January 22, 2025 MIR-25-04

Engine Room Fire aboard Fishing Vessel *Three Girls*

On August 11, 2024, about 2056 local time, while the fishing vessel *Three Girls* was engaged in fishing operations in the Gulf of Maine about 118 miles east-southeast of Portland, Maine, a fire broke out in the vessel's engine room (see figure 1 and figure 2).[1] The five crewmembers and a National Marine Fisheries Service observer abandoned the burning vessel into a liferaft and were rescued by a US Coast Guard cutter crew that same evening. There were no injuries, and no pollution was reported. Damage to the vessel was estimated at $1.3 million.[2]

Figure 1. *Three Girls* docked in Portland, Maine, on August 14, 2024, after the fire.

[1] 1 In this report, all times are eastern daylight time, and all miles are nautical miles (1.15 statute miles).

[2] Visit ntsb.gov to find additional information in the public docket for this NTSB investigation (case no. DCA24FM056). Use the CAROL Query to search investigations.

Casualty Summary	
Casualty type	Fire/Explosion
Location	Gulf of Maine, 118 nm east-southeast of Portland, Maine 43°07.37′ N, 67°58.78′ W
Date	August 11, 2024
Time	2056 eastern daylight time (coordinated universal time –4 hrs)
Persons on board	6
Injuries	None
Property damage	$1.3 million est.
Environmental damage	None
Weather	Visibility 10 nm, clear, winds southwest 10 kts, gusts 13 kts, seas 2–4 ft, air temperature 67°F, seawater temperature 63°F, sunset 2024, evening twilight 2102
Waterway information	Ocean, depth about 450 ft (at casualty site)

Figure 2. Area where the fire broke out aboard the fishing vessel *Three Girls*, as indicated by a circled *X*. (Background source: Google Maps)

1 Factual Information

1.1 Background

The 81.6-foot-long, steel-hulled, single-propeller commercial fishing vessel *Three Girls* was built in 1979 at Quality Marine in Theodore, Alabama, as the *Our Lady of the Seas*. In April 2020, Three Girls Fishing, LLC purchased the vessel and renamed it *Three Girls*. The vessel was licensed by the National Oceanic and Atmospheric Administration (NOAA) to engage in the New England multi-species fisheries trade and was used for groundfishing.[3]

1.2 Event Sequence

On August 2, 2024, the *Three Girls* arrived in Boston, Massachusetts, so the crew could prepare for a fishing trip. The crew consisted of a captain, a first mate, and three deckhands. A NOAA National Marine Fisheries Service (NMFS) observer was also aboard to collect data on fish species that were caught in each fishery area; the observer's agency had equipped him with a personal locator beacon (PLB) and a survival suit.[4] The captain had about 30 years of experience fishing, and the crew had various levels of experience in the fishing industry.

The crew loaded about 4,500 gallons of diesel fuel in the port and starboard fuel tanks and 30 tons (60,000 pounds) of ice in the fish hold. On August 9, about 2145, the crew of *Three Girls* departed Boston, bound for fishing grounds about 100 miles off the coast of New England.

After getting underway, the captain conducted an emergency drill with the crew. He sounded the general alarm, showed the location of the muster station, discussed abandon ship and man overboard procedures, and identified the locations of the vessel's safety gear, including the emergency position indicating radio beacon

[3] *Groundfishing*, or bottom trawling, is a fishing practice involving herding and capturing target species, which generally feed and dwell near the bottom of the sea (e.g. cod, haddock, or pollock) by towing a net along the ocean floor.

[4] PLBs are activated manually and transmit location data to NOAA's Search and Rescue Satellite Aided Tracking system on 406 MHz with lower-power 121.5-MHz homing signals. PLBs are registered to the owners with contact information available to search and rescue controllers. The NMFS observer's PLB was an ACR ResQLink View 406 MHz, model PLB-425. The PLB's unique identification number was assigned to the observer within his agency's internal tracking system. The agency's 24/7 emergency number was listed as the primary contact to be notified in the event of activation.

(EPIRB) and the six-person inflatable liferaft, which were both located outside the wheelhouse door.

