

National Transportation Safety Board

Marine Accident Brief

Collision of Tugboat Cerro Santiago with US Coast Guard Cutter Tampa

| Accident no. | DCA17PM011 |
|-------------------------|---|
| Vessel names | Cerro Santiago and Tampa |
| Accident type | Collision |
| Location | Miraflores Lake, Panama Canal, Panama 9°0'30.5" N, 79°36'17.9" W |
| Date | April 18, 2017 |
| Time | 0029 eastern standard time (coordinated universal time – 5 hours) |
| Injuries | None |
| Property damage | \$170,018 |
| Environmental damage | None reported |
| Weather | Visibility 8 miles, winds north-northwest at 7 knots, calm water, air temperature 78°F, water temperature 77°F |
| Waterway information | The Panama Canal is a 48-mile-long, man-made waterway that connects the Atlantic Ocean to the Pacific Ocean. Miraflores Lake, the site of the collision, is located between the Miraflores Locks and the Pedro Miguel Locks on the Pacific Ocean side of the canal. The lake measures approximately 0.91 miles in length with a channel width of 750 feet.* |

At 0029 local time on April 18, 2017, while transiting northbound through the Panama Canal, the Panama-flagged tugboat *Cerro Santiago* collided with the US Coast Guard cutter *Tampa* in Miraflores Lake, Panama. Although the tugboat was not damaged, the cutter sustained \$170,018 in damage to the stern as well as to various systems in the steering gear room. There were no injuries, nor was there any report of pollution.



Coast Guard cutter *Tampa* anchored off the Port of Colón, Panama, after the collision.

*Unless otherwise noted, all miles in this report are nautical miles (1.15 statute miles).



The accident area in Miraflores Lake, Panama Canal. (National Geospatial-Intelligence Agency chart 21602)

Accident Events

At 1305 local time on February 19, 2017, the *Tampa*—a 270-foot, Famous-class medium endurance cutter—departed Portsmouth, Virginia, for patrol operations in the Atlantic Ocean, the Gulf of Mexico, and the Pacific Ocean via the Panama Canal. At 0954 on February 28, the *Tampa* arrived at the Atlantic entrance of the Panama Canal and anchored off Colón to await the arrival of a Panama Canal pilot before beginning the southbound transit of the canal. The vessel transited the canal without incident, moored briefly at the naval base Vasco Núñez de Balboa (formerly known as the Rodman Naval Station), and then departed through the Pacific entrance into the Pacific Ocean at 1631 on March 2 to resume operations.

After the crew of the *Tampa* spent the next month and a half performing operations in the Pacific Ocean, the cutter returned to the canal, arriving at the Pacific entrance at 0814 on April 17 to prepare for the transit northbound through the canal. It moored starboard side to at the naval base (pier no. 2), where it received 28,000 gallons of diesel fuel; refueling was completed at 1521.

Besides the crew of 13 officers and 77 enlisted personnel, the cutter also had 28 detainees from multiple law enforcement activities, who were housed in a temporary shelter on the helicopter deck under a 24-hour armed guard.

For the commanding officer and many of the navigation team members, the latest transit through the canal was the fourth of their careers. Preparations were made by the development of a voyage plan, the performance of a navigation brief, and the completion of a risk assessment using the Coast Guard's Green-Amber-Red (GAR) model. The GAR model, which indicated a moderate (amber) level of risk, was based on several factors: complexity of the canal transit, traffic density, pace of operations prior to arrival at the fuel pier, reduced visibility caused by darkness, several watch rotations of the navigation team, and concerns over crew fatigue resulting from environmental conditions, particularly from the heat and humidity.

Following the GAR procedures, the commanding officer and crew developed mitigation strategies to address the risks they had identified. These strategies included scheduling the watch rotations to ensure no one assumed watch directly before or after daywork, tasking, or any other assignment, and encouraging crewmembers to rest while the vessel replenished fuel at the fuel pier. The team also identified the services of the Panama Canal pilots as a mitigation strategy to reduce the risks associated with traffic density and reduced visibility and stressed the importance of everyone on deck, including those involved in the navigation of the vessel, to act as a safety observer. Crewmembers were empowered to report any unsafe condition or unusual activity they observed.

