National Transportation Safety Board

Marine Accident Brief

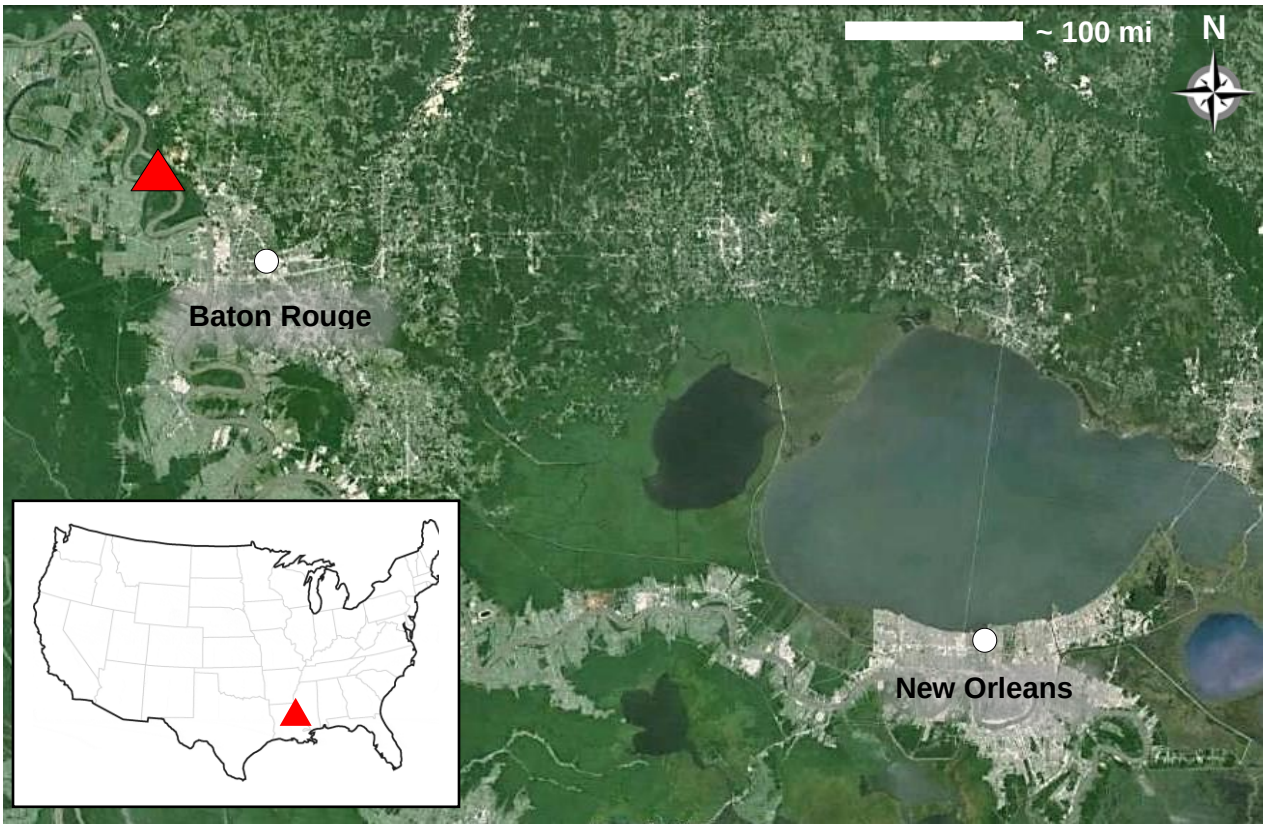
Engine Room Fire on Board Towing Vessel *Dennis Hendrix*

Accident no.	DCA15LM002
Vessel name	*Dennis Hendrix*
Accident type	Engine room fire
Location	Lower Mississippi River, about 10 miles* northwest of Baton Rouge, Louisiana; 30°34.1' N, 91°16.3' W
Date	October 31, 2014
Time	0742 central daylight time (coordinated universal time – 5 hours)
Injuries	None
Property damage	$3,800,000
Environmental damage	None
Weather	Daylight with clear visibility, light and variable winds, air temperature 47°F
Waterway information	Lower Mississippi River

On October 31, 2014, about 0742 local time, the uninspected towing vessel *Dennis Hendrix* was transiting upbound on the lower Mississippi River while pushing 24 loaded barges when a fire broke out in the engine room. Crewmembers began to fight the fire, and other vessels in the area provided firefighting and towing assistance. The fire burned until mid-afternoon. None of the 10 crewmembers were injured and no environmental damage was reported. The damage to the *Dennis Hendrix* was estimated at $3.8 million.

