wall Street* operations manual had not been updated since the ferry was converted in July 2012 from waterjet to a controllable pitch propeller. In addition, although



Damage to the *Seastreak Wall Street* starboard bow.

the transfer of control from one bridge station to another was a critical point in the vessel’s approach, no formal company guidance was available for executing this procedure. The captain also could have benefited from the mate’s assistance, but company policies did not adequately define crewmember roles. Approach maneuvers also were begun with too little time available to respond to an emergency situation.

Identical sets of control panel pushbuttons were located on either side of the order levers, one set of buttons for each propeller, port and starboard. A small red light in the upper left corner of each button would light when the button was active. In addition to using the order levers to change main propulsion engine rpm, the operator could use these pushbuttons to control vessel actions such as changing propeller pitch. When illuminated, lights on each button also identified, for instance, whether that control station was active and which operating mode was engaged. However, the available visual and audible cues to indicate mode and control transfer status were ambiguous.

A US vessel in domestic service is not required to develop and implement a safety management system (SMS), and the *Seastreak Wall Street* operated without this guidance. Operators can, however, voluntarily meet well-established international SMS standards that are required for many ships and include provisions for safe vessel operation, emergency procedures, and internal audits and management reviews.

The passenger requiring the most extensive medical treatment fell down a stairwell and sustained severe head injuries. Seastreak ferry crewmembers were not directed to control passenger access to stairwells, even when approaching a landing, nor were they required to make a passenger safety announcement upon arrival.

The NTSB noted that the *Seastreak Wall Street* was not fitted with a voyage data recorder (VDR), which could have provided substantial evidence to allow further insight into the operation of the ferry and its performance as it approached the pier. A VDR could have captured the vessel's operating conditions at specific points during the voyage, propulsion commands ordered and system responses, audio recording from the bridge, the status of the controllable pitch propulsion system, and a precise record of vessel movements, among other information.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the *Seastreak Wall Street's* allision with the pier was the captain's loss of vessel control because he was unaware the propulsion system was in Backup mode. In addition, his usual method of transferring control from one bridge station to another during the approach to the pier did not allow sufficient time and distance to react to the loss of vessel control. Contributing to the accident was Seastreak LLC's ineffective oversight of vessel operations. Contributing to the severity of injuries was Seastreak LLC's lack of procedures to limit passenger access to stairwells on the *Seastreak Wall Street* during potentially high-risk situations such as vessel docking and undocking.



Seastreak Wall Street

Sinking of Tall Ship *Bounty*

Vessel Identification

Port of registry	Greenport, New York
Flag	United States
Persons on board	16
Injuries/fatalities	3 serious injuries; 2 fatalities (one recovered, the other missing and presumed dead)

On October 29, 2012, the tall wooden ship *Bounty* sank off Cape Hatteras, North Carolina, while attempting to transit through the forecasted path of Hurricane Sandy. The 108-foot-long *Bounty*, a 50-year-old replica of an 18th Century British Admiralty vessel, had left New London, Connecticut, on October 25, 2012, to participate in a scheduled event in St. Petersburg, Florida. The 16 people on board knew before leaving New London that Hurricane Sandy had strengthened off the southeast US coast and that the vessel was sure to encounter rough weather during the transit. Nevertheless, the captain chose to sail and all of the mostly inexperienced crewmembers chose to go with him. The organization that owned the *Bounty* also knew of the storm and did nothing to dissuade the departure.

In the month prior, the *Bounty* had undergone a scheduled shipyard period, during which wood rot had been discovered in the hull. However, because of time and money constraints, the wood was not replaced. Instead, the captain (after reportedly consulting with the vessel organization) instructed the crew to simply apply paint to the rotted areas. Although the Coast Guard had inspected the *Bounty* at the shipyard for other reasons, it did not check the hull because the vessel was not due for a hull inspection for another 3 years.

Even in good weather conditions, the *Bounty* was known to “make water”—that is, water would gradually enter the bilge and have to be pumped. The compromised hull and the rough weather that the *Bounty* encountered about 2 days out from New London caused water to



The *Bounty* under sail. (Photo provided by the US Coast Guard)

enter the bilge more rapidly than usual. The *Bounty* had two electric bilge pumps, which were the primary means for dewatering, and two backup hydraulic pumps. The crew had also bought a gasoline-powered pump on a previous voyage but never tested or used it. Although putting to sea with an approaching hurricane, the captain had reportedly not given any orders to test-run the backup hydraulic pumps or the new gasoline pump. As the weather conditions deteriorated, propulsion equipment on board began to struggle and successively fail, rendering the electric and hydraulic pumps nonfunctioning. The crew then tried to start the previously unused gasoline pump, but to no avail.

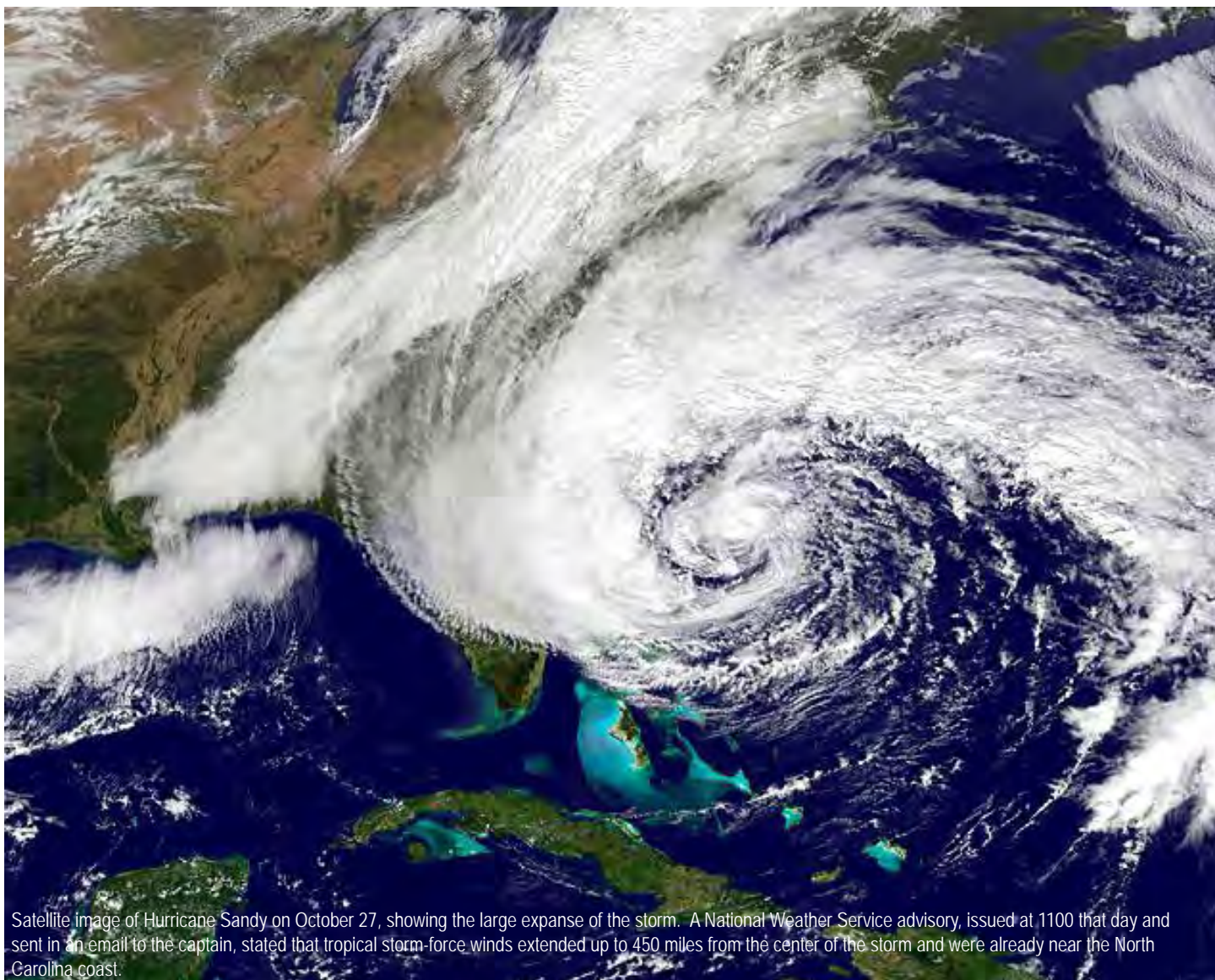
In the evening on October 28, the *Bounty* was experiencing the fiercest effects of Hurricane Sandy, and the chief mate talked to the captain about calling the Coast Guard. The captain initially declined, but later that same evening, when the water level in the engine room reached about 4 feet, the captain agreed to contact the Coast Guard. The Coast Guard launched a C130 aircraft in an effort to maintain radio contact overhead and assess the situation (conditions were too severe to launch helicopters at that time). Meanwhile, the *Bounty* crewmembers gathered gear and planned for abandoning ship. About 0330 on October 29, they donned immersion suits and, shortly after 0400, were considering launching one of the two 25-person inflatable liferafts when the *Bounty* heeled hard over and the bow was buried by a large wave. The chief mate notified the C130 crew, and the *Bounty* crew then

quickly abandoned ship into the water in total darkness. At this point, the Coast Guard launched two Jayhawk helicopters and an additional C130 aircraft. The seas were about 20 feet and the winds gusted as high as 90 knots.

