



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

February 21, 2024

MIR-24-04

Collision between Tugboat *Mark E Kuebler* and Tanker *Nisalah*

On January 22, 2023, about 1530 local time, the tugboat *Mark E Kuebler* and the tanker *Nisalah* collided while the tanker was transiting inbound in the Corpus Christi Ship Channel near Ingleside, Texas.¹ The tugboat's hull was breached and the tanker's propeller was damaged in the collision. The captain of the *Mark E Kuebler* grounded the tugboat to prevent it from sinking, and, while aground, a small sheen of hydraulic oil was observed near the tugboat (see figure 1). The oil was recovered with absorbent pads. No injuries were reported. Damage to the *Mark E Kuebler* was estimated at \$3 million; damage to the *Nisalah* was estimated at \$3.9 million.



Figure 1. *Mark E Kuebler* aground following the collision. (Source: G & H Towing)

¹ (a) In this report, all times are central standard time, and all miles are nautical miles (1.15 statute miles). (b) Visit [ntsb.gov](https://www.ntsb.gov) to find additional information in the [public docket](#) for this NTSB investigation (case no. DCA23FM016). Use the [CAROL Query](#) to search investigations.

Casualty type	Collision
Location	Corpus Christi Ship Channel between Port Aransas and Ingleside, Texas 27°49.57' N, 97°9.27' W (see figure 2)
Date	January 22, 2023
Time	1530 central standard time (coordinated universal time -6 hrs)
Persons on board	5 (<i>Mark E Kuebler</i>), 27 (<i>Nisalah</i>)
Injuries	None
Property damage	\$3 million (<i>Mark E Kuebler</i>) and \$3.9 million (<i>Nisalah</i>) est.
Environmental damage	Oil sheen 3 × 5 ft (hydraulic)
Weather	Visibility 5.4 mi, clear, winds northwest 10 kts, air temperature 65°F, water temperature 49°F
Waterway information	Channel, width 530 ft, depth 55 ft, current < 1 kt (flood)

