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MIR-22/09

## Contact of *Ava Claire* Tow with Leland Bowman Lock Gate

On March 22, 2021, at 0522 local time, the towing vessel *Ava Claire* was transiting with a crew of four westbound in the Gulf Intracoastal Waterway near Intracoastal City, Louisiana, pushing two fully loaded tank barges.<sup>1</sup> After entering the Leland Bowman Lock at mile 163W, the bow of the lead barge struck a closed lock gate, damaging and disabling the gate.<sup>2</sup> There were no reports of pollution or injuries. Damage to the lock gate was estimated at \$2.5 million.



**Figure 1.** *Ava Claire* under way before the casualty. (Source: General Marine Services)

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<sup>1</sup> (a) In this report, all times are central daylight time, and all miles are statute miles. (b) Visit [ntsb.gov](https://www.ntsb.gov) to find additional information in the [public docket](#) for this NTSB investigation (case no. DCA21FM022). Use the [CAROL Query](#) to search investigations.

<sup>2</sup> This section of the waterway was measured from the Harvey Lock (mile 0) in New Orleans, Louisiana, in both eastward (E) and westward (W) directions.

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<b>Casualty type</b>	Contact
<b>Location</b>	Leland Bowman Lock, Gulf Intracoastal Waterway, mile 163W, near Intracoastal City, Louisiana 29°47.19' N, 92°12.49' W
<b>Date</b>	March 22, 2021
<b>Time</b>	0522 central daylight time (coordinated universal time -5 hrs)
<b>Persons on board</b>	4
<b>Injuries</b>	None
<b>Property damage</b>	\$2.5 million est.
<b>Environmental damage</b>	None
<b>Weather</b>	Visibility 10 mi, clear, winds calm, seas calm, air temperature 57°F, water temperature 62°F, morning twilight 0645, sunrise 0708
<b>Waterway information</b>	Channel, width 110 ft, depth 15 ft, tidal current



**Figure 2.** Area where the *Ava Claire* tow contacted the Leland Bowman Lock gate, as indicated by the red X. (Background source: Google Maps)

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## 1. Factual Information

### 1.1 Background

The 84-foot-long towing vessel *Ava Claire* was built of steel in 2007 at the John Bludworth Shipyard in Corpus Christi, Texas. Originally named the *San Luis*, it was renamed the *Ava Claire* when it was acquired by General Marine Services (GMS) in 2016. The 8.5-foot-draft vessel was equipped with two steering rudders, four flanking rudders, and two 1,000-hp Cummins main propulsion diesel engines, each driving a five-bladed propeller.

On the day of the casualty, the *Ava Claire* was pushing ahead two 298-foot-long-by-54-foot-wide steel tank barges, the *HFL 437* and *HFL 439*. The barges were arranged in a single string, with the *HFL 439* in the lead, making the overall length of the tow about 679 feet. The barges, each with a draft of 9.5 feet, were loaded with a total of 53,166 barrels (2,232,980 gallons) of naphtha, a flammable hydrocarbon mixture. Built in 2015 by Trinity Marine Products in Ashland, Tennessee, the *HFL 437* and *HFL 439* were owned by the Hines Furlong Line and operated by GMS.

### 1.2 Casualty Events

At 1500 on March 20, 2021, the *Ava Claire* tow departed the Valero St. Charles Refinery, located at mile 125 on the Lower Mississippi River in Norco, Louisiana, bound for the Valero Port Arthur Refinery in Port Arthur, Texas. Over the next day and a half, the vessel and tow transited down river, locked through to the Gulf Intracoastal Waterway at Algiers, Louisiana, and headed westbound. The Gulf Intracoastal Waterway provided a protected navigation route between Florida and Texas. The captain reported no problems with the steering or propulsion systems during the transit through the Algiers Lock.

