



**MARINE ACCIDENT REPORT**

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**ATHENA  
Fire  
27 October 2010**

Danish Maritime Accident Investigation Board,

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**The casualty report was completed on 2 February 2012.**

**Case: 201012017**

**The Division for Investigation of Maritime Accidents/Danish Maritime Accident Investigation Board**

The Division for Investigation of Maritime Accidents was responsible for investigating accidents and serious occupational accidents on Danish merchant and fishing vessels. The Division also investigated accidents at sea on foreign ships in Danish waters.

On 15 June 2011 the Division for Investigation of Maritime Accidents was abolished and the Danish Maritime Accident Investigation Board was established as an independent institution to replace the Division for Investigation of Maritime Accidents.

When the Division for Investigation of Maritime Accidents was abolished on 15 June 2011, the investigation of this accident was in process, and the preparation of this report has been completed by the Maritime Accident Investigation Board, in agreement with the Faroese Maritime Authority.

The report is drawn up on behalf of and after agreement with the Faroese Maritime Authority in accordance with the rules, methods and recommendations for accident investigations which were applicable for the Division for Investigation of Maritime Accidents.

**Purpose**

The purpose of the investigation is to clarify the actual sequence of events leading to the accident. With this information in hand, others can take measures to prevent similar accidents in the future.

The aim of the investigations is not to establish legal or economic liability.

Front page image: ATHENA after the fire, on Falmouth Roads

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# 1 Summary

On 23 October 2010, factory trawler ATHENA departed from the Faroe Islands to fish horse mackerel in the Atlantic Ocean off Mauritania. There were 111 crew members on board. The ship intended to call at the Spanish port of Vigo on 28 October 2010, prior to the fishing operations, to get fishing gear and provisions on board.

On 27 October 2010 at 0540, a fire alarm sounded on the ship's bridge indicating fire in the processing area.

A factory foreman and two fireguards in the area on the ship where the fire broke out had not noticed the fire until it was detected by the ship's automatic fire alarm and detection system.

All crew members were alerted effectively by the ship's general alarm sounding over the entire ship and by other crew members knocking on cabin doors.

The fire had broken out in the forepart of a cargo hold on the 1<sup>st</sup> deck and had spread rapidly via an open hatch to a packing room on the 2<sup>nd</sup> deck.

The fire was fuelled by lots of corrugated cardboard packaging in both spaces and by air supplied through open doors and sliding hatches in surrounding bulkheads.

An immediate attempt to fight the fire by the use of a newly installed sprinkler system was given up because of the crew's lack of knowledge about the system and dense smoke in the area where the sprinkler system's valves should be operated. Further fire fighting was conducted by closing fire flaps and other openings and by cooling decks and surfaces.

All crew members but 13 persons were evacuated effectively and transferred to a cargo ship by use of life rafts.

The fire caused severe damage to the ship's interior, by heat and direct fire in the cargo hold on the 1<sup>st</sup> deck and in the packing room on the 2<sup>nd</sup> deck and by heat and smoke in the processing area and accommodation.

Later, the 13 persons who remained on board were assisted by shore-based fire fighters and salvors, and the ship was towed to Falmouth Roads, UK, where the fire was finally extinguished.

The fire was caused by electric arcing in a short circuit between a three-wire cable and a fluorescent lamp fixture.

## 2 Conclusions

*The Investigation Board assesses that*

- *the fire originated from electrical arcs of a short circuit at a three-wire cable and a fluorescent lamp fitting. The character of the burnt hole in the lamp housing leads to the assumption that there has been a phase to phase contact near the housing of the lamp fitting, or alternatively a phase to earth contact at this point and another phase to earth fault somewhere else in the system that could not be determined (6.1);*

- *an early and effective containment of the initial fire in the cargo hold on the 1<sup>st</sup> deck was made impossible because of the open hatch on the 2<sup>nd</sup> deck (6.2);*
- *the open doors and sliding hatches in the bulkheads on the 2<sup>nd</sup> deck and the consequent admission of air through these doors and sliding hatches made the fire develop in the cargo hold and the packing room (6.2);*
- *effective fire fighting of the initial fire was hindered because of open doors and hatches on the 2<sup>nd</sup> deck (6.2);*
- *inadequate instruction of the fireguards and factory foremen and an inappropriate routine with regard to keeping doors and hatches duly closed contributed to the fact that no fireguards or the factory foreman showed attention to this important issue (6.2);*
- *the fire was very close to spreading from the storeroom on the trawl deck to the rest of the accommodation (6.2);*
- *the fire fighting efforts were characterized by a random organization not in accordance with the fire muster list (6.3);*
- *effective fire fighting at an early stage by the use of the sprinkler system in the cargo hold on the 1<sup>st</sup> deck was not conducted because of lacking knowledge about the sprinkler system (6.3);*
- *effective fire fighting at an early stage by the use of the sprinkler system in the packing room on the 2<sup>nd</sup> deck was not conducted because the section valves were not easily accessible (6.3);*
- *the arrangement of the section valves for the sprinkler system was inappropriate with regard to easy accessibility from open deck (6.3);*
- *the effective closing of doors, hatches, fire flaps, etc. from open deck to the ship's interior and cooling of deck and surfaces by the use of fire hoses implied a containment of the fire in the ship's cargo hold on the 1<sup>st</sup> deck and in the packing room on the 2<sup>nd</sup> deck. Eventually, the open doors and sliding hatches caused severe soot and smoke damage to the ship's interior (6.3);*
- *the extensive and repetitive rehearsals of assembling the crew on deck, taking census and distributing immersion suits and lifejackets proved effective (6.4);*
- *the fireguard system was not quite effective because the fireguards had not been instructed to take action to prevent the fire spreading by ensuring that doors and other openings were kept closed (6.5);*
- *the fire drills had not been effective with regard to information about and rehearsals of the use of the sprinkler system (6.5);*
- *though the company had arranged for fireguards on board, the ship was well equipped with fire fighting appliances and fire drills had been held the fire safety had not been taken sufficiently into account in all respects (6.5).*

### 3 Recommendations and actions taken

After this fire, the Faroese Maritime Authority and the classification society have discussed the requirements to sprinkler systems, and the Faroese Maritime Authority has issued guidelines in May 2011. These parties will, however, continue this dialogue and address some issues, e.g. location of valves, requirements to approval of documentation, drainage etc.

#### **Recommendation to the authority:**

The Investigation Board recommends that The Faroese Maritime Authority establishes procedures about entering into unambiguous agreements with classification societies on survey and approval on behalf of the flag state.

#### **Recommendations to the owners:**

The Investigation Board recommends that the shipping company reviews the fire muster lists in other ships in order to ensure that they can actually be met by the manning of each individual ship.

The Investigation Board recommends that the shipping company continues to focus on and pay further attention to the effectiveness of fire drills.

### 4 The investigation

The accident investigation was carried out by the Division for Investigation of Maritime Accidents (from 15 June 2011 the Danish Maritime Accident Investigation Board) on behalf of and on the request of the Faroese Maritime Authority.

The investigation is based upon testimony from the master and the chief given to the Court in Tórshavn on 13 December 2010.

The master, crew members and representatives of the owners have given elaborated statements to the Investigation Board.

The Investigation Board has received material from the owners.

The accident was also investigated by the National Centre of Forensic Services, Crime-scene Unit (Fire Investigation Section), the Danish National Centre of Investigation, Serious Crime Division, and the Chief Constable of the Faroe Islands, who were assisted in their investigations by the Danish Institute of Fire and Security Technology.

The Investigation Board has received information and assistance from the Faroese Maritime Authority.

The Investigation Board has received the reports from the police interviews and investigations, including the investigation report from the Danish Institute of Fire and Security Technology.

Photos with examples of flawed electrical installations were presented to the Investigation Board.

## 5 Factual Information

### 5.1 Accident data

Type of accident (the incident in details)	Fire in cargo holds
Time and date of the accident	27 October 2010, about 0550 local time
Position of the accident	Approximately 47°39' N – 10°58' W
Area of accident	North Atlantic Ocean
Injured persons	0
IMO Casualty Class	Serious

### 5.2 Navigation data

Stage of navigation	Navigating in open sea
Stage of fishing	No fishing operations in progress
Port of departure	Kollafjørður, Faroe Islands
Date and time of departure	23 October 2010 at 1400
Pilot on board	No

### 5.3 Ship data

Name	ATHENA
Home port	Hósvík
Call sign	OW2133
IMO no.	8907096
Owner	Ocean Group Faroes Ltd.
Operator	P/f Tór, Hósvík, Faroe Islands
Register	Faroe Islands Ships Register
Flag State	Faroe Islands
Construction year	1992
Type of ship	Fishing ship
Type of fishing ship	Factory stern trawler
Tonnage	7,805
Classification society and class notation	Det Norske Veritas 1A1 ICE-C Fishing Vessel Stern Trawler
Length	90.104 metres
Engine power	5,916 kW
Area served	World-wide
Regulation	<ul style="list-style-type: none"><li>• Notice from the Faroese Maritime Authority E, 1 August 2006, Regulations on the construction and equipment etc. of fishing vessels, based on Attachment 1 to the Torremolinos Convention of 1977, as amended by Council Directive 97/70/EC.</li><li>• Class rules from Det Norske Veritas.</li></ul>

ATHENA was severely damaged by a fire in 2007 and repaired in China. The repair and reconstruction was finished in April 2010, whereupon the ship was trawling for mackerel in the North Atlantic.

## 5.4 The crew

According to the safe manning document of the Faroese Maritime Authority, the ship had to be manned with:

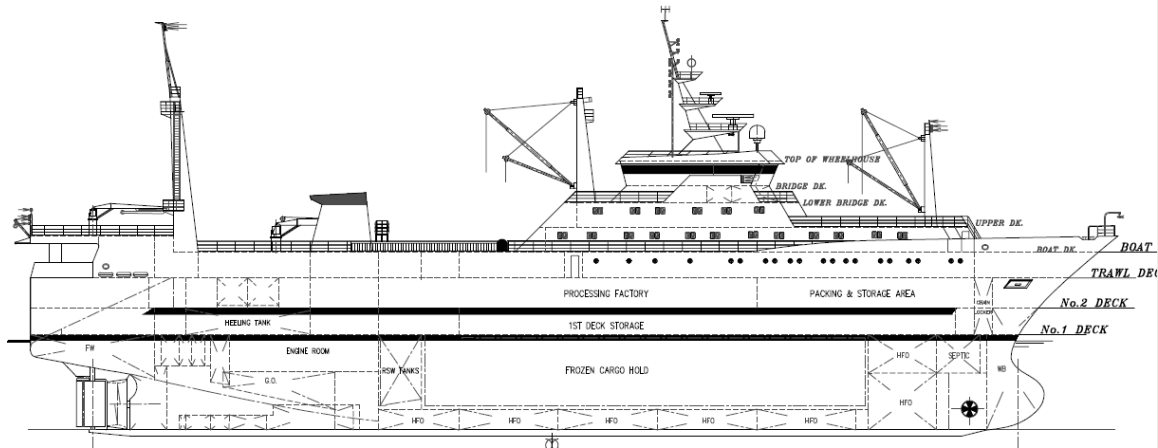
Number	Function
1	Skipper, 1 <sup>st</sup> class on fishing vessels
1	Chief mate, 3 <sup>rd</sup> class on fishing vessels
1	Watch-keeping officer, 3 <sup>rd</sup> class on fishing vessels
1	Chief engineer
1	Second engineer, ship's engineer 1 <sup>st</sup> class
1	Engineer officer, ship's mechanist 2 <sup>nd</sup> class
1	Motorman
3	Able seamen
1	Ordinary seaman
1	Cook
1	Assistant cook
<b>13</b>	<b>Total</b>

At the time of the fire, the ship was manned with:

Number	Function	Nationality
1	Master/skipper	Faroe Islands
1	2 <sup>nd</sup> officer	Ukraine
1	2 <sup>nd</sup> officer	Ukraine
1	Chief engineer	Faroe Islands
1	Factory manager	USA
1	Deck boatswain	Portugal
1	Trawl master	Russia
1	Trawl master	Azerbaijan
1	2nd engineer	Russia
1	3rd engineer	Russia
2	Electrician	Russia
1	Electrician	Ukraine
2	Reefer engineer	Russia
2	Motorman	Russia
1	Turner	Russia
1	Factory engineer	Russia
8	Deck hand	Peru
1	Fitter	Bulgaria
1	Chief cook	Russia
1	Assistant cook	Ukraine
2	Laundress	Russia
2	Steward	Russia
2	Factory foreman	Russia
1	Factory foreman	Ukraine
1	Doctor	Russia
73	Processor	China
<b>111</b>	<b>Total</b>	

