**NATIONAL TRANSPORTATION SAFETY BOARD**
**OFFICE OF MARINE SAFETY**
**WASHINGTON, D.C.**

# OPERATIONS GROUP FACTUAL REPORT

## A. ACCIDENT INFORMATION

| | |
|---|---|
| NTSB Accident No.: | **DCA15MM017** |
| Accident Type: | Collision |
| Location: | Houston Ship Channel, Upper Galveston Bay at buoys 89 & 90 in the vicinity of Morgan's Point. Lat 29-40.35N, Long 94-58.74 W 51.6′ N |
| Vessel No. 1: | Liberian-registered bulk carrier *Conti Peridot* |
| | IMO No. 9452634, Official No. 92092, 623 feet long, 106 foot beam, 32,983 gross tons, steel construction, built in 2011 |
| Owners, No. 1: | Conti Peridot Shipping Ltd. |
| Vessel No. 2: | Danish-registered chemical tanker *Carla Maersk* |
| | IMO No. 9171503, Official No. 19336 ZR 1999, 599 feet long, 106 foot beam, 29289 gross tons, steel construction, built in 1999 |
| Owners No. 2: | A.P. Moller – Maersk A/S |
| Date: | March 9, 2015 |
| Time: | 12:30:45 Central Daylight Time (CDT) |
| Injuries: | None |
| Complement: | 25, *Carla Maersk* |
| | 24, *Conti Peridot* |
| | 1 Houston Pilot aboard each vessel |

## B. OPERATIONS GROUP

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## C. ACCIDENT SUMMARY

For a summary of the accident, refer to the *Accident Summary Report* in the docket for this investigation.

## D. DETAILS OF THE OPERATIONS INVESTIGATION

Operations Accident Narrative


**Figure 1.** Bulk carrier *Conti Peridot*. The 623-foot–long vessel was powered by a single 9,480-kilowatt STX Man-B&W diesel engine and could make 14.2 knots. One pilot joined the master and other crewmembers on the bridge for the transit to its berth at City Dock 24 in Houston, Texas. .

The *Conti Peridot* arrived at the outer anchorage to the port of Houston on the 4th of March, 2015 after having departed Manzanillo, Mexico on the 18th of February and having transited the Panama, Canal. Due to visibility restrictions because of fog and docking logistics, the vessel remained at anchor until notification of berthing and pilot boarding time. The vessel heaved anchor on March 9th about 0730 and got underway towards the pilot station. The Houston pilot boarded the vessel at 0932 on in the fairway channel outside the breakwater at approximately buoy's 1 and 2 while the vessel was underway. Upon arriving on the bridge the master and pilot conducted a standard but required Master Pilot Exchange (MPX).[1] The pilot stated in interviews that he was aware there was a 100 percent chance of rain but at the time of the boarding it

[1] MPX- Master Pilot Exchange – a sharing of information, whereas the pilot informs the master and bridge team of the vessel of facts and necessary information for the harbor or waterway and the master informs the pilot about his vessels characteristics and other pertinent information for a safe transit to be conducted.

was a nice day with unlimited visibility. He had checked the weather forecast both the night before and while on the pilot boat prior to boarding, and in each case there was no fog mentioned in the forecast. While on board the pilot boat and enroute to the vessel the pilot referenced a "ship notes" [2] sheet. The note stated that 2 years before the accident, when another pilot known to the current pilot, had transited the *Conti Peridot* into Houston with a 35' draft[3], it was recommended that the next time the vessel called it should be transited with a 1-1.5' trim by the stern and possibly use an escort tug. On the accident transit, the *Conti Peridot* had a draft of 31'-03" forward and 31'-04" aft, essentially even keel. The pilot told investigators that after reading the "ship note" he made sure to judge the vessel's handling ability at the first couple of turns, and after doing so, in his assessment he could handle the ship. These turns were, at the time, accomplished low in the Bay in the first couple of reaches in the channel about 1000 hours at buoys 7 and 8, and then again at buoys 9 and 10. When these turns were executed the visibility was still fine. A short time later at about 1025, the *Conti Peridot* was overtaken (agreeably by both pilots) at the turn near buoy 16 by the *Nave Capella.* Again the Houston pilot aboard the *Conti Peridot* observed no handling problems.

The *Carla Maersk* was berthed at Petro-tex "A" dock (Texas Pertrochemical Terminal) in the Houston ship channel, near the Arco turning basin. The Houston Pilot boarded the vessel at the berth at 0900, and after conducting an exchange of necessary information with the vessel master the vessel's crew commenced preparing to get underway from the dock. At 0953 with the assist of two tugs, the vessel was all clear of

[2] Ship notes: Vessel identifying characteristics, usually filed by other (Association) organization pilots who have piloted the vessel before and felt that it be prudent or necessary to document certain characteristics about the vessel that would aid other pilots during future transits. This is not a requirement by the Association.