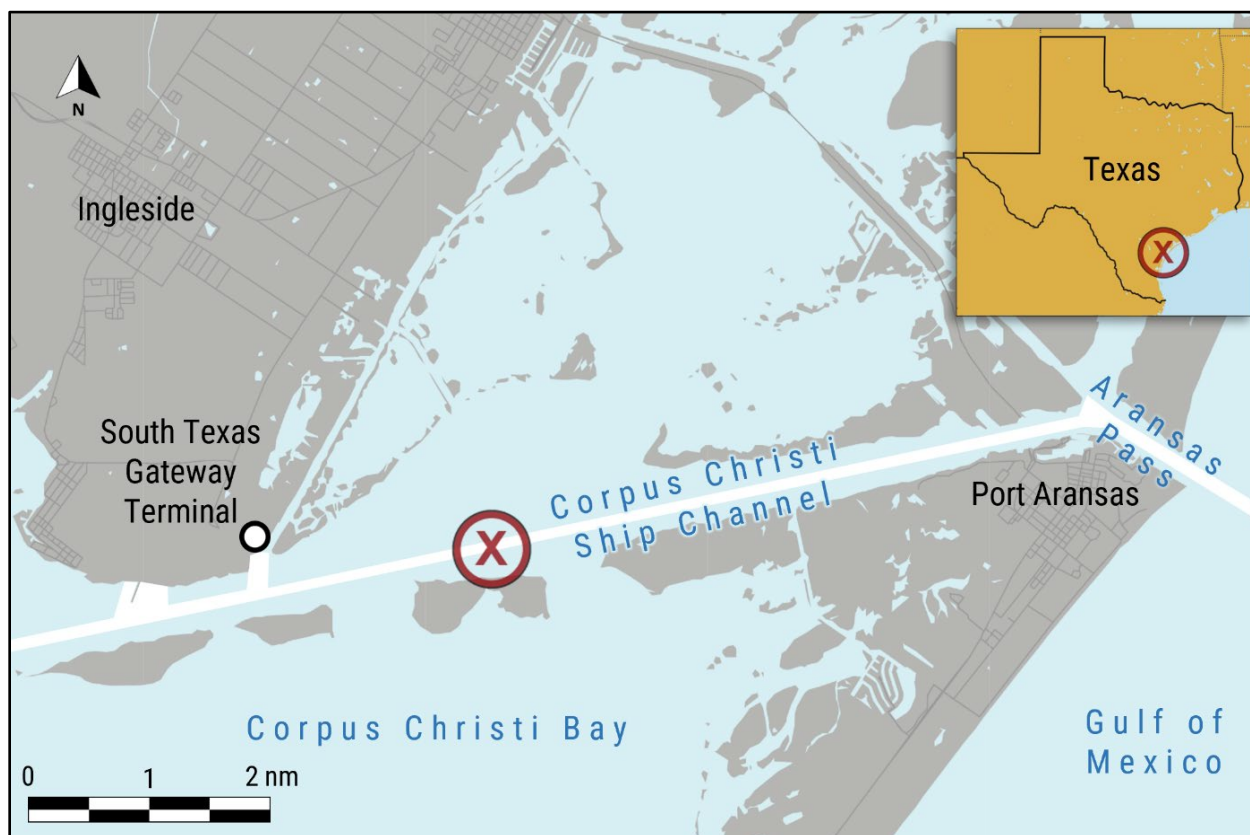


Figure 2. Area where the *Mark E Kuebler* and *Nisalah* collided, as indicated by a red X. (Background source: Google Maps)

1 Factual Information

1.1 Background

The *Mark E Kuebler*, owned by Bay-Houston Towing Co. and operated by G & H Towing Company, was a 98.5-foot-long, US-flagged, inspected towing vessel built in 2019 by Gulf Island Shipyards in Jennings, Louisiana. Two 3,386-hp diesel engines provided propulsion, each driving a Schottel azimuthing thruster, commonly referred to as an azimuthing stern drive or “Z-drive.” Each Z-drive was able to rotate 360° via integral hydraulic motors. This rotation, used in conjunction with the throttle inputs from the diesel engine driving the unit, allowed for variable thrust in all directions, eliminating the need for a rudder. The tugboat was capable of 13 knots at full speed and had a draft of 20 feet.

The tanker *Nisalah*, a very large crude carrier (VLCC), was owned by the National Shipping Company of Saudi Arabia and operated by Mideast Ship Management LTD (see figure 3). The 1,092.5-foot-long, Saudi Arabia-flagged tanker was built in 2010 by Daewoo Shipbuilding and Marine Engineering in Geoje, South Korea. A single 39,346-hp, slow-speed diesel engine driving a four-bladed, 32.5-foot-diameter, fixed-pitch, right-hand propeller provided main propulsion. The *Nisalah*'s cargo tanks were empty, and the vessel was in ballast condition at the time of the collision, with forward and aft drafts of 33.8 and 35.4 feet, respectively.²



Figure 3. Tanker *Nisalah* pre-casualty. (Source: Patrick Deenik)

1.2 Event Sequence

On January 22, about 1430, three Aransas-Corpus Christi pilots boarded the *Nisalah*, which had 24 crewmembers aboard, in the approaches to the Aransas Pass,

² A vessel that is *in ballast* is a vessel with empty cargo tanks or holds that has taken on ballast water.

the entrance to Corpus Christi Bay. The pilots and the master conducted a master-pilot exchange, and then pilot 1 took the conn for the inbound transit through the Aransas Pass and Corpus Christi Ship Channel to the South Texas Gateway Terminal in Ingleside, Texas, where the ship was scheduled to load a cargo of crude oil. In accordance with the pilots' normal operations, pilot 2 took the *Nisalah* conn from pilot 1 for a portion of the transit, and, about 1525, pilot 3 took the conn for the final part of the transit.

