



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

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MIR-23-21

Contact of Passenger Vessel *Cathlamet* with Ferry Terminal Dolphin

On July 28, 2022, about 0814 local time, the passenger and car ferry *Cathlamet* had crossed Puget Sound and was approaching the Fautleroy Ferry Terminal in Fautleroy, Washington, with 94 persons on board when the vessel struck a ferry terminal dolphin.¹ One minor injury was reported. The damage to the vessel was estimated at \$10 million, and the dolphin damage estimate was \$300,000.



Figure 1. The *Cathlamet* precasualty. (Source: Washington State Ferries)

¹ (a) In this report, all times are Pacific daylight time, and all miles are statute miles. (b) Visit [ntsb.gov](https://www.ntsb.gov) to find additional information in the [public docket](#) for this NTSB investigation (case no. DCA22FM032). Use the [CAROL Query](#) to search investigations.

Casualty type	Contact
Location	Puget Sound near Fauntleroy, Washington 47°31.23' N, 122°23.48' W
Date	July 28, 2022
Time	0814 Pacific daylight time (coordinated universal time -7 hrs)
Persons on board	94
Injuries	1 minor
Property damage	\$10.3 million est.
Environmental damage	None
Weather	Visibility 10 mi, clear, winds east 5-8 mph, air temperature 86°F, water temperature 67°F
Waterway information	Sound, depth 450 ft



Figure 2. Area where the *Cathlamet* struck a ferry terminal dolphin, as indicated by a red X. (Background source: Google Maps)

1. Factual Information

1.1 Background

The *Cathlamet*, owned and operated by Washington State Ferries (WSF), was a 328-foot-long passenger and car ferry built in 1981 by Marine Power and Equipment in Seattle, Washington. The ferry was powered by two General Electric 7FDM diesel engines capable of producing a total of 5,000 hp. The steel-hulled, double-ended vessel was designed with a pilothouse, propulsion system, and rudder at each end to allow the vessel to approach and depart the ferry terminals without turning around. When the ferry was transiting eastbound (toward Fauntleroy, Washington), the crew operated from the no. 2 pilothouse, using the no. 1 rudder and no. 1 propeller and propulsion system. When the ferry was transiting westbound, the crew operated from the no. 1 pilothouse, using the no. 2 rudder and no. 2 propeller and propulsion system. Above-deck structures included internal accommodation and service areas for 1,200 passengers, a crewmember break room, a captain's lounge, and an external deck space for 124 vehicles.

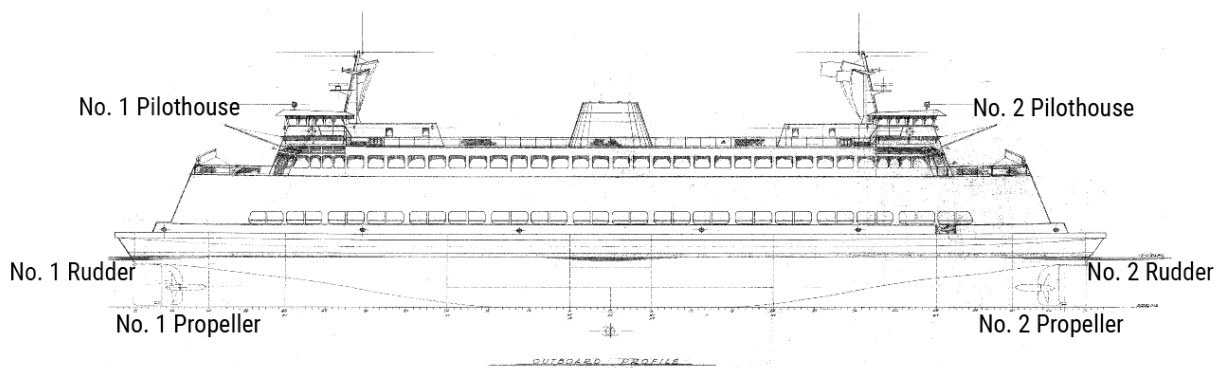


Figure 3. Drawing of the *Cathlamet* showing locations of the pilothouses, propulsion systems, and rudders on each end of the ferry. (Background source: WSF)

1.2 Event Sequence

On July 28, 2022, the *Cathlamet* was operating on the North Vashon Triangle Route, between Vashon Island, Southworth, and Fauntleroy, Washington.² While the vessel was transporting passengers and vehicles, two separate deck watch sections rotated between duty and rest periods. Each deck watch section consisted of a master, chief mate, four able seamen (with one designated as the quartermaster) and three ordinary seamen. The engineering department only had one duty section on board while the vessel was operating.

