National Transportation Safety Board

Marine Accident Brief

Engine Room Fire aboard Towing Vessel *George King*

Accident type	Fire/explosion	**No.**	DCA18FM012
Vessel name	*George King*		
Location	Lower Mississippi River, at mile 393.6, near St. Joseph, Louisiana, 31° 53.95' N, 091° 12.17' W		
Date	January 24, 2018		
Time	About 2041 central standard time (coordinated universal time – 6 hours)		
Injuries	None reported		
Property damage	>$500,000 est.		
Environmental damage	None reported		
Weather	Clear, visibility of 10 miles*, winds light from the north, air temperature 59°F		
Waterway information	The Lower Mississippi River near mile 393 is about 1 mile wide. The charted water depth in the channel is 24.9 feet.		

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

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

* All miles in this report are statute miles.

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Background

The *George King* was a twin-propeller towing vessel powered by two General Motors 16-645E7B diesel engines, each capable of producing 6,140 horsepower. The vessel was built in 1976 by St. Louis Ship and originally named the *Joe P. Gills*. It was owned by Marquette Transportation and homeported in St. Louis, Missouri.

The *George King*'s engine room was located aft of the galley and contained the two main propulsion engines, two generators, and all other associated equipment, including the vessel's electrically driven fire pump. The space had two levels: an upper level, which was also the main deck of the *George King*, and a lower level, where the main engines and reduction gears for the shafts were located.

Typical of inland river towing vessel designs, the *George King* had several windows located along the port and starboard bulkheads of the engine room upper level. In addition, double doors were located on the port and starboard side of the main deck for access into the engine room. While under way, the windows and doors were routinely left open for additional ventilation of the engine room.

In accordance with applicable regulations, a halon fixed firefighting system was installed, in lieu of a large semi-portable fire extinguisher, to suppress and extinguish a fire in the engine room. Halon is a liquefied, compressed gas that stops the spread of fire by chemically disrupting the combustion process. Along with two external activation stations located on the port and starboard sides aft of the engine room double doors, the system could be activated directly from the rudder room where the halon bottles, a time delay, a pressure switch, and a stop valve were located. Eleven nozzles distributed the halon in the engine room, and a siren was installed to warn personnel in the space that the system had been activated.