The *Three Girls* transited for about 12 hours, and the crew began fishing the following morning, August 10. Over the next 2 days, the crew completed about 10–15 tows and caught about 20,000 pounds of various groundfish. The catch was separated and stored on ice in the fish hold, which could hold about 180,000 pounds of fish.

During fishing operations that weekend, the vessel's main diesel engine was operating to provide propulsion, the starboard diesel generator was running to provide electrical power, and the winch diesel engine was running to provide hydraulic power to the fishing equipment, such as the net reel, two winches, and the cargo boom (figure 3 shows the location of this machinery and equipment). The captain stated that fishing operations were uneventful and that he "constantly" made rounds of the engine room.

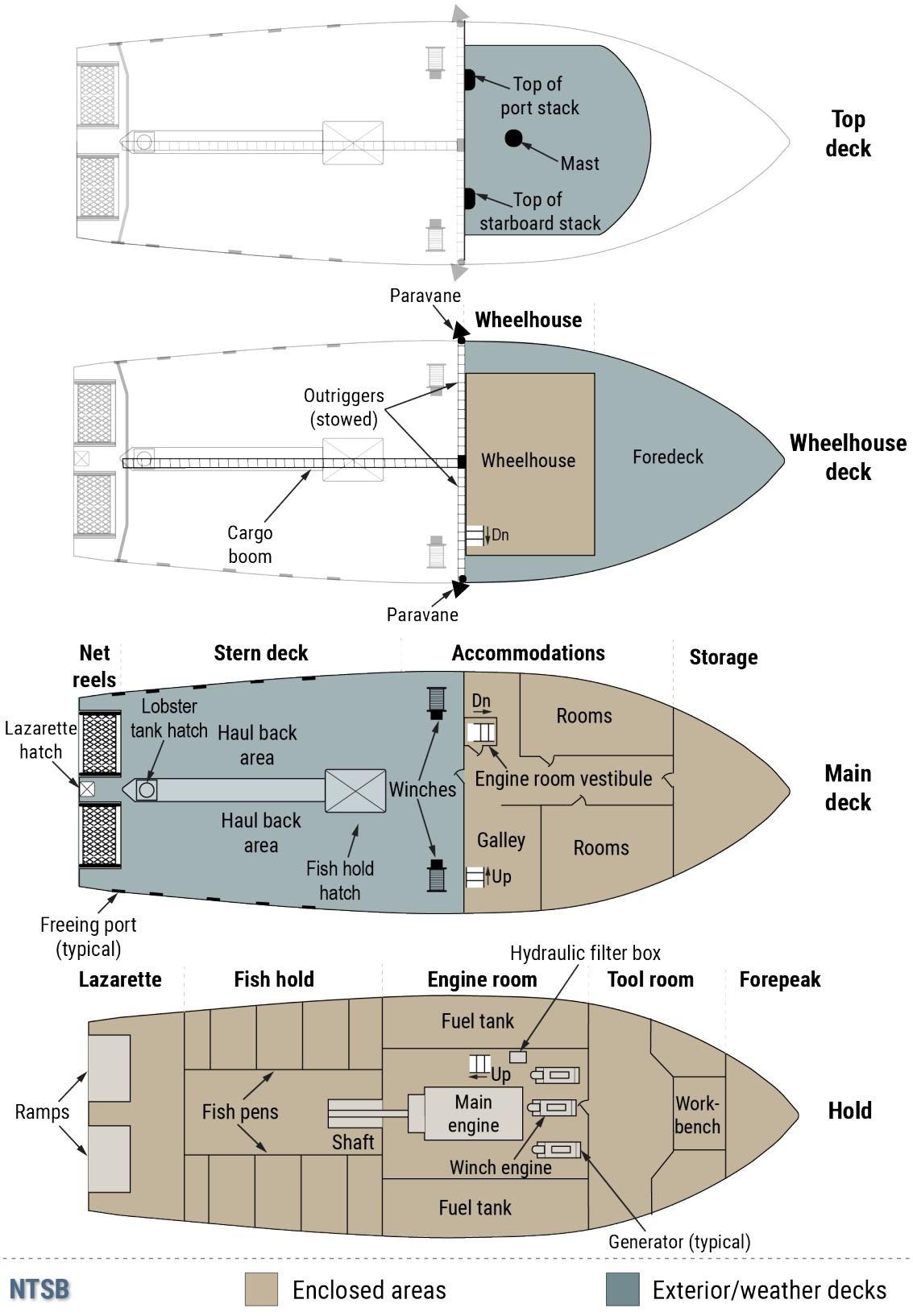

Figure 3. Plan view of *Three Girls*' decks. (Scale approximate)

On August 11, about 2030, the captain made a round of the engine room before returning to the wheelhouse to maneuver the vessel. He did not notice anything out of the ordinary during his round.

About 2045, the captain called the crew to report to the stern deck to begin hauling the fishing net back onto the vessel. Crewmembers and the NMFS observer retrieved their gear from the vestibule at the entrance to the engine room in the accommodation space—which included the crew staterooms and the galley—before reporting to the stern deck. As they arrived, the captain was in the port aft corner of the wheelhouse overlooking the stern, operating the hydraulic net reel to haul in the fishing net. None of the crewmembers reported anything unusual from the entrance to the engine room.

About 2050, after the fishing net was recovered from the seafloor, and when it was almost on the deck, the captain noticed a burning smell that he believed was something electrical in nature. He saw thick, black smoke billowing out from the engine room exhaust fan in the port stack. He shut off the winch engine remotely from the wheelhouse control station, ran to the main deck engine room entrance, opened the door, and observed black smoke coming out. The captain crouched, looked down, and saw orange flames and thick black smoke in the forward section of the engine room. According to the captain, he was unable to determine whether the fire was on the port or starboard side due to the amount of smoke. He determined that the fire was too intense to fight and directed the crew to report to the muster station and prepare to abandon ship.

