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

HUMAN PERFORMANCE GROUP CHAIRMAN'S 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, longitude 93° 56.4′ W
Vessel No. 1:	Liberian-registered bulk carrier *Conti Peridot,* IMO No. 9452634
Owners, No. 1:	*Conti Peridot* Shipping Ltd.
Vessel No. 2:	Danish-registered chemical tanker *Carla Maersk,* IMO No. 9171503
Owners No. 2:	A.P. Moller – Maersk A/S
Date:	March 9, 2015
Time:	12:30:45 Central Daylight Time (CDT)

B. HUMAN PERFORMANCE GROUP

Group Chairman:	Carrie Bell, Human Performance Investigator NTSB Office of Marine Safety 490 L'Enfant Plaza East, S.W., Washington, DC 20594
	Dr. Barry Strauch, National Resource Specialist, Human Factors NTSB Office of Marine Safety 490 L'Enfant Plaza East, S.W., Washington, DC 20594
	Parties to the accident listed in Deck Operations Group Factual[1]
	NOTE: Human Performance Group was not set up on scene, rather all crew and pilot interviews were conducted in parallel with the Deck Operations Group.

[1] Refer to Deck Operations Factual in NTSB accident docket

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 HUMAN FACTORS INVESTIGATION

The Human Factors Group worked cohesively with the Operations Group, convening on March 12 to interview the crew of the *Conti Peridot*; March 14 to interview the pilot from the *Conti Peridot*; March 15 to interview the pilot from the *Carla Maersk*; and March 18 to interview the crew onboard the *Carla Maersk.* In addition, the two groups, along with the IIC conducted follow-up interviews with the PBIRC, the Houston Pilot Associations representatives and the LoneStar Harbour Safety Committee representatives on July 28-30. The Human Factors Group examined multiple documents, including bridge logs, pilot cell phone records, work/rest logs, and recordings which were deemed relevant to the accident. Field Notes were generated and incorporated into one document by the NTSB Group Chairman of both the Human Factors and Operations Groups. These Field Notes were distributed to all involved parties at the end of the on scene portion of the investigation.

1. Vessel 1: *Conti Peridot*

After weighing anchor offshore of the entrance to the Houston Ship Channel and boarding a pilot, at about 0930 the *Conti Peridot* was inbound up the channel proceeding to its eventual destination at City Dock 24, to discharge its cargo of steel rolls. The *Conti Peridot* got underway in good visibility. According to an entry in the Houston Pilots' ship notes database, the *Conti Peridot* had trouble maneuvering when traveling at slow speeds.

The Houston pilot boarding the vessel had 24 years of piloting experience in the Houston Ship Channel (HSC). The pilot had not been on this vessel before. When the pilot boarded the *Conti Peridot*, he and the captain of the vessel conducted the master/pilot exchange and continued their voyage north toward city docks.

The captain and majority of the crew onboard the *Conti Peridot* were Filipino. The Chief Officer was Eastern European (Ukrainian). All crew members spoke English. The captain had 28 years of sailing experience. It was the first time he had been in the Houston Ship Channel. The helmsman had two years of experience as an Ordinary Seaman and one year as an AB prior to his 5.5 month service onboard the *Conti Peridot.* (See Section 4 for additional details regarding the captain and crew from interviews conducted on scene[2].) Throughout the voyage and at the time of the accident a watch stander was located in their designated area.

2. Vessel 2: *Carla Maersk*

The *Carla Maersk* departed Texas Petroleum Terminal (PetroTex) at about 0930 on March 9, 2015 with 216,049 barrels of Methyl Tertiary Butyl (MTBE) and a Houston pilot onboard, outbound for Venezuela. The *Carla Maersk* departed its berth in light rain with a low cloud ceiling.

[2] See docket for Interview Transcripts of *Conti Peridot* Captain and Crew members.

The Houston pilot onboard the *Carla Maersk* had 19 years of experience and had piloted similar size and type vessels throughout his career. The pilot had not been on this vessel before. He and the captain of the vessel conducted a brief master/pilot exchange[3], including a discussion about the weather (light rain at the time of boarding). He boarded around 9:30 and they waited for a few vessels to pass before getting underway.

The captain of the *Carla Maersk* was Swedish (Polish by birth). Overall, the bridge crew comprised Swedish, Romanian, Filipino nationality plus an Indian cadet[4]. All crew on the bridge at the time of the accident could speak English. The captain had 28 years of sailing experience. The helmsman had 2 years as AB and had been on the *Carla Maersk* for 3 months. (See Section 4 for additional details regarding the captain and crew from interviews conducted on scene[5].) Throughout the voyage and at the time of the accident a watch stander was located at the bow of the ship.

3. Injuries and Fatalities

There were no injuries or fatalities reported onboard either vessel following the accident. A "Shelter in Place" was put into effect for the surrounding port area. Injuries associated with that were not reported to NTSB.

4. Interviews

NTSB staff interviewed the captain and bridge team of both the *Conti Peridot* and the *Carla Maersk* following the accident. Interviews were also conducted with both Houston pilots. Follow-up interviews were conducted in July, 2015 with the Houston Port Authority and the Lonestar Harbour Safety Committee to better understand the port's operations and procedures during fog conditions and how/when the port is closed. The following are a synopsis of the on scene interviews.[6]

4.1. Pilot Interviews

4.1.1. Pilot Onboard *Conti Peridot*

The pilot onboard the *Conti Peridot* was interviewed on March 14 by the Operations and Human Performance Groups[7]. He had 24 years of experience as a Houston Pilot with the Houston Pilots Association (HPA). The Houston pilot on the *Conti Peridot* graduated from Texas A&M in 1975 with a degree in Marine Transportation and a 3rd mate's license. He worked with Sabine Towing & Transportation for 16 years, moving from AB Quartermaster to Master, at which point he joined the pilot program. He became a full branch pilot in 1993 with no restrictions, stating that he can pilot any vessel in the Houston Channel.

On the morning of the accident, he received a call at 0600 to travel to Galveston for a 0930 boarding. His transit was about an hour to the office, and then he had to board the pilot boat

[3] See *Conti Peridot* Pilot interview transcript in the docket
[4] See *Conti Peridot* Crew List in docket
[5] See docket for Interview Transcripts of the Captain and crew onboard the *Carla Maersk*.
[6] Refer to Interview transcripts in the docket to review interviews in their entirety.
[7] Refer to *Conti Peridot* Pilot Interview transcript in the docket to review the interview in its entirety.

to transit another hour to the vessel. He indicated that it was about three hours from the time he was notified until he boarded the vessel. He boarded the vessel and the *Conti Peridot* got underway from anchorage, heading to City Dock 24. The forecast indicated 100% chance of rain, yet it was a nice day when they got underway and visibility was good. Once aboard, he held the Master/Pilot Exchange and set up his laptop, also known as a Portable Pilot Unit (PPU) to prepare for the inbound transit, contacting the Coast Guard, noting that they were inbound. He checked the weather, and there was still no indication of fog in the forecast. He read the ship notes, which are informal notes regarding performance of the vessel. These notes are written byother pilots who previously piloted the vessel and want to share information they with other pilots who will pilot that vessel in the future. This particular note was highlighted, indicating that another pilot who had conned the vessel two years prior to this accident indicated that the vessel should have a 1.5 foot trim by the stern next time it came into Houston and that to "maybe get an escort tug". He did not make any changes to the vessel's trim, indicating that he had checked the vessel's handling at the first turn and felt it was okay. He let another vessel pass him at buoy 16 and stated that he no problems with handling and steering. As he was approaching buoys 47-48 and a loaded gas ship, he noted that the vessel handled really well, at 51 went to unlimited visibility for about 2 miles. Again, he stated that he had no problem making the turn, though he was aware of reports to VTS stating diminishing visibility ahead. Around buoys 61 and 62 the pilot said he was at zero visibility when he met another gas ship. He said that in about 12 minutes visibility had gone from 2 miles to zero. After passing this gas ship, near Red Fish, he was having trouble holding the middle at 10 knots, stating that the vessel was getting close to the bank and he was doing everything he could to control the movement with the weather. So he called the pilot of the next passing ship, the *Stolt Span*, a small tanker, and told him "I'm coming off the bank, to pay attention, watch me". Once the *Conti Peridot* passed the *Stolt Span*, the pilot stated that it took him nearly two miles to settle out from bank to bank. The fog was getting thicker and visibility continued to diminish as he was coming up to meet the *Caroline N*. In fact, at about 600 feet of visibility, he stated that he could hardly see the bow of his own ship. Looking ahead on his display, he recalled seeing three vessels lining up to meet him, and that the *Carla Maersk* was the second of the three vessels. He noted that they were all about a mile and half apart and he thought, "Gosh, this is the same scenario". He decided to slow down and allow the *Lincoln L* (tow pushing barge, northbound in barge channel), to move forward, to "take him out of the equation" since he knew he was going to have some trouble handling the ship with the next few vessels coming southbound. He set speed at half ahead after Bayport to give the *Lincoln L* time to stay ahead of him in the barge lane. As he prepared to pass the car carrier coming south [the first of the three ships], he continued to stay center, anticipating that "this thing's going to take a run off that bank—a sheer". As he expected, after passing the car carrier, the pilot described the *Conti Peridot* as "diving into the void" behind the car carrier and then "we're off to the races", describing the motion from bank to bank. At this point, he told the pilot on the *Carla Maersk* that he was "coming at him". He noticed the vessel's speed starting to slow so he decided to go full ahead to get the rudder to respond and hard over to starboard [with the rudder]. Though he was at full ahead and hard starboard, the vessel wasn't responding. It didn't respond until he was almost at the collision point, and then it started turning right, but it was too late. The vessel was at full ahead engine command when the *Conti Peridot* collided with the *Carla Maersk*. He then stopped the engine and ordered full astern.

