



National Transportation Safety Board

Marine Accident Brief

Collision of Bulk Carrier *Yochow* with Articulated Tug and Barge *OSG Independence/OSG 243*

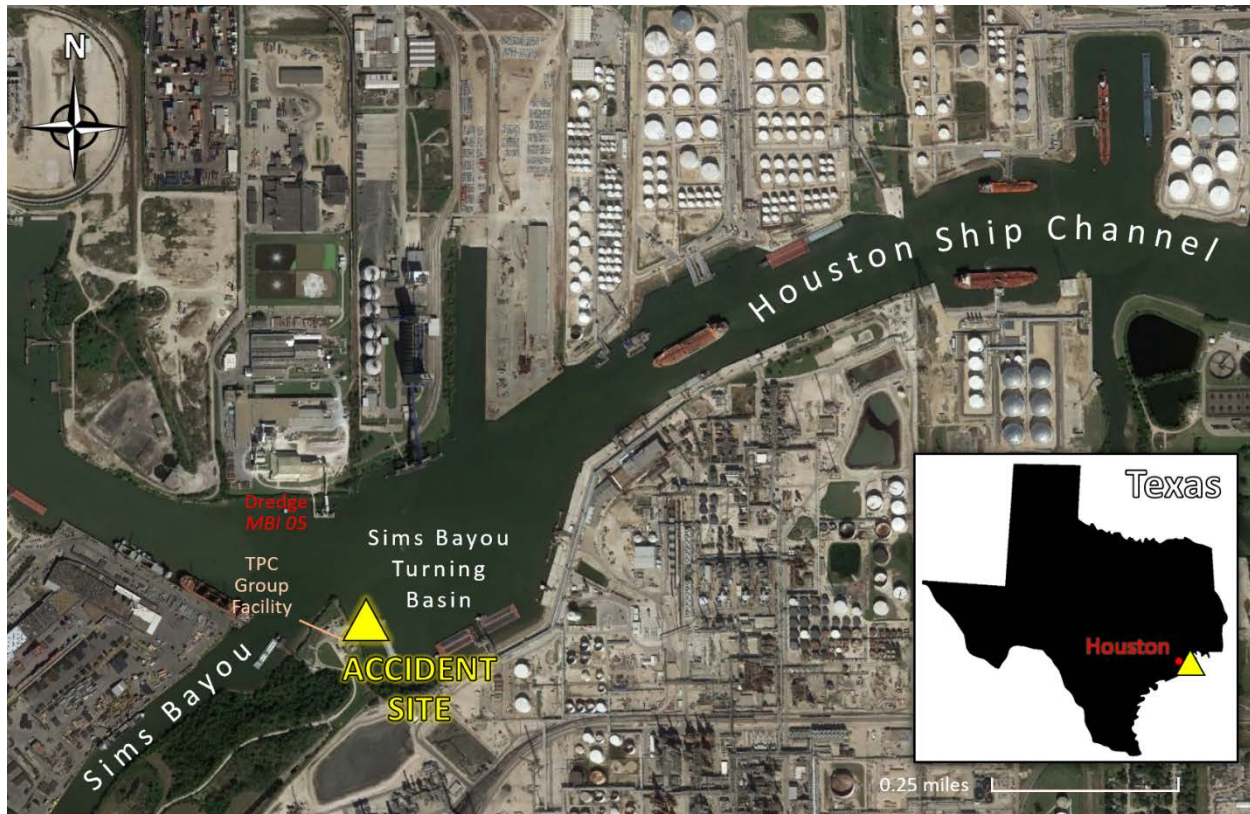
Accident type	Collision	No. DCA18FM026
Vessel names	<i>Yochow</i> , <i>OSG Independence/OSG 243</i>	
Location	Houston Ship Channel, Houston, Texas 29°43.12' N, 095°14.46' W	
Date	June 13, 2018	
Time	0250 central daylight time (coordinated universal time – 5 hours)	
Injuries	None	
Property damage	\$21,338,000 est.	
Environmental damage	None	
Weather	Clear visibility, winds southeast <10 knots, slack current, air temperature 77°F, water temperature 88°F	
Waterway information	The Houston Ship Channel extends 44 miles from Galveston across Galveston Bay to the city of Houston. ¹ It is 500 feet wide with a controlled depth of 30–38 feet at Sims Bayou Turning Basin.	

