



Danish Maritime Accident
Investigation Board

MARINE ACCIDENT REPORT

April 2017



VESTURLAND
Fire on 7 January 2017

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Front page: Deck on VESTURLAND. Source: DMAIB

The marine accident report is available from the website of the Danish Maritime Accident Investigation Board www.dmaib.com.

The Danish Maritime Accident Investigation Board

The Danish Maritime Accident Investigation Board is an independent unit under the Ministry of Business and Growth. It carries out investigations as an impartial unit that is, organizationally and legally, independent of other parties. The board investigates maritime accidents and occupational accidents on Danish and Greenland merchant and fishing ships, as well as accidents on foreign merchant ships in Danish and Greenland waters.

The Danish Maritime Accident Investigation Board investigates about 140 accidents annually. In case of very serious accidents, such as deaths and losses, or in case of other special circumstances, either a marine accident report or a summary report is published, depending on the extent and complexity of the events.

The investigation

This investigation has been made on the request of the Faroese Maritime Administration in accordance with the IMO Casualty Investigation Code¹ and the EU Directive on casualty investigation². It has been carried out separately from the criminal investigation, without having used legal evidence procedures and with no other basic aim than learning about accidents with the purpose of gaining and promoting an understanding of safety. Consequently, any use of this report for other purposes may lead to erroneous or misleading interpretations.

1 Resolution MSC.255(84) adopted on 16 May 2008.

2 Directive 2009/18/EC of The European Parliament and of the Council of 23 April 2009

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1. ABSTRACT

On 7 January 2017, VESTURLAND was fishing monkfish approximately 100 nautical miles west of the Faroe Islands. At approximately 1200, smoke was detected on the forward part of the vessel's main deck. Within ten minutes after the crewmembers had mustered, it became clear to the master that it was not possible to extinguish the fire and that the vessel had to be evacuated. He called for assistance and via the MRCC a rescue helicopter was sent to evacuate the crewmembers from VESTURLAND. Approximately two hours later, all crewmembers were hoisted from the vessel into the rescue helicopter. The vessel burnt out and was towed to shore where it was declared a constructive total loss.

The investigation set out to establish the origin and cause of the fire with the purpose of explaining how the fire created a situation which was unmanageable by the crew and, consequently, resulted in the evacuation of the vessel. The scope of the investigation was the technical circumstances related to the cause of the fire and the crewmembers' capacity to cope with the fire.

It has been found that the likely origin of the fire was one of the three storage rooms under the forecastle deck. However, the exact cause of the fire was not established. In the absence of other known sources of ignition, it is assumed that a fault in the electrical system, e.g. light fixtures, junction boxes, etc., created an electrical arc which created a situation where a fire could develop.

To handle fires, VESTURLAND had been certified and approved per national and EU statutory regulations and classification society rules. The vessel was per those regulations and rules built, equipped and manned to handle various types of fires. However, none of these measures proved to be useful for the crewmembers in the given situation.

The investigation found that, when the crewmembers were alerted about the fire, the master of the vessel had two options: To fight the fire or to evacuate the vessel. The choice between these two options depended on an assessment of whether the fire could be extinguished without exposing the crew to an undue risk of harm, which had to be weighed against the possibility and risk of evacuating the ship via the life rafts or helicopter. When the master decided to try to extinguish the fire, he had to assess how much firefighting to do before ordering the abandonment of the ship while leaving enough time for the helicopter to arrive alternatively to abandon the vessel via the life rafts.

On 7 January, the master made the decision within 10 minutes. He deemed it too dangerous for the crewmembers to initiate fire extinguishing after the engineer's attempt to inspect where the smoke came from, and because one of the breathing apparatuses malfunctioned. He therefore ordered the evacuation of the vessel. The early decision to abandon the vessel made it possible for the crewmembers to be evacuated in a timely and orderly manner.

2. FACTUAL INFORMATION

2.1 Photo of the ship



Figure 1: VESTURLAND

Source: Private photo

2.2 Ship particulars

Name of vessel:	VESTURLAND
Type of vessel:	Fishing vessel (gillnetter)
Nationality/flag:	Faroe Islands
Port of registry:	Hósvík, Faroe Islands
IMO number:	7014359
Call sign:	XPUU
IMO company no. (DOC):	5833110
Year built:	1970
Shipyard/number:	P/F Tórshavnar Skipasmiðja/15
Classification society:	DNV-GL
Length overall:	33.80 m
Breadth overall:	7.31 m
Gross tonnage:	295
Draught max.:	6.05 m
Engine rating:	685 kW
Service speed:	10 knots
Hull material:	Steel

2.3 Voyage particulars

Port of departure:	Toftir, Faroe Islands
Port of call:	N/A
Type of voyage:	Coastal
Cargo information:	Chilled fish
Manning:	10
Number of passengers:	0

2.4 Weather data

Wind – direction and speed:	South 10 m/s
Wave height:	3 m
Visibility:	Good
Light/dark:	Light
Current:	Unknown

2.5 Marine casualty or incident information

Type of marine casualty/incident:	Fire
IMO classification:	Very serious
Date, time:	7 January 2017 at 1200 (UTC 0)
Location:	Faroe Islands
Position:	60°49.366' N - 009°26.070' W
Ship's operation, voyage segment:	Fishing
Place on board:	Forecastle – storage rooms
Human factor data:	Yes
Consequences:	Total constructive loss of ship

2.6 Shore authority involvement and emergency response

Involved parties:	Defence Command Denmark MRCC Tórshavn, Faroe Islands
Resources used:	Ocean patrol vessel VAEDDEREN Rescue vessel BRIMIL Rescue helicopter OYHIL
Speed of response:	Approximately 75 minutes
Actions taken:	All crewmembers hoisted to helicopter VESTURLAND towed to harbour of Skála, Faroe Islands