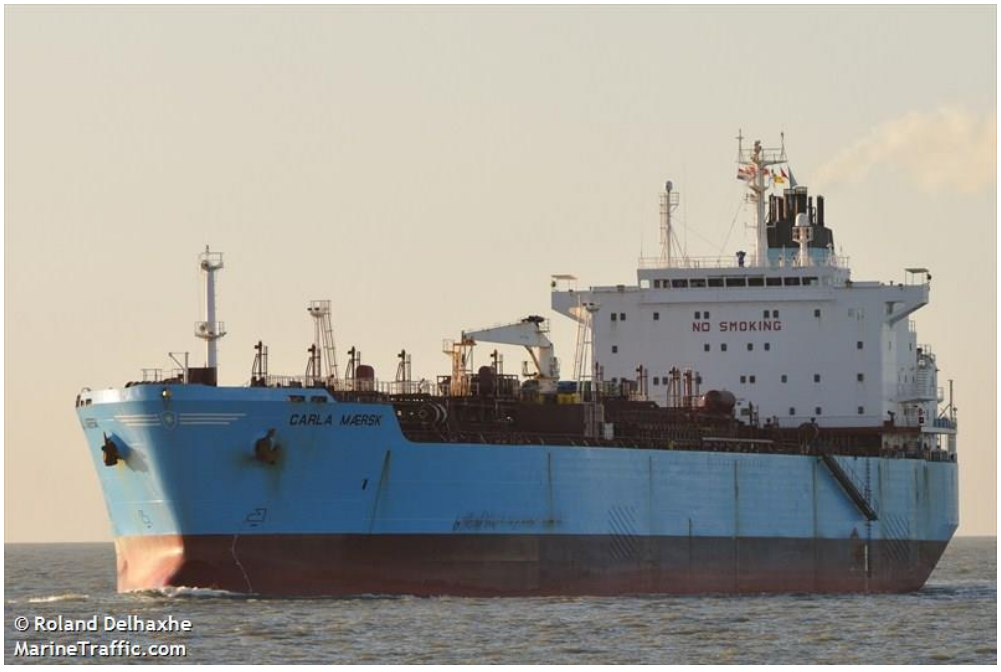
the berth and after letting the two tugs go the *Carla Maersk* commenced its transit outbound for sea following an auto carrier down the channel. The vessel was on an even keel with a draft of 10.2 m forward and 10.2 m aft. According to the pilot in the transit off the dock and up to the collision there were no problems handling the ship, or with the crews or engines performance. All steering orders were followed and all commands given to the engine were responded to appropriately.

***Unless otherwise mentioned for the duration of this report when the pilot or master give an order it can be assumed that said order has been verbally acknowledged by the crew and carried out.***

[3] Depth to which the hull sinks into the water column.

**Figure 2.** Chartlet of the Houston Ship Channel in Upper Galveston Bay including Morgan's Point and the entrance to Barbour's Cut. The red star denotes the accident site near navigation marker 89.

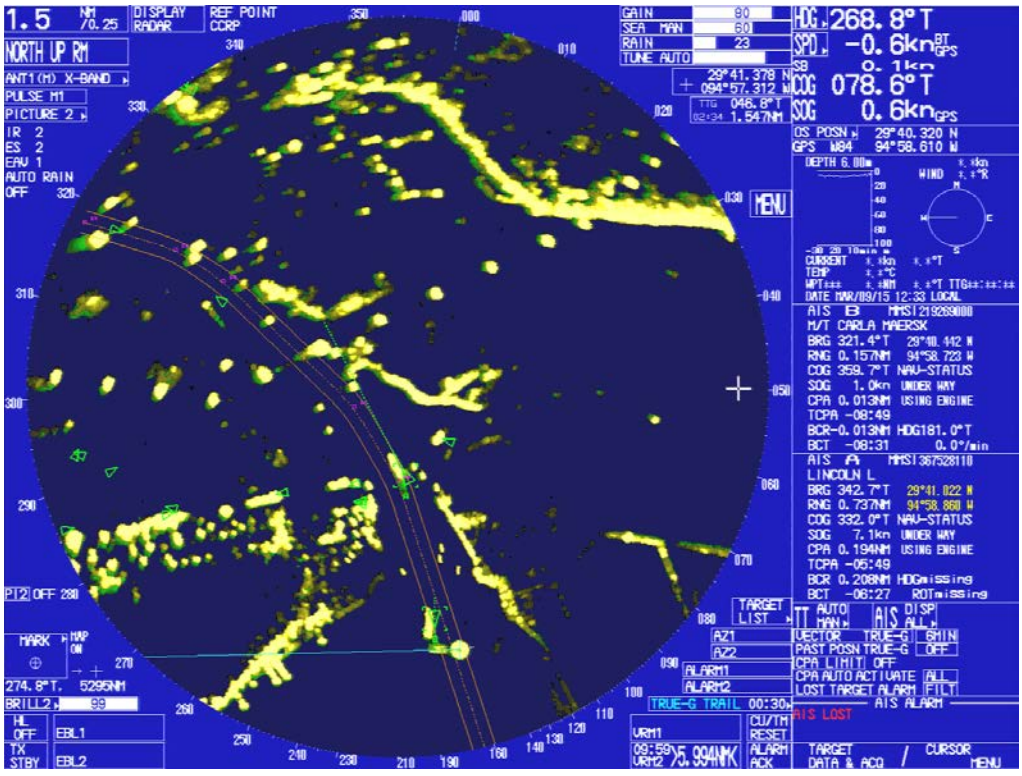
The *Carla Maersk* was following the car carrier *Gaia Leader* outbound in the channel about a mile to a mile and a half. The usual spacing for transits up and down the Houston Ship Channel for deep draft ships according to the pilots is about 1.5 miles. The pilots stated that this allows enough room to react in an emergency and also gives enough spacing when the vessels are meeting head on in the channel to maneuver safely around each other and steady up in the channel in preparation for the next meeting situation. The maneuver is common to the Houston Ship Channel and practiced in other similar waterways when large vessels are meeting.[4]




[4] The meeting maneuver referred to the "Texas chicken" maneuver is known locally to mariners who regularly navigate large vessels on the Houston Ship Channel. As two vessels approach from opposite directions, both turn to starboard to allow water displaced by their bows to move the ships away from each other and from the channel's centerline. After they pass, the suction of the displaced water flowing in behind the ships naturally pulls them back toward the center of the waterway.

**Figure 3.** Chemical Tanker *Carla Maersk*, view of the port (left) bow, the 599 foot long vessel's hull is light blue hull with a white superstructure. The port gangway is down along with a pilot ladder in anticipation of either boarding or disembarking a pilot. .

