December 16, 2024 MIR-24-38

Breakaway of Bulk Carrier *Chang Hang Hui Hai* and Subsequent Collision with Tugboat *Signet Defender*

On January 8, 2024, about 1237 local time, the dry bulk carrier *Chang Hang Hui Hai* was moored at dock no. 12 in the Brownsville Ship Channel in Brownsville, Texas, when it broke free during high winds (see figure 1 and figure 2).[1] The vessel drifted across the ship channel and struck the tugboat *Signet Defender*, which was tied up to the tugboat *Signet Magic* at the Signet Maritime pier along with the tugboat *Signet Ranger*. There were no injuries, and no pollution was reported. Damage was estimated at $2.5 million.

Figure 1. *Chang Hang Hui Hai* docked on March 3, 2013. (Source: Manuel Hernandez Lafuente)

[1] (a) In this report, all times are central standard 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. DCA24FM016). Use the CAROL Query to search investigations.

Casualty Summary	
Casualty type	Collision
Location	Brownsville Ship Channel, Brownsville, Texas 25°57.26′ N, 97°23.64′ W
Date	January 8, 2024
Time	1237 central standard time (coordinated universal time –6 hrs)
Persons on board	27 (*Chang Hang Hui Hai*), 0 (all other involved vessels)
Injuries	None
Property damage	$2.5 million est.
Environmental damage	None
Weather	Visibility 10 mi, clear, winds south 37 kts, gusts 62 kts, air temperature 82°F, water temperature 66°F
Waterway information	Channel, width 800 ft in area of collision, depth 39 ft, current 0 kts

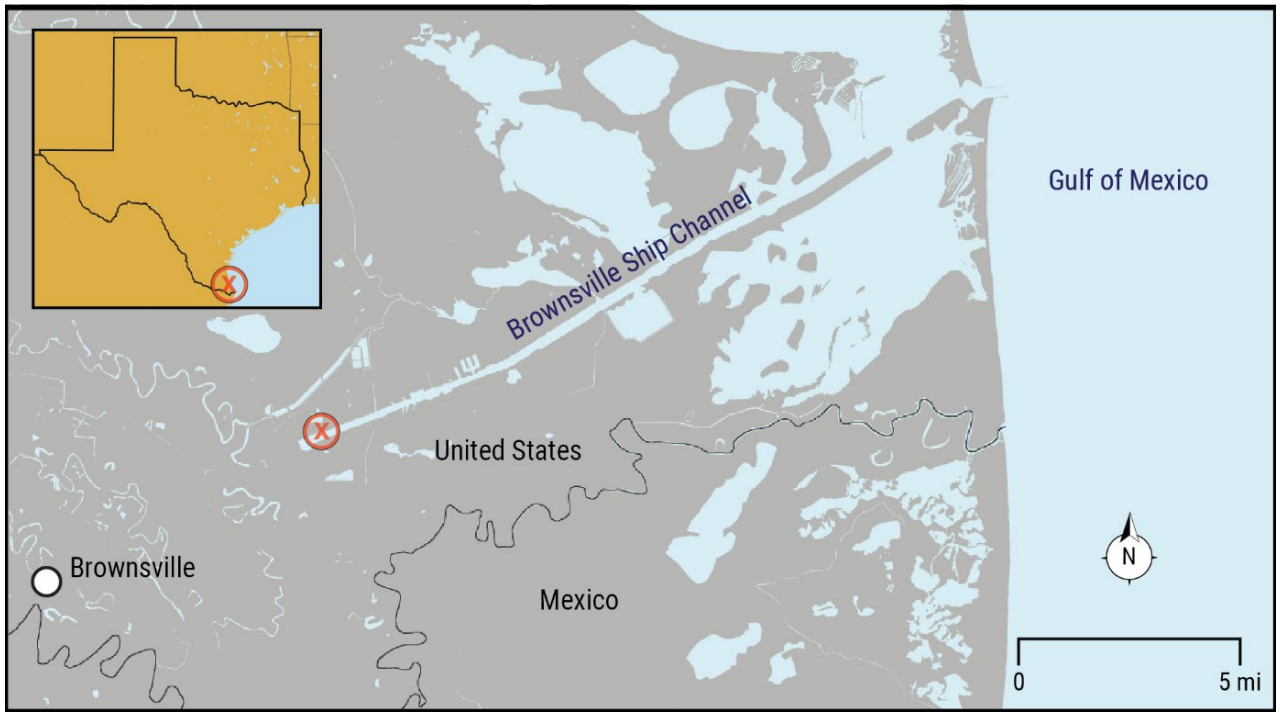

Figure 2. Area where the *Chang Hang Hui Hai* collision occurred, as indicated by a circled *X*. (Background source: Google Maps)

1 Factual Information

On January 7, 2024, at 0600, the China-flagged *Chang Hang Hui Hai*, a 656-foot-long bulk cargo ship, was moored at dock no. 12, port side to the pier, in the Brownsville Ship Channel, to discharge cargo. The vessel was secured with 10 mooring lines. The lines were made of polypropylene filament eight-strand rope, each 2.8 inches (72 millimeters) in diameter and 722 feet (220 meters) long, with a nominal breaking load of 134,885 pounds (600 kilonewtons).