About 0345, a new deck watch section reported on board at Vashon Island and relieved the off-going deck watch section, which departed the ferry. The other deck watch section remained on board the vessel resting. The newly arrived chief mate and quartermaster assumed navigation of the vessel. They navigated the vessel between stops on the ferry route until 0720, when the master, who had been walking around the vessel or in the crewmember break room since reporting on board (about 0345), relieved the chief mate while the vessel was docked at Fauntleroy. Shortly thereafter, the *Cathlamet* departed Fauntleroy and then arrived at Vashon Island at 0738.

After embarking 75 passengers and loading 8 vehicles, the vessel undocked and departed Vashon Island about 0803, 8 minutes behind the scheduled departure time, for its 2.8-nautical-mile return eastbound transit. The quartermaster was at the helm in the no. 2 pilothouse. According to the quartermaster, the master on watch arrived in the no. 2 pilothouse about 2 minutes later, at 0805.

² The ferry did not make a regular rotation of stops between Fauntleroy, Southworth, and Vashon Island. Rather, it mainly transited between either Fauntleroy and Southworth or Fauntleroy and Vashon Island, with occasional transits between Southworth and Vashon Island.

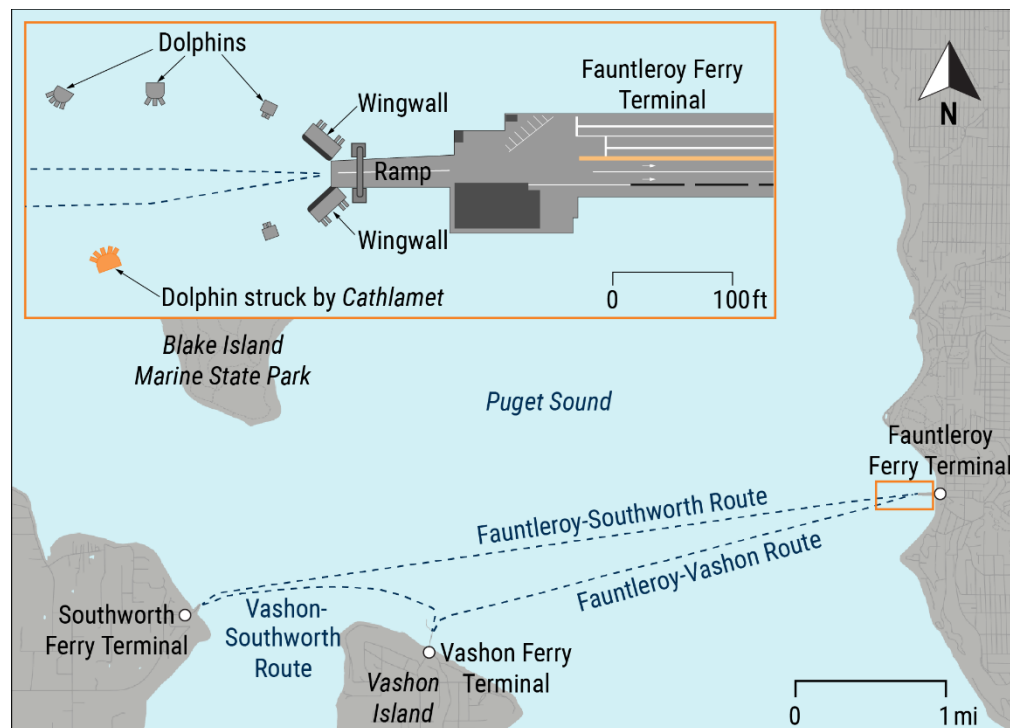


Figure 4. WSF's routes for the North Vashon Triangle. The inset shows the area near the Fauntleroy Ferry Terminal. (Background source: Google Maps)

The quartermaster remained at the helm as the ferry transited at 17.6 knots across Puget Sound on a course between 70° and 75° between Vashon Island and Fauntleroy. The quartermaster told investigators that after the master arrived in the pilothouse, the master initially sat in the desk chair located on the port side of the space, aft. The master took control of the ferry about 0810, before it was a half mile away from the Fauntleroy Ferry Terminal, to start preparing for the maneuver to dock the vessel.

After handing helm control to the master, the quartermaster moved away from the helm and became focused on reading a company memo near the chart table, about 10 feet aft of the helm. During this time, he was not watching the vessel's progress as it approached the ferry terminal.

