National Transportation Safety Board

Marine Accident Brief

Engine Room Fire on Board Towing Vessel *Leland Speakes*

Accident type	Fire/Explosion	**No.** DCA18FM014
Vessel name	*Leland Speakes*	
Location	Lower Mississippi River, mile 520.6, 16 miles south of Greenville, Mississippi 33°08.06' N, 091°05.41' W	
Date	February 21, 2018	
Time	About 0740 central standard time (coordinated universal time – 6 hours)	
Injuries	None	
Property damage	$4.5–5 million est.	
Environmental damage	None reported	
Weather	Cloudy, with surface fog, visibility 8 miles, winds from the south at 8 knots, air temperature 68°F, water temperature about 50°F	
Waterway information	The Lower Mississippi River near the location of the initial fire was 0.25 miles wide. The river current was estimated at 4–5 mph.	

On February 21, 2018, at 0740, the towing vessel *Leland Speakes* was pushing 21 barges upbound on the Lower Mississippi River when a fire broke out in the engine room at mile 520.6, south of Greenville, Mississippi. The nine crewmembers on board tried to fight the fire but, unable to control it, abandoned the vessel to a skiff dispatched from a Good Samaritan towboat. The abandoned tow drifted 11 miles downriver until another towing vessel pushed it into a sandbar. The fire burned until later that evening before being extinguished by fire response teams and vessels. None of the crewmembers were injured, and no environmental damage was reported. The damage to the *Leland Speakes* was estimated at $4.5–5 million.

***Leland Speakes* before the accident. (Photo courtesy of David L., Dick's Towboat Gallery)**

Background

The 150-foot-long *Leland Speakes*, a twin-propeller towboat, was built in 1967 by Jeffboat, Inc., Jeffersonville, Indiana. Originally named the *Mobile Leader*, the vessel was

renamed three times and owned by three different companies before being bought in April 2005 by its current owner and operator, Jantran, Inc. of Rosedale, Mississippi. The wheelhouse on the vessel was hydraulically raised to maintain forward visibility over tows and lowered to allow the vessel to transit low bridges. In the months before the accident, the vessel was moving barges between New Orleans, Louisiana, and Rosedale.

Accident Events

During the early morning of February 21, 2018, the *Leland Speakes* was pushing a tow up the Lower Mississippi River, en route to the Jantran facility near mile 585 in Rosedale. The towboat's nine crewmembers included a captain, second mate, mate, a pilot, three deckhands, an engineer, and a cook. Its tow consisted of 21 dry-cargo barges—configured 7 barges long by 3 barges wide—with the *Leland Speakes* faced up (connected) and pushing from behind. Seven barges at the head of the tow were empty.

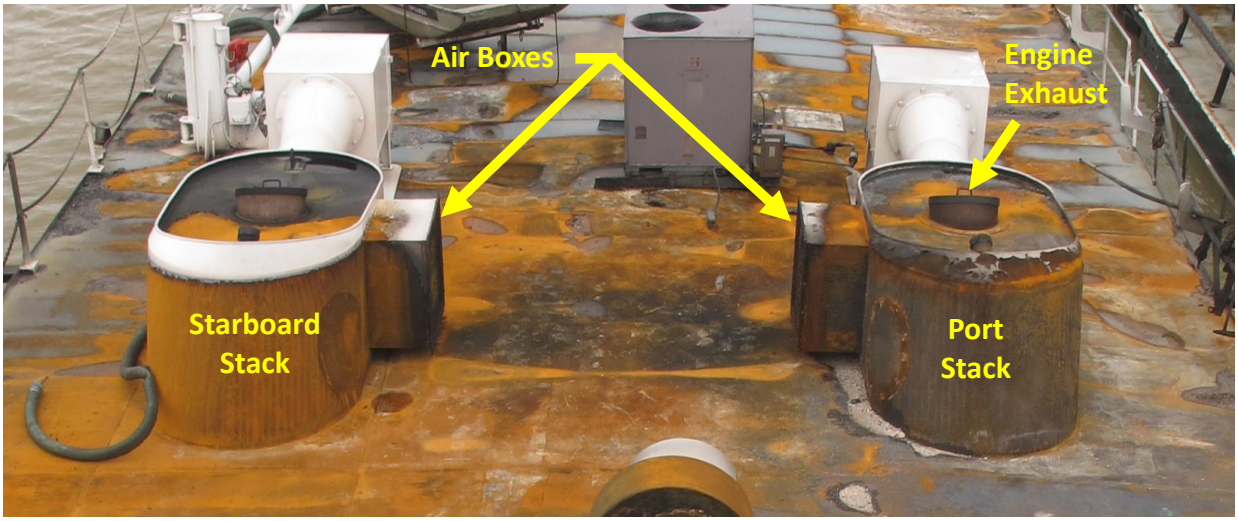
Map of area where *Leland Speakes* caught fire and drifted on the Lower Mississippi River. (Map data by Google Maps)

