National Transportation Safety Board

Marine Accident Brief

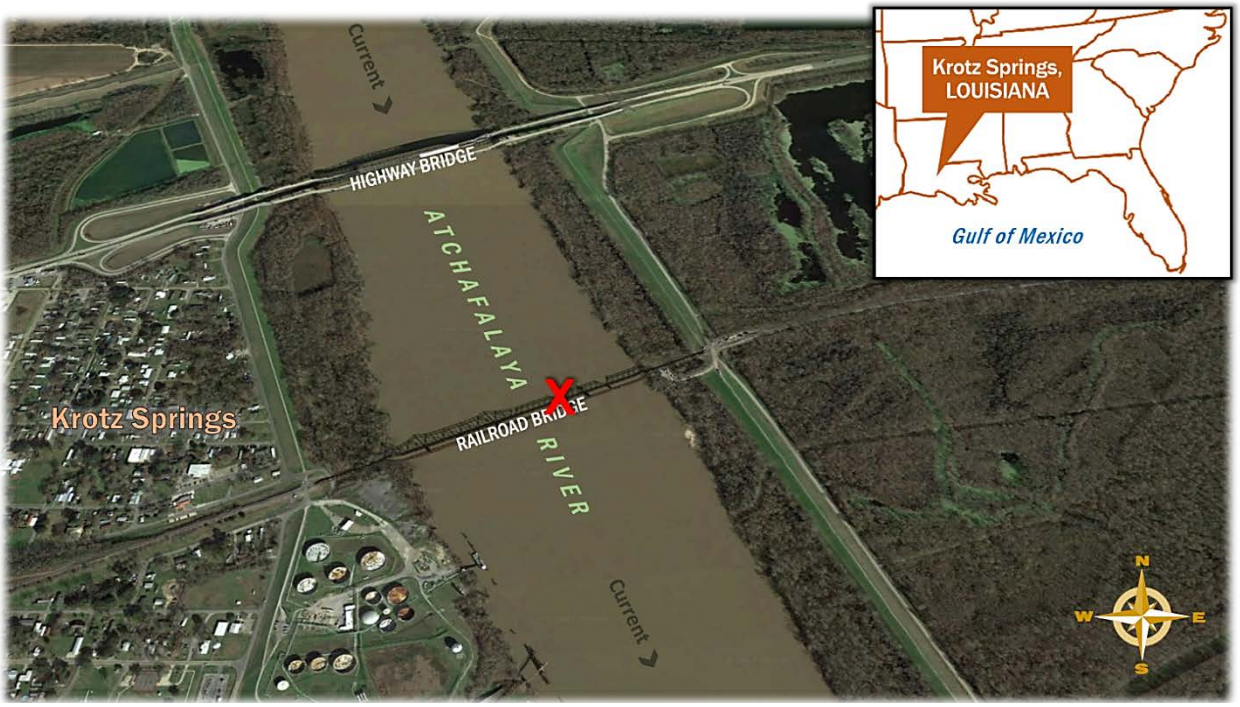
Allision of *Marguerite L. Terral* Tow with Krotz Springs Railroad Bridge

Accident no.	DCA17FM017
Vessel names	*Marguerite L. Terral*, *RM 3367*, *RM 3304B*
Accident type	Allision
Location	Atchafalaya River, mile marker 41.5; Krotz Springs, Louisiana 30°32'21.82" N, 91°44'43.57" W
Date	June 9, 2017
Time	1428 central daylight time (coordinated universal time – 5 hours)
Injuries	None
Property damage	>$4 million
Environmental damage	None
Weather	Partly cloudy, visibility 10 miles, winds west at 5 mph, air temperature 82°F
Waterway information	The navigable channel from the Old River Lock southward is 12 feet deep by 125 feet wide. According to the National Weather Service, the flood stage for that area is 29 feet. The river stage at the accident site was 23.86 feet and rising.

