Issued September 7, 2023 MIR-23-19

Grounding of Tugboat *CC Portland*

On August 7, 2022, at 1625 local time, the tugboat *CC Portland* grounded outside the Corpus Christi Ship Channel, near Ingleside, Texas, while repositioning to secure a tow line on the bow of the inbound liquefied natural gas carrier *LNG Fukurokuju*.[1] No injuries were reported by the five crewmembers aboard the *CC Portland* or the 27 crewmembers aboard the *LNG Fukurokuju*. An estimated 4–5 gallons of diesel fuel were released from a hull breach on the tugboat. Damage to the *CC Portland* was estimated at $1.3 million.

Figure 1. *CC Portland* underway precasualty. (Source: VesselFinder.com)

[1] (a) In this report, all times are central daylight time, and all miles are statute miles. (b) Visit ntsb.gov to find additional information in the public docket for this NTSB investigation (case no. DCA22FM035). Use the CAROL Query to search investigations.

Casualty type	Grounding/Stranding
Location	Corpus Christi Ship Channel, Ingleside, Texas 27°49.28′ N, 097°10.22′ W
Date	August 7, 2022
Time	1625 central daylight time (coordinated universal time –5 hrs)
Persons on board	5 (*CC Portland*), 27 (*LNG Fukurokuju*)
Injuries	None
Property damage	$1.3 million est.
Environmental damage	Est. 4–5 gallons diesel oil reported
Weather	Visibility 10 mi, scattered clouds, winds southeast 20-25 kts, 0.75-kt ebb current, air temperature 92°F, water temperature 86°F
Waterway information	Channel, width 500 ft, depth 47 ft

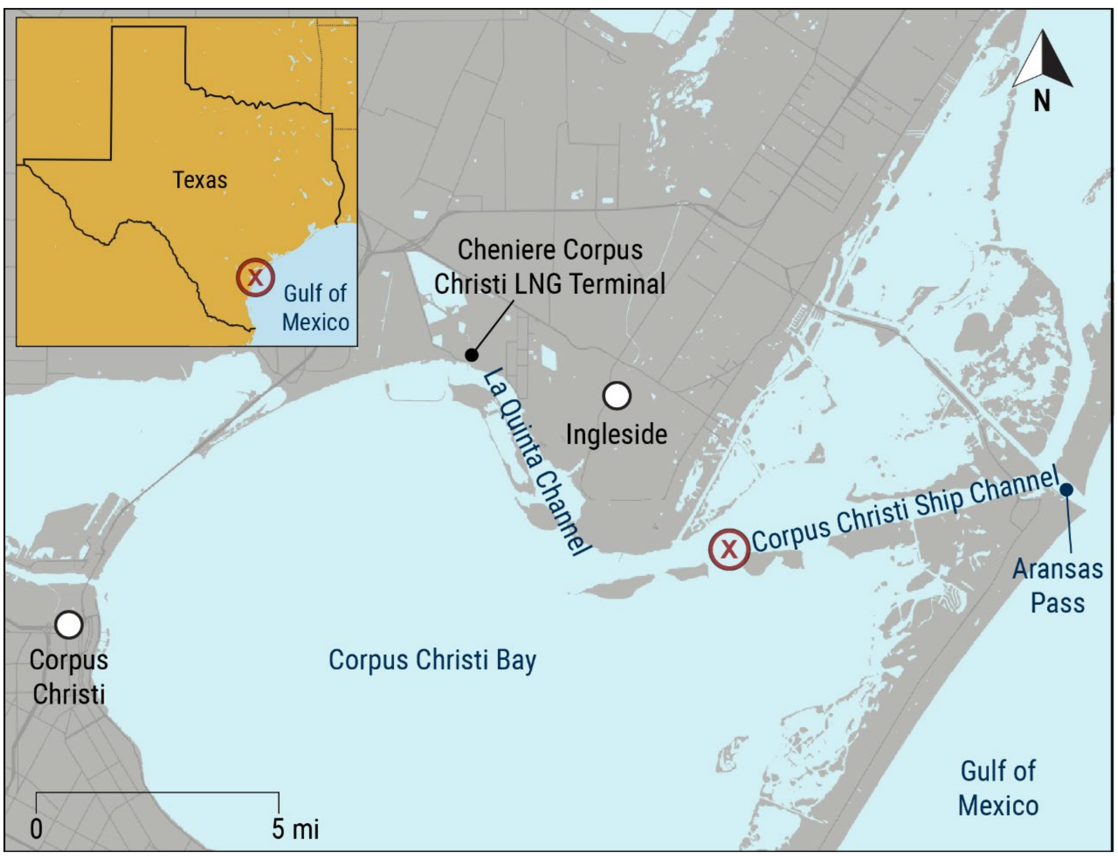

Figure 2. Area where the *CC Portland* grounded, as indicated by a red *X*. (Background source: Google Maps)

1. Factual Information

1.1 Background

Owned by CC Tugs LLC and operated by Edison Chouest Offshore LLC, the *CC Portland* was a 102.5-foot-long, US-flagged, steel-hulled, inspected towing vessel constructed in 2018. The *CC Portland* (a tractor tug) was primarily used to escort inbound and outbound liquefied natural gas (LNG) vessels through the Corpus Christi Ship Channel and La Quinta Channel to and from the Cheniere Corpus Christi LNG Terminal in Corpus Christi, Texas. Two 2,240-hp diesel engines provided propulsion, each driving an azimuthing stern drive, or "Z-drive" with a fixed-pitch propeller. 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 *CC Portland* was capable of speeds up to 13 knots.

