Issued October 4, 2022 MIR-22/25

Grounding of Passenger Ferry *Commodore*

On June 5, 2021, about 1608 local time, the high-speed catamaran passenger ferry *Commodore* was transiting northbound on the East River near Bushwick Inlet off Brooklyn, New York, when the vessel lost primary steering and speed control to both of its port hull water jets and then grounded.[1] One minor injury was reported among the 7 crewmembers and 107 passengers on board. The vessel was later refloated and drydocked for repair. No pollution was reported. Damage to the vessel was estimated at $2.5 million.

Figure 1. *Commodore* underway before the casualty, approaching the East 35th Street New York City Ferry Terminal. (Source: Seastreak)

[1] (a) In this report, all times are eastern daylight time, and all miles are statute miles. (b) Visit ntsb.gov to find additional information in the public docket for this NTSB investigation (case no. DCA21FM029). Use the CAROL Query to search investigations.

Casualty type	Grounding/Stranding
Location	Bushwick Inlet, East River, Brooklyn, New York 40°43.48′ N, 73°57.52′ W
Date	June 5, 2021
Time	1608 eastern daylight time (coordinated universal time –4 hrs)
Persons on board	114
Injuries	One minor
Property damage	$2.5 million est.
Environmental damage	None
Weather	Visibility 10 mi, clear, winds calm, seas calm, air temperature 87°F, water temperature 62°F
Waterway information	River, channel width 900 ft, project depth 35 ft, about 1.8-kt following current

Figure 2. Area where the *Commodore* grounded, as indicated by a red *X*. (Background source: Google Maps)

1. Factual Information

1.1 Background

The 137-foot-long, high-speed passenger ferry *Commodore* was built in 2018 at Gulf Craft shipyard in Franklin, Louisiana. As a small passenger vessel carrying more than 150 passengers, it was regulated under Title 46 *Code of Federal Regulations* Subchapter K. The high-speed catamaran (twin-hull), constructed of welded aluminum, provided short domestic commuter service between Manhattan and New Jersey. The vessel was owned and operated by Seastreak.

The ferry's superstructure provided passenger seating on three decks. The main and mid-deck seating areas were fully enclosed and air conditioned. The main deck had a seating capacity of 243 passengers, and mid-deck could accommodate 265 passengers inside and 42 passengers outside. The upper deck was open and uncovered to provide seasonal passenger seating for 130 people.

Each hull was divided into six watertight compartments and contained an engine room with two propulsion engines, two water jets, one electrical generator, one fuel tank, and auxiliary systems. Each engine room was accessible via doors located immediately aft of the midships passenger boarding area (one portside, one starboard-side). Two MTU 12V4000, type M64 marine diesel engines were installed in each engine room. Each engine was connected via gearboxes to Rolls Royce Kamewa 63S4 water jets. The ferry's design speed was 36 knots.

Each of the *Commodore*'s four water jet systems consisted of an inlet duct, a pump with an outlet nozzle shaping a jet stream, a steering nozzle, and a reversing (bucket) unit. Maneuvering thrust was obtained using both the buckets and nozzles and corresponded to the direction and magnitude of the control levers' movements. Ahead and astern thrust was obtained by raising and lowering a jet unit's reversing bucket. The steering nozzles controlled port and starboard thrust. The four water jets, listed from port to starboard, were named Port Jet Outer 1, Port Jet Inner 2, Starboard Jet Inner 3, and Starboard Jet Outer 4.

1.1.1 Bridge Propulsion and Steering Controls

The primary means for controlling the vessel's steering and propulsion was the CanMan Touch control system, a microprocessor-based remote-control system (manufactured by Kongsberg Maritime) used in conjunction with the water jet system to control the steering nozzle and reversing bucket of each water jet unit as well as the rpm of the main propulsion engines driving the water jet impellers. There were three control stations on the bridge: the center (main), port wing, and starboard wing. Two touchscreen displays (main A and main B) were located at the main control station. The main A touchscreen display monitor processed control (command) inputs for only the port water jets and engines, and the main B touchscreen display processed control (command) inputs for only the starboard water jets and engines. There was one touchscreen display at each wing control station. The wing touchscreen could display all four water jets and engines and could control the water jets through the main control station (main A and main B display screens). Each touchscreen had the same displays and alarms and was configured to transfer control between stations. Each control station had port and starboard thrust levers, a steering tiller, and a joystick. The port and starboard thrust levers operated their respective hull's two engines and reversing buckets, and by increasing or decreasing engine rpm, the amount of ahead or astern thrust from its driven water jet. The steering tiller turned all four of the waterjets' steering nozzles together. The joystick simplified maneuvering by offering a single lever control, combining the thrust magnitude and direction commands to all water jets.

Figure 3. *Commodore*'s main control station hand controls and water jet display screens. (Background source: US Coast Guard)

There were five primary control modes: hand, sea auto, sea manual, harbor auto, and harbor manual. The captain told investigators that he preferred to use the hand mode—using both thrust levers and the steering tiller—when maneuvering the vessel and during transits. The captain stated he only used the harbor auto mode (and the joystick) during steering loss drills. Harbor auto mode allowed the operator to control all thrust movements from the joystick and was primarily used to maneuver away from the pier or terminal. Harbor auto mode was preprogrammed with command inputs to move the vessel in the direction of the joystick's vector. If the vessel needed to be rotated, the joystick top could be rotated clockwise or counterclockwise to rotate the vessel around its center axis.