The *Leland Speakes* engineer conducted a visual check of the engine room from about 0445 to 0540, noting temperatures and pressures, checking engine oil levels, and filling the main engine fuel oil day tanks. He then completed logbook entries before heading to the wheelhouse about 0630 to email his daily report to the shoreside office. There he conversed with the captain who was operating the tow. Both the engineer and captain told investigators that all was normal at that point, and the engines were running at a typical transit rpm of 900 each, corresponding to a tow speed

the captain recalled to be about 4 mph.[1] The engineer then left the wheelhouse for his office in the aft part of the vessel, passing through the engine room sometime before 0730.

About 0740, several of the crewmembers heard what sounded like an "explosion." The engineer said the sound was followed by the port main engine alarm and then immediately by the fire alarm (automatic fire detection system alarm). He saw a fire in the engine room through his office window and tried to use the intercom to alert the captain, but it was not functioning. About the same time, the second mate looked into the engine room from the starboard-side door and saw black smoke and flames near the port engine. He also felt intense heat in the space. He said there was no way to enter the engine room in those conditions and alerted the captain by hand-held radio of the situation.

In the wheelhouse, the captain first noticed a reduction in engine noise and looked aft, where he saw black smoke and flames shooting out of the port stack air box (engine room exhaust vent), followed by flames and smoke from the starboard stack air box. Crewmembers said that within a couple minutes, the port side of the engine room, including the area around the main deck door area, was engulfed in flames.



Looking aft at stacks and air boxes post-fire.

The fire alarm audibly awoke sleeping crewmembers, and visual signals activated as well. About 2 minutes after the explosion, crewmembers tried to enter the forward portion of the upper engine room through an interior door but could not, as they found the door hot to the touch and through its window saw flames and smoke inside.

The engineer went to the portside main deck, forward of the engine room doors, and activated the emergency quick-closing valves for the port main engine fuel supply and engine room

[1] Available automatic identification system (AIS) data had vessel speeds ranging between 3.1 and 7 mph on the morning of the accident. The last recorded AIS data point was at mile 510, about 0505, and showed a vessel speed of 5.3 mph.

portside supply fan electrical power cutoff.[2] He stated that he left the starboard engine's fuel supply and fans online so that the engine would remain running, as he wanted the wheelhouse (captain) to retain maneuvering ability. Also, because the engineer wanted the vessel to keep electrical power as well, he did not activate the port or starboard generator fuel cutoffs. He closed two engine room windows but was unable to close others due to the smoke billowing out of them.

In the wheelhouse, the captain slowed the engines (reduced rpm) and took them out of gear (neutral position).[3] He noticed that the tow began to "top around" (turn from upbound to downbound) toward the left descending bank. Seeing that the port engine had now lost all rpm, the captain put the starboard engine back in gear, applied port rudder to counteract the starboard movement, and began increasing the throttle. The vessel did not respond to the rudder command. Realizing that he had lost steering, he took the starboard engine out of gear and called out on VHF radio that the *Leland Speakes* was on fire and had lost steering. The crew of nearby towing vessel *Gabe Gattle* replied that they were launching their skiff to assist.