The captain returned to the wheelhouse and used the VHF radio (channels 68 and 72) to request assistance from nearby fishing vessels. At 2056, he broadcast a distress call on VHF channel 16; he stated that the vessel was on fire and the crew was abandoning ship, and he also provided the vessel's position. According to the captain, while making the radio calls in the wheelhouse, he was gasping for air and could barely see the GPS position on the navigation console due to the amount of smoke. US Coast Guard Sector Northern New England (in Portland, Maine) received the distress call from the *Three Girls*.

Once alerted about the fire, the first mate ran into the accommodation space to collect as many survival suits from the crew quarters (staterooms) as he could carry. He brought five (of the vessel's seven survival suits) to the muster station (aft of the wheelhouse on the wheelhouse deck) where the crew had mustered. Due to the fire and smoke inside the vessel, the first mate was unable to retrieve the vessel's remaining two survival suits.

While the crew was mustering, the main engine was still in gear, moving the vessel ahead at 1–2 knots. Before leaving the wheelhouse, the captain had tried to put the engine into neutral, but the engine gear was stuck in the ahead direction. About this time, all electrical power throughout the vessel shut off.

The crew moved the liferaft from the wheelhouse deck to the stern deck, where they observed fire engulfing the wheelhouse. About this time, the captain directed all crewmembers and the observer to don their immersion suits. Because there were not enough immersion suits available for everyone, the captain elected not to wear one. The crew attempted to stay on the stern deck of the vessel as long as possible before deploying the liferaft and entering the water.

With the wheelhouse unattended, the vessel's heading changed, and smoke began blowing over the stern deck where the crew was mustered, so the captain gave the command to abandon ship. The crew inflated the liferaft on the stern deck. The captain entered the liferaft first with the vessel's EPIRB and directed the crew to push the raft down the stern ramp of the *Three Girls* with him inside it. Wearing survival suits, all crewmembers and the NMFS observer slid down the ramp into the water, holding onto the liferaft's painter, and each climbed into the liferaft.[5] The captain stated that the sea water temperature was 63°F, winds were 5–10 knots from the southwest, and seas were 2–3 feet that evening.