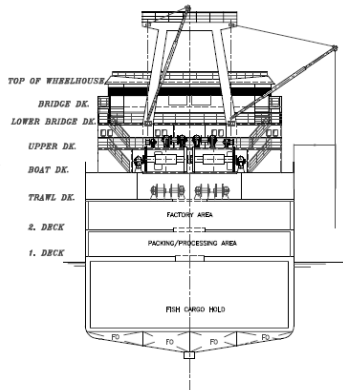


## 5.5 The ship's arrangement



Section of the general arrangement plan

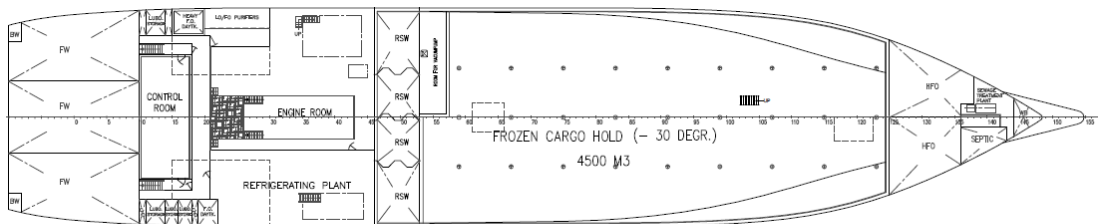
PROFILE



MIDSHIP SECTION

Section of the general arrangement plan

### Below 1<sup>st</sup> deck

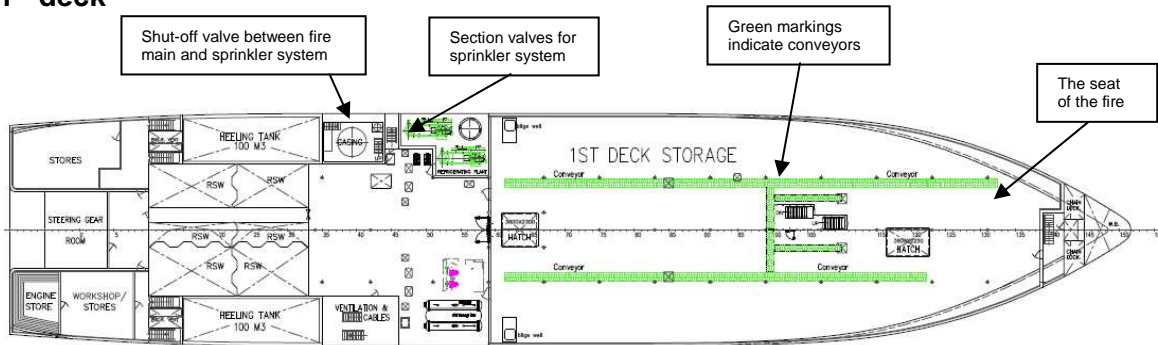


BELOW 1<sup>st</sup> deck

Section of the general arrangement plan

Over the tank top (on the general arrangement plan named 'Below 1<sup>st</sup> deck'), there were freshwater tanks and an engine room aft. The engine control room was situated after-most in the engine room compartment. In front of the engine room, there were RSW tanks for temporarily storing unprocessed fish. In front of the RSW tanks, a freezer hold was arranged, and forward were high tanks for fuel oil.

## 1<sup>st</sup> deck



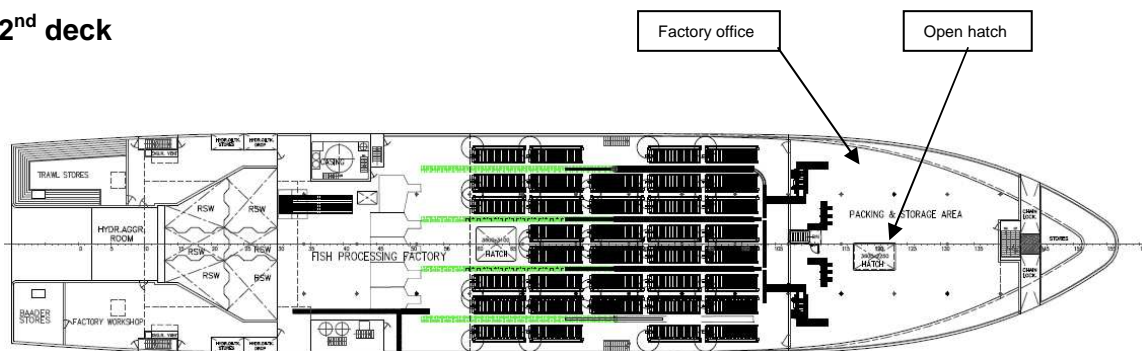
1<sup>st</sup> DECK

Section of the general arrangement plan

The deck above the engine room and the freezer hold was named the 1<sup>st</sup> deck. On this deck, there was a space aft of the freezer hold not used for any particular purpose. During this voyage, some pallets with corrugated cardboard packaging were stowed in the aft part of this room.

From amidship and forward, there was a freezer hold. In front of this hold, there was a staircase and the chain locker.

## 2<sup>nd</sup> deck



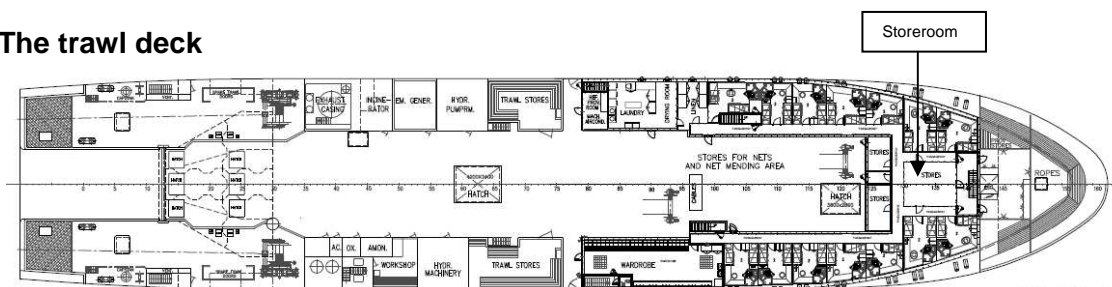
2<sup>nd</sup> DECK

Section of the general arrangement plan

The 2<sup>nd</sup> deck was arranged with workshops, storerooms and fish bins (RSW tanks) aft. In front of the RSW tanks, the fish processing compartment was arranged.

In front of the fish processing compartment, was the packing room. In the port side of the packing room, there was a factory office that is not shown in the general arrangement plan.

## The trawl deck



TRAWL DECK

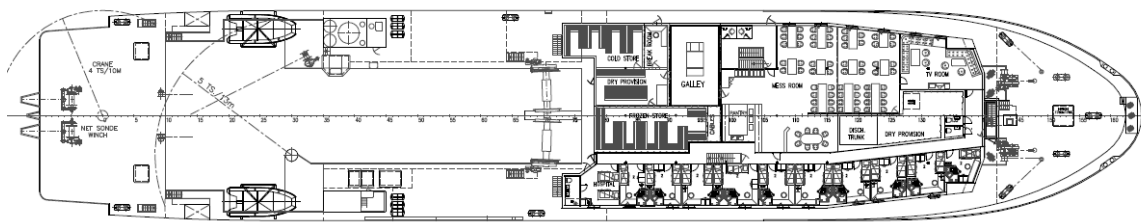
Section of the general arrangement plan

The trawl deck was arranged with a trawl slope aft and a trawl lane in the centre leading forward. The front part of the trawl lane was covered and surrounded by accommodation.

The port side of the trawl deck was arranged with an engine room casing with exhaust pipes and rooms for the incinerator, emergency generator, hydraulic plants and trawl stores. The starboard side was arranged with an engine room casing with ventilating ducts, etc., rooms for oxygen, acetylene and ammonia bottles, workshop, hydraulic plants and trawl stores.

In the forward part of the accommodation, in front of the trawl lane, there was a store-room.

**The boat deck**



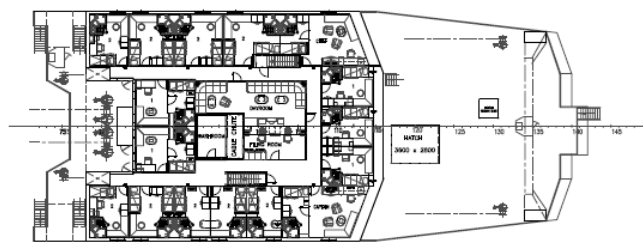
BOAT DECK

Section of the general arrangement plan

The boat deck was arranged with cabins in the starboard side and messroom, galley and provision stores at the centre and port side.

The boat deck sections aft were arranged with life rafts and the abandon-ship station.

**'Upper deck'**

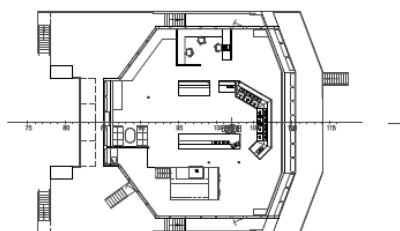


UPPER DECK

Section of the general arrangement plan

The upper deck was arranged with accommodation with cabins, office, conference room, laundry and the like.

**The bridge**



BRIDGE

Section of the general arrangement plan

## 5.6 Narratives

### The voyage

On 23 October 2010, ATHENA departed from the Faroe Island to fish horse mackerel in the Atlantic Ocean off Mauritania.

On board the ship were 111 crew members. The crew was composed of nine nationalities.

The ship was intended to call at the Spanish port of Vigo on 28 October 2010, prior to the fishing operations, in order to get fishing gear and provisions on board.

During the voyage towards Spain and the fishing grounds, some technical alterations of the transportation system for the catch were made by the ship's crew.

### Fire detection and alarm

#### On the bridge

On 27 October 2010 at 0540, a fire alarm sounded from the ship's automatic fire alarm system.

The officer of the watch was one of the ship's two 2<sup>nd</sup> officers. When the fire alarm sounded, he was sitting in a chair close to the fire detection and alarm panel, and he turned off the alarm. He noticed that the alarm indicated fire in the port side of the processing area and telephoned the duty factory foreman in the office in the packing room on the 2<sup>nd</sup> deck to hear what had occurred.

#### In the packing room on the 2<sup>nd</sup> deck and the freezer hold on the 1<sup>st</sup> deck

The duty factory foreman had briefly heard the fire alarm before the 2<sup>nd</sup> officer called him on the telephone. Immediately when the 2<sup>nd</sup> officer called him, he ran out from the office to investigate the situation. He was met by a crew member on duty as a fireguard in the freezer hold on the 1<sup>st</sup> deck just below the packing room. The crew member was hurrying upwards to the 2<sup>nd</sup> deck via a ladder through an open hatch. He shouted: "Problem!" and pointed down through the open hatch toward the 1<sup>st</sup> deck. Already at this time, when the duty foreman was still on the 2<sup>nd</sup> deck, he could hear a crackling sound like the burning of very dry wood.

The duty factory foreman hurried down the ladder to the 1<sup>st</sup> deck. He noticed dense smoke pouring from above the corrugated cardboard packaging and down to a height of approx. 1½ metres above deck. The smoke was completely thick and black. He tried to see through the smoke to locate the fire, but he could not. He heard the crackling sound coming from the forepart of the ship.

The duty factory foreman hurried back to the office, called the bridge and explained to the duty 2<sup>nd</sup> officer that there was dense smoke in the freezer hold on the 1<sup>st</sup> deck and that fire fighters with air breathing apparatuses were needed.

The crew member who was the fireguard on the 1<sup>st</sup> deck was sitting on a conveyor belt close to the hatch when he heard the fire alarm. He turned around, looked behind him and saw nothing unusual. He then looked forward and noticed black smoke in the forepart of the hold under the deck. He went forward to examine it further and saw lots of smoke. He then went back, climbed up through the open hatch and noticed that smoke came through the hatch into the packing room on the 2<sup>nd</sup> deck. On his way up through the hatch, the fireguard saw the foreman next to the hatch hurrying towards the factory office on the 2<sup>nd</sup> deck. When on the 2<sup>nd</sup> deck, he also met the other fireguard who had the duty on the 2<sup>nd</sup> deck. Plenty of smoke came up through the hatch.