Towboat *Leland Speakes* on fire after abandonment. (Photo courtesy of Leslie Jenkins, Jantran Inc.)

Meanwhile, the pilot, both mates, and the deck crew went to the vessel's five fire stations and stretched out hoses to prepare to fight the fire. However, they were unable to remotely start the towboat's fixed fire pump, which was located behind the starboard main engine gearbox on the lower level of the engine room. They assumed that it did not start because the electrical wiring to the pump or to the remote start had been damaged by the fire.

All the interviewed crew stated that access to the port side of the vessel near the engine room doors was restricted due to the intensity of the fire. The pilot stated that there was no way to reach the semi-portable fire extinguishers located in the engine room because "flames were hitting the roof, and rolling over half of [the engine room's] upper deck."

Aware of the inoperative fire pump, the captain had the crew try to extinguish the fire using three (of four) gasoline-powered portable "3-inch jiggler pumps" that were normally used to dewater the barges. They retrieved the pumps from the bow and prepared to run them near the engine room doors, drawing water from the river to discharge into the engine room. The crew had difficulty starting the pumps and it took several minutes to get them to prime (draw suction) and pump. The crew found that two older suction hoses were missing gaskets, so they had to switch to newer hoses to get the pumps primed. They succeeded in getting one pump to discharge water into

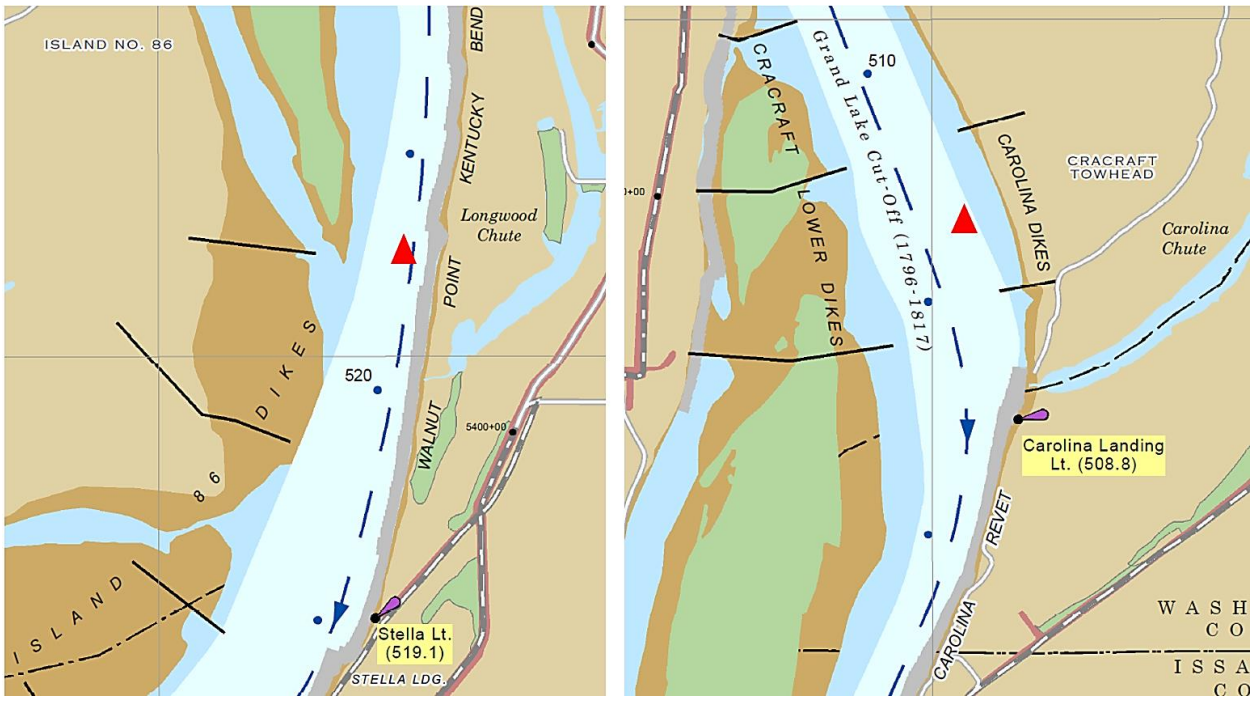
[2] The *Leland Speakes* had about 79,475 gallons of no. 2 diesel fuel on board at the time of the fire, and each of the main engine's fuel oil supply day tanks held a maximum 1,445 gallons, according to schematics.