According to the captain, 5–8 minutes passed from the time he first smelled smoke to when the crew abandoned the vessel. The captain and first mate were positioned by the liferaft entry door with paddles to prepare to maneuver the liferaft away from the unattended, burning vessel in the event it turned back toward the liferaft. The deckhands and the observer were positioned in the back of the liferaft opposite the entry door. Once in the liferaft, the observer activated his PLB; he stated that it was activated the entire time the crew was in the liferaft. Crewmembers also verified that the EPIRB was on and transmitting a signal.

After the distress call, the Coast Guard cutter *William Chadwick*, operating nearby, was diverted to the scene. At 2103, the Coast Guard District One Command Center received an alert from the EPIRB registered to the *Three Girls*. About 2119, the Command Center also received an alert from the PLB registered to the NMFS observer and called the primary contact (the NOAA 24/7 emergency line) to get additional information. At 2151, a fixed-wing surveillance aircraft was launched, and,

[5] On an inflatable liferaft, the *painter* is a line that attaches the raft to the vessel, and, when pulled, activates the inflation. The painter also acts as a guideline to deliver people safely to the floating liferaft when deployed.

at 2158, a search-and-rescue helicopter was launched from Air Station Cape Cod, Massachusetts.

The captain stated that, once the crew was in the liferaft, the *Three Girls* continued to move ahead, and crewmembers in the liferaft began to see lights from other nearby vessels on the horizon. Assuming the vessels would head for the burning *Three Girls*, not the liferaft, the captain deployed a rocket flare to show the location of the liferaft. Crewmembers stated that when they saw a Coast Guard plane and helicopter, the captain deployed a second rocket flare; the plane approached the liferaft and circled it several times (see figure 4).

Figure 4. View of the burning *Three Girls* from the rescue helicopter, with fire in the wheelhouse. (Source: Coast Guard)

A few minutes later, the fishing vessel *Princess Laura* arrived on scene and approached the liferaft. The *Three Girls* captain stated that the wind began picking up about this time and the water had a "chop on." He determined it would be too dangerous to board the *Princess Laura* from the liferaft and instructed the crew of the *Princess Laura* to back the vessel away from the liferaft.

At 2243, the Coast Guard cutter *William Chadwick* arrived on scene, and, at 2308, the cutter crew launched a rescue boat with four crewmembers. The crew of the *Three Girls* boarded the rescue boat and were transferred to the cutter about 2314; none of the crewmembers reported injuries. The cutter began transiting back to Portland about midnight, and the rescued crewmembers recalled they could see the *Three Girls* continuing to burn in the distance.

The *William Chadwick* arrived in Portland at 1100 the following morning (August 12). The *Three Girls* remained afloat as the fire continued to smolder. The following day, a tugboat was dispatched to recover the *Three Girls*, and on August 14, the *Three Girls* was docked in Portland. The local fire department boarded the vessel and extinguished the fire using water and foam.

1.3 Additional Information

1.3.1 Damage

After the fire was extinguished, National Transportation Safety Board and Coast Guard investigators boarded the *Three Girls* to inspect the damage. The Coast Guard also requested assistance from a local Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) certified fire investigator, who participated in the examination of the damage. The steel bulkheads, decks, and overhead of the wheelhouse displayed several areas of deck and bulkhead warpage, and all contents inside the wheelhouse had been completely consumed by the fire (see figure 5). Below the wheelhouse, all contents of the accommodation spaces were also completely consumed. Additionally, all internal bulkheads, frames, doors, furniture, and equipment were completely consumed by the fire on this deck (accommodation bulkheads and framing were comprised of white fiberglass-reinforced panels on the bulkheads and overheads with varnished trim, and staterooms had wood bunks and storage cabinets).

Figure 5. *Left to right*: Foredeck of the fishing vessel *Three Girls* after the fire, and fire damage to the interior of wheelhouse after the fire.

