



UNITED STATES COAST GUARD

REPORT OF THE INVESTIGATION INTO THE LOSS OF LIFE ONBOARD THE LIQUEFIED PETROLEUM GAS CARRIER CONCORDE (IMO #9734678), MARCUS HOOK ANCHORAGE IN THE DELAWARE RIVER, ON OCTOBER 27, 2018



U.S. Department of
Homeland Security

United States
Coast Guard



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LIQUEFIED PETROLEUM GAS (LPG) CARRIER CONCORDE (IMO #9734678), LOSS OF LIFE AT MARCUS HOOK ANCHORAGE IN THE DELAWARE RIVER NEAR MARCUS HOOK, PA, ON OCTOBER 27, 2018

ENDORSEMENT BY THE OFFICER IN CHARGE, MARINE INSPECTION

The record and the report of the investigation convened for the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments. It is recommend that this marine casualty investigation be closed.

ENDORSEMENT/ACTION ON RECOMMENDATIONS

Safety Recommendation 8.1.1: Recommend Commandant, Office of Commercial Vessel Compliance (CVC-2), coordinate with the International Maritime Organization to establish a standard of wear of personal flotation devices for commercial vessel crewmembers when working on deck. USCG Recreational Boating Statistics for 2017 state: "Where cause of death was known, 76% of fatal boating accident victims drowned. Of those drowning victims with reported life jacket usage, 84.5% were not wearing a life jacket." There are no readily available statistics for commercial vessels in regards to drowning deaths and life jacket usage. In the CONCORDE case, had the Motorman been wearing a personal flotation device, he likely would not have drowned.

Endorsement: Concur/Partially Concur/ Concur With Intent/ Do Not Concur

Safety Recommendation 8.1.2: Recommend Commandant, Office of Commercial Vessel Compliance (CVC-2), coordinate with the International Maritime Organization to develop regulations to ensure that all equipment used for bunkering operations is adequate for the service intended. These rules should also include specifications (material, rated load, testing frequency, etc.) for the equipment they recommend using for these types of operations.

Endorsement: Concur/Partially Concur/ Concur With Intent/ Do Not Concur



S. E. ANDERSON
Captain, U.S. Coast Guard
Officer in Charge, Marine Inspection
Sector Delaware Bay



16732
February 12, 2020

**LIQUEFIED PETROLEUM GAS (LPG) CARRIER CONCORDE (IMO #9734678), LOSS
OF LIFE AT MARCUS HOOK ANCHORAGE IN THE DELAWARE RIVER NEAR
MARCUS HOOK, PA, ON OCTOBER 27, 2018**

INVESTIGATING OFFICER'S REPORT

Executive Summary

At approximately 2229 EST, on October 27, 2018, the LPG CONCORDE conducted bunker operations with the tank barge BRYANT SEA at Marcus Hook Anchorage in the Delaware River. There were six people on the deck of the LPG CONCORDE and two people on the deck of the BRYANT SEA. On scene weather was as follows: air temperature 47 degrees Fahrenheit (8.3 degrees Celsius), winds generally eight-miles-per-hour from the west, water temperature 48.5 degrees Fahrenheit (9.2 degrees Celsius), barometric pressure was 29.6 inches of Hg with cloudy skies.

While finishing bunker operations, the Fitter onboard the LPG CONCORDE removed the last bolt from the bunker hose flange connecting the hose to the vessel. When the last bolt was removed from the bunker hose flange, the hose shifted and its weight transferred to a line used by the crew to stop or arrest the fall of the hose from the side of the vessel, (stopper line) the crew used the stopper line to secure the hose to the vessel's railing. The shifting weight caused increased strain on the stopper line. The stopper line subsequently parted causing the trunk of the hose to slide down the side of the ship and lifting the flange end of the hose rapidly up into the air. The Motorman was holding the bunker hose when the stopper line parted, his right arm was caught between the hose and the crane sling, lifting the Motorman with the flange end of the bunker hose into the air. Simultaneously, residual heavy fuel oil from the open end of the bunker hose splashed onto the Motorman, reducing his ability to hold onto the bunker hose. At the time of the accident the crane sling was still attached to the bunker hose. When the crane sling caught the weight of the hose, the Motorman's arm was released and he slid down the trunk of the hose to the deck railing. Unable to hold the deck railing, the Motorman slid into the Delaware River. Rescue efforts ensued for 11.5 hours, and covered 194 miles, but the Motorman was not found. He was presumed dead on October 28, 2018.

