



National Transportation Safety Board  
Washington, D.C. 20594  
Marine Accident Brief

Accident Number DCA03MM033

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Vessel: U.S. Passenger Vessel *Columbia* O.N. 557340, 418 feet long (LOA), 3,946 gross tons, inspected, built in 1974

Accident Type: Fire

Location: Wrangell Narrows near Wrangell, Alaska

Date: May 28, 2003

Time: 0144 local

Owner: State of Alaska

Property Damage: \$125,000

Injuries: None

Complement: Crew 43  
Passengers 170

## Accident Description

About 0121 on May 28, 2003, the Alaska Marine Highway System ferry *Columbia*, with 170 passengers on board, departed Petersburg, Alaska, en route to Wrangell, Alaska. The ferry was equipped with three ship-service diesel generators, located in the auxiliary engine room, and the vessel's electrical load required that two of the generators be online during normal underway operations. On this morning, the ship-service generators in use were Nos. 1 and 2.

Shortly after the *Columbia* left port, an oiler on watch made his normal inspection rounds of the engineering spaces. While the oiler was in the auxiliary engine room, he noticed an odor suggesting that an equipment item was overheating. He said that he was unable to locate the source of the odor and, about 0135, went to the control room and informed the watch engineer and the chief engineer of his observations.

The chief engineer said that he immediately went into the auxiliary engine room. He was searching for the source of the smell and standing between the diesel engines for the Nos. 1 and 2 generators when, about 0144, he heard an unusual noise and saw a burst of flames in the area of the No. 2 generator's cooling fan ports. The vessel then lost electrical power, which shut down the electrically driven main engine fuel pumps. The main engines then shut down, leaving the ship without propulsion power and the ability to steer while it was in Wrangell Narrows (figure 1).