In the engine room, the greatest extent of damage was in the forward, port corner of the engine room above the walkways, which were comprised of plywood decking on steel framing (see figure 6). This section of the engine room exhibited heavy fire damage and sustained significantly more damage than the starboard side of the engine room. Multiple electrical cables in the overhead were damaged, and all flexible hoses and connections were consumed. Several electrical breakers were melted within their breaker boxes in the forward part of the engine room. All exposed surfaces were heavily sooted; a few areas of "clean burn" were present between the winch engine exhaust piping and the hydraulic filter housing in the overhead above the port generator.[6] The lower portion of the main engine crankcase and all machinery in the bilge were undamaged by the fire, and the exterior paint coating was still intact.

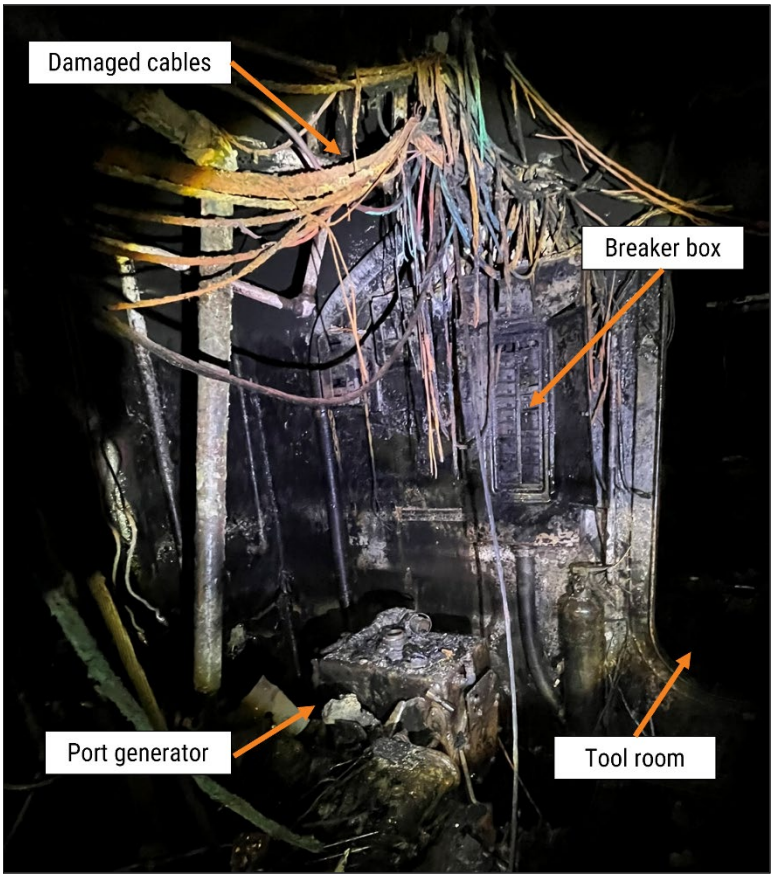

Figure 6. Fire damage in the port forward corner of the *Three Girls* engine room.

[6] *Clean burn* refers to fire patterns on a noncombustible surface where soot deposits have been burned away by direct flame contact or intense radiant heat, leaving a "clean" area bordered by sooty stains.

The door to the tool room, forward of the engine room, was found open, and most combustible items in the tool room near the engine room door, such as electrical cables, receptacles, and switches, had been consumed. Several items—such as filter cartridges, tools, and various spare parts—that were farther away from the door in the tool room were found undamaged.

In the engine room, the hydraulic hoses that had been connected to the return oil filter box in the overhead on the port side of the engine room were found detached, and the aluminum filter housing covers were consumed (see figure 7). Several hydraulic hoses throughout the engine room had melted adjacent to their steel connection fittings.

