



National Transportation Safety Board

Marine Accident Brief

Fire aboard Commercial Fishing Vessel *Raffaello*

Accident no.	DCA16FM019
Vessel name	<i>Raffaello</i>
Accident type	Fire
Location	Satala Shipyard, Pago Pago Harbor, American Samoa 14°16.3' S, 170°41.5' W
Date	January 17, 2016
Time	2310 Samoa standard time (coordinated universal time – 11 hours)
Injuries	One minor
Damage	\$2 million est.
Environmental damage	None reported
Weather	Clear visibility at 7 miles, winds south-southwest at 8 mph, calm seas, air temperature 87°F, water temperature 84°F ¹
Waterway information	Pago Pago Harbor is a large natural inlet in the central south coast of the island of Tutuila in American Samoa.

On January 17, 2016, at 2310 local time, a fire broke out on board the uninspected commercial fishing vessel *Raffaello* while it was moored to the fishing vessel *Judibana* at the Satala Shipyard in Pago Pago Harbor, Tutuila Island, American Samoa. The fire started in the captain's stateroom just forward of the machinery space exhaust trunk and was extinguished the next morning by the crews from both vessels along with shoreside firefighters. One of the 17 crewmembers on the *Raffaello* suffered minor burns while fighting the fire. Damage to the vessel was estimated at \$2 million.



Raffaello at sea prior to the accident. (Photo courtesy of Fishing Company Raffaello, LLC)

¹ All miles in this report are nautical miles (1.15 statute miles).

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the watchman proceeded to the aft hatch instead of taking the ladder to the accommodation area that was immediately in front of him. As he ran along the corridor in the accommodation area, he alerted the crew of the fire. The navigator awoke and went to the bridge to sound the general alarm but, because the space was filled with smoke, he was not able to sound it. He then called 911 to inform the local fire department of the fire on the vessel. *Raffaello*'s crew alerted the assistant engineer on watch aboard the *Judibana*, who in turn notified his chief engineer. About 2330, the chief engineer activated the *Judibana*'s general alarm.

The crewmembers aboard the *Raffaello* charged one hose from the aft main deck, which was supplied by the main fire pump and powered by the starboard generator. A second hose was pressurized from their portable emergency fire pump. Combating the fire from the top of the wheelhouse, they directed both hoses, solid stream, toward the machinery exhaust vents where flames emanated from the exhaust vent aluminum hat. *Judibana*'s crew joined in the firefighting efforts, charging one fire hose from their vessel's midship bridge deck and another hose from the aft main deck.

Then the chief engineer from the *Judibana*, who had worked previously in the same capacity on the *Raffaello* for over a year, visually inspected *Raffaello*'s engineering spaces to determine if the fire had spread to additional areas. He attempted to access the bridge stairway from within the vessel but found the door locked.

At 2340, a portion of the aluminum covering surrounding the starboard generator exhaust pipe located on the wheelhouse deck began to melt. Five minutes later, the crews observed smoke emanating from the master's cabin, which was located aft of the bridge and just forward of the exhaust trunk. Two of the three members fighting the fire from the top of the wheelhouse proceeded down one deck to the bridge deck after noticing smoke coming from the port side. *Raffaello*'s deck boss used a fire axe to break open the secured portside door to access the master's cabin. As the door was broken apart, a fireball briefly erupted outwardly through the door. *Raffaello*'s winchman, outfitted in a fire suit and self-contained breathing apparatus (SCBA), began combating the fire in the master's cabin. The fire continued to spread forward from the master's cabin to the radio room and into the wheelhouse.

At 0010, the Central Station Fagatogo Fire Department arrived on scene and provided an additional fire hose team. Firefighters opened the port and starboard portholes in the master's cabin to combat the fire.

Almost 2 hours later, about 0200, the fire in the captain's cabin was extinguished, but a small fire re-flashed in the captain's bathroom due to the continuous emission of heat from *Raffaello*'s running starboard generator engine through the adjacent exhaust trunk. The chief engineer on the *Judibana* gave the order to shut down that generator. Immediately afterwards, the fire was extinguished. Shutting down the starboard generator earlier would have reduced the number of hoses available to the crew for firefighting efforts.

The fire department conducted a post-control overhaul operation that included opening walls, ceilings, voids, and partitions to check for smoldering fires. At 0235, the overhaul operation was completed. Seaport Police instructed *Raffaello*'s crew to vacate the vessel until the arrival of the US Coast Guard.