The pilot reiterated to the investigators that the vessel handled well and that there was nothing mechanically wrong with it. When the ship went into zero visibility, the pilot stated, it

was difficult to stay in control because "you couldn't see your reference points to give you a better idea of the true head of the vessel." He said that, given what happened, he now believed that this vessel shouldn't be moved in the fog. He stated that, although the pilot notes indicated 1.5 feet of trim, he didn't know how much difference 1.5 feet of trim would have made in the scheme of things. The pilot stated on several occasions that this type and size of ship is "notorious" for being difficult to handle, particularly in the Houston Ship Channel (HSC) and that this class of ship, loaded to an even keel (31 feet in this case) is difficult to handle in this channel (624 x 105 bulk ship class).

When queried about the crew, the pilot stated that they bridge team did their jobs, but they couldn't see in zero visibility. He indicated that the laptop [PPU] provided a great deal of information, but that he really needed to see the head of the ship and its true motion to have good situational awareness. He mentioned that he "may have forgotten" to sound the fog signal but everybody inbound and outbound knew where he was by radio. He had a 1 whistle radio passing arrangement with the *Carla Maersk* and when he asked the pilot onboard the *Carla Maersk* if there was any way to see him on two (pass starboard to starboard vice port to port), the pilot said he could not; that he was committed (to passing on his port side). There was no way at that time for him to go from a 1 whistle to a 2, stating that the *Carla Maersk* may have hit his "living spaces". He had nothing negative to say about the captain on the *Carla Maersk*, stating that he did everything he could, given his situation. When asked what the captain of the *Conti Peridot* was doing when the situation was growing worse, he stated that he didn't think the captain (or crew) knew what was happening; "they didn't know we were going bank to bank", and no member of the bridge team questioned him as to what was going on. He said they didn't know that ship was coming outbound. When investigators asked him if the crew had ECDIS, he replied, "yes". When asked why the captain/crew did not query him as to what was going on, he said that he thought it was due to training. He mentioned that some crews of different ethnicities were more likely to question what he was doing than other crews, indicating that the Filipino captain and crew did not typically question his actions. The captain did not come over to where he was standing and look at his displays. The pilot had his laptop situated in the center of ship by the gyro repeater. He stated he was using the port radar at a 3 mile scale, and had a decent picture. He indicated that the gyro and laptop gave him the best information for shiphandling in this scenario.

Investigators asked if there was a contingency plan for fog setting in. The pilot stated that they usually closed the bar, but that most pilots just continue on to the dock or to the sea buoy and they usually depend on their laptop to assist them in doing so. He said that, even with all the "wonderful equipment" that assists the pilots in navigating, "when you have a ship that handles poorly, it's real difficult to get this thing up to the dock safely". He then stated that he probably could have anchored, but that he would have had to coordinate with the pilots behind him and those coming outbound and "you're in motion, and you would have to deal with all that". He also stated that, after he passed the *Stolt Span*, he thought he could continue safely.

The pilot didn't communicate the handling difficulties with the captain. When asked why he didn't inform the captain that he was having problems, he stated, "I didn't know if he could have addressed them…or if he could have helped me correct them". When asked if he felt like he should have told the captain he was having issues, he said yes, he was entitled to know, but he just didn't think it would have helped with the issue at the time.

When asked if it might be easier to anchor in the channel if VTS prescribed it for all vessels in fog conditions such as this, the pilot stated that he did not think it would be better—that each pilot has control of his ship and that they could make that call amongst themselves. When asked if it would have been feasible to anchor in the channel, he said yes, but it wouldn't have been pretty (getting everyone anchored at the same time) with the speeds they were going. He later stated that, had fog been forecasted, he would never have begun the transit after reading the pilot shipnotes regarding the handling of the vessel. He said that he has done this before in fog conditions, with no repercussions, stating that it was a safety decision. When asked whether he thought it would be good for VTS to know about the shipnotes—the poor handling of these types of ships, he said that he thought it might be useful for them to be aware of that. The one thing he noted that VTS might be able to do to help in a situation like this would be to provide accurate weather reports, such as developing fog in the area. Following the collision, once he ordered full astern, and the *Conti Peridot* separated from the *Carla Maersk*, he ordered the crew to drop the starboard anchor. He then made the necessary phone calls and awaited direction from authorities.

4.1.2. Pilot Onboard *Carla Maersk*

The pilot onboard the *Carla Maersk* was interviewed on March 15 by the Operations and Human Performance Groups. The pilot started working with harbor tugs in 1976 after high school. He worked mainly in the tug and barge industry before becoming a pilot 18 years ago. He was called for the job at 0700 (though his Activity/Sleep log[8] reflects a 0600 start time). He recalled that traffic was bad on the transit to work. There was a light drizzle and a low ceiling. He boarded the vessel at Petrotex, conducted the Master/Pilot Exchange and set up his PPU. He pulled the last line at 0930, anticipating fog on the transit due to the low ceiling. They departed the dock with two tugs, and an even keel. He stated that vessels at even keel normally do not handle well, but this one did. He recalled that it had a lot of power, and must have had a big rudder because it handled really well.

As they were transiting, he started hearing reports that fog was coming up the bay. He said when he saw the San Jacinto Monument, which was about halfway from where they had been docked at Morgan's Point; he could only see half of it due to the low ceiling, recalling "that's not a good sign". Then he said he heard the bar was closed and he felt this was good; as there would be less upcoming traffic to meet in the channel. He knew there were 4 ships that he would still have to meet. Knowing fog was coming in he discussed with the captain going into Barbour's Cut. However, after some conversation, he said they decided to dismiss that idea because they had no tugs and it was a hard turn with the ship and he was worried he might compromise [hit] the ship on the lash dock coming in. He stated that there were no objections from the captain and that he [the pilot] had done this many times before without any problems. He stated that the captain said, "The last time I went out, it was shut out. We couldn't see the bow of the ship but we made it ok", to which the pilot replied, "Yeah but you weren't meeting other ships"[9]. He reiterated to the captain that he could do it, it just wasn't "fun". Visibility was about ¾ mile, so he had the vessel at half ahead, still making 8-9 knots. He described the crew, specifically the chief mate and the captain as "excellent…very professional". He stated that he likes to pilot from right in front of the window on the bridge, but because of the deteriorating

[8] Refer to *Carla Maersk* Pilot Activity/Sleep Log, in docket and in Appendix A of this factual report.
[9] Refer to *Carla Maersk* Pilot Interview in docket for full review of the transcript.

weather, moved back behind the console with his PPU so he could also look at the radar. He had the radar set on 3 miles so he could see the buoys and traffic ahead. He said there were three or four crew members on the bridge, and there was already one crewman forward as lookout, but the captain sent a second lookout forward due to the reduced visibility ahead. Although the *Carla Maersk* was never in zero visibility during this transit (3/4 mile was the lowest visibility he mentioned), he described his definition of zero visibility as passing a set of buoys on either side and not being able to see them.