Fourteen of the *Bounty* crewmembers were eventually able to board the vessel's liferafts after a life-and-death struggle in the sea. Some of them were injured from the commotion on board before the vessel heeled over and/or from being struck by the vessel's rigging after abandoning ship. Later that morning, they were hoisted to safety by the helicopter crews. Hours later, one deceased crewmember was recovered from the water. The captain was never found.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the sinking of tall ship *Bounty* was the captain's reckless decision to sail the vessel into the well-forecasted path of Hurricane Sandy, which subjected the aging vessel and the inexperienced crew to conditions from which the vessel could not recover. Contributing to the sinking was the lack of effective safety oversight by the vessel organization.



Satellite image of Hurricane Sandy on October 27, showing the large expanse of the storm. A National Weather Service advisory, issued at 1100 that day and sent in an email to the captain, stated that tropical storm-force winds extended up to 450 miles from the center of the storm and were already near the North Carolina coast.

Breakaway of Tanker *Harbour Feature* from its Moorings and Subsequent Allision with the Sarah Mildred Long Bridge

Vessel Identification

Port of registry	Madeira
Flag	Portugal
Persons on board	20
Injuries/fatalities	None

On April 1, 2013, at 1324 eastern daylight time, the tanker *Harbour Feature* allided with the Sarah Mildred Long Bridge in Portsmouth, New Hampshire, after the vessel broke free from its moorings. No injuries or pollution resulted from the accident; however, the bridge sustained \$2.5 million in damage and the *Harbour Feature* \$1 million.

Earlier that day, the *Harbour Feature* had completed cargo loading at the Sprague facility on the Piscataqua River in Portsmouth. Before transiting to the United Kingdom, the ship docked for refueling at another Portsmouth facility, the New Hampshire State Port Authority's Marine Terminal Wharf, 3 miles downriver. Because the ship had a 29-foot draft at the stern and the Marine Terminal Wharf had a depth of only 30 feet at its west end, the Portsmouth pilot who shifted the vessel from Sprague to the wharf positioned the ship so that its bow extended 30 feet beyond the east end of the wharf and pointed downriver. The ship's stern was positioned about 150 feet from the Sarah Mildred Long Bridge. Ten of the ship's 23 total mooring lines were used to tie the ship at the wharf: three bow and two spring lines forward; three stern and two spring lines aft.

The Piscataqua River is well known for having strong tidal currents; the Portsmouth Pilots warn ship crews of this fact and the importance of skilled line tending when moored in the river. In fact, the shifting of the *Harbour Feature* from the Sprague facility to the Marine Terminal



The *Harbour Feature* under way. (Photo by dl3lat, at www.marinetraffic.com)

Wharf had been timed so that the ship would be under way during slack water at 1153. During flood tide, water rushes up the river and deflects off the river banks causing hazardous crosscurrents. About 1300, because the *Harbour Feature*'s bow extended beyond the eastern end of the wharf, the deflecting flood current pushed the bow away from the dock and increased the strain on the vessel's mooring lines.

Shortly after 1300, about 20 minutes after the pilot had disembarked, a crewmember on the *Harbour Feature* noticed that the forward mooring lines were tight. He ran to the bow to investigate and saw a large amount of dust and smoke emanating from the brakes of the ship's mooring line drums. The bridge team tried using the ship's bow thrusters to push the vessel toward the dock; however, this had no effect. As the tidal current pushed the bow farther into the river, the three mooring lines that were secured to bits of the vessel parted. Then, as the mooring winch brakes slipped in place, all remaining mooring lines ran free off the drums and fell into the water.

By 1324, the bridge team deployed both anchors in an attempt to keep the ship at the dock. The master also tried to gain control over the adrift vessel by using the main engine and rudder. The anchors did slow the drift, but the nearly 4-knot current still carried the vessel into the river. At 1327, the vessel's port side struck the Sarah Mildred Long Bridge.

Breakaway of Tanker *Harbour Feature* from its Moorings and Subsequent Allision with the Sarah Mildred Long Bridge

About 3.5 hours later, during slack water when the current relented, the ship was moved away from the bridge and re-moored at the Marine Terminal Wharf. This time, the bow was pointed upriver, and 18 mooring lines were used: 9 forward and 9 aft. In addition, a tug boat was positioned on the ship's starboard side, pushing the vessel toward the dock.

The *Harbour Feature*'s winch brakes were designed to hold 80 percent of the mooring lines' minimum breaking load, but were operationally set to hold only 60 percent. A test of the mooring winch brakes' holding capacity had been conducted about 1 month before the accident. During the test, the vessel's chief officer had noted that only about 3 millimeters of the brakes' asbestos lining remained. The manufacturer's operations manual stated that this brake lining should be replaced when worn

down to 3 millimeters. However, the lining had not been replaced when the accident occurred, indicating that the brake holding capacity may have been less than the operational setting of 60 percent. The heat that resulted from the mooring lines' rapidly paying out disintegrated the brake lining, and it could not be determined how thick the brake lining was before the accident.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the breakaway of the *Harbour Feature* from its moorings and subsequent allision with the Sarah Mildred Long Bridge was the inadequate mooring arrangement made by the master and the pilot for the vessel's location and the prevailing tidal conditions.



Aerial view of the Marine Terminal Wharf on the Piscataqua River. The overlaid blue arrows illustrate the direction of the strong flood current. The overlaid orange-red icons illustrate how the *Harbour Feature* moved toward the bridge after the mooring lines parted. (Background by Google Earth)

Allision of Tanker *Wawasan Ruby* with CSX Bayside Coal Pier

Vessel Identification

Port of registry	Panama-registered
Flag	Panama
Persons on board	24
Injuries/fatalities	1 injury (worker on a pier)

On August 25, 2012, about 1245 eastern daylight time, the tanker *Wawasan Ruby* allided with the CSX Bayside Coal Pier in Baltimore Harbor, Maryland, while the tanker was making a turn toward its destination berth. One person on the coal pier was injured. The damage to the pier totaled more than \$2 million; the *Wawasan Ruby* sustained an estimated \$15,000 in damage.

On the morning of the allision, the *Wawasan Ruby* arrived in Baltimore Harbor with a partial load of ethanol. About 1230, a docking pilot boarded the vessel to take it into Curtis Creek, a destination which would require making a sharp port turn of about 70 degrees. The docking pilot had not been on board a vessel that proceeded into Curtis Creek in 9 months, and the last vessel he piloted through this turn was smaller than the *Wawasan Ruby*.

When the pilot initiated the turn toward Curtis Creek, the *Wawasan Ruby* was proceeding at a speed of 9.6 knots. The pilot first ordered a 10-degree turn to starboard (he told investigators that he did so to give maximum room for the port turn into the creek). He then went midship, then port 20, and then—on realizing that the bow was not turning fast enough—quickly ordered hard to port. He also ordered the assisting tugboat trailing the ship to come up beside him and push on the ship’s port quarter to facilitate the port turn. However, these efforts were unsuccessful. He ordered the engine stopped, then quickly half astern, and then ordered hard starboard rudder. Shortly thereafter, he ordered the starboard anchor let go.