[3] The propulsion engines could not be remotely stopped from the wheelhouse.

the starboard door of the engine room; however, the pumps did not have a means to connect a fire hose to the discharge port, so water just poured into and cascaded down to the lower engine room. A second pump on the starboard side was running, but it was not primed and therefore did not initially discharge water. The crew was not able to set up a pump at the port engine room door due to the heat and flames on that side. The engineer also tried to discharge a portable dry-chem extinguisher into the port air box, with no effect on the fire.

The captain saw that the tow began to top around and he thought its lead barges would hit the riverbank. If they did, he did not want anyone on the bow to be endangered should the face wires/rigging used to connect the towboat to the barges break loose. Therefore, he ordered the crew off the *Leland Speakes*' forward decks and onto the tow. About this time, the second portable pump on the starboard side became primed and began discharging water. Because the crew had not yet pointed the pump into the engine room, the pump discharged onto the exterior deck.

Shortly thereafter, the captain determined that without propulsion, steering, or an operating fire pump, there was nothing more he could do and left the wheelhouse (about 20 minutes after the fire started). He accounted for all the other 8 crewmembers and had them muster on one of the tow's middle barges to await assistance. The skiff from the Good Samaritan towboat *Gabe Gattle* arrived and began to shuttle crewmembers (up to three at a time) to the bank of the river. Because the *Leland Speakes* was no longer making way under its own power, the tow was drifting downstream with the current at an estimated 5–6 mph. Due to the downstream movement, the first two sets of crewmembers placed on the bank were dropped off at different locations. The captain and pilot were the last two off the tow, and their skiff went to the bank to pick up another crewmember before returning to the *Gabe Gattle*. Eventually, with the additional assistance of another Good Samaritan towboat (the *Carl Cannon*), the entire crew was moved to the *Gabe Gattle*.



The red triangles show the location of (left) the *Leland Speakes* explosion and fire at mile 520.6, and (right) the subsequent beaching above mile 509. (US Army Corps of Engineers Lower Mississippi map no. 43 (left) and 44 (right).

By 0900, the winds had shifted from the south to the northwest and increased from 8 knots to gusts up to 30 knots. The tow continued to drift until the towboat *Maggie Leavell* was able to push it into a sandbar just above mile 509 on the left descending bank.[4] Emergency response and firefighting was conducted by a River Services Company Dive Team, a Big River Shipbuilders fire response team, a McKinney Salvage fire response team, the Coast Guard cutter *Patoka* using a buoy tender barge, and several vessels from Jantran and Terrel Riverservice. The *Leland Speaks* continued to burn throughout the morning and late afternoon. The captain stated that only when foam was applied to the fire, beginning at 1720, did the flames start to recede. The fire was extinguished later that same evening around 2100.

After being alerted to the fire and drifting tow, Coast Guard Sector Lower Mississippi River issued a waterway restriction from mile 520 to 511 at 0743. Later, at 0916, the Coast Guard broadened the restriction to span from mile 520 to 500. At 1543, the sector canceled the restriction but still requested that vessels give a wide berth and not overtake vessels involved in the *Leland Speakes* firefighting effort.

