# National Transportation Safety Board

## Marine Accident Brief

### Fire aboard Fishing Vessel *American Eagle*

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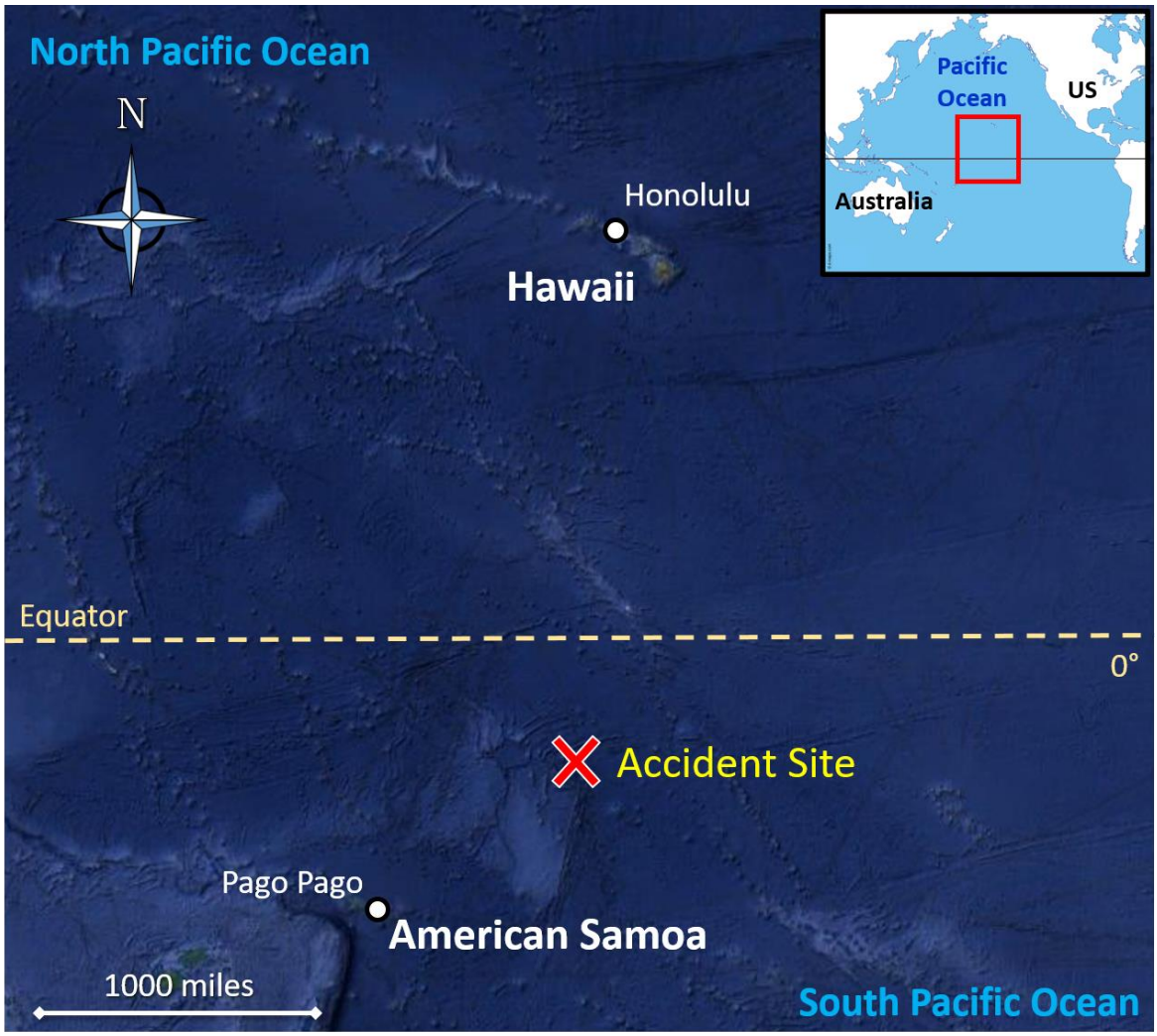
| **Accident no.** | DCA16FM025 |
| **Vessel name** | *American Eagle* |
| **Accident type** | Fire |
| **Location** | South Pacific Ocean, about 790 miles northeast of American Samoa<br>06°29.4' S, 159°58.8' W |
| **Date** | February 10, 2016 |
| **Time** | 0710 Samoa standard time (coordinated universal time – 11 hours) |
| **Injuries** | None reported |
| **Property damage** | >$500,000 est. |
| **Environmental damage** | None reported |
| **Weather** | Clear with visibility to 17 miles, winds east at 8 knots, air temperature 87°F |
| **Waterway information** | Open ocean with 3-foot swell, current 235° at 1.3 knots |