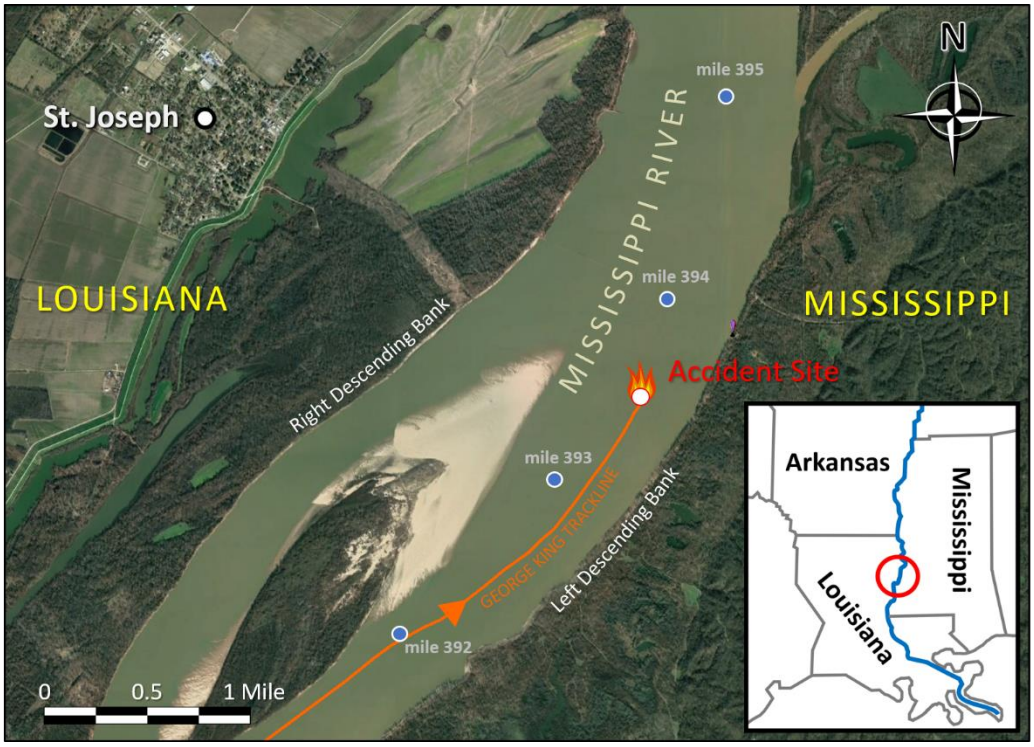
Accident Events

On January 24, the *George King* was proceeding upbound on the Mississippi River pushing 30 empty dry cargo barges en route to Wickliffe, Kentucky. Nine crewmembers were on board, including a captain, pilot, first mate, mate, senior deckhand, chief engineer, cook, and two deckhands. That evening, the chief engineer was conducting rounds of the engine room, and the captain was at the helm in the pilothouse.

Between 1800 and 1830, the chief engineer entered the engine room to conduct a round. He noted nothing abnormal. About 2000, he conducted another round of the engine room and again noted nothing abnormal.

About 2030, the captain observed a flash that originated from behind him as he faced forward. When he turned around, he saw flames coming from the port exhaust stack. He sounded the general alarm and notified the crew by radio that a fire was in progress in the engine room. The captain started to maneuver the tow toward the left descending bank and made distress calls.[1]

[1] The banks of western rivers are named left and right based on the direction as viewed from a vessel traveling downstream. To avoid confusion, commercial river traffic often calls the left bank the "left descending bank" and the right bank the "right descending bank." (Source: US Coast Guard)



Accident location. (Background by Google Earth Pro)

Upon hearing the general alarm, the chief engineer went to the muster station in the galley, where he met the other crewmembers. While the chief engineer was there, he opened the engine room door to assess the situation. From this position at the forward part of the engine room, he observed that the top of the port engine was completely engulfed in flames. He secured the door to prevent the fire from spreading into the galley.

Two teams were assembled to fight the fire while the remainder of the crew, excluding the captain, abandoned the towing vessel by boarding the empty barges. One fire team consisted of the first mate and a deckhand, who went to the port side and deployed a fire hose. The second team consisted of the chief engineer and a senior deckhand, who went to the starboard side of the vessel to start the fire pump and deploy the starboard-side fire hose. Due to the intensity of the fire, the teams were unable to enter the space to spray water directly at the source. Consequently, the teams sprayed water through open windows, which they stated was ineffective against the fire.

While fighting the fire, the chief engineer, who was standing outside the engine room, was knocked down by an explosion. He was not injured. The first mate notified the captain that the firefighting efforts were not effective and requested permission to shut off the fuel to the engines. In response, the captain directed the chief engineer to activate the emergency fuel oil shutoff valve located on the starboard side of the vessel, which he did. The engines and the generator stopped shortly thereafter.

Halon activation station

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

At the same time, the senior deckhand with another deckhand proceeded down the starboard side of the vessel, closing the engine room windows to ensure that the halon, when released, was contained within the engine room. After the deckhands closed all of the starboard-side windows, they met the chief engineer, who asked them if "they got it." They answered "yes." The chief engineer told investigators that his question was intended to confirm that the deckhands had activated the halon system from the starboard side, but the deckhands thought he was asking them if they had closed the windows. In the confusion, the halon system was never activated.

After directing the halon system to be activated, the captain ordered the remainder of the vessel's crew to abandon ship to the barges to wait for assistance. Because the intensity of the fire decreased after the *George King* was abandoned, the captain thought that the halon system had operated properly.

The towing vessel *Michael Reeves* was the first assist vessel to arrive on scene and made fast (connected) to the *George King*'s tow to help control it in the river. The towing vessel *St. Bartholomew* arrived next. The crews of the *St. Bartholomew* and the *George King* attempted to extinguish the fire using the *St. Bartholomew*'s fire hoses, but all efforts were abandoned when smoke was seen exiting from the port fuel tank hatch. The fire burned itself out the next day.