Under the rules and regulations of the Panama Canal Authority (ACP), a pilot on board a vessel assumes control of the navigation, rather than serving in an advisory capacity as compulsory state pilots do in the United States. Vessel traffic in the canal is managed by the ACP's Marine Traffic Control Center (MTC), whose efforts contribute to the prevention of collisions in a manner similar to those of a Vessel Traffic Service in the United States. Although the center provides traffic advisories to pilots, its primary responsibilities are to minimize a vessel's average transit time and to optimize the use of canal facilities, including the lock systems at both ends of the canal.

The MTC uses a Communications, Tracking, and Navigation (CTAN) system that relies on differential GPS-based locations, radar at both ends of the canal, and automatic identification system (AIS) data to develop a traffic image. Along with other safety-critical information, this image is displayed in the MTC and on the pilot's laptop computer as an electronic map in real time. The MTC also prepares an operation schedule based on the number and characteristics of all vessels in transit or waiting to transit the canal. Staff continuously monitors vessel operations and conveys traffic information to each pilot to ensure close adherence to each vessel's schedule.

At 2045, the crewmembers of the *Tampa* were preparing to get under way as they awaited the arrival of the Panama Canal pilot for the northbound transit. The commanding officer established a special navigation watch on the bridge to maneuver in the restricted waters of the Panama Canal. Because the entire transit was expected to take 12 hours, the navigation watch was divided into two sections: the first, from the naval base Vasco Núñez de Balboa to Gamboa Reach; the second, continuing from Gamboa Reach to Limon Bay.

Under this special navigation watch, communication between watchstanders was limited to communication essential to the safe movement of the vessel and essential to the bridge team. The bridge team consisted of the following: a conning officer, a deck watch officer, a coach/safety observer, a navigation evaluation officer, a quartermaster of the watch, two helmsmen, a forward lookout, an aft lookout, two bearing takers, the operations officer, and the commanding officer.

Communication from the pilot was directed to the conning officer, who in turn conveyed the orders and directions to the helmsman. The operations officer would serve as the coach/safety observer for the first watch section, and the executive officer would relieve the operations officer for the second watch section.



1. 0014, April 18

The northbound vessel *Tampa* exits the Miraflores Locks, transiting astern of the *Atlantic Acanthus*.

2. 0015

The southbound vessels *Cerro Santiago* and *Sun Ploeg* begin to exit the Pedro Miguel Locks.

3. 0020

The *Tampa* shifts to the west side of the channel to begin lining up for entrance into the west lane of the Pedro Miguel Locks.

4. 0023

The *Cerro Santiago* navigates to a position ahead of the *Sun Ploeg* to clear the approach for the *Atlantic Acanthus*.

5. 0026

The *Cerro Santiago*, traveling stern first, passes on the starboard side of the *Atlantic Acanthus*.

6. 0029

After turning from its southerly course and proceeding toward the *Tampa*, the *Cerro Santiago* contacts the stern of the cutter to starboard.

Vessel tracklines are based on AIS data, with the exception of the *Tampa*, whose AIS was operating in encrypted mode at the time of the accident. The cutter's track is based on testimony that indicated it was transiting astern of the *Atlantic Acanthus*.

In addition to the navigation watch sections, the commanding officer also assigned personnel to various locations on the *Tampa*: to the bow, in case the navigation team needed to release the vessel's anchors during the transit; to the stern, to assist with line handling and fendering functions; and to the aft steering room, in case the vessel needed to change to manual steering. In addition, three watchstanders were assigned to a secure space known as the Combat Information Center (CIC). The personnel serving in the CIC maintained a picture of all threats to the vessel using AIS data, surface search radar, and other sensors, and then disseminated that information to the team on the navigation bridge.

At the time that the *Tampa* was being prepared for departure, the tugboat *Cerro Santiago* was moored at the ACP facility on the east side of the canal, just north of the Pedro Miguel Locks, awaiting tasking. The *Cerro Santiago*, which was crewed by a master, an engineer, an assistant engineer, and two deckhands, was one of the ACP's 14 Cerro-class tugboats assisting ships in the canal 24 hours a day.¹ The tugboats were specifically constructed to provide 360-degree visibility from the bridge and to operate in close proximity to larger vessels in confined waters. The *Cerro Santiago* was equipped with two azimuth drives capable of being rotated 360 degrees to direct the thrust in any horizontal direction. The navigation bridge had duplicate control stations to which the operator could orient the navigation lighting based on the station preferred. According to the master, the tugboat was routinely operated from the stern-facing control station in a stern-first mode for pushing, pulling, and line handling. The stern, where the port and starboard line-handling winches were located, was reinforced with heavier framing, hull plating, and rubber fendering.