About 0710 local time on February 10, 2016, a fire broke out near several oxygen and acetylene cylinders stored below decks on the uninspected commercial fishing vessel *American Eagle* while it was transiting in the South Pacific Ocean. Crewmembers attempted to fight the fire but were unable to extinguish it. During the firefighting efforts, the vessel began to list. The crew abandoned the *American Eagle* into its skiffs and liferafts, leaving the vessel adrift without electrical power. Several hours later, after the fire had significantly diminished, a few crewmembers re-boarded the vessel, extinguished the remnants of the fire, and corrected the list using self-powered pumps dropped from a US Coast Guard aircraft. The following day they restarted the vessel's main engines and generators and transited to Pago Pago, American Samoa. Damage was estimated between $500,000 and $1 million. There were no injuries or environmental damage reported.

***American Eagle* abandoned and listing to port. (Photo by *American Eagle* crew)**

* Unless otherwise noted, all miles in this report are nautical miles.




The *American Eagle* was a stern-chute purse seiner built in Taiwan and delivered in 2003. Purse seiners deploy a large wall of netting called a "purse seine" in a circle around schooling fish. The netting is drawn tight to close, or "purse," the bottom of the net to prevent the catch from escaping by swimming downward.[1] The net is then pulled alongside the vessel where the fish are loaded aboard, frozen, and stowed in holds. The *American Eagle* had 24 holding tanks (12 port and 12 starboard) for a total cargo capacity of 2,019 cubic meters. It had an International Load Line Certificate issued by the American Bureau of Shipping (ABS) and a US Coast Guard Fishing Vessel Decal issued in April 2015 and valid to April 2017. The vessel had a high seas fishing permit with an area endorsement for highly migratory species from the Western and Central Pacific Fisheries Commission (WCPFC).[2]

[1] National Oceanographic and Atmospheric Administration, *Purse Seine: Fishing Gear and Risks to Protected Species*, http://www.nmfs.noaa.gov/pr/interactions/gear/purseseine.htm, accessed October 7, 2016.

[2] The WCPFC was established by the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, which commenced in 1994 and entered into force in 2004. The Commission "seeks to address problems in the management of high seas fisheries resulting from unregulated fishing, over-capitalization, excessive fleet capacity, vessel re-flagging to escape controls, insufficiently selective gear, unreliable databases and insufficient multilateral cooperation in respect to conservation and management of highly migratory fish stocks." Source: WCPFC website, https://www.wcpfc.int/, accessed February 11, 2016.

The *American Eagle* was rigged for tuna fishing. The fish and nets came aboard via the stern of the vessel to the "net deck," then the catch was transferred below to the "wet deck." The wet deck was a completely enclosed level on the ship where the fish were processed by the crew and transferred to the holds. A large skiff (boat) was stowed on the stern of the vessel, and three additional boats were stowed on the net deck. The vessel also carried a helicopter, which was located on a helicopter pad one deck above the pilothouse and launched for spotting schools of fish.