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***George King* still burning about 0749 on the day after the fire started. (Photo by US Coast Guard)**

The *George King* was extensively damaged by the fire, but the main structure of the vessel and the main propulsion system remained intact. The fire, as witnessed by the chief engineer and other crewmembers, was initially located on top of the forward section of the port main propulsion engine.

During a postaccident examination of the port engine, investigators discovered that the entire lube oil strainer housing, located just forward of the engine and constructed of aluminum, was gone. In addition, internal parts of the strainer, not made of aluminum, were found on the deck plates forward of the engine, as well as in the bilge located below the location of the strainer. The lube oil strainer on the starboard main engine remained intact.

After the fire, a commercial forensic science and engineering firm contracted by the vessel owner conducted an examination of the *George King* to ascertain the source of the fire. The examiners determined that, given the rapid growth of the fire and the captain's observation of flames in the port stack, the initial fuel for the fire was "almost certainly a spraying liquid fuel." Based on this determination, they examined the fuel and lube oil systems and concluded that the port main engine lube oil strainer was the likely area of origin for the fire.

Analysis

When the captain first saw flames, they were coming from the port stack. Upon opening the door from the galley to the engine room, the chief engineer saw flames engulfing the forward section of the port engine. After the fire, the port lube oil strainer housing was completely gone, suggesting that the strainer was subjected to heat greater than 1,221 degrees F, the melting point of aluminum. This evidence supports the fire examiners' determination that the fire originated in that general area.

Port main propulsion engine, looking forward. (Photo courtesy of Rob Harshman Forensic Science & Engineering, LLC)

Because the lube oil system was a pressurized system, a small leak in the strainer's housing or at the covers for the strainers could have caused escaping oil to atomize. Atomized oil is susceptible to ignition and flashover if there is a viable heat source located nearby, and there were a number of hot surfaces within the *George King*'s engine room. It is likely that atomized lube oil spraying from the port strainer was ignited after making contact with a hot surface near the strainer housing, which progressed into a continuous burning fire after an initial flashover. This scenario coincides with the statements of the captain, which identified a flash followed by flames coming from the engine room exhaust vents on the port stack.

Remains of the port lube oil strainer. (Photo courtesy of Rob Harshman Forensic Science & Engineering, LLC)

According to logs reviewed by investigators and interviews of the crewmembers, the towing vessel's crew participated in regular drills. However, the *George King* did not have firefighting personal protective equipment for crewmembers, nor was such equipment required by regulation. Fighting a fire without protective equipment significantly decreases the ability of fire teams to close in on and extinguish a fire or secure spaces to prevent the fire from spreading. As a result, the fire teams on the *George King* could only place a hose through engine room windows as their sole means to try to control and extinguish the fire.

The chief engineer, while fighting the fire, was knocked down by a pressure wave possibly caused by a rupture in a pressurized air cylinder in the engine room. Although he was not injured by the pressure wave, the situation demonstrates the risks to crews when fighting engine room fires.

Because of the risks associated with engine room fires, the effectiveness of fixed firefighting systems is critical. The crew did not activate the halon system because of the inability of the chief engineer to reach the halon activation station on the port side and a misunderstanding between crewmembers regarding activation from the starboard side. Had the system been activated, its effectiveness would have been limited because the portside doors to the engine room were open and several engine room windows were broken. In addition, engine room inlet and exhaust vents were fitted with fixed louvers that were not able to be closed. These openings would have allowed a significant amount of the discharging halon to escape the space instead of being contained in large enough volume to extinguish the fire. Additionally, these openings allowed for continued air draft to the fire, allowing it to spread.

Probable Cause

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

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Vessel Particulars

Vessel	*George King*
Owner/operator	Marquette Transportation Company, LLC
Port of registry	St. Louis, Missouri
Flag	United States
Type	Towing vessel
Year built	1976
Official/IMO number	576107
Classification society	N/A
Construction	Steel
Length	138 ft (42.06 m)
Draft	11 ft (3.35 m)
Beam/width	44 ft (13.41 m)
Gross tonnage	580
Engine power; manufacturer	2 X GM-16-645E7B-1042-EMD diesel engines, 12,280 hp (9,157 kW)
Persons on board	9

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

For more details about this accident, visit www.ntsb.gov and search for NTSB accident ID DCA18FM012.

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