At 2118, while the *Tampa* was moored, the pilot boarded the cutter port side from a pilot boat; 6 minutes later, it was under way heading northbound toward the Miraflores Locks. At 2315, after another ACP vessel dropped off seven Panamanian line handlers on the *Tampa* (at 2240) as required for passage through the canal, the vessel entered the east lane of the locks. About 2 hours later, at 0014 on April 18, the *Tampa* exited the locks into Miraflores Lake heading northwest at a speed ranging between 2.6 and 3.6 knots.

Meanwhile, at 2254, the *Cerro Santiago* was in transit southbound from the ACP facility. The tugboat was en route to assist a southbound, Cayman Islands-flagged chemical and oil tankship named the *Sun Ploeg* through the Pedro Miguel and the Miraflores Locks. The *Cerro Santiago* and the *Sun Ploeg* (identified as South 26, or S26, by the MTC) entered the east lane of the Pedro Miguel Locks at 2347 and, within an hour, began to exit those locks into Miraflores Lake at 0015 on April 18. Initially, the *Cerro Santiago* maneuvered to a position near the center wall that separates the approach to the east and west lanes just outside the southern entrance of the locks, while the *Sun Ploeg* was maneuvering to depart the locks and resume a southbound direction on the east side of the channel.

About 0020, the pilot directed the *Tampa* to be maneuvered toward the west side of the channel to begin lining up the vessel for entrance into the west lane of the Pedro Miguel Locks. As the *Tampa* shifted toward the west side of the channel, it proceeded on a course over ground of 313 degrees at a speed of 1.9 knots. The *Tampa* was following a northbound vessel, the Bahamas-flagged containership *Atlantic Acanthus*, toward the west lane of the locks. The *Atlantic Acanthus* was proceeding on a course over ground of 314 degrees at a speed of 1.4 knots.

Around this time, the pilot and navigation team on the *Tampa* identified a southbound tugboat—later determined to be the *Cerro Santiago*, which had passed down the starboard side of the northbound *Atlantic Acanthus*—approaching on a course where it would also pass down the

¹ The English translation of the Spanish word *cerro* is *hill*. The 14 Cerro-class tugboats built for the ACP are all named after hills located in Panama.

starboard side of the cutter. At 0023, the *Cerro Santiago* navigated to a position ahead of the *Sun Ploeg* to clear the approach for the *Atlantic Acanthus*. At 0026, the *Cerro Santiago* was on a course over ground of 122 degrees at a speed of 3.4 knots.

According to the members of the *Tampa*'s navigation team, the tugboat's deck lights were so intense that the lighting impacted their night vision. After the tugboat passed safely down the starboard side of the *Tampa*, the pilot and navigation team aboard the cutter focused their attention on the approach to the locks and the vessel traffic ahead. However, the *Cerro Santiago* suddenly rotated to starboard from its southerly course and, while still traveling stern first, began heading toward the *Tampa*. At 0029, the tugboat collided with the stern of the cutter to starboard.



Port side of tugboat *Cerro Santiago* postaccident in the Panama Canal. The exhaust stacks for the main diesel engines are just forward of the pilothouse.

Because the pilot and navigation team of the *Tampa* did not visually observe the tugboat's sudden turn toward the cutter in such close quarters and thereby could not foresee the impending collision, there was no sounding of the collision alarm. They did feel the impact, nonetheless. On contact, the pilot asked the navigation team, "What did we hit?" Immediately, crewmembers located aft on the *Tampa* informed the bridge team that the cutter had been struck on the stern by a tugboat. According to the pilot, he then radioed the master of the *Cerro Santiago* to ask him what happened, to which the master responded, "I screwed up." Afterwards, tshe tugboat resumed its southerly course to assist the southbound *Sun Ploeg* with the approach to the east lane of the Miraflores Locks.



