Report on the investigations into the

two engine room fires, subsequent flooding and foundering of the

fv *Elegance*

30 miles north-west of Shetland

on 30 January 2004

and

8.5 miles west of Shapinsay

on 5 March 2004

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Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1999

The fundamental purpose of investigating an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 1999 is to determine its circumstances and the causes with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame.

NOTE

This report is not written with liability in mind and is not intended to be used in court for the purpose of litigation. It endeavours to identify and analyse the relevant safety issues pertaining to the specific accident, and to make recommendations aimed at preventing similar accidents in the future.

CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

AVR	:	Automatic Voltage Regulator
EPIRB	:	Emergency Position Indicating Radio Beacon
ETV	:	Emergency Towing Vessel
kW	:	kilowatt
m^3	:	cubic metre
MCA	:	Maritime and Coastguard Agency
MF	:	Medium Frequency
MSN	:	Merchant Shipping Notice
MRSC	:	Maritime Rescue Sub-Centre
P&I	:	Protection and Indemnity
SARIS	:	Search and Rescue Information System
SI	:	Statutory Instrument
SIAS	:	Ship Investigation and Survey
SOSREP	:	Secretary of State’s Representative
UTC	:	Universal Co-ordinated Time

SYNOPSIS

On 30 January 2004, the twin rig trawler *Elegance* was fishing 30 miles north-west of Shetland. At about 1750 the skipper noticed smoke coming from the engine room exhaust ventilation terminal. On entering the engine room, the skipper saw a glow in the centreline area of the main engine, before being beaten back by the dense smoke. On leaving the space, the skipper operated the fuel system quick closing shut off valves. The main fuel supply valve failed to close, and both the main engine and generator continued to run. The main engine was later stopped from the wheelhouse. At 1755, the skipper transmitted a "Mayday" alerting the coastguard. Thirty minutes later, the skipper attempted to operate the fixed CO_2 system. Although the skipper was under the impression that the CO_2 system had been operated, the attempt had, in fact, failed because he did not fully understand how it worked and because the system was poorly maintained.

The skipper and engineer re-entered the engine room at 1840, without considering the dangers that the presence of CO_2 in the space might hold. They identified and isolated a leak on the main fuel filters that appeared to have caused the fire. The fire was reported out at 1856, and arrangements were made for the fv *Shamarah II* to provide a tow. The skipper cut away his trawl gear after connecting the towing hawser. *Elegance* initially berthed at Colla Firth at 0812 on 31 January and, subsequently, at Fraserburgh on 2 February for repairs.

Following extensive repairs, *Elegance* sailed at 1600 on 4 March 2004, in apparently good condition with the exception of a fuel oil purifier defect. At 2315, the skipper took the watch and, at 0135, he started to transfer fuel using the fuel transfer pump. About 10 minutes later the engine room fire alarm sounded in the wheelhouse.

The skipper entered the engine room, and saw a fire in the general vicinity of the main engine. The two crew were alerted, the ventilation flaps closed and main engine shut down. The CO_2 system was then activated. The fuel shut off valves were then closed while the skipper transmitted a "Pan Pan". The coastguard alerted a rescue helicopter, the Kirkwall lifeboat and despatched the ETV *Anglian Sovereign.*

The skipper attempted to enter the space, but was unable to do so because of the toxic effects of combustion and CO_2. A short while later, water was heard entering the engine room, and the vessel adopted a list to port. At 0333 on 5 March, a "Mayday" was transmitted. The Kirkwall lifeboat arrived at 0400 and connected a tow. The lifeboat's salvage pump was subsequently transferred to the fishing vessel by helicopter. The pump had little effect, and the water level in the engine room increased above the main engine. The stability worsened, resulting in *Elegance* being abandoned at 0614.

