National Transportation Safety Board

Marine Accident Brief

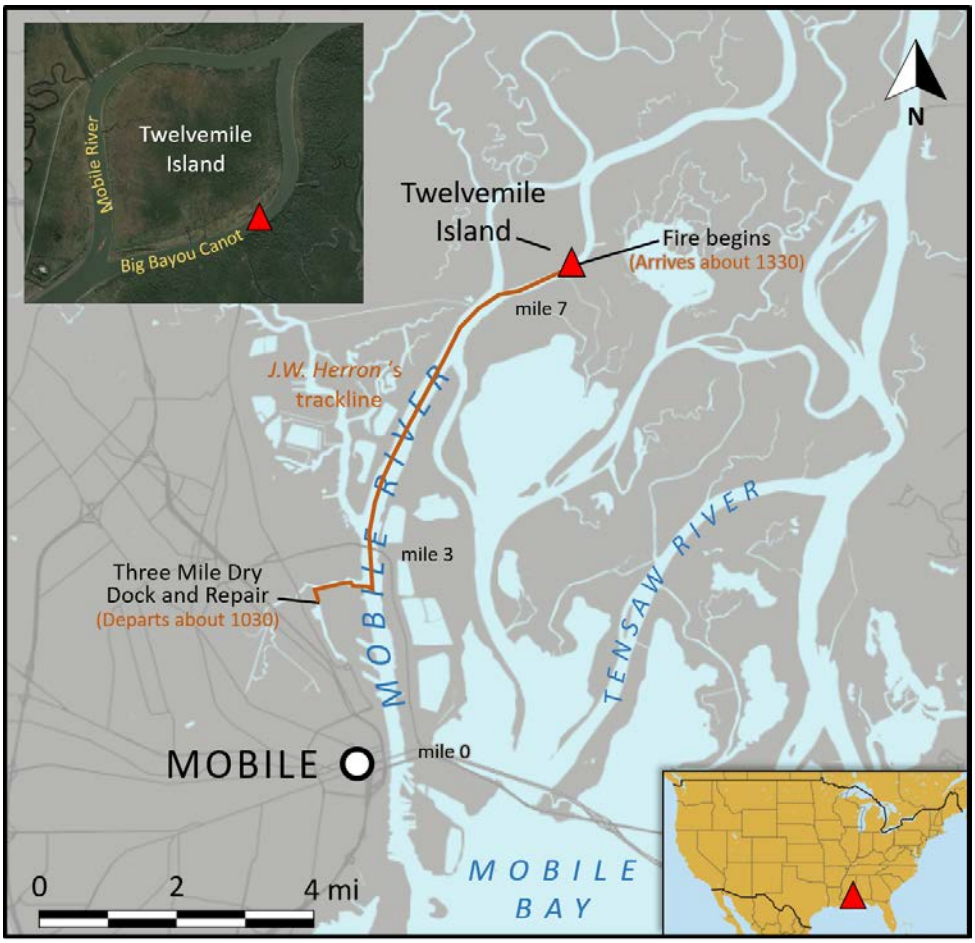
Engine Room Fire aboard Towing Vessel *J.W. Herron*

Accident type	Fire/Explosion	**No.** DCA18FM008
Vessel name	*J.W. Herron*	
Location	Big Bayou Canot, Twelvemile Island, near Mobile, Alabama 30°47.46' N, 087°59.55' W	
Date	December 13, 2017	
Time	1340 central standard time (coordinated universal time – 6 hours)	
Injuries	None reported	
Property damage	$1.5 million est.	
Environmental damage	None reported	
Weather	Clear, visibility 10 miles, winds south-southeast 8 knots with gusts to 17 knots, air temperature 54°F, water temperature about 63°F	
Waterway information	Big Bayou Canot flows around Twelvemile Island opposite of the main navigation channel of Mobile River at mile 7. The bayou is 7–15 feet deep and approximately 500 feet wide at the accident site.	

About 1340 local time on December 13, 2017, the towing vessel *J.W. Herron* was shifting barges on Big Bayou Canot near Twelvemile Island, approximately 8 miles north of Mobile, Alabama, when a fire began in the lower engine room and quickly spread.[1] After the crew of three partially secured the engines and fuel supply, heavy smoke and fire prevented them from attempting to extinguish the fire, forcing an immediate evacuation of the vessel to the barges. No pollution or injuries were reported. The estimated damage to the vessel was $1.5 million.