A frame from video captured by the *Tampa*'s stern camera at the time of contact. A yellow arrow highlights the *Cerro Santiago*, which was traveling stern first. In the foreground is the temporary shelter on the helicopter deck for the cutter's detainees. (Photo courtesy of Coast Guard)

Several Coast Guard crewmembers who had been located on the helicopter deck near the cutter's stern at the time of the accident had witnessed the tugboat turning toward the cutter. They proceeded toward the stern to investigate the matter just before the tugboat collided with the cutter's stern.

Immediately after the collision, the cutter's fast-response team performed an initial assessment of the damage and concluded that the damage was moderate and did not impact the watertight integrity of the vessel below the waterline. At 0054, the *Tampa* entered the Pedro Miguel Locks, where the crew performed a more extensive survey of the damage to verify that the cutter was watertight: it was determined to be safe to continue the northbound transit through the canal. The cutter exited the locks at 0123 and continued northbound through the canal for roughly the next 6 hours. At 0707, it passed through the Gatun Locks and then proceeded into the Atlantic Ocean, where it anchored at 0803 to await the arrival of NTSB and Coast Guard investigators. All 28 detainees on board were transferred to the Coast Guard cutter *Mohawk*.

At the time of the accident, the *Tampa*'s navigation lighting was energized, including the stern light, with each light visually verified as being operational, the status of which was noted in the deck log. The cutter's AIS was still operating in encrypted, or "blue forces," mode; thus, the broadcasted information was not being received by the *Cerro Santiago*, other commercial vessels nearby, or the MTC, all of which were equipped with AIS.



Damaged stern of the *Tampa*, which was moored postaccident in the anchorage off Colón on the Atlantic Ocean side of the canal.

Although investigators were not able to question the Panamanian mariners involved in this accident, they were given access to the investigative hearing convened by the ACP Board of Inspectors on April 21, 2017, and were later provided with a copy of the board's final report along with all evidence collected. In the hearing, the master of the *Cerro Santiago* indicated that he had graduated from a US maritime academy in 1980 and had 35 years of service without incident as master of towboats. In a written statement, he claimed, "I fell asleep for a few minutes [at the time of the accident] because I was tired, and when I regained consciousness it was too late." He also said that his crew had informed him that the tugboat damaged only the railing of the *Tampa* but did not sustain any damage itself.

The pilot on the *Tampa*, who also provided testimony during the hearing, stated that he was unclear on exactly what happened, given that the *Cerro Santiago* had safely passed the *Tampa* and that he had never intended to utilize the *Cerro Santiago* or any other tugboat for the transit. He also indicated that all his commands were properly executed by the crew and that the cutter's propulsion and steering were operational.

As part of their efforts, investigators visited the *Tampa* in the anchorage off Colón, surveyed the damage to the vessel, and interviewed select crewmembers who either were on watch or witnessed the *Cerro Santiago*'s maneuvering actions at the time of the collision. With the

assistance of the ACP, investigators also boarded the *Cerro Santiago*, which got under way with the accident master and crew.

While on board the *Cerro Santiago* with the investigators, the master explained the expectations of ACP shoreside management for operating the vessel, the functionality of the control systems for the azimuth drives, and his work/rest cycle for the month. On the night of the accident, after completing his seventh consecutive 8-hour workday (at 2400), the master was still operating the *Cerro Santiago*, on overtime, while awaiting his relief to arrive when the collision occurred about 8.5 hours into his watch. A log detailing the actual hours worked for each shift was not made available to investigators.



On the early morning of the accident at 0029 on April 18, the master had just completed his seventh consecutive 8-hour shift and, though scheduled to be off duty, was working overtime until his relief arrived.

According to the master of the *Cerro Santiago* and the representative of Panama's Tugboats Masters and Mates Union, the watch-relief process for masters on this type of ship-assist tugboat is often delayed for various reasons, including: the unavailability of a shuttle or launch to transport oncoming and off-going watchstanders, the location of the tugboat and vessel being assisted in the canal, or the position of the tugboat inside the new lock system. These delays frequently extended the standard watch period of 8 hours to 11–12 hours. In several documented cases, these watch-relief delays have resulted in 60–100 hours of overtime per 14-day period for certain tugboat masters.