The fireguard on the 2<sup>nd</sup> deck was sitting in a chair at the starboard side of the open hatch when the fire alarm sounded. He went to the factory office where the factory foreman was talking to the officer of the watch. He went back to where he had been sitting on the 2<sup>nd</sup> deck and he saw black smoke coming up through the hatch from the freezer hold on the 1<sup>st</sup> deck. He did not observe open fire at any time – only smoke – and he heard sounds like the crackling of something burning. The smoke moved aft along the ceiling.

He heard some sounds and sensed a strange smell coming from the hatch, which he had never experienced before. The fireguard colleague from the 1<sup>st</sup> deck came up through the hatch and he said to him: “*Run away!*” However, the fireguard colleague from the 1<sup>st</sup> deck did not run away. He was looking for something to do, but the fireguard on the 2<sup>nd</sup> deck hurried away and ran up to the accommodation on the trawl deck shouting: “*Fire!*”

#### In the accommodation

The fireguard and other crew members then hurried around in the accommodation shouting in Chinese and pounding on doors to alert the rest of the crew about the fire.

The factory manager, who was sleeping in his cabin on the upper deck, was awakened by the fire alarm. He had experienced fire on board a ship before and thus he was quite aware of any fire alarm and hurried from his cabin to the bridge.

The officer of the watch told the factory manager that the duty factory foreman was investigating the cause of the fire alarm. While the factory manager was still on the bridge, the fire alarm sounded again and was turned off again by the officer.

The factory manager believed for a short while that he could take a nap and before he left the bridge, he asked the officer on which background he was able to turn off the alarm. The officer answered that he had spoken with the duty foreman and that everything should be fine.

When the factory manager came back to his cabin and was just about to lie down, the general alarm sounded. He donned some clothes and ran to the bridge. He heard somebody shouting from the factory area.

The officer of the watch shouted: “*Factory!*” to the factory manager, who ran down to the factory to see what had happened.

The master was also awakened by the fire alarm. He immediately ran to the bridge where he met the officer but nobody else on the bridge. The master could smell smoke on the bridge and he activated the general alarm that sounded until the factory manager had stated that all Chinese crew were on the deck.

The officer of the watch ran from the bridge to investigate the reason for the fire alarm immediately after the master had arrived on the bridge.

#### In the engine room

The duty electrician was in the engine control room together with the duty engineer when the fire alarm sounded. He pushed the reset button for the fire alarm in the engine compartment, but the alarm went on again. Thereupon he contacted the officer of the watch and asked him to check the reason for the alarm. The officer answered that he was aware of the alarm. He tried to reset the alarm a couple of times, but the alarm continued sounding. They were informed by the duty officer that the activated fire detector was in the processing area.

The electrician left the engine control room and hurried towards the location of the activated detector. On his way there, he met the duty factory foreman. He had left the packing room because of smoke, and the electrician had to leave the area too because of smoke and returned to the engine room to take up his duties according to the fire muster list.

### **Distress signal**

At 0600, the officer of the watch returned to the bridge and reported to the master that it seemed impossible to enter the ship's interior where the fire had broken out. He then transmitted a short MAYDAY distress signal on VHF channel 16 and pushed the button for automatic transmission of a distress signal.

A few minutes later, the master transmitted a complete MAYDAY distress signal on VHF channel 16.

The distress signal was intercepted and answered by the cargo ship VEGA that was in the vicinity. The cargo ship VEGA informed about its position and that they would proceed towards ATHENA at 16 knots.

### **Fire fighting**

When the master activated the general alarm, he also stopped all fans on board while the officers were closing manually operated fire dampers. Soon after the transmission of the distress signal, the master ordered to prepare for abandon ship.

In the meantime, the officer of the watch, the other 2<sup>nd</sup> officer who had arrived to the bridge because of the fire alarm, and the ship's doctor donned fire fighter's outfits and breathing apparatuses and went into the corridor on the boat deck to close doors and fire dampers.

Then they went down the stairs on the starboard side, searched the accommodation on the trawl deck and closed doors and fire dampers. After some time, they were forced to withdraw to the deck to rest and change their air bottles in the air breathing apparatuses. They decided to approach the factory by the corridor in the accommodation on the trawl deck starboard side and use the front stairs, going downwards in the front of the ship. They came to the corridor's foremost corner, but they had to withdraw due to smoke and heat.

The factory manager ran from the bridge towards the processing area and on his way he met one of the fireguards shouting: "Fire!" He then ran through the boat deck and the upper deck accommodation kicking and knocking on cabin doors to get the crew members out.

After approximately five minutes, the factory manager was informed by the interpreter for the Chinese crew that a census had been held and all were on the trawl deck. Dense smoke was coming out of the forepart of the trawl deck. He then spoke with the master and it was decided that the crew had to abandon the ship.

Later, the factory manager and the factory foreman not on duty ran through the entrance on the starboard side aft down to a storeroom on the port side on the 1<sup>st</sup> deck to activate the sprinkler system by opening three section valves for the freezer hold on the 1<sup>st</sup> deck, but there was no pressure on the system. The factory manager then hurried back and on the way he shouted to somebody from the engine staff to start all pumps to get pressure on the sprinkler system.

Meanwhile, fire hoses had been prepared and connected on the trawl deck for cooling purposes.

Four fire fighters with air breathing apparatuses who had been inside had to be withdrawn because of the heat and smoke. The factory manager instructed them to stop and not to go in anymore. No further attempts at fire fighting by entering the ship's interior were carried out by the ship's crew. Based on the experience gained from a fire in the same ship three years prior to this one, efforts were made to prevent atmospheric air from nourishing the fire.

Fire fighters were ready and prepared for action, but they were not deployed further. The fire fighting teams were manned by the ship's deck crew and officers.

At approximately 1100, the factory manager spoke with one of the ship's owners by telephone and explained about the situation with the sprinkler system. During this conversation, he suddenly became aware that there might be a shut-off valve that had not been opened behind the bulkhead between the storeroom and the engine room casing. He hurried back to the 1<sup>st</sup> deck where he found a shut-off valve between the fire main and the sprinkler system for the freezer hold. He opened the valve and the system was pressurized. Thereafter, the sprinkler system was activated once or twice every hour for 5-10 minutes. It was not kept open continuously for stability reasons because it was not possible to drain water from the cargo hold.

During the onward passage towards Falmouth, a sharp eye was kept on all the decks to check temperatures.

British shore-based fire fighters specialized in ship fires entered the ship by helicopter. The factory manager explained the fire fighters about the situation and what had happened. After approximately one hour, the fire fighters decided that the ship had to be abandoned because of a risk of being poisoned by smoke and fumes from the fire, especially carbon monoxide.

ATHENA was drifting for 1½ - 2 days with no persons on board, whereupon a salvage team took over and the ship was towed into Falmouth Roads where the fire was finally extinguished by a salvage team.

## *5.7 Abandon ship*

Within approximately half an hour after the master came to the bridge and after a brief conversation with the factory manager, he decided to let the crew abandon the ship.

All crew members and officers not on duty had been awakened by the general alarm and by persons running through the accommodation shouting and knocking on doors to get all persons out.

Those who were not engaged in the fire fighting or other important and urgent tasks relating to the situation lined up quickly on the trawl deck in rows of four persons by occupation and nationality to make a fast and efficient census.

After the census and when it had been secured that nobody was indoors, all crew were directed from the trawl deck via stairs on the starboard side to the aft part of the boat deck to receive immersion suits and lifejackets and then downwards to the trawl deck via stairs on the port side. This went on in good order.

Eventually, dense smoke emerging from the forepart of the trawl deck forced the crew to withdraw further aft on the trawl deck.

When the master was ensured that another ship, i.e. VEGA, was heading towards ATHENA, he ordered the factory manager, who was in charge of the abandon ship operation, to let the crew embark the life rafts.

The factory manager gave a brief admonitory and reassuring speech and then, initially, the crew entered the life rafts to the windward side, starboard.

When deploying the life rafts on the starboard side, the rafts were hauled astern and tied together with ropes. One life raft came close to the trawl slope and it was attempted to embark this life raft via the slope. Two men went down the slope each holding a rope. However, they did not reach the life raft but fell into the water instead at the same time as the life raft came under the ship's quarter and was forced downwards by the ship's movements in the sea.

Thus, disembarking this way was cancelled and instead a life raft on the starboard side was used as a platform for receiving the crew members who climbed down the pilot ladder. From that "platform raft" the crew were distributed to other life rafts.

Under the leadership of the factory manager, the Chinese crew members were disembarked first via the pilot ladder on the starboard side, followed by the rest of the crew.

Simultaneously, the boatswain began coordinating disembarkation of the Peruvian crew members via the gangway on the port side.

13 persons remained on board ATHENA.

Then the cargo ship VEGA arrived, and the next 30 minutes were used to embark the persons on the life rafts. One life raft with eight persons had drifted approximately half a nautical mile and was picked up first by VEGA. Then the painters were cut for the remaining life rafts that subsequently drifted over to VEGA, and the crew members were assisted from the life rafts to VEGA.

VEGA brought all the rescued crew members to Falmouth.

## ***5.8 Fireguards***

Based on the experience gained from previous fires in this ship and the sister ship HERCULES and a near-fire in another sister ship POSEIDON, there were constantly fireguards on watch during the voyage. One fireguard was located in the cargo hold on the 1<sup>st</sup> deck, one fireguard was located in the packing room on the 2<sup>nd</sup> deck and one fireguard was continuously patrolling in the entire ship with 23 checkpoints at intervals of 45 minutes. The patrolling fireguard was not instructed to check whether doors and/or hatches were closed.

During the voyage from the Faroe Islands, only day work was carried out apart from the watch-keeping.

The task of the fireguards was to make sure that everything was normal and to report if anything was not normal. They were not instructed to take any action regarding fire fighting if a fire was observed, and no fire fighting equipment was prepared for immediate use by the fireguards.



## ***5.9 Fire fighting appliances***

The ship was well equipped with fire fighting appliances, including new fire fighter's outfits. A compressor to refill the air breathing apparatuses was installed in a room on the trawl deck. All equipment was in a good condition, and as a routine the fire main was always pressurized.

## ***5.10 Fire detection and alarm systems***

Two fire alarm systems were installed on board.

### **The general alarm system**

One system (the general alarm system) was manually controlled from the bridge and sounded by continuous ringing of electric bells all over the ship.

### **Automatic fire detection and alarm system**

Another fire alarm system functioned automatically and was both a fire detection and fire alarm system with a central unit on the bridge.

The system could be activated by smoke and heat detectors and by manually activated push buttons all over the ship. When activated, this system would give an alarm on the bridge and in the engine control room. If the alarm was not responded to and acknowledged by resetting it within a set period of time, the general alarm would be activated automatically.

The automatic fire detection and fire alarm system detected the fire and gave alarm to the bridge before any fireguard in the same spaces detected the fire.

The fireguards became aware of the fire by hearing the general alarm.

## ***5.11 Corrugated cardboard packaging***

In the ship's freezer holds below the 1<sup>st</sup> deck, on the 1<sup>st</sup> deck and in the packing room on the 2<sup>nd</sup> deck, approximately 500 tonnes of corrugated cardboard packaging were stowed. Some pallets with cardboard packaging were stowed in the aft part of the space aft of the cargo hold on the 1<sup>st</sup> deck that was not used for any particular purpose.

The cardboard packaging was stowed in bundles of 25 cardboard boxes up to approx. 0.3 metres below deck in the freezer hold and a little lower in the packing room. In the freezer hold, there was a longitudinal passage in the centre making it possible to walk through the hold.