With the no. 1 engine in operation for the eastbound transit (effectively the stern for the transit), the master called the engine room about 0812, according to the engine room logbook, to request that engine no. 2 be engaged so the propeller (bow for the transit) could be operated to help slow the vessel as it approached the ramp at the ferry dock. The engineer on watch confirmed that engine no. 2 was engaged.

According to the vessel's Data Logger, which monitored the helm and throttle controls, over about the next minute, a series of rudder commands was given, generally from about midships up to 15° starboard. At 0812:52, a final 15° rudder command to starboard was made, followed by stepped adjustments, before the rudder was ordered

and reached midships at 0813:19, when the ferry was about a third of a mile from the terminal ramp. There were no other helm or throttle commands noted. The US Coast Guard Vessel Traffic Service radar showed the *Cathlamet* turning to starboard while slowing from 17.6 knots to about 15.7 knots. Over the next 28 seconds, the vessel's heading continued to move to starboard as the *Cathlamet* approached the dock. The vessel's Automatic Identification System (AIS) data showed the *Cathlamet* on an easterly heading of 88° at 0813:27, which was bringing the *Cathlamet* to the south of the terminal. At 0813:37 the vessel's heading was at 90°. At 0813:45, it had a heading of 92°, was still to the south of the terminal, and was proceeding at 15.7 knots.

The quartermaster told investigators that he felt something was not right, looked up, saw that the vessel was off course, and started to walk toward the master. "There should have been more of a slowdown. It ... should have taken longer to the dock. It just didn't feel right," he said.



Figure 5. Still image from forward-looking camera footage on board the *Cathlamet* at the time the ferry's port bow struck the dolphin. (Source: Washington State Patrol)

At 0813:46, the Data Logger recorded a no. 1 (stern) rudder order of 35° to port, and the rudder angle reached 27° a few seconds later. The camera footage from on board the vessel and at the ferry terminal showed the vessel's port bow striking a ferry

terminal dolphin on the south side of the terminal at 0813:47.³ Coast Guard Vessel Traffic Service data showed the vessel was still at 15.7 knots at impact. The dolphin was about 190 feet west and about 35 feet south of the center of the ramp where the ferries docked.