About 0030 on March 22, the captain went to sleep after being relieved of the navigation watch by the pilot.<sup>3</sup> About 4.5 hours later, between 0500 and 0515, the captain awoke and proceeded to the wheelhouse to assume the watch early. Although the captain's daily watch rotation was 0600-1200 and 1800-2400, he stated that he normally took the morning watch soon after awakening.

When the captain entered the wheelhouse, the tow was approaching the Leland Bowman Lock, near Intracoastal City. According to a policy contained in the GMS vessel

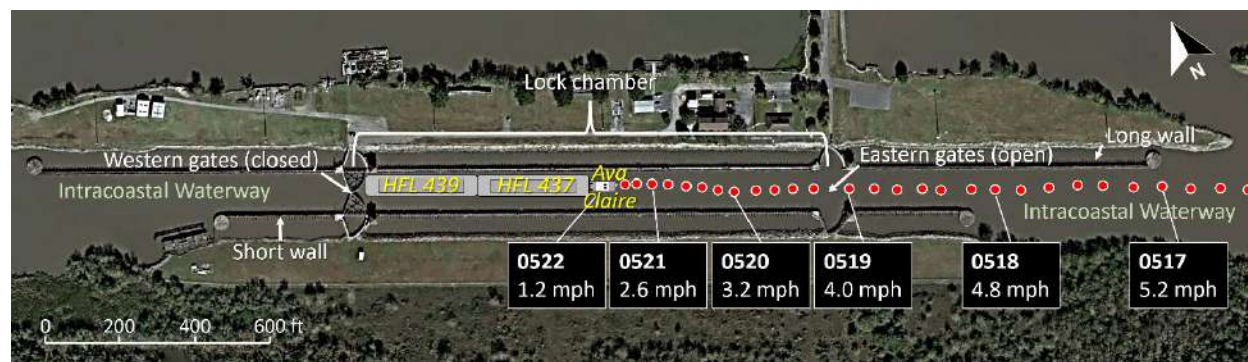
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<sup>3</sup> *Pilot* is a term used aboard towing vessels on inland waterways for a person, other than the captain, who navigates the vessel.

operations manual and dated October 2016, a change of watch was not to occur during “a critical move.” Whether a move was critical was to be determined by oncoming and offgoing watchstanders; examples in the manual included operations involving “bridges, locks, and docking operations.” According to a company representative, a copy of the operations manual was kept on board the vessel, and crewmembers were introduced to the manual and its procedures during company orientations and quarterly safety audits.

The *Ava Claire* pilot offered to take the tow through the Leland Bowman Lock before turning over the watch, but the captain declined the offer and took the helm about 5 minutes before maneuvering the tow into the lock. Before turning over the watch, the pilot informed the captain that he was having trouble communicating via handheld radio with the *Ava Claire* deckhand, who was stationed on the lead barge in preparation of the lock entry.

At 0516, when the *Ava Claire* was 0.2 miles from the lock, the speed of the tow was 5.2 mph. The captain stated that when the tow neared the long wall on the north side of the lock, he reduced the speed on the engines, keeping them “in clutch” ahead to provide steering control. The tow’s speed began to slow as the bow of the lead barge, *HFL 439*, passed between the open gates on the eastern side of the lock.



**Figure 3.** Automatic identification system (AIS) track of the *Ava Claire*, as indicated by the red dots, with a scaled representation of the tow added. The AIS antenna was located on the towing vessel, about 615 feet aft of the bow of barge *HFL 439*. (Background source: Google Earth)

The western gates to the Leland Bowman Lock were closed as the tow proceeded into the lock. According to the captain, the lock master typically instructed towing vessel operators by radio to “bring it all the way to the gate,” which meant stopping and tying off the tow with the bow of the lead barge about 50 feet from the closed gates. The captain intended to take this approach as he maneuvered the *Ava Claire* tow in the chamber. The captain said that during a lock transit, deckhands would call out the distances to the closed gates as the tow moved forward; however, on the morning of the casualty, he was not receiving reports because of ongoing trouble with their handheld radios. In a statement to the Coast Guard, the deckhand confirmed that he and the

captain were having “a little issue” with handheld radio communications and that the captain could not hear his distance calls.