Owned by LNG Fukurokuju Shipping Corporation and operated by MOL LNG Transport Company, the 961.3-foot-long, Bahamas-flagged LNG carrier *LNG Fukurokuju* was constructed in 2016 by the Kawasaki Shipbuilding Corporation in Sakaide, Japan. Propulsion was provided by a single 35,939-hp steam turbine engine driving a fixed-pitch propeller.

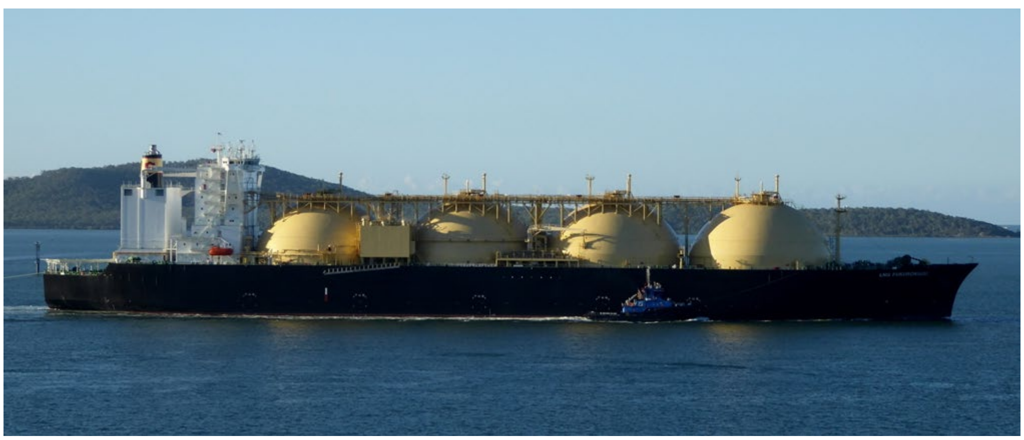

Figure 3. *LNG Fukurokuju* underway precasualty (Source: Tropic Maritime Images, www.shipspotting.com)

1.2 Event Sequence

On August 7, 2022, at 1445, the *CC Portland* got underway from the Cheniere Corpus Christi LNG Terminal on the La Quinta Channel to assist the inbound *LNG Fukurokuju* with navigating through the Corpus Christi Ship Channel, into the La Quinta Channel, and to the terminal. The *CC Portland* had a draft of 19 feet. The captain was at the helm when the tugboat departed; also on board were four other crewmembers, including the mate (in company training to qualify as a tractor tug captain), an engineer, and two deckhands.

The *CC Portland* was one of four tractor tugs dispatched to assist the *LNG Fukurokuju*, which had two pilots from the Aransas-Corpus Christi Pilots Association on board (as required, for its inbound transit).[2] Three other tugboats, the *CC Gregory*, *CC Aransas,* and *CC LaQuinta* (all operated by Edison Chouest), met the *LNG Fukurokuju* (which was in ballast condition with cold tanks) ahead of the *CC Portland* as the LNG carrier transited inbound from the Gulf of Mexico into the Corpus Christi Ship Channel. The *CC Gregory* met the *LNG Fukurokuju* offshore near the entrance to the channel, where the crew secured a tow line through the center chock at the stern of the *LNG Fukurokuju* (center lead aft position). Next, the *CC Aransas* and *CC LaQuinta* met the *LNG Fukurokuju* near Harbor Island. According to the Aransas-Corpus Christi pilots on board the *LNG Fukurokuju*, their goal for the transit (as was typically done with similar transits) was to have a tugboat secured in the center lead forward position before the LNG carrier reached the turn from the Corpus Christi Ship Channel into the La Quinta Channel, where the waterway narrowed from 500 feet to 300 feet.

At 1540, the *CC Portland* arrived on location near buoys 25 and 26 in the Corpus Christi Ship Channel (about 2.5 miles from the turn into the La Quinta Channel) to await the inbound *LNG Fukurokuju*, which was about 6 miles away and transiting the channel at 8.4 knots. For this assist, the *CC Portland* crew was to secure their tow line through the center chock on the bow of the *LNG Fukurokuju* (center lead forward position). To prepare for the assist, the captain transferred operational control of the *CC Portland* to the mate, who sat at the main operating station (conning chair); the captain positioned himself next to the mate. The captain was acting as a training master and thus was responsible for overseeing the mate as he assisted the LNG carrier in the center lead forward position (which was required for the company's tractor tug training program; see 1.3.3 Tractor Tug Captain Training Program). At 1555, the mate positioned the tugboat near the middle of the ship channel.

At 1618, the *LNG Fukurokuju* approached buoys 25 and 26 at a speed of 8.2 knots. About a minute later, the *CC Portland* mate positioned the tugboat with its bow 600 feet forward of (and facing) the *LNG Fukurokuju*'s bow, maneuvering the tugboat astern and moving it into position along the starboard side of the *LNG Fukurokuju*'s bulbous bow.