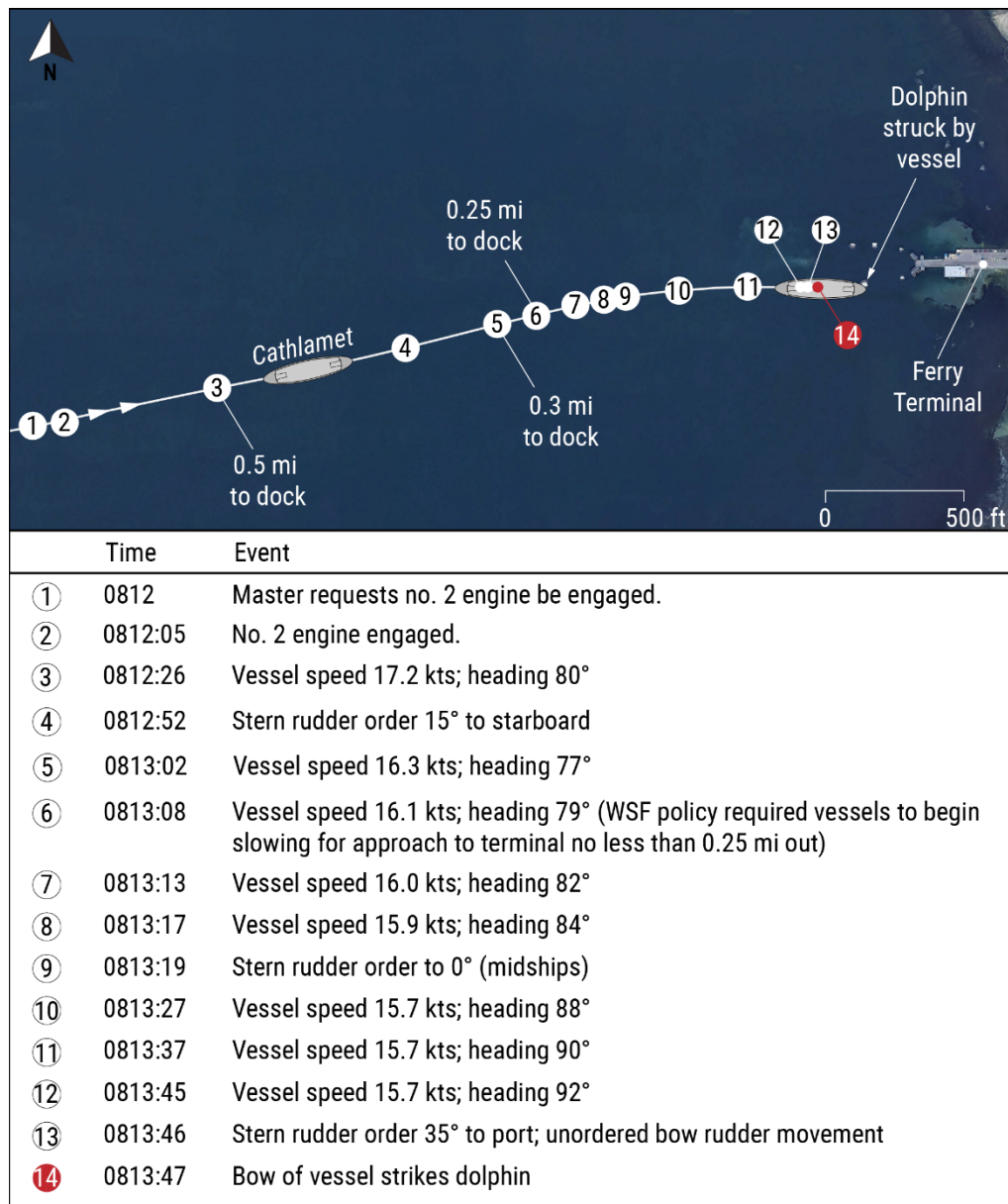


Figure 6. Trackline of the *Cathlamet* from the time the master requested engine engagement to the time the vessel struck the dolphin. (Background source: Google Earth)

³ A mooring dolphin is group of pilings (wood or metal) arrayed together with a metal framing around a cement cap and a wooden or timber rub rail, serving as a buffer to a vessel approaching a dock. The five dolphins at the Fauntleroy Ferry Terminal (three on the north side and two on the south side) were placed to guide a vessel into the ferry terminal.

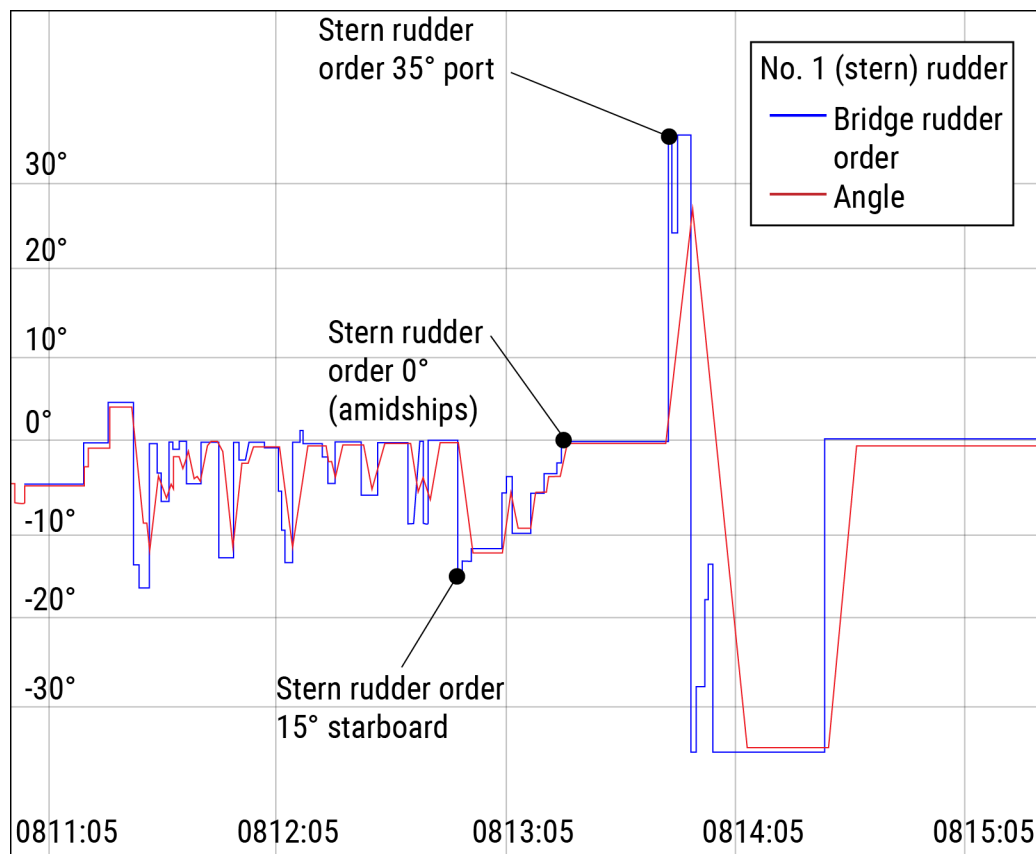


Figure 7. The no. 1 (stern) rudder order and rudder angle recorded by the vessel's Data Logger shortly after the captain took the helm (about 0810) to about a minute after the ferry's impact with the dolphin (0813:47). (Background source: WSF)