***J.W. Herron* under way prior to fire. (Photo by Draye, MarineTraffic.com)**

[1] All miles in this report are statute miles.



Location of accident where fire erupted in engine room of *J.W. Herron* following towboat's departure from dock. (Map data by Google Maps; satellite image by Google Earth Pro)

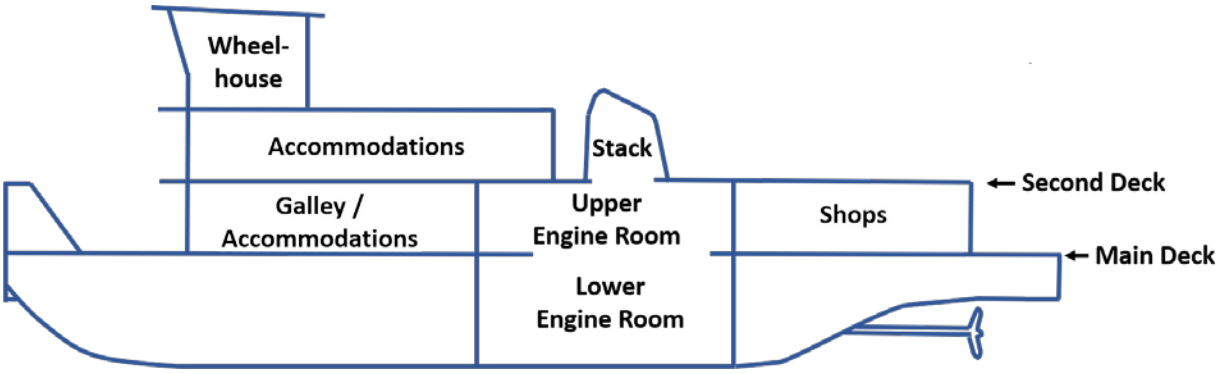
Background

The *J.W. Herron* was an 88-foot-long, twin-propeller towing vessel powered by two mechanically controlled EMD 645 twelve-cylinder diesel engines producing 3,000 total horsepower. The vessel was repowered in the late 1990s before the current owner purchased it in 2011. Originally named the *Tunica*, the vessel was built in 1967 by Wagren Steel Co. with GM 567 BC-type engines producing 2,400 total horsepower. The transmission was a Falk LST-type consisting of a reduction gear with an integral pneumatically operated clutch. The towboat was fitted with twin rudders (one aft of each propeller) and flanking rudders, all operated electromechanically through sticks in the wheelhouse.

The *J.W. Herron* was constructed of welded steel with three levels above the lower engine room and hull spaces. The engine room, located aft of the galley and accommodation spaces, contained the two main propulsion engines, two generators, and all other associated equipment, including the fire pump. The space had two levels: an upper level, which was also the main deck, and a lower level, where the main engines, clutches, and reduction gears for the shafts were located. The interior accommodation spaces and wheelhouse were finished with wood and plywood.

The *J.W. Herron* was typically scheduled for line hauls of six hopper barges on 30-day roundtrips from Mobile, Alabama, to Houston, Texas, through the Intracoastal Waterway. After

returning to Three Mile Dry Dock and Repair in Mobile, the vessel underwent maintenance on December 10 and 11. The vessel was assigned to barge shift work there over the next few days and afterward scheduled to head to Houston on December 14.



Simplified profile of *J.W. Herron* (not drawn to scale).

Accident Events

About 1030 on December 13, the *J.W. Herron* departed Three Mile Dry Dock and Repair. The crew—who consisted of the captain, the engineer, and a deckhand—began shifting barges in Mobile Harbor to assemble a tow for staging at Twelvemile Island, approximately 5 miles north via the Mobile River.[2] The tow consisted of seven empty hopper barges (each 200 feet long and 35 feet wide), a small deck barge, and a 45-foot-long shift boat named *Dana Jean*; it was configured three long on the port and center strings, with the starboard string comprising a single hopper barge at the head and the small deck barge aft, while the *Dana Jean* was being towed behind the *J.W. Herron*. After the tow was built, the crew began the transit upriver about 1140. According to the captain, the weather was good, with a light 8-mph wind from the south. He said that he had both propulsion engines at 600 rpm ahead for a corresponding speed of approximately 6 mph. Automatic identification system (AIS) data confirms the transit speed was just over 5 mph until the tow reached the staging area in Big Bayou Canot, on the east side of Twelvemile Island, about 1310.