The expansion of the canal led to several changes in operations, including an increase in the average number of daily vessel transits and the implementation of one-way traffic for larger vessels transiting in areas where space is insufficient for safe passage of oncoming traffic. Another notable change involved the use of tugboats to assist with movement and alignment of large vessels in the new lock systems. Previously, with the existing locks, the positioning of vessels was

performed by shoreside personnel using locomotive systems commonly referred to as "mules" located on each side of the locks.

In the new lock system, each vessel is assisted by two tugboats: one pulling the vessel forward; another located aft for alignment, braking, and positioning. If the vessel is one of the "neopanamax" vessels, this operation can require longer lock times as well as greater skill and concentration by both the canal pilots and the tugboat masters to prevent error.² The task demand is due mostly to having to maneuver in extremely close proximity to shoreside structures such as the lock walls and gates, which can be damaged by contact with the vessel and/or tugboats. With the assistance the tugboats provide to each vessel for both approaching and departing the lock, the need for precision maneuvering can require 6 or more hours of continuous operations.³ According to a senior representative with the labor union, the masters of these ACP-assist tugboats collectively have expressed concerns about these new operational challenges associated with the expanded canal. They have formally recommended the addition of a second master for all tugboats assigned to assist larger vessels during transit through the new lock systems to assist the primary master with the more demanding workload.

Although the ACP did not support the union's request for an additional master, it did commission a manpower optimization study, in addition to adopting measures to address potential risks before the expanded canal was officially opened to neopanamax vessels on June 26, 2016. For instance, in 2011 the ACP began workforce training at its Center for Simulation, Research and Maritime Development to prepare vessel operators for the operational changes, which involved a simulator training program for canal pilots and tugboat masters that had been modified to include scenarios and challenges presented by maneuvering the neopanamax vessels in sections of the canal and through the new lock systems.

To augment the simulator training, the ACP also built a facility, which opened on March 23, 2016, that allows mariners to use scale models of its tugboats and other vessel types that commonly transit through the canal. The scale models include a bulk carrier, a containership, and a liquid natural gas carrier, on which pilots and tugboat masters practice maneuvering tactics in a section of the canal known as Culebra Cut that was replicated to include existing and new locks, gates, and chambers. Whether the master of the *Cerro Santiago* completed this training or not at either facility could not be confirmed.⁴

Additionally, the *Cerro Santiago* and the 13 other Cerro-class tugboats were specifically designed and constructed to assist neopanamax vessels with safely passing through the newly constructed lock system and the newly widened canal. The tugboat masters who operate this class of tugboat had also reported to their labor union concerns related to the stability of the vessels and the need for precision control in order to operate them safely. According to ACP data, besides the

² The term *neopanamax*, interchangable with the term *new panamax*, refers to vessels that can transit the newly widened Panama Canal based on maximum dimensions of draft, tonnage, beam, length, and height.

³ See <u>http://micanaldepanama.com/expansion</u> for more details.

⁴ On August 8, 2017, the Coast Guard's Office of Investigations and Casualty Analysis formally requested additional data from the ACP on behalf of the NTSB regarding the master of the *Cerro Santiago*'s training record, his last physical examination, and postaccident drug-testing results. Also requested were procedures related to tasking of ship-assist tugboats and any research or studies examining the work/rest cycles of tugboat crews, both before the expansion of the canal and afterwards, that the ACP may have conducted or participated in. In a response to the Coast Guard dated September 13, the ACP indicated that all the information requested was either classified or confidential and therefore could not be released.

14 Cerro-class tugboats in service, there are an additional 32 tugboats of varied horsepower and design dedicated to assisting vessels through the Panama Canal.

NTSB and Coast Guard investigators examined the activity levels of the newly widened canal for the months from January through April 2017 and compared that data with the same period in 2016 before the expansion project was completed and opened. Based on data in the ACP's monthly publication *Advisory to Shipping*, which reports traffic statistics, the number of transits by oceangoing vessels averaged 1,045 vessels each month for that 4-month period in 2017, compared to an average of 1,003 each month for the same period in 2016. The increase amounts to one or more additional vessels transiting in the canal each day.

Yet, the vessel-in-transit time—the average time it takes for a vessel to pass through the canal either northbound or southbound—remained relatively stable: 11.85 hours for the period examined in 2016, compared to 11.64 hours for the 2017 average.