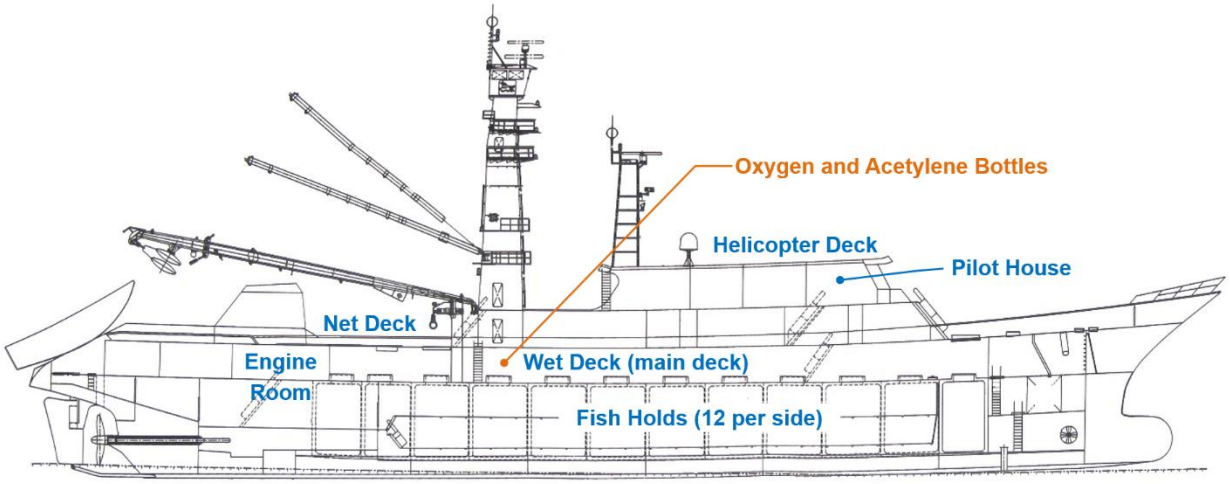
## Accident Events

Leading up to the accident, the vessel was transiting between fishing grounds about 790 miles away from American Samoa. The vessel's crew of 42 persons consisted of Chinese, Indonesian, Vietnamese, and Portuguese nationals, with an American captain, chief mate, and helicopter pilot. Additionally, two observers, one from Mexico and the other from the Federated States of Micronesia, were on board to monitor compliance with fishing treaties.

On the morning of the accident, two crewmembers were tasked with cutting bolts off a seawater valve flange forward of the engine room on the hold deck using an oxygen-acetylene (oxy-acetylene) torch. With a long length of dual gas hose, the crewmembers connected the cutting torch to acetylene and oxygen cylinders (commonly called "bottles") stored on the starboard side of the wet deck—a deck above and about 75 feet away from the work area. About 0710, the crewmember assigned to perform the cutting (hereinafter referred to as the "cutter") turned on the valves of the nozzle and used a striker to light the torch. He stated that he immediately noticed black smoke coming out of the torch and that the oxygen pressure seemed low. Consequently, the cutter closed both valves on the torch and told his assistant to replace the oxygen bottle. Before the assistant went above to the wet deck, however, he saw black smoke. The assistant informed the cutter, and the two crewmembers attempted to evacuate the space. The cutter stated that they initially could not find a way out because the smoke and flames blocked their primary route of escape. Another crewmember eventually called to them and led them out through the port side.

**Oxy-acetylene torch recovered from *American Eagle*.**

About the same time, a crewmember who was in the chief engineer's cabin heard a loud explosion. He left the cabin and walked aft to a ladder leading down to the wet deck on the starboard side. From the top of the ladder, he witnessed flames at the base of the ladder where the oxygen and acetylene cylinders had been stored. He told investigators that the flames were coming from the gauges on top of the tanks.