About 1621, the *CC Portland* matched the speed of the *LNG Fukurokuju* at 8.5 knots astern. During this time, the deck crew on the bow of the LNG carrier threw their heaving line down to the deckhands on the bow of the tugboat. The *CC Portland* deckhands connected the tugboat's tow line from the towing winch on the tugboat's bow to the heaving line using an eye on the end of the tow line. With the tow line connected to the heaving line, the crew on the bow of the *LNG Fukurokuju* began to pull

[2] The "Rules and Regulations Governing Pilots and Pilotage on the Corpus Christi Ship Channel" require two pilots to be on board all vessels greater than 900 feet in length overall.

in the heaving line through the centerline Panama chock on the LNG carrier.[3] The *CC Portland* mate notified one of the *LNG Fukurokuju* pilots via VHF that the tow line was going up to the LNG carrier's bow.

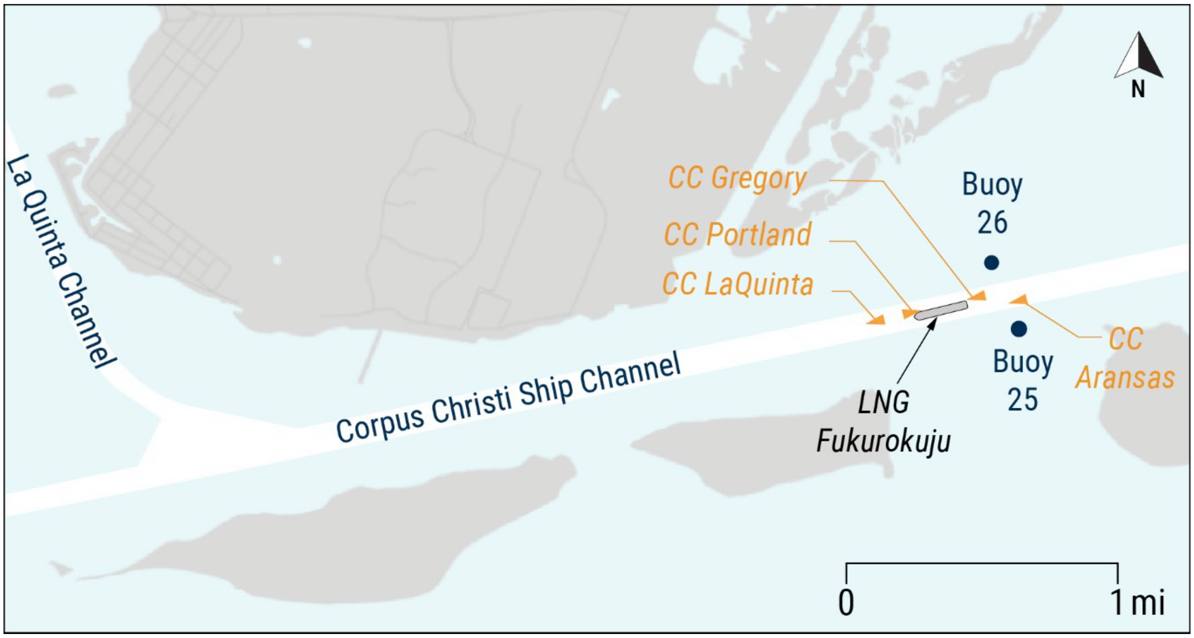

Figure 4. Approximate vessel positions when the *CC Portland* made up to the inbound *LNG Fukurokuju* (vessels not to scale). (Background source: Google Maps)

At 1623, the mate began increasing the tugboat's speed astern, pulling ahead of the LNG carrier's bow to reposition the tugboat in line with the centerline Panama chock. While pulling ahead of the *LNG Fukurokuju*, the *CC Portland* reached 10.2 knots, and the mate stated that the tugboat "zigzagged" and did "a couple of fishtails," moving the tugboat out of position to the port side of the LNG carrier. Based on the portable pilot unit used by one of the LNG carrier pilots, about 45 seconds later, the *CC Portland*'s speed was reduced to below 8 knots, while the *LNG Fukurokuju* transited between 8.7 and 9.0 knots. According to the mate, the movement of the tugboat while repositioning ahead of the LNG carrier "created the speed loss."

The tugboat's loss of speed created a "belly" (loss of tension on the tow line between the tugboat and LNG carrier). About 1624, the *LNG Fukurokuju*'s voyage data recorder on the bridge captured an unidentified radio communication stating, "we got a line back there pretty low," as the slack caused the tow line–the eye of which had not yet reached the chock of the LNG carrier–to dip into the water.

[3] A *Panama chock* is a type of closed chock used for temporary mooring and towing lines. Mounted to the deck or bulwark, the chock must be constructed according to the ISO 13728 standard. The name derives from its use in connecting ships to the locomotives that pulled them through the Panama Canal Locks.

The mate gradually increased the angle of the starboard Z-drive by adding "ten degrees, [then] fifteen degrees max," re-directing thrust laterally to position the tugboat in line with the LNG carrier. However, the mate was unable to move the tugboat to the centerline of the LNG carrier. The mate continued to increase the angle of the starboard Z-drive, but the stern of the tugboat began to swing to starboard as it moved down the port bow of the LNG carrier.

The *LNG Fukurokuju* began to overtake the *CC Portland*, and the attached heaving line parted, sending the tow line into the water. The captain stated, "…when everything was happening, it was too dangerous for me to [take over]." Instead, with the captain "coaching" him, the mate again attempted to correct the tugboat's position by increasing speed astern; however, he stated that when maneuvering the tugboat back in line with the LNG carrier, there was no response from the port Z-drive and the tugboat "wouldn't go to port."