On November 12, 2018, a good samaritan found the Motorman's remains in Penns Grove, New Jersey. The Penns Grove Police Department and Medical Examiner subsequently recovered the remains, identified the remains, and determined the Motorman died by drowning.

As a result of its investigation, the Coast Guard has determined that the initiating event for this casualty was the material failure of the stopper line attached to the transfer hose. The causal factors that contributed to this casualty include: (1) the stopper line had deteriorated over time;

(2) failure to annually test the load bearing capacity of the stopper line; (3) failure of the managing operator to provide specific instructions on rigging a bunker hose; (4) failure of the Motorman to avoid the pinch point located between the bunker hose and the crane sling; and (5) failure of the Motorman to wear a personal flotation device.

1. Preliminary Statement

1.1. This marine casualty investigation was conducted and this report was submitted in accordance with Title 46, Code of Federal Regulations (CFR), Subpart 4.07, and under the authority of Title 46, United States Code (USC), Chapter 63.

1.2. The Investigating Office did not designate any parties-in-interest in this investigation.

1.3. The Coast Guard was the lead agency for all evidence collection activities involving this investigation.

1.4. All times listed in this report are approximate and are given in Eastern Standard Time using a 24-hour format.

2. Vessel Involved in the Incident



Figure 1. Undated photograph of LPG CONCORDE provided by Dorian LPG Management Corp.

Official Name:	LPG CONCORDE
Identification Number:	9734678
Flag:	Bahamas
Vessel Class/Type/Sub-Type	Tank Ship/Gas Carrier/LPG
Build Year:	2015

Gross Tonnage:	48,060 GT
Length:	738.6 Feet
Beam/Width:	120.1 Feet
Draft/Depth:	72.8 Feet
Main/Primary Propulsion: (Configuration/System Type, Ahead Horse Power)	Slow Speed Diesel
Owner:	Hisamoto Kisen Co., LTD. 116-2 Ootabu, Hinasecho, Bizen City, Okayama, 701-3203, Japan
Operator:	Dorian LPG Management Corp. 24 Poseidonos Avenue Kallithea 17674 Greece

3. Deceased, Missing, and/or Injured Persons

Relationship to Vessel	Sex	Age	Status
Motorman	Male	40	Deceased

4. Findings of Fact

4.1. The Incident:

4.1.1. On October 27, 2018 at 1700, the LPG CONCORDE was anchored at Marcus Hook Anchorage in Marcus Hook, PA. The tug DR. MILTON WANER and tank barge BRYANT SEA were moored alongside the LPG CONCORDE conducting bunkering operations.

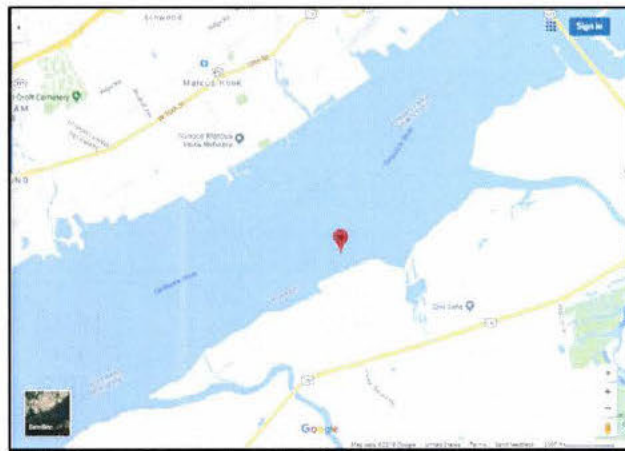


Figure 2. Google Maps image of the location of the casualty in the Delaware River.

4.1.2. At 1730, the LPG CONCORDE received a six-inch heavy fuel oil (HFO) bunker hose from the barge BRYANT SEA. The LPG CONCORDE used its crane to hoist the hose from the deck of the BRYANT SEA to the deck of the LPG CONCORDE. Once on

deck and attached to the vessel, an Ordinary Seaman (OS) on watch tied a one-inch natural fiber line to the bunker hose and the deck railing.

4.1.3. At 1810, the LPG CONCORDE commenced bunkering from the BRYANT SEA. They received Marine Gasoline (MGO) first and then HFO from two separate hoses.

4.1.4. At 2157, the LPG CONCORDE finished bunkering from the barge BRYANT SEA. They commenced securing bunker operations, finished their paper work, returned hand-held radios back to the BRYANT SEA Barge Captain, and started removing the bunker hoses.