**Schematic of *American Eagle* identifying location of oxygen and acetylene bottles.**

The assistant deck boss was alerted to the fire and ran to the pilothouse to inform the captain and chief mate of the emergency. The captain, who was listening to fishing reports on the radio, went to the bridge wing and observed smoke coming up through a hatchway on the net deck. The captain returned to the pilothouse, announced "Fire!" on the public address (PA) system, and then turned the vessel slowly to port to get winds over the deck favorable for firefighting.

Crewmembers in the area attempted to fight the fire with portable fire extinguishers, but without success. After the captain's PA system announcement, the crew mustered on the helicopter deck, two crewmembers donned firefighting gear, and firehoses were charged. The chief mate then provided instructions to the firefighters and tended their lifeline as they advanced on the fire. While the crew fought the fire, the captain radioed fishing vessels in the area and the *Fong Seong 888*, a fishing vessel supply-ship. Once contacted, the *Fong Seong 888* began heading toward the *American Eagle*'s location, about 70 miles away.

The firefighters attempted to approach the fire several times but were driven back by heat and smoke. After the firefighters retreated, the crew stopped ventilation to the wet deck in an attempt to smother the fire by removing oxygen.

According to statements from the crew, at some point during the firefighting effort the ship suddenly listed to port. Water was likely accumulating from firefighting efforts and was not being pumped overboard. About the same time, smoke from the fire increased significantly. The chief engineer recommended to the captain that they abandon the vessel. At 1010, the captain gave the order to abandon ship. The *American Eagle*'s four boats were launched, along with two inflatable liferafts, while the captain contacted the vessel's representative to relay the information to the US Coast Guard. The captain also ordered the engineers to secure the main engine and

electrical generators. The crew then boarded the boats and liferafts and activated the emergency position indicating radio beacon (EPIRB).[3]

**Frame from crew video taken from the *American Eagle*'s skiff of ship's boats and liferafts adrift after abandoning ship. (Video provided by Coast Guard)**

In response to the reported emergency, the Coast Guard launched a C-130 fixed wing aircraft from Hawaii, about 1,650 miles north of the vessel. Meanwhile, the crew of the *American Eagle* drifted in the skiffs and liferafts near the location of the abandoned vessel until the *Fong Seong 888* arrived on scene about 5 hours later. By this time, the smoke rising from the *American Eagle* had diminished, and consequently the captain and an emergency crew re-boarded their vessel. Once on board, the emergency crew determined that it was safe to continue their firefighting efforts with equipment and crew assistance from the *Fong Seong 888*. The fire was extinguished at 1630. Later that evening, the Coast Guard C-130 arrived overhead and dropped two pumps, which the crew used to remove the accumulated firefighting water, thereby correcting the list.

After the fire was extinguished, the captain reported to the Coast Guard that they had started the *American Eagle*'s emergency generator. The captain and nine crewmembers remained on board overnight as fire watches. The rest of the crew, including those in the boats and liferafts, were transferred to the *Fong Seong 888*.

The following day, with the assistance of the electrician aboard the *Fong Seong 888*, the *American Eagle* crew restarted an electrical generator and the main engine. The vessel then proceeded under its own power to Pago Pago, American Samoa, where it arrived on February 14.

The *American Eagle* suffered heavy smoke damage throughout vessel and extensive fire damage throughout the wet deck. Electrical wiring was burned and the fire caused structural damage to about 60-feet of the side shell (near the oxygen and acetylene cylinders, from frame 62

[3] An *EPIRB* alerts search and rescue services in an emergency by transmitting a coded message on the 406 MHz distress frequency via satellite and Earth stations to the nearest rescue coordination center. The device can be activated manually or automatically when submerged and deployed from the vessel.