Engine and water jet panels, located to the left of the captain's chair, provided the operator with: (1) each main engine's operating pressures, temperatures, and rpm; (2) a jet alarm panel that included water jet system alarms; (3) emergency-stop buttons for each of the main propulsion engines. Main engine emergency-stop buttons were also located at each wing station.

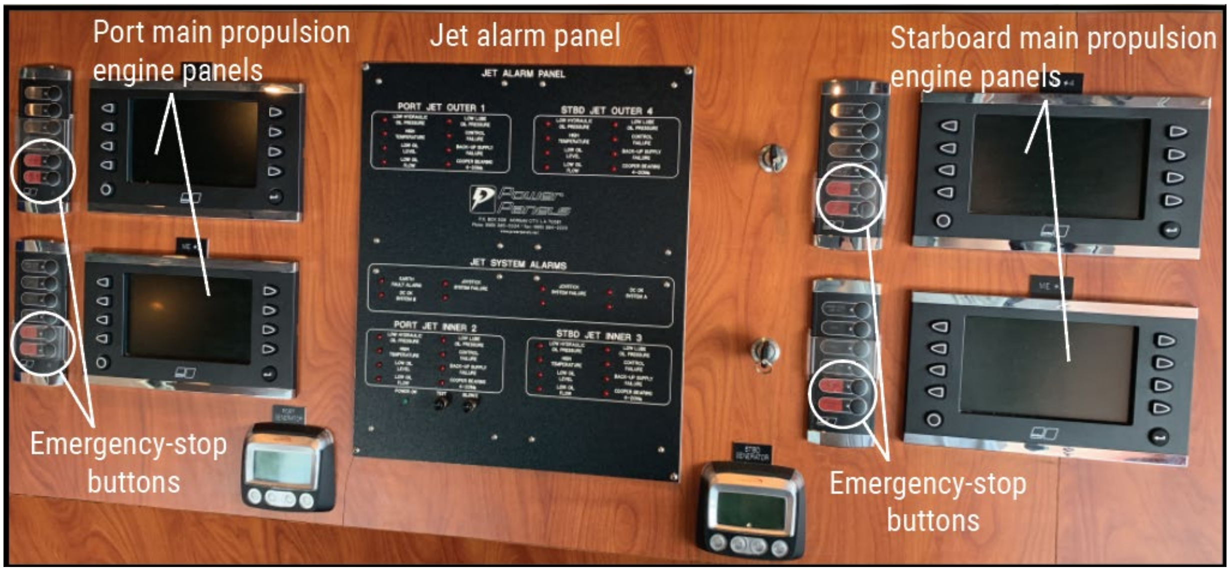

Figure 4. *Commodore*'s main control station main propulsion engine panels, jet alarm panel, and emergency-stop buttons, located to the left of the captain's chair.

Two back-up control stations, to be used in the event of failure of the primary controls, were located outboard of the main A and main B display screens at the main control station. The back-up system was isolated (electrically separated) from the main system and had its own power supply. To transfer control from the primary to the back-up system, the operator would push the two "back-up on/off" buttons. Once the lights on the buttons illuminated, the back-up controls would be available, and the operator could steer and adjust the rpm with the back-up controls. The

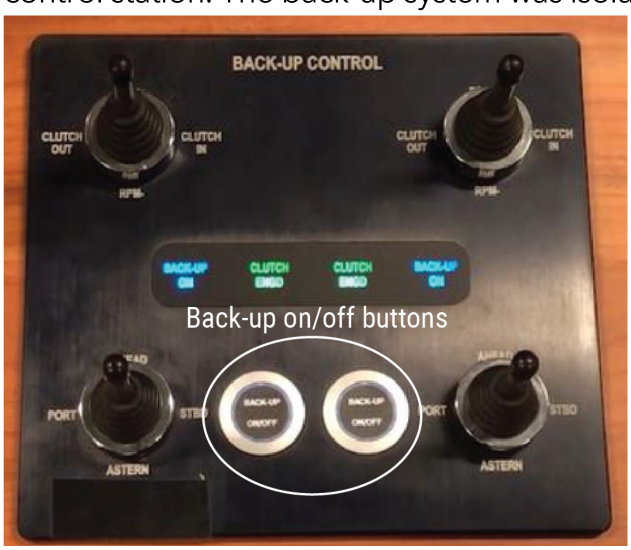

Figure 5. One of *Commodore*'s back-up control panels, with back-up on/off buttons illuminated showing that back-up control is on. (Background source: Kongsberg Maritime)

back-up controls to the left of the main A display screen controlled only the port water jet buckets, steering nozzles, and main engine clutches via direct activation of the hydraulic control valves. The back-up controls to the right of the main B display screen controlled the same for the starboard water jets. According to the Rolls Royce operating manual for the vessel:

> When a control failure bucket/steering is detected, the bucket/steering is frozen in the position it had when the failure occurred (the hydraulic control valve(s) of the bucket/steering are disconnected). The bucket/steering of the jet can no longer be changed with the control lever, only with the back-up system.