The stern of the tugboat began to "sheer off to starboard," and the tugboat began to move outside of the Corpus Christi Ship Channel. The mate stated that, as the tugboat's stern continued to move to starboard, he saw the vessel was going to ground. The mate slowed the *CC Portland*, but at 1625, the tugboat grounded by the stern on its starboard side outside of the channel near buoy 25 in about 10 feet of water. The tugboat captain reported hearing something pop as the tugboat grounded.

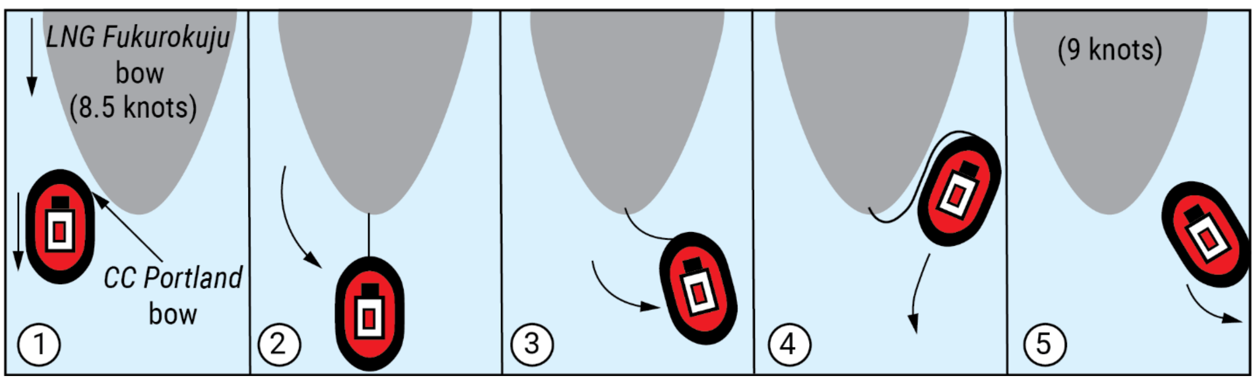

Figure 5. Sequence of events in the *CC Portland* grounding. 1) The *CC Portland* took a position underneath the starboard bow of *LNG Fukurokuju* (while moving astern with the ship) as the heaving line was lowered and the tow line was passed up. 2) As the tow line was pulled in by the crew on the *LNG Fukurokuju*, the *CC Portland* accelerated to reposition the tug ahead of the *LNG Fukurokuju* along the centerline. 3) While attempting to maneuver to the centerline, the *CC Portland* moved out of position to the port side of the *LNG Fukurokuju*. 4) As the mate attempted to correct the *CC Portland*'s position to the centerline of the LNG carrier, the tug lost speed and stabilized along the port bow of the *LNG Fukurokuju*. The position of the tug pulled the tow line to the stern and into the water as the heaving line parted. 5) As the *CC Portland* accelerated astern to regain position, the tug lost speed and directional control as it continued moving to starboard before leaving the channel and running aground. (Illustration not to scale.)

The captain of the *CC Portland*, unsure if the tow line was made fast to the *LNG Fukurokuju*, activated the emergency release on the tow winch and notified the *LNG Fukurokuju* bridge via radio stating, "we are stuck aground freewheeling."[4] About a minute later, either the captain or mate of the tugboat again notified the *LNG Fukurokuju* bridge, "we are aground, we're stuck."

Noticing oil in the water, the *CC Portland* crew shut down the main engines and deployed spill kits to prevent further pollution. The crew of the *CC Portland* notified the US Coast Guard of the grounding and reported that the vessel was leaking oil from the starboard Z-drive and that there was a hole in the starboard-side fuel tank.

The crew on the bow of the *LNG Fukurokuju* radioed to the bridge that the tugboat was aground on the LNG carrier's port side. One of the pilots on the *LNG Fukurokuju* released the escorting tugboat *CC Aransas* to assist the *CC Portland*. The *CC Aransas* met the grounded *CC Portland* at 1630. The *LNG Fukurokuju* continued without incident to the Cheniere Corpus Christi LNG Terminal after repositioning the *CC LaQuinta* in the center lead forward position vacated by the *CC Portland*.

The *CC Portland* crew remained on board the vessel into the evening so that damage to the vessel could be assessed. The Coast Guard and on-scene authorities determined that 4-5 gallons of fuel oil had been released and there was no active sheening. The Coast Guard estimated there was a potential for 300–400 gallons of oil (gear) to leak from the Z-drive unit and a potential for 7,105 gallons of fuel oil to leak from the starboard fuel tank. The *CC Portland* was unable to transit using its own propulsion and had to be towed from the grounding site. At 2359, the *CC LaQuinta* initiated a tow of the *CC Portland*, and at 0043, on August 8, the *CC Portland* moored at a nearby facility in Harbor Island, Texas, for additional damage assessment.

1.3 Additional Information

1.3.1 Damage

On August 8, divers examined the *CC Portland*. They discovered that the starboard Z-drive had been sheared off at the bolts connecting the drive to the flange. The port Z-drive was intact, but it had been fouled by the tugboat's tow line. The divers found extensive damage to three starboard keel coolers. Additionally, they reported that one keel cooler support bracket had been ripped from the hull, leaving a hole measuring 4 inches by 3 inches in the no. 2 day fuel tank.