A passenger who had been standing on the portside passenger deck forward saw that the vessel was about to strike the dolphin and started to move aft toward the house. When the ferry struck the dolphin, the area where he had been standing collapsed from the impact. He hung onto a railing, which prevented him from falling onto the damaged deck below. When the deck collapsed, the port passenger deck structure also folded onto the car deck and penetrated the interior of a parked car, just missing the occupant who was sitting in the driver's seat.

After the ferry struck the dolphin, the vessel continued to move forward toward the shore where recreational vessels were anchored. The quartermaster told investigators that the master looked at him, asking twice, "what happened?" Realizing that the vessel was still moving forward and possibly could strike the anchored vessels or run aground, the quartermaster told the master to "back out." He told the master to back out two more times, before the master engaged both engines and stopped the vessel's forward motion—actions that were recorded in the Data Logger.

Shortly after the contact, the master of the other (resting) deck watch section arrived in the pilothouse, took control of the vessel, and maneuvered it to the ferry

terminal. The crewmembers from both deck watches and the engineers completed a safety check of the passengers and assessed the damage to the vessel as it docked at the terminal at 0820. The passengers and vehicles departed the vessel about 0930, once the ferry was safely docked and emergency medical services personnel checked passengers for injuries.

1.3 Additional Information

1.3.1 Damage

The impact with the dolphin caused extensive damage to the *Cathlamet's* structure at and above the portside main deck, causing about 30 feet of the forward port section of the passenger deck to collapse.



Figure 8. The damaged *Cathlamet* after the contact with the dolphin.



Figure 9. Damage to the front (*left*) and back (*right*) of the vehicle impacted by the vessel structure.

The *Cathlamet* was drydocked on August 29 to complete a damage survey. During the hull exam, inspectors discovered minor scraping damage at the bottom of the no. 2 rudder, which, according to Coast Guard investigators, indicated that the rudder may have touched bottom following the contact. There were also six insets along the hull's port side, just below the vehicle deck. This damage coincided with the area impacted by the dolphin.

The dolphin sustained significant damage to several of its metal pilings, the metal framing, and to the cement cap, as well as to the rub rail.

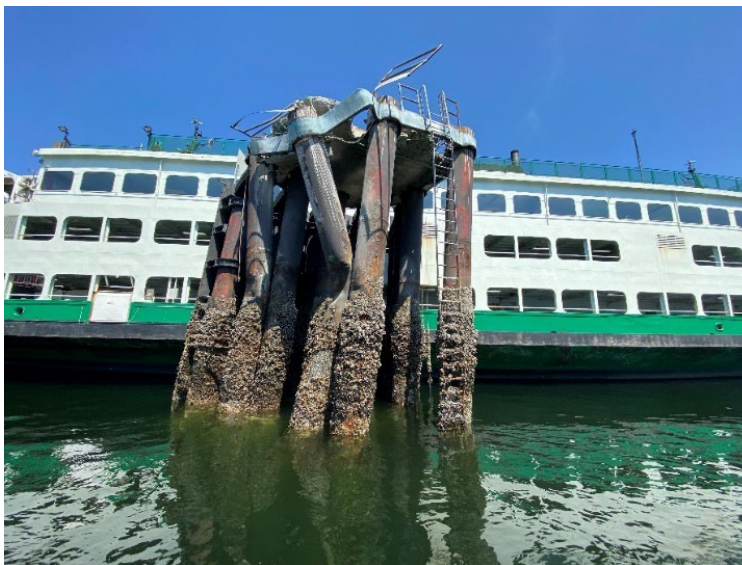


Figure 10. The damaged dolphin. (Source: WSF)

1.3.2 Postcasualty Actions

Coast Guard investigators examined and tested the no. 1 steering and propulsion systems. The no. 1 engine/propeller and no. 1 rudder were found to be in proper operating condition. In addition, both the helm and engine control in the no. 2 pilothouse were found to be operating properly.