The *Carla Maersk* continued outbound through the channel at about 9 knots on average with master and pilot on the bridge. About half way through the transit to Morgan's Point the pilot heard that the Bar[5] was closed (1130) and knew that no more inbound traffic other than what was already in the channel would be coming up to meet him on the way down to the Gulf. With the low ceiling and rain he could see only half the height of the San Jacinto monument, but eventually, once they got down to Morgan's Point, they could still see about ¾ miles.




[5] The "Bar" closing referenced here is solely based on the observations and evaluation of conditions in and around the harbor by the "next" pilot to board an inbound vessel for bound for Houston. The Houston pilot can base this decision on current and predicted weather, local conditions, and additional information available from other pilots on the channel. The pilot term "closing the Bar," is separate and apart from the more regulatory term of "Closing the Port," which can only be issued by the United States Coast Guard Captain of the Port.

**Figure 4.** Radar image captured from *Conti Peridot* VDR data. At bottom of screen the collision of the two vessels is shown to the west side of the channel. The time on the image is 1231 local time. Other vessel information relative to the *Conti Peridot* is also displayed at about the moment of impact.

Meanwhile, further to the south in Galveston Bay as the *Conti Peridot* approached and met the *BW Kyoto* at 1115 between buoys 46 and 48, they still had unlimited visibility and the *Conti Peridot* pilot remarked he had no problem getting the ship back to the centerline after the maneuver. The *BW Kyoto* was 755' long and 118' wide.

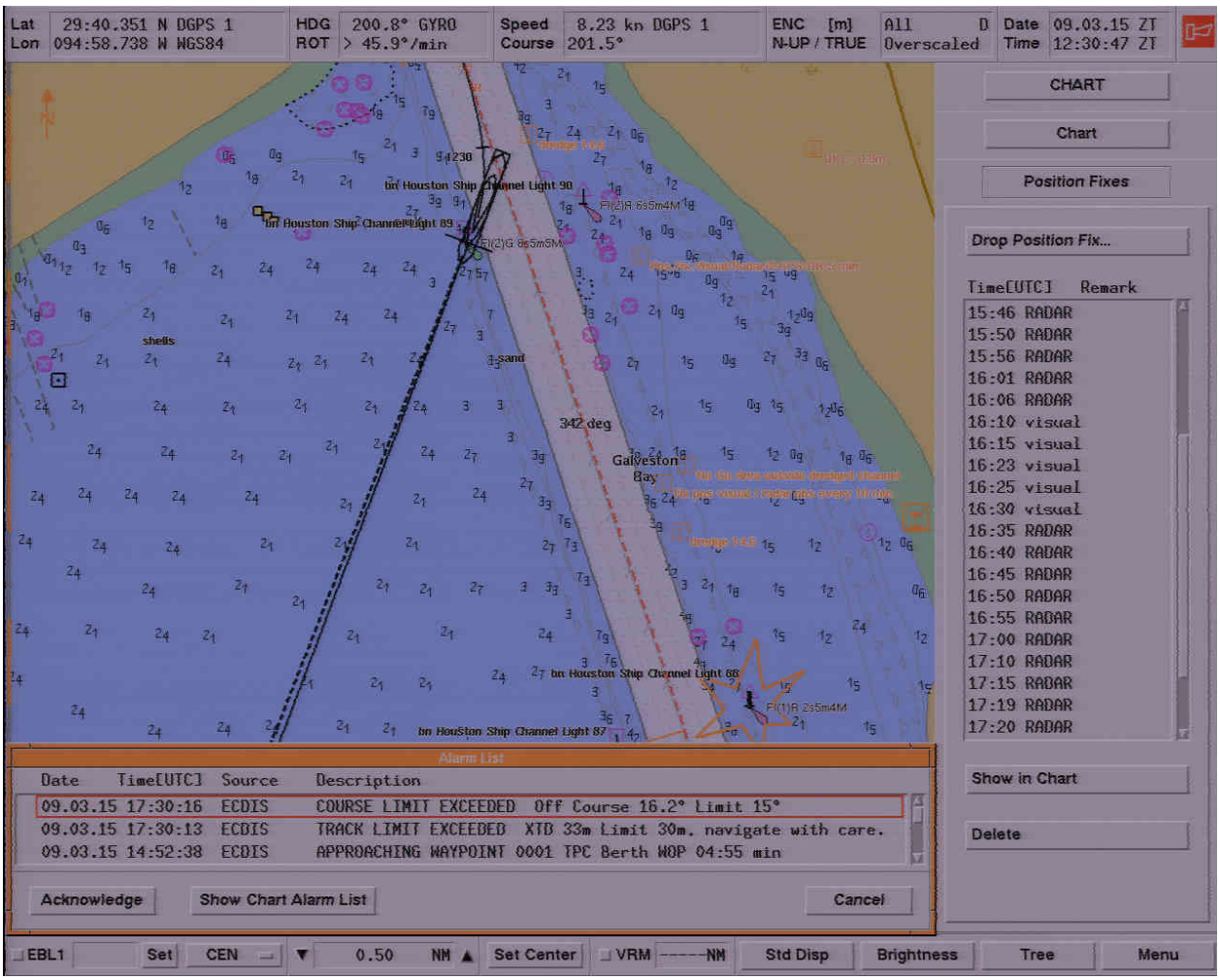



**Figure 5.** ECDIS (Electronic Chart Display Information System) image from Carla Maersk at approximate time of accident 1231. Image shows the southbound Carla Maersk leading off to the right and out of the channel. The image doesn't

show the *Conti Peridot* at the time of impact. All information displayed on the screen is relevant to the *Carla Maersk*.