The *Dennis Hendrix* on the Mississippi River. (Photo by American Commercial Lines)

* The miles in this report are statute miles.



Satellite image of a section of Louisiana, with the accident location on the Mississippi River overlaid by a red triangle. Inset is a map of the United States with the accident location marked. (Background by Google Earth)

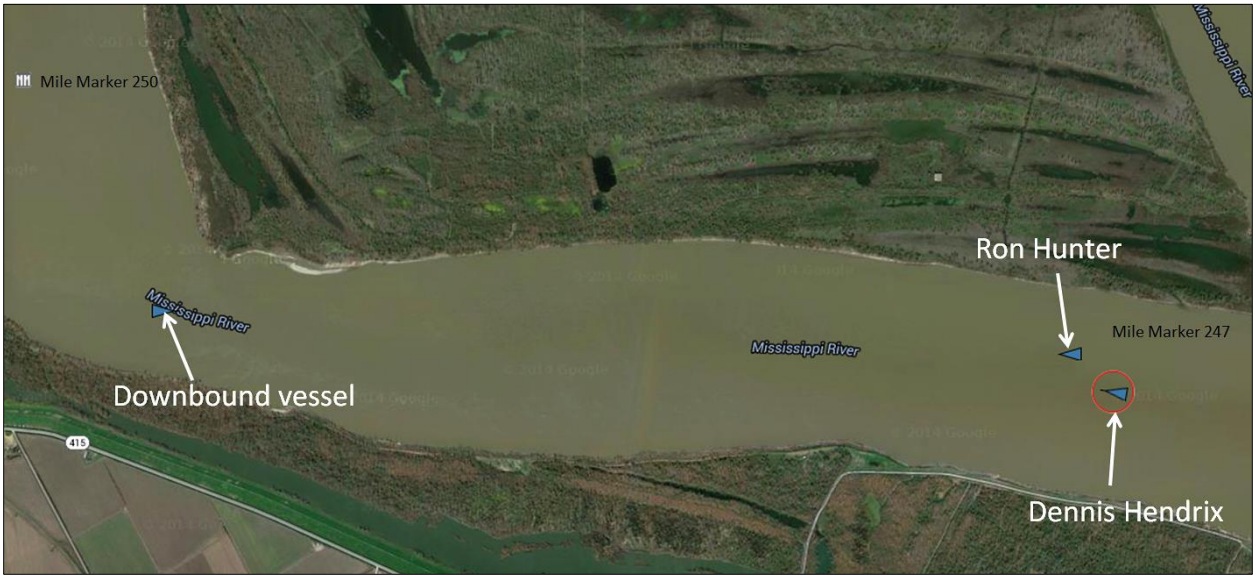
About 0700, one of the vessel's two chief engineers was on duty in the engine room. He told investigators that each of the three main engines (medium-speed, 16-cylinder, turbocharged diesel engines, each driving a propeller via a set of reduction/reversing gears) was operating at about 840 rpm at the time. He said the exhaust gas temperatures, oil pressures, and fuel pressures were normal and that "everything checked out good."

About 0730, the *Dennis Hendrix* approached the *Ron Hunter*, another towing vessel ahead in the river, transiting in the same direction. Recognizing a potential conflict with a downbound vessel farther ahead, the *Dennis Hendrix* captain, operating in the wheelhouse, increased the engine speed to the maximum of 900 rpm on all three engines so that he could overtake the *Ron Hunter* before meeting the downbound vessel.

About the same time, the *Dennis Hendrix* on-duty chief engineer was in the lower engine room checking the fuel rack readings. He saw that the rack on the starboard engine was full, indicating that the fuel rack positions (controlled by the engine's governor, which provides fuel to each injector to maintain desired engine speed) were at maximum. He told investigators he heard a "laboring" sound from the starboard engine, so he went up the ladder to the upper engine room to check the fuel control. As he reached for the door, the starboard engine exploded and blew out the windows on the starboard side of the engine room. He recalled seeing flames coming from the starboard engine.

The *Dennis Hendrix* captain heard the explosion and saw a reflection of flames and black smoke in the window on the starboard side of the wheelhouse. He took all three engines out of

gear and sounded the general alarm to alert the crew of the fire. The *Dennis Hendrix* began to lose speed at 0742, according to automatic identification system (AIS) data.