On June 9, 2017, the towing vessel *Marguerite L. Terral* was pushing a flotilla of six cargo barges downbound on the Atchafalaya River in Krotz Springs, Louisiana, 35 miles west of Baton Rouge.[1] At 1428 local time, the starboard lead barge in the tow, *RM 3367*, and the barge immediately aft, *RM 3304B*, contacted a pier of the Union Pacific Railroad Bridge at mile marker (mm) 41.5. The allision resulted in damage to both barges and the bridge, totaling more than $4 million in repairs. There were no reports of pollution or injuries associated with this accident.

***Marguerite L. Terral* under way before the accident. (Photo courtesy of Terral River Service)**

[1] Unless otherwise noted, in this report all miles are *statute miles*, speeds are *speed over ground*, and courses are *course over ground*.



Marked by a red *X*, the site where the *Marguerite L. Terral* tow allided with a pier of the railroad bridge on the Atchafalaya River in Krotz Springs, Louisiana. (Background by Google Earth Pro)

Accident Events

The head of the Atchafalaya River begins at the confluence of the Red River and the Lower Old River, just west of the US Army Corps of Engineers' Old River Lock. The river is approximately 137 miles in length, flowing from Simmesport, Louisiana, into the Gulf of Mexico just south of Morgan City, Louisiana. Below its junction with the Port Allen–Morgan City route the river is part of the Inland Waterway, not the Western Rivers, system.

For June 8–9, 2017, the discharge of the river at Simmesport, as measured by the US Geological Survey, averaged 460,000 cubic feet per second (cfs), which was higher than the median daily average of 340,000 cfs recorded over a 6-year period. The US Geological Survey did not have a gauge at Krotz Springs; the nearest one was 10 miles upstream in Melville, Louisiana. Based on interpolation of the measurement data collected on June 5 and 19 at the Melville gauge, investigators estimated that the discharge and mean channel velocity of the Atchafalaya River was approximately 441,500 cfs and 5.46 feet per second (ft/s) at the time of the accident. The current was estimated at 3.5 knots.

On the morning of June 9, the *Marguerite L. Terral* was moored at the Terral River Service facility on the Lower Old River in Lettsworth, Louisiana.[2] The vessel had arrived there at 0505 from Grand Rivers, Kentucky, with 12 hopper barges loaded with sandstone rock.

[2] In a previous accident on June 9, 2012, the *Marguerite L. Terral* sustained fire in the engine room while pushing 12 empty barges on the Mississippi River near Hickman, Kentucky. None of the six crewmembers suffered injury, nor was there any pollution. The NTSB could not determine the source of the fire but acknowledged that "the extent of the fire damage was the crew's failure to set fire boundaries, shut down the ventilation, and use the onboard fire suppression equipment effectively." *Engine Room Fire On Board Towing Vessel* Marguerite L. Terral, NTSB/MAB-14/04.

The vessel was scheduled to depart the facility later that day with six of the hopper barges destined for Houma, Louisiana. The route would require transiting down the Atchafalaya River below the Port Allen–Morgan City route where the river becomes an inland waterway. The merchant mariner credential for the captain, which specified master of towing vessels upon inland waters and Western Rivers, had the proper scope for operating the *Marguerite L. Terral*, but the pilot's was limited to the Western Rivers.

Due to this credentialing issue, the previous day (June 8) Terral River Service had employed another pilot as a temporary hire to serve on the final portion of the voyage. He was a trip pilot (hereafter referred to as "pilot") working with the company for the first time.[3] At 0715 on June 9, the pilot arrived at the facility in Lettsworth, where the port captain and another shoreside company employee provided him with an orientation of the company's policies, specifically regarding shipboard safety and the Responsible Carrier Program.[4]

At 0930, the pilot boarded the *Marguerite L. Terral*. Although it was his first time on the vessel, it was not his first time working with the captain, with whom he worked on a previous trip. The captain then helped to familiarize the pilot with the procedures for emergencies, bridge transits, and, if necessary, use of assist tugs. The crew of the *Marguerite L. Terral* totaled six, including the captain and the pilot.