The pilot stated that he asked the captain to sound the fog signal when they were near Morgan's Point. The signal was started. At this point, he was looking at his PPU and noticed that the *Conti Peridot* was over on his side of the channel. The *Conti Peridot* was still 2 miles out and the two pilots had agreed, via VHF Channel 13, to meet port to port. This meeting was arranged prior to the *Conti Peridot* meeting the car carrier. He recalled that he saw that he had just passed the car carrier and assumed he was just "out of shape" because of the car carrier. He stated that the *Conti Peridot*'s heading on his PPU showed the vessel heading back toward the middle of the channel. He still could not visually see the ship due to the low visibility. Then he observed the vessel on the PPU as it started heading for the bank. The pilot recalled that, suddenly, he could visually see him, about ¾ mile away and that he was "pointing right at me". He later stated that the *Conti Peridot* was at about a 45 degree angle relative to the *Carla Maersk*. The captain (on the *Carla*) asked the pilot, "What the hell is he doing?" To which the pilot said "I don't know but he's fixing to whack us". He stated that the pilot on the *Conti Peridot* radioed him and he heard "go left, go left Larry," but he was already starting his break to the right in preparation for meeting him. Once he visually saw the *Conti Peridot*, he stated that he knew the collision was unavoidable, but he went hard starboard and full ahead thinking he'd just run away as much as possible even if went aground.

When asked if there was any way the collision could have been avoided, the pilot said that if the *Conti Peridot* pilot had told me he was "taking runs" I would have helped him-- if he had called me and told me he had a problem, I would have stayed in the middle of the channel until I saw him and then broke one way or the other. "He didn't tell me he was having problems. I didn't have any idea." When asked if he would have done anything differently had he known that the *Conti Peridot* was a poor handling ship, he said no, that the other pilot had more experience than him and that they handle ships like this all the time. He stated that "we're good at our jobs…it's amazing we don't have more incidents. That's a very busy channel, and you get a poor handling ship, it'll wear you out."

When queried again about the decision to keep going and not turn into Barbour's Cut, the pilot said that it was risky to pull in there without any tugs because the *Carla Maersk* did not have a bow thruster. He didn't want to take the risk of hitting the ship that was at the dock right inside Barbour's Cut, so he decided to continue on. He reiterated to the investigator that he did not consider anchoring in the channel. Upon further questioning, he said that he did not blame the other pilot at all for the accident, even though he didn't say anything to him. He said that, because the pilot on the *Conti Peridot* was in shut out fog, he could understand how difficult it was to try and right the ship after getting "out of shape". An investigator asked the pilot to describe what he might do if that situation arises again and he was the inbound pilot. He said that decision would be tough-- if the weather was good when you got underway, but now, 2-3 hours inbound fog is setting in, "we've got to keep ships moving, we've got to keep the channel moving."

He stated that there were no problems with the crew or the vessel's mechanics, that everything and everyone did as asked. He also noted that, post collision, he felt the crew did a very good job responding. He did not have any correspondence with the other accident pilot after collision. After the collision, he noted that the vessel healed over about 20 degrees, but righted back in about 45 minutes. There was some confusion as to whether the MTBE was leaking, but eventually, they knew that it was and communicated this to the Coast Guard and VTS. He stayed on the *Carla Maersk* until about 2100, when he boarded the pilot boat.

When asked about procedures for transiting or not transiting in the fog, the pilot indicated that there aren't really any specific procedures. He said that if there is zero visibility, he can't see bow of his own ship, he will not transit. He stated that, if visibility was that poor, he would anchor, regardless of the ships around him—that is, if there are inbound ships that he would have to meet. If there were no ships coming inbound, he would continue, because, even if he grounded, it would be in soft mud.

When asked about cell phone use, the pilot stated that, at no time during the transit did he use a cell phone.

4.2. *Conti Peridot* Crew Interviews

4.2.1. Ordinary Seaman-on bow lookout

Investigators interviewed the Ordinary Seaman (OS), who was on the bow of the *Conti Peridot*, serving as lookout on the day of the accident. This interview took place on Thursday, March 12. The OS stated that he studied in the Philippines and was currently doing a 10 month contract on the *Conti Peridot*. He had been aboard the *Conti Peridot* for six months and was standing watch on a 4-8-4 hour watch rotation (e.g., duty from 0000-0400, off duty 0400-1200, duty from 1200-1600). His responsibilities at the time were watch keeping while underway. This was his first trip into HSC. On the day of the accident, he was on the bow with the Bosun and had been on the bow for nearly two hours. He recounted seeing the car carrier while the Bosun was on the bow with him and he notified the captain on the bridge via the radio. He estimated visibility to be about 500 meters when he first spotted the *Carla Maersk*. He recalled hearing the Maersk ship's whistle. He also stated that the *Conti Peridot*'s whistle was sounding on the bow.

Once he knew the ships were going to collide, he stated that he ran for the ladder and went down one deck to the cargo hold No. 1 before the collision. When the vessels collided he said he fell down. Note: There was some confusion as to whether he immediately went back up to the bow (or why he had gone down to the cargo hold in the first place—possibly his muster station?). Once the collision occurred, he said the captain then told the Bosun to drop anchor. The Bosun then told the OS to drop the starboard anchor. After the collision, he stated that he remained forward, to survey damage at the bow after the vessels moved away from each other. He later stated that this was the first time anything like this had happened to him.

4.2.2. Bosun on bow

Investigators interviewed the Bosun, who was on the bow of the *Conti Peridot*, serving as a second lookout on the day of the accident. This interview took place on Thursday, March

12[10]. The Bosun stated that he had been onboard the vessel for five months. He was quickly promoted from OS to Able Bodied Seaman (AB) to Bosun. His previous experience included mostly general cargo ships (log ships). He had been with his current company for three years, sailing on similar ships/bulk carriers. He stated that he was a day-worker and had never steered this ship. On the day of the accident he woke up 0730 to work standby forward, as a lookout. There was a little bit of fog—he stated that he could see about 500m. He rigged the starboard accommodation ladder for the pilot boat and then prepared the anchor for letting go. After the pilot boarded, the AB took the pilot to the bridge while the he, the Bosun, went to the bow.

The Bosun stated that they met the *Stolt* tanker, and then the car ship. The car ship passed them about 10-15 minutes before the collision. He stated that he did not hear a whistle from the car ship and that he did not see them until about 300m. Visibility was getting worse. Although the OS on the bow stated that he heard the *Conti Peridot* whistle at the time of the accident, the Bosun stated that he did not hear signals from his own ship. He noticed a red buoy to his starboard and heard a horn when he saw the *Carla Maersk*. (He did not indicate where the horn was coming from.) At this point, the *Conti Peridot* was going to port and he saw the *Carla Maersk* going to starboard. When he saw the ships closing in on one another, he stated that he ran down the starboard ladder, then felt the impact when the ships collided, but that it did not knock him down. He stated that he knew he had to run from the collision, otherwise, "I'm 100% dead." After observing the damage on the bow, he notified the captain of the damage and the missing port anchor. The captain ordered him to drop the anchor. He stated that he was up on the bow until about 1700. He described an air pressure release and recalled that he was crying and that the chemical release smelled very bad, so he used a dusk mask until they were able to don masks with filters, roughly five minutes after the accident.

4.2.3. 2nd Mate on Bridge

Investigators interviewed the 2nd mate, who was on duty on the *Conti Peridot*, serving as lookout on the day of the accident. This interview took place on Thursday, March 12[11]. The 2nd mate served as a cadet from 1999 until about 2002. He went to a maritime university in the Philippines and received his license in 2007 as 3rd mate (Navigational Watch Officer). He became 2nd mate in November of 2014. He came aboard the *Conti Peridot* as 3rd mate and was then promoted to 2nd. He had been aboard for just over 8 months at the time of the accident. He stated that this was not his first time on this ship. He stated that his duties included voyage planning, maintaining bridge equipment and being in charge of communications. His duty schedule included the 1200-1600 watch.

He recounted checking the steering when the pilot came on board the morning of the accident, as well as checking the other equipment on the bridge, and everything checked out ok. He recalled that he took his lunch at 1130 and was not aware of the low visibility until he got on watch. He could not say specifically how far he could see when asked about the "level" of visibility, but described it as "not so good".

He listed three people on the bridge, not including himself. They were the captain, helmsman and pilot. He had just relieved the 3rd mate at noon. When specifically asked about an additional lookout, the 2nd mate stated that there was no additional lookout on the bridge wing

[10] Refer to *Conti Peridot* Interview with Bosun located in the docket for full transcription.
[11] Refer to *Conti Peridot* Interview with 2nd Mate located in the docket for full transcription.

prior to the accident. However, the captain stated, in his interview with investigators[12], that he assigned the chief mate as an additional lookout. Moreover, the chief mate stated, in his interview[13] that, though the captain did not assigned as an alternate lookout, he had scheduled both the bosun and the OS as lookouts when he put the schedule together for this shift, and therefore, they had two lookouts during these conditions. He said that he was on the telegraph continuously, next to the helmsman, making bell book entries and watching the helmsman. He said the pilot was using his PPU and his port radar, and was standing close to the repeater while the captain was walking around. Both radars were on as well as the ECDIS. He recalled meeting and passing the car ship and remembered the pilots on each of the ships talking to each other. He tried describing what he saw, the attitudes of both vessels using his hands. He remembered the engine on half ahead and then the pilot ordered full ahead.