During the 1.5-hour transit, the engineer stated that the temperatures of the engine room machinery were “just fine” when he checked them. He looked at water and bearing temperatures and pressures for water, oil, the air blower, and the air clutch for both the port and starboard propulsion systems.

On arrival at Twelvemile Island, the captain landed the aft end of the tow on the east side of the bayou. The engineer and deckhand left the *J.W. Herron* and positioned themselves on the aft center barge with handheld VHF radios. By 1330, they had tied lines to the trees on the bank and relocated the *Dana Jean* to the starboard side of the *J.W. Herron* with the small towboat’s engines running in neutral.

Next, the crew unfaced (untied) the towboat from the aft center barge, so that the captain could reposition the *J.W. Herron* to push the front of the tow into the bank and then the starboard head barge could be tied to the trees. To position the vessel, the captain stated that he “walked” the

[2] *Staging* in the towing industry refers to the activity of securing barges for short-term storage, which involves parking or shifting the barges.

towboat from the back of the tow by putting the port propeller in reverse and leaving the starboard propeller in forward. Once clear of the port string, he placed both engines in forward and moved toward the port head barge (facing north). Next, the captain spun the *J.W. Herron* clockwise by moving the starboard engine to neutral and then to reverse. With the vessel positioned to push the tow into the bank, he returned the starboard engine to forward and, with both engines, pushed the tow at an idle speed of approximately 345 rpm. However, noticing that the tow was not moving toward the bank as expected, the captain increased the throttle of both engines to approximately 500 rpm. He then looked aft and saw no propeller wash from the starboard side. The captain thought that there might have been a problem with the control system to the engines, as he later stated, but did not hear anything unusual at the time.

Meanwhile, the engineer and deckhand were making their way forward to the head of the tow to tie off the starboard head barge. The captain attempted to radio the engineer to inform him of the issue, but the engineer's radio had a dead battery. About 1340, the deckhand and engineer noticed "dark black" smoke emanating from the area of the stack fan outlet (not the engine exhaust) on the port side and then from the portside engine room door. The captain saw the engineer pointing, yelling, and next running across the barges toward the *J.W. Herron*.

After the captain met the deckhand and engineer at the starboard tow knee, the captain and engineer proceeded down the starboard side of the towboat's main deck to access the engine room. According to the engineer, the engine room was filled with black smoke, but while looking through the forwardmost engine room window (of four windows) he saw a "glow" emanating from the back of the port engine, between the engine and the gearbox. The captain, who was a bit farther aft than the engineer, also saw thick black smoke, but he stated that he could not see anything through the window.

Images from captain's camera phone capture evolution of fire aboard *J.W. Herron*, 9 minutes after smoke was first noticed through when fire department began firefighting with water cannons.

The captain stated that all four engine room windows and the double doors on the main deck on both the port and starboard sides of the engine room were open. With the towboat positioned starboard-to the wind direction, he noticed that the smoke was blowing out of the port windows and door as it traveled through the engine room. The captain instructed the engineer to board the *Dana Jean* with the deckhand and move it away from the burning *J.W. Herron*. He then pulled the remote emergency fuel shutoffs for the starboard generator and starboard propulsion engine, which were located above the forwardmost engine room window. However, after he proceeded around the forward side of the wheelhouse, he was unable to reach the shutdowns for the port generator and propulsion engine due to the smoke. According to the captain, approximately 4,000 gallons of no. 2 diesel oil and approximately 200 gallons of lube oil were in the vessel's tanks.

On returning to the wheelhouse, the captain noticed that the fire alarm (heat sensor) for the engine room was flashing and buzzing, but he did not see any other locations indicated. He put the port engine in neutral and called the vessel company. As he was preparing to call the US Coast Guard, he was forced from the wheelhouse, around 1349. The captain then evacuated the towboat, headed down the barges, and met the engineer and deckhand aboard the *Dana Jean*. The vessel's AIS, located in the wheelhouse, stopped transmitting at 1415.