The voyage planning for the vessel's transit down the Atchafalaya River, which had been completed by the captain before the pilot arrived on board, was discussed with the pilot as well. The discussion covered information related to all bridge transits during daylight hours, high-water restrictions in place downriver in Morgan City, and the location where the *Marguerite L. Terral* would moor the flotilla to facilitate the offloading of cargo.

The captain and pilot also discussed the bridge clearances along the route and contacted personnel at the Union Pacific Railroad Bridge—also known by mariners as the Krotz Springs Railroad Bridge—to verify the vertical clearance on the bridge. The bridge was a riveted-steel truss structure that spanned the Atchafalaya River in Krotz Springs at mm 41.5 east to west. Designed to be opened for the passage of waterway traffic, the Krotz Springs Railroad Bridge was a "swing bridge," which opened by rotating horizontally on a central axis, or pivot pedestal, in line with the navigational channel.[5] The western channel through which most downbound traffic transited had a horizontal span of 129.5 feet. There were no fender systems or other protection systems on the bridge piers or on the pivot pedestal for the drawspan. A half a mile upriver, at mm 41.0, was the Krotz Springs Highway Bridge (US Highway 190), a fixed-span bridge with a horizonal span of 475 feet and a vertical clearance of 58 feet.

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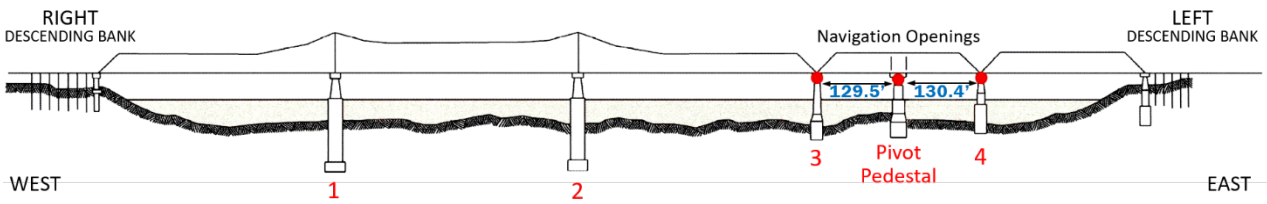
[3] *Trip pilots* are frequently used by inland towing companies to address shortages of licensed crewmembers for a limited term; as such, they are considered to be independent contractors rather than permanent employees of the company.

[4] The Responsible Carrier Program is a set of operating principles and practices intended to enhance the safety and environmental protection of the tug, tow, and barge industry. The program was developed by the American Waterways Operators and its members.

[5] Commandant Instruction M16590.5C, *Bridge Administration Manual*, US Coast Guard, March 26, 2004.



A drawing of the Krotz Springs Railroad Bridge while looking upriver. The piers have been numbered in this report for identification purposes only. (Image courtesy of US Army Corps of Engineers)

The bridge tender informed the captain and pilot on the *Marguerite L. Terral* that the clearance on the Krotz Springs Railroad Bridge was 17 feet. Considering that the vessel's air draft with the wheelhouse fully lowered was 16.9 feet, the captain and pilot felt that the bridge's clearance did not provide an ample safety margin to pass under the bridge. They decided therefore to ask the bridge tender to open the drawspan to allow the tow to pass through the bridge rather than under it in the closed position. The bridge tender would have to start the motor from the control station to rotate the movable portion of the bridge clockwise to the fully opened position before the tow could pass through the bridge without any overhead obstructions.

At 1033, the *Marguerite L. Terral* departed the company facility with the six barges arranged two units wide by three units long. The overall length of the tow, including the *Marguerite L. Terral*, was 699 feet, with a width of 70 feet. Barge *RM 3367* was the lead barge on the starboard position of the flotilla, and barge *FR 1640* was the lead barge on the port side.