The captain told investigators that as he was maneuvering the tow in the lock, the GPS feed to his electronic chart system (ECS) failed, denying him his primary source of speed indication (a postcasualty replay of the ECS data confirmed the loss of the GPS signal). Thus, he had to judge the speed of the tow by watching the illuminated lock wall out his side windows and the lock gates out his forward windows.

According to the captain, when the head of the tow was about 600 feet from the western gates, he moved the engine throttles to slow astern. Based on automatic identification system (AIS) data, the tow’s speed at the time was 3.7 mph and decreasing.

The deckhand stated that radio communications improved when the head of the tow was about 250 feet from the western gates. At this time, the captain was able to hear the deckhand’s distance calls. AIS data shows that the vessel’s speed was 3 mph. The captain said that when the tow was about 200 feet from the gates, he put the engines at full astern. The tow continued to slow but did not fully stop before the starboard bow of the *HFL 439* struck gate no. 3 on the northwest side of the lock at 0522. The tow’s speed when it contacted the gate was 1.2 mph.

## 1.3 Additional Information

### 1.3.1 Personnel

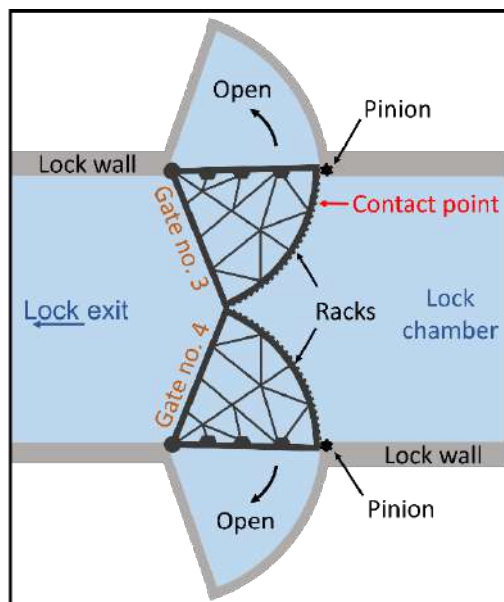
The captain of the *Ava Claire* had worked in the towing industry for 31 years. He had served as a pilot, relief captain, and captain on towing vessels for over 20 years, working on rivers and the Gulf Intracoastal Waterway. He stated that he had at least 10 years of experience transiting through the Leland Bowman Lock on a regular basis.

The captain was hired by GMS and joined the *Ava Claire* on February 4, 2021, about a month and a half before the casualty. In the 6.5 years before joining the company, he worked for another company captaining various 2,600-hp towing vessels. The captain stated that his former company’s vessels backed down better than the 2,000-hp *Ava Claire* and that he was “used to having the stopping power” of a 2,600-hp vessel.

Upon joining the *Ava Claire*, the captain worked as a pilot to gain familiarity with the vessel before taking over as captain. He said that during this familiarization period, the *Ava Claire* operated only on rivers and not the Intracoastal Waterway. The captain noted that in the shallower water of the Intracoastal Waterway, tows did not slow as quickly as they did in the deeper rivers.

Postcasualty tests for alcohol and other drugs for the captain were negative.

According to the captain, the deckhand had not been on the *Ava Claire* very long before the casualty occurred, having recently come from another vessel (the deckhand has since left the company).



**Figure 4.** Simplified illustration of Leland Bowman Lock western gates showing the point of contact by barge *HFL 439* (in red).