The locations of the *Dennis Hendrix*, the *Ron Hunter*, and the downbound vessel about 0742, when the fire broke out. (Image compiled from Portvision and Google Earth)

On hearing the general alarm, the crewmembers gathered on the main deck and prepared to fight the engine room fire. Once fire hoses were rigged, initial firefighting efforts took place on the starboard side where the windows blew out. The *Dennis Hendrix* was equipped with a carbon dioxide fixed fire suppression system in the engine room, and once all 10 crewmembers were accounted for, the captain ordered the chief engineer to activate the system, which he did. About 0750, the US Coast Guard and the vessel owner/operator American Commercial Lines (ACL) were notified of the situation and the Coast Guard broadcast a request for nearby vessels to assist.

The chief engineer went to the emergency fuel shut-off station, located on the outer deck by the starboard door to the engine room, to close the fuel supply valves to the engines. According to crew statements, closing the valves proved difficult (possibly because the valves may have been seized) and required the help of additional crewmembers, which delayed the closure. After the fuel supply valves were closed, the *Dennis Hendrix* lost electrical power, and the vessel's emergency battery power activated to continue powering communications equipment and lighting. The crew used a portable engine-driven fire pump to draw firefighting water from the river.

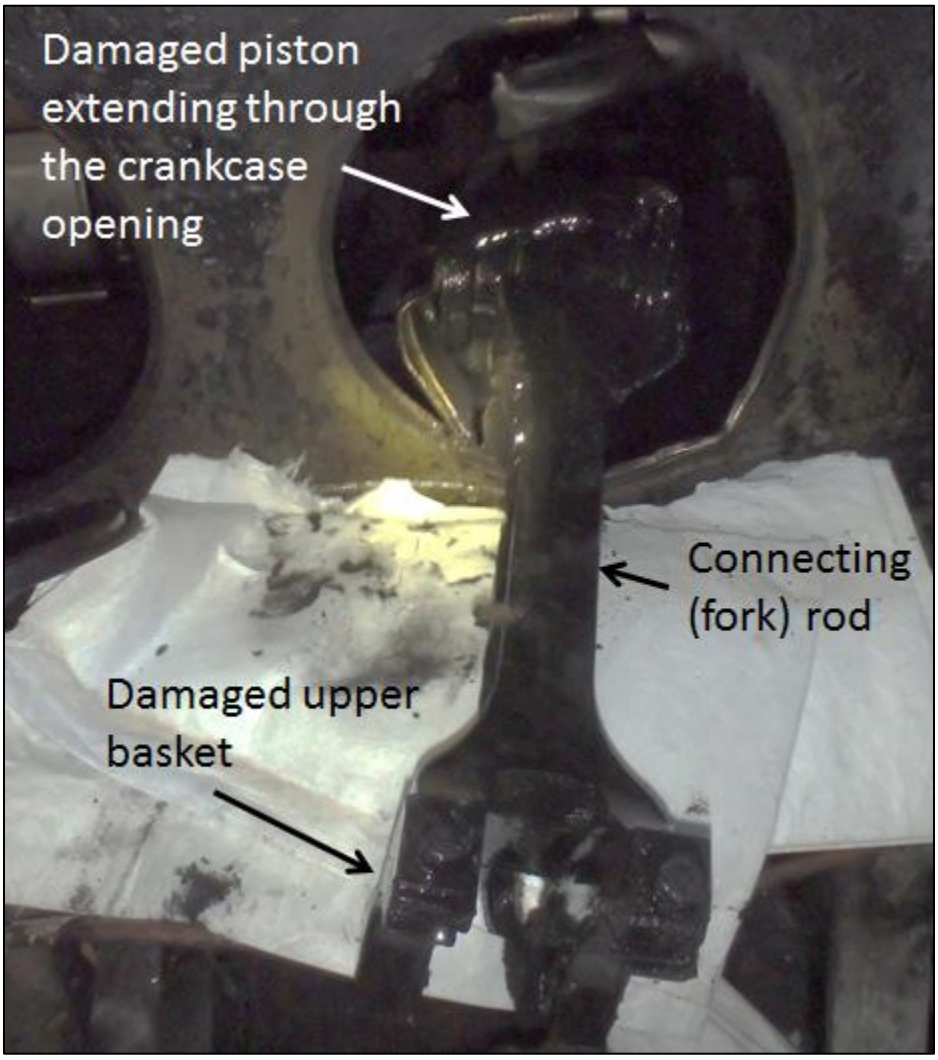
Because the *Dennis Hendrix* was no longer moving under its own power on the river, the *Ron Hunter* took the *Dennis Hendrix* and barges under tow to the right ascending bank (north side) of the river, out of the way of other vessel traffic.