The watch rotation on the vessel was scheduled for 6 hours on followed by 6 hours off. The captain held the front watch, 0500–1100 and 1700–2300. The pilot was on the 1100–1700 and 2300–0500 watches. Each watch had two deckhands assigned.

The captain, who was conning the vessel, conducted an underway training session in the wheelhouse with the pilot. The training continued until around 1118 when the pilot assumed control of the vessel between the Kansas City Southern Railroad Bridge at mm 4.9 and the Louisiana Highway 1 Bridge at mm 5.3 in Simmesport. The captain remained on the navigation bridge to monitor the pilot's approach to the fixed highway bridge until the towing vessel and flotilla cleared it. Afterward, he retired to his stateroom.

At 1325, while continuing downriver, the pilot successfully navigated the *Marguerite L. Terral* tow through the Missouri Pacific Railroad Bridge in Melville at mm 29.5. According to the automatic identification system (AIS) data, the *Marguerite L. Terral* was transiting at 9 knots.

At 1340, the *Marguerite L. Terral* was at mm 32.5 proceeding at a speed of 8 knots. The pilot contacted the bridge tender of the Krotz Springs Railroad Bridge via the vessel's cell phone to request that the drawspan be opened at his estimated time of arrival at 1420; he also inquired about any scheduled rail traffic that might interfere with the opening of the drawspan. The bridge tender told the pilot that there was no rail traffic anticipated at the estimated arrival time but added that there would be a crew change taking place between the bridge tenders around that time. "Come on down, and we'll have it open for you," the bridge tender then said, referring to the bridge's drawspan.

Once the phone call ended, the bridge tender contacted Union Pacific's engineering department to obtain permission to open the drawspan. This permission was required to ensure that all train traffic intending to use the bridge system had been notified and to stop all traffic from

moving across the bridge during a specified time. Permission was given to the bridge tender: the train traffic was halted at 1347 through 1445.

He then departed the bridge tender's station—a small housing structure located above the track in the center of the truss on the drawspan—to begin a visual inspection of the rail and bridge. While on the bridge, he was met by two Union Pacific supervisors who had arrived unannounced to conduct an observation and performance assessment of the bridge tender (a practice Union Pacific does approximately once a month). The bridge tender told investigators that he informed the supervisors, both of whom were accompanying him during the visual inspection, of the request for a drawspan opening that he had received from the *Marguerite L. Terral*.

At 1416, after maneuvering the *Marguerite L. Terral* around an area of the river known as the "39-mile bend," the pilot acquired a line of sight on both the Krotz Springs Highway Bridge and the railroad bridge downriver. The *Marguerite L. Terral* was moving at a speed of 10 knots with a course of 173 degrees and a heading of 160 degrees. As he began slowing the vessel, the pilot directed the two deckhands on watch to proceed to the head of the tow to assist with the approach to both bridges. The pilot noticed that the railroad bridge, however, was still closed. He attempted to contact the bridge tender twice using the vessel's VHF radio, but both radio callouts went unanswered.

The pilot then positioned the head of the tow above the highway bridge toward the left descending bank as an effort to offset the current's lateral force, which was setting the tow toward the right descending bank.[6] At 1417, the pilot attempted to contact the bridge using the vessel's cell phone, but while the phone was ringing he received a response via VHF radio from the bridge tender hailing, "Southbound boat at the 39." The bridge tender, who had still been performing the pre-opening examination of the bridge, had contacted the vessel after visually observing the *Marguerite L. Terral* and its flotilla round the bend.

During the radio communication, the bridge tender told the pilot that he would need "five minutes" to open the drawspan for the vessel to transit. The pilot did not express any concerns to the bridge tender regarding the time needed to open the bridge; as he stated to investigators, he felt he had enough "point" (the position of the head of the flotilla in relation to the current) to counter the impact of the current on the bow of the tow.