Later that day, the dive team returned to the grounding site and located and marked the missing starboard Z-drive, which was on the bottom of the waterway outside

[4] *Freewheeling* occurs when a tugboat allows the tow winch to run "free" (without a brake or tension/resistance from the winch) so that as the tugboat moves out of position, the larger ship doesn't pull the tugboat or possibly capsize it.

of the channel on the south (green) side and presented no hazard to traffic. Two days later, divers recovered the Z-drive.

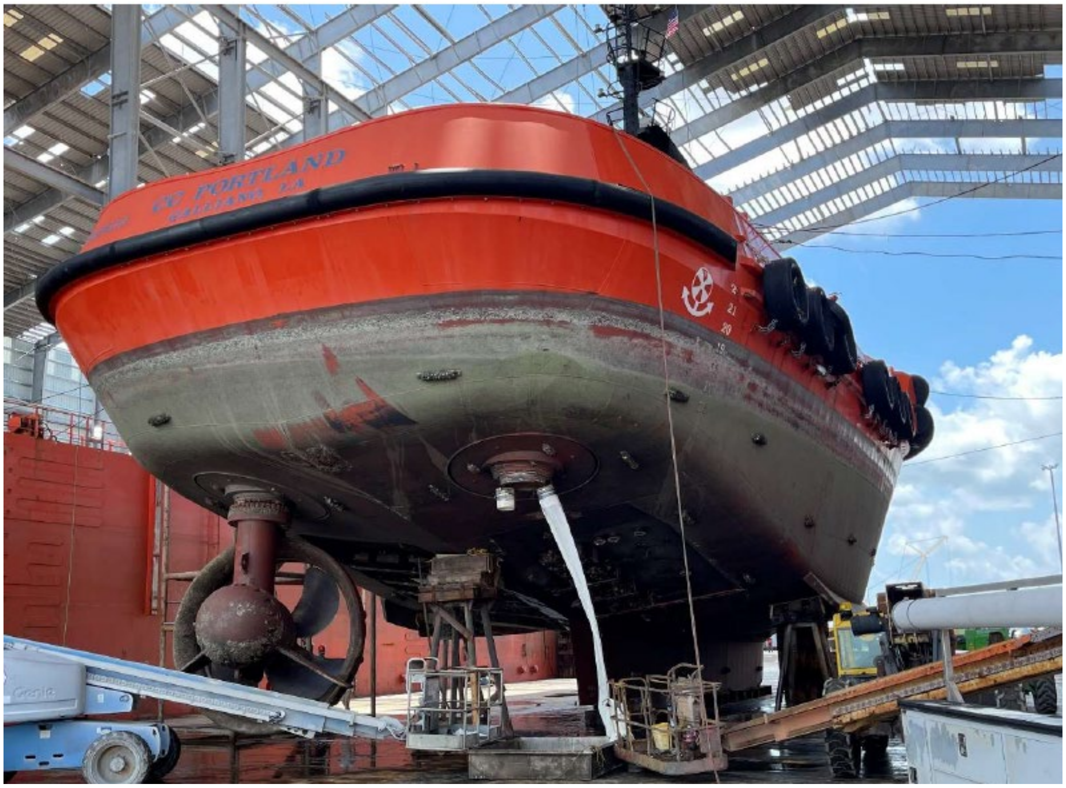

Figure 6. The *CC Portland* in drydock showing the missing starboard Z-drive unit. (Source: Coast Guard)

After temporary repairs were made, the *CC Portland* transited under its own power from Corpus Christi to Port Fourchon, Louisiana, to be drydocked for permanent repairs, including replacement of the starboard Z-drive unit with a new unit. The total cost to repair damages was about $1 million.

The *LNG Fukurokuju* did not report any damage.

1.3.2 Personnel

The *CC Portland* captain held a valid Coast Guard-issued merchant mariner credential as a Master of Vessels Less than 500 Gross Tons Limited to Near Coastal Voyages and an Officer in Charge of a Navigation Watch on Towing Vessels Less than 300 Gross Registered Tons Limited to Near Coastal Voyages. He had been employed by Edison Chouest Offshore for 14 years and had been working as tractor tug captain since 2018.

The *CC Portland* mate held a valid Coast Guard-issued merchant mariner credential as a Master of Self-Propelled Vessels of Less than 100 Gross Registered Tons

Upon Near Coastal Waters. He was hired by Edison Chouset Offshore about 6 months before the casualty. Previously, the mate had worked for 3 years for a river cruise line as mate and captain, and before that, he worked for 27 years as a captain for a search and recovery and salvage vessel operator.

During his time with the cruise line, the mate gained experience operating small cruise vessels between 235 feet and 328 feet in length equipped with propulsion systems similar to the Z-drive units on the *CC Portland*. The mate noted the difference in sensitivity and engine responsiveness between the Z-drives on small cruise ships and the *CC Portland*, stating that the *CC Portland* Z-drives were "far more responsive."