### 1.3.2 Leland Bowman Lock

The Leland Bowman Lock was completed in 1985, replacing a lock that had existed since 1934. It was 110 feet wide by 1,140 feet long, with a 15-foot mean depth in the chamber. Operated by the US Army Corps of Engineers, its primary purpose was to prevent saltwater intrusion into freshwater river systems. Each gate at the lock was opened and closed by a pinion driving a rack mounted at the top edge of the plating that formed the water barrier. At night, the length of the lock was illuminated by high-mast lighting. The captain stated that the lighting was sufficient, although he found that depth perception was more difficult with the nighttime illumination. The lock was fully operational at the time of the casualty.

There are no data for tides and tidal currents at the lock, but tidal currents are known to exist in the area. The *Ava Claire* captain stated that there was a “fair current” acting on the stern of the tow on the morning of the casualty, which he “didn’t quite predict” when he took the watch.

### 1.3.3 Damage

A 10-inch-wide section of steel hull plating on the bow of barge *HFL 439* was inset a maximum of 1.5 inches where it struck the lock gate. The damage was not substantial enough to require repairs. Barge *HFL 437* and the *Ava Claire* were not damaged in the casualty.

Steel plating, internal framing, and sections of the rack on lock gate no. 3 were bent 12 inches inward where the barge struck the gate. The gate structure was also knocked out of alignment, preventing it from being



**Figure 5.** Damaged steel plating and rack on gate.

fully opened. At the time of this report, damage below the waterline had not been assessed, nor the gate repaired.

## 2. Analysis

### 2.1 Captain's Experience

The *Ava Claire* was pushing two fully loaded barges in the Leland Bowman Lock on the Gulf Intracoastal Waterway when the lead barge struck the lock's no. 3 gate. The captain at the helm of the *Ava Claire* had at least 10 years' experience maneuvering tows in the waterway system, including the Leland Bowman Lock. However, at the time of the casualty, he had not piloted a tow through the waterway or the lock with the 2,000-hp *Ava Claire*. In the previous 6.5 years, he had captained 2,600-hp towing vessels that he said had more stopping power. When he joined the *Ava Claire* about a month and half before the casualty, he operated the *Ava Claire* for a brief time as a pilot to gain familiarity with the towing vessel before taking over as captain. Yet, during this period, the vessel only operated in rivers that had deeper water. In shallower waters such as the Gulf Intracoastal Waterway, vessels and tows can be slower to react to steering and propulsion inputs. The captain's limited familiarity with operating the lower-horsepower *Ava Claire* (in comparison to his experience with towing vessels that had 30% more horsepower) in the Intracoastal Waterway may have contributed to a misjudgment of the timing and magnitude of the engine commands needed to slow the tow as it entered the Leland Bowman Lock.

### 2.2 Navigation Challenges

Additional factors on the morning of the casualty added to the captain's challenges as he attempted to maneuver the *Ava Claire* tow. A tidal current may have been pushing the tow from astern, adding speed as the tow approached the lock. As the *Ava Claire* entered the lock chamber, the GPS feed to the vessel's ECS was lost, denying the captain his primary electronic source of speed indication. Judging the speed by eye alone, the captain may have been affected by poor depth perception, which is common during nighttime operations.

Problems with radio communications between the deckhand and the captain further impacted the captain's ability to judge speed and distance in the 1,140-foot-long lock chamber. Due to these problems, the captain did not receive reports from the deckhand on the closing distance to the lock gates until the head of the tow was 250 feet from the lock gate, at which time the tow was moving at 3 mph. Given the loss of the GPS feed to ECS at a critical moment of operation and the lack of communication with the

deckhand, it would have been prudent for the captain to take extra precautions such as slowing and stopping the tow earlier in the lock.

## 2.3 Sleep Inertia

The casualty occurred at 0522, less than half an hour after the captain had awakened that morning. He had slept for about 4.5 hours following his previous watch. Upon taking the helm watch, he almost immediately began maneuvering the tow into the lock. At the time, the captain was likely experiencing the effects of sleep inertia—the temporary feeling of grogginess felt immediately upon waking up. Sleep inertia negatively affects an operator’s performance, vigilance, alertness, and decision-making for 30 minutes or more after waking, especially in demanding situations that require high levels of attention and cognitive demand.<sup>4</sup> Further, waking during a circadian low and partial sleep deprivation can amplify the effects of sleep inertia.<sup>5</sup> The captain’s sleep inertia, coupled with the challenges presented by the operating environment, would have negatively impacted his ability to safely navigate through the lock.