At 1418, the *Marguerite L. Terral* was at mm 40.1 traveling at a speed of 8 knots with a course of 162 degrees and a heading of 150 degrees. The pilot notified the two deckhands at the head of the tow of the time needed to open the railroad drawspan and then directed them to watch the flotilla's port side in relation to the highway bridge.

At 1425, the pilot successfully cleared the Krotz Springs Highway Bridge as the vessel was traveling at a speed of 6 knots with a course of 158 degrees and a heading of 158 degrees. The pilot reportedly scanned the Krotz Springs Railroad Bridge to see if there was a vertical clearance

[6] The banks of the Mississippi River and its tributaries are named *left* and *right* when traveling downstream. Commerical river traffic often refers to the left bank as the *left descending bank* and the right bank as the *right descending bank*.

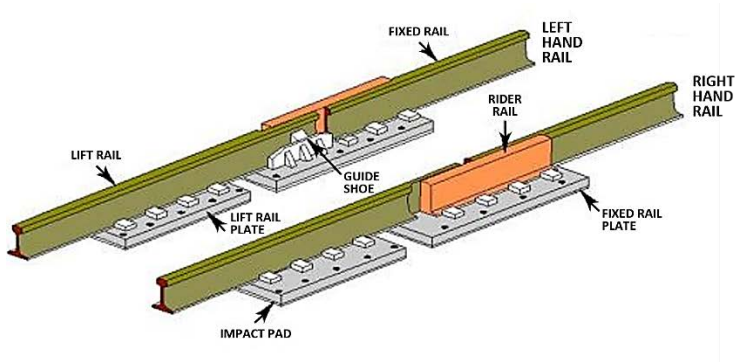
gauge on the structure so that he could validate the vertical clearance of 17 feet stated by the bridge tender, but the bridge was not outfitted with one.[7]

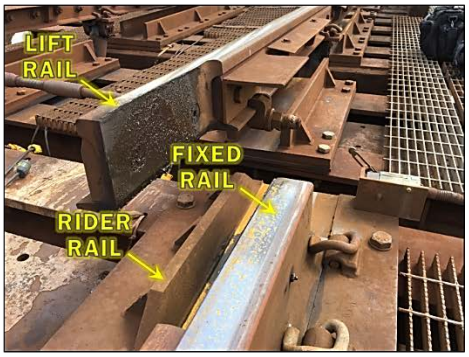
When the drawspan was opened approximately three quarters of the way and rotating, the pilot put both main diesel engine throttles to full ahead in an attempt to pass through the opening and "outrun" the westerly set of the river current. This action, which resulted in some increase in the speed and greater control over the vessel, allowed him to clear the bow of the lead barge on the starboard side, *RM 3367*, between the pivot pedestal and pier no. 3 (the easternmost pier supporting the fixed portion of the bridge extending from the right descending bank).[8] The pilot also lowered the retractable wheelhouse an undetermined distance from its fully raised position, but not down to its lowest height, in an effort to protect its hydraulic pistons from potential damage. Nonetheless, at 1428, the aft starboard side of the *RM 3367* and the bow of the barge next in the tow string, *RM 3304B*, allided with pier no. 3. AIS-recorded speeds indicated a steady increase from 6 to 8 knots, with a course of 150 degrees and a heading of 141 degrees, once the tow had cleared the highway bridge upriver.

Damage

The impact caused failure of the connecting wires for both the *RM 3367* and the lead barge on the port side, *FR 1640*; subsequently, both barges began to drift downriver. Although some of the other wires connecting the remaining four barges either loosened or failed, the barges remained linked together and connected to the *Marguerite L. Terral*. Crewmembers on three nearby towing vessels—*Tony Lippman*, *Ryan*, and *Charlie C*—overheard VHF-radio communications following the allision and responded by assisting with regaining control of the two drifting barges.

The force of the impact also caused pier no. 3, which supported the western portion of the fixed-bridge structure, to shift horizontally. Multiple large-diameter positioning pins and bolts attaching the northern and southern truss-mounting plates to the caisson were sheered. The fixed portion of the bridge truss on the western side shifted horizontally as well, causing a misalignment of the lift rail with the fixed and rider rails. The total damage resulting from the allision exceeded $4 million.