Just before the accident, the 2nd mate remembered that the engine was on half ahead and the pilot gave the helmsman compass course of 060. He ordered hard starboard and full ahead. At this time, he described seeing the port side of the *Carla Maersk* just before they collided. When he could visually see the *Carla Maersk*, it was on the starboard side of the Conti. When asked if he had access to the AIS and radar, he said yes. However, he stated that he was not looking at either of the displays to see the traffic ahead. When asked why he did not look at them, he stated that he "could not remember".

Once the collision occurred, the pilot ordered stop engines, so the 2nd mate stopped the engines. He then wrote down the lat/long of the collision in the log book and everyone began going to their emergency stations.

When asked why he thought the pilot did not discuss the issues he was having with the captain (regarding maneuvering the vessel), the 2nd mate stated only that the pilot was "good", describing him as "calm" and that he gave good direction. Investigators then asked the 2nd mate how much experience he had in dealing with pilots. He said he had probably worked with at least 20 pilots in his career.

When asked about his sleep the night before the collision, the 2nd mate said he went to bed at 0400 and slept until 1100, which was normal for his duty shift.

4.2.4. Chief Mate, on bridge but not on watch

Investigators interviewed the Chief Mate, who was on the bridge, but not on watch at the time of the accident. This interview took place on Thursday, March 12. He had six years of experience as Chief Mate. He stated that he had a captain's license but had never served as captain. This was his second contract on this vessel and the second time he had been in the HSC.

His watch duty occurred between 0400 and 0800 on the morning of the accident. When he had lunch, he noticed that the visibility was bad, at about 1210. He could not recall whether or not he heard a fog signal from the *Conti Peridot*. He came up on the bridge for three reasons: 1) to find out more information about what time the ship would be docking so the crew could prepare for mooring, etc.; 2) to see if the captain needed a break to go eat; 3) to see if they needed additional lookout since visibility was bad. He said the captain did not want anything to eat and needed to stay on the bridge due to visibility. He stated that the captain was on the port

[12] Refer to *Conti Peridot* Captain Interview located in the docket for full transcription.
[13] Refer to *Conti Peridot* Chief Mate Interview located in the docket for full transcription.

side of the bridge, "watching his computer". He recalled the 2nd mate was near the telegraph, watching AIS and radar the entire time he remained was on the bridge, which was up until the collision.

He saw the car carrier pass on the port side, very close, no more than 15-20 meters apart and recalled that visibility was only about 100 meters. He stated that the pilot looked nervous and was keeping the vessel in the middle of the channel, hardly going starboard when they passed the car carrier. He stated "the captain was nervous and he tried to speak with -- but I don't know with who". He stated that he then moved to the starboard side of the bridge, but kept quiet, not wanting to disturb anyone. NOTE: The Chief Mate never indicated that he was made an alternate lookout by the captain.

He recalled that visibility got worse, that he could see nothing in front of him. He said the pilot contacted the *Carla Maersk* via his VHF, walkie talkie, but he remembered that there was no answer and the "pilot was nervous." Before he called *Carla* again, the pilot gave another order to port. Then he was able to reach *Carla Maersk* pilot. He said that the pilot asked the *Carla* pilot to go to port, but that he said "No." He then recalled that the fog lifted immediately in front of them he could see the *Carla*-- "I see he's crossing our course". Once the collision occurred, the chief mate informed the captain that he must go down and inspect the damage.

He recalled that the captain was watching the radar or AIS, stating that he that he "very often" watched the ECDIS. He said that, in restricted visibility, an additional lookout is typically assigned. He stated that the OS and the bosun were on watch at the time of the accident. He said that he was trying to watch the ECDIS and radar, but only from a distance and that he could not see it very well. When asked if he had heard a fog signal, he said that yes, he had heard the *Conti Peridot's* fog signal one time before the collision.

When asked what he thought of the captain, he stated that he had only worked with him for a few weeks, but that he was "good", and was effective in giving orders. He was asked about his thoughts regarding the pilot on the *Conti Peridot* on several occasions, and his answers ranged from "not that good" to "good." Additionally, at one point he stated that he thought the pilot on the *Carla Maersk* could have done something to prevent the accident.

He stated that he slept approximately 6 hours the night before his shift, which started at 0800 on the day of the accident. He could not recall the amount of time he slept on the days previous to this.

4.2.5. AB Helmsman

Investigators interviewed the helmsman, who was on duty and at the helm of the *Conti Peridot*, on the day of the accident. This interview took place on Thursday, March 12[14]. The helmsman spent 3 years as OS and one year as AB. He sailed on varying sized vessels in Australia, China, Japan, and New Orleans prior to his work on the *Conti Peridot*. His maritime studies took place in the Philippines. He joined the *Conti Peridot* 5.5 months ago and this was his first contract on this vessel.

The helmsman stated that he had come on watch at 1150 on the day of the accident and was scheduled to stand watch from 1200-1600. On the day of the accident, he stated that the rudder was responding correctly. The pilot was giving commands and he was responding

[14] Refer to the Conti Peridot AB Helmsman Interview in the docket for full transcription.

accordingly. He said that he considers himself a "very good" helmsman. Just prior to the accident, he recalled that it was foggy, estimating he could see about 150 meters--from the bridge to the bow and he could not see the buoys. He also indicated that when the current was strong, steering this vessel was more difficult. However, everything was working properly. The last command from the pilot was "Hard starboard", and then the vessels collided. The ROT (rate of turn) indicator was starboard.

The helmsman noted that weather information is not typically shared at handover from other helmsman, since they are not watching out the window.

4.2.6. Captain on Bridge

Investigators interviewed the captain of the *Conti Peridot*, who was on the bridge on the day of the accident. This interview took place on Thursday, March 12[15]. He served on *Conti Peridot* for about 6 months, then took a 3 month vacation and came back about one month prior to the accident. He boarded the vessel in Manzanillo, Mexico on 2/16/2015. The captain has been sailing since 1987, starting in the Merchant Marines. This was his first transit in the Houston Ship Channel. He stated that the ship handles well. He stated that, at a slower speed, it was harder to maintain maneuverability on this vessel.

The captain stated that English is the official language on the vessel. He indicated that while some crewmembers were more fluent in English than others, all were able to communicate effectively. If needed, crewmembers would explain something a second time to ensure that the other person understood. He added that at the time of the accident, with people of three nationalities on the bridge (Philippines, Ukraine, and US) communications was not an issue as bridge communications tended to be limited to marine specific ones.

On the morning of the accident, the captain recalled that the Pilot boarding had been rescheduled from 0530 to 0930. They picked up the pilot at 0932. Visibility was good. When the pilot came aboard, he said they exchanged information, talked about the possibility of rain and discussed visibility. He stated that at 1130, he heard the Houston Channel was closed due to fog. When asked about his comfort level navigating in the fog, the captain stated that he was not comfortable in the fog. He recalled that, at some point during the transit (he could not indicate a time), the captain suggested anchoring due to limited visibility. However, the pilot did not want to do that. When asked how he felt about that, the captain described the pilot as "very responsible". He believed that the pilot performed professionally and was as good as pilots he has worked with in other parts of the world.

Visibility was gradually closing in. As they were coming up toward the car carrier, the captain estimated that he could only see it when it was approximately 100 meters away. He recalled that the *Conti Peridot* passed the car carrier at 1225. He stated that "things were ok". He indicated that they passed very close, about 60 meters apart.

According to the captain, the bridge was adequately manned, given the limited visibility. The captain noted that he had designated his chief mate as an additional lookout prior to the collision due to the fog. (NOTE: The chief mate did not indicate that he was made a lookout while he was on the bridge observing.[16]) When the captain first saw the *Carla Maersk*, he stated

[15] Refer to the Conti Peridot Captain Interview in the docket for full transcription.
[16] Refer to Conti Peridot Chief Mate Interview in docket for details.

that he heard the pilot on the *Carla Maersk* say "Why are you in this position?", to which the pilot on the *Conti Peridot* replied, "Go to your left", and the other pilot stated, "No, I can't". The captain indicated that there was no more communication between the pilots before the collision occurred.