2.7 The relevant ship's crew

Master	39 years old. Held certificate of competency STCW II/3 – master home trade. He had been at sea for approximately 20 years, primarily on fishing vessels, and he had been with the company for six years whereof he had served six months on VESTURLAND.
Second mate	30 years old. Held certificate of competency STCW II/2 – master. He had been at sea for approximately 10 years and

Third mate	he had been with the company for six months on board VESTURLAND. 35 years old. Held certificate of competency STCW II/2 – master. He had been at sea for approximately 13 years and he had been 2 months with the company serving on VESTURLAND.
Engineer	23 years old. Held certificate of competency STCW III/3. He had been at sea for approximately one year and had been with the company for six months serving on VESTURLAND.
Cook	19 years old. Had no professional maritime background and he had worked for the company for four months.

2.8 Scene of the accident

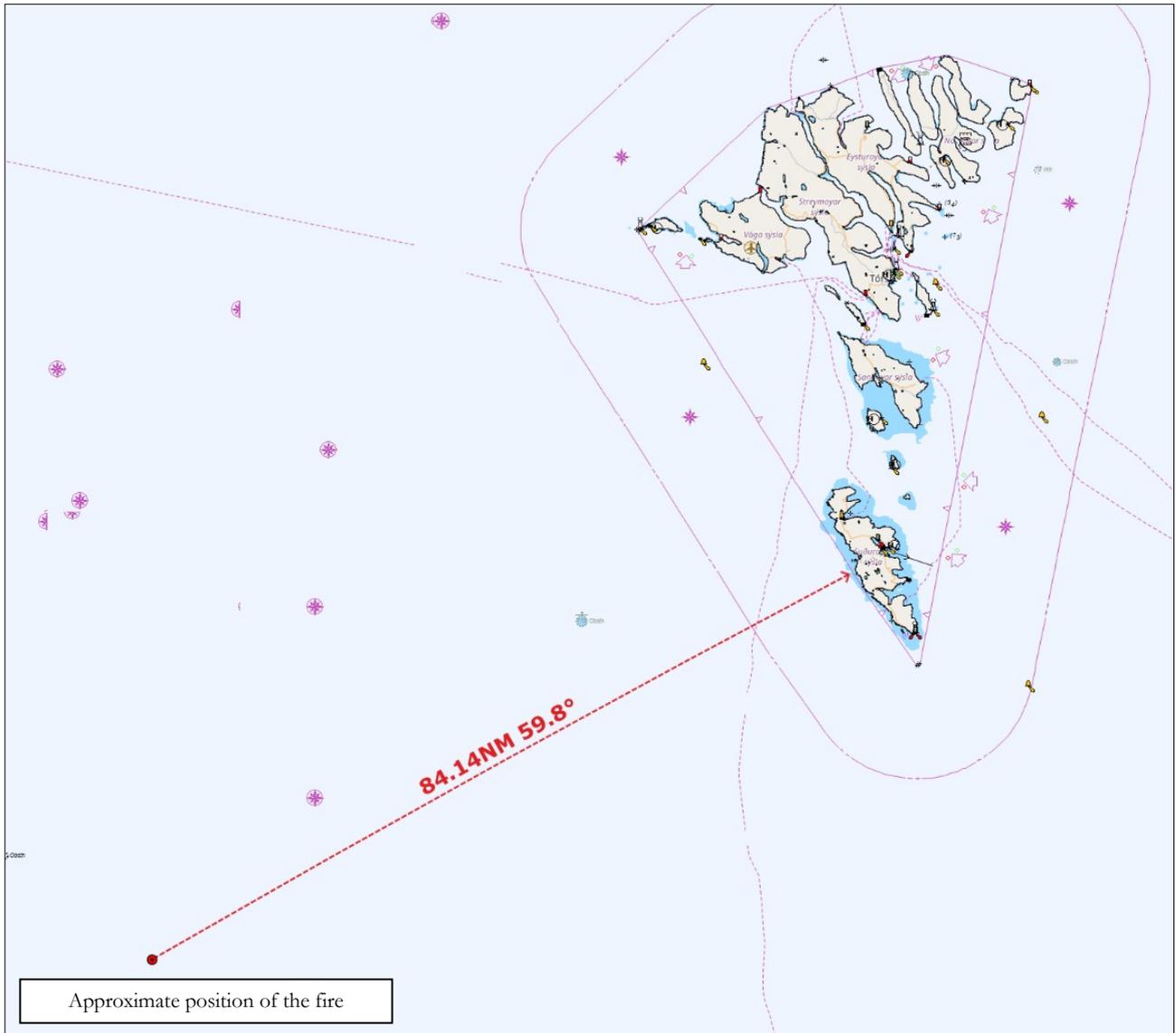


Figure 2: Approximate position of the fire southeast of Faroe Islands
Source: © Made Smart Group BV 2016, C-Map data © Jeppessen AS 2016

3. NARRATIVE ABOUT THE ACCIDENT

3.1 Background

VESTURLAND was for almost a year been operated by a Faroese shipping company specializing in fishing vessels. Before that it was operated by a shipping company specialized in supplying support/chase/guard vessels for the offshore oil industry and cable/pipe-laying operations.

The crew on board VESTURLAND was of mixed nationality. All the deckhands were from Lithuania, Latvia and the Philippines, and the officers were from the Faroe Islands. The working language on board was English and Faroese. When the ship was alongside, typically for two days depending on the weather, the crew from the Faroe Islands went home, and the rest of the crewmembers stayed on board.