The *Wawasan Ruby* under way. (Photo by Pascal Bredel, available at www.vesseltracker.com)

As the *Wawasan Ruby* approached the CSX coal pier, no one on board the ship sounded the whistle to warn of the impending allision. Moments later, the ship’s bulbous bow struck the pier. The ship continued forward, damaging a 200-foot-long stretch of the pier until finally coming to a stop. The ship also damaged a crane (loader) on the pier, and a crane worker sustained back and shoulder injuries in the allision.

Following the accident, the Coast Guard obtained automatic identification system (AIS) information from the National Vessel Movement Center, showing previous transits through the accident area by four other ships. These vessels were only slightly larger than the *Wawasan Ruby* but had turned toward Curtis Creek at a much slower average speed (3–6 knots) than the *Wawasan Ruby* had (9–10 knots). Further, the other four ships had used assist tugboats secured to the vessels to aid them through the turn—the *Wawasan Ruby* had not.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the allision of the tanker *Wawasan Ruby* with the CSX Bayside Coal Pier was the high rate of speed at which the pilot and the master were operating the vessel while attempting a 70-degree turn into Curtis Creek.

Allision of the *Dale A. Heller* Tow with Marseilles Dam

Vessel Identification

Port of registry	Cincinnati, Ohio
Flag	United States
Persons on board	9
Injuries/fatalities	None

On April 18, 2013, about 1740 central daylight time, the towing vessel *Dale A. Heller* was pushing a 14-barge tow on the Illinois River and attempting to enter the Marseilles Canal adjacent to the Marseilles Dam when it encountered a strong crosscurrent. Several barges broke away, struck and damaged the dam's gates, and sank. No one was injured; however, the damage to the barges and the dam totaled nearly \$54 million.

The Marseilles Dam has eight submersible gates (60 feet wide by 16 feet high), remotely controlled by a US Army Corps of Engineers (USACE) lockmaster at the Marseilles Lock control station. Each gate could be individually raised from a fully closed position (no water passing through) to fully open, at which point the bottom of the gate would be vertically raised 9 feet from the closed position. The amount of water flowing through the dam was communicated to mariners as follows: If all eight gates were open 3 feet, the lockmaster would say 24 feet of gate was open (8 times 3 feet). When fully open, the dam had 72 feet of open gate. Vessel operators would estimate the amount of crosscurrent in the canal approach based on how much water the lockmaster was allowing to go through the dam (the more water through the dam, the stronger the crosscurrent).

During the week of April 15–19, 2013, the area experienced excessive rainfall and widespread flooding. The *Dale A. Heller* tow arrived above and east of the Marseilles Dam on the morning of April 17. Thirteen of its 14 barges carried various bulk cargo; one barge was empty. That morning, the dam had 22.5 feet of open



The towing vessel *Dale A. Heller* under way. (Photo by Jeff L. Yates)

gate. The river was rising and more rain was expected, so the *Dale A. Heller* crew decided to hold up for several hours about 0.75 mile above the dam and wait for better conditions. During the wait, a large amount of rain caused a rapid rise in the river, and the lockmaster opened the dam to 66 feet of open gate. The *Dale A. Heller* tow began to have difficulty holding its position due to the rapid flow of water in the river.

About 1400 on April 18, a conference call was held regarding the deteriorating river conditions. The call included personnel from the Coast Guard, USACE, and other industry stakeholders, and the group also discussed the emergency that was developing involving the *Dale A. Heller* tow. No immediate location was available to tie up the tow, and the water levels were expected to rise further still. The group ultimately decided to move the *Dale A. Heller* tow west into the Marseilles Canal, as it would provide a safe haven from the rough waters. However, the group was concerned about outdraft at the approach to the canal because of the heavy water flow through the Marseilles Dam, and decided that three other towing vessels (*Loyd Murphy*, *City of Ottawa*, and *Creve Coeur*) would assist the *Dale A. Heller* during the canal approach. The lockmaster said that he could temporarily close 16 feet of gate during that time (closing 16 feet of gate would mean the dam had 50 feet of gate open).

A number of people on the conference call misunderstood the lockmaster and believed that only

16 feet of gate would be open. This information was also conveyed to the towing vessel captains. The *Dale A. Heller* captain later told investigators that he would not have attempted the move into the Marseilles Canal had he known that the dam had 50 feet of gate open.

About 1700, the towing vessels prepared for the approach into Marseilles Canal. The *Creve Coeur* was positioned on the forward starboard side; the *Loyd Murphy* on the starboard quarter; the *City of Ottawa* at the head; and the *Dale A. Heller* at the aft end. About 20 minutes later, a USACE supervisor noticed that the water level had risen quickly and was in danger of breaching the levee and flooding the city of Marseilles. It was agreed that the gates be opened up an additional 8 feet (to 58 feet open gate), and this was communicated to the vessel crews and the lockmaster. However, instead of following through on that agreement, the lockmaster opened the gates to 66 feet.

About 1733, as the head of the tow entered the Marseilles Canal, the outdraft at the dam began pulling the tow toward the dam. The USACE supervisor told the lockmaster to close all gates, but it was too late. The lead barge on the starboard side allided with the

concrete retaining wall, causing several barges to break loose. Eventually, all 14 barges broke away; seven of them ended up against the dam, and four of those sank.

The damage to the barges and loss of cargo totaled \$3,767,000; the damage to the dam was estimated at between \$40 million and \$50 million. In addition, flooding in the city of Marseilles caused extensive damage to homes, businesses, and other property. Although the town may have flooded even if the allision had not occurred, the damage caused by the allision likely exacerbated the flooding.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the allision of the *Dale A. Heller* tow with the Marseilles Dam was the decision by all involved parties to proceed with the passage of the tow during a period of record high water and significant risk. Contributing to the accident was the failure of the Marseilles Dam lockmaster and the *Dale A. Heller* captain to communicate effectively about the actual positioning of the dam's gates before and during the transit.



The Marseilles Dam after the barges broke away. Several barges can be seen pushing against the dam. The city of Marseilles, seen in the top right of the photo, flooded. (Photo by US Coast Guard)

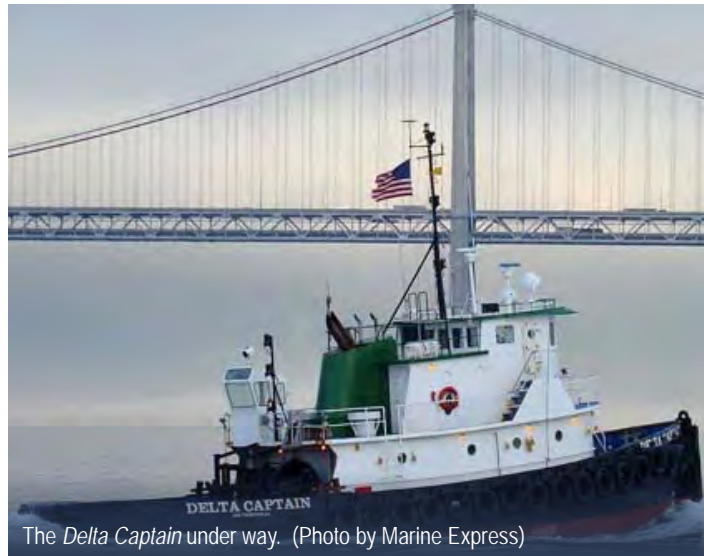
Sinking of Towing Vessel *Delta Captain*

Vessel Identification

Port of registry	San Francisco, California
Flag	United States
Persons on board	4
Injuries/fatalities	None

On April 13, 2013, about 1455 Pacific daylight time, the towing vessel *Delta Captain* sank about 13 nautical miles west of Point Sur, California, after experiencing uncontrolled flooding in its engine room. The four crewmembers abandoned the vessel within about 10 minutes after the flooding began and were rescued without injury by the Coast Guard. The vessel sank; its estimated value was \$2.5 million.

The *Delta Captain* had left Alameda, near San Francisco, California, the day before, towing a 225-foot-long crane deck barge to Long Beach, California. About a day into the voyage, the engineer noticed water ingress near the aft bulkhead in the engine room, in the vicinity of a 6-inch-diameter pipe that passed through the bulkhead to the steering gear space. The crewmembers activated bilge and fire pumps and tried to plug the area where



The *Delta Captain* under way. (Photo by Marine Express)

the water was entering, but the high rate of ingress thwarted their efforts.