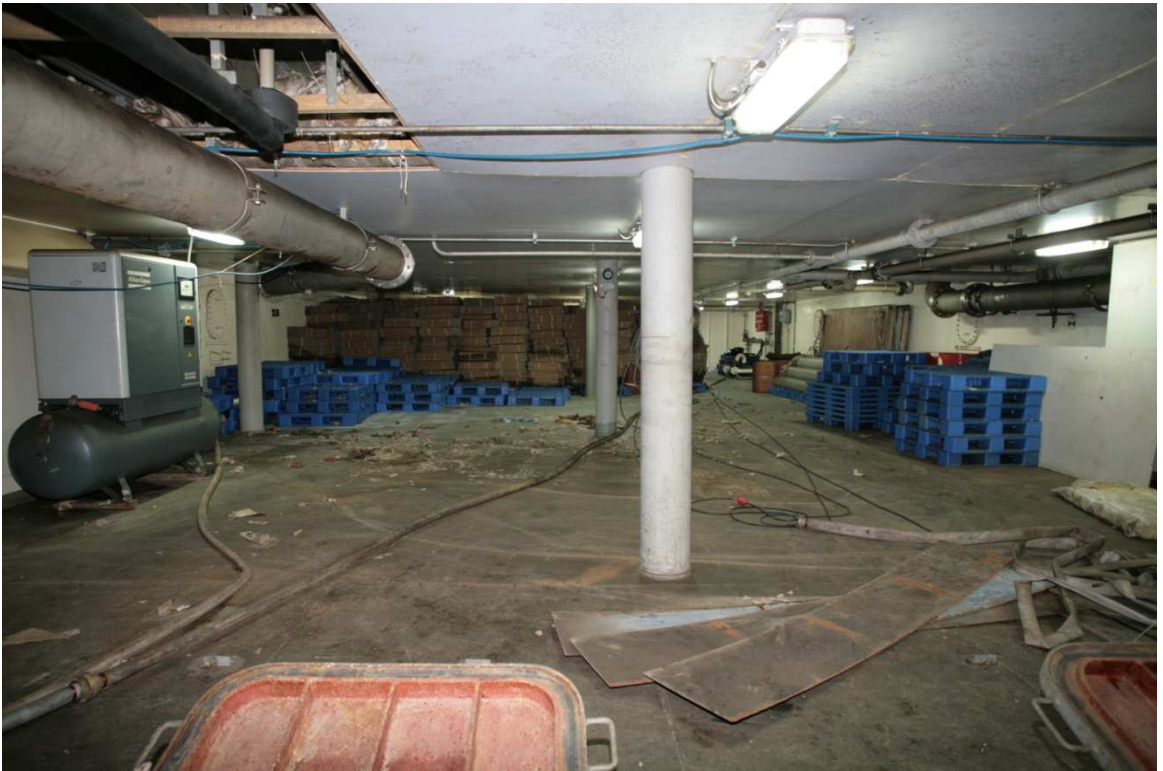
As experienced in severe fires in the same ship and a sister ship in 2007, the cardboard packaging was recognized by the owners and by the ship's crew and officers as a highly combustible material.

No freezing plants were in service in the hold where the corrugated cardboard boxes were stowed when the fire broke out.



Stowage of corrugated cardboard packaging

Photo: The Investigation Board



Cardboard packaging in the aft part of the space aft of the cargo hold on the 1<sup>st</sup> deck

Photo: The Investigation Board

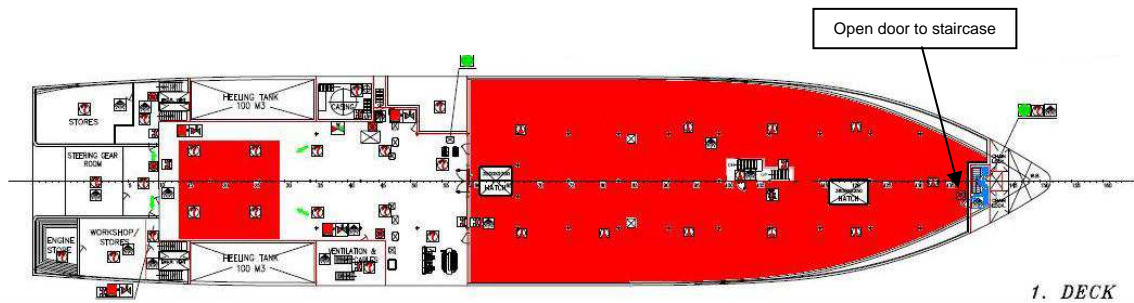
### 5.12 Open hatches and doors

During the passage from the Faroe Islands, the fore hatch on the 2<sup>nd</sup> deck was kept open because the crew had transferred corrugated packaging material from the freezer hold on the 1<sup>st</sup> deck to the packing room on the 2<sup>nd</sup> deck. This open hatch caused the fire to spread rapidly from the freezer hold on the 1<sup>st</sup> deck to the packing room on the 2<sup>nd</sup> deck.

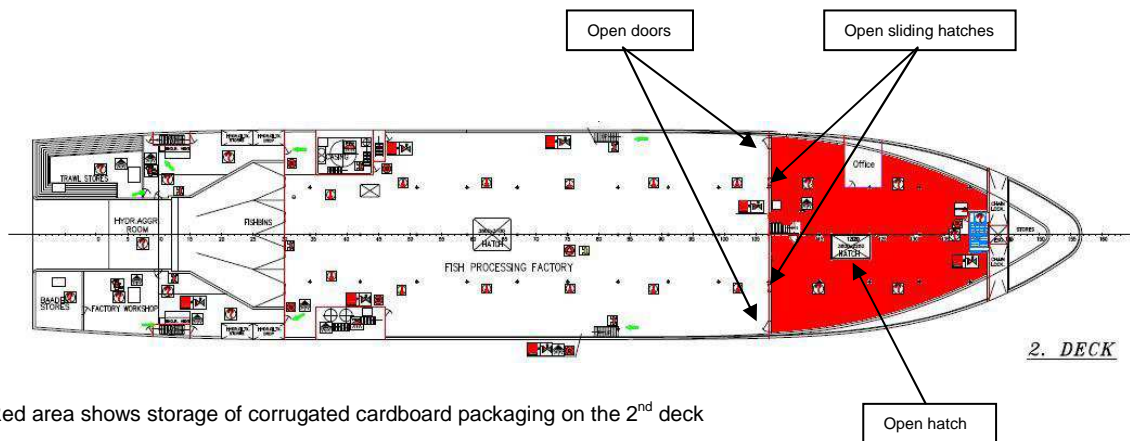
A door in the bulkhead in front of the freezer hold on the 1<sup>st</sup> deck leading to a staircase was open.

Two sliding hatches in the bulkhead between the packing room on the 2<sup>nd</sup> deck and the processing area on the same deck were open. Two doors in the same bulkhead were kept open, one in the port side and one in the starboard side.

At first, the open sliding hatches and doors meant that the fire was supplied with air from the adjacent spaces and later that heat and smoke spread to the processing area and via the staircase also to the ship's accommodation.



Red areas show storage of corrugated cardboard packaging on the 1<sup>st</sup> deck



Red area shows storage of corrugated cardboard packaging on the 2<sup>nd</sup> deck





Open door in front of cargo hold on the 1<sup>st</sup> deck

Photo: The Investigation Board



Open hatch on the 2<sup>nd</sup> deck, packing room

Photo: The Investigation Board





Open sliding hatch viewed from the processing area

Photo: The Investigation Board

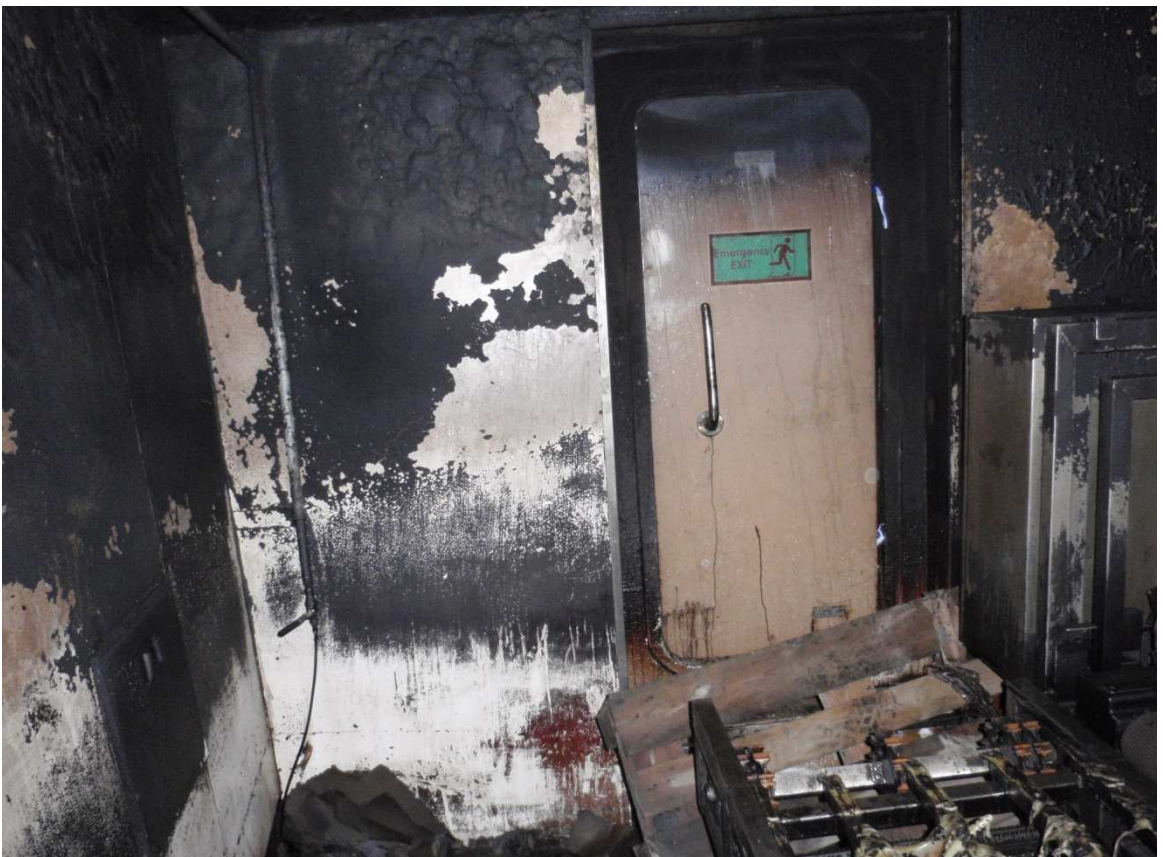


Open sliding hatch viewed from the processing area

Photo: The Investigation Board



Port side door in bulkhead between processing area and packing room on the 2nd deck (open during fire)  
Photo: The Investigation Board



Door in the starboard side of bulkhead between processing area and packing room on the 2nd deck (open during fire)  
Photo: The Investigation Board



### 5.13 Sprinkler system

Based on legislation and the lessons learned from severe fires in the same ship and a sister ship in 2007, the freezer hold on the 1<sup>st</sup> deck and the packing room on the 2<sup>nd</sup> deck were protected by a fixed fire extinguishing system consisting of an open sprinkler system newly installed during the ship's rebuilding in China. The space aft of the freezer hold on the 1<sup>st</sup> deck temporarily used for storing cardboard packaging was not protected by a fixed fire extinguishing system.

The sprinkler system was designed by the owners, and the flag state authority intended that the sprinkler system was plan approved and surveyed by the classification society on behalf of the flag state. However, the communication between the flag state authority and the classification society about the approval of the sprinkler system proved not effective, and the sprinkler system was not plan approved and surveyed by any instance.

When the sprinkler system was about to be used, it was supplied with seawater from the fire main that was always under pressure from at least one fire pump.

The sprinkler system in the cargo hold on the 1<sup>st</sup> deck consisted of three sections, each section to be manually operated by a butterfly valve in a storeroom located on the port side aft of and adjacent to the cargo hold. A shut-off valve to isolate the sprinkler system from the fire main was installed in the port engine room casing aft of and adjacent to the storeroom.

The sprinkler system in the packing room on the 2<sup>nd</sup> deck consisted of two sections, each section to be manually operated by a butterfly valve located behind a trapdoor in the ceiling plate in the processing area adjacent to the bulkhead between the packing room and the processing area. No shut-off valve had been installed to isolate these sections of the sprinkler system. Thus, these section valves were constantly pressurized by the fire main.