Five tugboats had been dispatched to provide harbor-assist operations for the *Nisalah's* arrival, and the pilots assigned each of the tugboats to positions on the tanker as they met the inbound ship. The *Mark E Kuebler*, which had five crewmembers aboard, was assigned to the starboard quarter position when it met the *Nisalah* at 1528 near buoys 19 and 20 in the Corpus Christi Ship Channel. The *Ted C Litton* was assigned to the starboard bow; the *Mercury* was assigned to center lead forward (bow); and the *Apollo* was assigned to center lead aft (stern). The *Connolly M* was tasked to stand by and assist where needed.

When the *Mark E Kuebler* met the tanker, the *Apollo* was made up to the stern. The other tugboats were transiting on either side of the *Nisalah* and had not yet made up to the tanker. For a few minutes, the *Mark E Kuebler* also transited near the *Nisalah*, "pacing" the tanker along its starboard quarter. The mate was operating the tugboat, and the captain was in his stateroom. The *Nisalah's* speed over ground was 9.6 knots.

The *Mark E Kuebler's* hawser and winch were located on the bow of the tugboat. The mate stated that the chock on the *Nisalah*—through which the tugboat's hawser would be made up—was located where the tanker's hull curved inward toward the stern and flared outward from the waterline to the deck edge. Therefore, the mate decided that he would turn the tugboat around and transit in the astern direction so that, when made up, the hawser would tend forward from the tanker and the tugboat could lie alongside the tanker where the side of the ship's hull was vertical.

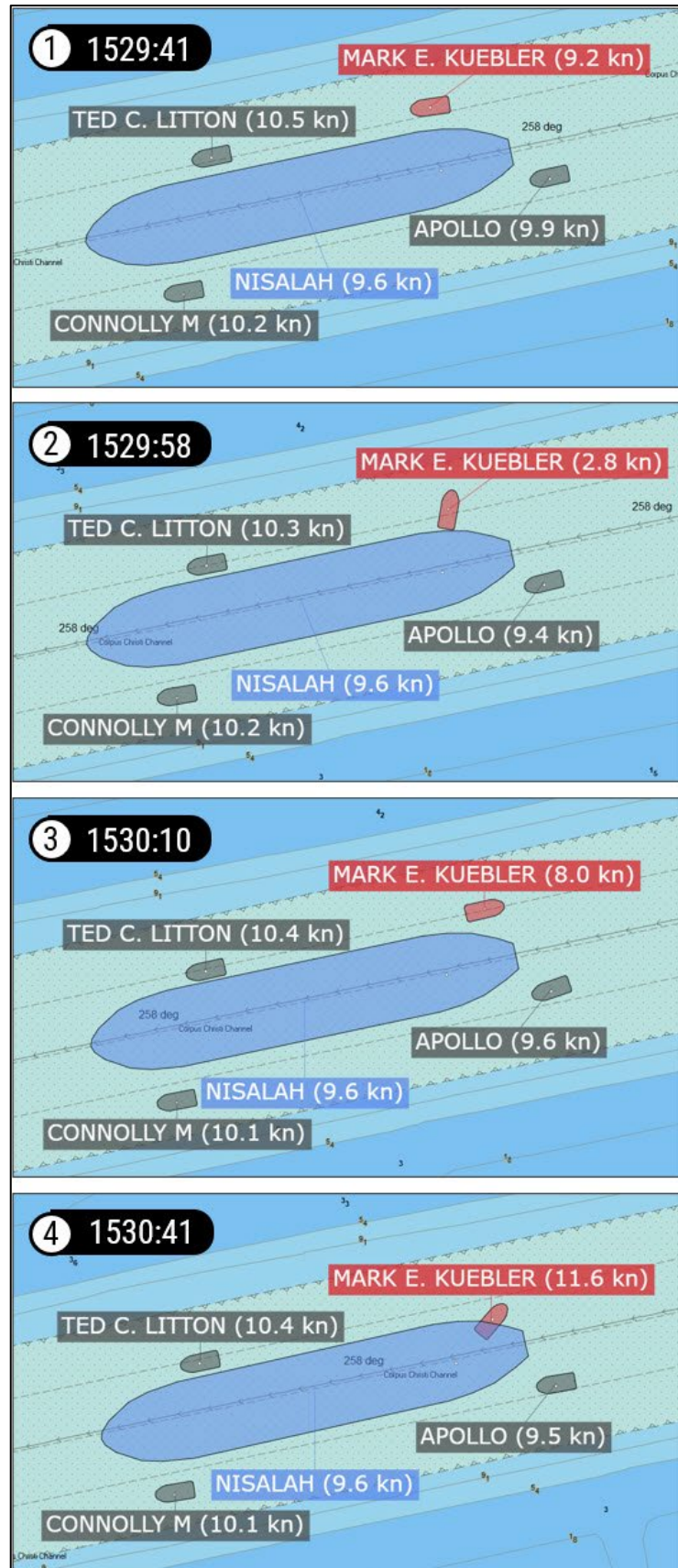
To prepare to move into position, the *Mark E Kuebler* mate used the Z-drives to spin the tugboat clockwise 180° (see figure 4). The mate stated that, while completing the spin maneuver, the tugboat fell back near the stern of the *Nisalah*, so he increased power on the tugboat's engines to regain position on the tanker's starboard quarter.