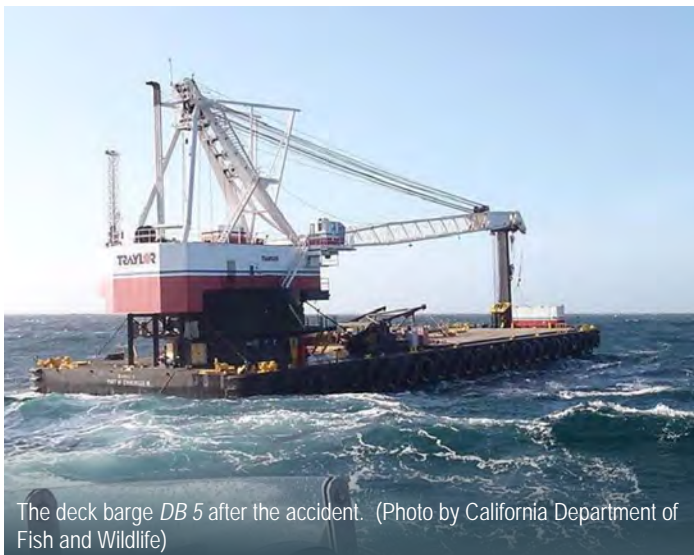
The crew thought that the chance of saving the boat might increase by releasing the tow wire to the barge. However, the crew could not reach the winch drum to release the tow because the stern was partially submerged. About 1455, the captain contacted the Coast Guard and directed the crew to launch the vessel's liferaft. Shortly thereafter, the four crewmembers abandoned ship.

About 1623, a Coast Guard helicopter arrived on scene and hoisted the uninjured crew from the liferaft.

The water depth in the area was about 3,000 feet, and the *Delta Captain* crew reported that the vessel appeared to still be attached to the deck barge's towline after sinking. However, the next day, two towing vessels arrived at the site of the adrift deck barge and reported that the *Delta Captain* was not still connected to the barge's towline. One of the responding vessels towed the deck barge to shore.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the sinking of the towing vessel *Delta Captain* was uncontrolled flooding of the steering gear space and engine room from an undetermined source in the steering gear space.



The deck barge *DB 5* after the accident. (Photo by California Department of Fish and Wildlife)

Grounding of Commercial Towing Vessel *Justice*

Vessel Identification

Port of registry	New York, NY
Flag	United States
Construction	Steel
Persons on board	5 crew

The towing vessel *Justice* was heading to Buzzards Bay, Massachusetts, with five crewmembers when it grounded on a hard, rocky bottom southwest of Cape Cod Canal, just outside Hog Island Channel on March 21, 2013. The impact, at 0001 eastern daylight time, sheared the starboard stern drive from the vessel and resulted in the discharge of 232 gallons of gear oil. The vessel docked 15 minutes later without further incident using its remaining port stern drive. No one was injured.

The *Justice* was transiting eastbound through the canal to escort another tug. The mate used the autopilot feature to set the port azimuthing stern drive (ASD) to steer and hold a course he typically used to transit that leg of the channel. The navigational and propulsion systems were working properly, and the mate continually watched his surroundings and checked the chart plotter and radar. The vessel's speed was about 8.5 knots.

The mate said that he may have started the accident leg a bit further to starboard than normal in the channel, but he was comfortable with the tug's position. As the transit continued, however, he became aware that the vessel was moving toward the west side of the channel, and about 2359, he became concerned with its position.

About 0001, the mate took manual control of the steering, but the *Justice* grounded 5 seconds later. The United States Coast Guard later developed a trackline from automatic identification system (AIS) data that showed the tug had been moving progressively to starboard and crossed outside the channel's western edge.



Stern view of *Justice* in dry dock after the accident. (Photo by US Coast Guard)

The lower portion of the integrated nozzle and propeller of the starboard ASD was sheared off in the accident, and the mate used the port ASD to maneuver the vessel back into the channel. The *Justice* immediately took on a 2- to 4-degree port list due to the lost weight of the sheared-off starboard ASD. The master coordinated a vessel assessment by the crew, relieved the mate, and docked the vessel.

The Cape Cod Canal was closed to deep-draft vessels after the grounding and reopened after the lost ASD was recovered later the same day. Flooding was contained in the upper part of the ASD, and no water entered the hull.

Pollution response units began overflights of Buzzards Bay the same day. A visible oil sheen was reported but deemed unrecoverable. Another visible sheen was seen around the vessel at the Massachusetts Maritime Academy dock, and sorbent boom was deployed around the vessel the next morning. The tug held 36,788 gallons of diesel fuel at the time, but without damage to the hull, no fuel oil was released. The owner reported that the cost to repair the *Justice* was about \$1.2 million.

The mate had navigated the same waterway for the previous 7 months and was familiar with the operating characteristics of the *Justice*. He stated that use of the autopilot was common practice for this transit, and he set a routine course on the accident leg of the channel.

The mate described the transit as routine until moments before the grounding. He did not think the vessel passed unusually close to a lighted buoy, although AIS data showed the vessel's trackline passing a few feet away.

On the night of the accident, navigational aids—channel markers, lights, and lighted buoys—as well as the vessel's chart plotter would have clearly indicated the boundaries of the 500-foot-wide navigable channel. AIS data show the *Justice* was on a course toward a large, fixed light when the vessel grounded on a charted rocky ledge 140 yards before it. Although the mate's use of autopilot was considered typical and he made minor

course corrections to the autopilot, avoiding the rocky ledge would have required aggressive course adjustment well in advance of the light.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the grounding of the commercial towing vessel *Justice* in Hog Island Channel was the mate's ineffective use of the vessel's autopilot to maintain a course within the navigable channel and his delay in taking manual control as the vessel approached charted hazards.



Lower part of starboard ASD after salvage. (Photo by US Coast Guard)

Grounding and Sinking of the Harbor Assist Tug *Kaleen McAllister*

Vessel Identification

Port of registry	New York, NY
Construction	Steel
Propulsion type	Controllable pitch, azimuthing stern drive
Persons on board	3

Near sunset on the evening of May 4, 2013, the harbor assist tug *Kaleen McAllister* got under way from its berth in Baltimore Harbor with a crew of three to assist in docking a tow and barge entering the port. A few minutes later, the tug struck the charted edge of a collapsed pier and began flooding.

The tug returned to its berth, where the crew and shoreside support personnel attempted to control the flooding, but the effort was unsuccessful and the vessel sank alongside the pier within 30 minutes. No one was injured. The sinking resulted in the discharge of about 2,400 gallons of diesel fuel and estimated vessel repair costs of \$1.5 million.

The *Kaleen McAllister* is a subtype of towing vessel typically known as a harbor assist tug. These tugs assist larger and less maneuverable ships or large tows with barges in docking and transiting to and from the confined waters of harbors. Harbor assist tugs have a relatively deep draft and high propulsive power for their size.

At 1948 on May 4, the mate backed the tug astern to the end of the pier to begin a trip to assist in docking a tow and barge entering Baltimore Harbor. He turned to port to head eastward into the harbor and West Channel.

The mate stated that he was navigating by visual reference to maintain a green buoy dead ahead of him, and he intended to pass between the lighted yellow dolphin (cluster of closely driven piles) and the adjacent



The sunken vessel oil-boomed off and resting on the bottom at its berth on the east side of Pier 1 on May 6, 2013. The remaining exposed pilings of the collapsed pier and associated dolphin are seen above the wheelhouse.

collapsed pier that was parallel to Pier 1. Based on his experience with the area, he judged that he would pass north of any hazards associated with the collapsed pier. He also stated that he did not refer to the chart plotter on a laptop in the wheelhouse. About 1951, he felt “a rumble under the hull” and stopped the engine. At that time he noted that “the pilings of the abandoned pier were closer to my starboard side than anticipated.”

The master stated he was in his room when the tug departed and a few minutes later felt “contact of the hull with a submerged object.” When the mate shouted for assistance, the master went to the wheelhouse where he noted that the depth finder showed enough water under the keel to operate.