More vessels arrived to assist throughout the morning. By the captain's account, eight vessels helped with either towing or firefighting. In the afternoon, two Exxon Mobil fire boats from Baton Rouge arrived on scene and, about 1430, their crews were able to extinguish the fire using foam. Shortly thereafter, the *Dennis Hendrix* crewmembers recovered personal items from their cabins and were then transferred ashore in a small skiff boat. A local physician checked the crew for injuries. The crew was also tested for alcohol and illegal drugs; all results were negative.

Firefighting efforts on the *Dennis Hendrix.* (Photo by the Coast Guard)

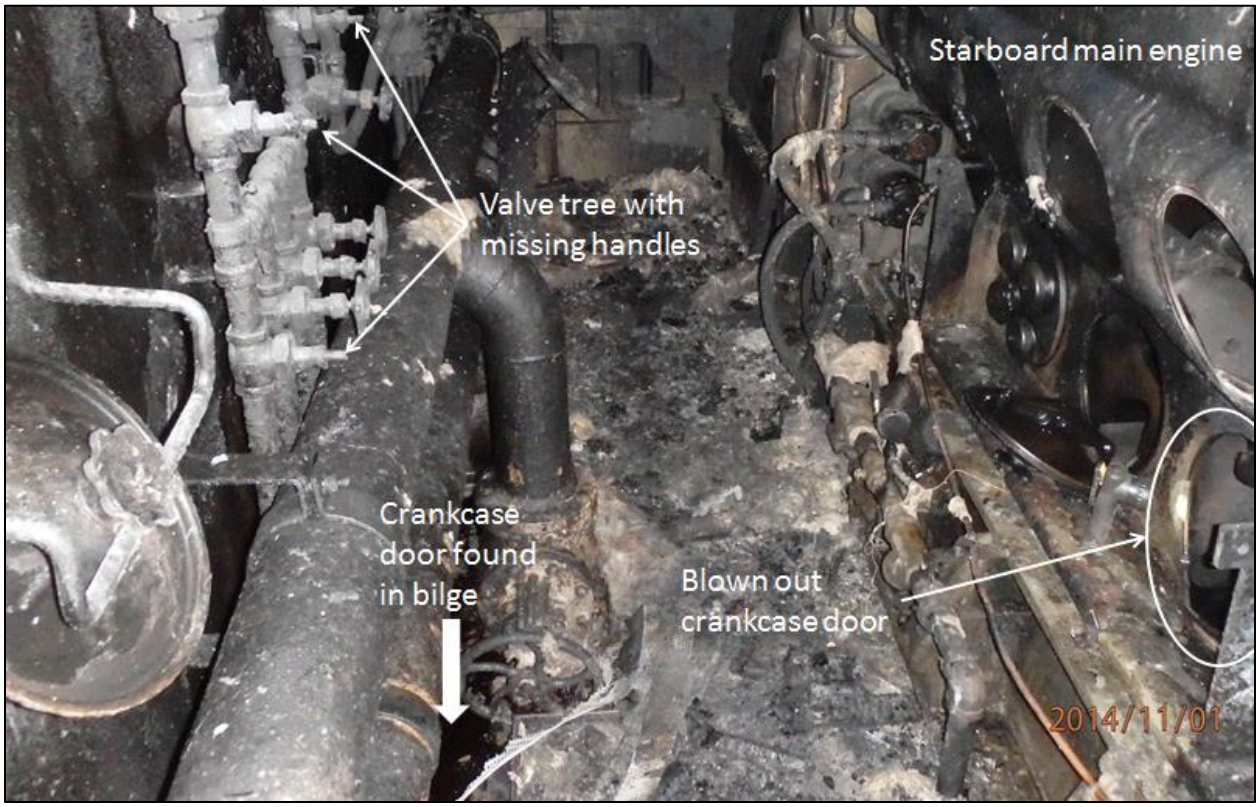
The engine room on board the *Dennis Hendrix* was significantly damaged as a result of the fire, and the remainder of the vessel's spaces suffered heat, smoke, and water damage. Postaccident surveys conducted by the Coast Guard and ACL described distorted decks and bulkheads, burned and charred wooden structural members, and soot and smoke damage throughout the main accommodation deck.