At 0800 the ETV picked up the lifeboat's towing line and headed towards Kirkwall. *Elegance* later developed a list of approximately 6-8° to port and the ETV transferred a salvage team, with pumps, to *Elegance*. They were unable to improve the situation

and, at 1420, while about 2 miles off Kirkwall, the list worsened to 15-20° and the salvage team left. The ETV towed the vessel to deeper water where she plunged by the stern, sinking in 36m of water, 8.5 miles west of Shapinsay.

Recommendations have been made with respect to:

- The improvement of maintenance, training, operating knowledge and safety precautions relating to the safe use of CO_2 fixed fire-fighting systems.
- The design of sea water systems for new fishing vessels.
- Critical pipework systems.
- On-board safety training on fishing vessels.
- The fitting of fire detection sensors with particular reference to the use of smoke detectors.
- Information exchange between the crews of fishing vessels and salvors during salvage operations.

fv *Elegance*

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *ELEGANCE* AND ACCIDENT

Vessel details

Registered owner	:	Elegance Fishing Company Limited, Peterhead
Port of registry	:	Ullapool - UL540
Flag	:	UK
Type	:	Fishing vessel
Built	:	1998 at Gdansk, Poland
Construction	:	Steel
Length overall	:	27.86m
Registered length		23.92m
Gross tonnage	:	357.00
Engine power and type	:	742.00kW produced by a single Caterpillar 351 2B-TA engine
Service speed	:	11.5 knots
Propulsion method	:	Single, controllable pitch propeller
Electrical supply	:	Two Caterpillar 3306 DIT generators were fitted, each producing 150kW, 450v 50hz, 3phase supplies.

Accident details

Time and date	:	1755 on 30 January 2004 and 0145 on 5 March 2004
Location of incident	:	60° 51’N 002° 17W 30nm north-west of the Shetland Islands and 59° 20’N 002° 20’W 2.5nm south-east of North Ronaldsay
Persons on board	:	Five on 30 January 2004, and three on 5 March 2004
Injuries/fatalities	:	Nil
Damage	:	30 January 2004 – fire damage 5 March 2004 – vessel lost

1.2 FIRST FIRE – 30 JANUARY 2004 (all times are UTC)

1.2.1 Fishing trip pattern and background

Elegance normally fished in the vicinity of Aisha Ness, about 30 miles west of Shetland. There were usually three or four trawls each day, with each tow lasting between 4 and 6 hours. The catch was landed about every 7 days, frequently at Scrabster or Peterhead, with the Peterhead landing normally coinciding with a crew change occurring about every 14 days.

The recent trip sequence started on 19 January 2004 when the crew of four changed after the catch was landed at Peterhead.

On 28 January 2004, *Elegance* berthed at Scrabster to offload her catch and to effect repairs to the hydraulic oil cooler located in the engine room. The vessel also bunkered 10,000 litres of fuel into Nos 8 and 9 tanks. On completion of bunkering, these tanks were approximately 30 percent and 60 percent full respectively.

Elegance sailed from Scrabster at 2300 the next day. The engineer visited the engine room once during his 0600 - 0900 watch on 30 January. No instructions were left for any other watchkeepers to visit the space. The vessel arrived at the fishing grounds at approximately 1400. In accordance with normal practice, the skipper took the watch at about 1430, after shooting the two nets on the twin rig arrangement. The engineer checked the engine room immediately afterwards, then joined the remainder of the crew resting in their cabins.

Just before the fire was discovered, the vessel was towing at 2-3 knots on autopilot in a north-easterly direction. The wind was west-north-west, force 5 to 6. *Elegance* was rolling heavily in moderate to rough seas with a wave height of about 2 metres and in a swell of 1.5 metres.