Two local fire department vessels arrived on scene around 1510, at which time the captain described the fire as past its apex and winding down, with a small fire in the engine room and another below the wheelhouse. Fire department personnel did not communicate with the captain but began fighting the fire with water cannons. About 1630 (before the fire was completely extinguished), the *J.W. Herron* crew departed the scene to complete drug and alcohol testing.

Another Three Mile towboat, the *Tommy Jack*, which had transited upriver to assist the crew of the *J.W. Herron*, towed the vessel back to the dock. The *J.W. Herron*'s hull was not breeched during the fire, and the main structure and main propulsion system remained intact, despite the extensive fire damage throughout the vessel. There was no report of fuel or oil spilled.

***J.W. Herron* post-fire at Three Mile Dry Dock and Repair.**

Starboard main engine (looking aft).

Other Information

Propulsion system

The captain told investigators that when he lost starboard propulsion he initially thought there was a problem with the control system. The towboat had pneumatic controls for engine speed (throttle) and direction. In neutral, the engine output shaft would turn; when the throttle was pushed forward, a pneumatic signal would engage the clutch by admitting air to a rubber tire that inflated, squeezing on a drum, and driving the propeller shaft; and to reverse propulsion, the clutch had mechanically engaged pinions. The captain stated that after the fire, he suspected the cause was a slipping clutch that overheated. He said that low clutch air pressure would result in partial tire inflation, causing the clutch tire to spin against the drum pads. If the condition persisted, the aluminum in the clutch assembly would heat and ignite the rubber tire, whose embers may then ignite oil in the bilge or combustibles in the engine room. In the case of the *J.W. Herron*, the captain stated that the ignitable fuel may have been oil in the bilge or the engine lube oil in the lines running just above the clutch (the engineer stated that the bilge was pumped out 3 days before the accident but sometimes in the past it contained some fuel and lube oil). Based on the captain's experience, slipping clutches first produced a "white" smoke, which turned into "black" smoke when the rubber tire burned.

Although the engineer stated that he did not know the cause of the fire, he suggested that it might have been a lack of oil in the engine's gear-driven air blower or the heat of a slipping clutch. The vessel did not have an alarm alerting the crew to low air pressure to the clutch; however, the engineer checked the clutch pressure during the transit and stated that it was normal, as were the oil pressures and other machinery temperatures. He did not recall any fuel leaks from the engines under typical operation, but he had previously seen engine vibrations loosen copper tubing flare fittings, which would then weep oil. He resolved the leaking fittings by tightening them while under way. According to the engineer, a 3/8-inch copper tubing with flare fittings was supplying lube oil to the air blowers above the clutch; the operating pressure in the line was approximately 18 pounds and the engine sump held approximately 80 gallons of oil. Investigators confirmed that the oil supply line constructed of steel ran inside the valve covers down the starboard side of the engine, transitioned to copper tubing upon exiting the valve covers, and remained copper to the blowers. The fittings and tubes appeared to be intact post-fire but were not pressure-tested. In the past, the engineer had attempted to replace the copper tubing with steel per the engine manual, but he could not find the part in steel.

Above the clutch were also twin 1.5-inch stainless steel-braided rubber hoses, held in place with double hose clamps, that vented the engine crankcase to the air blowers. After the fire, these hoses were missing.

Machinery maintenance

The *J.W. Herron* was owned by Graestone Logistics and leased under a bareboat charter arrangement by Four Rivers Towing, both of Murray, Kentucky. Three Mile Dry Dock and Repair, where the *J.W. Herron* regularly operated, performed the maintenance work on towboats owned by Graestone and operated by Four Rivers, who supplied the crew and was responsible for maintenance. The accident captain was both the owner of the operating company and a co-owner of Three Mile.

According to the accident captain, maintenance on machinery was conducted "in house." His company operated four boats with clutch and gear systems similar to the *J.W. Herron*'s. For overhauls of the Falk reduction gears and air clutches, he hired an expert from a gear repair company to oversee repairs in a supervisory role.