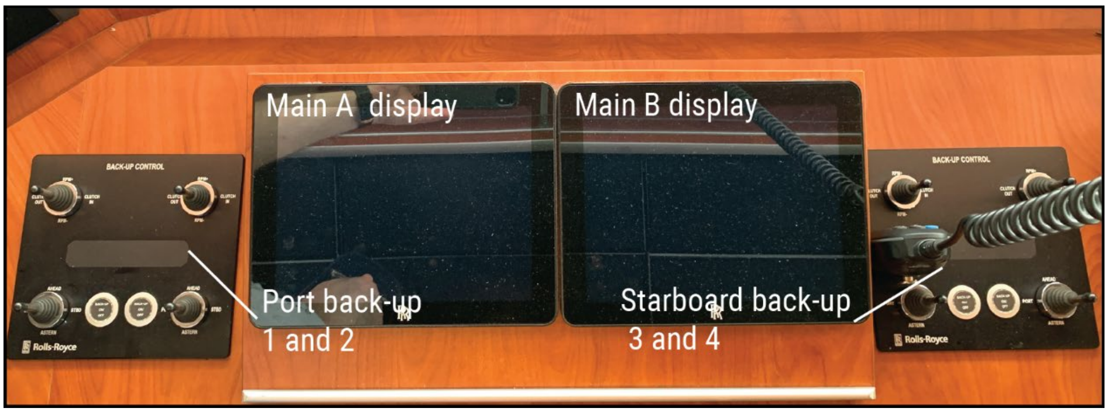

Figure 6. *Commodore*'s main control station main A and main B display screens and back-up controls (port back-up 1 and 2 and starboard back-up 3 and 4).

1.2 Event Sequence

After 4 days idle at the pier per the normal schedule, the *Commodore* was scheduled to operate on June 5, 2021. About 1533, the *Commodore* departed the Sandy Hook Ferry Landing in Sandy Hook, New Jersey, with 107 passengers and 7 crew, en route to the East 35th Street NYC Ferry Terminal along the East River in midtown Manhattan. The *Commodore*'s crew consisted of a captain, mate, engineer, and four deckhands. This was the vessel's second transit to the East 35th Street terminal and the sixth overall arrival/departure terminal for the crew that day (the vessel transited to onload fuel in the morning and its first passenger trip began at 1230). The captain undocked the vessel from the Sandy Hook Ferry Landing from the port wing control station. Shortly after departure, the captain transferred control to the main control station, operating in hand mode.

The transit was uneventful, and the vessel passed under the Brooklyn Bridge about 1603. A few minutes later, at 1607:09, while the vessel was transiting full ahead in a northerly direction in the East River about 1.3 miles from the East 35th Street terminal, the jet alarm panel actuated, providing audible and visual (flashing light) indicators that "control failure" had occurred in both the Port Jet Outer 1 and Port Jet Inner 2 water jet systems. At the same time, display screen main A went blank. The vessel's automatic identification system (AIS)-recorded speed at the time was 37.9 knots with a heading of 015°.

The vessel's closed-circuit television (CCTV) on the bridge captured the captain and mate, who were seated at the main control station, as they sprang up from their chairs and looked at the main control console, assessing the situation. The CCTV showed that neither the captain nor the mate silenced the control failure alarms on the jet alarm panel immediately following their activation or throughout the event. Twelve seconds later, at 1607:21, the captain pulled both thrust levers back to the zero position (neutral), attempting to slow the vessel. The starboard water jets slowed from 1,750 rpm to 970 rpm, but the port water jets remained full ahead at 1,750 rpm, and the vessel immediately began turning to starboard. According to AIS, the *Commodore*'s speed was reduced to about 16.9 knots with a heading of 076°. The captain tapped on the main B touchscreen and noticed two red triangles were flashing over the port water jet icons. He pressed on one of the two red triangles, attempting to "reconnect the water jet controls" to regain control, but he quickly realized that the system was not available because the water jet reconnect icon was "not flashing green." Seconds later, at 1607:45, the captain grabbed the thrust levers again and placed them in full reverse. The starboard-hull jets responded to the command inputs by lowering their reversing buckets and increasing the starboard engines' rpm to about 1,400, providing full reverse thrust. The port water jets and engines did not respond to the command inputs and remained at full ahead with their buckets raised. The vessel continued in a starboard turn. Seconds later, the mate announced via the vessel's intercom for passengers to "take their seats" and "please remain seated."

The captain told investigators that he then placed the throttles and steering controls in "harbor [auto] mode." At 1608:08, both starboard engines reduced from 1,400 rpm to 750 rpm after the captain pulled the joystick backward, attempting to reverse the thrust direction on all water jets to stop the vessel's forward movement. The main A display screen was still blank. About 10 seconds later, the captain left the main control station and ran to the port wing station. At 1608:40, the captain transferred control to the port wing station via the port wing touchscreen display and tapped on one of the red triangles, again attempting to reconnect the water jet controls. However, the captain told investigators that the system would not reconnect. The captain placed both thrust levers in the full reverse position and pushed the steering tiller hard to port. He told investigators that he believed he received the same nonresponse that he had received at the main control station.