The next morning, January 8, at 0919, the National Weather Service broadcast an urgent marine weather message. A small craft advisory was in effect, with a gale warning for the evening. At 0930, as recorded in the ship's log, the winds were Beaufort 5 (17–21 knots) from the southwest.[2]

As the morning progressed, the winds increased. Two US Coast Guard Port State Control officers boarded the vessel at 1034 for a routine inspection, and one noted that the winds were "starting to pick up." The chief mate evaluated the increasing wind conditions and ordered additional mooring lines to be deployed, bringing the total to 16 (see figure 3). The crew added a headline, two breast lines forward, one breast line aft (a bight) and two stern lines. The ship carried three (additional) spare mooring lines.

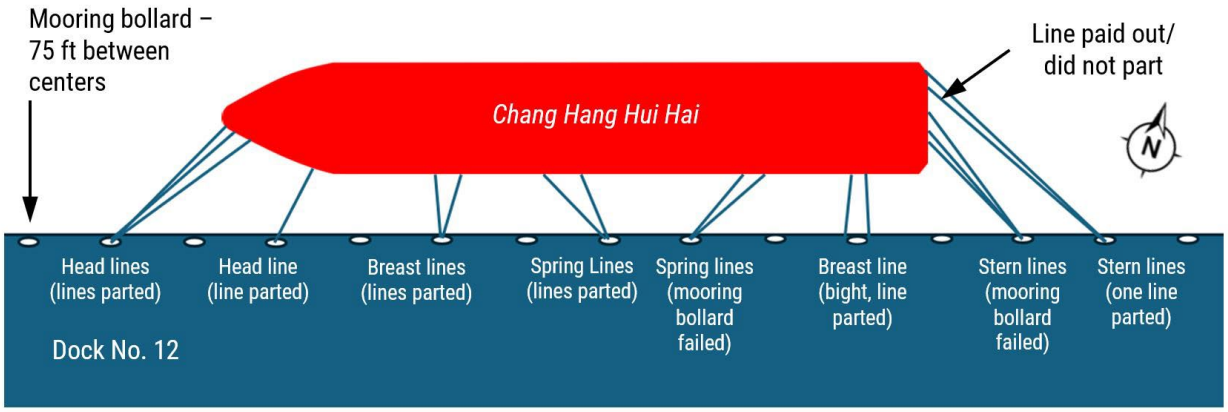

Figure 3. *Chang Hang Hui Hai* mooring line arrangement (scale approximate).

[2] The *Beaufort wind scale*, developed in 1805, is a method for estimating wind strength without using instruments. The scale ranges from force 0 (winds less than 1 knot) to force 12 (hurricane: winds 64 knots or more). It is still used for its original purpose as well as for tying various components of weather (wind strength, sea state, and observable effects) into a unified picture.

The vessel was in ballast while offloading, with a freeboard (distance to the main deck from the water's surface) of about 35 feet. At 1147, a wind advisory was issued and in effect until 1400, warning of south winds 17–26 knots with gusts up to 39 knots. The *Chang Hang Hui Hai*'s crew continued to monitor the mooring lines. At 1230, the vessel's CCTV monitoring system showed the stern lines were holding satisfactorily. However, at 1235, the bow began to move away from the dock. At 1237, the wind speed indicator on the bridge registered 50–55 knots, and the bow was rapidly moving away from the dock. One of the Coast Guard officers, from the bridge, sighted only two lines still attached forward and a parted line trailing in the water. Within a minute, the remaining headlines parted.

At 1238, one of the Coast Guard officers noted the wind speed indicator was registering 59 knots. The ship's master called for tug and pilot assistance and ordered the engine room to "standby engine" (per typical practice, the engine had been secured while the vessel was alongside the dock and unloading cargo). At 1240, the crew let go the starboard anchor, and the captain noted that "all lines forward were broken." The crew let go the port anchor at 1242. Despite the two anchors in the water (intended to stop the vessel's movement), the ship's bow was at a 30° angle to the dock, and the vessel had begun drifting across the channel. Although the master had ordered the ship's main engine started, he decided not to use it to assist in controlling the vessel because lines were floating on the water surface and could foul the propeller.