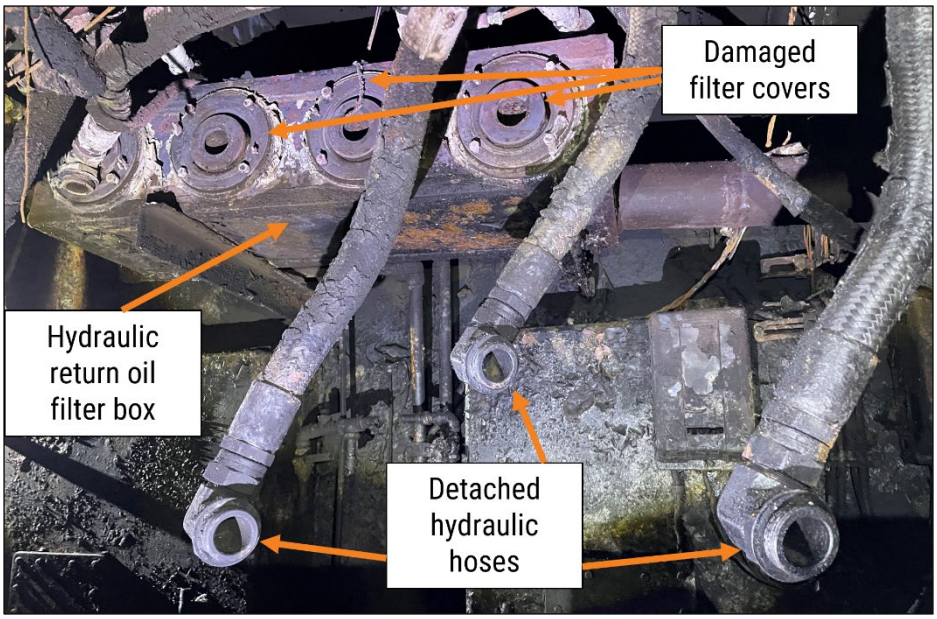

Figure 7. Hydraulic system return oil filter box in the *Three Girls* engine room after the fire.

The main engine cylinder head covers, the air intake manifold, and the portside turbocharger were damaged and melted. Investigators found the plastic tubing used to monitor the port and starboard fuel tank levels melted and separated.

After the fire, the *Three Girls* was declared a constructive total loss estimated at $1.3 million, and the vessel was scrapped.

1.3.2 Main Engine and Generators

The Caterpillar 3512 main engine aboard the *Three Girls* had been installed in 2020 as a reconditioned engine. The main engine had about 4,000 operating hours on it since its last overhaul about two seasons before the accident voyage. At full

speed, the engine was rated at 1,200 rpm. While the crew was hauling back the net on the evening of the fire, the captain stated that the main engine was running at about 750 rpm, providing propulsion for the vessel.

The vessel was equipped with two electrical generators: one on the starboard side of the engine room, and one on the port side. The 65-kilowatt starboard generator was running at the time of the fire, providing electrical power for the vessel, and, according to the captain, it was running at 25–35% of rated load. The 55-kilowatt diesel generator on the port side of the engine room was not running at the time of the fire.

The main engine and both electrical generators could only be started and stopped locally in the engine room (not remotely).

1.3.3 Winch Engine

In 2020, the vessel's operating company added a 380-horsepower diesel-driven Caterpillar 3406 engine to replace a power takeoff hydraulic pump arrangement off the main engine shaft that had been originally installed on the vessel.[7] The winch engine was installed under the walkways of the engine room in between the two generators and forward of the main engine. The winch engine could be started and stopped remotely at the hydraulic control station in the wheelhouse. At full speed, the engine was rated at 1,800 rpm. The exhaust piping was wrapped with sections of insulation blankets. At the time of the fire, the winch engine had about 2,000 hours of run time on it. On the evening of the fire, just before the fire broke out, the captain estimated the winch engine was running at nearly full speed.

The hydraulic oil used aboard the *Three Girls* was Fleetline AW 32, a noncorrosive petroleum-based oil. The hydraulic oil's flash point (the minimum temperature at which it would give off vapors that could form an ignitable mixture) was 329°F.

The winch engine shaft was coupled to five hydraulic pumps: one pump for the net reels, two pumps for the winches, and two pumps for the deck cargo boom. The hydraulic pump discharged to several hydraulic hoses on the aft end of the pump in the lower engine room, which were connected to steel supply and return pipes. The supply pipes ran above the main engine and out to the hydraulic equipment on the stern deck. The return pipes ran alongside the supply pipes above the main engine

[7] A *power takeoff* is a device, typically connected to the flywheel of an engine, that transfers power from the engine to a secondary application, such as a hydraulic pump, generator, air compressor, pneumatic blower, or vacuum pump.

and connected into a return oil filter box in the overhead of the engine room above the port generator in the forward port corner of the engine room. The steel return oil filter box housed a bank of four filter cartridge housings and was piped back to the hydraulic oil storage tank on the port side of the vessel via a 4-inch-diameter pipe.