VESTURLAND was fishing monkfish approximately 100 nautical miles west of the Faroe Islands. The fish was usually landed once a week in Torshavn, Faroe Islands, but on the last voyage, the fish had been landed in Toftir, Faroe Islands, because of construction works in the usual berth in Torshavn. After having landed the monkfish, VESTURLAND departed from Toftir on 3 January 2017 at approximately 2100 bound for the fishing grounds west of the Faroe Islands. It was a twelve-hour voyage and, while underway, the deck crew rested, and the mate and master kept the navigational watch. VESTURLAND arrived at the fishing grounds on the morning of 4 January 2017 and commenced fishing. The weather was good with a southerly strong breeze and a wave height of 3-4 metres.

3.2 Sequence of events

The narrative presented is from the perspective of various crewmembers on VESTURLAND. Statements of time are given in local time in Faroe Islands (UTC 0), unless otherwise specified.

On 7 January at approximately 0700, the crew had finished setting the nets and the crewmembers went to their cabins to rest. The engineer took the watch on the bridge, keeping a lookout and ensuring that the ship kept its position close to the gillnet buoys.

At 1000, the engineer went to the cook's cabin to wake him up so he could start preparing lunch. Before going to the galley, the cook went to the bridge and had a short conversation with the engineer. He thereafter went to the galley to tidy up and clean the plates left by the night shift before going on deck to collect provisions. The provisions were stored in a storage room under the fore-castle and in two freezers standing on the forward part of the main deck. Normally, the cook stored some of the provisions in a box in the starboard side corridor aft to avoid crossing the main deck while the crew was working on deck. As the cook approached the box with provisions, he saw light grey smoke coming from the forward part of the main deck, and he sensed the smell

of something burning. He rushed to the bridge to alert the engineer about the smoke and thereafter went below to wake up the rest of the crewmembers who were asleep in their cabins.

The engineer went to the master's cabin and alerted him about the presence of smoke on deck. The master immediately went to the main deck corridor (figure 3) and met one of the mates and the engineer. He told them to don their breathing apparatuses and inspect the forward part of the vessel to determine where the smoke came from. The master then rushed to his cabin to get dressed. Meanwhile, the deckhands prepared two fire hoses and connected them to the fire hydrants located in the corridor on the starboard side of the main deck. Other crewmembers collected the fire extinguishers from the accommodation and engine room. As the smoke drifted aftwards, some crewmembers noticed the distinct smell of burning wood.

When the master returned to the corridor, the engineer was wearing a breathing apparatus, but the mate had problems connecting the air-regulating valve to the mask. The engineer decided to make a quick inspection of the forward part of the ship in an attempt to identify the source of the smoke. At this stage, none of the crewmembers felt any heat or saw any flames. As the engineer proceeded forward on the port side of the main deck, he took a rubber water hose connected to a fire hydrant. As he proceeded forward, he was engulfed in smoke, felt disorientated, and decided to return to the corridor.

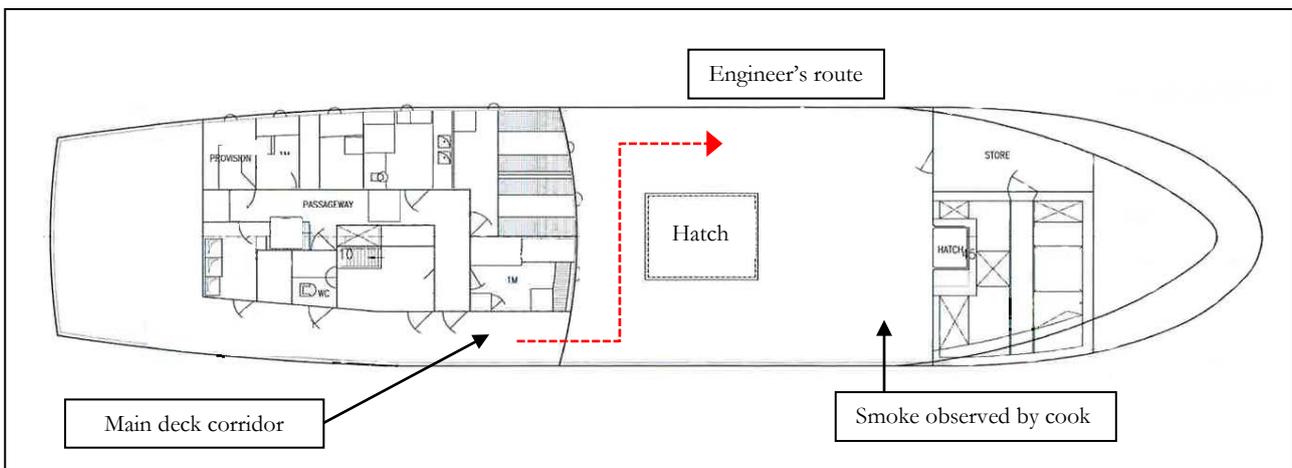


Figure 3: Layout of main deck on VESTURLAND
Source: Thor P/F and DMAIB

When the engineer returned, the master and mate had made the breathing apparatus work, but based on the amount of smoke the master decided that it would not be safe to initiate any further inspection of the forecabin. They then abandoned any attempt to extinguish the fire by use of the fire hoses. The master had realized that the ship was lost and he focused on ensuring the safe evacuation of the crew.

The master ordered all the crewmembers to assemble on the bridge and counted them to ensure that all were present. The master increased the ship's speed, set the course towards shore, called the Faroese fishing control agency (VØRN) at approximately 1230, and informed them about the fire and that the situation was unmanageable. VØRN received the message and relayed it to the MRCC Torshavn³. The MRCC contacted the rescue helicopter services and notified Joint Arctic Command that dispatched VAEDDEREN, an ocean patrol vessel patrolling Faroese waters.