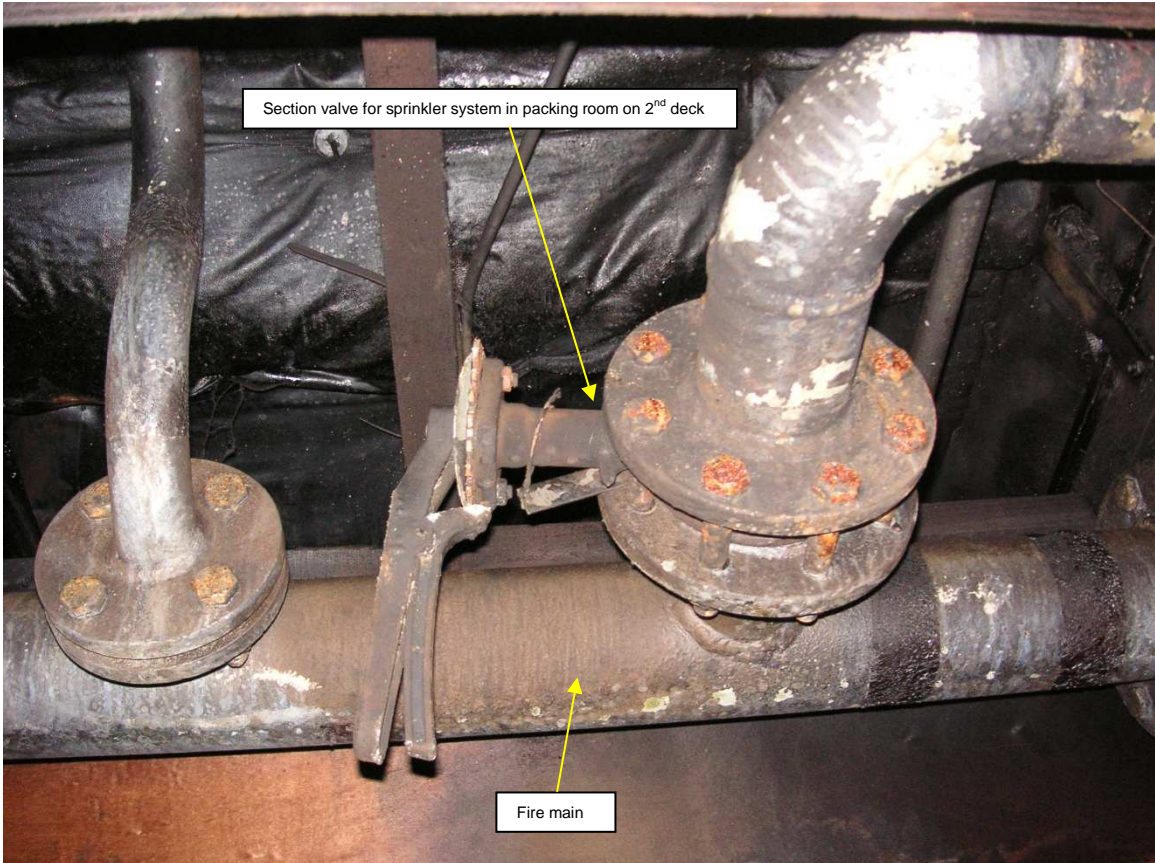


Sprinkler system's section valves for sprinkler on the 1st deck



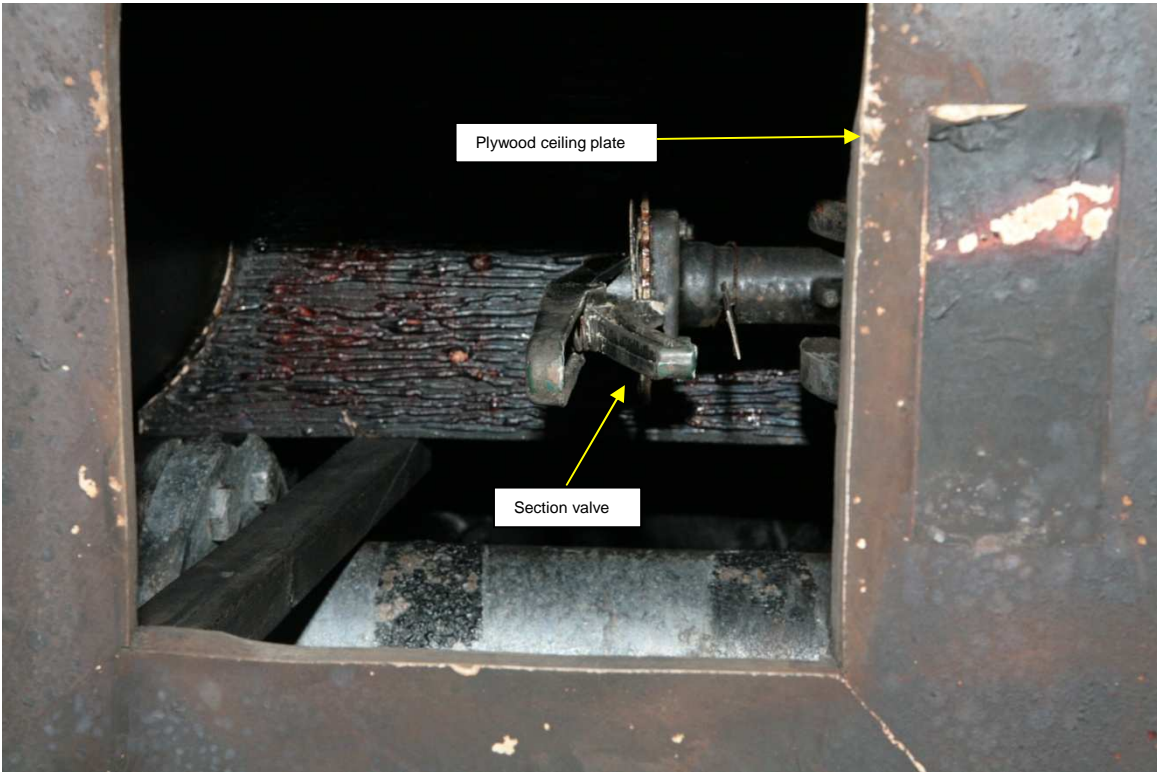
Sprinkler system's shut-off and isolating valve for sprinkler sections on the 1st deck

Photo: the Investigation Board



Section valve for sprinkler system in packing room on the 2<sup>nd</sup> deck, situated above ceiling plates





Section valve for sprinkler system in packing room on the 2<sup>nd</sup> deck

Photo: the Investigation Board



Ceiling plate and opening for operation of section valve for sprinkler system in packing room on the 2<sup>nd</sup> deck

Photo: the Investigation Board

### 5.14 Fire muster list

The fire muster list was made in English, Russian and Chinese and was displayed in the accommodation.

Extract from the fire muster list:

Master	On the bridge during fire – in command of the entire operations
Chief officer	Fire leader, in charge of the fire fighting outside the engine room area and in cooperation with the master via portable radio. If fire in engine room, assist 1 <sup>st</sup> engineer
1 <sup>st</sup> officer	Take over the watch on the bridge. Prepare internal radio communication. Ensure external radio communication to other parties. Substitute for master
2 <sup>nd</sup> officer	In charge of closing fire flaps. Substitute for chief officer
Chief engineer	Engine room. Makes ready fire pumps and other fire fighting appliances in the engine room. Shut off ventilation. Releases Clean Agent FS49C2 if fire in engine room, in cooperation with the master
1 <sup>st</sup> engineer	Fire leader, in charge of the fire fighting inside the engine room area and in cooperation with the master via portable radio. If fire outside engine room, assist chief officer
2 <sup>nd</sup> engineer	Closing down all engine room fans and doors. If or when ordered, close down remote emergency shut-off valves. Substitute for chief engineer
3 <sup>rd</sup> engineer	Closing down all engine room fans and doors. In charge of refilling air breathing apparatus bottles with BAUER compressor. Substitute for 1 <sup>st</sup> engineer

However, the fire muster list could not be met by the manning prescribed in the safe manning document. Nor could it be met by the manning on board during the voyage in question:

- The fire muster list laid down the tasks of the chief officer, 1<sup>st</sup> officer and 2<sup>nd</sup> officer.
  - The safe manning document prescribed two officers only.
  - There was no chief officer on board. No officer acted as chief officer according to the fire muster list.
- The fire muster list laid down the tasks of the chief engineer, 1<sup>st</sup> engineer, 2<sup>nd</sup> engineer and 3<sup>rd</sup> engineer.
  - The safe manning document prescribed three engineers only.
  - There were only three engineers on board.

### 5.15 Drills

Fire drills were held every month, but no fire drill had been held during this voyage. A drill scheduled for the day before the accident had been postponed because of bad weather.

An essential element in fire drills that had been thoroughly rehearsed was to let the crew who had no other specific duties muster on the trawl deck ready for census, further instructions and abandon ship.

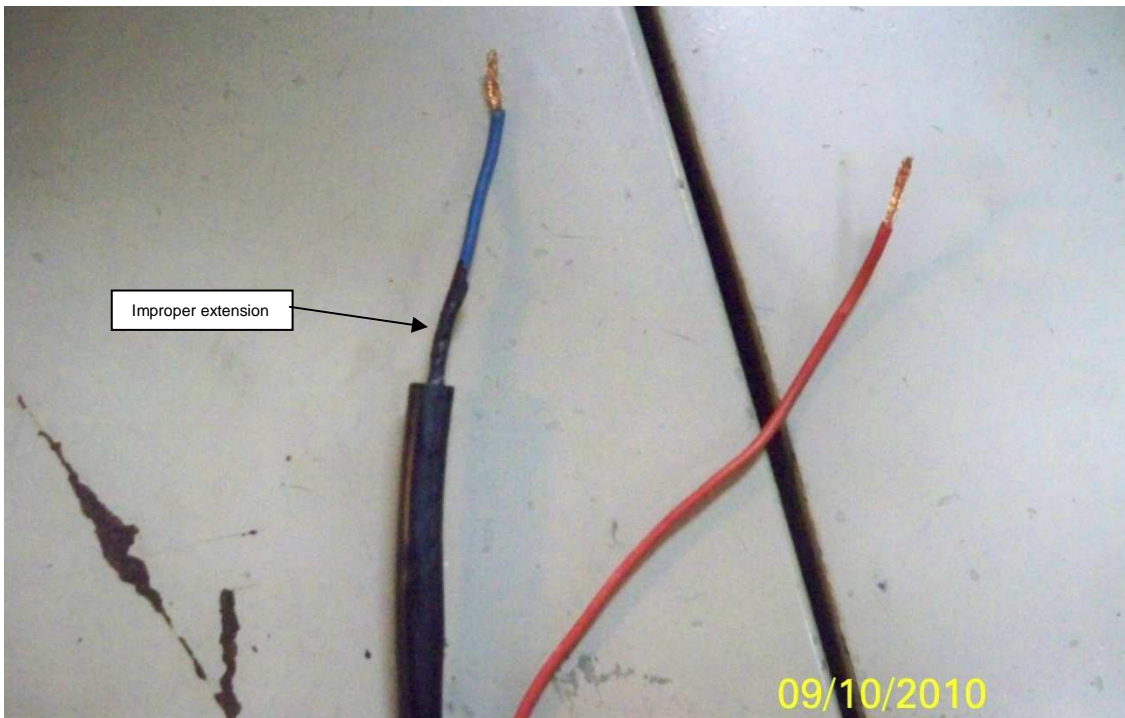
According to the statements made, the crew was instructed during fire drills about the location of the sprinkler systems' section valves, but the sprinkler systems were never activated because it would damage the ship's interior and the corrugated cardboard packaging in the protected spaces.

## 5.16 Shipyard/repair

After a severe fire in 2007, the ship had been reconstructed at a shipyard in China.

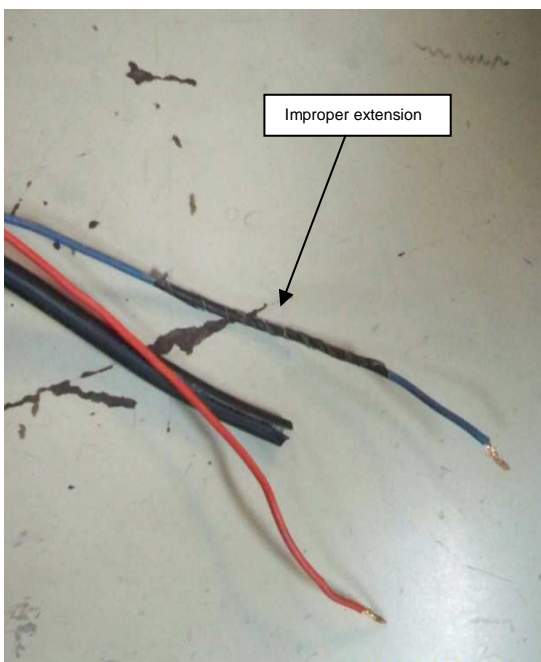
In short, the reconstruction included most of the ship outside the engine room area, i.e. the processing areas, cargo holds, accommodation and the bridge.