According to the mate, as the *Mark E Kuebler* transited in the astern direction, the tugboat had about 50-60 feet of separation from the tanker. However, as the tugboat moved forward on the tanker, the stern of his vessel began to be drawn in toward the *Nisalah*. The mate increased engine power and attempted to steer the tugboat's stern away from the *Nisalah*, but the tugboat continued to be pulled toward the tanker. As the *Mark E Kuebler* closed on the *Nisalah*, its speed was 11.6 knots.

About 1530, the *Nisalah* pilots and bridge team heard a noise and felt the ship shudder.

Figure 4. *Mark E Kuebler/Nisalah* collision sequence from automatic identification system data.

1) *Mark E Kuebler* paces *Nisalah*.
 2) Tugboat conducts 180° spin maneuver. 3) *Mark E Kuebler* begins to regain position, transiting in astern direction. 4) Tugboat is pulled in toward tanker, and vessels collide. (Source: Made Smart plotter)



At the same time, the tanker's engine speed, which had been 50 rpm, dropped to 33 rpm (without any propulsion order from the bridge or engine control room) and then accelerated again, returning to the original rpm after a brief settling-out period.

The mate stated that the mast and stacks of the *Mark E Kuebler* struck the hull of the *Nisalah*'s stern first, then the stern of the tugboat hit the tanker. Unknown to the tugboat crew at the time, the *Nisalah*'s propeller had struck the *Mark E Kuebler*, slicing through the tugboat's hull. After the collision, the tugboat fell back astern of the tanker. Shortly thereafter, the *Mark E Kuebler*'s captain came to the wheelhouse and took control of the vessel.

The *Nisalah* master and pilot 3 went to the starboard bridging and looked down at the starboard quarter. They observed the mast on the *Mark E Kuebler* had been bent over, so the pilot called the tugboat to confirm that the vessel was okay. The *Mark E Kuebler* captain responded that the tugboat's mast had hit the tanker but was otherwise fine, and the tugboat would continue the job. However, shortly after, the tugboat captain radioed the *Nisalah* pilot again to state that the tugboat was getting a bilge high-water alarm. In response, the pilot ordered the *Connolly M* to switch out with the *Mark E Kuebler* at the starboard quarter position (no lines were passed between the tugboat and tanker at any time before or during the casualty). The *Mark E Kuebler* crew inspected the tugboat and discovered water flooding into the Z-drive machinery room.