After having sent the distress message, the master ordered some of the crewmembers to collect the emergency equipment from the master's cabin, i.e. the pyrotechnics and the line-throwing appliance so it would be ready for use. The crew on deck connected a fire hose to a fire hydrant on the bridge deck so they could create a barrier of water if the fire spread aftwards.

After a while, the master noticed that the engine control was lost, and it became impossible to adjust the speed, which he reported to MRCC at 1316. Shortly after, the light went out and the automatic steering was also lost. Thereafter, the master and the mate kept the heading by manual steering. As the vessel proceeded at full speed towards shore, the smoke penetrated the openings in the stairwell door and became increasingly intense on the bridge. The crewmembers had to leave the bridge and stand outside. The master turned the ship to an easterly course to get the wind on the side to minimize the crewmembers' exposure to the smoke.

The immersion suits were stored in the smoke-filled stairwell leading from the bridge to the accommodation. To access the immersion suits some of the crewmembers took turns to open the stairwell door, take a few of the suits, and pass them on to the crewmembers waiting on deck. Once they had all donned the immersion suits, they waited for the helicopter to arrive. The master continuously updated the crew about the arrival time of the helicopter, which had a calming effect on the crew. During the waiting time, several crewmembers felt radiant heat from the bridge deck on starboard side indicating that the warm smoke had spread from the forecabin to the accommodation area. Two of the crewmembers saw thin flames appearing from the forward hatch on the starboard side. They realised that there was not much time left until the fire would engulf the ship and that they soon had to abandon the ship.

The rescue helicopter was on site at 1338 and communicated with the master over the VHF radio. The helicopter pilot requested the master to change the course to a southerly course before the evacuation could start. By then, the entire crew were standing on the starboard side of the main deck (figure 4).

³ Maritime Rescue Co-ordination Center.



*Figure 4: VESTURLAND seen from helicopter moments before the evacuation.
Source: Atlantic Airways*

As the last person on board, the master went to the starboard side by the funnel and closed the quick closing valves to the fuel oil tanks before he was evacuated. Thereby, fuel oil to the propulsion engine was cut off and the vessel would stop within minutes. At 1400, the master and rescue swimmer were hoisted together on board the helicopter.

At 1402, the helicopter returned to shore heading for the hospital in Tórshavn. At the hospital, the crewmembers were examined for smoke poisoning and discharged the same day.

The Danish ocean patrol ship VAEDDEREN arrived at VESTURLAND at 1715 the same day as the fire broke out. The fire had by then spread to the entire ship, and the crew on VAEDDEREN heard several explosions. The crew deemed it too hazardous to initiate fire extinguishing at close proximity to VESTURLAND. Later that day, when the rescue ship BRIMIL arrived at the site, firefighting was initiated with foam monitors, but the fire continuously flared up again. The firefighting efforts continued until the next day when VESTURLAND had been cooled by water and foam. By then the vessel was completely burnt down.

A boarding team from BRIMIL managed to fasten a towing line from VESTURLAND to BRIMIL. VESTURLAND was towed to the harbour of Skála, Faroe Islands, where it was moored at the berth.

4. INVESTIGATION DATA

In the following sections, the systems and equipment that were relevant to the accident will be described. Other parts of the ship, e.g. engine room, accommodation and fishing gear, which have been deemed irrelevant for the findings have been omitted from the description.

4.1 Description of VESTURLAND

VESTURLAND (figure 5) was built in 1970 and was designed as a longline fishing vessel with a dry freezing hold, but in the 1970s it was converted into a prawn trawler and later into a gillnet fishing vessel. Within the last five years, the vessel had been chartered as a guard ship for short periods of time. Therefore, VESTURLAND had been modified several times since it was built in 1970. Various equipment and layout of the deck had been changed and new electrical wiring had been made, e.g. to supply new navigational equipment and hydraulic motors on deck. The DMAIB has not been able to reconstruct the entire history of modifications made to the vessel because the changes made to the vessel had been made by several owners over a period of approximately 40 years.