According to the captain, all the hydraulic hoses had been replaced 2 years before the fire. The captain stated that the typical hydraulic pressure in the system was between 2,200–2,800 pounds per square inch (psi) while operational. The captain estimated that, on the evening of the fire, the hydraulic system was running 80-90%, with all the hydraulic components operational at full load just before the fire broke out.

In a postcasualty interview, the captain stated that about 2 years before the fire, he noticed the return oil filter box "bulging" while the hydraulic system was operating. At that time, the return pipe to the storage tank was 2 inches in diameter. The shore engineer replaced the 2-inch pipe with a 4-inch pipe to allow more oil to flow back to the storage tank and relieve pressure from the filter box. The captain said he had not seen the filter box bulge since the piping had been modified.

1.3.4 Engine Room Ventilation

Ventilation was provided to the engine room via an electrically driven fan in the starboard stack, drawing in fresh air and discharging into the starboard side of the engine room in a forward direction. An electrically driven exhaust fan, located in the port stack, drew air from the port aft side of the engine room and discharged out through the aft side of the port stack. Neither fan was equipped with a louver to close off the air supply, and neither was able to be started or stopped remotely.

1.3.5 Firefighting Equipment

The *Three Girls* was equipped with an electrically driven fire pump and several fire extinguishers. There was no fixed fire extinguishing system, nor was there any smoke or fire detection system in the engine room (none were required). In the accommodation spaces, there were four battery-operated smoke/carbon dioxide detectors. The vessel was also equipped with a closed-circuit camera system, but the system was not functional and was in the process of being repaired at the time of the fire.

2 Analysis

While the fishing vessel *Three Girls* was underway and fishing in the Gulf of Maine, a fire broke out in the engine room as the crew hauled in the net.

Coast Guard, ATF, and NTSB investigators' postcasualty examination of the vessel showed substantial damage on all decks. Because the captain reported initially observing fire in the engine room, investigators concentrated their inspection there. In the engine room, the greatest extent of damage was observed in the forward, port corner of the engine room above the walkways (plywood decking above steel framing). The lower portion of the main engine and all machinery below the walkways were undamaged by fire, so the fire had most likely not started below the walkways in the lower engine room. Several exposed surfaces were heavily covered in soot, and there were a few areas of "clean burn" present between the hydraulic return oil filter housing and the winch engine that was operating at the time, indicating the fire had burned hottest there. Therefore, the fire area of origin was likely in the port, forward corner of the engine room between the hydraulic return oil filter housing and the winch engine.

All hydraulic hoses from the hydraulic return oil filter box were found detached from their aluminum filter housing covers, which had been melted away by the fire, indicating the hoses, their fittings, or another component of the box had failed. Due to the extent of the fire damage throughout the engine room, investigators were unable to determine which hydraulic hose, fitting, or component may have initially failed. The integrity of the filter box itself may have been compromised due to the excessive internal pressure that the box had been exposed to before the return pipe was enlarged, which had caused the box to bulge (as observed by the captain 2 years before the fire). If the filter box or a component of the filter box failed, pressurized hydraulic oil would have sprayed into the engine room onto nearby operating machinery. Hydraulic oil is widely used in the marine industry for power transmission and is used under high pressure (2,000–3,000 psi), and the vessel's captain reported this system typically had pressures of 2,200–2,800 psi. When a failure in a hydraulic system causes a breach, such as a ruptured hose or failed fitting, the pressurized hydraulic oil can escape at high velocities and become atomized into an extremely flammable and potentially explosive mist, particularly where ignition sources are present.[8]

A few minutes before the captain discovered the fire, he was operating the hydraulic net reel to haul the fishing net back on deck. The hydraulic system was