When the captain first saw the *Carla Maersk*, it was located 30 degrees perpendicular to the channel. They had agreed to a port to port pass, but once they could see the aspect of the vessel, the captain stated that they knew they could not pass port to port. When asked if the captain agreed with the pilot's orders, from the time they saw the *Carla Maersk* until the collision, he said that yes, he agreed with his decisions. He stated that orders to helm and engine orders were made in agreement by the captain and the pilot. The captain stated that he believed that the accident could not have been avoided.

4.3. *Carla Maersk* Crew Interviews

4.3.1. AB On Bow

Investigators interviewed the AB who was located on the bow of the *Carla Maersk* when the accident took place. This interview was conducted on Wednesday, March 17[17]. The AB started sailing in 1998. Previous to that, he studied in the Philippines from 1997-1998. He had been an AB for two years, serving on the *Carla Maersk* for nearly three months. His responsibilities on the vessel were the helmsman duties, lookout, cargo, and tending to mooring lines. He stated that the ship typically steers steady.

The AB was scheduled for watch from 1200 to 1800. His shift was 6 hours on, 6 hrs off while outbound from port. This was the typical schedule when in port (6 on, 6 off). When asked how long he slept the night before the accident, he stated that he went to bed at 6am the morning of the accident and got up at 11am, a total of 5 hours. The 2nd officer told him to make proper lookout since visibility was reduced. He was relieving his colleague on the bow. He stated that no one else was on the bow at that time. He indicated that it was starting to get foggy when he came on watch at noon, but that visibility was about 1 mile. As the fog increased, the fog signal was turned on. He stated that he donned his ear protection (Ear Defenders) because the fog signal was very loud. He indicated that he did not hear the *Conti Peridot*'s fog signal. When asked if he would be able to hear with his hearing protection, he stated that, yes, he could still hear external sounds while wearing hearing protection and would have been able to hear if the *Conti Peridot* signaled. He reported that he was on the bow by himself then the OS came up as fog was getting worse to aid him. He stated that he reported all targets to the bridge, including one down the starboard side (a small boat), a tug and barge to the port side, and then he reported the *Conti Peridot*, to the port side of the *Carla Maersk*. The AB stated that, after the collision, everyone went to their muster station to prepare for an emergency.

4.3.2. AB Helmsman

Investigators interviewed the AB helmsman who was located at the helm of the *Carla Maersk* when the accident took place. This interview was conducted on Wednesday, March 17[18]. The helmsman had been sailing for 11 years; 6 as AB. He joined Maersk in 2011 and came

[17] Refer to Carla Maersk AB On Bow Interview in docket for details.
[18] Refer to the Carla Maersk AB Helmsman Interview in the docket for full interview transcription.

aboard the Carla Maersk 4 months prior to the accident. This was his first time onboard this vessel. He stated that he had experience sailing (steering) in and out of various ports.

The helmsman recalled that his watch schedule on the day of the accident was 0000 to 0600 completing cargo loading duties, then 1200 to 1800 as helmsman. He stated that he slept from 0700 to 1100 between watches that morning. He stated that, at 1155, he went to the bridge to relieve his coworker and was at the wheel at the time of the accident. Everything went normally during the turnover; they discussed the current and normal turnover checklist duties. The helmsman stated that the steering was working well when he took the wheel and the rudder was doing what it was supposed to do.

He stated that he heard reports of the passing vessels while at the helm. They were passing other vessels port to port. When the watch stander indicated that the *Conti Peridot* was close, the AB said he could see it about 2-3 cables (1200-1800 feet) away. He remembered that, soon after, he heard the captain say, "What happened to the ship? She's turning…" The pilot then gave the Hard Starboard command. It was the last movement (action) taken before the collision occurred.

When asked about his typical work/rest schedule, the helmsman stated that he typically gets 4-5 hours of sleep between his 6 hour watch shifts.

4.3.3. 2nd Mate on Bridge

Investigators interviewed the 2nd mate who was located on the bridge of the *Carla Maersk* when the accident took place. This interview was conducted on Wednesday, March 17[19]. He served on the *Carla Maersk* for 2 months prior to the accident, but had also served a 10 month contract on the *Carla Maersk* previously to this. The 2nd mate stated that he had been sailing since 2001. He graduated from the Philippine Merchant Marine Academy in 2004, sailing on a total of nine chemical tankers since graduating. He said that he had served on 3 *Carla Maersk* contracts and was promoted to 2nd officer in May 2014. He was also 2nd Officer for another company for one year and had worked as a captain previously. He said that he had transited the HSC "plenty of times". He stated that it is difficult to come up the Houston Ship Channel.

On the morning of the accident, the 2nd mate recalled that he was on his regular watch schedule, loading cargo from 0000-0400 that morning, . He stated that he went to bed after work, around 0500. He said he got up at 1100, had breakfast at 1145 and was on the bridge at 1200 for his watch. He commented that he usually sleeps about 6 hours between shifts. He recounted that he and the relief officer completed their turnover, using a checklist.

At noon, he said that visibility was good, about 8 miles, but decreasing as they continued the transit. He remembered that the bridge received a call that a tug and barge were getting ready to pass. The bridge team saw it, but he stated that it didn't come out of the fog until about ½ mi away. The 2nd mate indicated that he was standing to the right of the helmsman, so he could see the telegraph. He said the captain was standing with the pilot; pilot on the port side using his own radar (on his PPU). The radar on the port side was set to 1.5 miles, head up and he was viewing the starboard radar at 0.75 North up.

[19] Refer to the Carla Maersk 2nd Mate on Bridge Interview in the docket for full interview transcription.

He stated that the bridge wing doors were not open on bridge of *Carla Maersk.* The 2nd mate indicated that the helmsman was following the pilot's orders and that they had started the normal passing procedure (with the *Conti Peridot*). He stated that visibility was about 0.55 miles when he saw the *Conti Peridot*. He said that the fog appeared to be behind the *Conti Peridot*. As they started their normal passing procedure, the 2nd mate said he saw the *Conti Peridot* start to turn to port. He said that he could see the shape or aspect of the ship (from its starboard side). He recounted that they had to "get ready for impact". Engines were at ½ ahead prior to collision, but when they saw the *Conti Peridot*, the pilot ordered full ahead. The captain went to the telegraph, taking action to go full ahead. The 2nd mate stated that when the collision occurred, he gave the alarm for everyone to go to their muster stations. He could not remember if the captain told him to do that, but he said he knew it was his duty.

When investigators asked about cell phone use, he stated that there were no personal cell phones in use on the bridge around the time of the accident. When asked about precautions taken in these restricted visibility conditions, he stated that they brought a second lookout to the bridge when they realized the fog was getting worse. In addition, he said they sounded the fog signal.

4.3.4. Captain on Bridge

Investigators interviewed the captain of the *Carla Maersk* on Wednesday, March 17.[20] The captain started going to sea in 1988 and started as OS/AB. He went to the maritime academy in 1999 and became an officer in 2002. He became captain in 2009 and has sailed as captain since then with Maersk. Since 2001, the main type of vessel he has with has been chemical tankers. He typically sails 6 months as captain each year and has sailed this vessel as captain since 2012. He stated that he does not frequently transit into Houston but has gone through the HSC more frequently due to industry needs, stating that he has been in and out of Houston maybe a "couple of dozen times".

The captain recalled that the *Carla Maersk* loaded cargo 2 days prior to the accident. The pilot boarded the *Carla Maersk* in port around 0900, with no issues. They had two tugs and were ready to depart when the pilot said they needed to wait for car carrier to pass and before departed.

The captain recalled that they had rainy weather and that he asked the pilot about fog. He said the pilot said there were no fog predictions. He informed the captain that there would be 11 vessels inbound (piloted) in addition to small barges. He stated that they completed the Master/Pilot Exchange and reviewed the pilot card. He said that the pilot spent some time working with the towboat barge traffic in and alongside the channel to prepare for their transit.

When they reached the last bridge, the pilot informed the captain of reported poor visibility in Galveston. The captain recalled that the pilot was concerned about the visibility and that, at the bridge, the visibility was approximately 1.5 miles. They discussed dropping anchor in Galveston, but he recalled that the pilot said no, if anything they should drop anchor in the channel or possibly go to Barbour's Cut. This discussion continued for about 15 minutes while the *Conti Peridot* continued to transit southbound in the channel. At one point, the pilot told the captain that they must decide now if they were going to do either of those things. {HOLD: VDR Audio transcript discussion will be included here upon VDR transcript release.}The captain

[20] Refer to *Carla Maersk* Captain Interview located in the docket for detailed transcription.

stated that a mutual decision was made regarding Barbour's Cut, indicating that it was a "no go" without tugs and the vessel's speed was likely too fast already to make it into Barbour's Cut. He recalled that they decided to just proceed on.