Figure 7. *Commodore*'s position, speed, and heading in the minutes surrounding the grounding (from AIS). (Background source: Google Earth)

Still in a starboard turn, the *Commodore* approached the entrance to Bushwick Inlet on the Brooklyn side of the East River, where the riverbank was predominated by seawalls and facilities. At 1608:55 the mate again announced over the intercom to "please remain seated." The vessel entered the mouth of the Bushwick Inlet, and at 1608:58 the port hull first struck the inlet's old pilings, riprap, and bottom on the northern portion of the inlet entrance at 8.8 knots. The starboard hull then contacted old, submerged pilings and riprap along the southern shoreline as the vessel passed over them. The port engines continued at 1,750 rpm, and the starboard engines continued at 750 rpm, as the vessel moved farther along the inlet's southern shoreline and slowed. At 1609:03, the captain left the port wing station and returned to the center console to transfer control back to the main control station via the main B display screen. He attempted several times to reconnect the port water jets without success. Both thrust levers stayed in the full reverse position. CCTV footage showed that the port engines remained at 1,750 rpm and the starboard engines remained at 750 rpm during the transfer. The main A display screen remained blank and was not available to the operators.

The captain told investigators he believed he used the back-up control system after he returned to the main control station from the port wing station. However, the CCTV-recorded footage from all three control stations on the bridge during the time of the casualty showed that the captain did not attempt to use the back-up control system located at the main control station.

The vessel came to a stop along the southern shoreline of the Bushwick Inlet about 1612. The port hull was breached, and seawater quickly entered the port engine room. The bilge alarms sounded, and the engineer started the engine room bilge pump but observed that the inflow of water exceeded the pump's capacity. At 1612:41, the engineer secured the port main engines followed by the port generator (the starboard generator remained online, and the starboard engines were secured at 1630). The engineer and a deckhand then inserted a portable emergency bilge pump to remove the flood water, but the combined pumping could still not keep up with the inflow of water. The vessel began to list to port.

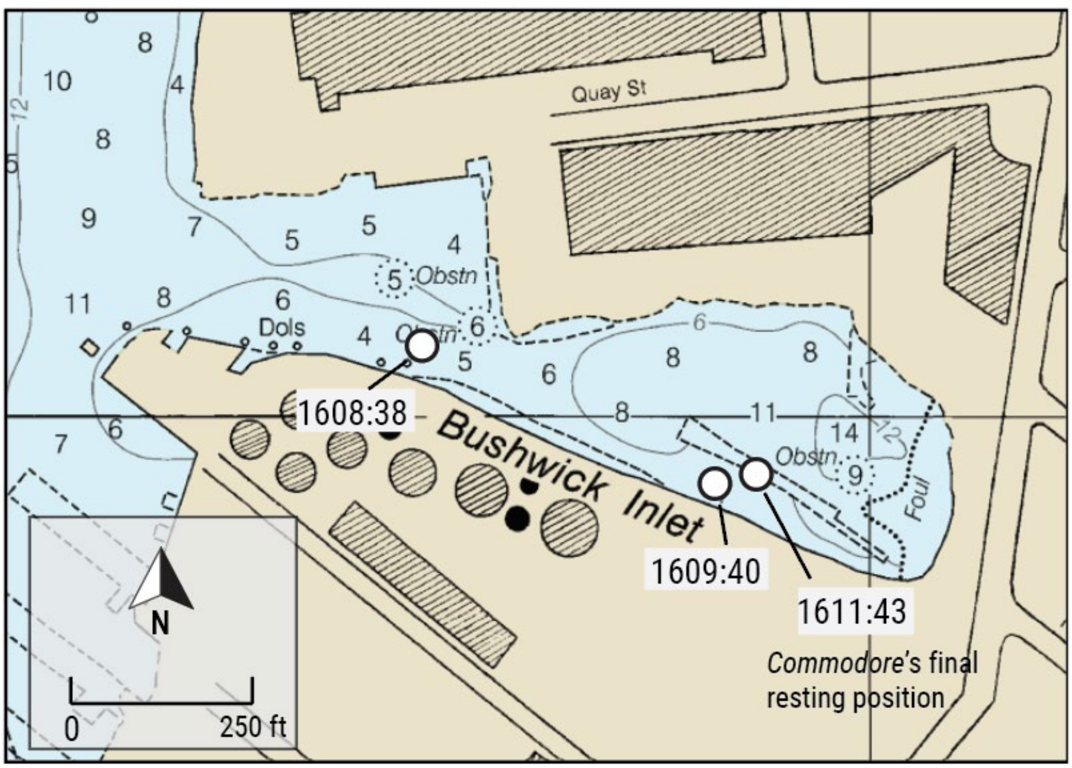

Figure 8. *Commodore*'s positions within the Bushwick Inlet as the vessel grounded and came to rest. (Background source: National Oceanic and Atmospheric Administration)

The captain reported the emergency via the vessel's radio on VHF channel 16 and his personal mobile phone, and the mate called company representatives via her personal mobile phone. Fire and police department boats that had been working nearby arrived about 4 minutes after the grounding. Three US Coast Guard boats from Staten Island, New York, later arrived at the scene. The emergency responders transferred all the passengers and crew to shore via boats and took them to the closest dock, at the Brooklyn Navy Yard. One crewmember was taken to the hospital for heat exhaustion. The vessel was later refloated, towed to North River Shipyard in Nyack, New York, and drydocked for repairs.