As a result of the fire, all main deck house and interior spaces were damaged, distorted, or destroyed, except for the steering room and portions of a deck locker. All machinery, electrical components, and accessories in the lower engine room and shaft alley suffered heat damage. The port main engine sustained severe damage to its engine block, crankshaft, and piston components.

***Leland Speakes* on fire and abandoned at 1249. (Photo courtesy of Leslie Jenkins, Jantran Inc.)**

Additional Information

Personnel

The captain, pilot, and engineers were properly credentialed and had decades of experience on river tows, which included experience in their current positions and previous service on the

[4] The banks of the Western Rivers are referred to as left and right when traveling downstream because the rivers meander and can flow in any direction—south, east, west, and even north. Thus, when a section of the river flows from north to south, the east bank of the Mississippi River is referred to as the left bank and the west bank as the right bank. To avoid confusion, commercial traffic often calls the left bank the left descending bank and the right bank the right descending bank.

Leland Speakes. In addition, following the fire, the captain and engineer were drug-tested; all results were negative. Alcohol testing was not conducted.

Engine Room Ventilation, Fire Equipment, and Drills

The second mate said both the port and starboard engine room doors were open the morning of the fire and the engineer stated the windows were as well. The mate told investigators it was normal practice to operate the vessel with the exterior engine room doors open on the *Leland Speakes*. The engineer stated that under way the "doors and windows were open for the purpose of letting the heat out of the engine room" and the captain said unless the weather was rainy or cold the doors and windows would be open.

The captain and crew stated that drills consisted of ringing the general alarm and verifying that it could be heard throughout the vessel. Then the fire pump was pressurized and hoses were led out from all stations and tested by spraying water. Abandon-ship and man-overboard scenarios were also practiced. Crew interviews indicated that specific fire simulation scenarios were not done during drills, such as a galley fire or loss of fire pump during a fire. According to the requirement found in Jantran's [company's] "Safety Meeting Handbook," the captain said fire drills were conducted once a month and general alarm checks done every week. The captain conducted a fire drill 3 days before the accident.

The mate stated that he had used the engine room fire pump successfully the day before the accident to wash off the deck. All four gasoline-powered portable pumps were reportedly tested weekly by starting them and had been tested in the week before the accident. The weekly test did not typically include priming the pumps and spraying water; that step was done about once per month.

The *Leland Speakes* did not have a fixed CO_2 fire-extinguishing/suppression system for the engine room. Instead, the towboat was equipped with two semiportable B5-150-pound dry chemical extinguishers on wheeled carts. One extinguisher was located on the upper deck of the engine room; the other was on the lower level. Subchapter M regulations for towing vessels certificated for rivers, lakes, bays and sounds, regardless of build date, allow for engine rooms to be protected by semiportable (160-B) or fixed fire extinguishing systems. They also require at least one fire pump.

Engine Failure and Maintenance

The *Leland Speakes*' two main propulsion engines were EMD two-stroke, mechanically controlled, 16-cylinder 645 E7B's. The port engineer believed the engines were originally built as E7B's around 1967 and were in that basic configuration with subsequent EMD-specified upgrades (such as power assemblies). To the port engineer's knowledge, the engines did not have a horsepower upgrade over their lifetime and were rated at 3,100 hp each. The port engineer stated that under reported conditions at the time of the fire (900 rpm with 24 barges), a typical engine load would be about 80 percent of full load.

Following the accident, investigators examined the engine room and found the outboard (port side) of the port main engine crankcase severely damaged at cylinder no. 8. They also found a piston and connecting rod outside the engine on the deck plate.

A postaccident survey report concluded that the fire resulted from a failure inside the port main engine:

> ". . . the cap securing both No. 16 and No. 8 connecting rods to the crankshaft failed, which propelled the No. 8 piston and rod through the opposite crankcase inspection port. Given the absence of the piston, all fuel injected into the No. 8 cylinder flowed into the crankcase which apparently, due to friction caused by the failure had reached temperatures capable of igniting the fuel and/or oil in the vicinity."