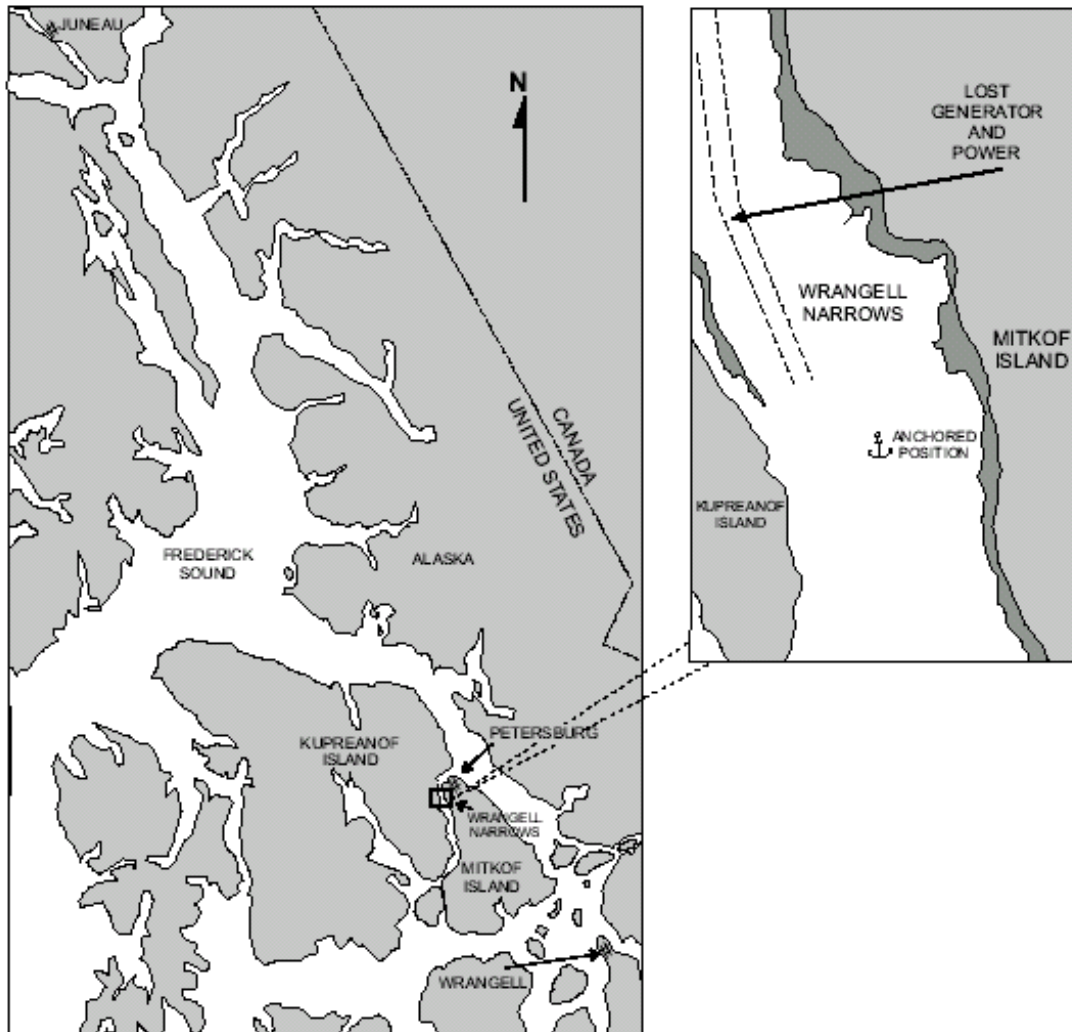


Figure 1. Wrangell Narrows, where the *Columbia* lost electrical power.

The chief engineer stated that the emergency diesel generator then started automatically, supplying power for the emergency lighting, some navigation equipment, and the steering system. He said that he immediately returned to the control room and ordered the watch engineer to start the diesel engine that powered the ship's omnidirectional bow thruster, which gave the crew on navigation watch the capability to use the bow thruster and the vessel rudder to move out of the traffic lane and to drop anchor.

The chief engineer noticed that the circuit breaker for the No. 2 generator had tripped on the main switchboard. He then ordered the shutdown of the No. 2 generator's diesel engine remotely from the control room and returned to the auxiliary engine room, accompanied by the junior engineer. The chief engineer and the junior engineer observed a fire beneath the turbocharger of the No. 2 generator's diesel engine. The junior engineer

put out the fire using a portable CO<sub>2</sub> extinguisher; however, the smoke continued to increase and became so thick that the two men had to leave the auxiliary engine room.

Upon returning to the control room, the chief engineer telephoned the bridge to report the generator fire and to request that the firefighting team be called out. The chief engineer then ordered all off-watch engineering personnel to report to assist with the emergency.

The firefighting team reported to the engine control room. After being briefed about the fire by the chief engineer and the junior engineer, two men from the team (the chief mate and the third engineer), wearing fire-protective clothing and self-contained breathing apparatus, entered the auxiliary engine room about 0153. Once in the auxiliary engine room, the third engineer discovered that the air filter on the turbocharger of the No. 2 generator was on fire, producing billowing smoke that filled the space. The third engineer lifted the burning air filter out of the air intake, and the chief mate put out the fire using a portable CO<sub>2</sub> fire extinguisher. The team then began inspecting the auxiliary engine room for other fires and damage. A short time later, the chief mate noticed that the air filter had reignited, and the team doused the filter with water to extinguish the fire. By 0207, the *Columbia* crew established that the No. 2 generator fire was extinguished and, in accordance with the company's operating procedures, posted a reflash watch as a precaution.

The *Columbia*'s engineers ventilated the engineering spaces and then started the Nos. 1 and 3 ship-service diesel generators. After electrical power was fully restored, the crew restarted the two main engines at 0230, and engine control was shifted to the bridge so that the navigation watch could resume the voyage to Wrangell.