1.3 Additional Information

1.3.1 Damage

The *Commodore* sustained an 18-inch-long-by-3.5-inch-high tear in the port hull plating as a result of the vessel's contact with submerged pilings on the northern shoreline of the Bushwick Inlet. The tear crossed the watertight boundaries of the fuel void tank and port engine room. Both spaces flooded and filled with 6–8 feet of water, and the vessel came to rest on the inlet's seafloor. There was also a crack from the leading edge of the 18-inch tear that measured about 12 inches. In addition, a 2-inch crack was recorded 10 feet aft of the 18-inch tear. There was damage to the entire port engine room wiring harness, both port propulsion engines, clutches, transmissions, and the port generator, which were repaired. There was also minor damage to the starboard hull. The total estimated cost to repair the vessel was about $2.5 million.

1.3.2 Personnel

Postcasualty tests for alcohol and other drugs for the crew were negative.

The captain of the *Commodore* had worked in the maritime industry for over 20 years. He spent 10 years working on fishing vessels before transitioning to the passenger vessel industry. The captain had worked for Seastreak for 9 years before the casualty. He received his Coast Guard credential as master up to 100 tons on near coastal waters in 2009, and he served as a credentialed mate until he was promoted to captain in 2016. He told investigators he had work experience with similar water jet propulsion systems on Seastreak's *Highlands*, *New York*, and *New Jersey* ferries. To qualify as captain on the *Commodore*, Seastreak required 60 hours of familiarization training and transits aboard the vessel with senior captains. The captain stated that he completed this requirement over a 1.5-year period. He completed the training to operate the *Commodore* in March 2019 and was validated by the designated person ashore shortly thereafter.

The mate worked on and off for the company for about 10 years as a deckhand, senior deckhand, and mate. She worked on the *Commodore* periodically over the summer and fall of 2020 as the senior deckhand, and she completed familiarization training aboard the *Commodore* in September 2020. She attained her Coast Guard credential as master up to 100 tons on near coastal waters in December 2020 and was promoted to mate shortly thereafter, attaining full-time employment status with Seastreak in April 2021. The mate had work experience as a deckhand and senior deckhand on vessels with similar water jet propulsion systems (Seastreak's *New York*, *New Jersey*, and *Highlands* ferries). The casualty transit was her first trip as mate on the *Commodore*.

On the day of the casualty, the *Commodore*'s crew was scheduled to work a 16-hour day. The vessel took on diesel fuel and potable water en route to its first scheduled departure at 1230 from Seastreak's ferry terminal at the Atlantic Highlands Municipal Marina in Atlantic Highlands, New Jersey. The captain reported to work at 0830 on the day of the casualty. He was on board the *Highlands* ferry for 15.5 hours on the day before the casualty (from 0530-2130) and was off the previous 3 days. The mate reported to work at 0745 on the day of the casualty. She was off the day before the casualty and had worked 16 hours (0500-2100) the previous day (Thursday) on the *Highlands* as mate. On Wednesday, the mate worked 7.5 hours (0500-1230) on the *New York* ferry.

1.3.3 Safety Management System and Training

The Pilothouse Information Book, which was part of Seastreak's Ferry Safety Management System (SMS), was available on the *Commodore*'s bridge. The book contained a section called "Emergency Operation," explaining that in the event of an electrical failure in the main control system, the vessel could be operated by the back-up system. The next section in the Pilothouse Information Book, titled "Manual Control of the Hydraulic Control Valves," contained instructions for manually steering the vessel, slowing down, and speeding up using the hydraulic control valves. A section called "Steering Control Loss" explained that if a water jet was not operable, the operator should disconnect the faulty water jet unit in the control panel and use the other available water jets to maneuver the vessel to the nearest harbor. According to the "Emergency Drill and Exercise Schedule" in Seastreak's Ferry SMS, crewmembers were to drill, exercise, and train on propulsion and steering loss every other month. Although crewmembers conducted monthly drills for loss of steering and propulsion controls, they did not perform drills in which they shifted to the back-up control system.

In addition, each Seastreak vessel, including the *Commodore*, had a failure mode and effects analysis (FMEA) manual that systematically identified potential equipment failures that could result in undesirable consequences such as loss of propulsion or loss of propulsion control. The FMEA manual was developed by the propulsion and controls manufacturer (Rolls Royce, acquired by Kongsberg Maritime in April 2019) and was part of the materials delivered to Seastreak in October 2017. The company's SMS familiarization training workbook, which was based on the vessel's FMEA manual, required the captain, mate, and senior deckhand to understand, implement, and operate the following failure modes: control failure, steering failure (including emergency steering), and propulsion systems failure.