At 0250 local time on June 13, 2018, the inbound bulk carrier *Yochow* collided with the articulated tug and barge *OSG Independence/OSG 243*, which was moored at the TPC Group, Inc. facility on the Houston Ship Channel in Houston, Texas. *OSG 243*'s tanks were empty and awaiting a cargo of methyl tert-butyl ether (MTBE). As a result of the collision, two of the barge's tanks and *Yochow*'s bulbous bow were holed, and the facility suffered extensive structural damage. There were no injuries among the crew of 18 on the *Yochow* or the 8 aboard the tug *OSG Independence*, nor was any pollution reported. Damage to the facility (\$20 million), the barge (\$1 million), and the bulk carrier (\$338,000) amounted to an estimated \$21,338,000.



Bulk carrier *Yochow* under way.

¹ All miles in this report are nautical miles.



Location where *Yochow* collided with *OSG Independence's* barge, *OSG 243*, in the Houston Ship Channel. (Satellite image from Google Earth Pro)

Background

The Hong Kong-flagged *Yochow*, built in 2015, was a 590-foot-long bulk carrier of typical design operated by Beikun Shipping (Tianjin) Co., Ltd. The vessel had a flat-bottomed hull, a bulbous bow, and a single propeller driven by a slow-speed diesel engine. On arrival at the pilot station on June 12, the bulk carrier was carrying a partial load of steel coil and pipe, after having discharged cargo in Veracruz, Mexico, 2 days prior. Houston was its first US port call on this voyage, and it had no documented history of detentions or casualties. *Yochow's* 18 crewmembers were of mixed nationality. At the time of the accident, the pilot, the master, the second mate, and a helmsman were on the bridge.

The *OSG Independence/OSG 243* was an articulated tug and barge (ATB), a unit consisting of a barge with a notch in the stern for an accompanying tug to make fast with mechanical pins. It was flagged in the United States and operated by OSG Ship Management, Inc., with the *OSG Independence* accompanying the *OSG 243* in the notch. Built in 1982 as the *Ocean 211*, the tank barge was reconfigured with a double hull in 2006.² The tug and barge were moored at the "A" dock at the TPC Group facility when the collision occurred. The barge's tanks were inerted and waiting for a cargo of MTBE to load.

² The *Oil Pollution Act of 1990* phased in a requirement for petroleum to be transported in double-hull tank vessels and tank barges. See Public Law 101-380.

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The TPC facility was located on the south side of the Houston Ship Channel, west of the Sims Bayou Turning Basin. Just before the turning basin, the channel was about 300 feet wide with a controlled depth between 30 and 38 feet. Inbound vessels must negotiate a 70-degree turn to starboard just past the facility.

Accident Events

On June 12, the *OSG Independence/OSG 243* arrived at the TPC facility and moored starboard-side in order to load a cargo of MTBE.³ Connections were made with the shoreside cargo-loading arm and vapor-recovery hose, but cargo operations had not yet commenced.

A Houston pilot boarded the *Yochow* outside of Galveston at the pilot station. Interviews and documentation indicated that all the vessel's systems, including steering and bridge equipment, were functioning properly. The pilot described the ship's handling characteristics as typical for its age and design, with a tendency to "slide" due to a flat bottom, suggesting that the vessel would advance along its original course even as the heading changed. The bulk carrier was trimmed close to even keel after allowance for freshwater. Given that *Yochow's* bridge had been darkened for night vision, a rudder angle indicator was lit and easily seen from the pilot's position, and the second mate told investigators that he could still see the helmsman's movements in the dark. The engine remained in engine room control with three engineers on duty. The vessel had no bow thruster.