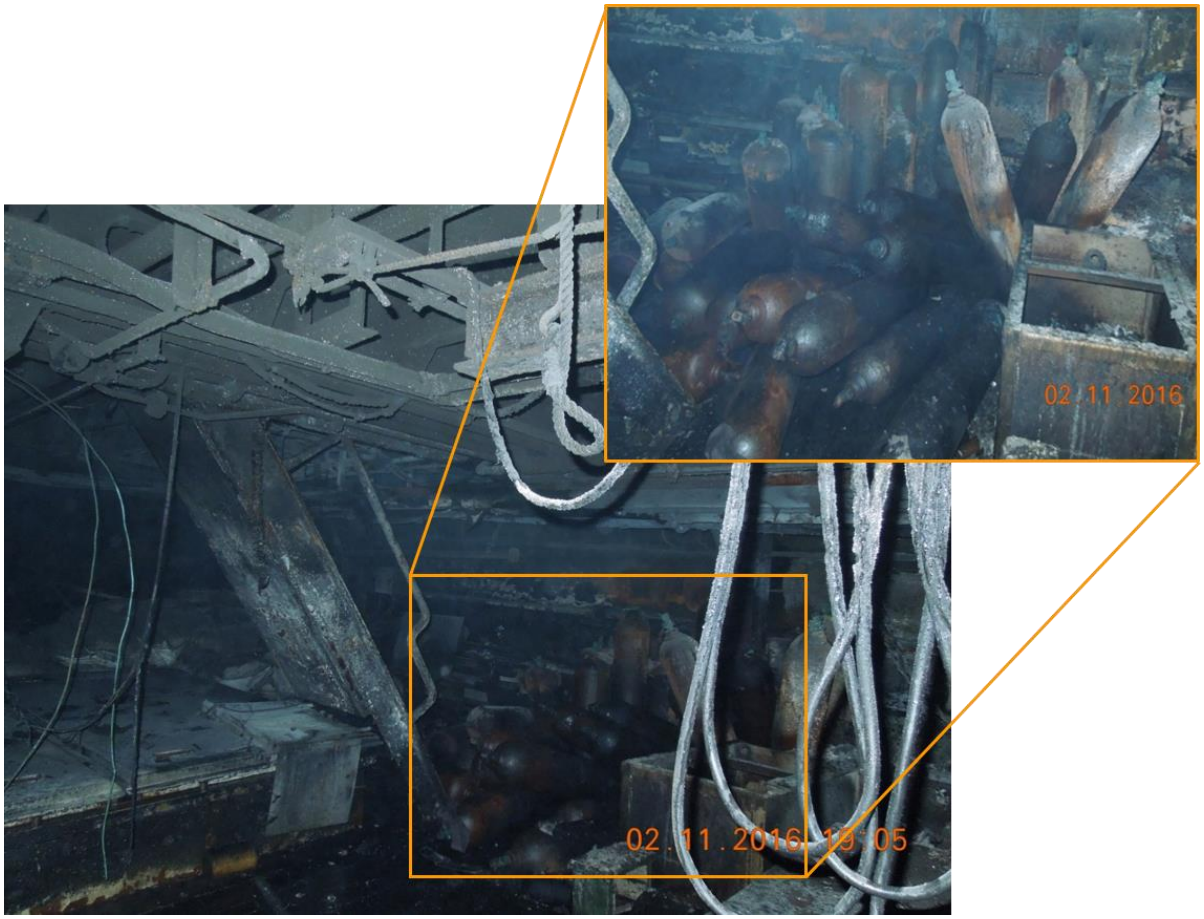
aft to the bulkhead at frame 32) on the wet deck. Heat caused the main deck and supporting frames above the fire to warp.

## Analysis

### Cause of Fire

The fuel source for the fire was determined to be acetylene gas stored in several cylinders. Oxygen and acetylene cylinders were stored together on the wet deck near the ladder on the starboard side. The captain said they were secured to the bulkhead by a strap. Typically, the welders secured the oxy-acetylene torch by closing the valves on the torch side of the assembly only; the valves for the "in use" oxygen and acetylene bottles and regulators were always left open on the tank side and ready for immediate use. Post-fire, investigators found that none of the oxygen or acetylene bottles had safety caps that are normally installed when not in use to protect the valves atop the cylinders from damage.