Seven minutes later at 1121 the Conti Peridot was at buoys 51 and 52 and visibility had dropped to 2 miles. The pilot had just taken the *Conti Peridot* through a 10 degree turn and again stated to investigators that he experienced no handling problems. He reported into Vessel Traffic Service (VTS[6]) that he was at Redfish and visibility was two miles[7].

At 1135 the pilot had now lined up his vessel to meet the *Karoline N*, a 745' vessel with a 105' beam (width). At this point, the visibility was "zero" in the pilot's own words, but in measureable distance he estimated it to be 800-900' as he met and passed the *Karoline N* at navigation marker 60. Upon moving to the right and passing the *Karoline N* port to port (1 whistle) as previously agreed to by both pilots, the *Conti Peridot* now "sensed the void" in the channel behind the *Karoline N* from the displaced water as they passed and in the pilot's words the *Conti Peridot* "dove to the left." The pilot told investigators that his vessel now smelled the bank and he was "doing everything he could to control her."

[6] VTS – Vessel Traffic Service, the purpose of a Vessel Traffic Service (VTS) is to provide active monitoring and navigational advice for vessels in particularly confined and busy waterways. VTS Centers encompass a wide range of techniques and capabilities aimed at preventing vessel collisions, rammings, and groundings in the harbor, harbor approach and inland waterway phase of navigation. They are also designed to expedite ship movements, increase transportation system efficiency, and improve all-weather operating capability.

[7] This is a mandatory call in point for VTS and Redfish is a small channel that connects the main Houston Ship Channel and Galveston Bay, mostly used by smaller craft.

After the vessel dived to the left, a replay of the pilots PPU[8] showed the vessel coming off the left bank of the channel and heading for the right bank. Prior to meeting the next vessel the pilot assessed that the move to the right bank was also cause for concern and he radiod the next vessel he was meeting and the Houston pilot aboard it. The next vessel was the *Stolt Span* and visibility was estimated to be 400-600 feet. In other words the pilot on the *Conti Peridot* could barely see his own bow from time to time. Over the VHF radio he told the other pilot, "pay attention, watch me, I'm coming off the bank." The pilot told interviewers that the pilot aboard the *Stolt Span*, radioed back acknowledgement and stated "we can make this work." The *Conti Peridot* pilot told investigators that from the time he met and passed the *Karoline N* and then passed the *Stolt Span* it took him about 2 miles to get the vessel under control. These two meeting and passing maneuvers occurred while the engine was on full ahead and the vessel was making about 11 knots average speed. The speed dropped significantly by a knot or 2 during this 2 mile stretch between the two aforementioned vessels, due to the vessel's motion from one side of the channel to the other.[9]

After passing the *Stolt Span* and regaining heading control of his vessel, the *Conti Peridot* passed navigation marker's 70-74 with visibility diminished to less than the ship's length and the pilot unable to see the bow. At 1206 the *Conti Peridot* made the turn to starboard at markers 75 and 76 and proceeded past the southern portion of the Bayport Flare. About 1210 and north of the Flare passing marker 78 to starboard, the pilot assessed the outbound traffic he would be meeting along with the tow boat *Lincoln*

[8] Portable Pilot Unit: a compact laptop computer with electronic navigation and charting software used by pilots in addition to the vessels own navigation equipment

*L* and its barge; which was ahead of him and north bound in the barge lane to the *Conti Peridot's* starboard side. The pilot told investigators that he wanted to "take the *Lincoln L* out of the picture." As he exited the Flare he ordered the engines to half ahead which he felt would give the towboat time to move further ahead and out of the equation so he wouldn't be meeting deep draft ships at the same time a towboat was close alongside.

With the *Conti Peridot* now on the Morgan's Point inner range which has a true course of 341, the *Conti Peridot* pilot was now setting up for meeting the next three downbound vessels.

Aboard the *Carla Maersk* about the same time at 1207.5, the pilot and master were starting to comment on the reported decreasing visibility, especially south of Morgan's Point in the bay and farther south, and the ships they would have to meet as they proceeded. The pilot stated that he didn't want to meet the inbound ships in the visibility conditions he was anticipating, and went on to say that if there were no inbounds it'd be okay to keep going. The two continued to weigh the pros and cons of the situation as the vessel continued to transit south at about 9 knots with the engines on half ahead. They discussed the possibility of going into Barbour's Cut with or without the aid of tugs and then anchoring in the turning basin to wait out the fog and/or traffic. The discussion continued up to about 1221 when the pilot commented something similar to, it's too late now we gotta keep going.

With no change in decision the vessel continued south and the pilot commenced to prepare for the transit down the channel and to enter Upper Galveston Bay south of

[9] Times, vessels names, and speeds were all taken from the playback of the *Conti Peridot's* pilots

Morgan's Point. The vessel called out another lookout from the crew and the pilot had the mate change the radar to 1.5 mile scale and the pilot said he moved his laptop from the front bridge windows back to where he could view the radar with his laptop in front of him. Additionally they commenced sounding the fog signal. The *Conti Peridot* during the transit and up to the time of the accident had never initiated fog signals.

About 15 minutes before the accident the pilot on the *Conti Peridot* contacted the pilot on the *Gaia Leader* and initiated a port to port meeting arrangement. The pilot was positioning his vessel for a standard meeting and passing execution. The *Conti Peridot* engine was on half ahead and both vessels as they approached were making approximately 9.5 knots. The two vessels met and passed at approximately 12:24 with nothing out of the ordinary said on the radio or heard on the VDR. During his interview, the pilot stated that he did "squeeze" the other vessel by staying in the center anticipating the his ship was going to take a run off the bank. After the *Gaia Leader* passed due to her large displacement his vessel then dove hard to the left, similar to what had happened in passing the Stolt Span (an hour before) with the *Conti Peridot* seeking the void left astern of the *Gaia Leader* due to its passing.