The pilot conned the *Yochow* from the centerline windows. The helmsman was directly behind him, with the mate near the engine order telegraph just to the helmsman's left. While on the bridge, the master would station himself near the electronic chart display and information system (ECDIS) console to the right of the helm.

The *Yochow* passage from the pilot station through Galveston Bay to Lynchburg Landing was uneventful. The second mate and a helmsman relieved the watch at midnight. This helmsman manually steered from the time he came on watch at 2345 until several hours later—without relief. The weather on the morning of June 13 was clear, wind negligible, and current slack.

The channel makes an approximate 100-degree turn to port at Lynchburg Landing near San Jacinto State Park. Upon reaching this area at 0115, the pilot gave a port 20-degree command to start the turn. The helmsman answered, "Port 20," but put the helm 20 degrees to starboard. In catching the error, the pilot ordered, "Midships," 11 seconds later, then repeated the port-20 order 2 seconds later. Using a full-ahead bell, the bridge team was able to stop the vessel's swing to starboard about 38 seconds after the original command to port and regain the channel.

Following the helmsman's error and recovery, the pilot and second mate had a brief conversation about the mate's duty to watch the helmsman. The second mate agreed to double-check the helmsman with each command. The master was not on the bridge at the time; the mate offered to call him, but the pilot declined. Although the second mate did not understand conversational English, he told investigators he understood the pilot's orders.

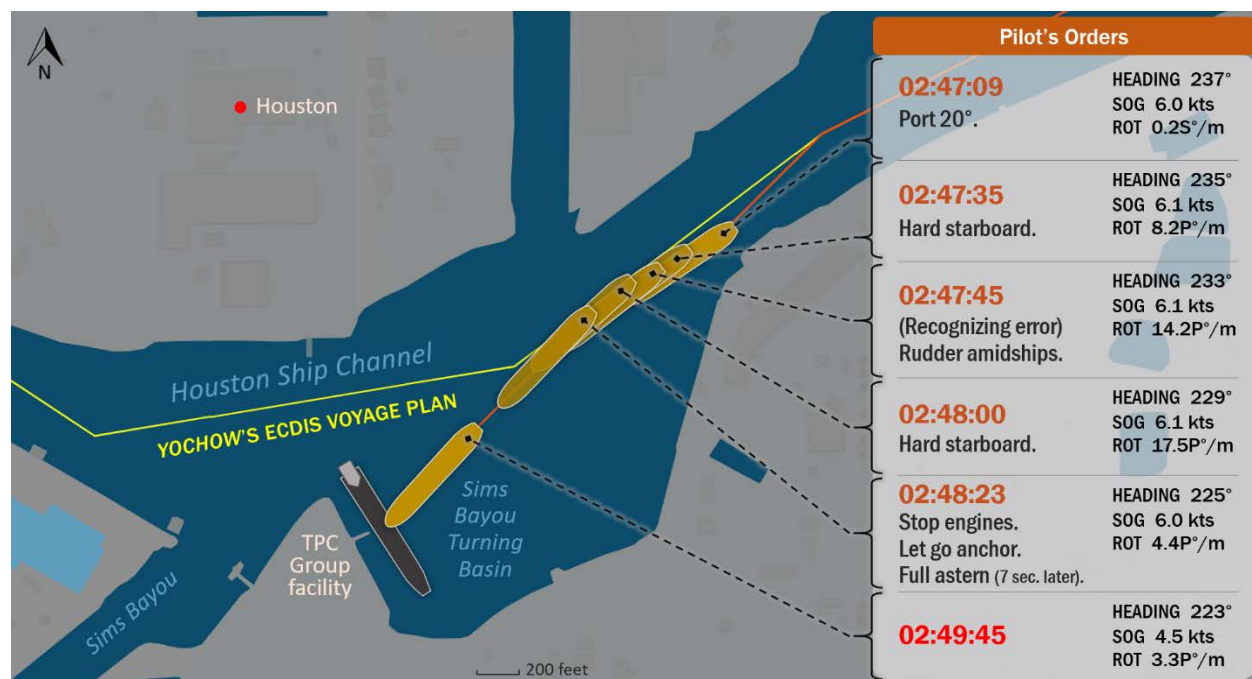
³ MTBE is a flammable additive in unleaded gasoline that reduces carbon monoxide and volatile organic compound emissions and enhances the octane content. TPC Group, Inc. is one of the leading North American producers of MTBE, primarily for export.