At left, an illustration of a section of a lift rail properly aligned with the fixed and rider rails. Conversely, at right, the misalignment of the lift rail on the Krotz Springs Railroad Bridge following the allision. (Graphic courtesy of CMI-Promex)

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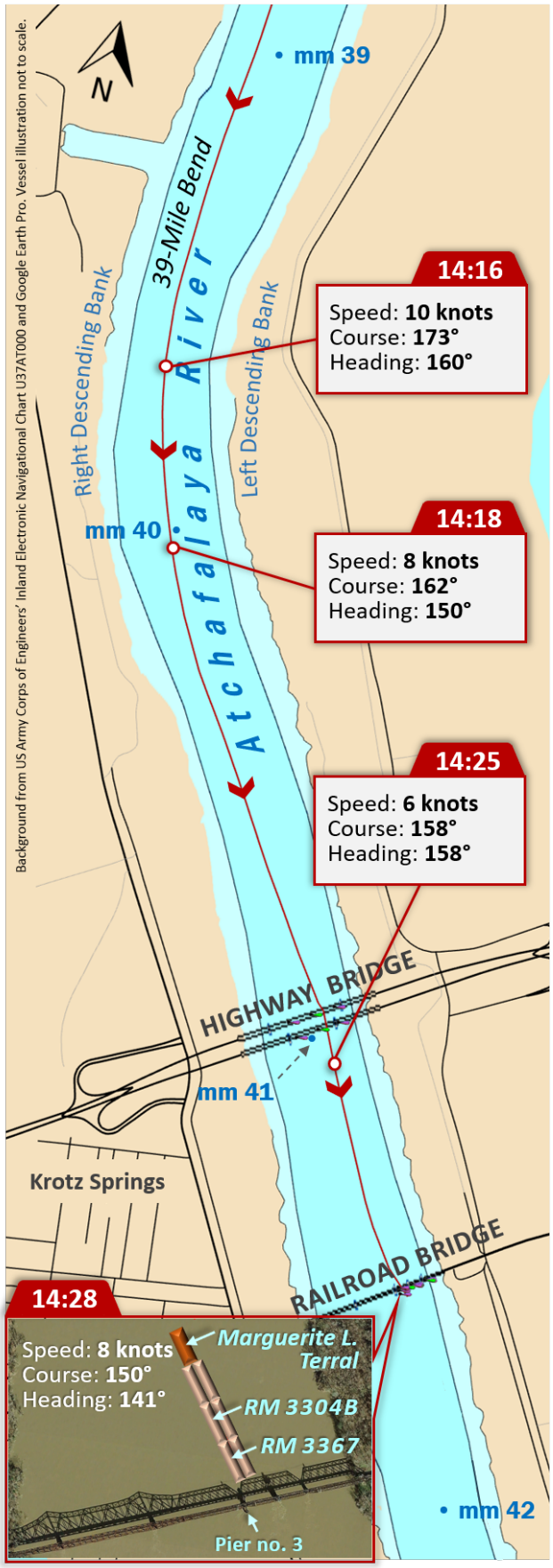
[7] According to Title 33 *Code of Federal Regulations* (CFR), Part 118.160, a vertical clearance gauge was required on the Krotz Springs Railroad Bridge to ensure the safe navigation of vessels. The clearance gauge, a measurement indicating the vertical distance between the lowest steel structure of the drawspan and the level of the water, should have been installed on the end of the right channel pier facing approaching vessels.

[8] For identification purposes only, four piers of the railroad bridge have been numbered in this report from west to east.



Awakened by a change in the engine's rpm, the captain departed his stateroom, partially dressed, and proceeded to the starboard side of the main deck. Based on his observation, he determined that the towing vessel and flotilla were setting down on the bridge pier. However, before he could reach the navigation bridge, the lead barge had contacted the pier. After he finished dressing, the captain proceeded to the navigation bridge, where he relieved the pilot and then directed him to notify various authorities. Meanwhile, the *Marguerite L. Terral* tow had already cleared the railroad bridge.