Following the fire, a Coast Guard investigator measures the distance between the wooden studs and the exhaust pipe of *Raffaello's* starboard generator, on which a 15-inch section of insulation is missing at the top. (Photo by US Coast Guard)

Analysis

While *Raffaello* was pierside in the Satala Shipyard, investigators reviewed documentation, certificates, and records for the vessel and conducted a post-fire examination of the machinery spaces, affected areas, and firefighting equipment. The vessel appeared to have been in good order and condition. It had the required firefighting equipment aboard; no discrepancies were recorded.

Investigators determined that the ignition source of the fire was a 15-inch section of the starboard generator exhaust pipe at the top of the exhaust trunk without insulation (lagging). Approximately 2.5 inches away from the uninsulated exhaust trunk were charred 2-inch-by-4-inch wooden studs and 0.25-inch plywood sheathing used for a partition of the master cabin bathroom. Investigators concluded radiant heat traveled uninhibited to the wooden partition, heating and

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charring the wood until it ignited.² The fire was caused by a long process of wood deterioration known as “pyrolysis.”³

The vessel complied with the Coast Guard’s regulations for commercial fishing vessel dockside safety examination, although the decal expired on December 31, 2015. This former voluntary examination became mandatory in 2015 for vessels operating more than 3 miles offshore; however, a vessel whose examination expiration date occurred after October 15, 2015, had five years from the date of inspection to complete the re-examination.⁴ These examinations primarily assessed compliance with the regulations for lifesaving and basic safety equipment applicable to fishing vessels; they did not include a detailed assessment of hull and machinery installations.

Investigators discovered two of the three original Caterpillar D353 300 kilowatt generators were replaced with two Caterpillar C32 634 kilowatt generators in dry-dock at Keppel Shipyard, Singapore, in December 2013. At the time, the 8-inch generator exhaust pipes were replaced with 10-inch pipes. Inspectors from the US Coast Guard Marine Inspection Detachment Singapore attended the installation and noted the changes made to diesel generators were determined to be “in kind,” that is, the vessel had not had a major conversion after September 15, 1991. No deficiencies or outstanding items were listed for the generators. The activity was logged into the Coast Guard database and closed satisfactory on December 29, 2013.⁵

The 17 crewmembers on board the *Raffaello* at the time of the incident were not screened for drugs and alcohol by their marine employer in accordance with post-casualty drug testing regulations. The Coast Guard determined that testing in this instance was not required.

Based on testimony from the navigator, the exhaust lagging on the starboard generator was changed annually. However, investigators did not find any records or other evidence verifying that the task was accomplished each year or any evidence indicating why the insulation was missing.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the fire aboard the commercial fishing vessel *Raffaello* was the lack of insulation on the starboard generator exhaust gas pipe resulting in the ignition of combustible material in close proximity.

² *Radiation* is heat traveling via electromagnetic waves without objects or gases carrying it along. Radiated heat goes out in all directions, unnoticed until it strikes an object. Source: *A Reporter’s Guide to Fire and the NFPA* [National Fire Protection Association].

³ Vytenis Babrauskas, Ph.D. ‘*Pyrophoric Carbon*’ and Long-term, Low-temperature Ignition of Wood.

⁴ Marine Safety Information Bulletin [MSIB], *Implementation of New Requirements for Commercial Fishing Vessels*. MSIB No. 18-14.

⁵ Marine Information for Safety and Law Enforcement System (Activity No. 4775806).

Vessel Particulars

Vessel	<i>Raffaello</i>
Owner/operator	Fishing Company Raffaello, LLC
Port of registry	Las Vegas, Nevada
Flag	United States
Type	Fishing vessel
Year built	1972
Official number (US)	539046
IMO number	7212377
Construction	Steel
Length	174.2 ft (53.1 m)
Draft	19.5 ft (5.9 m)
Beam/width	40 ft (12.2 m)
Gross ITC tonnage	1097 gross tons
Starboard generator power	850 hp (634 kW) Caterpillar Model C32, V-12, 4-Stroke Water-Cooled Diesel
Persons on board	17

NTSB investigators worked closely with our counterparts from Coast Guard Marine Safety Detachment American Samoa, Investigations National Center of Expertise (New Orleans), and Sector Honolulu throughout this investigation.

For more details about this accident, visit www.nts.gov and search for NTSB accident ID DCA16FM019.

Issued: May 5, 2017

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

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

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