When the *Conti Peridot* met the Gaia Leader the *Carla Maersk* was still up around the corner of Morgan's Point about 2 miles away. The two vessels and their passing manuever could not be seen from the *Carla Maersk* due to the fog.

Shortly after the *Conti Peridot* and *Gaia Leader* passed each other the pilot on the *Conti Peridot* radioed the pilot aboard the *Carla Maersk* and again initiated a port to

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PPU.

port (one whistle) passing arrangement request. The time was approximately 10 minutes before the collsion. The pilot on the *Carla Maersk* acknowledged the request. The pilot on the Conti Peridot now concentrated on setting up for meeting the *Carla Maersk*.

The Houston pilot aboard the *Conti Peridot* described the moments leading up to the collision to investigators during his interview. After passing the Gaia Leader his vessel now made a run for the left bank and he applied counter rudder to try and slow the rate of turn and heading swing to port. At some point the vessel after running to the left now started back to the right. The pilot applied counter rudder to deal with a strong run to the right hand side bank. He continued that as he came off the right bank and saw that his vessel's speed had been reduced, he realized he needed more "wheel wash," or thrust over the rudder, he ordered the engine to full ahead with the rudder hard right. At the same time the pilot was attending to the manuevering commands aboard the *Conti Peridot*, he was also on the radio giving warning to the pilot aboard the *Carla Maersk*. He stated to investigators that he remembered trying to give a warning to the pilot on the *Carla Maersk*, something to the affect of, I'm heading your way, and try to miss me. He also stated that he had asked the other pilot to come left. This was opposite of the previously arranged port to port passing but the pilot went on to explain that since his vessel was moving strongly to the left he was hoping the other pilot could do the same to avoid the collision. The pilot on the *Carla Maersk* replied that he could not come left as he had already committed to his move to starboard in preparation for their meeting. As the *Conti Peridot* came off the starboard bank and continued to sheer to the left visibility finally opened enough for the pilot and bridge team aboard the *Carla Maersk* to finally see the bow of the bulker heading for them across the channel. The pilot on the *Carla*

*Maersk* ordered the rudder to hard right and the engine to full ahead in order to turn as quickly as he could away from the oncoming bow of the *Conti Peridot.*

At 1231 the bow of the *Conti Peridot* struck the port side of the *Carla Maersk* just forward of amidships. The collsion ruptured several ballast and cargo tanks, which released the cargo of the *Carla Maersk* into the channel and environment. The bow of the *Conti Peridot* was damaged and the port anchor was lost due to the collison. Anchors on neither vessel were deployed during the accident sequence. Both vessels shortly thereafter seperated and anchored in the vicinity of the collision.

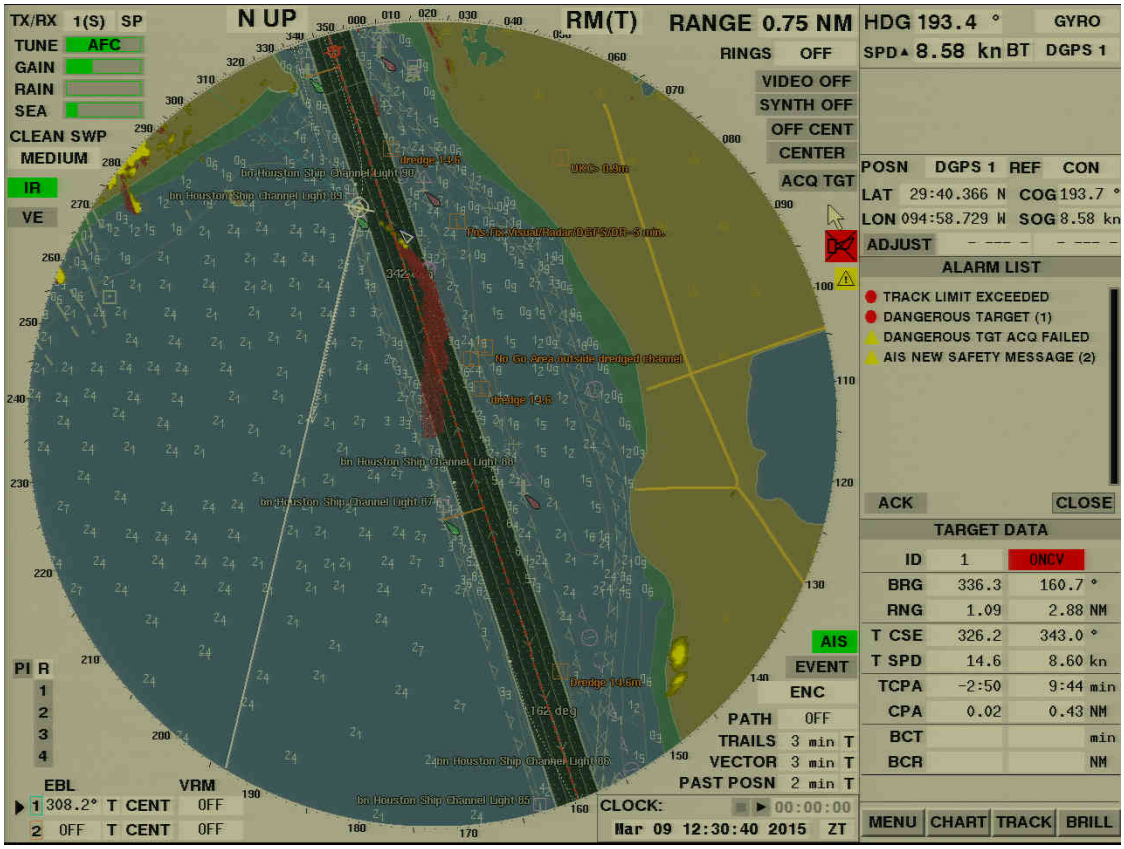

**Figure 6.** Image of *Carla Maersk* ECDIS display with radar overlay about the time of the collision. The *Carla Maersk* is to the west side of the channel at the top of the screen with the white line (cursor) extending from it to the edge of the circle. The *Conti Peridot* is seen slightly to the lower left of the *Carla Maersk* and the red "tracks" of its radar return and previous path is depicted.