As the fog began to increase, the captain stated that he sent an extra man forward as lookout and started sounding the fog signal. The captain stated that after they passed Barbour's Cut, the pilot moved his laptop over and on to radar so he could see both. He said that when they saw the *Conti Peridot*, his second mate "confirmed [we] were at 05 distance" on radar. He said that they saw a vessel ahead, and the pilot initiated a turn to starboard 10 degree rudder for passing port to port. He recounted that everything looked normal at first, could see the *Conti's* name [near the bow], then saw her starting to turn to port, but then the vessel continued to turn to port. He said that he got concerned as she (the *Conti Peridot*) was turning more than she should. He saw the starboard side of the *Conti* at about the same time the pilot ordered hard to starboard and full ahead. He said that he was thinking that's what he would have ordered too and he said he then pushed the telegraph. He said that he was waiting for bow of *Conti Peridot* to stop swinging and go back to center, but it keeping veering toward them. He stated that the *Conti Peridot* hit the *Carla Maersk* at about 90 degrees on their port side. He remembered that they were full ahead and lost speed, (possibly ran aground).The pilot then ordered astern and came right off and they lowered down anchor one shackle in the water.

When investigators asked his opinion about the *Carla* pilot's actions when they saw the *Conti Peridot* coming out of the fog, he said that he agreed with his pilot's actions, and also agreed with the pilot telling the *Conti* pilot that he could not go to port when asked to do so. He noted that the *Carla*'s swing was already to starboard and he didn't think it would help (prevent the collision). He said the bow of *Conti*, from his perspective, was always going to port and he did not recall ever seeing it come to starboard.

The captain said he did not hear any sound signals from the *Conti Peridot*, and he believed everything looked okay until he saw the visual aspect of vessel. He stated that he would have liked to have been informed that *Conti Peridot* was having trouble.

Having frequented the Houston Ship Channel, he stated that he believes it to be challenging, due to having to stay in the middle of the channel and then maneuver to pass around a ship [meet opposite track vessels]. He recalled that he has been here, in the channel, previously when restrictions for outbound or inbound traffic were put in place due to visibility.

When asked about crew working hours and differences from port watch and sea watch with regard to STCW considerations, he stated that his ship always follows policy and that he is adamant in ensuring that his crew gets their required rest. He said that he felt well rested after two days in port and 0900 pilot boarding.

5. Situational Awareness

Situational awareness can be defined as the primary basis for subsequent decision making and performance in operation of complex dynamic systems[21]. The operator should be able to perceive relevant information, such as environment, system, self, etc. and integrate that data in conjunction with mission goals and predict future events and states of the system based on this knowledge. In order to maintain situational awareness at its optimal level, communication is

[21] Endsley, M. (1995). Measurement of situation awareness in dynamic systems, *Human Factors, 37*, 65-84.

essential with the ship and its systems, other vessels, VTS, and fellow crewmembers. Maintaining communication with crew members is particularly important in order to have a shared mental model of the situation and the ship's systems. By sharing our mental models, we reduce risk that errors will go unnoticed, namely errors of perception, calculation and prediction.[22]

According to statements from the crew onboard the *Conti Peridot*, they were unaware of any issue the pilot was having with the handling of the vessel until seconds before the accident. When asked where the captain was standing prior to the accident, the pilot stated that he was walking around and possibly checking emails, but he wasn't sure. This information was not confirmed by other interviews or by the captain's interview. The chief mate recalled in his interview that, when he entered the bridge around 1210, visibility was very bad and that the captain was "watching his computer".

5.1 Lack of redundancy

Typically, on the bridge of a ship, there is redundancy in the information being provided to the pilot and bridge team. Electronically processed information is provided by the computer systems (ECDIS[23], etc.), but crew also has access to "raw" data, which is what is considered the "out the window" information. Electronic data, if not cross-checked or confirmed with raw data can be misleading, or sometimes even incorrect. If outside information is not available, due to adverse weather conditions, such as heavy fog, the pilot and crew no longer have that redundancy. This lack of redundancy can also lead to spatial disorientation.

On the flip side, under-reliance on displays in restricted visibility can also become problematic. Humans are limited to the number of resources we can attend to simultaneously. Interviews with the *Conti Peridot* crew as well as the pilot indicate that radar and EDCIS displays were not being utilized. Crew members recalled that the captain was not constantly monitoring the displays, nor were the other crew members; in fact, when investigators asked the pilot where the captain was standing during the majority of the voyage, he could not recall, though he noted that he might have been "checking email"[24].

5.2 Spatial Disorientation

Fog affects perceptual judgments of speed and distance and lowers contrast substantially, causing objects to appear fainter and less distinct. Fog conditions can hinder the ability for pilots to see oncoming traffic and other external references, such as buoys and channel perimeters. Restricted visibility, which often leads to a loss of some or all external references, can be described as spatial disorientation. Spatial disorientation is a failure of an operator to sense accurately the direction of motion in relation to the vessel they are commanding. This notion of spatial disorientation can also affect how the pilot handles a ship if they do not adequately

[22] Crouch, T. (2013). *Navigating the Human Element*; An introduction to Human Factors for Professional Mariners.
[23] An Electronic Chart Display & Information System (ECDIS) is a computer-based navigation information system that complies with International Maritime Organization (IMO) regulations and can be used as an alternative to paper nautical charts.
[24] Refer to Conti Peridot Pilot Interview in docket for details.

perceive the objects around them. When external visual references are unavailable, hazards are more pervasive and judgements may be askew.

The pilot on the *Conti Peridot* was operating in heavy fog and stated that, on several occasions he could not see beyond the bow of the ship. He was aware, via electronic display information and VHF communications of outbound ships, though he stated that he was only seeing them when they were within ½ mile of his vessel. When the *Carla Maersk* appeared in front of them, crew stated that it came out of the fog"; "appeared out of nowhere", assuming that the *Carla Maersk* was the vessel that was in the wrong 'orientation', facing sideways in the channel. The chief mate recalled that the fog lifted immediately in front of them and he could see the *Carla*—which he mistakenly thought was crossing the channel in front of the *Conti Peridot*, stating, "I see he's crossing our course", when in fact, the *Conti Peridot* crossing the channel.

5.3 Workload

Workload affects ability to ascertain situational awareness. While the pilot on the *Conti Peridot* was surrounded by the bridge team, the captain and the crew were not actively monitoring the progress of their vessel, based on their own testimony. Additionally, several crew members indicated that they were not watching the radar, indicating that it was not their duty at the time. The pilot, concerned about the handling of the ship was not communicating the issues at hand with the crew. The VDR[25] clearly exhibits [a quiet] bridge, where no discussions are being had regarding the handling of the vessel or explanations as to why the pilot is continuously changing course (helm commands) in an effort to stay in the channel center to be properly set-up to meet oncoming ship traffic. The pilot on the *Conti Peridot* estimated that he had a mile and a half before meeting the *Carla Maersk*, though he stated it had taken him 2 miles to get straightened out in the previous passing.

5.4 Communications--Bridge of *Conti Peridot*

According to Crouch (2013)[26], 60% of all marine accidents that fault the human operator are related to ineffective communication. The captain and crew of the *Conti Peridot* indicated in interviews that they were not aware of the ship handling issue the pilot was having prior to meeting the *Carla Maersk*. Several crew members, however, reported that they passed very close to oncoming ships after meeting the *Stolt Span*. Bridge Resource Management (BRM) is the effective use by a vessel's bridge team of all available resources—information, equipment, and personnel—to safely operate a vessel. BRM was developed to help operators enhance the quality of teamwork and to recognize and mitigate the consequences of operator errors. As part of the BRM concept, the captain and crew are equally responsible for ensuring safe passage on the waterway and maintaining situational awareness.

The pilot on *Conti Peridot* acknowledged his awareness of the ship's poor handling, stating that "this class of ship is really notorious for being a poor handling ship."[27] The pilot stated in his interview that he knew he was going to have some handling issues before he passed the *Carla Maersk*, yet he did not communicate this to the pilot on the *Carla Maersk*. As the

[25] Refer to VDR transcript in docket for additional information.
[26] Crouch, T. (2013). *Navigating the Human Element*. An introduction to Human Factors for Professional Mariners
[27] Refer to Conti Peridot Pilot interview for additional details regarding the ship's poor handling qualities.

weather began to deteriorate (decreasing visibility due to fog), crew interviews indicate that the pilot did not mention any problems. The pilot stated that he did not think the captain knew what was going on, but even if he did, that he would not have been able to help, thus, he did not say anything to him. Because he had done this run on numerous occasions, without incident, he stated that he thought he could get the vessel under control in time to pass the *Carla Maersk.* Additionally, the pilot stated that dropping anchor in the channel was not an option he had seriously considered, nor discussed with the captain. He stated that he probably could have anchored, but that he would have had to coordinate with the pilots behind him and those coming outbound and "you're in motion, and you would have to deal with all that".