Crew members have stated that the electrical installations in the processing area, cargo holds and the accommodation made at the reconstruction were flawed in several respects, necessitating a long series of repairs by the ship's own electricians after the ship had left the shipyard.



Electric cable with an improper extension of wire

Photo: crew member from ATHENA



Electric cable with an improper extension of wire

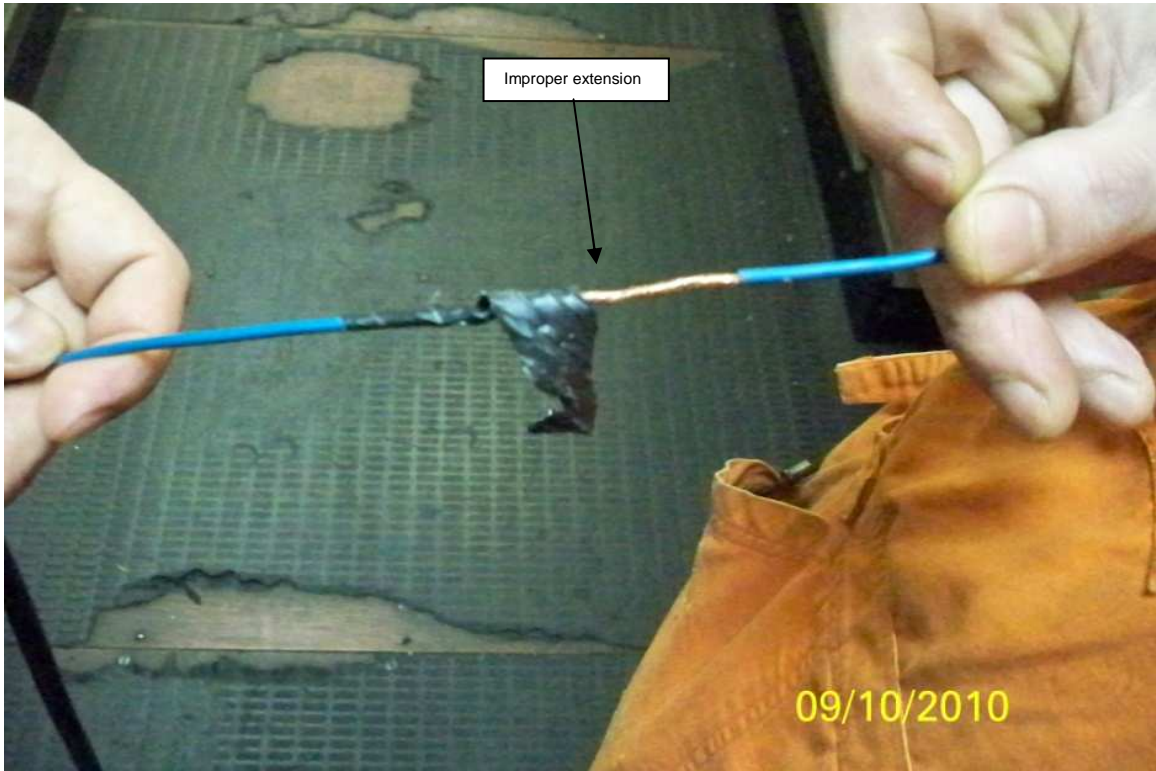
Photo: crew member of ATHENA

A crew member has stated that once a conveyor belt had stopped when the cable was subjected to tension, and when it was no longer subjected to tension, the conveyor belt would be running again. When the cable was cut up, it was revealed that a wire had been joined inside the cable end-to-end.

It was also stated that there were many connections where the wire had not been properly fastened and thus fell out from the terminals.

However, the classification society was not informed about that, and during the Investigation Board's investigation of this fire no such defects were found in the electrical installations.





Electric cable with an improper extension of wire

Photo: crew member from ATHENA



Electric cable with an improper extension of wire

Photo: crew member from ATHENA

## 5.17 Survey

The Faroese Maritime Authority and the classification society Det Norske Veritas surveyed the ship during and after the reconstruction at the shipyard. At the time of the fire, the ship held valid certificates.

## 5.18 Consequences

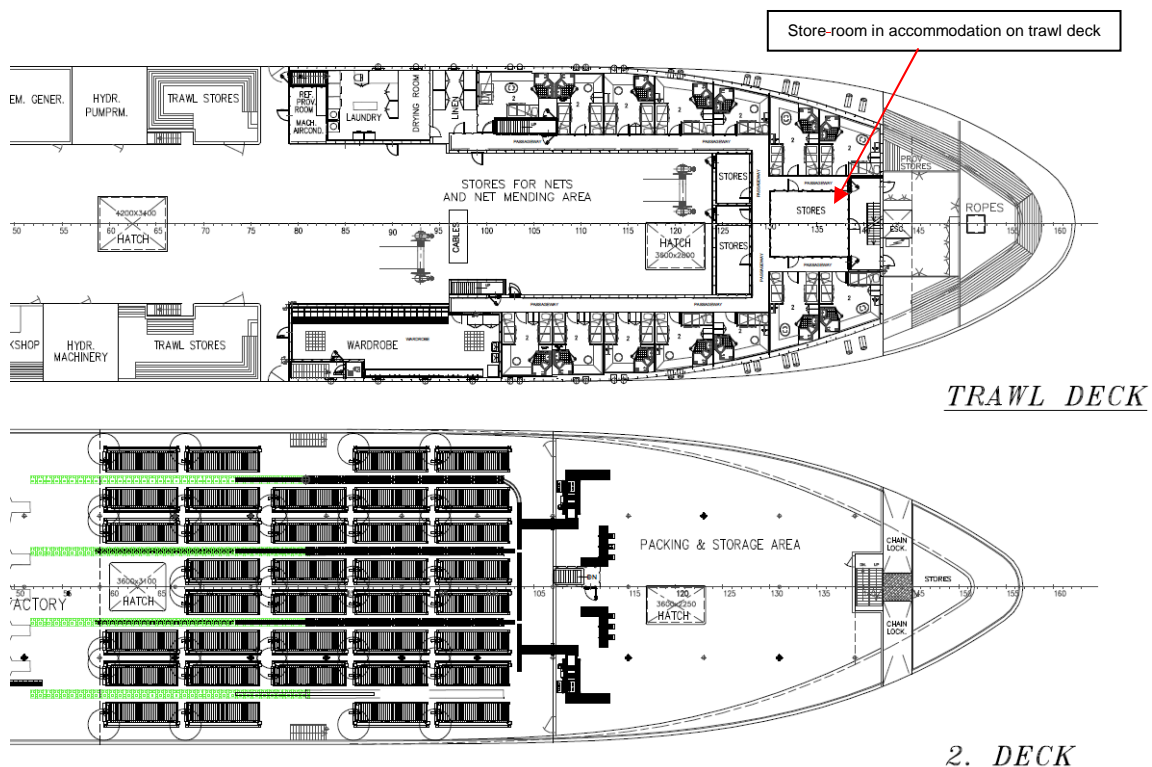
No lives were lost and no persons were injured by the fire.

The fire caused severe fire damage to the ship's interior in the freezer hold on the 1<sup>st</sup> deck and in the packing room on the 2<sup>nd</sup> deck. Furthermore, the fire caused severe smoke and soot damage to the processing area on the 1<sup>st</sup> deck and to the entire accommodation.

The temperature in the processing area close to the bulkhead of the packing room, where two sliding hatches and two doors were kept open, did not melt several rolls of plastic film for wrapping of frozen fish, neither did it put an electronic scale out of operation.

A storeroom in the accommodation on the trawl deck was damaged by an isolated fire in combustible material standing on or near the steel shelves. The steel shelves welded to the deck were exposed to heat conduction from the fire in the packing room on the 2<sup>nd</sup> deck below. Thus, the shelving system's steel structure had become so hot that it could ignite combustible materials. The fire had extinguished itself, probably due to a lack of oxygen.

In general, the engine room areas and other machinery spaces were not damaged. Nor was the freezing hold "Below 1<sup>st</sup> deck" damaged. After the fire, the ship was towed to the Faroe Islands where it was due to undergo extensive repairs.



Extract from General Arrangement





Storeroom in accommodation on trawl deck

Photo: The Investigation Board



Storeroom in accommodation on trawl deck

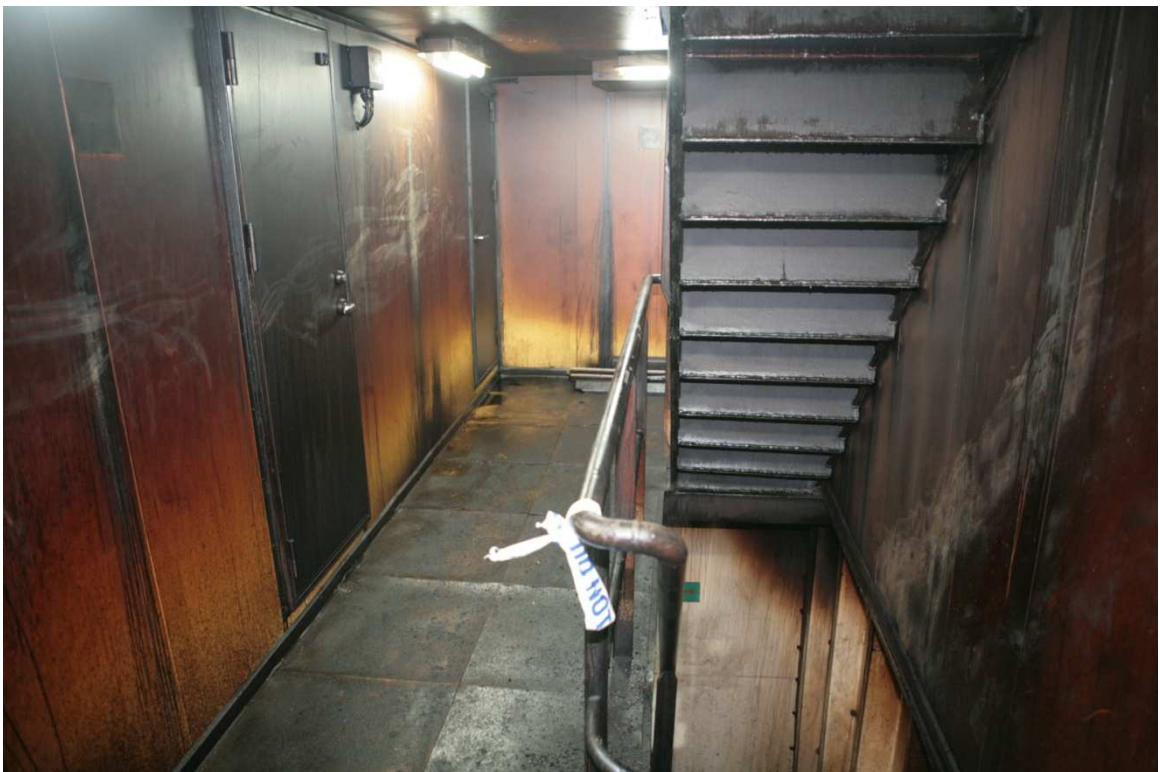
Photo: The Investigation Board





Forepart of packing room on the 2<sup>nd</sup> deck

Photo: The Investigation Board



Soot damage to the accommodation

Photo: The Investigation Board



Aft part of the packing room

Photo: The Investigation Board



### 5.19 The seat, cause and source of the fire

The seat, cause and source of the fire were identified by a team from the National Centre of Forensic Services, Crimescene Unit, Fire Investigation Section and the Danish Institute of Fire and Security Technology.

A fluorescent lamp fixture installed in the fore part on the port side of the freezer hold on the 1<sup>st</sup> deck was found to have a hole of approx. 16 x 8 mm in the housing, which was made of approx. 1 mm steel plate. The hole was created by melting as a result of electric arcs.

On each side of the housing, there was a junction box with a cable entry at each end in which cables were connected with wires from the fixture. In the cable leading to the fixture, there was damage to the cable metal braid, and the cable identification marking had partly melted away.