The master took over maneuvering the tug as the deckhand and mate checked for damage in the machinery spaces, where they discovered rapid flooding in the engine room bilge. The master felt it was unsafe to proceed, turned the vessel around to return to Pier 1, and notified McAllister’s dispatch office and the United States Coast Guard of the contact.

By about 2030, the tug had sunk and an oil sheen was observed. The vessel settled on the bottom with a port list and its wheelhouse top just above the surface of the water. An estimated 2,400 gallons of diesel fuel were discharged into the harbor.

Grounding and Sinking of the Harbor Assist Tug *Kaleen McAllister*

The vessel was underwater for 3 weeks, and the owner estimated \$1.5 million in repairs would be required to return the tug to service.

Tide data and a US Army Corps of Engineers sonar survey of the bottom profile at the north end of the collapsed pier indicate the vessel struck a fixed, submerged object at the northwest end of the old pier.

The mate stated that he typically backed off Pier 1 and dead reckoned to an unlit buoy to the east. On the other hand, the master told Coast Guard investigators that he would back the vessel to the end of the pier, turn 180 degrees, and then go forward until the tug was north of the dolphin before proceeding east. He attributed this practice to an abundance of caution. However, the master had witnessed the mate on 30 or 40 jobs and was aware that both the mate at the time of the grounding and other *McAllister* tug masters navigated between the dolphins and the collapsed pier, and it seemed to be a safe practice.

The mate told Coast Guard investigators that he had piloted tugs to and from Pier 1 about 500 times, both alone and in training with a master observing. He stated that when heading east he usually transited between the lighted dolphin and the collapsed pier, had done so during observed training, and had never been instructed not to transit this route. However, he had never seen the master on board at the time of the accident (who was his trainer) navigate between the lighted buoy and the collapsed pier.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the grounding and sinking of the harbor assist tug *Kaleen McAllister* was the mate's practice of transiting near a submerged portion of a collapsed pier, a known and charted underwater hazard, which ultimately resulted in the vessel striking the obstruction.



Kaleen McAllister in dry dock after salvage. (Photo by US Coast Guard)

Engine Room Fire on Board Towing Vessel *Marguerite L. Terral*

Vessel Identification

Port of registry	Lake Providence, Louisiana
Flag	United States
Persons on board	6
Injuries/fatalities	None

On June 9, 2012, about 1705 central daylight time, the towing vessel *Marguerite L. Terral* was pushing 12 empty barges on the Mississippi River near Hickman, Kentucky, when the vessel's port engine caught fire. The six-person crew tried unsuccessfully to extinguish the fire before evacuating onto one of the barges. No one was injured and no pollution resulted from the fire. The damage to the vessel was estimated to be \$2.6 million.

The captain, who was making a round of the vessel before taking his watch, saw flames through an open engine room door about the same time as an alarm sounded in the wheelhouse. The vessel was equipped with a fixed CO₂ fire suppression system for the engine room, but flames prevented the crew from releasing the CO₂ from one of the remote release stations near the engine room door. The crew could also have activated the fire suppression system from the steering gear room; however, no evidence indicates that the crew attempted to do so.

Shortly thereafter, the crew used portable fire extinguishers to try to control the fire. However, the crew had not shut off the ventilation or closed the doors to the engine room; therefore, oxygen was readily available to sustain the fire. At 1710, the captain ordered everyone to evacuate onto the nearest of the 12 barges, and one of the deckhands shut off the fuel supply to the vessel's engines before leaving.

Local responders arrived on scene, and together with crew of the responding towing vessel *Edna T. Gattle*, they used portable and onboard fire pumps to fight



Stern of vessel showing fire damage. (Photo by US Coast Guard)

the fire. Finally, about 2200, the fire was extinguished. The *Marguerite L. Terral* was extensively damaged as the fire spread to nearby rooms on the vessel. The damage amount was estimated to be \$2.6 million.

Because the crew was unable to access the ventilation shutdown levers in the fire, the US Coast Guard Inspection and Compliance Directorate issued Safety Alert 05-12, titled "Pressure Switch Location for Fixed Fire Suppression Systems," in December 2012. The Coast Guard published this safety alert to educate the marine industry about the issues involving the installation and locations of control systems associated with fire suppression systems. The safety alert emphasized that control switches for fire suppression systems should not be located in the space they are designed to protect.

Probable Cause

The National Transportation Safety Board could not determine the origin of the engine room fire on board the *Marguerite L. Terral*. Contributing to the extent of the fire damage was the crew's failure to set fire boundaries, shut down the ventilation, and use the onboard fire suppression equipment effectively.

Capsizing of Towing Vessel *Megan McB*

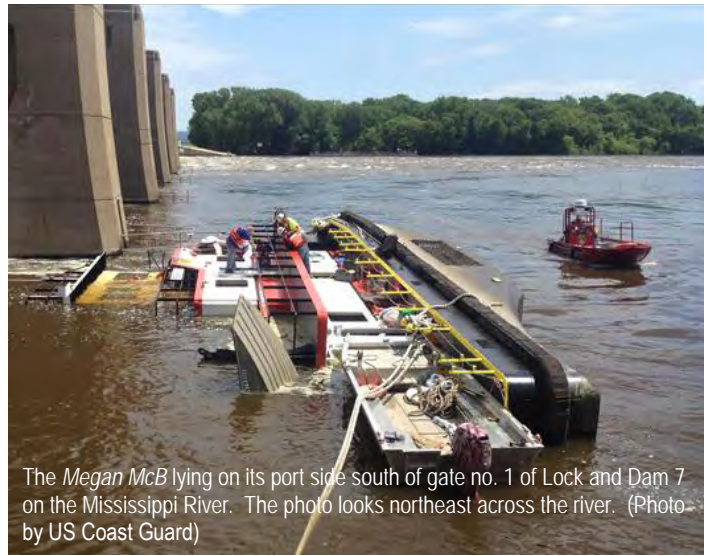
Vessel Identification

Port of registry	La Crosse, Wisconsin
Flag	United States
Persons on board	3
Injuries/fatalities	1 fatality

On July 3, 2013, at 0558 central daylight time, the towing vessel *Megan McB* lost engine throttle control while the crew was trying to maneuver the vessel into the main lock of Lock and Dam 7 on the Mississippi River near La Crescent, Minnesota. The strong current swept the vessel into gate no. 1 of the dam, where the vessel capsized. One crewmember died in the accident. Damage to the vessel was estimated at \$500,000.

The *Megan McB* was a new vessel that had been in service only a couple of months before the accident. It was owned by Brennan Marine, and was the only one of the company’s vessels equipped with electronic (as opposed to air) engine control throttles. One of the aspects of the electronic throttles was that each time the vessel’s diesel engines were started, the “station select” button needed to be pressed on the electronic control head. The control head controlled both the marine transmissions (forward and astern controls) and the main diesel engines’ speed. If the station select button on the control head was not pressed after engine startup, the electronic throttles would not control the engines.

The pilot who would operate the *Megan McB* at the time of the capsizing joined the vessel crew in the middle of a shift, at 0100 on the morning of the accident. He had been called in unexpectedly, had never previously served on board the *Megan McB*, and had only piloted Brennan Marine vessels with air throttles.



The *Megan McB* lying on its port side south of gate no. 1 of Lock and Dam 7 on the Mississippi River. The photo looks northeast across the river. (Photo by US Coast Guard)

About 0545 that morning, the crew prepared for an upcoming, scheduled crew change, which also included switching over the onboard generators and temporarily shutting down the diesel engines. As expected, the electrical power to the electronic control head in the wheelhouse was deactivated during this process. Shortly thereafter, the engines were restarted, and the pilot prepared to maneuver the *Megan McB* into the main lock to assist a tow. But when he tried to engage the engines they did not respond because the pilot had not pressed the station select button. The pilot later told investigators that he did not know he had to press this button to control the engines; he had received no instruction in using the electronic control head.

By this time, the strong and swift river current—estimated to be about three times stronger than usual due to heavy rainfall—swept the *Megan McB* into the nearby gate no. 1 of the dam. The top of the vessel’s superstructure became pinned against the catwalk atop the dam, causing the hull to be pushed out from underneath the superstructure. Moments later, the *Megan McB* capsized. The pilot and the first mate were able to escape unharmed, but the deckhand died in the capsizing.