1.3.3 Tractor Tug Captain Training Program

At the time of the grounding, the *CC Portland* mate was working to complete the company's tractor tug training program to meet the company qualification for a tugboat captain. The program was outlined in a company document, "Tractor Tug Training Program," which also served as the trainee's log of completed training items. Each training item required a captain (training master) to observe as the trainee performed a specific maneuver/evolution, providing intervention as necessary for operational safety, and sign off on the item if "the trainee has completed the evolution with 100% proficiency, without question." If the training master was not satisfied with the trainee's performance, the trainee would be required to repeat the maneuver/evolution. The training was organized so that successive sections built upon demonstrated skills that were signed off in previous sections. Trainees were required to complete all training sections sequentially.

The mate began the training program to qualify as a tugboat captain about 6 months before the casualty. According to the mate, the August 7 casualty voyage was "the last of all the training." However, according to the mate's training sign-off sheet, he had only completed two of the required five signoffs for ship assist maneuvers in the center lead forward position. Additionally, there were numerous instances in the log in which later elements had been marked completed before previous elements or the mate had counted single maneuvers for different sections.

Investigators asked company training masters to verify each time their initials appeared on the mate's sign-off sheet. All six interviewed training masters raised concerns that many of the initials on the mate's sign-off sheet either did not match their own handwriting or that the initials were for training elements, positions, or maneuvers that they never completed with the mate. Interviewed tugboat captains and training masters with the company also expressed concern with the mate's ability to operate a tugboat in the center lead forward position.

1.3.4 Tugboat Operations in the Center Lead Forward Position

When a ship is moving through the water in the forward direction, a high-pressure area forms around the bow. When a tugboat is in the center lead forward position, it is subjected to the hydrodynamic forces created by the high-pressure area of the ship it is assisting. The speed of the vessel also increases these hydrodynamic forces exponentially. The pressure increases with decreasing distance to the bow, and therefore the hydrodynamic forces are greatest when a tugboat is very close to the ship's bow while making up the hawser. According to the Pilot's Pocket Guide and Checklist, "The position in front of the ship's (bulbous) bow is one of the most dangerous for the tug."[5]

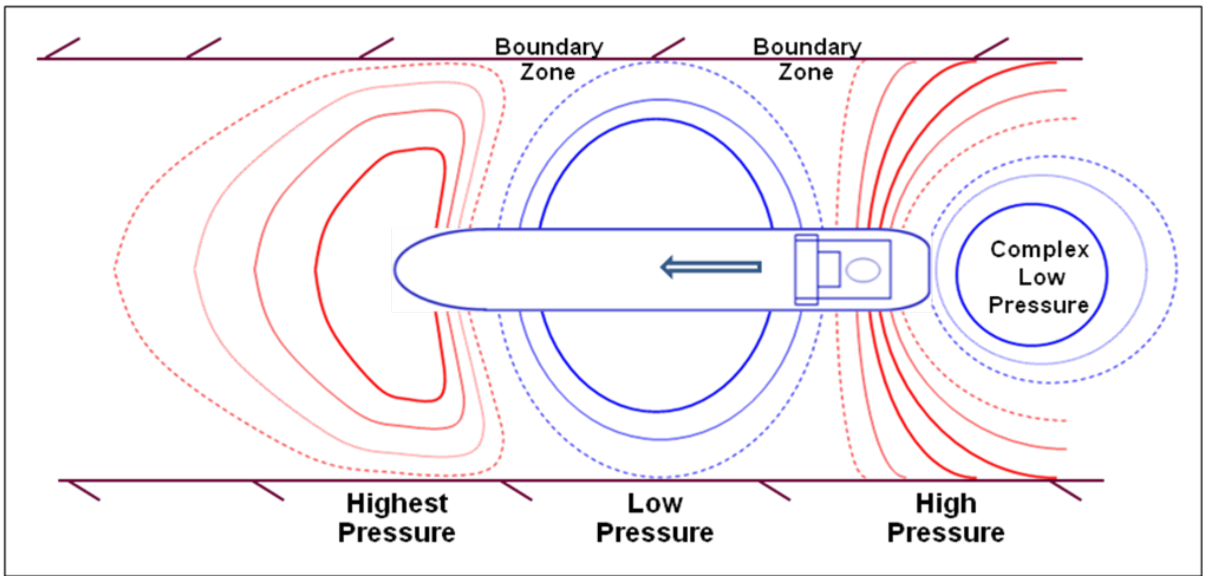

Figure 7. Ship-generated pressure fields for vessel navigation in enclosed/confined water. (Source: P.J. McArthur)

According to the textbook *Bow Tug Operations with Azimuth Stern Drive Tugs: Risks and Effectiveness*, "a good guideline is that ship's speed should not be higher than 60 percent of the tug's maximum speed ahead."[6]

Investigators interviewed six company tugboat captains—all with experience operating tugboats out of the Cheniere Corpus Christi LNG Terminal—who noted the challenges associated with the center lead forward position. These captains stated that this position is "the most technically difficult" and, despite years of experience, they "still get nervous doing it." The captains also noted the speed at which they felt comfortable

[5] UK Chamber of Shipping, *Pilot's Pocket Guide and Checklist: Working Safely with Harbour Tugs – Reducing the Risks in Port Towage*, Second Edition, 2021.

[6] Henk Hensen, *Bow Tug Operations with Azimuth Stern Drive Tugs: Risks and Effectiveness, Third Edition* (Rotterdam: STC Publishing, 2016).

performing this maneuver—for five of the captains, this speed ranged between 5 and 7 knots. One captain stated that when performing the center lead forward maneuver at 7.5–8 knots, the tugboat loses effectiveness because it is often operating at 75-85% of its maximum power. The captain added that "you never want to max out because you don't have any power to get out, and you're using the rest, 15-20% just to do what needs to be done on the job."