[8] When hydraulic oil is released under pressure, it often results in an atomized spray or mist of oil droplets that may extend as far as 10 meters (32.8 feet) from the break.

running about 90%, with all the hydraulic components operational at full load, and the winch engine was running at nearly full speed. The starboard generator was also running. The winch engine's exhaust manifold and piping, which were located near several components of the hydraulic system, would have been operating at 800–1,000°F. The exhaust piping was wrapped with sections of insulation blanketing; this insulation had gaps between pieces where the spray of hydraulic oil could have penetrated and made contact directly with the exhaust manifold or pipe. The running starboard generator, located starboard of the winch engine, would have had a temperature of about 600°F, well above the flashpoint of the hydraulic oil (329°F). The surface temperature of either the winch engine exhaust manifold and piping or starboard generator hot surfaces could have provided an ignition source for the spraying pressurized hydraulic oil from a failed component of the hydraulic return oil filter box/housing. However, because the winch engine exhaust manifold and piping were closer to the filter box and were hotter than the starboard generator, the exhaust manifold or piping were more likely to cause the ignition of a fire. Investigators could not find any alternative ignition or fuel sources near the fire area of origin. Therefore, the cause of the fire was likely the ignition of pressurized hydraulic oil spraying on components of the running winch engine exhaust system.

When the captain discovered the fire, he determined it was too intense to fight. After directing the crew to prepare to abandon ship, he shut down the winch engine from the wheelhouse remote station, which would have stopped the spray of pressurized hydraulic oil that was fueling the fire. However, he was unable to stop the main engine—which was providing propulsion—and starboard electrical generator—which powered the supply and exhaust ventilation fans in the engine room—from the wheelhouse because neither engine was equipped with remote shutoffs. Additionally, there were no dampers or remote shutoffs for the supply and exhaust fans in the engine room to secure this ventilation. Therefore, oxygen, feeding the fire, continued to circulate throughout the engine room, and the fire continued to burn. Within minutes, the fire overwhelmed the wheelhouse, and smoke began blowing over the stern deck, where the crew had mustered. The inability to secure ventilation to the engine room allowed for a continued supply of oxygen to the fire, hastening its growth and spread.

The captain determined it was no longer safe for the crew to remain aboard the vessel and gave the order to abandon ship. The crew launched and entered the liferaft in an expeditious and orderly fashion less than 8 minutes from the time the captain first smelled smoke. Once in the liferaft, the crew ensured that the vessel's EPIRB was activated to provide their accurate position to responders. Additionally, the NMFS observer's PLB provided notification to shoreside entities and provided real-time position information.

3 Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the fire aboard the fishing vessel *Three Girls* was likely the failure of a component on the hydraulic system (located in the engine room) for on-deck fishing equipment, resulting in pressurized hydraulic oil spraying onto a running engine's exhaust system and igniting.

3.2 Lessons Learned

Securing Engines and Ventilation During Engine Room Fires

After an engine room fire ignites, it is imperative to remove the sources of available fuel and ventilation to the fire to prevent it from spreading. Vessel designers, builders, owners, and operators are encouraged to install, regularly test, and have emergency drills that incorporate remote shut offs for all machinery within these spaces to ensure the machinery can be remotely stopped from outside the space where it is situated. Additionally, to prevent the reintroduction of oxygen to the space, vessel designers and owners should ensure that the ventilation, both natural and forced draft, can be completely and remotely secured to all engine rooms.

Vessel Particulars

Vessel	*Three Girls*
Type	Fishing (Fishing vessel)
Owner/Operator	Three Girls Fishing, LLC (Commercial)
Flag	United States
Port of registry	Portland, Maine
Year built	1979
Official number	609865 (US)
IMO number	N/A
Classification society	N/A
Length (overall)	81.6 ft (24.9 m)
Breadth (max.)	24.0 ft (7.3 m)
Draft (casualty)	11.0 ft (3.4 m)
Tonnage	783 GRT
Engine power; manufacturer	1 x 850 hp (634 kW); Caterpillar 3512 diesel engine

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