The *Megan McB* was later refloated; it sustained flooding damage estimated at \$500,000.

Brennan Marine did not have a process for instructing first-time *Megan McB* pilots about the vessel’s electronic engine control throttles, even though the need to press

the station select button for engine control was unique to the *Megan McB*. Like to the accident pilot, the pilot originally scheduled to work the shift also did not know how to operate the electronic control head when he first piloted the *Megan McB*. He told investigators that he too did not have engine control the first time he got under way with the vessel, but in his case, the mate who had served on board the *Megan McB* during the delivery transit from the shipyard came to his aid and alerted him about pressing the station select button.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the capsizing of towing vessel *Megan McB* was the replacement pilot's unfamiliarity with the vessel's electronic engine control throttles, which resulted in his inability to avoid gate no. 1 of Lock and Dam 7. Contributing to the capsizing was Brennan Marine's lack of effective procedures to ensure that the *Megan McB* was operated by a replacement pilot familiar with the electronic engine control throttles, which were unique to this one vessel in the company fleet.



Aerial view of Lock and Dam 7, looking west across the river. (Photo by US Coast Guard)

Fire and Explosions on Board Towing Vessel *Safety Runner* and Kirby Barges 28182 and 28194

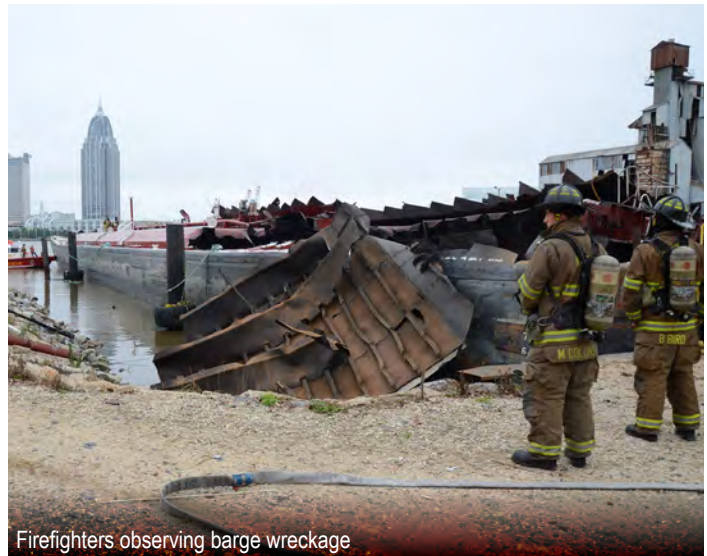
Vessel Identification

Port of registry	<i>Safety Runner</i> : New Orleans, Louisiana; Kirby 28182 and 28194: Wilmington, Delaware
Flag	United States
Persons on board	<i>Safety Runner</i> : 20; Kirby 28182 and 28194: None
Injuries/fatalities	3 serious

On April 24, 2013, at 2030 central daylight time, the towing vessel *Safety Runner* docked on the Mobile River in Mobile, Alabama, alongside two Kirby barges that were having their tanks cleaned. Shortly thereafter, flammable vapors being vented from the barges' open tank hatches entered the *Safety Runner*'s engine room and ignited. The fire spread to the barges, causing explosions. Three persons sustained serious burn injuries, and the total damage to the vessel and barges was estimated at \$5.7 million.

The two barges had been brought to the Oil Recovery Company (ORC) facility early that morning for tank cleaning. The two barges had a total of about 11 barrels, or 462 gallons, of residual natural gasoline (a liquid, flammable, first distillation of crude oil).

Between noon and 1300, two ORC employees opened all cargo tanks and hatches on the barges and began to strip the tanks of residual gasoline. Flammable vapors vented to the atmosphere. The two ORC employees finished stripping the tanks at 2000 and installed six portable fans on board each barge to help ventilate the tanks. At 2030, the *Safety Runner* pulled in next to the barges (immediately next to the 28194) to drop off a radio technician. The *Safety Runner* captain later told Coast Guard investigators that he was unaware of



Firefighters observing barge wreckage

the tank cleaning operation in progress. Shortly after the radio technician disembarked, the *Safety Runner*'s main engines "started to run away," according to the captain. Tank vapors had begun entering the vessel's air intakes, and this fueled the engines. The captain tried to shut off the engines from the pilothouse, but failed. Two deckhands then activated the engines' emergency shutdowns on the main deck; however, the engines still did not shut down. The concentration of the tank vapors was high enough that it introduced additional fuel to power the engines, even though the vessel's normal fuel supply had been shut off. Shortly thereafter, flames began shooting along both sides of the *Safety Runner* and onto both barges, followed by several explosions.

Three people sustained serious burns: an ORC employee, a deckhand on the *Safety Runner*, and the radio technician who was standing on land immediately in front of the *Safety Runner*. The two barges were declared total losses. The *Safety Runner* was extensively fire damaged. The total damage amount for the barges and vessel was estimated to be \$5.7 million.

Investigators found evidence of inadequate management oversight by ORC, including employing a barge person in charge without proper credentials and not having an operations manual that specifically addressed tank cleaning operations at the ORC facility. Instead, ORC used an operations manual intended only for mobile facilities, such as vacuum trucks and tankers. Further,

in that manual, ORC had attached pages from the Oil Companies International Marine Forum (OCIMF) International Safety Guide for Oil Tankers and Terminals (ISGOTT) that described only what procedures ought to be contained in operations manuals, rather than writing its own procedures specific to the risks associated with tank cleaning operations at the ORC facility. The manual did not address hazards associated with motor vessels—full of ignition sources—docking alongside barges during tank cleaning operations.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the fire and explosions involving towing vessel *Safety Runner* and Kirby barges 28182 and 28194 was the failure of the ORC Facility to isolate tank cleaning operations from sources of ignition. Contributing to the accident was ORC's failure to provide its employees with tank cleaning training and procedures that followed industry standards and government regulations for reducing the risk of fire during tank cleaning operations.



Explosion damage to barge cargo tank.

Fire on Board Towing Vessel *Shanon E. Settoon*

Vessel Identification

Port of registry	Belle River, Louisiana
Flag	United States
Persons on board	4
Injuries/fatalities	1 fatality

On March 12, 2013, at 1745 central daylight time, the towing vessel *Shanon E. Settoon* struck and ruptured a submerged gas pipeline in Bayou Perot, Louisiana, while the vessel was approaching an oil terminal. An explosion and fire ensued. The *Shanon E. Settoon* was destroyed by the fire, and the captain died a month later from the burns he suffered in the accident.

When the accident occurred, the *Shanon E. Settoon* was inbound with a tank barge to a temporary facility on Bayou Perot, operated by the Louisiana Delta Oil Company (LDOC). There, the tank barge was to load an additional 1,600 gallons of crude oil to top off its current onboard cargo of 93,000 gallons.

The captain on board the *Shanon E. Settoon* was uncertain of how to get to the LDOC facility, and three times that afternoon during the vessel's transit, he spoke with an LDOC contractor at the facility to clarify the directions. The LDOC contractor told him that the tow could either enter via the North Canal, or go slightly farther to the southeast and then turn and come in that way. The captain chose the more southeast approach. As the tow neared the facility, the captain spotted a couple of obstructions on the surface of the water, and he diverted course to starboard to avoid them. The vessel then struck and ruptured a submerged Chevron pipeline, which contained petroleum gas at 250 pounds per square inch of pressure. On realizing that the vessel had struck something under the water, the captain tried to maneuver the tow away from the obstruction; shortly thereafter, gas escaping from the ruptured pipeline entered the air intake for the vessel's



main diesel engines and exploded. An intense fire, fed by the escaping gas under pressure, ensued. The four crewmembers escaped from the burning vessel; however, the captain sustained second- and third-degree burns from which he died a month later.

The *Shanon E. Settoon* was completely destroyed in the fire. About 1,000 gallons of diesel fuel from the vessel, and a considerable amount of petroleum gas from the pipeline, were spilled in the accident. The tank barge sustained only minor damage and did not spill any of the crude oil it was carrying.