A waste bucket used for discarded cigarette butts was located adjacent to the cylinders. Investigators learned that the area on the wet deck near the ladder was a regular smoking stop for the crew who passed through the space.




**Oxygen and acetylene bottles post-fire on the starboard side of the wet deck aft of the ladder, with close-up of bottles without safety caps. Bottles were displaced from their storage location forward of the ladder. (Photo by *American Eagle* crew)**

Investigators obtained and reviewed the 16-channel digital video recorder (DVR) footage from cameras throughout the vessel to help determine the ignition source and the cause of the fire. Fourteen of the 15 camera feeds were initially obtained on scene and reviewed, but a single camera feed—which pointed toward the bottle storage location on the wet deck—was not accessible. After investigators removed the DVR's hard drive, the Office of Research and Engineering at the National Transportation Safety Board (NTSB) attempted to recover all image data from it. Only eight channels were recovered from the heat-damaged drive; none of them was the channel from the camera near the bottles.


**Wet deck layout including locations of oxygen and acetylene bottle storage and area where Coast Guard investigators determined the fire likely started. Green arrows show planned egress routes from the wet deck. (Schematic from *American Eagle*'s "Fire Control & Life Saving Plan")**

An approximately 90-foot-long dual-gas hose was rigged between the torch and the melted end near the fire. The oxy-acetylene torch and two sections of hose (one adjacent to the torch, the other to the regulator) were examined at the NTSB's Materials Laboratory to determine potential causes for the fire. Although the hose closest to the fire as well as the cylinder valves and gauges were destroyed by the flames and heat, investigators were able to determine two possible mechanisms that could have led to the initiation of the fire based on the sections provided: leakage from the hose and flashback.

Leakage from the hose was the most likely cause based on the evidence. The examined welding apparatus hose was in poor condition with discoloration, color fade, crazing, cracking, bending wear, several holes, and a 6-inch electrical tape repair at a hose separation. Several of the holes had been repaired, which is not a recommended practice. Leakage from the acetylene hose alone was an ignition hazard because there is essentially no lower or upper flammability limit for the gas (lower flammable limit: 2 percent; upper flammable limit: 98 percent). Any leakage from the oxygen lines only intensified the potential condition, likely creating the flammable atmosphere

that ignited. Cinders from the nearby waste bucket used for cigarette butts were a potential ignition source, but the ignition source could not definitely be determined.

Flashback is the condition of the flame propagating down the hose of an oxy-fuel welding system. The flame burns backwards into the hose, causing a popping or squealing noise. It can cause an explosion in the hose with the potential to injure an operator. To prevent this occurrence, a flashback arrestor is usually employed on the torch. There was no flashback arrestor hardware on the torch that investigators examined. Additionally, using a pressure lower than recommended can cause a flashback; thus, one of the many holes present in the hose from the *American Eagle* could have caused a pressure reduction.

Nevertheless, flashback is the less likely of the two potential causes of the fire because the hose showed no signs of thermal damage or an explosion (bulging, tearing, etc.). In addition, flashback usually takes place while the torch is in use, while at the time of the fire the torch had just been shut off. The visible damage to the hose was more consistent with photo/environmental degradation of the polymeric hose material (faded exterior color, surface crazing and cracking, and splitting).

**Recovered hose with evidence of repairs consistent with electrical tape. The entire lengths of both hose sections showed signs of degradation.**

Once the fire started, the substantial number of oxygen and acetylene bottles in the space would have provided enough fuel and oxygen to make the fire difficult to extinguish. To avoid cylinder explosions, acetylene bottles have low-temperature melting fuse plugs at the top of the cylinder to allow gas to escape when the cylinder becomes heated. Following the fire, some cylinders had melted holes where fusible plugs had been fitted. The pressurized gas contents of the cylinders were released to the fire through these holes.