At 1243, the vessel's continued drift pulled two bollards off the dock along with the five lines (two aft spring and three stern lines) that had been secured to them. At 1249, the *Chang Hang Hui Hai* collided with the tugboat *Signet Defender*, which was moored on the opposite side of the channel (see figure 4). Fourteen minutes had passed from the time the vessel started to drift until the collision.

This first collision led to cascading collisions. The *Signet Defender* was pushed into the side of the tugboat *Signet Magic*, which was moored alongside the *Signet Defender.* The Signet Maritime pier was destroyed as the *Signet Magic* was pushed into it. The pier was pushed into the tugboat *Signet Ranger*, tied up on the other side of the pier.

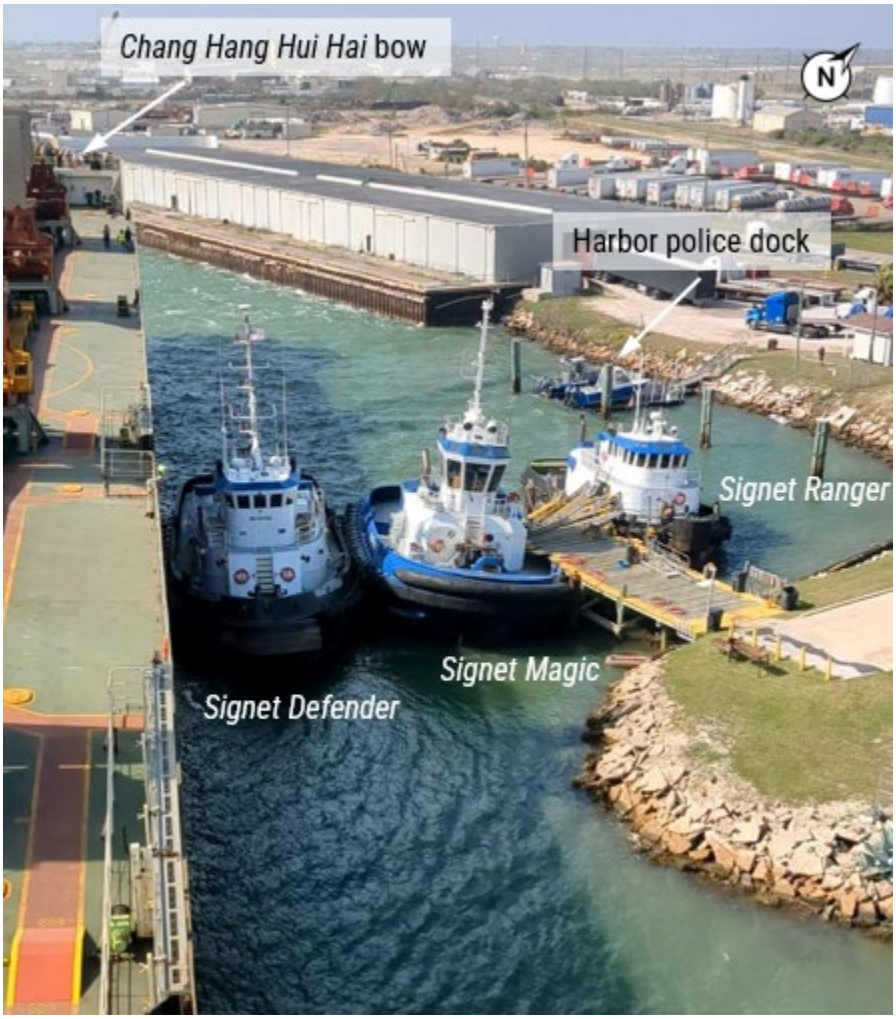

Figure 4. *Chang Hang Hui Hai* colliding with the tugboat *Signet Defender*. (Source: Coast Guard)

As the winds continued to blow after the collision (at 1253, winds in Brownsville were from the south at 37 knots, gusting to 62 knots), tugboat crewmembers got the three Signet tugboats, which were not damaged by the collision, underway to assist. At 1300, the tugs began maneuvering to hold the *Chang Hang Hui Hai* in place. At 1305, the master began using the *Chang Hang Hui Hai*'s main engine to assist with maneuvering and controlling the vessel's position. Along with the tugs and the main engine, the ship's anchors also helped the ship hold its position steady in the 800-foot-wide inlet.