The most significant fire damage was in the vicinity of the starboard engine. It was found to have one of the crankcase doors blown out on its starboard side. Inside the crankcase door opening, parts of the bottom basket (or rod cap) for the connecting (fork) rod of piston no. 5 were found; this bottom basket had separated from the rod. In addition, the piston and piston skirt were fragmented and deformed. On top of the engine, the rocker gear covers were melted.



The damaged lower connecting rod attached to the no. 5 piston, partially removed from the starboard main engine. (Photo by the Coast Guard)

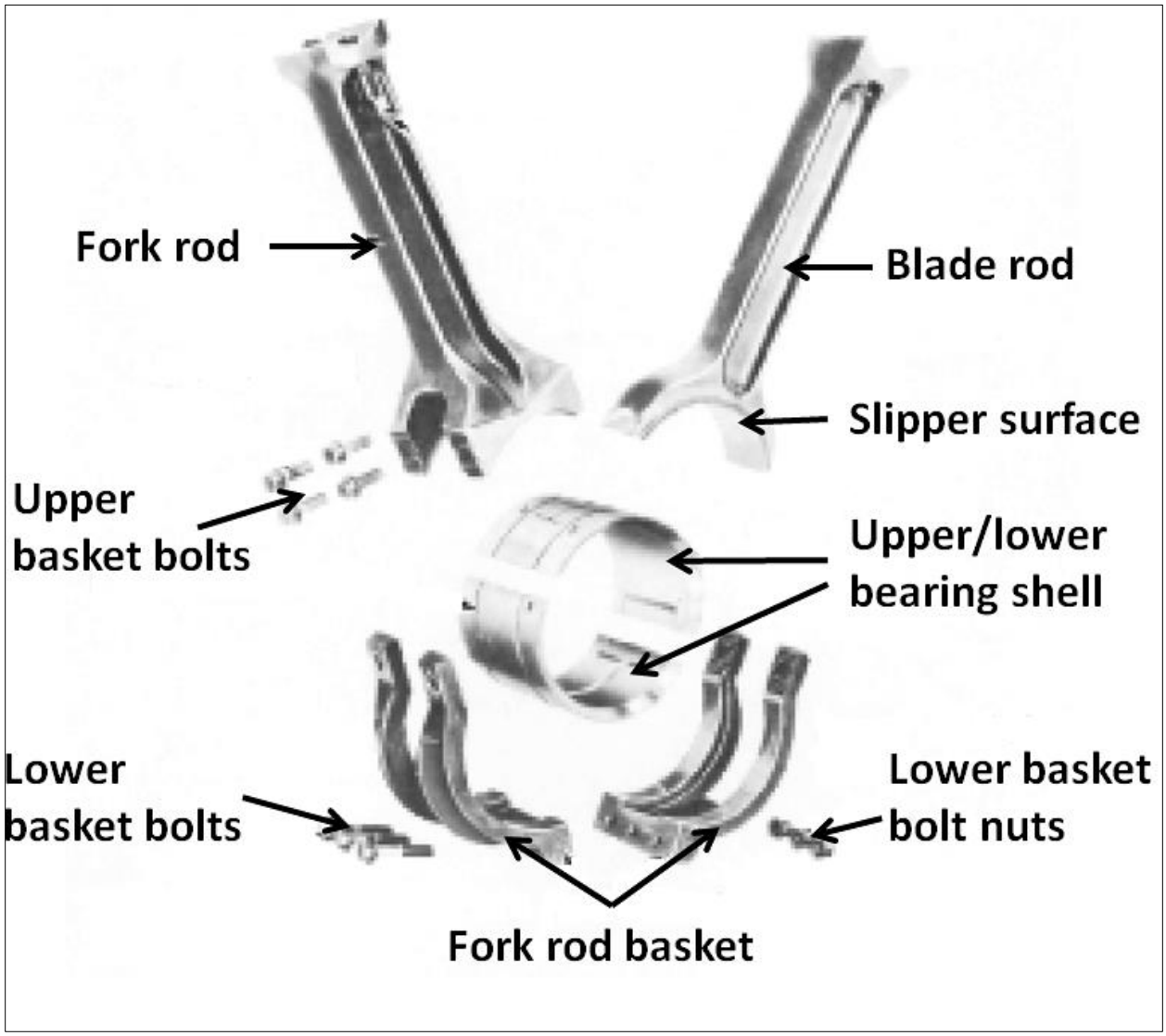
The crankcase door that blew out was found in the bilge between the engine and the starboard lube oil tank. Investigators determined that the door made contact with a nearby bank of valves for the lube oil tanks. Some of the valves had missing handles that showed evidence of being sheared off due to direct force in the area immediately adjacent to the crankcase door opening.