Investigators assessed the speeds of eight LNG vessels transiting inbound through the Corpus Christi Ship Channel using historical automatic identification system data from June 2022. Based on interviews with tugboat operators and Aransas-Corpus Christi pilots, investigators identified an approximate 2-mile stretch in the Corpus Christi Ship Channel where bow tugboats are typically secured in the center lead forward position to prepare for the turn into La Quinta Channel. The average speed of the eight assessed LNG vessels was 8.5 knots (ranging from 7.0 to 11.5 knots) nearest buoys 25 and 26. The average speed was 6.3 knots (ranging between 5.5 and 7.2 knots) when approaching the turn into the La Quinta Channel. There was no company or pilot association policy outlining a prescribed safe speed for center lead forward bow assist tugboat operations in the Corpus Christi Ship Channel.

1.3.5 Related Casualties

The NTSB investigated the April 2022 collision between the tugboat *George M* and the containership *MSC Aquarius* in the Houston Ship Channel near Morgan's Point, Texas.[7] The *George M* was in the center lead forward position when the tugboat moved out of position with the containership's centerline while passing up the tugboat's tow line. While attempting to move the tugboat back into position, the mate operating the tug overcorrected, causing the tugboat's starboard bow to strike the starboard bow of the containership. As the mate on the *George M* continued to attempt to reposition the tugboat, a loss in speed resulted in a second collision, disabling the tugboat's starboard Z-drive unit. The NTSB determined that the probable cause of the collision was the mate's attempt to make up bow to bow while the tugboat and containership were transiting at a speed that was excessive for the advanced harbor-assist maneuver (the containership was transiting at 9.7 knots—2.7 knots higher than the company's limit of 7 knots). In the investigation report, the NTSB noted the effect of hydrodynamic forces around an assisted vessel's bow: "The increased forces acting on a tugboat at higher speed require more reserve power, maneuverability, and operator skill to overcome."

In 2013, the Dutch Safety Board investigated a casualty resulting in the capsizing of a tugboat while it attempted to make up to the bow of a large ferry. In its report, the Dutch Safety Board determined high speed to be one of the main causes of the

[7] National Transportation Safety Board (NTSB), *Collision between Tugboat* George M *and Containership* MSC Aquarius (Washington, DC: NTSB, 2023).

capsizing. Following the casualty, a working group comprised of members of the International Tug Masters Association and the Nautical Institute conducted surveys of pilots, tugboat captains, and ship masters from around the world to determine what were considered safe speeds and safe procedures for tugboat operations. A large majority of survey respondents reported that their maximum speed while making up a tugboat to the bow of a vessel was 6 knots.[8]

2. Analysis

To make up the *CC Portland* to the *LNG Fukurokuju* at the center lead forward position, the mate maneuvered the tugboat into position along the starboard side of the bow of the *LNG Fukurokuju*, which was transiting 8.5 knots. Once the *LNG Fukurokuju* crew began hauling up the tug's tow line, the mate increased the tug's speed astern, reaching 10.2 knots while repositioning the tug in line with and forward of the *LNG Fukurokuju*'s bow.

Automatic identification system data from June 2022 showed that other LNG carriers had transited an average of 8.5 knots nearest buoys 25 and 26, where the *CC Portland* attempted to make up to the *LNG Fukurokuju*. Therefore, the speed of the *LNG Fukurokuju* was typical for the area. However, hydrodynamic forces created by a ship increase exponentially with speed and with decreasing distance to the bow. Consequently, the forces acting on the *CC Portland* were even greater as it approached the bow of the *LNG Fukurokuju*, given the speeds of both vessels and the tugboat's proximity to the LNG carrier's bow when the mate attempted to re-position the tugboat off the bow of the *LNG Fukurokuju*, and these forces hampered the mate's ability to control the tugboat.

Higher speed also reduces the amount of reserve propulsion power available to the operator. If the tugboat moves out of position, the operator has less power to regain position as compared to the same maneuver at a lower ship transit speed. When the *CC Portland* was positioned underneath the *LNG Fukurokuju*'s bow, the tugboat matched the LNG carrier's 8.5-knot speed—meaning the tugboat was working at 65% of its maximum speed (13 knots). When the mate increased the tugboat's speed to over 10 knots to pull ahead of the LNG carrier, the *CC Portland* was operating at nearly 80% of its maximum speed—far greater than the 60% recommended in the *Bow Tug Operations with Azimuth Stern Drive Tugs: Risks and Effectiveness* textbook. As speed increases, the margin of error decreases to the point where regaining position may be impossible.

[8] Henk Hensen, Daan Merkelbach, and F. van Wijnen, *Report on Safe Tug Procedures Based on Pilot, Tug Master and Ship Captain Questionnaires*, April 20, 2013.