5.5 Communications-- Between pilots onboard both vessels

After the meeting arrangement between the *Conti Peridot* and *Carla Maersk*, there was no communication between the two pilots, until minutes before the accident. During the Chief Mate's interview, he stated that, while he was on the bridge, observing, he did not hear the pilot say anything about issues he was having staying straight in the channel. He noticed that the pilot "seemed nervous" as they were getting closer to the *Carla Maersk*, but didn't hear him mention anything about having trouble. The chief mate did not mention that he thought the pilot was having trouble in the channel. When interviewers asked the chief mate if the pilot was talking to the captain during any of this, he said "No." He recalled that the pilot was standing left of the center of the bridge and that the captain was on the starboard side, near the ladder. He stated that he did not hear the pilot say anything to anyone during this time until he called the pilot on the *Carla Maersk* minutes prior to the collision, asking him to "go to port"[28]. Per the captain's interview on the *Conti Peridot*[29] When the captain first saw the *Carla Maersk*, he stated that he heard the pilot on the *Carla Maersk* say "Why are you in this position?", to which the pilot on the *Conti Peridot* replied, "Go to your left", and the other pilot stated, "no, I can't". The captain indicated that there was no more communication between the pilots before the collision occurred.

6 Distractions

6.1 Cell Phones

Investigators received cell phone numbers from each of the pilot's attorneys and subpoenaed the records for each[30],[31]. Both ship cell phones and SAT phones were subpoenaed as well as the cell phone for the captain on the *Carla Maersk*. Cell phones numbers for *Conti Peridot* captain were provided without subpoenas. Unfortunately, NTSB was unable to obtain any data on those international phone records. However, Carla Maersk provided a copy of their ship cell phone records[32] and INMARSAT logs[33] for the day of the accident. (Note that these were not official cell phone company records and were provided to NTSB in Excel format.)

Phone records for the pilot on the *Conti Peridot* provide evidence of 4 outgoing text messages during his time on the *Conti Peridot*, from 1014 to 1212. He received an incoming text

[28] Refer to *Conti Peridot* Chief Mate Interview in docket.
[29] Refer to *Conti Peridot* Captain Interview in docket.
[30] Refer to Cell phone DCA15MM017 Phone Records-Pilot on *Conti Carla.*
[31] Refer to Cell phone DCA15MM017 Phone Records-Pilot on *Carla Maersk.*
[32] Refer to *Carla Maersk* Mobile Phone Call list 090315
[33] Refer to *Carla Maersk* INMARSAT Log MAR 2015

message at 1218, 13 minutes prior to the accident. He made one phone call during his time onboard (prior to the accident) at 1032 for nearly two minutes (118 seconds). He also received one phone call during that time at 1031 for a length of 18 seconds. Based on his 72 hour work/rest history, no evidence of cell activity was found during the times he reported he was sleeping[34]. When asked about cell phone use of the crew, the pilot on the *Conti Peridot*[35] stated that the captain may have taken a couple of calls from the agent on the ship phone, but this was never confirmed. When queried about cell phone use on the bridge, crew and pilots indicated that cell phones were not in use on the bridge during their time on the bridge.

Phone records for the pilot on the *Carla Maersk* indicate that he did not send or receive any text messages during his time onboard the vessel (up to the time of the accident.). He made one phone call at 1049 for a total of 39 seconds and retrieved a voicemail at 0949. No evidence of cell activity was reported during the times he reported he was sleeping[36]. Data from the *Carla Maersk* ship mobile phone indicated that no calls, incoming our outgoing, were made during the transit in the HSC prior to the collision. [37] As mentioned above, international cell phone records for the captain of the *Carla Maer*sk were not obtained.

In summary, no phone calls by either pilot were made immediately prior to the accident. The *Carla Maersk* company cell or bridge phone was utilized in the hours preceding the accident. Since we were unable to obtain personal cell phone information from international numbers, no ship or cell data from the *Conti Peridot* was obtained. These hindrances in obtaining records for international cell phone use made it impossible to fully analyze personal cell phone use on the bridge, though pilot distraction by cell phone use can be ruled out.

When asked if cell phone use is acceptable for pilots during their pilotage, the Houston Pilots Association (HPA) stated that they recommend to the members (pilots) that cell phones be used solely for navigational purposes when piloting. This topic is reportedly discussed at HPA meetings and during various training classes.

7 Pilot Work/Rest Cycles

Investigators obtained a 96 hour profile on each of the accident pilots while on-scene. The day before the accident the pilot on the *Conti Peridot* took three naps[38] totaling more than 7 hours. His first nap the day prior to the accident occurred onboard the pilot boat on his way to work, then one on the ship almost immediately after he boarded (with a 15 minute break to complete paperwork as the #2 pilot onboard the ship). He then took a 2 hour nap from 1630-1830. He went to bed at 2300 and slept until 0600, approximately 7 hours the night prior to the accident. He did not make any phone calls or send any texts during periods shown as "sleeping" on his Sleep/Activity log. He was awake for about 6.5 hours before the accident occurred.

The day before the accident, the pilot of the *Carla Maersk* took a 2.5 hour nap during his working hours, slept 4 hours later in the evening, then went to bed at 1030, sleeping until 6am, approximately 7.5 hours the night prior to the accident[39]. He worked two singles and a double in

[34] Refer to *Conti Peridot* Pilot 96 hour Work/Rest History (Appx A)
[35] Refer to *Conti Peridot* Pilot Interview in docket.
[36] Refer to *Carla Maersk* Pilot 96 hour Work/Rest History (Appx A)
[37] Refer to *Carla Maersk* Mobile Phone Call List
[38] Refer to *Conti Peridot* Sleep/Activity Log in docket and in APPX A of this document for additional information.
[39] Refer to *Carla Maersk* Sleep/Activity Log in docket and in APPX A of this document for additional information

the week leading up to the accident. However, he averaged 9.9 hours of sleep per 24 hour period in the 96 hours prior to the accident. He was awake for about 6.5 hours before the accident occurred.

8 Medical and Post-Accident Toxicology Testing[40]

8.1 Pilot on *Conti Peridot*

The pilot on the *Conti Peridot* was a 63 year old male. His last medical exam was performed on February 19, 2015. The pilot's medical certificate, provided on-scene by his attorneys, was up to date. He wears reading glasses, and uses a fit bit to track his rest and fitness. He walks daily and takes vitamins. A review of his records by the NTSB doctor indicated that none of the medications he was taking have warnings for impairment of judgment, sleepiness, or reaction time. His mandatory post-accident drug and alcohol test was negative.

8.2 Pilot on the *Carla Maersk*

The pilot on the Carla Maersk was a 56 year old male. His last medical exam was in 2014. A review of his records by an NTSB doctor indicated that none of the medications he was taking at the time of the accident carry warnings for impairment of judgment, sleepiness, or reaction time. His mandatory post-accident drug and alcohol test was negative.

8.3 Crew on *Conti Peridot*

The post-accident urine drug testing performed on the *Conti Peridot* crew was negative for each crewmember tested.

8.4 Crew on *Carla Maersk*

The post-accident urine drug testing performed on the *Carla Maersk* crew was negative for each crewmember tested.

8.5 Vessel Traffic Service (VTS) Personnel

Post-accident urine testing was performed for the five USCG members on watch for VTS at the time of the accident. One specimen was identified as "untestable". According to emails received with the test results, this was reportedly due to an error in paperwork rather than as a result of any test performed on the urine. The other four tests were negative. No results were received by NTSB regarding any non-USCG members working the VTS at the time of the accident.

9 Training

9.1 Pilot on *Conti Peridot*

[40] Refer to DCA15MM017 Medical Investigation - (OUO) document in docket

The attorneys for the pilot on the *Conti Peridot* provided numerous training documents for the pilot. He most recently completed a 16 hour course in Bridge Resource Management (BRM) in February 2015. Other training in the last five years included: Restricted Visibility Navigation for Pilots (2014); Collision Regulations for Pilots (2013); Pilot Incident Management (2013); Raven Electronics Navigation Systems Training (2013); Error Detection and Application of Advanced Radar Techniques in Confined Waters (2012); BRM for Marine Pilots-Renewal (2012); Fatigue, Sleep and Medications (2010); 1-day Radar Observer Recertification Course (2012); General Shiphandling (2011); Legal Aspects of Piloting; Ship Simulator Course (2010).