Water continued to rise in the *Mark E Kuebler*'s Z-drive machinery room. Because of the danger of sinking due to the flooding, the captain of the *Mark E Kuebler* intentionally grounded the tugboat in the bank outside of the Corpus Christi Ship Channel. The *Nisalah* pilots and crew saw no indications of damage to their vessel, and the tanker proceeded to the terminal and moored without further incident.

1.3 Additional Information

1.3.1 Damage

The *Nisalah* propeller strike caused multiple gashes in the *Mark E Kuebler*'s hull at the stern, along with hull warping and damage to the vessel's fendering system (see figure 5). The tugboat's aft peak tank and Z-drive machinery room were breached, flooding both spaces to the waterline and inundating equipment. Salvage expenses for the tugboat were estimated at \$1 million, and repair costs were estimated at \$3 million.



Figure 5. Damage to *Mark E Kuebler* stern hull and fendering system from the *Nisalah* propeller.

All four blades on the *Nisalah*'s propeller sustained damage when it struck the *Mark E Kuebler*'s hull, including loss of metal along the tips and leading edges as well as gouges and ripples on the blade faces. Repair costs to the *Nisalah* were estimated at \$3.9 million.

1.3.2 *Mark E Kuebler* Mate Experience, Training, and Readiness

The *Mark E Kuebler* mate held valid US Coast Guard-issued merchant marine credentials as master of self-propelled vessels of less than 500 gross register tons upon inland waters and master of self-propelled vessels of less than 100 gross register tons upon near coastal waters. His credential was endorsed for assistance towing. The mate stated that he had been employed as a licensed master since 1999, working on sailboats, yachts, crew boats, and a ferry before being hired by G & H Towing in January 2022.

The mate's work with G & H Towing was his first experience on tugboats and with Z-drives. Since his hiring, the mate had completed the company's "Z-drive Assessment Record" (ZDAR) for the *Mark E Kuebler*'s class of tugboat. The ZDAR required operators to demonstrate knowledge of tugboat and emergency procedures and to perform various harbor-assist and other operations under the supervision of a qualified captain. The 281 line items in the ZDAR included tasks to "demonstrate ability to advance bow first and rotate tug 180 degrees to advance stern first while maintain[ing] course" and to "demonstrate ability to land stern first

alongside ship quarter and make fast hawser line" a minimum of five times. The mate had been assigned to the *Mark E Kuebler* since August 2022.

Following the casualty, the mate completed a work-rest report indicating that he had gotten 11 hours or more of uninterrupted sleep in each of the two nights before the casualty. The mate submitted to postcasualty tests for alcohol and other drugs; the results were negative for all tested-for substances. There was no evidence of cell phone use or other distractions in the time leading up to the collision.

1.3.3 Postcasualty Actions

After the casualty, G & H Towing instituted a policy restricting stern-first landings of tugboats on assisted vessels to speeds of 7 knots or less. According to a company representative, attempting the maneuver at speeds over 7 knots would be ineffective because all of the tugboat's engine thrust would be used to maintain the tugboat's position alongside the assisted vessel. The company representative added that the margin for error "significantly increases" at speeds greater than 7 knots, and stated, "We have recently seen incidents across industry, and the common factor is operators trying to perform advanced maneuvers at high speeds which gives a higher risk factor with no reward."

2 Analysis

The *Mark E Kuebler* was one of five tugboats assigned to assist the inbound tanker *Nisalah* in transiting through the Corpus Christi Ship Channel to a terminal in Ingleside. After meeting the *Nisalah* in the Corpus Christi Ship Channel, the *Mark E Kuebler* transited off the tanker's starboard quarter for a brief period. The mate on the tugboat then executed a clockwise 180° spin maneuver in preparation for making up to the larger vessel. During the maneuver, the tugboat fell back toward the stern of the tanker, and, in response, the mate on the *Mark E Kuebler* increased the speed of the tugboat to regain position off the tanker's starboard quarter. However, as the *Mark E Kuebler*—now transiting in the astern direction—moved forward about 50–60 feet offset from the *Nisalah*, the tugboat's stern was drawn in toward the tanker. The mate attempted to counteract this motion by increasing engine power and turning the Z-drives to steer the tugboat's stern away from the tanker; however, the tugboat's thrust was not able to overcome the hydrodynamic forces pulling the vessel into the tanker. Consequently, the *Mark E Kuebler* collided with the *Nisalah*.