Maintenance records, which were kept on board the vessel only, were destroyed in the fire. The engineer recalled that 3 years before the fire the engines were overhauled, and the captain and engineer revealed that either the port- or starboard-side clutch was renewed. The captain stated that there was no upcoming maintenance scheduled for the gears or clutches and that the lifespan for the clutch tire was typically 5 to 7 years and the tires were about 3 years old. Both crewmembers told investigators that gears and clutches were inspected visually over the years, which included recording clearance measurements. The engineer said that about every 60 days he changed lube oil filters for the reduction gears, and about every 3 months he removed the clutch covers to check the air pressure to the clutch as well as the clearances between the clutch and the drum.

When asked if they had a planned maintenance system, the engineer said they conducted more "routine maintenance" for overhauls, which they determined by the service life hours, unless inspections indicated an earlier period.

Condition of engine and transmission

The captain of the towboat who regularly navigated the *J.W. Herron* from Mobile to Houston stated that he was not aware of any previous issues with the engine or clutch. Interviews of the accident captain and engineer revealed that the towboat had two incidents related to the clutch within a few weeks of the fire. The first was around November 20, when the starboard engine quickly increased in rpms while operating in shallow water. Following the incident, the engineer inspected the clutch and checked clearances and found them to be satisfactory, so no parts were replaced. The second incident, around December 9, occurred when the starboard propeller hit a log and, as the engineer told the captain, they "smoked a clutch tire." An inspection similar to the prior incident's was conducted December 10 and 11; the components and clearances were again deemed satisfactory, so no parts were replaced.

Fire investigation report

A day after the fire, a commercial forensic science firm contracted by the vessel's insurer conducted an examination of the *J.W. Herron* to ascertain the source of the fire. The firm's report classified the fire as accidental and noted that fire patterns indicated that damage to the starboard engine was more extensive than to the port engine, whose valve covers remained intact while the starboard's were melted. The clutch tires for each engine were found to be equally damaged. A vacuum canister for the engine's crankcase oil, which was located above the clutch tire area, had connecting hoses burned away at both engines. The firm concluded that the fire occurred near the aft end of the starboard engine, likely from a ruptured hose on the vacuum canister that would have

sprayed lube oil throughout the engine compartment and onto hot engine surfaces and the clutch tire, thus igniting the oil. Once the oil ignited, the fire would have spread by burning combustible materials as well as diesel fuel and lube oil systems in the engine compartment, before reaching the upper level via direct flame impingement and conduction. The report also noted that heat buildup from the slipping clutch, which was described by the captain, rendered the clutch tire a potential ignition source.

Fire damage of engine room's upper level (looking forward).

Fire equipment, detection, and drills

The crew did not discuss starting the electrically driven fire pump or taking other actions to combat the fire. Although hoses were located on each side of the main deck and the fire pump system valves were lined up to operate, the hazards and limited visibility caused by the thick black smoke prevented the crew from reaching the remote start-switch for the pump, which was directly above the exterior starboard-side engine room door. The engine room was not fitted with a fixed fire-suppression system, nor was it required to be. Instead, a large, semi-portable CO_2 fire extinguisher was located on the aft port side of the lower engine room, along with handheld CO_2 extinguishers on both the upper and lower levels of the engine room. There was no self-contained breathing apparatus (SCBA) on board the vessel for the crew to enter dangerous atmospheres.

Engine shutdowns and remote fuel supply shutoffs for the propulsion and generator diesel engines were located on the port and starboard sides at the forwardmost engine room window. The captain succeeded in pulling the starboard set, but not the port set due to the smoke.

The crew stated that the vessel's fire detection system was functioning and gave both audible and visual indications at the time of the fire. There were two heat sensors in the engine room, one on each level, and others throughout the vessel.

The captain said fire drills were conducted about once a month. Although documentation of the drills for the *J.W. Herron* was lost in the fire, he did provide documentation for company fire drill scenarios, accompanying crew sign-in sheets, and general shipboard "Fire Safety Instruction and Orientation."

Engine room ventilation

Typical of inland river towing vessel designs, the *J.W. Herron* had four residential-type (not marine-grade weathertight) vertically opening windows located along the port and starboard bulkheads on the upper level of the engine room. In addition, for exterior access into the engine room there were double doors located on the port and starboard sides of the main deck, and for access from interior spaces there were three steel dog-type doors. The exterior windows and doors were routinely left open for ventilation of the engine room, whereas the interior doors were typically closed. The crew was unable to secure the two sets of supply and exhaust fans providing engine room ventilation as they were controlled from within the engine room, so they remained running during the fire. Additionally, the exhaust ventilation outlets for the engine room located on the aft side of the stacks had fixed louvers and thereby could not be closed.