The pilot in addition to the description of the accident offered to investigators a description of the handling of this type and other certain types of ships calling and their operating peculiarities from his experience. He stated that some certain ships, and certain classes of ships don't like shallw water and narrow channels like ours, (the Houston Ship Channel). He described bulk carrier ships when even-keeled and over 30 foot draft of about 625 foot (length) by about 106 foot (beam) dimension are notorious for being a poor handling ship, even in good visibility.

## Hydrodynamic Forces

The hydrodynamic force referred to as "bank effect," which the *Conti Peridot* pilot described encountering several times on the day of the accident, is common. In fact, pilots and experienced mariners regularly use bank effect to their benefit in maneuvering vessels in narrow waterways. The following are brief and general descriptions[10] of the hydrodynamic forces that played a role in the *Conti Peridot's* transit on the day of the accident.

### Bank Effect and Using Bank Effect to Advantage.

[10] The descriptions are derived from Henry Hooyer's book, *Narrow Channels and Their Effects on Ship Handling*. Cornell Maritime Press, Inc., 1983, pp. 85-87 and 89.

When a ship is transiting close to a waterway bank, water builds up between the bow of the ship and the bank.[11] The water build-up results in higher pressure against the bow on the "on-shore" side and a lower pressure on the "off-shore" side. The drop in pressure on one side creates an imbalance, and the imbalance is the source of the bow's deflection away from the bank. To keep the ship to one side of the waterway, rudder must be applied: the closer the ship is to the bank, the more rudder (greater rudder angle) is needed to compensate for bank effect.

Bank effect can be used to a mariner's advantage, such as in navigating a bend in a narrow waterway. Just before entering the bend, the ship is allowed to come closer to the outside bank of the bend. Once bank effect begins pushing the ship's bow away from the bank, the mariner can control the bank effect with, as an example, 10 degrees of rudder. While in the bend, the ship will then turn without rudder effort—that is, with the rudder at midship or with only a few degrees of rudder input—because the stern suction (explained below) makes the ship turn.

**Stern Suction**. When a ship encounters bank effect and its bow sheers, the stern comes closer to the bank from which the bow sheered. As a result of the stern's proximity to the bank, suction on the stern becomes stronger. Large deep draft vessels generate strong suction effect in narrow waterways. Mariners who are experienced in

[11] When a ship operates in an area with a shoal or shallow water near the channel edge, a positive (high) pressure area builds up off the bow near the shallow water and pushes the bow away from the shallow water or bank. This effect is known as bow cushion. As the water flow moves down the vessel's side, a negative (low) pressure area builds up at the vessel's stern and moves the stern toward the shallow water or bank. This effect is known as stern suction. Stern suction is stronger that bow cushion and requires constant corrective rudder and increased power to overcome.

taking ships through narrow waterways are able to anticipate suction and control it (such as using the suction to turn the ship).

**Breaking a Sheer**. Before a sheer develops, bank effect should be anticipated and preemptive rudder applied, such as a momentary 20 or 30 degrees. If that does not steady the ship, increasing the engine rpm can help. Increased engine thrust translates quickly into stronger rudder force (longitudinal inertia prevents the ship from gaining speed too quickly). When the ship steadies under hard rudder and increased engine rpm, the engine should be brought back to the original speed and, if the ship is still close to the bank, the rudder should be decreased gradually. The reason for the gradual rudder decrease is that, as long as the ship is close to the bank, the ship is still under the influence of bank effect. Until the ship is clear of bank effect, some amount of rudder should be applied.

**Figure 7.** Picture of the *Carla Maersk* navigation bridge shown from port to starboard. Consoles are equipped with radars, ECDIS's steering stand located in the center and control console for telegraph.

**Figure 8.** Picture of the *Conti Peridot* navigation bridge looking from port to starboard. Center consoles are equipped with radars and ECDIS along with centered steering stand and control panels for Telegraph and communications equipment

## Dynamic Instability

In addition to the hydrodynamic forces acting on the vessel, the trim of a vessel affects its handling characteristics. The *Conti Peridot* was evenly trimmed when it commenced its inbound transit, that is, the ship had virtually the same draft forward and aft. Had the *Conti Peridot* been trimmed by the stern to a greater degree as opposed to the even keel trim existing at the time of the accident, its handling characteristics would

have been improved. According to a widely used shiphandling text, "The steering characteristics of a ship on an even keel vary depending on the ship's hull form. A ship with a large block coefficient[12] steers poorly, tending to be directionally unstable.[13] This condition is amplified if the ship trims by the head as she enters shallow water."[14] The *Conti Peridot* had a "full" hull form , with a large block coefficient, and the vessel was transiting a relatively shallow channel. Further, evenly trimmed, full vessels tend to trim by the head (go down by the bow) proportionally with increased speed, meaning the draft forward will increase while the draft aft will decrease.