As a ship moves through a waterway, the flow of water around the hull produces areas of high and low pressure that can influence the movement of another vessel, such as a tugboat, operating in close proximity (see figure 6). The textbook *ASD Tugs: Thrust and Azimuth* explains:

In simple terms, a ship moving bow first displaces or pushes water out of its way, in essence making room for the body of the hull to pass. Once the water flow has rounded the bow, it accelerates and seeks to fill in the trough left by the passing ship. This factor, combined with the low resistance of the ship's side, creates a low-pressure zone. The result is suction toward the hull. As the water nears the ship's stern, it comes under the influence of the propeller. The water flow on the intake side of

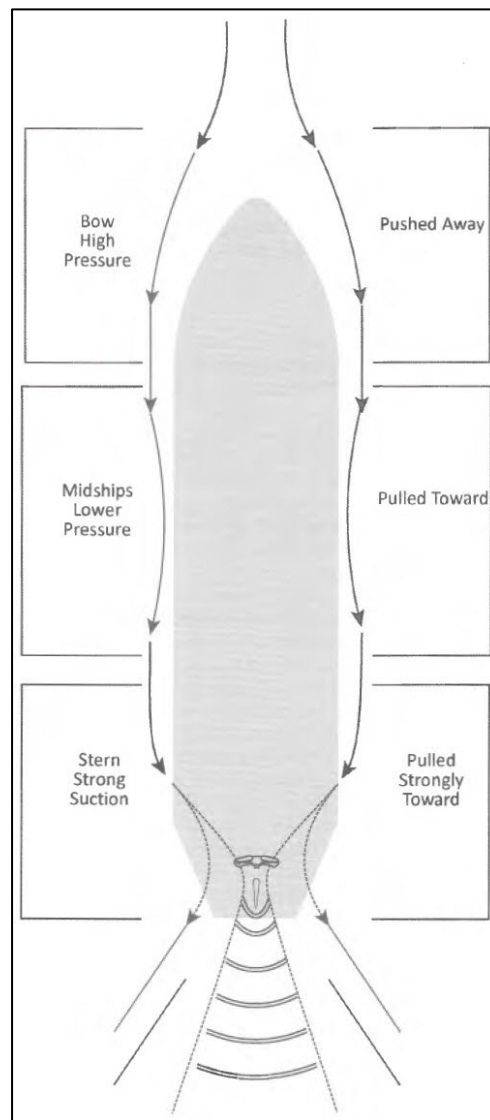


Figure 6. Pressure zones around a ship moving through a channel. (Source: J. Slesinger)

the propeller accelerates and accentuates the drop in pressure, increasing the suction toward the ship's hull.³

As the *Mark E Kuebler* moved to get into position alongside the *Nisalah* after executing the 180° spin, the tugboat (moving in the astern direction) approached the area of low pressure on the *Nisalah*'s starboard quarter. Because the *Nisalah* was in ballast, the inward curve of the ship's hull toward the stern at the waterline was more pronounced than it would have been if the ship were loaded. Thus, the pressure near the VLCC's starboard quarter was further reduced as compared to the vessel at its loaded draft. In addition, the drop in pressure was further accentuated near the propeller. The hydrodynamic suction produced by the low pressure in this area caused the *Mark E Kuebler*'s stern to be drawn into the tanker.