4.1.5. At 2215, the Third Engineer from the LPG CONCORDE communicated with the Barge Captain about the removal of the HFO bunker hose. The Barge Captain confirmed that the hose had been gravity drained back into the barge and that the crew from the LPG CONCORDE could then remove the hose.

The red arrow points to the location of the Motorman. The yellow arrow points to the positioning of the Motorman's arm in relation to the bunker hose and crane sling.



Figure 3. Location of crewmembers when the bunker hose was disconnected, provided by Mr. [REDACTED]. The hose in the photo is a four-inch hose, the hose used during the incident was a six-inch hose.

4.1.6. At 2229:55, the Motorman had his arms wrapped around the bunker hose and was adjusting it so the Fitter could remove the last bolt. The crane sling was still attached to the bunker hose just behind the Motorman's right arm. The last bolt to be removed was located at the 12:00 position on the flange. When the last bolt was removed, the hose began to fall down the side of the LPG CONCORDE. The weight of the hose then shifted onto the stopper line connecting the bunker hose to the deck railing.

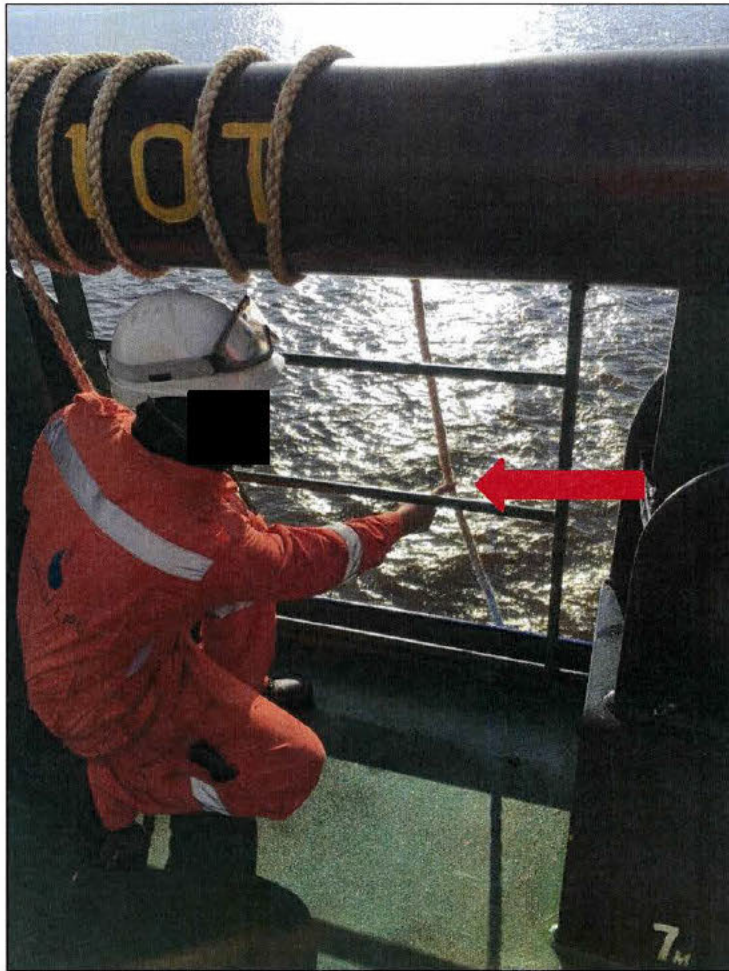


Figure 4. Crewmember pointing to where the stopper line parted. Provided by Mr. [REDACTED]

4.1.7. At 2230:00, the stopper line parted. The bunker hose then continued its slide down the side of the LPG CONCORDE causing the end of the hose to rapidly rise up into the air. The shifting bunker hose pinched the Motorman's arm between the hose and the crane sling lifting him up into the air. The crane sling then took on the load of the bunker hose, releasing the Motorman's arm. During this process, residual HFO splashed onto the Motorman making it difficult for him to hold onto anything, and he subsequently slid down the bunker hose and landed on the deck railing. A few seconds after landing on the deck railing, he slid off the side of the vessel and into the water.