At 1305, during a 69-knot gust of wind, the *Signet Defender* pushed ahead at full power, creating propeller wash that capsized a docked small harbor police boat and damaged its dock.

At 1320, a harbor pilot arrived on board the *Chang Hang Hui Hai*. The pilot worked with the vessel's crew and the tugs to move the ship back to its original berth. At 1603, all lines were made fast, with the *Chang Hang Hui Hai* secured port side along the dock. The tugs remained, pushing on the vessel's starboard side to keep it in place until the winds died down.

At 1620, and again at 2100, the ship's crew conducted soundings of all tanks, finding no indication of a breach in the hull. At 1930, a hull inspection was conducted using a pilot ladder, and no apparent damage was found.

The *Chang Hang Hui Hai* and the three tugboats incurred no structural damage. The costs to replace the demolished Signet Maritime pier, the harbor police dock, and dock no. 12 were estimated at $2.1 million, $85,000, and $22,000, respectively. The cost to replace the damaged harbor police boat was estimated at $321,000.

During the casualty event, 10 mooring lines parted, one line (starboard stern line) paid out all the way, and two mooring bollards, holding five lines, failed. A review of the mooring lines' original manufactured certificates showed that the lines met the standards of the ship's classification society. Inspection records showed that the crew had examined the mooring lines every 3 months, looking for anything that would make them unsuitable for use. When examining the mooring lines, crewmembers rated the lines as either very good, good, fair, or poor on the mooring rope inspection record. The last visual inspection of the mooring lines before the collision, on December 21, 2023, recorded each line in "good" condition. Neither postcasualty testing of the mooring lines nor an assessment of the failed mooring bollards was conducted.

2 Analysis

The casualty occurred on the morning of January 8, during rapidly deteriorating weather conditions, with wind speeds increasing and gusts reaching 62 knots within only a few hours.

As conditions worsened, the *Chang Hang Hui Hai* crew increased the initial 10-line mooring arrangement to 16 lines—all lines available, excluding the spares. As the winds picked up, the higher wind speed increased the wind load (force) acting on the *Chang Hang Hui Hai*'s lateral surface area above the water (the sail area). The bulker's freeboard had been increasing as it offloaded, increasing its sail area. This force, acting on the vessel nearly perpendicular to its length, significantly strained the mooring lines holding the ship to dock no.12. The force of wind against the ship's

side overcame the breaking strength of several lines forward, causing them to part and the ship's bow to move away from the pier. This began a cascading failure as the remaining lines took up additional strain. Ten mooring lines and two bollards (with five lines attached) failed, and one line paid out, leading to the ship drifting away from the dock, across an 800-foot-wide section of the Brownsville Ship Channel, where it collided with the *Signet Defender*.

Neither postcasualty testing of the mooring lines nor an assessment of the mooring bollards' condition was conducted. However, all the lines were certificated and in good condition, per their last inspection. Nevertheless, without postcasualty tests or an assessment of the condition of the mooring lines and bollards, investigators could not definitively rule out weakened or overloaded mooring lines or overloaded bollards as contributing factors in the casualty.

3 Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the breakaway of the dry bulk carrier *Chang Hang Hui Hai* from a dock and subsequent collision with the tugboat *Signet Defender* was the force of the wind acting on the exposed freeboard of the *Chang Hang Hui Hai*, which overcame the breaking strength of several mooring lines.

Vessel Particulars

Vessel	*Chang Hang Hui Hai*	*Signet Defender*
Type	Cargo, Dry Bulk (Dry bulk carrier)	Towing/Barge (Tugboat)
Owner/Operator	Shanghai Ming Wah Shipping Co., Ltd. (Commercial)	Signet Maritime Corporation (Commercial)
Flag	China	United States
Port of registry	Shanghai, China	Pascagoula, Mississippi
Year built	2010	1998
Official number	N/A	1070115 (US)
IMO number	9436109	9201982
Classification society	China Classification Society	American Bureau of Shipping
Length (overall)	656.1 ft (200.0 m)	103.5 ft (31.5 m)
Breadth (max.)	105.0 ft (32.0 m)	37.0 ft (11.3 m)
Draft (casualty)	41.0 ft (12.5 m)	14.0 ft (4.3 m)
Tonnage	33,547 GT ITC	191 GRT / 385 GT ITC
Engine power; manufacturer	1 x 11,412 hp (8,510 kW); MAN B&W 6S50MC-C diesel engine	2 x 1,950 hp (1,454 kW); EMD 16-645E6 diesel engines

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