Training records for the captain and mate showed that they trained according to the vessel's FMEA-manual-based requirements, which reflected the back-up control mode was an area of their training, but, according to interviews, neither had to demonstrate application or proficiency to the trainer. The mate told investigators that during her familiarization training period, the *Commodore* operated mainly in the primary steering and propulsion control modes, using the thrust levers, joystick, and steering tiller. The captain told investigators he had only used the back-up control system to clear debris from a water jet inlet duct. He also stated it was "not practical" to use "four separate joysticks" to control the engines, as would be required in back-up mode.

1.3.4 Postcasualty Actions

On June 16, a service engineer from Kongsberg Maritime (the manufacturer of the CanMan Touch system) boarded the *Commodore* and extracted data from secure digital (SD) cards containing graphical user interface (GUI) log files from all display screens except main A (attempts to access the main A GUI log files were unsuccessful). Each display screen contained an embedded computer that booted from an SD card that contained all the software needed to run the display screen functions. The SD card also stored logs and the root file system.

Kongsberg determined that before the casualty, the Can Man Touch software system was generating an unprecedented number of error messages (the GUI logs showed about 200,000 failure messages from June 1 to June 5). The log file section had reached maximum file size, which meant that any older entries would have been overwritten. A side effect of generating these error messages caused the software to write two large configuration files to the attached SD card every minute or so. Data could only be written to the flash memory in the SD card a limited number of times before the SD card would fail.

The CanMan Touch system displayed active failures via a red failure log tab on all four display screens: main A, main B, port wing station, and starboard wing station. If an operator clicked the red failure log tab, an indication of the specific failure code(s) would be displayed. Any registered failure code was displayed under the failure log tab every time a failure occurred.

Kongsberg found that the system recorded failure codes from June 1 to June 5 (system failure messages would have been displayed as active). The vessel was not in service from June 1 to June 4. On June 5, the day of the casualty, in accordance with Seastreak's Ferry SMS, the crew completed "Checklist 1," a startup checklist containing checks of propulsion, power, and steering systems, including engine and jet alarms. The crew did not note any active failures.

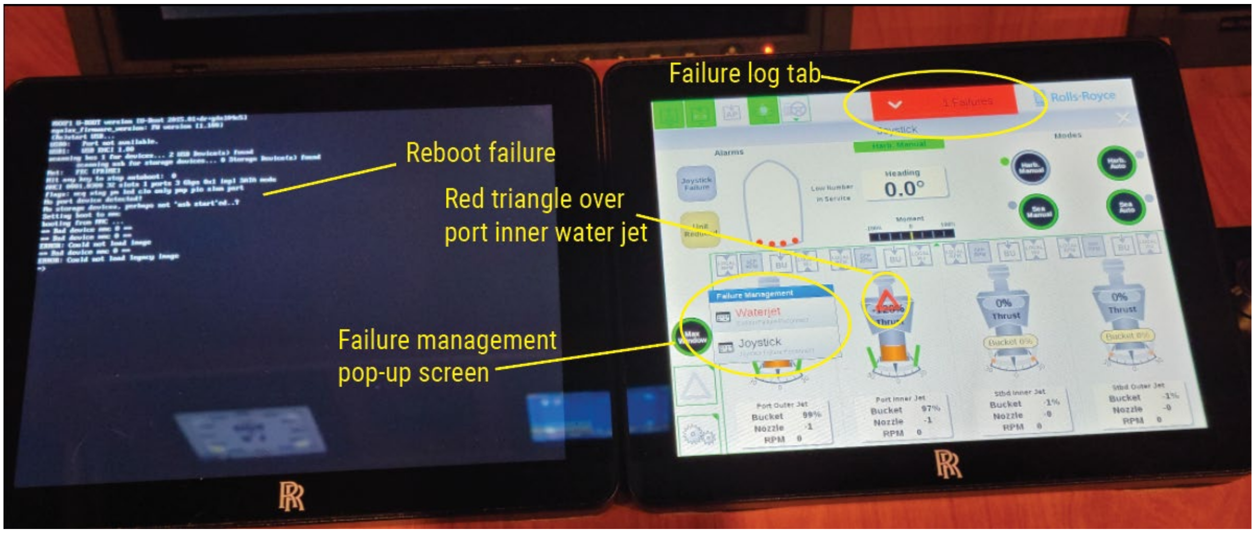

Figure 9. *Commodore*'s main control station during postcasualty examination, showing the main A display screen's reboot failure (*left*) and the red failure log tab, red triangle over the port inner water jet icon, and the failure management pop-up screen on the main B display screen (*right*). (Background source: Coast Guard)

On July 7, Kongsberg issued a service letter mandating that vessels with CanMan Touch control system software receive a necessary update. The background to the letter stated the following:

> Kongsberg Maritime has identified a situation which could result in an intermittent, repeating alarm caused by a redundant signal within our system. In certain situations, this alarm can cause a failure record to be written to the SD card approximately once every second. It is considered possible that this could shorten the expected lifetime of the card. Once this happens, the card is then not available to the system and as the card is crucial for system function any failure of the SD card would lead to system failure.