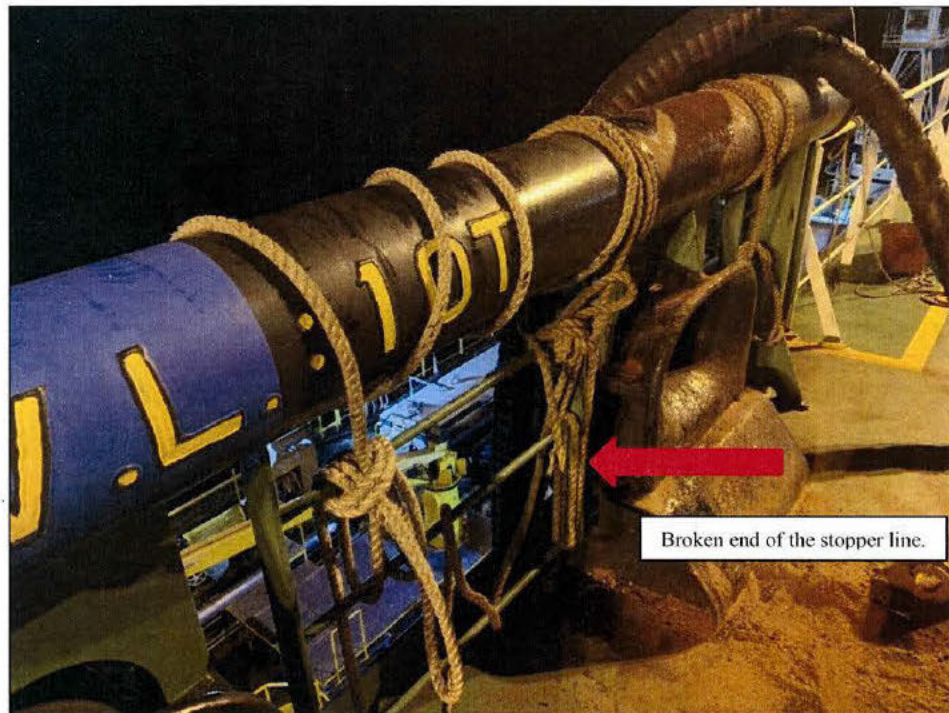


Figure 3. Location where the Motorman fell overboard, photo by Mr. [REDACTED]

4.1.8. At 2230:05, the Motorman landed in the water between the LPG CONCORDE and the BRYANT SEA. Crewmembers from the BRYANT SEA attempted to render assistance but were unable locate the Motorman from the LPG CONCORDE.

4.1.9. At 0030, on October 28, 2018, post-casualty alcohol testing required by 46 CFR 4.06 was completed for the following individuals onboard the LPG CONCORDE: the Third Engineer, the Bosun, the Able Seaman, the Fitter, and the Wiper. All results were [REDACTED].

4.1.10. At 0915, on October 29, 2018, post-casualty drug testing required by 46 CFR 4.06 was completed for the entire crew of the LPG CONCORDE. All results were [REDACTED].

4.1.11. At 1746, on November 12, 2018, the remains of the Motorman washed ashore in Penns Grove, NJ. The Penns Grove Police Department took custody of the remains and delivered them to the Gloucester County Medical Examiner.

4.1.12. At 1613, on December 5, 2018, the toxicology report for the Motorman showed that his blood alcohol content (BAC) was 0.041. This was due to the decomposition of the Motorman's body while in the water.

4.2. Additional/Supporting Information:

4.2.1. At 2213, on October 27, 2018, the on-scene weather was: temperature 47 degrees Fahrenheit (8.3 degrees Celsius), winds approximately eight-miles-per-hour from the west, water temperature 48.5 degrees Fahrenheit (9.2 degrees Celsius), barometric pressure was 29.6 inches of Hg under cloudy skies.

4.2.2. The crew of the LPG CONCORDE had used the same stopper line for every bunker operation since the ship was commissioned in 2015. The line was approximately three years old. In its new condition the safe working load for the stopper line was approximately 1,150 pounds. Figure 4 displays the broken end of the stopper line.



Figure 4. Stopper line broken end, provided by Mr. [REDACTED]



Figure 5. Stopper line displayed on the pier, approximately 83 feet, provided by Coast Guard Sector Delaware Bay Investigations.

4.2.3. Portions of the line used onboard the LPG CONCORDE were taken as evidence and subsequently sent to be tested at Columbia University's Carleton Laboratory (see figures 4 and 5). Three destructive breaking strength tests were conducted on these samples, which resulted in the following values: test (1) 691 pounds, test (2) 735 pounds, test (3) 569 pounds, with an average breaking strength of 665 pounds.