The total number of transits by vessels with a beam or width of 91 feet or more averaged 786 vessels each month for that first quarter in 2017, compared to an average of 702 each month for the same period in 2016—an approximate increase of three additional vessels of that size transiting in the canal each day and using the new locks at each end. The number of assist tugboats available remained stable, a total of 46 for both periods.

Analysis

This accident was the second collision in the canal to occur in less than a year between a Coast Guard cutter and a Panama-flagged towing vessel; the NTSB investigated both accidents. On June 2, 2016, at 0111, the Coast Guard cutter *Thetis* and the ACP towing vessel *Matachin* collided in Las Cascadas Reach, approximately 5.6 miles north of Miraflores Lake. Similarly, the times for both accidents occurred just after midnight.

Neither the pilot nor any of the navigation team members on the *Tampa* identified any concerns related to the functionality of the bridge navigation equipment, nor did the master of the *Cerro Santiago* regarding his vessel. In addition, the engineering, steering, and other vital systems on both vessels were determined to have been operating in good order. On the night of the accident, the visibility was reported as being good by all individuals involved, and both vessels' navigation lights were illuminated, including the *Tampa*'s stern light.

The navigation team members of the *Tampa* underwent required postaccident drug testing: the results were negative.⁵ The Panama Canal Authority required the master of the *Cerro Santiago* to be drug tested; however, those test results were not provided.

The operations officer stated to investigators that the *Tampa* had a specific policy on setting the AIS to non-encrypted broadcast mode during periods of navigation when the cutter was not engaged in law enforcement operations. That setting change was overlooked by the navigation team during the pre-departure preparations at Vasco Núñez de Balboa, so the AIS remained in encrypted mode through the time of the accident. However, the lack of broadcasting AIS data,

⁵ Urine drug testing is limited to identifying urinary metabolites of amphetamine, methamphetamine, cocaine, codeine, morphine, heroin, phencyclidine (PCP), methylenedioxymethamphetamine (MDA), methylenedioxyamphetamine (MDA), and tetrahydrocannabinol (THC). Coast Guard crewmembers were tested in accordance with internal policy contained in the Commandant Instruction M5100.47B, "Safety and Environmental Health Manual" (May 2016).

which could be received by commercial vessels such as the *Cerro Santiago*, likely did not have a role in the collision due to the close proximity and visibility at the time of the accident.

As the customary practice of ship-assist tugboats, the radar system on the *Cerro Santiago* was shut off during assist and support operations to protect line handlers working in close proximity to the vessel's radar from potentially harmful exposure to the electromagnetic fields generated by the radar system. Also, given the limited confines of Miraflores Lake and the traffic density passing through the area, a majority of the tasking performed by the master of the *Cerro Santiago* was completed using predominantly visual means augmented by the radio communication with the ship being serviced.

Investigators examined the work/rest cycles and medical factors for the Coast Guard personnel involved and determined that there were no indications of crew fatigue. Investigators were not allowed to formally interview the master of the *Cerro Santiago* to explore the results of his most recent merchant mariner physical examination, obtain any information on his medical conditions or medications he may have been using at the time of the accident, or obtain details related to his sleep quality. However, based on his work/rest cycle preceding the accident, on the increased workload placed on him, and on the time at which the accident occurred, investigators determined that fatigue was a factor in this accident.

The collision between the *Tampa* and the *Cerro Santiago* occurred at 0029, not too long after midnight, at a time of morning when individuals are biologically predisposed to sleep.⁶ The master had been working in the wheelhouse alone for a period of time that exceeded 8 continuous hours. It was his seventh consecutive day of similar shift work followed by the overtime he was working while awaiting his relief; consequently, as he acknowledged, he was "tired."

Long work hours and extended shifts lead not only to fatigue but also to physical and mental stress. Furthermore, working schedules that alternate daytime work with nighttime work in the same week can diminish performance and result in sleep deprivation. In these situations, a worker is not able to get sleep of sufficient duration because of the insufficient time between work shifts, along with the logistics associated with commuting to and from the worksite and the often-competing demands for his/her time for family and personal life.

The statistical analysis performed by investigators on the activity levels in the newly expanded canal during the first 4 months of 2017, compared to the same period in 2016 before the expansion, identified an increase in the workload activity of the canal's tugboat fleet and the masters who operate them. Although the tugboat fleet remained constant over that period—at 46 units—and the average in-transit time of vessels moving through the system slightly reduced—from 11.85 to 11.64 hours—the number of larger vessels with beams of 91 feet and over transiting the canal increased by three vessels each day.