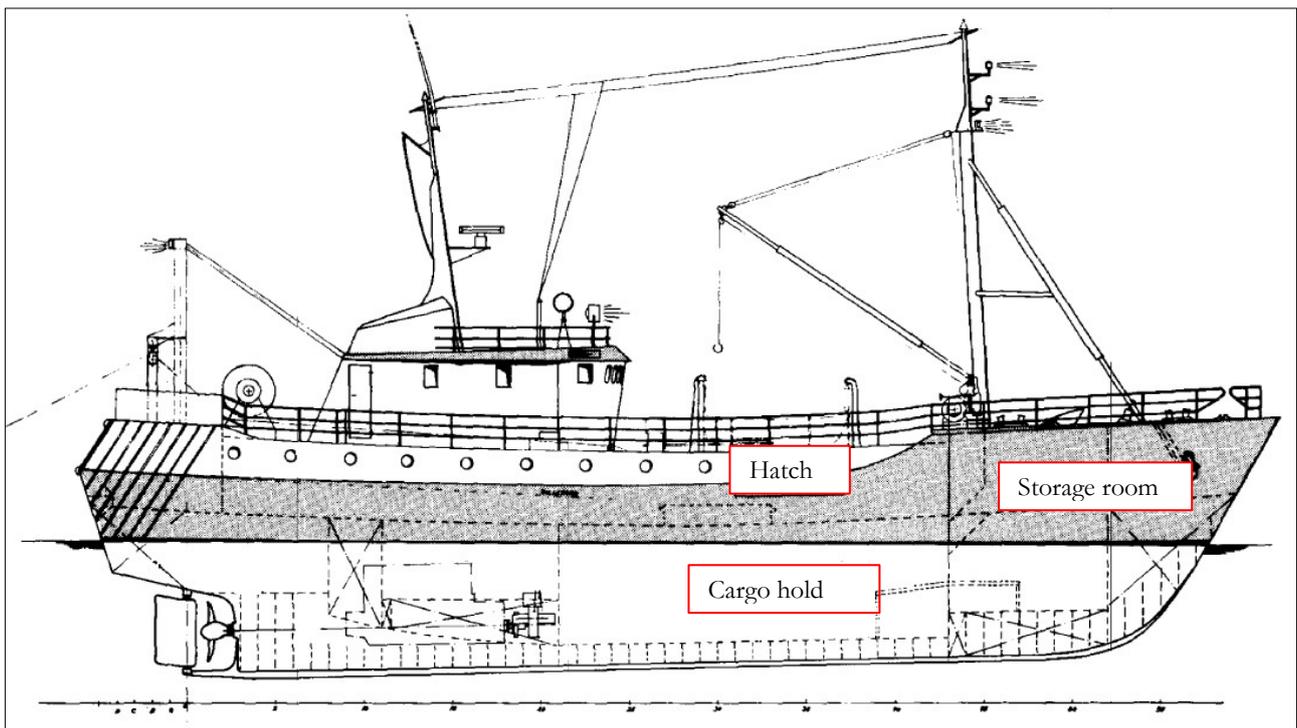


Figure 5: Extract from an original GA plan – VESTURLAND

Source: Thor P/F

The original freezing plant, which was located under the forecastle, had been dismantled and the fish was therefore chilled using flake ice from shore ice plants. The room where the freezing plant was located had been converted into a storage room for engine spare parts, provisions, etc. (figure

5). In the storage rooms under the forecastle, all of the bulkheads and ceilings had a lining of wooden planks and were insulated with glass wool, which would presumably insulate the rooms when the fish was frozen in the freezing plant before being stowed in the hold below. None of the bulkheads or doors was insulated with fire resistant material. The cargo hold could be accessed from the forward storage room via a wooden stairwell. In the cargo hold, the floor was made of concrete and the bulkheads were made of steel.

The ship's forward and aft main deck was sheltered, enabling the crew to work without being exposed to the rain and sea. This also meant that the officer on watch did not have an overview of the deck area when the main hatch on the main deck was closed (figure 5). The roof was made partly of steel, partly of aluminium. The nets were brought on board via the hatches (figure 5) on port and starboard side forward. Once the nets were on the deck, the fish was sorted and gutted before it was stowed in fish boxes and iced in the freezing hold. There was a hydraulic motor driven by an electric pump mounted on the forward part of the main deck and a hydraulic oil tank was located behind the door to the forecastle storage rooms. The hydraulic system was used for the anchor winch and the net windlass.

The ship had been surveyed, approved and classed as a fishing vessel according to DNV Legacy Rules with the class notation: 1A1 ICE-C Fishing Vessel. The latest class certificate was issued in May 2014. The Faroese Maritime Administration had assigned VESTURLAND a trading area permitting trade in the Atlantic Ocean north of 36° northern latitude in May 2014.

4.2 Firefighting and lifesaving on VESTURLAND

There were two measures for fighting a fire on VESTURLAND. The engine room was equipped with a fixed fire extinguishing plant⁴ and fire hydrants, including fire hoses, were located on the main deck, the bridge deck and in the engine room (figure 6). The water for extinguishing fire was delivered by the ship's general service pump. However, the pump and the fire hydrants on deck were also used for supplying water for cleaning the deck and fishing gear. Therefore, the fire hydrants on deck were permanently mounted with rubber hoses, which were well suited for the daily cleaning on deck. If the fire hydrants were to be used for firefighting, the permanently mounted rubber hose connections were to be replaced with fire hoses. There were twelve portable fire extinguishers located in various compartments on the vessel.