The other master, who had assumed the helm following the casualty, informed investigators that he had "full steering and propulsion control" of the two main engines and both the no. 1 and no. 2 rudders while docking the vessel at the Fauntleroy Terminal. WSF personnel downloaded the vessel's onboard Data Logger information, which recorded the vessel's speed, rudder control inputs (order), and rudder angle. NTSB investigators evaluated the Data Logger information along with AIS data to develop a timeline of the vessel speed and rudder commands from the time the master requested to engage the no. 2 engine until the casualty at the Fauntleroy Terminal.

1.3.3 Watchstanding Procedures

WSF's safety management system (SMS) contained operational procedures that included bridge watchstanding orders, a pre-arrival checklist, and a pre-departure checklist, among other items. When the *Cathlamet* was in transit, WSF policy required that there were two positions assigned to the pilothouse to ensure the safe navigation of the vessel: the credentialed master or chief mate and the uncredentialed quartermaster. According to WSF's bridge watchstanding orders for the *Cathlamet*, "A licensed [credentialed] deck officer must be present on the bridge prior to transferring control and at all times while underway." Although the quartermaster position did not require a Coast Guard deck officer credential, the quartermaster could undock the vessel and navigate the ferry between the ferry terminals under the supervision of either the credentialed master or chief mate, per WSF policy (found in its SMS).

When the ferry was docking, WSF policy stated that only the master or the chief mate could be at the helm and navigate the vessel. According to WSF's operational procedures, during docking, the quartermaster was to witness the landing. The quartermaster told investigators that they were trained to stand to the right of the master or chief mate between the helm and the radar and serve as a lookout. The quartermaster was to warn the master of any unsafe conditions and could assume the helm if the master or chief mate became incapacitated.

WSF's operational procedures also required that, after assuming control, the credentialed officer (master or chief mate) was to notify the engine room that the vessel was approaching the terminal so they could engage the other (forward) engine's propeller. The credentialed officer was also required to contact the ferry terminal by radio to confirm it was ready for the vessel to dock. The radio communication between the credentialed officer and the terminal was to be monitored by the deck crewmembers on duty, and after they heard that the terminal was ready for the vessel, they were to head out on deck to prepare the vessel for arrival. The credentialed officer was also required to ensure that a deck crewmember made an arrival announcement on the public address system. WSF's pre-arrival checklist required the credentialed officer to "slow the vessel at an appropriate distance from the dock, but no less than one-quarter mile out." The credentialed officer was required to sound the landing signal on the vessel's whistle (one long and two short blasts) before the vessel docked.

The two ferry personnel at the Fauntleroy Ferry Terminal who monitored the radio stated that they did not recall receiving a radio call from the *Cathlamet's* master as the ferry approached before the casualty. The quartermaster also told investigators that he did not hear the master make a notification to the ferry terminal. In addition, the passengers and crewmembers on board did not recall hearing an arrival announcement or landing signal before the vessel struck the dolphin.

1.3.4 Master

The master began working for WSF in June 1985 as an ordinary seaman. He advanced to positions of greater responsibility, becoming an able seaman in 1987, a credentialed mate in 1992, and a credentialed master in 1995. From September 2007 until his retirement in July 2022, he served as a relief master or as the master of a deck watch.

Following the casualty, the master submitted to alcohol and other drug testing in accordance with Coast Guard regulations, and the results were negative. A review of his cellular phone records found that before and during the casualty, the master was not on the phone.

The master's 96-hour work/rest history showed that he had been sleeping 5 to 6 hours a night before the casualty. Investigators asked the quartermaster to describe the master's demeanor when he would arrive on the *Cathlamet* for the watch, and he replied that the master is typically "always tired in the morning." When the master arrived in the pilothouse and relieved the chief mate at 0720 on the day of the casualty, the quartermaster noted that he "just seemed tired." The master stated that he arrived at the vessel at 0330 for his shift before taking his first watch at 0720. In the time between arriving and taking his first watch, the master stated that his normal routine was to walk around the vessel and that he "checks things out." The master had been working the same shift (reporting to the ferry about 0330 on his workday) for about 6 months.

Coast Guard Investigators interviewed the master on the day of the casualty. When asked if he felt rested when he arrived at the vessel on the morning of the casualty, the master said, "Well, I don't know if I'd call it 100% rested ... I mean, it was hot out, very hot, you know, trying to sleep." (At the time of the casualty, there was a heat wave occurring in the Seattle area.) The master informed investigators of a family member's medical condition and overall health, which had been deteriorating, and that the situation had been bothering him. The master told investigators, "I got engagement, and the next thing I know I hit, I hit the dolphin. That's all I know."