Personnel and Equipment

The pilot, who held a Coast Guard merchant mariner credential, was authorized to serve as master of towing vessels upon the Great Lakes, inland waters, and Western Rivers. Serving under that credential required him to wear corrective lenses and keep a spare on board; on the day of the accident, he was wearing his glasses. He also stated that he was not taking any prescriptions or over-the-counter medications of any type.

The pilot began his career in the maritime industry in 1991 and received his credential as master in 2001. He said that he had worked on the Atchafalaya River for many years and was "very familiar" with the Krotz Springs area. In the year preceding the accident, he transited through the Krotz Springs Railroad Bridge approximately 7 times, which included at least one southbound transit with loaded barges during an earlier high-water event. He began serving as a trip pilot in 2012.

He stated that during previous southbound transits he had requested that the drawspan on the Krotz Springs Railroad Bridge be opened at a similar time in the transit, that is, when he was 5 miles or more upriver. This advance request allowed him the opportunity to hold the towing vessel and flotilla in position or slow the downriver transit speed before reaching the 39-mile

bend. He stated that he never considered requesting an assist tug, because, in his assessment, the existing river conditions did not warrant such a request.

The pilot told investigators that just after he cleared the highway bridge he was starting to have concerns regarding the safe transit through the railroad bridge and therefore began to assess his options. One possibility included lowering the retractable wheelhouse of the *Marguerite L. Terral* and attempting the transit under the drawspan. However, as he realized, the bridge did not have a vertical clearance gauge by which he could validate the bridge tender's air draft measurement. With the retractable wheelhouse in the highest position, the air draft on the *Marguerite L. Terral* was 38 feet.

He also questioned the possibility of putting the transmission into reverse, or astern propulsion, which he felt could have resulted in a capsizing moment called "tripping," by placing the vessel perpendicular to the current and thereby placing the upper superstructure in contact with the bridge. He said that, given that the river current was setting the southbound towing vessel and flotilla toward the right descending bank as he approached the bridge, he attempted to point the head of the tow toward the pivot pedestal of the span to counter the set of the current.

According to the pilot, there was insufficient area below the 39-mile bend to perform a maneuver known as "topping around," in which the flotilla would be rotated 180 degrees to place the bow into the current. Moreover, due to the bottom type, bank structure, and obstructions in that section of the waterway, the pilot felt that there was no area where the flotilla could be intentionally grounded in a safe and controlled manner to await the opening of the drawspan.

The vessel was equipped with flanking rudders. Installed forward of the propellers, these rudders control the action of the lateral forces on the tow when astern propulsion is applied. Flanking rudders are installed on towing vessels that push large flotillas to provide the additional maneuverability needed while navigating river bends, transiting through locking systems, and maneuvering in barge fleeting areas. The navigation bridge equipment and all vital systems on the *Marguerite L. Terral*—such as the steering, propulsion, hydraulic, and electrical systems—were functioning as designed.

The bridge tender, who had been employed by Union Pacific for more than 7 years, had been serving on the Krotz Springs Railroad Bridge since November 2010. Of the three bridge tenders working 8-hour shifts, he was considered the senior tender and therefore was assigned the day shift from 0700 to 1500.

According to the bridge tender, the motor control system that powered the drawspan could be set to open from the closed to the fully opened position in as few as 3 minutes. He stated that he and the other bridge tenders normally attempted to open it at a slower swing rate of approximately 5 minutes, because the slower rotation time reduced the risk of the drawspan swinging beyond 90 degrees and locking up so that it could not be returned to a closed position without mechanical intervention. There were no written procedures that addressed the opening or closing of the drawspan.