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The *Yochow* approached the turn at Sims Bayou about 90 minutes later at a slow bell. Prior to the approach, the pilot checked in with vessel traffic service (VTS), who informed him of the dredge *MBI 05* operating in the channel just past the turn. He requested that his office contact the dredge's crew to inform them of *Yochow*'s approach. The pilot planned to turn wide at Sims Bayou, intending to stay to the south side of the channel to pass the dredge. On the voyage data recorder (VDR), the master can be heard on the bridge at this time, although there was no conversation between the master and pilot about negotiating either the upcoming turn or meeting the dredge. The pilot gave a port 20-degree command to bring the ship slightly left, ahead of the turn, and the helmsman answered accordingly. His next order 24 seconds later (at 02:47:35) was "hard starboard" to make the turn. The helmsman repeated the pilot's order but immediately put the rudder hard to port.

Ten seconds later, the pilot recognized the error and ordered midships while tapping with his fingers on the rudder angle indicator above his head to get the helmsman's attention. It took the steering gear 15 seconds to shift from hard port to midships, and then the pilot repeated his original hard-starboard order. The rudder reached hard starboard 12 seconds later, although the ship's heading was still falling to port at about 12 degrees per minute.

When the *Yochow* was about one ship's length away from the *OSG Independence/OSG 243*, the pilot ordered at 02:48:23, "Stop engines. Let go anchor," 48 seconds after his original order to starboard. He followed this order with full astern 7 seconds later and then ordered the whistle sounded. At this point the *Yochow* was making 6 knots, and its heading was still falling to port. The pilot told investigators that increasing the engine speed to power through the turn, as he had done earlier, would risk hitting the tug, which likely had a sleeping crew on board. He chose instead to attempt to stop the vessel and risk hitting the barge ahead of it.



According to electronic data, last 10 minutes of *Yochow*'s trackline leading up to accident based on pilot's orders. (Background from Google Earth)

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With the port anchor and two shots of chain deployed, the *Yochow* collided at approximately 4.5 knots with the port side of the tank barge *OSG 243* amidships at 02:49:45. The crew sounded the bulk carrier's whistle just before, in an attempt to warn the crew aboard the ATB.

Yochow's bulbous bow penetrated the moored barge's no. 5P ballast tank from 4 feet above the waterline to the turn of the bilge and inboard along 22 feet of the bottom plating, damaging piping, framing, and reach rods. The length of the breach was 7 feet 4 inches, and the deepest penetration was approximately 10 feet. The inner hull (nos. 5P and 6P cargo tanks) was inset but not holed by the bulbous bow; however, the bow holed tank no. 6P at the top, allowing inert gas to escape. The vessel's starboard anchor also damaged 30 feet of handrail, a cantilever deck, chocks, and fish plate on the barge's port side. In addition, *OSG 243*'s starboard side, which was lying against the facility fendering, sustained indented side shell as well as damage to the framing in nos. 5S and 6S ballast tanks, the main deck, a cantilever deck, handrails, and nearby valves and deck grating. Additionally, several mooring lines parted. The tug *OSG Independence* was undamaged.