The Houston pilot aboard the *Conti Peridot* related his experience to investigators stating that these "similar type ships, bulkers with lengths of about 620' and beams of about 106,' and with a draft over 30,' these types of ships are really notorious for being a poor handling ship.[15]

Maintaining a deeper draft aft than at the bow, known as stern trim, is important because as a ship's stern trim increases, it becomes more directionally stable and "from a shiphandler's point of view….a ship steers better" as a result; a less stable ship requires "more rudder for a longer period of time [to check its swing] than is required to start that swing."[16] Previously in this factual it was noted that a "ship note" regarding the *Conti Peridot* was issued and kept on record for all future Houston Pilots and the current

[12] Block coefficient is the ratio of volume of a ship's displacement to the volume of a rectangular box around the submerged portion of a ship's hull.

[13] The ABS *Guide for Vessel Maneuverability* states, "An important aspect of maneuverability of a vessel to stay on course." Directional stability is the tendency of a ship to maintain a straight-line course with the rudder angle at zero, or midships.

[14] D. H. MacElrevey, Shiphandling for the Mariner, 2nd ed. (Cambridge, MD: Cornell Maritime Press, 1988). pp. 49-52.

[15] Quote from Conti Peridot pilot interview p 19, Lines 9-21.

accident pilot to read. The note from the previous pilot who rode the ship about 2 years before with a 35' draft stated that the vessel should have a draft or trim by the stern of 1 to 1.5 feet.'[17]

## Navigation Bridge Personnel

**Houston Pilot aboard *Conti Peridot*:**

The pilot at the time of the accident was a 1975 graduate of Texas Maritime Academy in Galveston. Upon graduation he worked for Sabine Towing and Transportation as an Able Seaman and quartermaster (steering). He worked for Sabine for 16 years and worked his way up to attain a masters position. He left Sabine in 1991 to become a Houston pilot. He participated in the deputy program[18] for two years and upon successful completion became a full branch pilot[19] in 1993 up to present. Up to the day of the incident the pilot had handled over 4,900 ships. The pilot stated during the interviews that he was well rested and had enough sleep. He wore reading glasses but did not need glasses to see distances. He stated there were no medical issues affecting his job or license and mentioned two prescription medications he was taking and added he was taking no "over the counter" medications. Prior to this incident he had never been in a collision. The pilot also stated to investigators that the crew did everything he asked of

[16] Shiphandling for the Mariner, pp.49-52.

[17] Ship note referenced above located in docket

[18] The deputy program commences after the pilot's application is accepted by the Pilot Board. A 3 year program then begins with the deputy pilot riding along with a senior pilot for 6 months who critiques and assesses the trainee's ability. The training starts with vessels of smaller tonnage, length and draft, and as the new pilot progresses, the ship size the are allowed to pilot increases accordingly.

[19] Full Branch is a term given to pilots once completed the deputy or apprenticeship program and are now qualified to singularly pilot any vessel calling at the port of Houston.

them. At the time of collision the pilot could see the bow of the *Carla Maersk,* but not the house.

**Houston Pilot aboard *Carla Maersk*:**

The pilot at the time of the accident started working on harbor tugs after graduating high school in 1976. The pilot continued working on harbor tugs achieving an AB endorsement and then a license about 3 years later and started working for Exxon pushing oil barges for two years. All maritime training prior to applying for the Houston Pilots was hawsepipe (experience gained working directly in the marine industry). The pilot's experience since becoming a full pilot included thousands of vessel transits of all sizes. The only Bridge Resource Management (BRM) training he had was during some shiphandling training in 1998 and nothing since. The pilot recalled getting at least 6-8 hours sleep for the past three nights prior to the accident but could not recall the exact hours. He stated he obtained about 6-61/2 hours sleep and felt well rested prior to his assignment aboard the *Carla Maersk.* His last yearly physical exam was in November of 2009 and he was taking prescription medication for high blood pressure.

***Carla Maersk* Master**:

The Master of the Carla Maersk was of Swedish nationality and 43 years old at the time of the accident. The master of the Carla Maersk started sailing in 1988 as ordinary seaman and later as an able bodied seaman. He attended a Swedish Maritime Academy in 1999 and after graduating from the academy started working as a licensed deck officer in 2002. He obtained his master's license in 2009 and has been sailing as

master ever since. He has only sailed on vessels similar to the *Carla Maersk*, specifically, chemical tankers. On average he sails approximately six months per year and first came aboard the *Carla Maersk* in August of 2012. He has been into or out of the Houston area (channel) a couple dozen times. He has not worked with the Houston pilot aboard the *Carla Maersk* before. He was aware of the maneuver (meeting head on and then break to starboard) for meeting vessels in the channel because of his previous visits.

The pilot and master conducted an MPX prior to departing the berth. At the time of the exchange (prior to the "Bar" closing) the pilot informed the master there were eleven piloted ships inbound, to which the master told investigators was normal for his experience, along with the various tow traffic. The discussion included the weather, rain but no prediction of fog. The master told investigators that in assessing the pilot he was very confident in the pilots ability at the time. The master responded that the Houston Ship Channel was challenging when asked to describe transiting it by investigators during his interview. He stated that one way traffic would be safer than "texas chicken" meetings. The master told investigators that no cell phones were in use on the bridge either by the pilot or anyone on the bridge team around the time of the accident. He estimated obtaining about 8 hours of sleep per night for the 3 previous nights while they were loading cargo in port and felt good the morning they were to depart.

***Conti Peridot* Master**:

The master of the *Conti Peridot* was of Filipino nationality and 53 years old at the time of the accident. He graduated from the Philippine Merchant Marine Academy in 1983. He has been sailing as master since 2004 in all oceans around the world and has been aboard the *Conti Peridot* now for the second time after joining about a month ago before the vessel left Manzanillo bound for Houston. During the MPX the *Conti Peridot* master recounted that in discussing upcoming weather for the inbound transit they had only anticipated rain in the forecast, not fog. The conversation continued to if visibility was to become a problem, what were the options, and that once committed into the narrow parts of the channel you have to continue. The master felt comfortable with the pilot and could "sense that he's a very responsible pilot." The master confirmed to his knowledge and observation that helm and engine orders were carried out as the pilot ordered. The master stated during the interview that compared to different ships he has been on as master, this one reacts quite slow. The *Conti Peridot* was not sounding the fog signal at the time of the accident. At the time of the accident the master estimated the visibility (when he first saw the Carla Maersk) was about 300 meters.