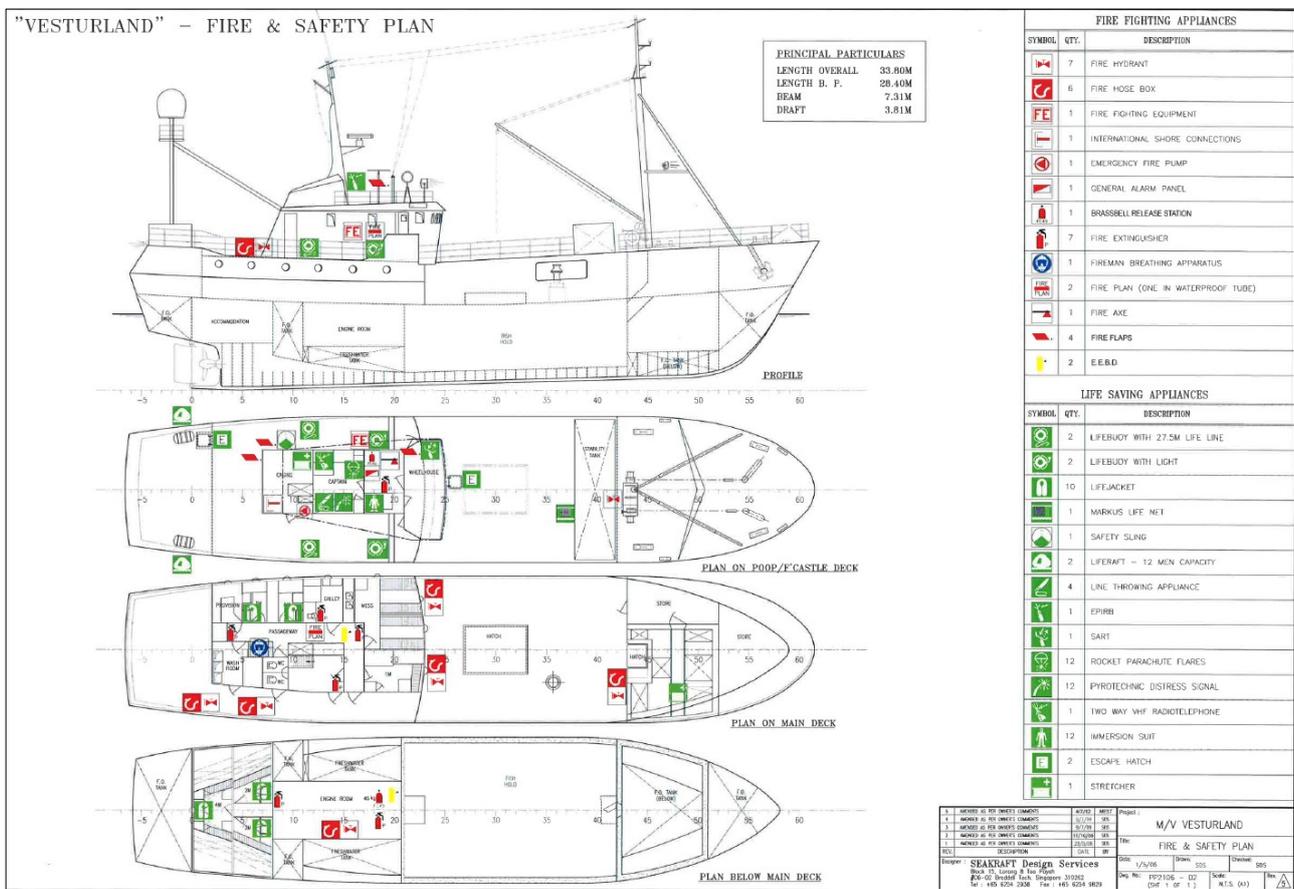


Figure 6: Fire and Safety Plan – VESTURLAND
 Source: Thor P/F

Equipment for two firefighters was located on the main deck, including four bottles of compressed air, but there was no compressor for filling the bottles. It was not a mandatory requirement for this size of fishing vessel to be equipped with firefighter equipment, but the previous

⁴ Clean Agent FS 49 C2, which was an extinguishing gas mixture that suppressed fire while maintaining breathable concentrations of oxygen in the air.

operator of the vessel had previously experienced serious fires on vessels and therefore deemed it to be necessary equipment. The muster list assigned the engineer and one of the mates as fire-fighters.

Standard household smoke detectors were mounted in the different compartments on board, which did not provide the officer on watch an early warning about a fire unless the officer could hear the detector's alarm. It should, however, be noted that an automated fire detection system was not a mandatory requirement on this kind of fishing vessel. The crewmembers' possibility of locating and extinguishing a fire in its early stages therefore relied on the crew hearing the alarm on the individual detector or on them observing smoke. As seen on the fire plan (figure 6), the accommodation and storage rooms were not insulated with fire resistant material making it possible to contain the fire for a prolonged period. Normally is storage compartments on ships not fitted with structural fire protection, because the risk of fire is small.

VESTURLAND was equipped with two life rafts with a capacity of twelve persons each, which were mounted on the port and starboard quarters. Each crewmember had a lifejacket in his cabin, and immersion suits were stored in a locker located in the stairwell leading from the accommodation to the bridge. The immersion suits were designed to be donned with a lifejacket if the crew jumped or fell into the sea, or if the ship was abandoned by throwing the life rafts over board and jumping onto them.

The crewmembers familiarized new on-signers with the location of the equipment and their duties during an emergency. It was, however, not common to conduct fire and boat drills at regular intervals that included training in the use of the on-board fire and safety equipment. In the absence of a compressor to refill the air bottles for the breathing apparatuses, it was impossible for the crew to familiarize themselves with the use of the breathing apparatuses while at sea because the air bottles could not be refilled with compressed air after use.

4.3 Investigation of the scene of the fire

The investigation into the cause and development of the fire was made by the Danish Police and the DMAIB and was based on the crewmembers' eyewitness accounts, pictures taken from the rescue helicopter and reports from the ocean patrol ship that towed VESTURLAND to shore. Furthermore, the DMAIB conducted an investigation of the ship while it was alongside. The investigation established that the intense heat from the fire had spread to all of the vessel's compartments and engulfed the entire vessel. The purpose of the fire investigation was to establish the origin and the cause of the fire. Furthermore, the purpose was to explain how the fire spread to the rest of the ship from where it originated.

Testimonies from the crewmembers indicated that the light grey smoke came from the storage rooms in the forecabin and that the smoke had a distinct smell of burning wood. Figure 7 below shows a layout of the forward storage rooms.