The impact of the barge against the wharf damaged the structure's pilings and walkways of the TPC facility. The barge moved approximately 70 to 100 feet forward on contact, ripping off the vapor recovery hose and causing the loading arm to fail at the ship's reducer just outboard of the manifold.

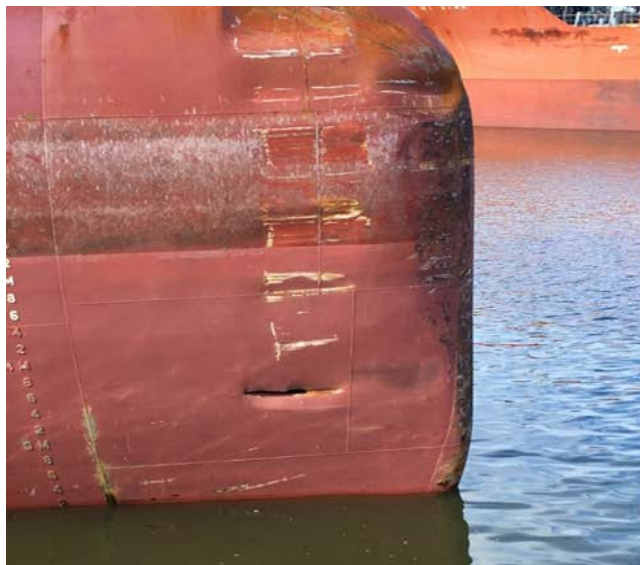
The *Yochow*'s bulbous bow was holed, and the forepeak was flooded to the waterline. The bow at the main deck was damaged where it contacted the barge's upper deck.



Damage to *OSG 243*, port side. Yellow circles identify, at top, cantilever deck damaged by *Yochow*'s bow rake and, at bottom, side shell at waterline in no. 5P ballast tank penetrated by bulk carrier's bulbous bow.



TPC facility on Houston Ship Channel. The impact pushed the pedestrian bridge off its support, crushing conduit below. (Photo by Coast Guard)



Yochow's bow showing, at left, holed bulbous bow and depth of penetration and, at right, damaged upper starboard bow.

Additional Information

Houston was the master's first American port call of the voyage. His work/rest log indicated that he had been working since 0900 the day before the accident. When the collision occurred, the master had been working for nearly 18 hours, although the *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers* (STCW) requires a minimum of 10 hours of rest within a 24-hour period. According to the pilot and master's statements to investigators, the master would leave the bridge occasionally during the passage to

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briefly refresh. Per the pilot's request, the master kept a radio with him; however, no conversation between the officer on watch and the master was heard on the VDR at any time he was off the bridge during the passage.

The work/rest log for the helmsman on watch at the time of the accident showed only 8 hours of watch the previous day. His only documented work outside of watches was a drill on June 11 and an unmooring in Veracruz the previous day. However, in a later deposition, the helmsman stated he also worked on deck from 0800 to 1730 (with a 2-hour lunch), which was not reflected in the log; in that case he did not meet the minimum of 10 hours of rest within a 24-hour period.

Analysis

The Houston Ship Channel above Lynchburg Landing is a meandering and narrow waterway with facilities lining both banks for several miles. Much of the channel before the accident site is less than 500 feet wide, with minimal room for error in shiphandling. The pilot indicated, and electronic data showed, that the bridge team was able to successfully navigate the channel and meet traffic with an understanding of the ship's handling characteristics and the prevailing conditions, without an assist tug. Investigators found no deficiencies with the steering gear or other engineering or bridge equipment.