Postaccident photo of the inboard side of *Leland Speakes*' port main engine at the lower engine room level.

The towboat engineer stated that he knew of no problems with the engines, nor were any reported to him by the port engineers or the engineer he relieved less than a day before the fire. Both the engineer and the pilot (who was previously an engineer on the *Leland Speakes*) told investigators that, every morning, the engineers sent electronic versions of their handwritten maintenance logs to the office. The company scheduled maintenance of lube oil, fuel, and air filters based on engine operating hours and consideration of the manufacturer's recommendations.

The last major overhaul of the *Leland Speakes*' two EMD engines was completed on December 8, 2016, at the Jantran facility in Rosedale. The overhaul was supervised by the Jantran port engineer or his representative and performed by a Jantran employee crew (towboat engineers worked alongside the port engineering crew under their direction and procedures). The port engineer told investigators that engine overhauls were typically done at 25,000 to 30,000 hours of operation. On the morning of the accident, the starboard engine had accumulated about 9,588 hours since the December 2016 overhaul. The port engineer also stated that Jantran engine overhauls were performed in accordance with the EMD service manual with EMD tools. If machining work or other specialized services were required, they would be contracted out, but the last overhaul did not require such services. That overhaul was typical and consisted of replacing cylinder kits, rod

bearings, main bearings, and cam bearings. The parts used for overhauls were new GE aftermarket parts and the port engineer stated that he had not experienced problems with GE parts on other overhauls.

Jantran overhauls on the *Leland Speakes*' EMD engines used a three-torque step procedure developed by the port engineer, not found in the EMD service manual. The first torque was done during the overhaul; the rod to the cap was torqued when the cylinder piston was put in (and slid back and forth laterally on the crank to make sure it did not bind). The engine was then started, run at idle for one minute, and then stopped, and crew would then check the bearing temperatures. That process was repeated twice more, after 5 minutes and then 10 minutes of run time. Next, the engine was torqued a second time. Lastly, the towboat was operated in the river for several hours at full operating load, temperatures, and rpm. On return to the dock, everything on the rotating assembly was re-torqued a third time (including connecting rods and main bearings fasteners).

The port engineer stated that the two-piece cap found in EMD piston rods had extra bolts (as compared to a single-piece cap used in other engine designs), and the hardware was smaller than other engines he had worked on. This difference was why the port engineer conducted additional torque checks on EMD assemblies during engine overhauls.

Analysis

The fire was determined to be caused by a mechanical failure of the port main engine when piston rod connecting caps failed and components breeched the crankcase, resulting in subsequent ignition of fuel and lube oil off the hot engine. Before the failure, the vessel was proceeding at about 80 percent of engine load and no vessel navigation systems or engine problems were noted by the crew. The engine was overhauled about 14 months before the accident, in accordance with Jantran procedures, which included operator torque procedures and checks in addition to the manufacturer's guidance to ensure proper torqueing of engine components.

NTSB investigated a recent towboat engine room fire caused by a similar failure on an EMD 16-645E7B engine. In October 2014, the towboat *Dennis Hendrix* was upbound pushing 24 loaded barges on the Lower Mississippi River when a fire broke out in the engine room and burned for several hours until extinguished. The NTSB determined that the probable cause of the engine room fire was "a catastrophic failure of the starboard main engine resulting from loose bolts on the no. 5 cylinder rod cap while the engine was operating at a high load condition." However, although similar, a definitive pattern could not be established from just these two cases (*Dennis Hendrix* and *Leland Speakes*).

Aboard the *Leland Speakes*, the loss of the steering experienced within minutes after the fire started was likely caused by damage to the steering gear control signal wiring, which ran through the center of the engine room under the main deck catwalk and into the steering gear room.