4.2.4. The two sections of bunker hose used for bunkering HFO the day of the casualty were manufactured by APPOLLOFLEX OS&D. One section of hose was 50 feet in

length and the other was 35 feet in length. The hoses were both six inches in diameter and there were four flanges inserted between the two sections. The total weight of the hoses and flanges without any fuel present is approximately 927 pounds.

4.2.5. The tankerman onboard the barge stated that the bunker hose had been gravity drained back into the barge upon completion of the bunkering operation. Once that operation was completed, the engineers onboard the LPG CONCORDE drained the remaining HFO into a drum located underneath the flanges where the bunker hose connected to the vessel.

4.2.6. The LPG CONCORDE was de-ballasting at the time of the marine casualty. The ballast water overboard discharge port is located in the vicinity of where the Motorman fell overboard.

5. Analysis

5.1. *Failure to annually test the load bearing capacity of the stopper line.* The crew of the LPG CONCORDE used one-inch natural fiber line as a stopper for the bunker line. The stopper line was used to assist in securing the bunker hose to the vessel by connecting it to the deck railing of the vessel in way of the manifold, which would help prevent the hose from falling over the side should its flange come loose from the connection point at the fuel manifold. The stopper line was made from natural fiber, and, in new condition, it had a rated safe working load of approximately 1,150 pounds (static loading). The stopper line that failed in this case had not been tested since it was placed into service in 2015. In the United States, weight bearing equipment is required to be inspected at each use and annually in accordance with Occupational Safety and Health Administration's (OSHA) requirements outlined in 29 CFR 1926.251. We would expect that the strength of the natural fibers in this stopper line to be reduced over time due to a number of factors (exposure to the elements, wear from frequent use, etc.). In fact, three load tests of the stopper line used onboard the LPG CONCORDE were conducted after the casualty, and we found an average breaking strength of only 665 pounds under a static load; a 42% reduction in rated strength from the original safe working load.

The six-inch diameter bunker hose used for HFO was made by APPOLLOFLEX OS&D. As discussed in 4.2.4 above, the total weight of the two sections of bunker hose was approximately 927 pounds. Clearly, this load is much greater than the 665 pounds the line was likely able to support based on the testing described in 4.2.3 above. Therefore, the weight of the bunker hose exceeded the average breaking strength of the stopper line by almost 30%.

Unlike other lifting gear, there are no annual international load testing requirements for manila line, regardless of use. By contrast, loading straps are load tested annually and are rated for specific loads/use. Had the crew used a rated loading strap in lieu of the manila stopper line, it is likely that this casualty, resulting in the loss of a mariner's life, would not have occurred.

5.2. *Failure of the Dorian LPG Management Corp. to define a properly rigged bunker hose.* Dorian LPG Management Corp.'s bunker procedures are covered in section 6.2.31 of their fleet instructions manual. These procedures guide employees to Form SAF 02, Bunkering

Operation Check-List. Section D.9 on page 03 of the check-list says, “The transfer hose is properly rigged and fully bolted and secured to manifolds on ship and barge”. There is no minimum requirement defining the term “properly rigged.”

On the night of the casualty, the ship’s crane was used to lift the bunker hose from the barge to the vessel’s deck. After the first bolts were installed fastening the bunker hose flange to the ship’s fuel transfer system, the lifting strap had to be adjusted to allow access to the remainder of the bunker hose flange bolts. When the crane lifting sling was slackened, the weight of the bunker hose was transferred from the crane to the flange bolts. When the crew removed the flange bolts, the weight of the bunker hose was transferred to the stopper line, and the stopper line almost instantly suffered a material failure under the weight of the bunker hose and parted. If the company required the stopper line to be a rated load bearing strap, outlined the maintenance for the strap, and removed the strap from service when it was worn, then the stopper line may not have suffered a material failure.

5.3. *Failure to replace the deteriorated stopper line.* The stopper line used in bunkering procedures had been onboard for approximately three years. Over time, the line deteriorated and lost approximately 42% of its original strength. In new condition, the line had a safe working load of 1,150 pounds but in its deteriorated condition it could only support an approximately 665 pound load. In the United States, OSHA standard 29 CFR 1926.251(d)(6) requires the replacement of deteriorated natural fiber line if any of the following are found during an inspection: abnormal wear, powdered fiber between strands, broken or cut fibers, and variations in the size or roundness of strands, discoloration or rotting, or distortion of hardware in the sling. The stopper line was stored in an oil spill equipment locker on deck, which exposed it to various petroleum products and chemicals. Exposure to fuels, oils, salt water and chemicals likely reduced the life span of the natural fiber line. Natural fiber line deteriorates over time. If the vessel had used a synthetic line then the stopper line may not have deteriorated at the same rate as it did being natural fiber, the reduced detrition which may have prevented the material failure of the stopper line. If the line had been stored in a more secure environment out of the elements and away from exposure to hazardous materials, it may not have deteriorated as much as it had, allowing it to support the load of the bunker hose. Lastly, replacing the line on a set schedule would have reduced the amount of time the line was able to deteriorate and may have prevented the material failure of the stopper line.