Aft side of *J.W. Herron* stacks, with engine room exhaust vents, post-fire.

Personnel

The accident captain was not the regular captain of the *J.W. Herron*, but captained towboats for barge shifts in the Mobile area two to three times a month. He stated that he had been running towboats on the rivers for more than 49 years, was a licensed pilot for more than 45 years, and had been captain for nearly 40 years. He held a current Coast Guard credential as master of towing on Western Rivers.

The engineer was not credentialed, nor was he required to be. He had worked 28 years for various inland river companies, including as a chief engineer for the last 9 years, six of which were as engineer on the *J.W. Herron*. He stated that typically he made engine room rounds about every 2.5 hours while under way, including at night, and slept 1.5 to 2 hours between rounds.

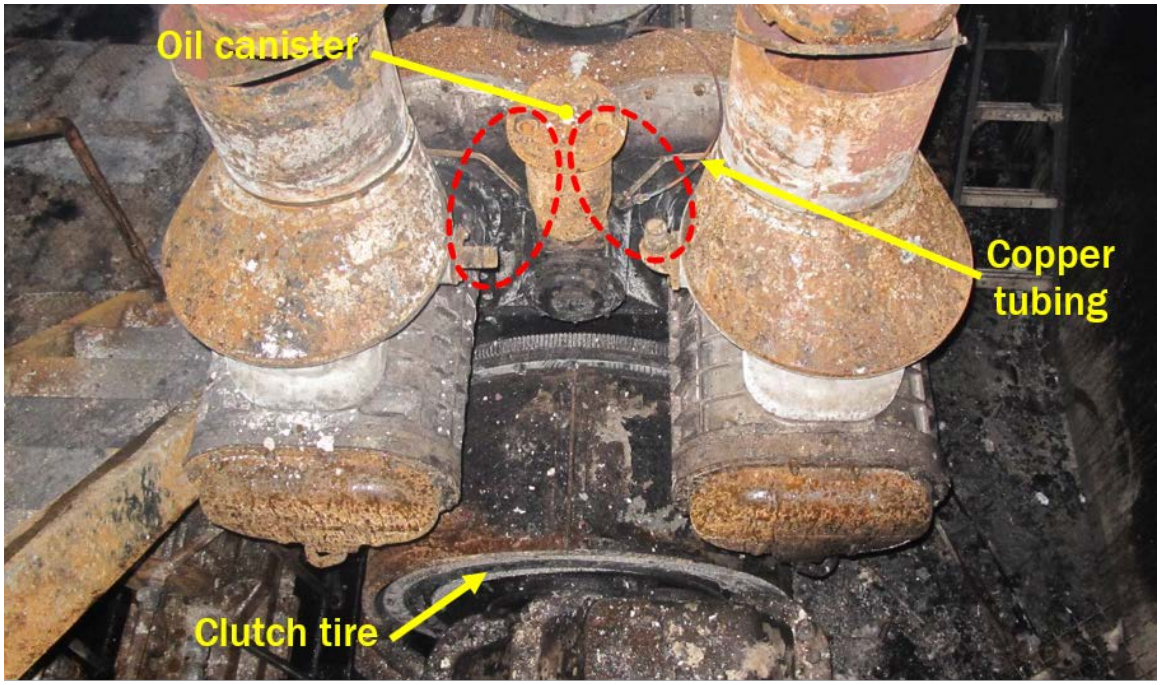
Drug and alcohol tests administered to the crew resulted in the engineer testing positive for methamphetamine. An NTSB medical evaluation determined that the engineer's results showed that at some point during the several hours to days prior to the test, the engineer had used methamphetamine, for which the engineer did not provide a valid prescription. However, the

evaluation noted that urine testing cannot determine precisely when a person used the drug, the timing of impairment from its use, or the degree of impairment.

Analysis

Although there was no evidence of the engineer, who tested positive for methamphetamine, being impaired in behavior or decision-making ability on the morning of the accident, any drug use by a crewmember poses a safety hazard while on board a vessel.