**Oxygen and acetylene bottles on deck post-fire. Arrow shows a hole at the melted pressure-relief fusible plug location on one of the bottles. (Photo by Coast Guard)**

## Oxygen and Acetylene Cylinder Storage

On the *American Eagle*, the fire broke out in an area where over 25 oxygen and acetylene bottles were stored together on the enclosed main deck, or wet deck, of the vessel. The captain had no documentation of the origin of the oxygen or acetylene bottles. Title 46 *Code of Federal Regulations* (*CFR*) Part 147 contains requirements for hazardous ships' stores used for vessel upkeep and maintenance, including compressed oxygen and acetylene gasses.[4] In part, the *CFR* provides requirements for cylinder construction, filling, and marking. It states that compressed gas cylinders "must always be secured and, when not in use, they must be stowed in a rack in an upright position, with the protection cap in place." For acetylene cylinders, the *CFR* allows that only 600 standard cubic feet or less may be stowed on or below decks, while for oxygen cylinders, no more than 3,000 standard cubic feet may be stowed on board. The specific number, cylinder size, or percentage charged of acetylene and oxygen bottles on board the *American Eagle* could not be determined. However, similar-sized cylinders hold about 400–450 cubic feet, and thus the number of acetylene bottles was well in excess of the storage limit, and the the number of oxygen bottles was possibly in excess. The bottles were not stored in a rack of any kind; they were stored vertically

[4] Title 46 *CFR* Part 147 applies to all Coast Guard inspected vessels. The *American Eagle* was an uninspected fishing vessel.

and strapped to the bulkhead. Although the *American Eagle* was not subject to the stowage regulations as an uninspected fishing vessel, these regulations represent best practices that owners and operators should follow for the safety of the the crew and vessel.[5]

## Crew and Training

The captain and chief mate of the US-flagged *American Eagle* were US citizens with valid Coast Guard-issued merchant mariner credentials. The remainder of the licensed officers, including the chief engineer, were non-US citizens. Longstanding US law requires US citizenship for the captain, chief engineer, and officers in charge of deck and engineering watches on documented US-flagged vessels. The law also dictates that unlicensed seamen must be US citizens or permanent residents, although an exception to this requirement is made for fishing vessels fishing for highly migratory species such as tuna.[6] A 2006 statute (as amended) provided an additional exemption that relieved the US citizenship requirement for all crewmembers except the captain in purse seine fishing vessels based in American Samoa and fishing under a license issued pursuant to the 1987 *Treaty on Fisheries Between the Governments of Certain Pacific Island States and the Government of the United States of America*.[7] The *American Eagle* was operating under this exemption until January 1, 2016, when its treaty fishing license expired. However, since the vessel was under way at the time, the vessel received permission from the Fourteenth Coast Guard District to continue operating with a foreign chief engineer until its next call in American Samoa.

Since the crew and observers hailed from seven different countries, it is unlikely that they shared a common language. The *American Eagle* employed a single translator—an Indonesian national—for the entire complement of 44 persons on board. US law and Coast Guard policy for fishing vessels operating under the citizenship exemption provide no English or common language requirement, with the exception of navigation officers, in the Distant Water Tuna Fleet (DWTF).[8] The *American Eagle* was operating in compliance with law and policy during the accident voyage. But the lack of a common language raises concern about whether the vessel's crew, and crews of other vessels like the *American Eagle* operating under the same exemption, could properly train for and respond to emergencies aboard ship.