Twice during the transit, including just prior to the accident, the pilot gave a rudder order that the helmsman correctly repeated, yet he turned the wheel in the opposite direction. In both cases, the pilot—not the watch officer—noted the error and took action to direct the helmsman to correct the rudder. Bridge procedures provided by *Yochow*'s operator were silent on the duties of the mate on watch in restricted waters, including watching the helm. The second mate told investigators though that "one of my duties as the officer on duty is to monitor the helmsman." The master's standing orders stated as follows: "Cross Check the bridge team member's action and communicate freely and openly on concerns you may have to avoid 'One Man Error'. Instruct the lookout and helmsman also to communicate freely and openly without hesitation or holding back." The pilot told investigators that it is not an uncommon scenario to have helm orders improperly executed and that pilots learn to watch for it. Giving the command midships will grab the helmsman's attention quicker than just repeating the original command.

Bridge resource management (BRM) is an industry standard for using all available technical and human resources to safely execute a vessel's passage plan. It requires all involved to maintain situational awareness and share information freely to address contingencies. Included in this concept is the expectation for the officer of the watch to check the rudder angle indicator with each helm order and the rpm indicator with each ordered change of speed. The mate on watch, who was standing next to the helm, did not notice or correct the helmsman during the two steering errors.

According to their logs, the mate and helmsman each stood 8 hours of watch per day and met *STCW* rest requirements. However, the helmsman stated that he performed work that was not reflected in the log, which the investigation found meant that he would not have met work/rest requirements. Failure to adhere to work/rest guidelines can lead to fatigue and thereby can impair a crewmember's alertness and ability to safely operate a vessel or perform safety-related duties. Further, at the time of the accident the helmsman had been at the wheel continuously for almost 3 hours, at night, without relief, and was likely fatigued.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the collision of the bulk carrier *Yochow* with the tank barge of the articulated tug and barge *OSG Independence/OSG 243* was the mate's failure to effectively monitor the helmsman, contrary to the principles of good bridge resource management. Contributing to the accident was the lack of company and shipboard oversight to ensure crewmembers adhered to work/rest guidelines, resulting in fatigue of the helmsman.

Managing Fatigue

Fatigue impacts every aspect of human performance, including decision-making, reaction time, and comprehension, all of which affect seafarers' ability to safely navigate. Having fatigued crewmembers in critical positions when navigating a busy channel increases the probability of errors that lead to incidents. Companies should include fatigue management procedures in their safety management systems and ensure compliance with applicable work/rest requirements.

Vessel Particulars

Vessel	<i>Yochow</i>	<i>OSG 243</i>
Owner/operator	Grand Famous Shipping, LTD / Beikun Shipping Co., LTD.	Maritrans Operating Partners LP/ OSG Ship Management, Inc.
Port of registry	Hong Kong	Wilmington, Delaware
Flag	Hong Kong	United States
Type	Bulk carrier	Tank barge
Year built	2015	1982; reconfigured to double hull in 2006
Official number (US)	Not applicable	646669
IMO number	9728394	None
Classification society	NK	ABS
Construction	Welded steel	Welded steel
Length	590 ft (180 m)	557.3 ft (169.9m) (w/o ATB)
Draft	32.2 ft (9.8 m)	31.5 ft (9.6 m)
Beam/width	98 ft (30 m)	83 ft (25.3 m)
Gross and/or ITC tonnage	21,538 ITC	14,513 GRT / 16,286 ITC
Engine power; manufacturer	7,067 hp (5,720 kW); MAN-B&W 6S46ME-B8.3	Not applicable
Persons on board	18	0

NTSB investigators worked closely with our counterparts from Coast Guard Sector Houston/Galveston throughout this investigation.

For more details about this accident, visit www.nts.gov and search for NTSB accident ID DCA18FM026.

Issued: April 23, 2019

The NTSB has authority to investigate and establish the probable cause of any major marine casualty or any marine casualty involving both public and nonpublic vessels under Title 49 *United States Code*, Section 1131(b)(1). This report is based on factual information either gathered by NTSB investigators or provided by the Coast Guard from its informal investigation of the accident.

The NTSB does not assign fault or blame for a marine casualty; rather, as specified by NTSB regulation, “[NTSB] 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 conducting investigations 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).