9.2 Pilot on *Carla Maersk*

At the time of this report, investigators were awaiting requested training documents for pilot on *Carla Maersk.*

10 Waterways Oversight

Interviews with Houston Pilots Association and Port Commission were conducted by investigators in both the Deck Operations and Human Performance groups. Statements from pilots and commissioners indicate that port closings follow certain procedures and that halting traffic within the channel is up to the discretion of the pilots transiting in the channel. Through these interviews, NTSB investigators learned that the pilots can transit the HSC at their own discretion, even in adverse weather. In addition, oversight committees indicate that the responsibility to close the bar lies solely with the pilots when and if they believe the conditions are too dangerous to maneuver.

The NTSB has investigated several accidents involving the Houston Ship Channel, some of which also occurred in fog conditions. Investigators expressed concern regarding this trend when meeting with the Port of Houston Authority, the Lonestar Harbour Safety Committee, the Pilot Board of Commissioners Investigating Review Board, and the Houston Pilots. Specific procedures for closing the port in fog seemed to be based upon circumstantial evidence. For example, one interviewee in the LoneStar interview stated that, "my experience has been that typically the call to close the bar or open the bar has been made by the individual pilot organizations and then that filters back up through the VTS, which then disseminates the closure."[41] Similarly, when the accident pilots were asked about procedures for closing the port due to fog, they both stated that anchoring in the channel or closing the bar were decisions left to the discretion of the pilots themselves who are working in the channel at the time of restricted visibility. Both indicated that it was difficult to anchor in the channel due to coordination between the various pilots and the time it would take to get started again, should they anchor. Additionally, pilots only have authority over the deep draft vessels, so even if they stop traffic, the shallow draft can continue to move about. Only the captain of the port has authority to stop other vessels in the port. Specific policies are not currently in place for making decisions to continue transiting or halt movement in the channel. Discussions regarding standards or policies for closing the port in specific conditions indicate that the decision to close the port is not based on a set of criteria, per se, but based on information from pilots, VTS, weather conditions, etc. In

[41] Refer to LoneStar Interview transcript in docket for details.

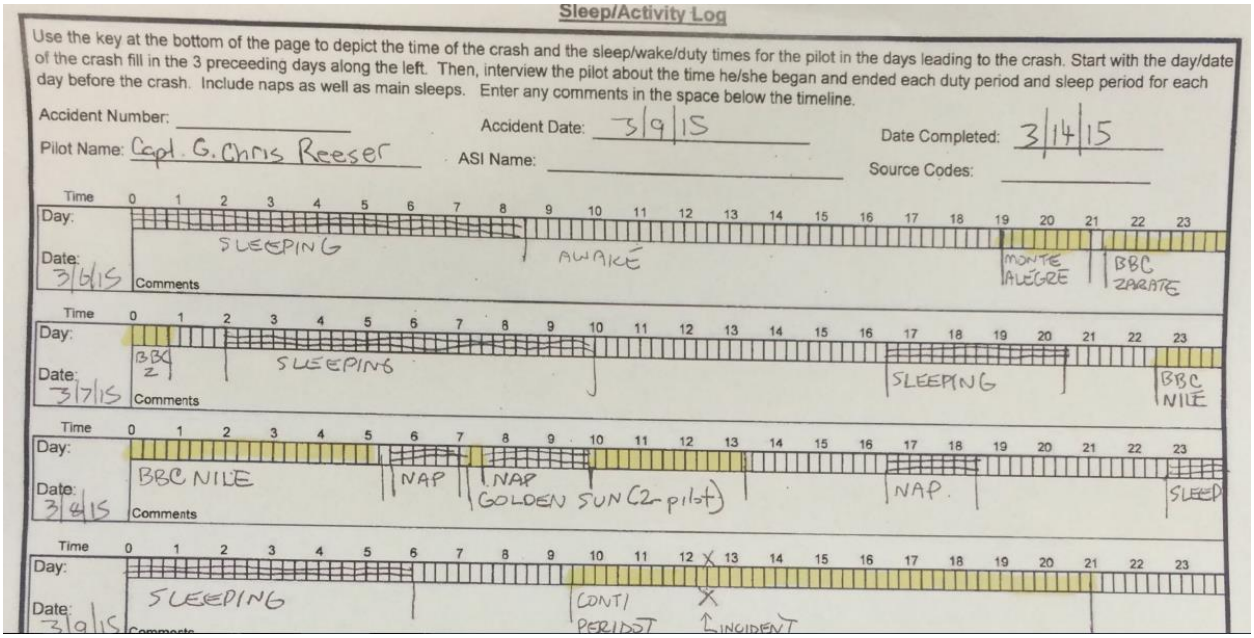
addition to the entities listed above, a Port Coordination Team is put into place when the port is closed, though not always "immediately" after the port is closed. This is primarily stood up to prioritize vessels once the port reopens.

END OF REPORT

Carrie Bell
Human Performance Investigator

APPX A- 96 HOUR PROFILES

Conti Peridot Pilot Sleep/Activity log



Sleep/Activity Log

Use the key at the bottom of the page to depict the time of the crash and the sleep/wake/duty times for the pilot in the days leading to the crash. Start with the day/date of the crash fill in the 3 preceeding days along the left. Then, interview the pilot about the time he/she began and ended each duty period and sleep period for each day before the crash. Include naps as well as main sleeps. Enter any comments in the space below the timeline.

Accident Number: _____ Accident Date: 3/9/15 Date Completed: 3/14/15

Pilot Name: Capt. G. Chris Reeser ASI Name: _____ Source Codes: _____

Time 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Day: Date: 3/6/15 Comments: SLEEPING AWAKE MONTE ALEGRE BBC ZARATE

Day: Date: 3/7/15 Comments: BBC 2 SLEEPING SLEEPING BBC NILE

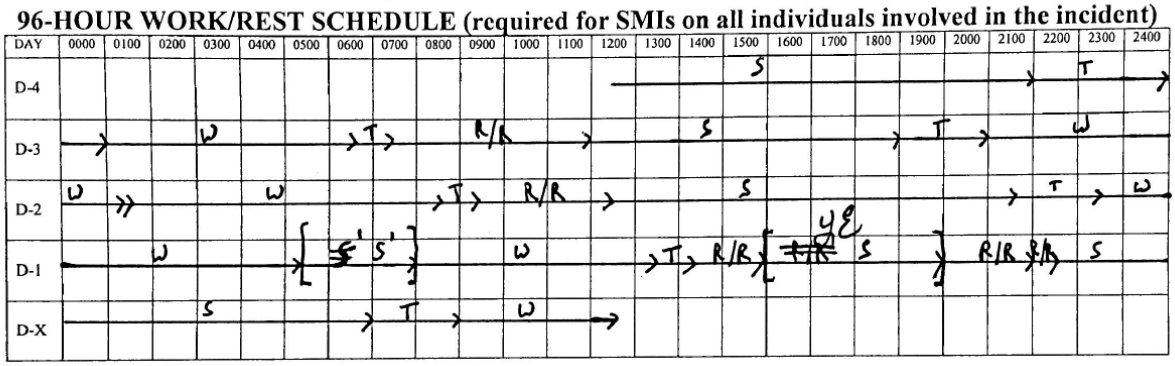
Day: Date: 3/8/15 Comments: BBC NILE NAP NAP GOLDEN SUN (2-pilot) NAP SLEEP

Day: Date: 3/9/15 Comments: SLEEPING CONTI PERIDOT INCIDENT

Carla Maersk Pilot Sleep/Activity Log

U. S. Coast Guard Marine Safety Unit Texas City — Captain Evans

96-HOUR WORK/REST SCHEDULE (required for SMIs on all individuals involved in the incident)



D-X: Date of incident: Mon, Mar 9 D-1: 1 day before incident: Sun, Mar 8 D-2: 2 days before incident: Sat, Mar 7

D-3: 3 days before incident: Fri, Mar 6 D-4: 4 days before incident: Thurs, Mar 5

F: Meal
W: Watch
M: Maintenance Work
S: Sleep
C: Cargo Watch
R: Recreation (including time ashore)
A: Alcoholic drink
O: Other _____

T: Transit
R/R: Rest/Recreation
S': Sleep aboard Pilot Boat

Prepared by: Keith D. Letourneau Signature: [redacted] Date: Mar 15, 2015