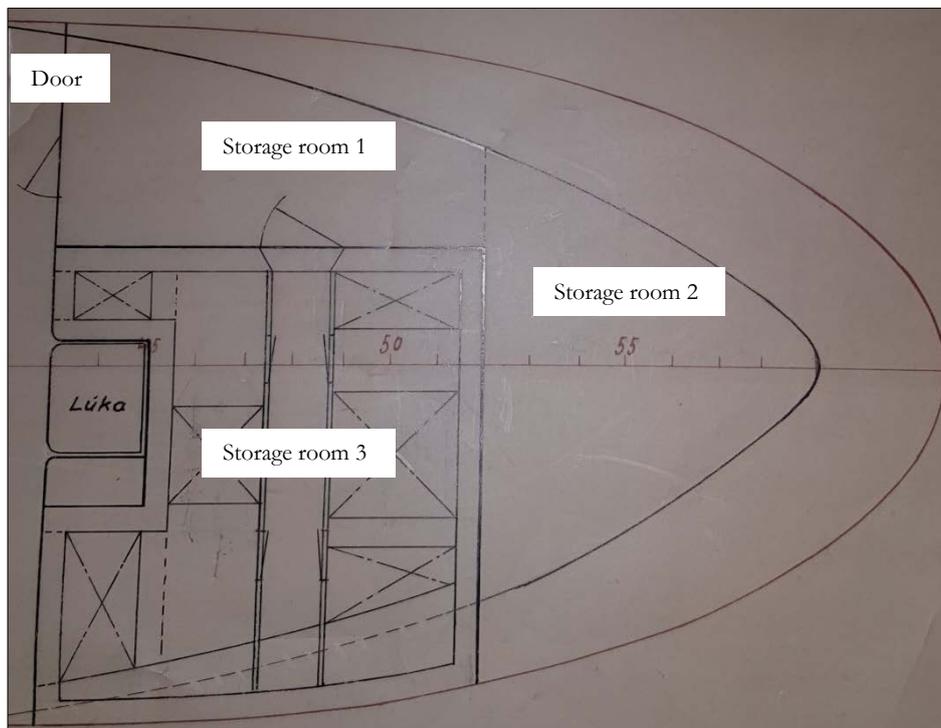


Figure 7: Extract from GA plan
Source: MEST Shipyard

The storage room was accessible by a door on the port side. Usually the door to the storage was open and secured with a hinge if the weather was good. All three storage rooms were used only for storing provisions, engine parts, ropes and other items used in the daily operation of the vessel.

The smoke initially observed from the forward part of the main deck was white or light grey and had a distinct smell of burning wood. This indicated that the fire originated from the storage

rooms in the forecastle, which was lined with wood planks. Video recordings from the rescue helicopter, which arrived at the ship approximately 90 minutes after the smoke was detected, also indicated that the smoke originated from the forward part of the ship. From the recordings, minor changes in the ships paint could be observed which were most likely caused by heat radiating from the storage room under the forecastle deck (figure 8). The time difference between the two pictures was approximately 20 minutes.



*Figure 8: Extract recording from helicopter
Source: Atlantic Airways*

In conclusion, it is likely that the fire originated from one of the three storage rooms in the fore-castle. Therefore, the investigation of the scene of the fire was focused on these three rooms and the identification of a source that could produce sufficient heat to ignite a fire. The timeframe from when the crewmembers left the deck area until smoke was detected was approximately four hours. At any given time in that period, the fire could have been smouldering and/or igniting.

The source of the fire was not readily visible during the inspection of the storage rooms in the fore-castle because the fire had destroyed the wooden lining and shelves (figure 9 and 10), which caused the shelves to collapse, scattering the stored items throughout the rooms. The electrical wiring and lighting which was mounted on the wooden lining was for the most part incinerated, and it was not possible to reconstruct the origin of the remaining wiring (figure 11). The only electrical equipment in use in the storage rooms was the lighting fixtures. A freezing compressor was located in storage room 1, but was not in use, and in storage room 3 a portable electrical heater was located which was not in use either.

From pictures taken prior to the fire, it can be established that the lighting in the storage rooms consisted of both fluorescent light fixtures and regular light bulbs.



Figure 9: Disconnected compressor in storage room before the fire
Source: THOR P/F



Figure 10: Location of the disconnected cooling compressor in storage room 1 after the fire
Source: DMAIB



Figure 11: Cable tray in storage room 1 and cable penetration between storage rooms 1 and 2
Source: DMAIB

Testimonies by the shipping company's inspectors and crewmembers stated that the rooms were used only for storage and therefore did not have any machinery in use which could produce heat or ignite a fire. The investigation of the storage rooms did not contradict these statements. There was no immediately visible source of heat and ignition which could provide sufficient temperatures to ignite the materials present in the storage rooms. On that basis, it can be assumed that the fire originated from a lightning arc in the electrical system, e.g. lighting fixtures, loose wiring in junction boxes, etc. The phenomenon of electric arcing occurring in light fixtures is known from other accidents⁵ and the black colouring of the deck on the forecastle (figure 8) could be an indication that the light fixture below in storage room no. 1 had ignited and oxidized the wooden lining in the ceiling that later ignited.

Once the fire had ignited, there was an abundance of material in the stores rooms, e.g. provisions, rags, etc., to feed the fire, enabling it to develop. The wooden structures in the storage rooms would facilitate that process. The ignition temperature of wood depends on many factors, such as size, shape, moisture content and type. Generally, the ignition temperature of wood is approximately 200°C. The combustion and heat release rate of wood and wood-based materials depends heavily on the physical form of the material, the amount of air available, the moisture content, etc.

⁵ URD – Fire on 4 March 2014, DMAIB (2014).

ATHENA – Fire on 27 October 2010, DMAIB (2012).

HERKULES – Fire on 20 April 2007, DMA (2008).

As the ship structure was made of steel, the radiant heat from the fire would travel (by radiation) to the adjacent compartments enabling the fire to spread outside the storage rooms. When the crew stood outside the bridge, they were not able to observe how the fire spread from the storage rooms to the deck because the entire deck area was enclosed. It is, however, likely that the heat radiation/flames reached the hydraulic oil tank, which was located behind the main deck doorway to the storage room (figure 12). The investigation of the deck area showed that the tank was empty and the sight glass had melted, enabling some of the tank contents to spill or spray from the heated tank onto the deck enabling the fire to spread to the deck area.

The crewmembers noticed that the surface of the deck outside the bridge was heated and that water quickly evaporated from deck. This indicated that heated smoke was travelling from the forward part of the ship to the aft, thus transferring heat, allowing objects inside the closed forward deck area to come closer to the ignition temperature. Once objects such as freezers and fishing gear, etc. ignited, the fire could develop rapidly because the temperature increased in the enclosed space while being fed by oxygen via the hatches and from corridor on the aft deck.