The master retired from WSF the day after the casualty, surrendered his Coast Guard credential, and would not provide any additional information to investigators.

1.3.5 Washington State Ferries Procedure Review

WSF conducted its own investigation into the events that led to the dolphin strike. As an outcome of this investigation, WSF assembled an internal working group to evaluate their current bridge resource management program—the goal being to assess and improve the safety of ferry vessel operations. The draft updated procedures that resulted from the working group's efforts, which are still under internal review as of the

date of this report, provide guidance to bridge team members to improve communication, teamwork, decision-making, and situational awareness, all in order to prevent complacency. The procedures also attempt to clarify the responsibilities of the bridge team member positions, including for the quartermaster when serving as a witness when the vessel is docking and undocking. In addition, the procedures provide guidance to bridge team members to challenge navigational orders, questionable acts, and omissions, ensuring that a potentially hazardous situation is identified, communicated, and resolved before the vessel is in danger.

2. Analysis

On the morning of July 28, the passenger and car ferry *Cathlamet* had crossed Puget Sound and was approaching the Fauntleroy Ferry Terminal when the vessel struck a ferry terminal dolphin about 0814.

The master assumed the helm from the quartermaster about 0810, before the *Cathlamet* was a half mile from the Fauntleroy Ferry Terminal. As the ferry approached, the master contacted the engine room about 0812 to engage the no. 2 engine so it was available to help slow the vessel, in accordance with WSF's docking procedures. Over the next few minutes, the master made a series of rudder commands, generally from about midships up to 15° starboard (based on Data Logger information). At 0812:52, a final 15° rudder command to starboard was made, followed by stepped adjustments, before the rudder was ordered and reached midships at 0813:19. Per the Data Logger, the master took no other rudder actions (or any actions) until just before the vessel struck the dolphin. Other than engaging the bow engine, the remaining pre-arrival checklist requirements were not performed—these included slowing the vessel when it reached a quarter mile from the dock (the vessel maintained its speed of 15.7 knots), radioing the terminal, sounding the whistle, or ensuring the landing announcement was made over the vessel's public address system.

After the rudder was midships, the *Cathlamet* was on an easterly heading of 88°, which was moving the vessel south of the terminal ramp's centerline. As the vessel proceeded during the next 28 seconds, the heading continued to move to starboard—reaching 92° just before it struck the dolphin. As the vessel approached the dolphin, the master did not take any action to correct the ferry's course, slow down, or sound the alarm to alert the crewmembers and passengers that something was wrong. At 0813:46, the Data Logger recorded a helm input (rudder order) of 35° to port. Investigators were unable to determine if the master recognized the impending collision and attempted to turn the vessel or if the order occurred as a result of the contact (even though the time stamp is 1 second before impact). The vessel struck the dolphin at 0813:47. The master's statement to investigators following the contact showed that he seemed unaware of how the vessel had ended up striking the dolphin. The master also asked the quartermaster what had happened, further suggesting that the master was unaware of the events leading up to the dolphin strike. Additionally, the quartermaster had to prompt the master three times to maneuver the ferry astern to avoid running aground. These statements, combined with the master's actions and inactions, indicate that the master experienced a lapse in attention, likely due to some form of progressive incapacitation between when he engaged the bow engine and before the ferry was a quarter mile from the dock.

2.1 Fatigue

Investigators sought to determine why the master became incapacitated in the minutes before the attempted docking. The master declined interview requests after the day of the casualty; therefore, this analysis relied on other available data. The master's alcohol and other drug test results and cellular phone records indicated that he was not under the influence of an illegal substance or distracted by a portable electronic device at the time of the casualty.

In the days leading up to the casualty, the master reported receiving between 5-6 hours of sleep each night before arriving to the ferry around 0330 to 0345 each morning and assuming the watch about 0720. The master stated that in the roughly 4 hours of off-watch time, he did his typical walkaround, which indicated he likely did not sleep. When asked to describe the master's demeanor, the quartermaster reported that the master frequently appeared to be tired, including on the day of the casualty.

Individuals typically require 7-8 hours of sleep per night to avoid the effects of fatigue. A cumulative sleep debt can accrue over the course of several days when an individual consistently receives less than 8 hours of sleep. In the days preceding the casualty, the master was likely fatigued due to an accumulated sleep debt. Additionally, his sleep quality was likely affected by personal stressors, such as a family member's deteriorating health and a noted heat wave in the area, that further contributed to his fatigue.