## INJURIES TO PERSONS

There were no reported injuries to crewmen working aboard the *Conti Peridot* or the *Carla Maersk*.

## LONESTAR

Lonestar, previously HOGANSAC (Houston Galveston Safety Committee) is in effect a harbor safety committee. The Council holds meetings on a quarterly basis which are open to the public. The meetings can be called for more frequently if necessary. Subcommittees are formed to address specific aspects of the Waterway System and are usually comprised of members that have a concerned interest and specific knowledge to each subject area. The Council itself is comprised of stakeholders that have a vested interest on a wide range of issues relevant to the ports of Houston, Galveston, Texas City, and Freeport including the associated waterways of the Gulf Intercoastal Waterway. There are committees within the councils that deal with specific areas of concern, such as vessel operators, maritime security, and waterway maintenance and improvement. The council's main concern is the safe and efficient use of the waterway and the surrounding areas. Meetings are usually held on a quarterly basis and are open to the public.

## BOARD OF PILOT COMMISSIONERS FOR HARRIS COUNTY PORTS

The Board of Pilot Commissioners for Harris County Ports (the "Pilot Board") is made up of seven members of varying backgrounds who are appointed by Harris County and the city of Houston governance, as is their chairman. Two of the Board members at the time of the accident had maritime backgrounds. The Board chairman stated once a Commission overseen investigation is initiated, anything from revocation of the pilot's license to another form of disciplinary action can take place "or any number of things."

The Pilot Board relies on the pilot's annual physical mandated by federal law for the physical health qualifications of the pilots and requires evidence that meet requirements in the review of the pilot's physical health. If the pilot is granted a license by the Coast Guard, which is a requirement prior to becoming a state licensed pilot, than that satisfies the physical requirement for the Commission. During the application process and review process when aspiring pilots or state licensed pilots come up for review before the Board, the Board will ask if there have been any health issues or changes since their license had been granted.

## EQUIPMENT Portable Pilot Unit (PPU)

Both Houston pilots on both accident vessels were using their PPU's as a primary source of navigating the channel along with each vessels electronic bridge equipment. Neither pilot reported any problems with either their own portable laptops or the vessels bridge equipment that they were piloting. One pilot remarked during interviews that the electronic equipment "nowadays was so good it might have led them to try more than they could." [20]

[20] Conti Peridot pilot interview

## WATERWAY

The main Houston Ship Channel in the area of the accident was 530 feet wide with a project depth of 45 feet. The barge lanes located on both sides of the main channel were 235 feet wide with a project depth of 12 feet.

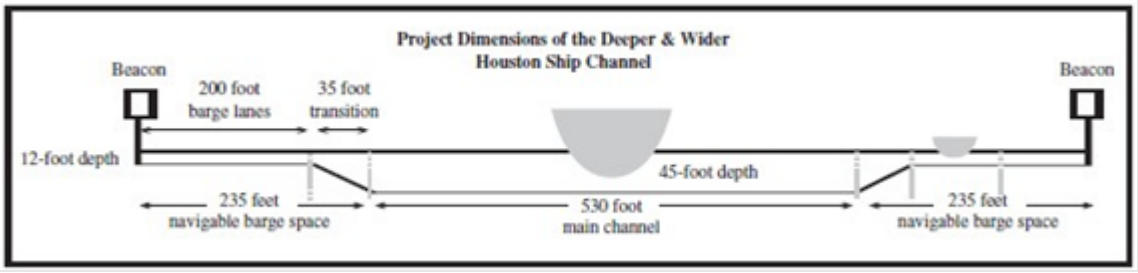


**Figure 9.** Main and barge channel dimension of the Houston Ship Channel. From Navigating the Houston Ship Channel, Houston-Galveston Navigation Safety Advisory Committee, previously HOGANSAC now Lone Star.

In addition to the main channel dimensions, the area in the vicinity of the accident was at the uppermost portion of Galveston Bay approximately 1 nm south of Morgan's Point to the west and Atkinson Island to the east. The barge lanes described above continue on the east side of the channel (the north or inbound barge lane) up to navigation marker 92 and terminates there at top of Atkinson Island where Cedar Bayou meets the Houston Ship Channel. The south or outbound barge lane west of but adjacent to the Houston Ship Channel starts just south of navigation marker 89.

Aids to Navigation (ATON)

As a normal course of post accident operations the U. S. Coast Guard conducts an ATON verification survey in the immediate vicinity of the accident area. This is to ensure all lights, markers and buoys are in position and functioning properly. Prior to the accident, according to the Coast Guard lighted navigation marker "89" had been previously destroyed. A Coast Guard Cutter was actually enroute to repuild the light

when this accident occurred. Subsequently due to the close proximity of the collision to the lights charted postion and the safety zone established around the area of the accident due to the release of product from the chemical tanker no ATON verification survey was done.

## WEATHER

At 1230 CDT, winds were light at about 10 knots or less from the east. Temperature readings taken from NOAA Data Buoy Station MGPT2 –Morgan's Point, Texas, were Air – 54 F, Water – 54 F, and the barometer was 1023.4 mb. This buoy was positioned at 29.682 N, 094.985 S. About 0.5 nm west of the accident site. Tidal current predictions for Morgans Point for the time of the accident and referenced to Bolivar Roads shows a negligible current force, or slack water at the accident time and location.[21]

[21] For a more detailed report on the weather see weather factual located in docket.