Because the initial location of the fire was in the lower engine room, its immediate intensity and rapid spread likely resulted in damage to the remote-start button electrical wiring for the tow's single fire pump. As a result, the pump was rendered inoperative due to its location near the initial fire and the crewmembers were left without their primary means to extinguish the fire—water hoses. The engine room contained two semi-portable dry chemical extinguishers to combat engine room fires, but again, due to the fire's initial intensity and large amount of smoke they were not accessible. Regardless, they were likely insufficient to extinguish the fire given its size and the

large amount of available fuel to sustain it. Thus, without propulsion, steering, or a means to effectively fight the fire, the captain's decision to evacuate the vessel was reasonable.

The engineer shut down only the portside ventilation fans in the engine room, leaving the starboard-side fans running to provide the captain an engine to maneuver with. Nevertheless, even if all the fans had been shut down, the engine room inlets and exhaust vents would have remained open, as the vessel design did not incorporate any means, such as dampers, to effectively close off air supply to the engine room. At the time of the fire, both the port- and starboard-side doors to the engine room were open as were the engine room windows, although this practice risked expanding engine room fires by allowing continued supply of oxygen. The exterior doors and windows were regularly left open to cool the engine room, as the crew stated they did so due to the heat generated by the engines. This practice, although found on other inland towboat operations, indicates that the ventilation system for the engine room was under-designed for the ambient conditions *Leland Speakes* operated in for its engine load. However, even if the crew shut the windows, given that they were residential type, they would have likely failed in the large fire.

Furthermore, the small confines of the engine room and the location of firefighting equipment inside that space demonstrate a risk to crews fighting engine room fires. Had the fire pump operated, the sole means to try to control and extinguish the fire would have been to place hoses through an engine room door or window. On smaller vessels, such as towboats, the risk to crews fighting engine room fires has led to the development of designs that incorporate both a means for shutting down ventilation to the engine room and a fire suppression system, such as a fixed CO_2 system, to extinguish the fire without requiring crews to enter the space.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the engine room fire on board the *Leland Speakes* was a catastrophic failure and crankcase breach of the port main engine resulting from failure of the caps that secured two piston connecting rods to the crankshaft. Contributing to the severity of the fire was the vessel's lack of a fixed fire-extinguishing system for the engine room and lack of redundant fire pumps.

Vessel Particulars

Vessel	*Leland Speakes*
Owner/operator	Jantran, Inc.
Port of registry	Rosedale, Mississippi
Flag	United States
Type	Towing vessel
Year built	1967
Official number (US)	511857
IMO number	N/A
Construction	Welded steel
Classification Society	N/A
Length	150.2 ft (45.8 m)
Draft	9.7 ft (3 m)
Beam/width	44.2 ft (13.5 m)
Gross tonnage	638 gross tons
Engine power; manufacturer	2 x 3,100 hp (2,312 kW), EMD 16-645E7B, 6,200 hp total
Persons on board	9

NTSB investigators worked closely with our counterparts from Coast Guard Marine Safety Detachment (MSD) Vicksburg throughout this investigation.

For more details about this accident, visit www.ntsb.gov and search for NTSB accident ID DCA18FM014.

Issued: May 15, 2019

The NTSB has authority to investigate and establish the probable cause of any major marine casualty or any marine casualty involving both public and nonpublic vessels under Title 49 *United States Code*, Section 1131(b)(1). This report is based on factual information either gathered by NTSB investigators or provided by the Coast Guard from its informal investigation of the accident.

The NTSB does not assign fault or blame for a marine casualty; rather, as specified by NTSB regulation, "[NTSB] investigations are fact-finding proceedings with no formal issues and no adverse parties . . . and are not conducted for the purpose of determining the rights or liabilities of any person." Title 49 *Code of Federal Regulations*, Section 831.4.

Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by conducting investigations and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report. Title 49 *United States Code*, Section 1154(b).