When the captain first saw flames, they were coming from the aft side of the starboard stack, from the engine room exhaust ventilation louvers, indicating a fire in the starboard side of the engine room. Following the accident, the captain suspected that the initiating event was a slipping clutch, as evidenced by the loss of propulsion on the starboard engine before the fire. The clutch slipping was a potential source of ignition rather than a fuel source. The forensic fire report, which indicated that the fire was hottest near the aft portion of the starboard engine, stated that the likely initiating event was the heat of the slipping clutch or a hot engine surface that ignited lube oil from a ruptured hose on the vacuum canister. Investigators also found that copper tubing with flare fittings that carried pressurized lube oil to the engine blowers ran in the same area of the vacuum canister hoses above the clutches and therefore could have been a potential fuel source. As the engineer pointed out, the flare fittings had wept in the past from engine vibration. Because the crew was not able to reach the emergency engine shutdown, lube oil pressurized from a running engine would have fed the fire until the sump emptied or the engine stopped.



Aft side of starboard engine (viewed from above), with oil canister, remnants of clutch tire, and copper tubing identified. Red circles indicate areas where 1.5-inch stainless steel-braided rubber hoses were missing.

Although the captain was in the wheelhouse when smoke was first noticed, the crew was on the barges. During the few minutes taken to re-board the vessel and begin firefighting, the crew could not start the fire pump, shut the starboard engine fuel supply valves, stop the starboard

engine, or secure the ventilation, as these areas were overcome by smoke. The speed of which the fire grew to encompass the engine room and the location of primary fire equipment within that same space together eliminated the opportunity for the crew to effectively fight the fire; thus, immediate evacuation from the vessel was reasonable. Had the crew been able to reach the port engine shutdowns, the additional diesel fuel in the day tank would not have been available to fuel the fire. In addition, the engine room supply and exhaust fans remained in operation during the fire because they were controlled from the engine room and thereby could not be shut down. Nevertheless, if they had been secured, the engine room inlet and exhaust vents would still not have been able to be shut because they were fitted with fixed louvers. 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 risks expanding engine room fires. However, even if the crew could shut the engine room windows, given that they were not marine grade the windows would have likely cracked or blown out in the fire. The inability to secure all ventilation allowed for a continued oxygen supply to the fire, hastening its growth and spread.

Furthermore, the small confines of the engine room space and the location of fire equipment within that same space demonstrated a risk to crews fighting engine room fires. Even if the crew could have reached the start button for the fire pump (located in the engine room), their sole means to try to control and extinguish the fire would have been to place a hose through an engine room window or door. On smaller vessels such as tows, the risk to crews fighting engine room fires has led to the development of designs that incorporate both a means for securing 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 aboard the towing vessel *J.W. Herron* was leaking lube oil from a propulsion diesel engine hose or tubing fitting that was ignited off an exposed hot engine surface or slipping clutch. Contributing to the severity of the fire was the location of the emergency engine shutdowns and fuel supply shutoffs near the exterior engine room doors, which proved to be inaccessible. Contributing to the spread of the fire was the inability to secure ventilation to the engine room.

Accessing Remote Engine Room Shutdowns

The location of remote emergency shutdowns to the engine room—quick-closing valves for fuel and lube oil systems, remote stops for ventilation fans, and engine stops—as well as fire pump start controls may not be accessible during a fire. Therefore, the accessibility of these shutdowns and controls should be evaluated during fire-response planning. Alternative remote emergency shutdown locations, such as the wheelhouse, should be considered for redundancy.

Vessel Particulars

Vessel	*J.W. Herron*
Owner/operator	Graestone Logistics, LLC / Four Rivers Towing, LLC
Port of registry	Paducah, Kentucky
Flag	United States
Type	Towing vessel
Year built	1967
Official (U.S.)/IMO number	507640
Classification Society	N/A
Construction	Steel
Length	88 ft (26.8 m)
Draft	9.1 ft (2.8 m)
Beam/width	34 ft (10.4 m)
Gross tonnage (US)	345
Engine power; manufacturer	2 x 1,500 hp (1,119 kW), total 3,000 hp (2,237 kW); GM 12-645 EMD diesel engines
Persons on board	3

NTSB investigators worked closely with our counterparts from Coast Guard Sector Mobile throughout this investigation.

For more details about this accident, visit www.ntsb.gov and search for NTSB accident ID DCA18FM008.

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