Figure 12: Picture showing the hydraulic oil tank outside storage room prior to the fire. Sight glass in the red circle.

Source: Thor P/F

The pictures from the rescue helicopter at 1402 (figure 13) indicate that the fire was in its early stages when the crewmembers were evacuated because the ship did not show extensive heat damage on the steel plating and because the smoke was not dense. When the ocean patrol vessel VAEDDEREN arrived at the scene at 1715, approximately three hours after the crew had been

hoisted off VESTURLAND, the vessel was engulfed in flames. How the fire developed between 1400 and 1715 is unknown.



Figure 13: Picture of ship at approximately 1400 after it had been evacuated

Source: Atlantic Airways

5. ANALYSIS

5.1 The ship's capacity to fight the fire

VESTURLAND had been certified and approved per national and EU statutory regulations and class rules. It was deemed to be in good seaworthy condition. The vessel was per those regulations and rules built, equipped and manned to handle various fires, e.g. in the engine room, in the accommodation and on deck. On 7 January 2017, the available equipment did, however, not enable the crewmembers to extinguish the fire though it was confined to the forward part of the ship and had not developed to an extent where the crewmembers initially felt any heat or saw any flames. In the following, the vessel's capacity to extinguish the fire will be analysed.

VESTURLAND had not been designed with structural fire protection in the forecabin, e.g. insulated bulkheads and/or fire doors. Furthermore, there was no fire and/or smoke detection systems connected to an alarm panel, which made it impossible to have a systematic early detection and containment of a smouldering fire. When fighting fires on ships, it is essential that they are detected and contained early because the on-board firefighting equipment provides a limited capacity for the crewmembers to extinguish a fire, e.g. there is a limited number of breathing apparatuses and fire hoses. On VESTURLAND, there were two breathing apparatuses with two spare air bottles and no compressor to refill them. This meant that each firefighter would have approximately 1/2-1 hour of air available for extinguishing the fire. In the smoke-filled environment on deck it was not possible to use a fire hose without being equipped with a breathing apparatus. Having two sets of firefighter's equipment did not allow for having a back-up team to assist the firefighters if something unexpected occurred or to have redundant equipment if one of the breathing apparatuses malfunctioned. Furthermore, the time available to extinguish the fire was limited because it would adversely affect the vessel's stability to fill the forward storage rooms and the cargo hold with water from the fire hoses.

On 7 January, when the crewmembers were alerted about the smoke, and it was presumed that a fire had broken out, the master of the vessel was left with two options: To fight the fire or to evacuate the vessel. The choice between these two options depended on an assessment of whether or not the fire could be extinguished without exposing the crew to an undue risk of harm, which had to be weighed against the possibility and risk of evacuating the ship via the life rafts or helicopter. When the master decided to try to extinguish the fire, he had to assess how much firefighting to do before ordering the abandonment of the ship while leaving enough time for the helicopter to arrive or to abandon the vessel via the life rafts. On 7 January, the master made the decision within 10 minutes. He deemed it too dangerous for the crewmembers to initiate fire extinguishing based on the engineer's attempt to inspect where the smoke came from and because one of the breathing apparatuses malfunctioned. Without having a functioning firefighting team with breathing apparatuses, the master deemed it necessary to order the crewmembers to muster on the bridge and called for assistance to evacuate the vessel. The early decision to abandon the vessel made it possible for the crewmembers to be evacuated in a timely and orderly manner.

The fact that regular fire drills were not conducted *most likely* did not have any influence *on the given situation*. All crewmembers mustered and prepared the fire extinguishing equipment quickly and were aware of their duties. The adverse effects of the intensifying smoke making the crew anxious and malfunctioning equipment would not necessarily have been addressed during the fire drills.

6. CONCLUSIONS

The investigation had two purposes: Firstly, to establish the origin and cause of the fire and, secondly, to explain how the fire created a situation which was unmanageable by the crew, thus resulting in the evacuation of the vessel. The scope of the investigation was the technical circumstances related to the start of the fire, and the crewmembers' capacity to fight the fire.

The investigation found that the likely origin of the fire could be located to one of the three storage rooms in the forecastle. However, the exact cause of the fire was not established. In the absence of other known sources of ignition, it is a possibility that a fault in the electrical system, e.g. light fixtures, junction boxes, etc., created an electrical arc, which created a situation where a fire could develop. Previous investigations of fires on board ships have shown that these installations have acted as sources of ignition.

The capacity of fishing vessels, such as VESTURLAND, to extinguish fires is limited by the amount of equipment and the lack of structural fire protection to contain the fire within certain areas of the vessel. Therefore, it is essential *that fires are detected as early as possible* enabling the vessel's crew to respond without entering smoke filled areas with little knowledge about the extent of the fire.

Given that most fishing vessels are of limited size, an early decision has to be made whether to attempt to extinguish the fire or to abandon the vessel while there is enough time to do it in an orderly manner. On 7 January 2017, the master made the decision within 10 minutes. This early decision to abandon the vessel made it possible for the crewmembers to be evacuated safely.

7. PREVENTIVE MEASURES

The operator of VESTURLAND has notified DMAIB that the companies' other fishing vessels are equipped with fire detection systems providing the crew with an early warning about a developing fire. This provides the crew with the necessary time to assess the most appropriate way of fighting the fire or the need for an immediate evacuation of the vessel.

The Faroese Maritime Authority has informed DMAIB about the following:

“From 2014 Faroese Maritime Authority has required that all fishing vessels transferred to Faroese flag should have a fire detection system on board.

As a result of the fire on board Vesturland, the Faroese Maritime Authority in future must make this requirement for all existing fishing vessels also, in order to give the crew an early warning about a developing fire”.