These larger vessels, with their need for assistance in transiting through the locks and the canal itself, have placed additional task loads on the tugboat operators. Higher workloads for the tugboat masters associated with these new locks, specifically in providing assistance with the approach to and departure from the lock, combined with the average 2.5 hours or more of constant positioning, pulling, and backing required while in the lock, all can lead to an increase in fatigue and thereby a negative impact on performance.

⁶ Mary A. Carskadon and William C. Dement, "Normal Human Sleep: An Overview," *Principles and Practice of Sleep Medicine*, 4th edition (2005).

Over the years, the NTSB has investigated many accidents in all transportation modes in which fatigue was cited as the probable cause or a contributing cause. Reducing fatigue-related accidents has been a long-time focus of the agency; the issue is discussed in depth, along with risk-reduction and prevention measures, in the NTSB 2017–2018 Most Wanted List of Transportation Safety Improvements.

Coast Guard Actions Postaccident

The *Tampa* added a written instruction on the vessel's port entry checklist that requires the watchstander to verify that the AIS is operating in non-encrypted mode. In addition, for future transits of the canal, the *Tampa*'s aft lookout will be equipped with an air horn and handheld flares, which may be used when necessary to secure the attention of any vessel not operating in accordance with the rules of navigation. The position of shipping officer also was added back to the bridge watch composition. That position, which is charged with managing input from the CIC and the dedicated lookout, was staffed during the southbound transit; however, considering the staffing in the CIC, it was deemed a redundant capability and therefore removed for the northbound transit. As an organization-wide effort, the lessons learned from this accident have been added to the Coast Guard's briefing program and will be discussed prior to future transits of the canal during briefings conducted on Coast Guard vessels.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the collision between the tugboat *Cerro Santiago* and the US Coast Guard cutter *Tampa* was the failure of the master of the *Cerro Santiago* to maintain a vigilant watch due to fatigue.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

ROBERT L. SUMWALT III Chairman

CHRISTOPHER A. HART Member

EARL F. WEENER Member

T. BELLA DINH-ZARR Member

Adopted: November 20, 2017

| Vessels | Татра | Cerro Santiago |
|-------------------------------|--|--|
| Owner/operator | US Coast Guard | Panama Canal Authority |
| Port of registry | Portsmouth, Virginia | Port of Balboa, Panama |
| Flag | United States | Republic of Panama |
| Туре | Coast Guard cutter | Tugboat |
| Year built/ shipyard | 1984/Tacoma Boatbuilding, Tacoma, Washington | 2013/Astilleros Armon S.A., Navia-Asturias, Spain |
| Official/IMO number | None | 9669495 |
| Classification society | N/A | American Bureau of Shipping (ABS) |
| Construction | Steel | Steel |
| Length | 270 ft (82 m) | 94.8 ft (28.9 m) |
| Draft | 14.5 ft (4.4 m) | 20.3 ft (6.2 m) |
| Beam/width | 38 ft (12 m) | 44.3 ft (13.5 m) |
| Gross and/or ITC tonnage | 1,829 long tons | 484 gross tons |
| Engine power; manufacturer | 7,300 hp (6,712 kW), diesel; (2) Fairbanks Morse ALCO V-18 diesels @ 3,650 hp each | 6,250 hp (4,660 kW), diesel; (2) General Electric 8L250MDA10 diesels @ 3,125 hp each |
| Persons on board | 90 crewmembers, 28 detainees | 5 |

Vessel Particulars

NTSB investigators worked closely with our counterparts from Coast Guard Investigations National Center of Expertise (New Orleans).

For more details about this accident, visit <u>www.ntsb.gov</u> and search for NTSB accident ID DCA17PM011.

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

The NTSB does not assign fault or blame for a marine casualty; rather, as specified by NTSB regulation, "[NTSB] investigations are fact-finding proceedings with no formal issues and no adverse parties . . . and are not conducted for the purpose of determining the rights or liabilities of any person." Title 49 *Code of Federal Regulations*, Section 831.4.

Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by conducting investigations and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report. Title 49 *United States Code*, Section 1154(b).