Union Pacific did not perform any post-casualty chemical testing of the bridge tender; therefore, the use of alcohol or dangerous drugs by this individual cannot be excluded. Post-casualty chemical testing was performed on the pilot of the *Marguerite L. Terral*: the results were negative.

Analysis

The law and operational requirements currently governing drawbridges over navigable waters of the United States, such as the Krotz Springs Railroad Bridge, state that all drawbridges must open promptly and fully for the passage of vessels when an opening request is received. In this case, the pilot of the *Marguerite L. Terral* provided the first request at 1340 clearly stating to the bridge tender that he needed the railroad drawspan opened at his estimated time of arrival at 1420.

The bridge tender acknowledged this initial request and subsequently obtained permission from Union Pacific's engineering department to block all rail traffic between 1347 and 1445. Yet, instead of completing the rail and bridge assessment and then returning to the bridge tender's station to open the drawspan, he became distracted by the unannounced visit from the company's two supervisors and thereby lost awareness of the time that had passed. Such inspections should never interfere with the safety of bridge operations. The drawspan should have been opened and available for the *Marguerite L. Terral* to safely transit at the time requested.

The pilot did not take advantage of the risk mitigation policy in the company's safety management system (SMS), which stated that assist tugs would be made available for bridge transits, when requested, to ensure safe passage during periods of strong currents caused by higher-than-normal river levels and other unfavorable conditions. Nevertheless, the pilot's decision to not request such assistance was reasonable, considering that the river conditions at the time of the accident, though far from optimal, were not significantly adverse.

The trackline of the *Marguerite L. Terral* between the highway bridge and the railroad bridge obtained from the vessel's electronic chart system (ECS), a transit of about half a mile, confirmed that the force of the current had laterally set the tow toward the right descending bank. Although the pilot attempted to maintain a suitable heading as he approached the railroad bridge, he was unable to overcome the current. The pilot's reduction of forward speed to allow time for the bridge tender to fully open the drawspan reduced the water flow across the vessel's rudders and thus diminished control of the towing vessel and flotilla.

When the pilot first became aware that the railroad drawspan was still in the closed position at the time he obtained a line of sight on the Krotz Springs Railroad Bridge at 1416, the *Marguerite L. Terral* tow was around mm 39.8 and above the Krotz Springs Highway Bridge. At this point, the pilot had at least 1.5 miles of distance to take all actions necessary to prevent contact with the structure. These actions included attempting to stop the forward movement entirely or, if this strategy was not feasible as he indicated, attempting to further slow the downriver movement by applying astern propulsion and using the flanking rudder system to maintain control of the unit.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the allision of the *Marguerite L. Terral* tow with the Krotz Springs Railroad Bridge was the bridge tender's delay in providing a timely opening of the drawspan, as requested, due to distraction by his other duties. Contributing to the accident was the pilot's failure to properly compensate for the current during the approach to the bridge.

Vessel Particulars

Vessels	*Marguerite L. Terral*	*RM 3367*	*RM 3304B*
Owner / operator	Terral River Service, Inc.	Robert B Miller & Associates, Inc.	Robert B Miller & Associates, Inc.
Port of registry	Lake Providence, Louisiana	St. Louis, Missouri	St. Louis, Missouri
Flag	United States	United States	United States
Type	Towing vessel	Freight barge	Freight barge
Year built	2002	2015	2013
Official number (US)	1129737	1259506	1250789
Construction	Steel	Steel	Steel
Length	98.9 ft (30.1 m)	200 ft (61 m)	200 ft (61 m)
Draft	10.2 ft (3.1 m)	35 ft (10.7 m)	35 ft (10.7 m)
Beam/width	32 ft (9.7 m)	13 ft (3.9 m)	13 ft (3.9 m)
Gross tonnage	326	764	764
Engine power; manufacturer	2 X 1500 hp (1,118 kW) Caterpillar 3512	N/A	N/A
Persons on board	6	N/A	N/A

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

For more details about this accident, visit www.ntsb.gov and search for NTSB accident ID DCA17FM017.

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