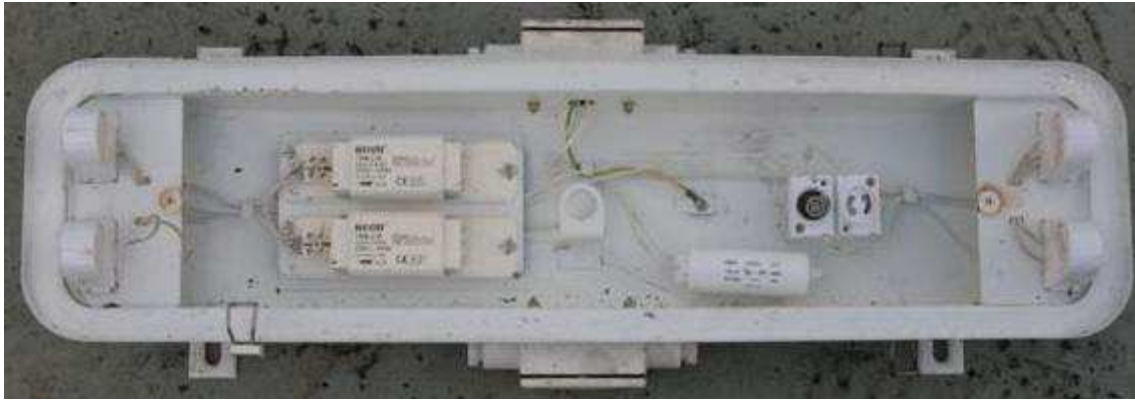
Thus, according to the team from the National Centre of Forensic Services, Crimescene Unit, Fire Investigation Section and the Danish Institute of Fire and Security Technology, the fire was most likely caused by arcs from a short circuit between a fluorescent tube fixture and a three-wire electrical cable for that fixture.

The arcs had ignited combustible material adjacent to the fluorescent tube fixture, i.e. the wooden ceiling construction and the insulating and/or corrugated cardboard packaging. The fire was fuelled by the large amounts of cardboard packaging in the freezer hold on the 1<sup>st</sup> deck and immediately spread to the packing room on the 2<sup>nd</sup> deck via the open hatch.

The ceiling below the deck over the freezer hold consisted of plywood mounted on lathing, which in turn was fitted to steel brackets welded on the steel deck. The cavity above the plywood had been filled with polyurethane foam. Under the plywood, on steel hoops were mounted cable trays with cables for, among other things, lighting in the room. The lighting consisted of fluorescent lighting fixtures.

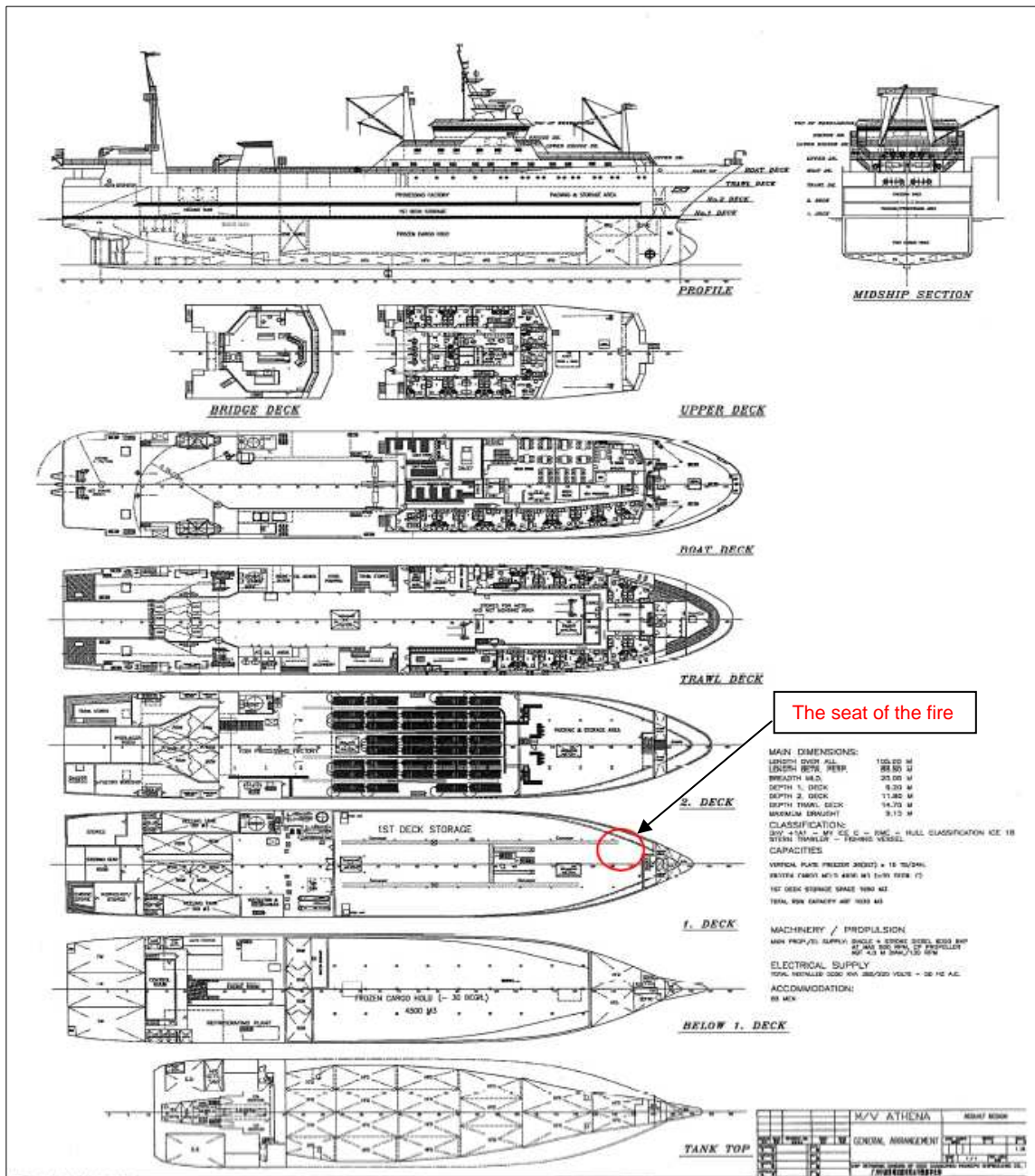
Each fixture was protected by a strong lattice structure. The fluorescent lamp fixtures fitted during the ship's recent rebuilding appeared to be of a robust and substantial type with a plastic shielding that proved to be difficult to ignite. The fluorescent lamp in question was protected by a 16 amp. circuit breaker. Residual current devices are not used in ships' electrical installations.





A non-damaged fixture without fluorescent tubes and plastic screen

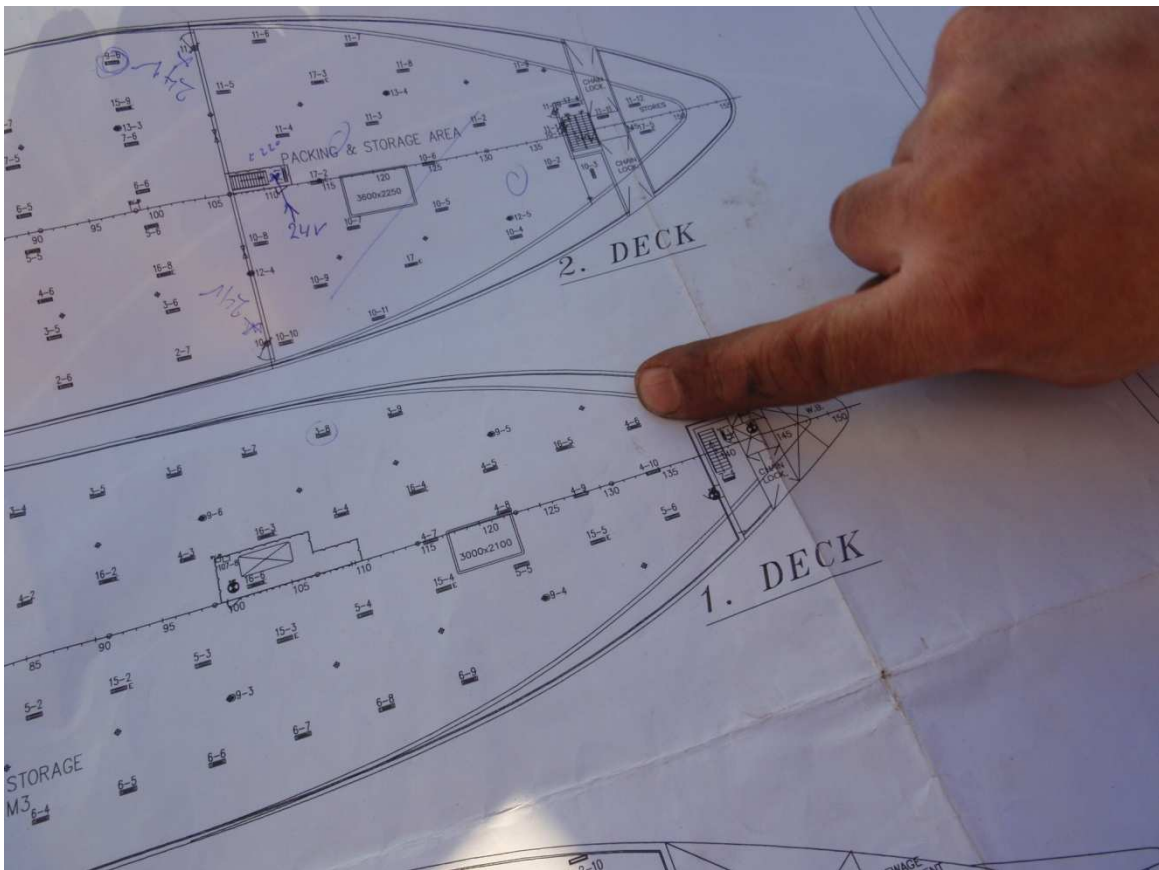
Photo: The Danish Institute of Fire and Security Technology



The seat of the fire shown on General Arrangement

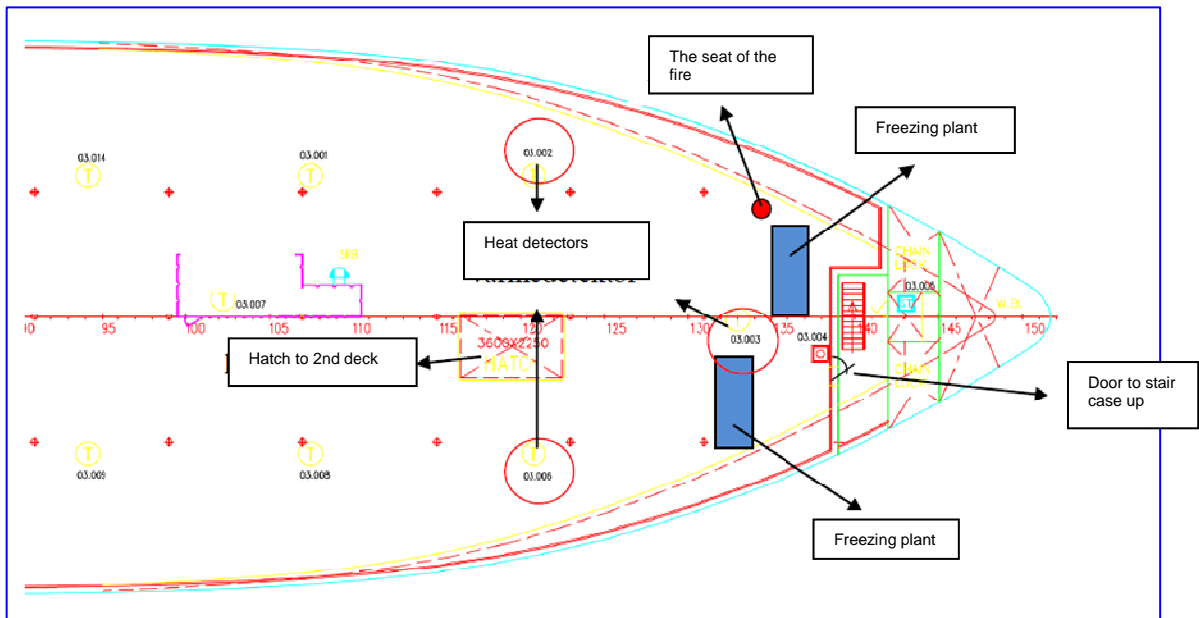
Source: The Danish Institute of Fire and Security Technology