5.4. *The Motorman failed to keep his arms clear of the pinch area between the bunker hose and the crane sling.* The Motorman wrapped his arms around the bunker hose just forward of where the crane lifting sling was located in an effort to lift the bunker hose and remove pressure from the flange bolts that held the bunker hose in place. When the Fitter removed the last flange bolt, the bunker hose weight shifted to the stopper line. The stopper line immediately parted causing the flanged end of the hose to violently slide outboard and upward due to its configuration within the crane sling, catching the Motorman’s arm between the hose and sling. The force of the bunker hose shifting, in conjunction with the Motorman’s pinched condition, rapidly lifted the Motorman from the deck and ejected him from the vessel. Had the Motorman avoided placing himself in that pinch point, he likely would not have been ejected from the vessel.

5.5. *The Motorman fell into the water.* The Medical Examiner’s report stated that the cause of the Motorman’s death was drowning. A study conducted by the Center for Disease Control and Prevention found that 90% of people who drowned in boating-related accidents

were not wearing a personal flotation device (PFD) (aka life jacket). It is highly likely that had the motorman been wearing a PFD, he would not have drowned.

6. Conclusions

6.1. Determination of Cause:

6.1.1. The initiating event for this casualty occurred due to a material failure of the stopper line securing the bunker hose to the deck rail on the LPG CONCORDE.

6.1.1.1. The stopper line had not been load tested since it was placed into service in 2015.

6.1.1.2. The stopper line lost approximately 42% of its original strength due to deterioration.

6.1.1.3. Dorian LPG Management Corp. failed to establish clear guidelines on how to properly rig bunker hose.

6.1.2. The first subsequent event was the Motorman being ejected from the vessel.

6.1.2.1. The Motorman failed to keep his arms clear of the pinch area between the bunker hose and the crane sling.

6.1.3. The second subsequent event was the drowning of the Motorman.

6.1.3.1. The Motorman fell between 70 and 80 feet from the main deck into the water. He was not wearing a personal flotation device. His death was determined to be caused by drowning.

6.2. Evidence of Act(s) or Violation(s) of Law by Any Coast Guard Credentialed Mariner Subject to Action under 46 USC Chapter 77: None.

6.3. Evidence of Act(s) or Violation(s) of Law by U.S. Coast Guard Personnel, or any other person: None.

6.4. Evidence of Act(s) Subject to Civil Penalty: None.

6.5. Evidence of Criminal Act(s): None.

6.6. Need for New or Amended U.S. Law or Regulation: None.

6.7. Unsafe Actions or Conditions that Were Not Causal Factors:

6.7.1. In paragraph 4.1.11, the Motorman's toxicology report showed that he had a (BAC) of 0.041 at his time of death. As per the Medical Examiner, the BAC found in the Motorman's body was a result of decomposition.

7. Actions Taken Since the Incident

7.1. No action has been taken by the Coast Guard since the incident.

8. Recommendations

8.1. Safety Recommendation:

8.1.1. Recommend Commandant, Office of Commercial Vessel Compliance (CVC-2), coordinate with the International Maritime Organization to establish a standard of wear of PFD for commercial vessel crewmembers when working on deck. USCG Recreational Boating Statistics for 2017 state: "Where cause of death was known, 76% of fatal boating accident victims drowned. Of those drowning victims with reported life jacket usage, 84.5% were not wearing a life jacket." There are no readily available statistics for commercial vessels in regards to drowning deaths and life jacket usage. In the LPG CONCORDE case, had the Motorman been wearing a personal flotation device, he likely would not have drowned.

8.1.2. Recommend Commandant, Office of Commercial Vessel Compliance (CVC-2), coordinate with the International Maritime Organization to develop regulations to ensure that all equipment used for bunker operations is adequate for the service intended. These rules should also include specifications (material, rated load, testing frequency, etc.) for the equipment they recommend using for these types of operations.

8.2. Administrative Recommendations: None.



Chief Warrant Officer, U.S. Coast Guard
Investigating Officer