Given the numerous, uncharted pipelines in the area that present submerged hazards, and given that the locations of oil and gas facilities may be temporary and subject to change, it is essential that vessel companies provide their operators with up-to-date, well-researched information to ensure safe navigation. The *Shanon E. Settoon* captain attempted to avoid a visible hazard but inadvertently struck a submerged one.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the explosion and fire on board the *Shanon E. Settoon* was the introduction of petroleum gas into the main engines after the vessel struck and ruptured a submerged pipeline due to incomplete navigational information provided to the captain by the vessel company.

Grounding and Sinking of Towing Vessel *Stephen L. Colby*

Vessel Identification

Hailing port	Paducah, Kentucky
Construction	Steel
Tonnage	597 gross tons
Persons on board	9

The uninspected towing vessel *Stephen L. Colby* struck hard bottom in the Upper Mississippi River and partially sank off the right descending riverbank in LeClaire, Iowa, at 1555 on November 25, 2013. Six of the nine crewmembers on board made it to the riverbank on their own, and the nearby towing vessel *Aaron F. Barrett* recovered the remaining three crewmembers from the partially sunken vessel. No one was injured.

The *Stephen L. Colby* was operated by Marquette Transportation Co. as a line haul boat, a term commonly used in the inland towing industry for a vessel in continuous operation as it picks up and drops off barges at multiple locations along the waterway. At the time of the accident, the *Stephen L. Colby* was transiting upriver from St. Louis, Missouri, to Clinton, Iowa, to pick up 15 loaded dry cargo barges.

As the *Stephen L. Colby* approached mile 497, the mate on watch in the wheelhouse heard and felt the hull strike something near the bow area. He slowed the vessel, and a check of the engine room revealed a significant amount of water spraying up through the deck plating.

The mate sounded the general alarm signal, maneuvered toward the right descending riverbank to ground the vessel in shallow water, and requested support from the *Aaron F. Barrett*, which was about 1 mile downriver at the time.

Once the vessel was grounded on the riverbank, six of the crew disembarked safely ashore, and the mate, master, and engineer remained on board. The tug lost



The *Stephen L. Colby* in the days after the sinking. The superstructure remained above the waterline when the vessel came to rest on the Mississippi River bottom near LeClaire, Iowa. (Photo by US Coast Guard)

power as the water level quickly rose in the engine room, and it slid about 50 feet off the riverbank before the *Aaron F. Barrett* came alongside and held the *Stephen L. Colby* in position until the hull came to rest on the river bottom. The mate, master, and engineer then abandoned the partially submerged *Stephen L. Colby* and boarded the *Aaron F. Barrett*.

Shortly after the *Stephen L. Colby* sank, the crew of the *Aaron F. Barrett* deployed oil containment boom around the vessel. At first light the next morning, local responders, oil recovery personnel, and the Coast Guard continued the response effort. Oil response and salvage operations continued for about 2 weeks after the accident.

US Army Corps of Engineers (USACE) soundings and a side-scanning sonar survey found no unknown hazards or obstructions on the river bottom. Using automatic identification system (AIS) data obtained from the *Stephen L. Colby*, the USACE determined the vessel had remained within the navigable channel before the accident.

The shallowest calculated water depth recorded along the vessel's path at the time of the survey was 9.9 feet. According to Coast Guard information, the vessel owner reported the draft of the *Stephen L. Colby* at the time of the accident to be 9 feet both forward and aft, leaving an underkeel clearance of 8 to 11 inches at idle speed. Although the squat effect was not calculated in this situation, this hydrodynamic phenomenon—caused

when a vessel passes through shallow water at speed—very likely reduced the vessel’s underkeel clearance even further.

The *Stephen L. Colby*’s electronic navigational tools were operational and available to the mate at the time of the accident.

The vessel’s safety management system required the master and wheelhouse person on watch to maintain appropriate draft and trim but did not specify a minimum underkeel clearance for each vessel in the fleet to maintain as a safety margin.

Low water concerns along the Upper Mississippi River have persisted since 2012, mainly due to drought conditions. The area near the *Stephen L. Colby* grounding is known to require particular caution at low water because the bottom is hard rock with a stepped or shelf formation.

In November 16, 2013, the port captain for the vessel owner sent an e-mail reminder to all company vessel operators to use caution while transiting two specific areas of the waterway, including the area just upstream

of the accident site. The e-mail warned, in part, “There are rock shelves in those areas and there have been several incidents over the years of a boat . . . hitting those rocks and puncturing the hulls.” The mate stated that he was not aware of this caution, but he knew those areas of the Upper Mississippi River presented special risks.

“There are rock shelves in those areas and there have been several incidents over the years of boats . . . hitting those rocks and puncturing the hulls.”

—Company caution to operators

Probable Cause

The National Transportation Safety Board determines that the probable cause of the grounding and sinking of the *Stephen L. Colby* was the failure of the master and mate to ensure sufficient underkeel clearance for the intended transit through the accident area.

Squat effect and hydrodynamics

A ship moving through shallow water experiences pronounced effects from the proximity of the bottom. Similarly, a ship in a channel is affected by the proximity of the sides of the channel. These hydrodynamic effects—squat, bank cushion, and bank suction—can easily cause errors in piloting that lead to grounding.

Squat is caused by the interaction of the hull of the ship, the bottom, and the water between. As a ship moves through shallow water, some of the water it displaces rushes under the vessel to rise again at the stern. This causes a venturi effect, decreasing upward pressure on the hull. Squat makes the ship sink deeper in the water than normal and slows the vessel.

The faster the ship moves through shallow water, the greater this effect. Groundings on both charted and

uncharted shoals and rocks have occurred because of this phenomenon, when at reduced speed the ship could have safely cleared the dangers.

When navigating in shallow water, the navigator must reduce speed to avoid squat. If bow and stern waves appear nearly perpendicular to the direction of travel, and the vessel slows with no change in shaft speed, squat is occurring. Immediately slow the ship to counter it. Squatting also occurs in deep water, but the effect is more pronounced and dangerous in shoal water. The large waves generated by a squatting ship also endanger shore facilities and other craft.

Skilled pilots may use hydrodynamic effects to advantage in particular situations, but the average mariner’s best choice is slow speed and careful attention to piloting.

— From *The American Practical Navigator: An Epitome of Navigation*, originally by Nathaniel Bowditch, first published in Newburyport, Massachusetts, 1802

Fire on Board Motor Yacht *Ocean Alexander 85E06*

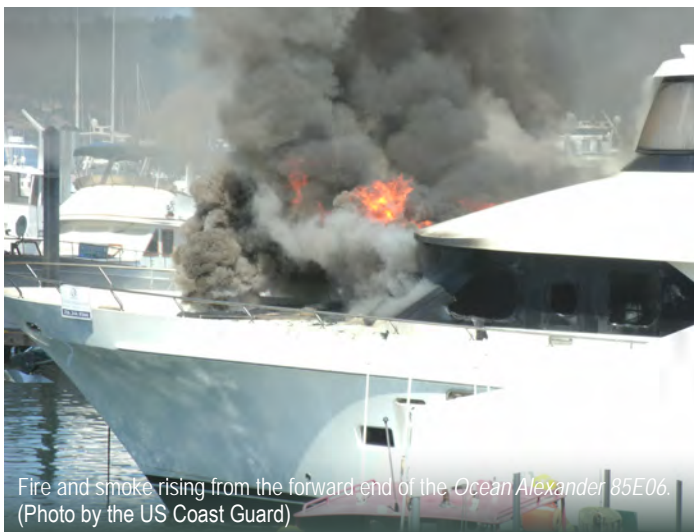
Vessel Identification

Port of registry	Seattle, Washington
Flag	United States
Persons on board	None
Injuries/fatalities	None

On July 10, 2013, about 1000 Pacific daylight time, a fire broke out in a forward compartment on the newly built motor yacht *Ocean Alexander 85E06*. The vessel was moored and on display for purchase at the Roche Harbor Resort Marina in Washington state, and no one was on board at the time. The yacht, valued at nearly \$3.7 million, was a total loss.

The yacht had been built in Taiwan and shipped to Washington state. It was owned by Seattle-based Ocean Alexander Marine Yacht Sales, Inc., and had been displayed and offered for sale at the Roche Harbor Resort Marina since early summer 2013. The name of the yacht reflected the builder's hull number and was temporary only.

The fire was discovered by the marina's harbor master, who saw smoke billowing from the yacht's bow hatch.