There was no policy or guidance (for company tugboats or other vessels transiting the area) outlining a prescribed safe speed for tugboats completing ship bow-assist maneuvers in the Corpus Christi Ship Channel. Therefore, on the day of the casualty, there was no policy limiting the tugboat's speed while the mate was attempting to match the LNG carrier's speed of 8.5 knots and reposition the tugboat. After the casualty, other tugboat captains (who worked for the same company) told investigators that they felt comfortable performing bow-assist maneuvers at much lower speeds (ranging from 5 to 7 knots). Additionally, the NTSB previously investigated a similar collision in 2022 between the tugboat *George M* and containership *MSC Aquarius* in which the tugboat's company established a speed limit of 7 knots for performing bow-assist maneuvers. Had the *CC Portland*'s operator established a similar policy, the captain and mate would have had to wait for the LNG carrier to reduce its speed in order to execute the maneuver on the day of the casualty, thus reducing the effect of the hydrodynamic forces acting on the tugboat and increasing the amount of reserve propulsion power available.

As the mate attempted to reposition the *CC Portland*, his inputs directed more thrust laterally, and the tugboat therefore lost speed astern. As the *CC Portland* lost speed, the tugboat began to move down the port bow of the *LNG Fukurokuju.* This movement pulled the tow line (attached at the bow), to the stern of the tugboat, causing the heaving line to snap and sending the tow line into the water. As the mate increased propulsion astern to regain position, the port Z-drive was fouled by the submerged tow line, thus significantly impacting the tugboat's maneuverability. At the time, the mate and training master were unaware that the port Z-drive was fouled as the mate continued to attempt to maneuver the tugboat back to the LNG carrier's centerline. With only the starboard Z-drive operational, the mate was unable to regain position, and as a result, the tug departed the ship channel and ran aground.

At the time of the casualty, the *CC Portland* mate had not yet completed the company's tractor tug training program, which included bow-assist maneuvers (two of the required five assist maneuvers in the center lead forward position were documented). A review of the mate's training sign-off sheet showed that he had not completed the training in accordance with company guidelines—elements were completed out of order, and, in many cases, the mate counted single maneuvers for different sections. Further, nearly all training masters that had reportedly signed off on the mate's training raised concerns that many of the initials on the mate's sign-off sheet either did not match their own handwriting or were for training elements, positions, or maneuvers that they never completed with the mate. Therefore, the mate inaccurately represented how much training he had completed. Because he did so, his training masters—including the *CC Portland* captain on the day of the casualty—were likely under the impression that the mate was further along in the training program and thus more advanced in his skillset than he actually was.

The *CC Portland* captain was responsible for overseeing operational safety and decision-making on board the vessel. As such, the captain was expected to monitor the vessel's movement and the mate's performance while maintaining an overall awareness of the situation. At the time of the casualty, the captain was "coaching" the mate (who was in the conning chair) through the maneuver and did not take direct action until after the *CC Portland* had grounded. Had the captain attempted to take over the conning chair, the time lost during the transfer could have been time the mate needed to successfully reposition the tugboat. Therefore, the captain likely did not have sufficient time between the loss of control and the grounding to safely switch positions with the mate and take control of the tugboat.

3. Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the grounding of the *CC Portland* was the mate's attempt to make up bow to bow with a liquefied natural gas carrier while the tugboat and liquefied natural gas carrier transited at a speed that was excessive for the advanced harbor-assist maneuver. Contributing to the casualty was the lack of a company policy regarding maximum allowable speed for bow assist maneuvers.

3.2 Lessons Learned

Speed During Bow-to-bow Harbor-assist Operations

The National Transportation Safety Board has previously noted the effect of speed on bow-to-bow harbor-assist operations in other investigations. The risk of a casualty during these operations with azimuthing stern drive (ASD) tugboats increases with increasing speed. Hydrodynamic forces around an assisted vessel's bow increase exponentially with speed, while the amount of reserve propulsion power available to the tugboat operator decreases. Therefore, owners and operators of ASD tugboats that perform bow-to-bow harbor-assist operations should set speed limits for these maneuvers. These limits may vary for different classes of tugboats based on design. Tugboat operators should communicate these pre-determined speed limits to pilots and ship masters in command of the vessels that they are assisting before engaging in these maneuvers.

Vessel	*CC Portland*	*LNG Fukurokuju*
Type	Towing/Barge (Tugboat)	Cargo, Liquid bulk (Liquid natural gas carrier)
Owner/Operator	CC Tugs LLC/Edison Chouest Offshore LLC (Commercial)	LNG Fukurokuju Shipping Corporation/MOL LNG Transport Company (Commercial)
Flag	United States	Bahamas
Port of registry	Galliano, Louisiana	Nassau, Bahamas
Year built	2018	2016
Official number (US)	1286413	N/A
IMO number	9824112	9666986
Classification society	American Bureau of Shipping	Nippon Kaiji Kyokai
Length (overall)	102.5 ft (31.2 m)	961.3 ft (293.0 m)
Breadth (max.)	42.6 ft (13.0 m)	160.4 ft (48.9 m)
Draft (casualty)	19.0 ft (5.8 m)	33.7 ft (10.3 m)
Tonnage	293 GRT	127,242 GT ITC
Engine power; manufacturer	2 x 2,240 hp (1,670 kW); Caterpillar 3516E diesel engines	35,939 hp (26,800 kW); Kawasaki URA-400 steam turbine engine

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

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable cause of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for any accident or event investigated by the agency. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 Code of Federal Regulations section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 United States Code section 1154(b)).

For more detailed background information on this report, visit the NTSB Case Analysis and Reporting Online (CAROL) website and search for NTSB accident ID DCA22FM035. 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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