Starboard main engine with the crankcase door blown out. (Photo by the Coast Guard)

The damaged no. 5 piston and the connecting rod assembly were removed from the starboard engine and sent to a mechanical and metallurgical consultant for examination. The specific items examined were from starboard engine cylinder no. 5 and adjacent cylinder no. 13. A report submitted by Busch and Associates Inc. to ACL concluded that the no. 5 piston and connecting rod assembly failed due to loose bolts on the lower basket, leading to fatigue failure of the blade and rod and upper connecting rod bearing.

The report and its findings were shared with the engine manufacturer and the service provider.



Connecting rods, bearing shells, and basket. (Graphic from Electro Motive Diesel 645E7B Turbocharged Marine Engine Maintenance, March 1981)

ACL provided investigators with documentation from the last overhaul of the starboard engine, which took place in late 2011. At that time, the engine was rebuilt with new parts from the engine manufacturer. New crankshafts were installed, and the blocks were line bored. The company stated that the interval for overhauling the engine was 28,000 hours. At the time of the accident, the engine had just over 23,600 hours.

According to ACL, the most recent maintenance on the starboard engine was a clutch replacement in June 2014 and a fuel injector replacement in July 2014, both of which had been scheduled ahead of time. Also, earlier in June 2014, the crew conducted a routine biannual maintenance inspection, which required a general tune-up, torque checks, and inspection of piston rings, liners, cam lobes and rollers, air filtration, and other components of the engine. The inspection form, completed June 4, 2014, specifically required testing the torque between the basket and the connecting rod. To comply with the engine maintenance manual, the required torque for basket to rod was 190 foot-pounds and for rod to basket 75 foot-pounds. The torque test was satisfactory; all components that were tested during the inspection fell within the limits

specified on the inspection form, and the crew noted no findings or comments. Any further onboard records of engine readings and minor maintenance were destroyed in the fire.

ACL noted that the starboard propeller sustained minor damage at some point before October 21, 2014, from what was concluded to be "drift in the river." After the propeller was damaged, the crew checked the firing pressure of the starboard engine cylinders on October 21 and 24. The firing pressure was within 10 percent of the mean, and the cylinders performed normally. However, it was still determined that the damaged starboard propeller required replacement, which was scheduled to be done after the completion of the accident voyage, according to documentation ACL provided to investigators.

ACL provided investigators with vessel performance data from before and after the starboard propeller was damaged. On October 22, 2014, after the damage, the starboard engine was operated at 901 rpm while pushing a load of barges, and the engine "dead racked," meaning the engine needed full fuel delivery. By contrast, 2 days earlier on October 20, 2014, before the propeller was damaged, the engine did not dead rack, even though it was operated at 905 rpm while pushing the same load of barges. Conclusively, as a result of the damage to the starboard propeller and the additional rpm (from 840 to 900) required to overtake the *Ron Hunter*, the starboard engine was under greater load and required a heavier rack just before the explosion.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the engine room fire on board the *Dennis Hendrix* 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.

Vessel Particulars

Vessel	*Dennis Hendrix*
Owner/operator	American Commercial Lines, LLC
Port of registry	Jeffersonville, Indiana
Flag	United States
Type	Towing vessel
Year built	1977
Official number (US)	583466
IMO number	8424575
Construction	Steel
Length	180 ft (55 m)
Draft	8.5 ft (2.6 m)
Beam/width	52 ft (16 m)
Gross and/or ITC* tonnage	180 ITC tons
Engine power; manufacturer	3,070 hp (2,287 kW); EMD16/645E7B
Persons on board	10

* International Tonnage Convention

For more details about this accident, visit www.ntsb.gov and search for NTSB accident ID DCA15LM002.

Adopted: November 9, 2015

NTSB investigators worked closely with our counterparts from Coast Guard Marine Safety Unit Baton Rouge throughout this investigation.