## Rehabilitation of the Electrical Plant

On May 28, 2003, the *Columbia* arrived in Ketchikan, Alaska, where Alaska Marine Highway System officials had the No. 2 generator removed so that it could be sent to an electrical repair facility. Consulting engineers also checked the other ship-service generators. The *Columbia*'s engineers told the consulting engineers that generators Nos. 1 and 3 had operated satisfactorily while en route to Ketchikan; however, megger<sup>1</sup> tests revealed that the No. 3 generator had a short (low resistance to ground) on one phase and was not suitable to operate. Agency officials, therefore, also had the No. 3 generator removed from the engineroom so that it could be sent to the electrical repair facility to be examined further and repaired. Because the *Columbia* now lacked two operable ship-service generators, the ferry had to be taken out of service. On June 4, 2003, the Alaska Marine Highway System had a new generator installed so that the ferry could operate, and the *Columbia* was returned to service.

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<sup>1</sup> A test instrument used to measure insulation resistance and other high resistances.

According to agency officials, the Nos. 2 and 3 ship-service generators on the accident ferry had last been overhauled in 1999. The examination of generator No. 3 at the repair facility in early June 2003 revealed that the insulating varnish appeared to be in “excellent condition.” Examiners found no evidence of an insulation breakdown that could account for the low megger reading. The contract repair technicians then rewound the generator, and, on June 12, 2003, megger tests were conducted indicating that the generator was in proper operating condition. The tests on June 12 were witnessed by the port engineer for the Alaska Marine Highway System and a representative of the American Bureau of Shipping (ABS), the ferry’s classification society. On June 13, 2003, while the *Columbia* was in Bellingham, Washington, the repaired generator was loaded onto the ferry. Installation of the generator was completed while the ferry was underway. On June 20, 2003, the *Columbia* returned to Bellingham, where the repaired generator underwent a day of testing under the supervision of an ABS representative, who determined that the generator operated satisfactorily.

The initial examination of ship-service generator No. 2 showed that the equipment unit had sustained heavy damage from the fire. Much of the copper wiring in the lower part of the generator had melted and vaporized. The Alaska Marine Highway System contracted for an in-depth failure analysis, which was conducted in July 2003. Consultant engineers removed the remaining windings and inspected them for evidence of improper assembly or insulation failures, but could find no failure condition. The examining contractor concluded that the insulation breakdown had occurred in the lower part of the generator, which had been mostly destroyed. He further concluded that

an electrical event or events, possibly the switchboard fire of a few years ago or the indiscriminate application of Hi-Pot testing during the dip and bake process, caused aging or hard spots in at least one of the windings near the bottom of the generator. This caused a short between turns which increased the current in that coil. The heat was eventually enough to cause additional turns to become shorted and then to start the melting process in the winding. As the molten copper started to flow, it shorted windings phase to phase, and the event quickly became a catastrophic failure.

The switchboard fire referred to by the contractor occurred on June 6, 2000.<sup>2</sup> At the time, the Nos. 1 and No. 2 generators were in operation. The engineer on watch was making an inspection round of the engineering spaces when he observed that the No. 2 generator was surging “from a slower speed to a higher speed” and was moving erratically on its foundation. The engineer proceeded to the control room, where he observed fire coming out of the switchboard. The fire was subsequently extinguished by the crew. An investigation into the fire determined that it had been caused by a short circuit in the switchboard, and that the short circuit had caused “substantial damage” to the switchboard. The No. 2 generator was examined following the accident and found to be undamaged.

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<sup>2</sup> For more information, see National Transportation Safety Board, *Fire On Board the U.S. Passenger Ferry Columbia, Chatham Strait, Near Juneau, Alaska, June 6, 2000*, Marine Accident Report NTSB/MAR-01/02 (Washington, DC: NTSB, 2001).

## **Probable Cause**

The National Transportation Safety Board determines that the probable cause of the fire and the destruction of the wiring in the No. 2 ship-service generator on the *Columbia* was a breakdown in the generator's wiring insulation.

**Adopted: April 19, 2004**