Fatigued individuals exhibit decreased attention, reaction time, vigilance, and decision-making, and are susceptible to brief periods of uncontrolled sleep episodes known as microsleeps. A microsleep is a brief period of sleep lasting a few seconds. The International Maritime Organization notes that, "during microsleep, the brain disengages from the environment (it stops processing visual information and sounds)," so it is possible for a person to experience microsleep without recognizing that it has happened.⁴

Our investigation found that rudder commands were insufficient to line up the vessel for docking, and the master did not properly slow the vessel. The master also did not radio the terminal or ensure an arrival announcement was made over the public address system. Additionally, there were no rudder commands for 28 seconds before the contact. Finally, the master did not recall what had occurred. These events are all consistent with incapacitation from a microsleep. Therefore, beginning sometime after the master called the engine room, the master likely experienced a microsleep due to fatigue.

⁴ International Maritime Organization, "Guidelines on Fatigue," MSC. 1/Circ. 1598, January 2019, 15.

2.2 Complacency

The repetitive nature of ferry operations requires operators to sustain a high level of vigilance to prevent complacency. Complacency occurs when operators repeatedly complete a task without consequence, desensitizing them to its inherent risk. As with any repetitive task, individuals become increasingly familiar and comfortable over time with performing the task, which can lead to complacency.

The bridge team on the *Cathlamet* exhibited complacency through their noncompliance with WSF policies when undocking and docking the ferry. The WSF policy required that the credentialed master or chief mate be present in the pilothouse when undocking the vessel. However, when the vessel departed Vashon Island, the uncredentialed quartermaster was at the helm, and the master was not in the no. 2 pilothouse, as he should have been. Additionally, WSF policy required that the master be at the helm and the quartermaster serve as a witness when the vessel is docking. As the *Cathlamet* approached the Fauntleroy Ferry Terminal, the quartermaster did not actively monitor the master as the ferry approached the dock, as required by company policy, when he could have quickly taken the helm if the master became incapacitated.

Adherence to procedures can help combat complacency. In this casualty, watchstanders did not adhere to procedures, which created a single point of failure. The requirement for a second person on the bridge provides redundancy in case a problem arises, such as the master becoming incapacitated. Following the casualty, WSF initiated a review and update of its bridge resource management policies and procedures; the review was still in progress at the time this report published.

3. Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the contact of the passenger vessel *Cathlamet* with the dolphin at the Fauntleroy Ferry Terminal was the master's incapacitation, likely due to a microsleep, while the vessel was docking, and the quartermaster not actively monitoring the approach to the ferry terminal and intervening before the contact.

3.2 Lessons Learned

Watchstanding, Fatigue, and Complacency

Fatigue is often a factor in casualties investigated by the NTSB. Fatigue affects all aspects of human performance, including decision-making, alertness, and reaction time. Mariners should understand the performance effects of sleep loss and recognize the dangers of fatigue, such as microsleeps. When affected by fatigue, mariners should arrange for a qualified watchstander to serve in their place and avoid being on duty when unable to safely carry out their responsibilities.

In addition, repetitive operations, such as ferry transits—back and forth on the same route—require operators to sustain a high level of vigilance to prevent complacency. Complacency occurs when operators repeatedly complete a task without consequence, desensitizing them to its inherent risk. As with any repetitive task, individuals become increasingly familiar and comfortable over time. To combat complacency, operators should comply with procedures, such as operating checklists, that are in place to prevent single points of failure, and companies should train operators on the importance of following procedures.

Vessel	<i>Cathlamet</i>
Type	Passenger (Ferry)
Owner/Operator	Washington State Ferries (Government)
Flag	United States
Port of registry	Seattle, Washington
Year built	1981
Official number (US)	636551
IMO number	N/A
Classification society	N/A
Length (overall)	328.0 ft (100.0 m)
Breadth (max.)	78.8 ft (24.0 m)
Draft (casualty)	16.6 ft (5.1 m)
Tonnage	1,384 GRT
Engine power; manufacturer	2 x 2,500 hp (1,864 kW); 7FDM GE diesel engines

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

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The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident 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 investigating accidents and incidents 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)).

For more detailed background information on this report, visit the [NTSB Case Analysis and Reporting Online \(CAROL\) website](#) and search for NTSB accident ID DCA22FM032. Recent publications are available in their entirety on the [NTSB website](#). Other information about available publications also may be obtained from the website or by contacting—

National Transportation Safety Board
 Records Management Division, CIO-40
 490 L’Enfant Plaza, SW
 Washington, DC 20594
 (800) 877-6799 or (202) 314-6551