Additionally, the Coast Guard's policy letter addressing the DWTF manning exemption states that the Coast Guard "considers the DWTF to be high-risk vessels" due to a history of not demonstrating full compliance with regulatory requirements during safety examinations, vessel losses, fatalities, and marine incidents between 2006 and 2014. Recently, the NTSB investigated a

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[5] Additionally, the Occupational Safety and Health Administration (OSHA) provides standards for gas welding and cutting, including transporting and storing compressed gas cylinders, in Title 29 *CFR* 1926.350. In part, OSHA rules for welding, cutting, and brazing require operators to use flashback arrestors, check valves and hoses for leaks, and never repair hose damage with tape or other materials. Source: Title 29 *CFR* Part 1910.253(b)(2)–1926.253(b)(4).

[6] Title 46 *United States Code* (*USC*) Section 8103.

[7] *Coast Guard and Maritime Transportation Act of 2006* (Public Law 109-241), as amended by the *Coast Guard Authorization Act of 2010* (Public Law 111-281), the *Coast Guard and Maritime Transportation Act of 2012* (Public Law 112-213), and the *Howard Coble Coast Guard and Maritime Transportation Act of 2014* (Public Law 113-281).

[8] Coast Guard, *Distant Water Tuna Fleet (DWTF) Vessels Manning Exemption Guidance*, CG-CVC Policy Letter 13-04 CH-01 (March 2015).

fire aboard another DWTF commercial fishing vessel in American Samoa. The fire occurred a few weeks before the *American Eagle* fire and was determined to have been caused by a lack of insulation on engine exhaust piping with combustible material nearby.[9]

Electronic records obtained from the vessel documented monthly safety meetings and drills conducted during the year prior to the accident. Investigators could not verify that the meetings and drills were conducted as logged; however, an entry in the ship's deck log on January 4, 2016, stated that the crew conducted a fire drill and held a safety meeting where "abandon ship…and man-overboard were addressed."

When the fire started, the crewmember serving as the cutter and his assistant did not know a secondary evacuation route and consequently had to be led out by another crewmember. Reports of the firefighting efforts varied among crewmember statements, but the overall results were unsuccessful. At least one statement reported that the chief engineer and a portion of the crew began abandoning ship prior to the captain's order. Although the effectiveness of training on board the *American Eagle* could not be directly assessed, investigators determined that it was likely insufficient given the language barriers and the response to the fire.

## Probable Cause

The National Transportation Safety Board determines that the probable cause of the fire on board the commercial fishing vessel *American Eagle* was the ignition from an undetermined source of acetylene gas mixed with oxygen, most likely leaking from a degraded hose connected to cylinders stored in a working space below decks. Contributing to the severity of the fire were the numerous acetylene and oxygen cylinders improperly stowed near the fire, which provided additional fuel and oxygen to the fire. Contributing to the extent of the damage on board the vessel was the lack of a common language between all crewmembers, which hampered firefighting efforts.

[9] NTSB, *Fire aboard Commercial Fishing Vessel* Raffaello, Marine Accident Brief NTSB/MAB-17/13, p. 5.

## Vessel Particulars

| Vessel | *American Eagle* |
|---|---|
| **Owners** | American Eagle Fishing, LLC/<br>Trans-Global International Company, Ltd |
| **Managing Owner** | American Eagle Fishing, LLC |
| **Port of registry** | Pago Pago, American Samoa |
| **Flag** | United States |
| **Type** | Fishing vessel |
| **Year built** | 2003 |
| **Official number (US)** | 1206090 |
| **IMO number** | 8974398 |
| **Classification Society** | American Bureau of Shipping |
| **Construction** | Steel |
| **Length (overall)** | 292 ft 8 in (89.2 m) |
| **Draft (design)** | 22 ft 2 in (6.75 m) |
| **Beam (maximum)** | 47 ft (14.3 m) |
| **Gross tonnage (ITC)** | 2,310 gross tons |
| **Engine power; manufacturer** | 4,437 hp (3,309 kW) Daihatsu 6DKM-36 diesel engine |
| **Persons on board** | 44 |

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

For more details about this accident, visit www.ntsb.gov and search for NTSB accident ID DCA16FM025.

## Issued: August 31, 2017