On July 19, investigators, representatives from Seastreak, Kongsberg, and the Coast Guard, along with a manufacturer service engineer, conducted verification tests of the back-up steering and propulsion controls for both the port and starboard propulsion systems. All back-up controls functioned and tested as designed. Postcasualty testing also confirmed that the control systems were functioning correctly and that the starboard water jets and engines were available during the casualty. The only inoperable piece of equipment identified was the SD card from the main A display, which processed control inputs for the port water jets and engines.

Seastreak informed investigators that, based on the lessons learned from this casualty, the company changed its SMS casualty control procedures for a loss of propulsion and steering control. The updated emergency procedures directed the operator to make a single attempt to reconnect the water jets. If control was not restored, the operator should immediately shift to back-up control. If back-up control failed, the operator should stop the engines using the emergency-stop buttons.

2. Analysis

While transiting to the East 35th Street terminal at full speed (about 37 knots), the *Commodore*'s (water) jet alarm panel actuated, providing audible and visual indicators on the bridge that a control failure had occurred in the catamaran's Port Jet Outer 1 and Port Jet Inner 2 water jet systems. At the same time, the main A touchscreen control system software display, which processed control inputs for the port hull's water jets and engines, went blank. The captain first focused on the main A touchscreen, believing the screen had temporarily lost communication and would reconnect. Operating in hand mode, using throttle levers for thrust magnitude and a steering tiller for thrust direction, the captain pulled both thrust levers back to the zero position (neutral thrust), attempting to slow the vessel. The starboard hull's two water jets slowed from 1,750 rpm to 970 rpm, but the two port water jets remained full ahead at 1,750 rpm. This immediately resulted in the vessel turning to starboard. The captain then put the throttles in full reverse in an attempt to stop the forward movement of the vessel, an input that normally would have dropped both hulls' reversing buckets (reversing their thrust direction). The starboard-hull jets responded to the command inputs, providing reverse thrust at 1,400 rpm, but the port-hull jets remained at full ahead at 1,750 rpm, slowing the vessel but also increasing its rate of turn to starboard. Next, in an attempt to regain control by switching to another primary control mode, the captain put the vessel's throttle and steering control into harbor auto mode and pulled the joystick backward, to again reverse thrust and stop the vessel. The starboard engines reduced to 750 rpm, but the port engines remained at 1,750 rpm. The captain then transferred propulsion and steering control to the port wing station, but he received the same nonresponse and quickly transferred control back to the main control station. The *Commodore* continued to turn and slow as it entered the relatively narrow opening to Bushwick Inlet at about 8.8 knots. The ferry narrowly missed contact with seawalls and facilities that predominate the east side of the river near the inlet. The vessel grounded quickly in the shallow water of the inlet. About 1 minute and 52 seconds had elapsed between the time of the first alarm and the vessel grounding.

The manufacturer of the CanMan Touch system that controlled the water jet steering and thrust, Kongsberg Maritime, concluded that a problem with the system software ultimately led to a failed SD card for display screen main A, causing the loss of the main A display monitor, and, along with it, the loss of primary propulsion and steering control for the two water jets and main engines in the port hull. The failure of the main A display screen's SD card caused the operating system to halt before starting up the controller software on that screen, causing a reboot failure, meaning that the main A display screen went blank and could not restart. The loss of the main A display screen also resulted in the loss of the primary controls (thrust lever, joystick, and steering tiller) for the port engines and water jets. The starboard water jets' propulsion controls were available and fully functional, and therefore the captain's command inputs (pulling back both thrust levers to zero) created an immediate turn to starboard because the starboard water jets responded by slowing down and the port water jets remained at full ahead (per their design when a control failure was detected). Postcasualty testing confirmed the starboard water jets were available to the operators.

About a month after the casualty, on July 7, Kongsberg issued a service letter to its customers mandating a software update that would correct the issue that caused the *Commodore*'s loss of main A display screen and primary port hull water jet controls.

2.1 Operator Actions

Based on investigators' review of CCTV footage, the captain was focused on the reconnection of the port water jets' controls. He told investigators he believed that the main A display screen temporarily lost communication and would reconnect and restore steering and propulsion control. Neither the captain nor the mate looked at or silenced (via the jet alarm panel) the control failure alarms for the two port water jet systems on the jet alarm panel to the left of the captain's chair. When the captain pulled the throttles and joystick back, the vessel did not respond as he expected and began to turn, and he could not determine why he was unable to regain control in the short time before the vessel entered Bushwick Inlet and then grounded. Had the captain or mate recognized the control failure alarms and understood that they indicated the loss of primary control for the port engines and water jets, they would have realized that attempting to reconnect the primary control system (via the display screen) would not work.