Marine accident report



The seat of the fire, 1<sup>st</sup> deck forepart, the fluorescent tube fixture

Photo: The Investigation Board



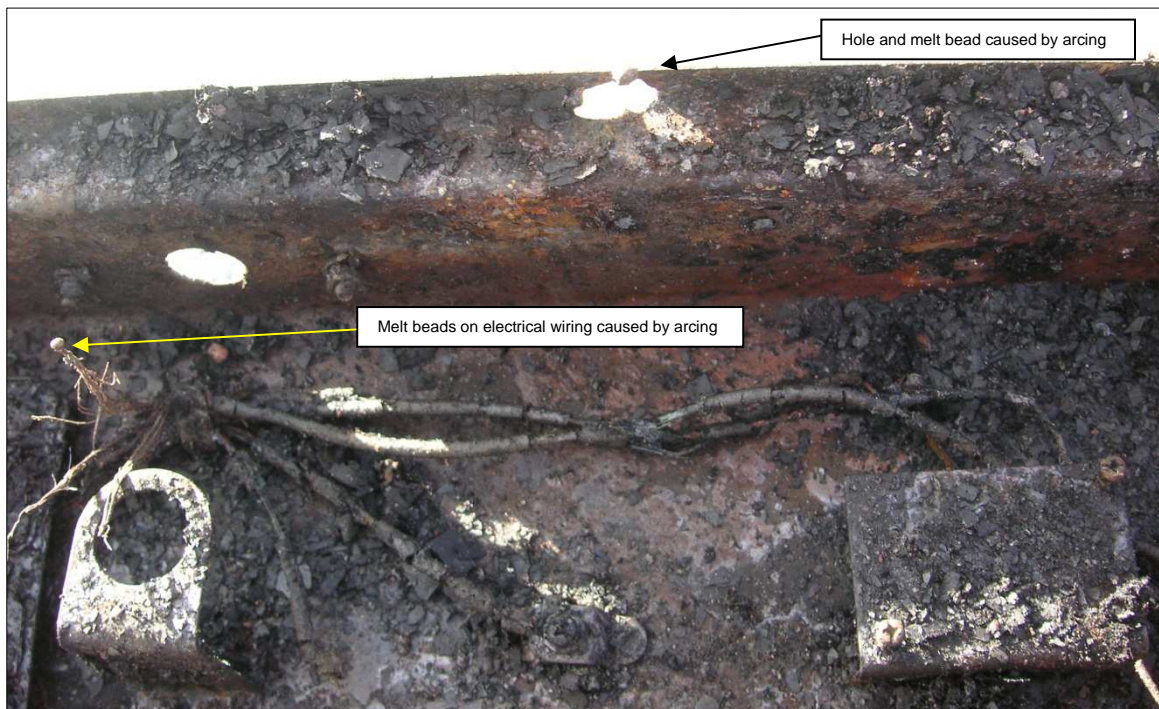
Extract from General Arrangement, 1<sup>st</sup> deck forepart





Damage to housing for fluorescent lamp fitting, caused by electric arcing

Photo: The Investigation Board



Damage to fluorescent lamp fitting, caused by electric arcing

Photo: The Investigation Board





Melt beads on wiring in fluorescent tube fixture caused by arcing

Photo: The Investigation Board



Damage to cable metal braid and cable identification marking caused by arcing

Photo: The Investigation Board

## 6 Analyses

In the analyses, the facts are written in normal font and the Investigation Board's conclusions are in italics.

### 6.1 *The cause of the fire*

The fire was identified as being caused by electric arcs at a fluorescent tube fixture.

The electric arcs were caused by short circuit.

There is no evidence that the short circuit was caused by a technical defect in the fixture as such.

On each side of the fluorescent lamp fitting, there was a junction box with a cable entry at each end in which cables were connected with wires from the fixture. In the cable leading to the fixture, there was damage to the cable metal braid, and the cable identification marking had partly melted away.

Crew members have stated that the electrical installations in the processing area, cargo holds and the accommodation made at the ship's reconstruction in China were flawed in several respects that necessitated a long series of repairs by the ship's own electricians after the ship had left the shipyard. It was also stated there were many electrical connections where the wire had not been properly fastened and thus fell out from the terminals. However, during the Investigation Board's investigation of this fire no such defects were found in the electrical installations.

*The Investigation Board assesses that the fire originated from electrical arcs of a short circuit at a three-wire cable and a fluorescent lamp fitting. The character of the burnt hole in the lamp housing leads to the assumption that there has been a phase to phase contact near the housing of the lamp fitting, or alternatively a phase to earth contact at this point and another phase to earth fault somewhere else in the system that could not be determined.*

### 6.2 *The spreading of the fire*

The electric arcs ignited combustible material adjacent to the fluorescent tube fixture, i.e. cardboard packaging or wooden ceiling construction.

The fire was fuelled by the large amounts of cardboard packaging in the freezer hold on the 1<sup>st</sup> deck and immediately spread to the packing room on the 2<sup>nd</sup> deck via the open hatch.

The fire itself was kept inside the freezer hold on the 1<sup>st</sup> deck and the packing room on the 2<sup>nd</sup> deck apart from a minor fire in the storeroom on the trawl deck.

A hatch on the 2<sup>nd</sup> deck and one door in the bulkhead in front of the freezer hold on the 1<sup>st</sup> deck leading to a staircase were open.

Two sliding hatches and two doors in the bulkhead between the packing room on the 2<sup>nd</sup> deck and the processing area on the same deck and one door in front of the packing room were not closed. None of these hatches and doors was closed by the duty factory foreman or by any of the fireguards who were in the area when the fire broke out.

At first, the open sliding hatches and doors meant that the fire was supplied with air from the adjacent spaces and later that heat and smoke spread to the processing area and via the staircase also to the ship's accommodation.

A storeroom in the accommodation on the trawl deck was on fire because of heat conduction.

*The Investigation Board assesses that an early and effective containment of the initial fire in the freezing hold on the 1<sup>st</sup> deck was made impossible because of the open hatch on the 2<sup>nd</sup> deck.*

*The Investigation Board assesses that the open doors and sliding hatches in the bulkheads on the 2<sup>nd</sup> deck and the consequent admission of air through these doors and sliding hatches made the fire develop in the freezer hold and the packing room.*

*The Investigation Board assesses that an effective fire fighting of the initial fire was hindered because of open doors and hatches on the 2<sup>nd</sup> deck.*

*The Investigation Board assesses that inadequate instruction to the fireguards and factory foremen and an inappropriate routine with regard to keeping doors and hatches duly closed contributed to the fact that no fireguards or the factory foremen showed attention to this important issue.*

*The Investigation Board assesses that the fire was very close to spreading from the storeroom on the trawl deck to the rest of the accommodation.*

### **6.3 Fire fighting by the ship's crew**

The master stopped all fans in the ship, while the officers were closing manually operated fire dampers.

The officers and the ship's doctor donned fire fighter's outfits and breathing apparatuses and went into the corridor on the boat deck to close doors and fire dampers. They searched the accommodation on the trawl deck, closed doors and fire dampers and were then forced to withdraw to the deck to rest and change air bottles. They decided to reach the factory, but had to withdraw due to smoke and heat.

The factory manager and the factory foreman not on duty tried in vain to activate the sprinkler system by opening three section valves for the cargo hold on the 1<sup>st</sup> deck but gave up because there was no pressure on the system.

Fire hoses were prepared and connected on the trawl deck for cooling purposes.

Four fire fighters with air breathing apparatuses who had been inside stated that they could not fight the fire because of the intense heat. The factory manager told them to stop and not to go in anymore.

Except for this, no fire fighting was carried out by entering the ship's interior by the ship's crew. Based on the experience gained from an earlier fire in the same ship three years prior to this one efforts were made to prevent atmospheric air from nourishing the fire.

According to the fire muster list, the chief officer is the fire leader. However, there was no chief officer on board. Both 2<sup>nd</sup> officers were acting as such in accordance with the fire muster list, and in some respects the factory manager seemed to be in charge as a chief officer.

No persons on board had proper knowledge about operating the sprinkler system and no persons on board took the initiative at an early stage of the fire to investigate how to supply water to the sprinkler system for the freezer hold on the 1<sup>st</sup> deck.

No attempt was made to open the section valves of the sprinkler system for the packing room on the 2<sup>nd</sup> deck. The access to the valves was considered impossible because of heat and dense smoke. However, the temperature in this area was never high enough to melt plastic or to put an electronic scale out of operation.

The location of the section valves for the sprinkler system necessitated access to the ship's interior on the 1<sup>st</sup> deck and on the 2<sup>nd</sup> deck for operating the sprinkler system.

*The Investigation Board assesses that the fire fighting efforts were characterized by a random organization not in accordance with the fire muster list.*

*The Investigation Board assesses that effective fire fighting at an early stage by the use of the sprinkler system in the freezer hold on the 1<sup>st</sup> deck was not conducted because of lacking knowledge about the sprinkler system.*

*The Investigation Board assesses that effective fire fighting at an early stage by the use of the sprinkler system in the packing room on the 2<sup>nd</sup> deck was not conducted because the section valves were not easily accessible.*

*The Investigation Board assesses that the arrangement of the section valves for the sprinkler system was inappropriate with regard to easy accessibility from open deck.*

*The Investigation Board assesses that the effective closing of doors, hatches, fire flaps, etc. from open deck to the ship's interior and cooling of deck and surfaces by the use of fire hoses implied a containment of the fire in the ship's cargo hold on the 1<sup>st</sup> deck and in the packing room on the 2<sup>nd</sup> deck. Eventually, the open doors and sliding hatches caused severe soot and smoke damage to the ship's interior.*

## **6.4 Abandon ship**

Based on previous experiences with severe fires in this ship and a sister ship, the owners considered the abandon ship drills very important.

As soon as the general alarm sounded and all crew members had been alerted, all those who had no tasks according to the muster list assembled on the deck, as rehearsed, ready for census and further instructions.

No persons got trapped by smoke or fire in the ship's interior.

All crew members except for 13 key persons who stayed on board were transferred safe and sound to the cargo ship VEGA.

*The Investigation Board assesses that the extensive and repetitive rehearsals of assembling the crew on deck, taking census and distributing immersion suits and lifejackets proved effective.*

## **6.5 Fire safety**

Based on the experience gained from previous fires, fireguards were constantly on watch during the voyage. One in the freezer hold on the 1<sup>st</sup> deck, one in the packing room on the 2<sup>nd</sup> deck, and one continuously on patrol in the entire ship.



The task of the fireguards was to make sure that everything was normal and to report if anything was not normal. They were not instructed to take any action in regard of fire fighting in case a fire was observed, and no fire fighting equipment was prepared for immediate use by the fireguards. They were not instructed to check or ensure whether doors or hatches were closed either, and they did not close any doors or other openings before or after the fire was observed. The fireguards did not observe the fire until it was detected and alarmed by the automatic fire detection and alarm system.

*The Investigation Board assesses that the fireguard system was not quite effective because the fireguards had not been instructed to take action to prevent the fire spreading by ensuring that doors and other openings were kept closed.*

There was no chief officer on board. During the fire, two officers acted as 2<sup>nd</sup> officers with regard to the fire muster list.

The factory manager acted in accordance with his functions in the fire muster list with census and having control with all crew. However, in some respects the factory manager also acted, as per discretionary decisions, as the chief officer was supposed to do according to the muster list.

No person on board was familiar with the use of the sprinkler system, and the section valves for the sprinkler system were not easily accessible.

The fire muster list could not be met by the manning that was prescribed in the safe manning document. Nor could it be met by the manning on board on the voyage in question.

*The Investigation Board assesses that the fire drills had not been effective with regard to information about and rehearsals of the use of the sprinkler system.*

*The Investigation Board assesses that the fire safety had not been taken sufficiently into account in all respects though the company had arranged for fireguards on board, the ship was well equipped with fire fighting appliances and fire drills had been held.*

## **7 Subsequently**

ATHENA was towed from Falmouth to the Faroe Islands for repair.

On 9 May 2011, when the ship had been repaired and refurbished and only needed some final insulation works, another fire broke out while the ship was berthed.

This fire was caused by chemical processes in the two-component insulation and is not subject to an investigation by this Investigation Board. It led to the total loss of the ship.



ATHENA on fire on 9 May 2011 at the Faroe Islands

Photo: FiskerForum