As the *Mark E Kuebler* attempted to regain position on the *Nisalah*, the VLCC's speed was 9.6 knots. Hydrodynamic forces created by a ship increase exponentially with speed, and therefore an increase of even a few knots has a significant effect on the forces acting on a tugboat operating nearby.⁴ Moreover, as the *Mark E Kuebler* attempted to move into position, the tugboat's speed increased to 11.6 knots—just 1.4 knots less than its maximum-rated ahead speed. Higher speed reduces the amount of reserve propulsion power available to the operator. Because most of the tugboat engines' power was being used to regain position on the *Nisalah*, the *Mark E Kuebler* had insufficient power to counteract the hydrodynamic forces created by the tanker. After the collision, the tugboat's operating company instituted a policy limiting stern-first landings of tugboats on assisted vessels to speeds of 7 knots or less.

³ Jeffrey Slesinger, *ASD Tugs: Thrust and Azimuth*, 2nd ed (Atglen: Schiffer Publishing Ltd, 2019), 172-173.

⁴ UK Chamber of Shipping, *Pilot's Pocket Guide and Checklist: Working Safely with Harbour Tugs - Reducing the Risks in Port Towage*, 2nd ed. (London: UK Chamber of Shipping, 2021).

3 Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the collision between the tugboat *Mark E Kuebler* and the tanker *Nisalah* was the mate maneuvering the tugboat near the starboard quarter of the tanker, which resulted in the tugboat being drawn in toward the tanker by hydrodynamic forces that the tugboat had insufficient reserve power to counteract due to the transit speed of the vessels.

3.2 Lessons Learned

Hydrodynamic Forces between Vessels in a Channel

As a large ship moves through a channel, a low-pressure suction is particularly strong on the vessel's quarters near the inlet side of the propeller, and hydrodynamic forces increase exponentially with the vessel's speed. Therefore, a small vessel operating near a larger vessel must maintain a safe operating distance or have sufficient reserve power to counteract the hydrodynamic forces to avoid being pulled into the other vessel and risking collision. If a small vessel must operate near a larger vessel—such as a tugboat conducting harbor-assist operations—the operator of the smaller vessel should be aware of the hazards caused by hydrodynamic forces and, if necessary, maintain a safe distance until the larger vessel slows and the hydrodynamic forces are reduced.

Speed During Harbor-Assist Maneuvers

Owners and operators of Z-drive tugboats that perform harbor-assist operations should set speed limits for advanced maneuvers such as stern-first approaches. These limits may vary for different classes of tugboats based on design. Tugboat operators should communicate these limits to ship masters or pilots in command of the vessels that they are assisting before engaging in these maneuvers.

Vessel	<i>Mark E Kuebler</i>	<i>Nisalah</i>
Type	Towing/Barge (Tugboat)	Cargo, Liquid Bulk (Tanker)
Owner/Operator	Bay Houston Towing Co./ G & H Towing Company (Commercial)	National Shipping Company of Saudi Arabia/Mideast Ship Management LTD (Commercial)
Flag	United States	Saudi Arabia
Port of registry	Houston, Texas	Dammam, Saudi Arabia
Year built	2018	2010
Official number (US)	1289845	N/A
IMO number	9866110	9484730
Classification society	American Bureau of Shipping	American Bureau of Shipping
Length (overall)	98.5 ft (30.0 m)	1,092.5 ft (333.0 m)
Breadth (max.)	42.7 ft (13.0 m)	196.9 ft (60.0 m)
Draft (casualty)	20.0 ft (6.1 m)	34.6 ft (10.6 m)
Tonnage	411 GT ITC	162,863 GT ITC
Engine power; manufacturer	2 × 3,386 hp (2,525 kW); Caterpillar 3516E-HD Tier 4 diesel engines	1 × 39,346 hp (29,340 kW); MAN B&W 6S90MC-C diesel engine

NTSB investigators worked closely with our counterparts from **Coast Guard Sector Corpus Christi** throughout this investigation.

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For more detailed background information on this report, visit the [NTSB Case Analysis and Reporting Online \(CAROL\) website](#) and search for NTSB accident ID DCA23FM016. 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—

National Transportation Safety Board
Records Management Division, CIO-40
490 L’Enfant Plaza, SW
Washington, DC 20594
(800) 877-6799 or (202) 314-6551