Per Seastreak's SMS, in the event of an electrical failure in the main control system, the vessel could be operated by the back-up system. The SMS also contained instructions for manually steering the vessel, slowing down, and speeding up using the hydraulic control valves. The captain should have transferred control from the primary controls to the back-up controls and maneuvered the vessel using hydraulic control valves. However, the captain attempted to regain control by trying to reconnect the primary control system at both the main control station and port wing station. He pulled back on the throttles, then put them in reverse, then tried to gain control by shifting into another operation mode (harbor auto mode). With only the starboard-hull jets and engines responding, the captain's actions initiated and maintained a starboard turn and reduced the vessel's speed.

Inspected passenger vessels are required to have emergency main propulsion engine stops that are independent of the control system, and the *Commodore* was fitted with them. The captain could have pushed the emergency-stop buttons on all engines, rapidly reducing speed and stopping the vessel, giving him and the mate time to assess the loss of control situation. Or, had the captain or mate recognized that they had lost primary control of the port engines and water jets, the captain could have pushed the emergency-stop buttons for just the port engines and maneuvered the vessel with the two starboard water jets.

2.2 Training and Oversight

Following the casualty, the manufacturer of the control system concluded that the system bridge displays showed active failures, indicated by a red tab in the upper part of the display screen, for several days before the casualty (the first failure code entry was recorded on June 1). Seastreak's SMS required that, as part of vessel start-up, operators check that no system warnings or alarms were indicated in the control system display panels. However, the *Commodore* crew made several transits on the day of the casualty, and there was no indication that they identified or reported the active failures. Had the active failures been identified and reported to the company, the company would have had an opportunity to take action. They may have attempted to troubleshoot, or they could have taken the vessel out of service. They also could have contacted the manufacturer who may have resolved the problem with the SD card before it led to failure of the control system. An effective SMS would have ensured personnel were able to identify critical system alarms and knew how to address them.

To shift to back-up control mode on the *Commodore*, the operator had to simply depress buttons on the back-up control panels. During this casualty, the captain could have used the back-up control panel to reduce rpm on all four engines, steer with the nozzles, and reverse thrust. Training records for the captain and mate reflected the back-up control mode was an area of their training, but neither had to demonstrate application or proficiency to the trainer. The captain's unfamiliarity with operating the back-up control system indicates that his training had been ineffective. He told investigators he only used the back-up system to clear debris from a water jet inlet duct and indicated it was not practical to use “four separate joysticks” to control the engines.

Although Seastreak’s SMS contained information about potential responses for loss of control, it did not have procedures that clearly listed steps for the operators to follow in a time-critical loss of propulsion and steering control emergency. With a high-speed ferry operating at speeds in excess of 35 knots in congested waters, a quick response time is required of the operator, and clear procedures are vital to achieving a rapid response. An effective SMS would have clear steps for recognizing a control failure and then responding by using the back-up control or other alternatives. In addition, company training on the SMS emergency response procedures should also be required. Following the casualty, Seastreak updated their SMS emergency procedures for loss of propulsion and steering control, directing the operator to make a single attempt to reconnect the water jets, then shift to back-up control, then use the emergency-stop buttons to stop the engines.

The captain had means to control the vessel following the loss of primary control of the port hull’s engines and water jets, but he did not take the specific action required to gain control. Crews should train and conduct emergency drills to appropriately respond when a primary control system failure occurs and use the back-up system to maneuver the vessel. Vessel owners and operators should continuously evaluate vessel-specific operations and procedures and improve training programs to ensure effectiveness of crew drills and best practices.

3. Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the grounding of the passenger ferry *Commodore* was the loss of the primary control system for the catamaran’s port water jets and propulsion engines due to a flaw in the system manufacturer’s software causing a memory card failure. Contributing to the casualty was the company’s lack of clear safety management system procedures for primary control system failure and ineffective oversight of crew training on failure modes for loss of propulsion and steering control, resulting in the captain not identifying the nature of the loss of control and either engaging back-up control or using emergency engine shutdowns to stop the vessel.

3.2 Lessons Learned

Training for Loss of Propulsion and Steering

The loss of propulsion and steering control while transiting in channels or maneuvering near immediate hazards (grounding, traffic, objects), when response time is critical, demands crewmembers act quickly to mitigate potential casualties. Safety management systems should identify potential failure modes and specific responses. Effective company training on the loss of propulsion and steering controls builds crew confidence and proficiency and improves a crew's ability to respond during an actual emergency. Training should include requirements for the practical demonstration of loss of control procedures and use of emergency back-up systems. Vessel owners and operators should continuously evaluate training programs to ensure effectiveness of drills and implement changes to improve safety management system procedures.

Vessel	*Commodore*
Type	Passenger (Ferry)
Flag	United States
Port of registry	Atlantic Highlands, New Jersey
Year built	2018
Official number (US)	1278588
IMO number	9842243
Classification society	American Bureau of Shipping
Length (overall)	137.3 ft (41.8 m)
Beam	39.4 ft (12.0 m)
Draft (casualty)	5.2 ft (1.6 m)
Tonnage	99 GRT
Engine power; manufacturer	4 x 1,874 hp (1,397 kW) MTU 12V400-M64 diesel engines

NTSB investigators worked closely with our counterparts from **Coast Guard Sector New York** throughout this investigation.