Given his limited experience with the *Ava Claire*, his lack of a full night’s sleep, and the time of day, the captain’s taking the watch immediately before navigating the *Ava Claire* tow through the Leland Bowman Lock increased the risk of this critical maneuver. The *Ava Claire* company’s policy required watchstanders to delay turnover of the watch during “a critical move.” This prudent measure eliminates an individual’s subjective decision on whether to change the watch during events such as entering a lock. As the master of the *Ava Claire*, the captain should have been familiar with the vessel operating policies and procedures and should not have taken the watch on the morning of the casualty. However, his decision to take the watch may have also been the result of impairment caused by sleep inertia.

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<sup>4</sup> Caldwell, John, Brian Prazinko, and J. Lynn Caldwell, “Fatigue in Aviation Sustained Operations, the Utility of Napping, and the Problem of Sleep Inertia,” US Army Aeromedical Research Laboratory, 2002.

<sup>5</sup> (a) A *circadian low* occurs when the body has a stronger desire to sleep, typically between the hours of 0300 and 0500. (b) Hilditch, Cassie and Andrew McHill, “Sleep inertia: current insights,” *Nature and Science of Sleep*, 2019. (c) Tassi, Patricia, Anne Bonnefond, Ophe’lie Engasser, Alain Hoeft, Roland Eschenlauer, Alain Muzet, “EEG spectral power and cognitive performance during sleep inertia: the effect of normal sleep duration and partial sleep deprivation,” *Physiology & Behavior* 87, 2006.



## 3. Conclusions

### 3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the contact of the *Ava Claire* tow with the Leland Bowman Lock gate was the towing vessel captain's decision to assume the helm watch and attempt a predawn transit into the lock immediately after awakening while he was likely impaired by sleep inertia.

### 3.2 Lesson Learned: Conducting High-Risk Operations Immediately after Awakening

Sleep inertia is the temporary feeling of grogginess felt immediately upon awakening. Studies have shown that the effects of sleep inertia include reduced alertness, slower reaction time, less accuracy, degraded memory, and impaired decision-making ability. Sleep inertia generally lasts for about 30 minutes after waking but may last longer if a person is sleep deprived. Mariners should allow time to fully recover from sleep inertia before taking a watch and performing critical duties.

Vessels	<i>Ava Claire</i>	<i>HFL 437, HFL 439</i>
Type	Towing/Barge (Towing vessel)	Towing/Barge (Tank barges)
Flag	United States	United States
Port of registry	Baton Rouge, Louisiana	Nashville, Tennessee
Year built	2007	2015
Official number (US)	1195054	1262989, 1262990
IMO number	N/A	N/A
Classification society	N/A	N/A
Length (overall)	84.0 ft (25.6 m)	297.5 ft (90.7 m)
Beam	20.0 ft (6.1 m)	54.0 ft (16.5 m)
Draft (casualty)	8.5 ft (2.6 m)	10.0 ft (3.0 m)
Tonnage	266 GRT	1,619 GRT
Engine power; manufacturer	2 x 1,000 hp (746 kW) Cummins KTA38-M1 diesel engines	Not propelled

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

The National Transportation Safety Board (NTSB) is an independent federal agency dedicated to promoting aviation, railroad, highway, marine, and pipeline safety. Established in 1967, the agency is mandated by Congress through the Independent Safety Board Act of 1974, to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

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For more detailed background information on this report, visit the NTSB investigations website and search for NTSB accident ID DCA21FM022. Recent publications are available in their entirety on the NTSB website. Other information about available publications also may be obtained from the website or by contacting—

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