Fire and smoke rising from the forward end of the *Ocean Alexander 85E06*.
(Photo by the US Coast Guard)



The starboard side of the *Ocean Alexander 85E06* after the fire was extinguished. The stern is visible and the bow has sunk below the water. The pollution prevention boom can be seen in the foreground. (Photo by the US Coast Guard)

He alerted the local fire department and together with marina employees began hosing water to suppress the fire. The vessel's fixed fire suppression system was also activated.

Fire department and Coast Guard personnel assisted in the firefighting, but the efforts did not extinguish the fire until it had severely damaged the vessel. Also, the water weight that accumulated on board from the firefighting efforts caused the vessel to sink almost completely.

An estimated 1,600 gallons of diesel fuel spilled into the waterway; about 1,200 gallons were recovered during cleanup efforts.

The wreckage was moved to a shipyard for examination. The exact source of the fire remains unknown, but the postfire inspection and eyewitness accounts support the conclusion that the fire was electrical in nature and originated in the forward accommodation area.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the fire on board the *Ocean Alexander 85E06* was an electrical fault of an unknown source, located in the vessel's forward accommodation area.

Summary of Lessons Learned from Accident Investigations

Of the 23 reports completed in 2014, fishing vessels and towing vessels were the most common vessel types.

- 5 fishing vessel accident reports
- 9 towing vessel accident reports

Important Issues:

- **CONTROL SYSTEM UNDERSTANDING:** As bridge systems become increasingly technologically advanced, it is important that operators have a thorough understanding of the systems they are using. In two casualties reported this year, a lack of understanding of vessel control systems led to accidents. (*Seastreak Wall Street* and *Megan McB*)
- **PASSENGER SAFETY DURING CRITICAL MANEUVERS:** Stairways on passenger vessels can be a hazard when docking and undocking. During the *Seastreak Wall Street* allision, people standing near the stairways were seriously injured when the vessel allided with the dock. Vessel operators should develop procedures to control passenger access to stairways during docking and undocking. (Please see NTSB video on stairway safety at: <http://www.nts.gov/safety/safety-alerts/Pages/Safety-Videos.aspx>.)
- **PROPER MAINTENANCE:** Proper maintenance is of the utmost importance with wooden vessels. Two accident reports from this publication highlight this fact. In both accidents the wooden vessels had maintenance issues that had been identified, but repair work was deferred. Both vessels encountered problems when facing heavy weather and both sank as a result. (*Bounty* and *Moonlight Maid*)
- **CREW TRAINING:** Several accidents from this publication highlight the importance of training. Know your vessel and its systems. Use realistic drills. Inadequate response to a fire on the *Marguerite L. Terral* and flooding on the *Ricky B* led to the loss of both vessels.





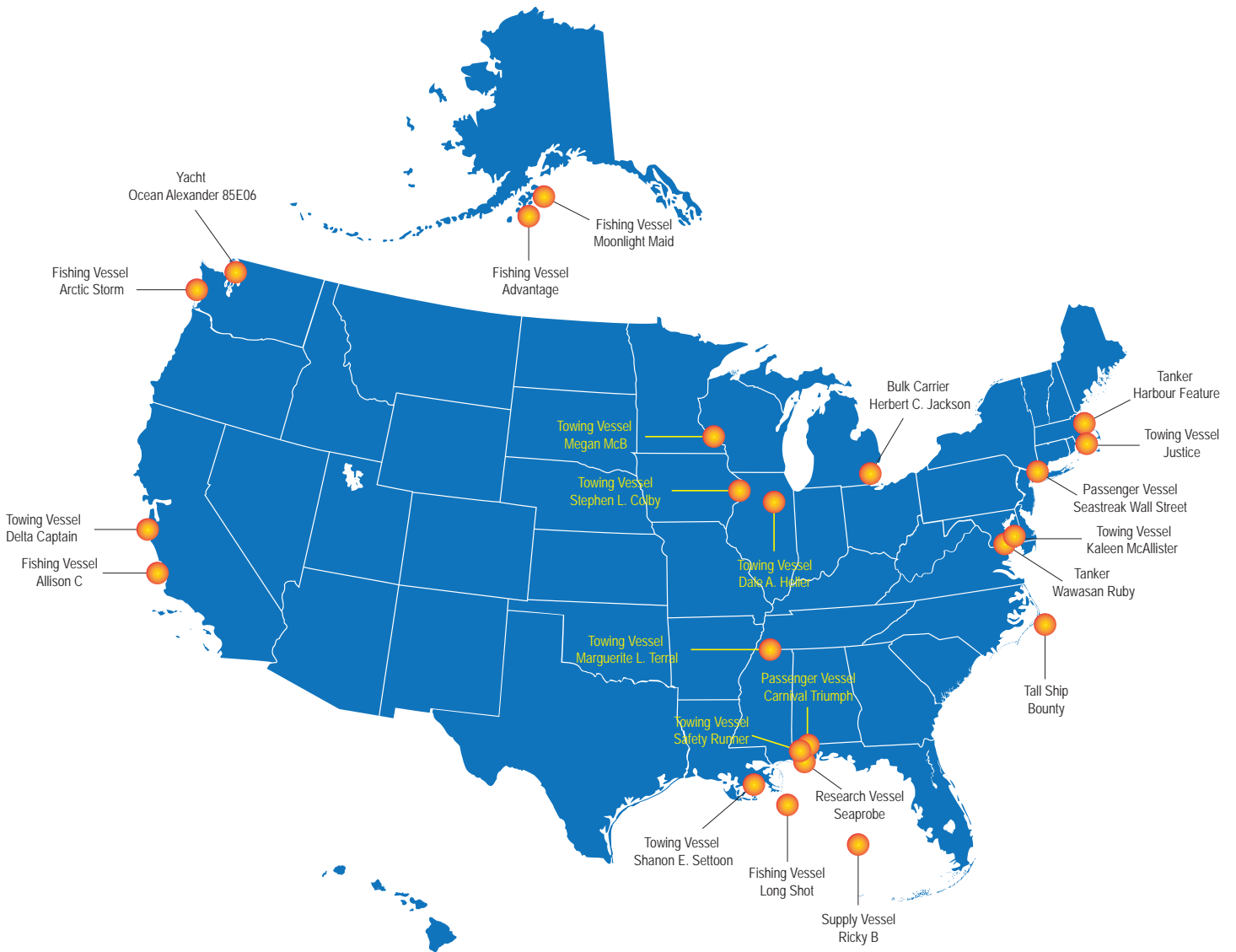
The National Transportation Safety Board, Office of Marine Safety, would like to thank the Coast Guard Office of Investigations and Casualty Analysis (CG-INV), the Investigations National Center of Expertise, and Coast Guard Activities Europe for their ongoing support of investigative activities.



Safety Board investigators work closely with our US Coast Guard counterparts to gather facts and evidence at the scene of an accident. NTSB would like to acknowledge the following Coast Guard units for their support:

ACCIDENT	COAST GUARD UNIT
Advantage	MSD Kodiak, Sector Anchorage
Allison C	Sector San Francisco
Arctic Storm	MSU Portland
Bounty	Sector Hampton Roads, Investigations National Center of Expertise (INCOE)
Carnival Triumph	Sector Mobile
Dale A Heller	MSU Chicago
Delta Captain	Sector Los Angeles/Long Beach
Harbour Feature	MSD Portsmouth (NH), Sector Northern New England
Herbert C Jackson	Sector Detroit
Justice	Sector Southeastern New England
Kaleen McAllister	Sector Baltimore
Long Shot	MSD Panama City
Marguerite L Terral	MSU Paducah
Megan McB	MSD St. Paul
Moonlight Maid	Sector Anchorage
Ocean Alexander	Sector Puget Sound
Ricky B	MSU Morgan City
Safety Runner	Sector Mobile
Seaprobe	Sector Mobile
Seastreak Wall Street	Sector New York
Shanon E. Settoon	MSU Houma, MSU Morgan City, Investigations COE
Stephen L Colby	MSD Quad Cities, Sector Upper Mississippi River
Wawasan Ruby	Sector Baltimore

2014 Marine Accident Locations





Safer Seas 2014
LESSONS LEARNED FROM
MARINE ACCIDENT INVESTIGATIONS