1.2.2 Discovery of the fire and crew actions

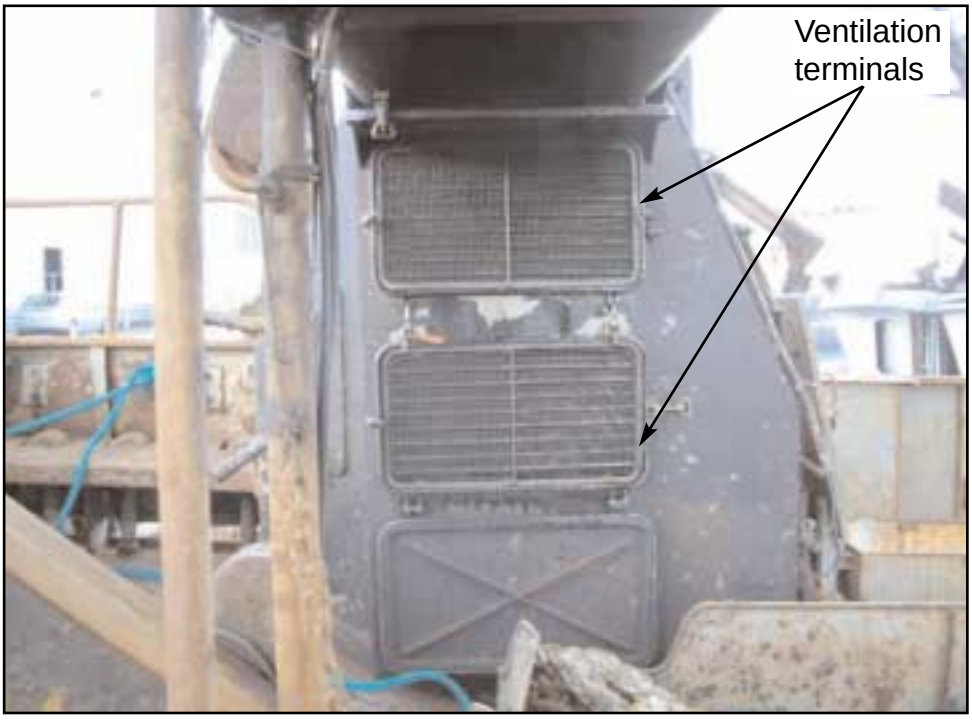
Elegance had been towing for about 3 hours when, at 1750, the skipper went outside the wheelhouse and noticed smoke coming from the port side of the engine room ventilation exhaust trunking **(Figure 1)**. At that time no fire alarms were enunciating from the surveillance system located in the wheelhouse. The skipper immediately went to the engine room, although he had no particular concerns at this time.

On opening the engine room door, the skipper was confronted by dense smoke. Nevertheless, he managed to descend about three steps down the access ladder. From there, he could see a bright glow through the smoke in the area just forward of the engine turbo chargers, which he took to be the fire.

The skipper then left the engine room and shouted the alarm. He went directly to the remote fuel valve operating position and operated all the remote shut off valve levers. In doing so, he found that the lever used to operate the daily tank

fuel valve, which isolates the main engine and generator, was disconnected from its operating cable. The clevis pin connecting the lever to the cable was missing **(Figure 2)**. He therefore attempted to operate the valve, as best he could, by pulling on the cable. Shortly afterwards, *Elegance* was plunged into darkness.

Figure 1



Engine room exhaust ventilation system terminals situated on the port gallows

Figure 2

Fuel quick shut off valve arrangement

On the way back to the wheelhouse, the skipper ensured that the crew were awake, and instructed them to make their way to the wheelhouse. In the wheelhouse, he reduced the propeller pitch and set the engine to idle.

At 1755 the skipper transmitted a “Mayday”, reporting that there was a fire in the engine room and that the “crew were in a state of panic”. The vessel’s position was 60° 51N and 002° 17W, the temperature was 8°C, wind gale force, gusting 35 knots, and the sea state was very rough with a heavy swell.

In view of the perceived stress levels on board, the coastguard instructed the skipper to activate the EPIRB and to launch the liferaft in preparation for abandoning the vessel. Two tankers, three fishing vessels, the tug *Tystie* from Sullom Voe, and the ETV *Anglian Sovereign* responded to the “Mayday”. The coastguard requested the Peterhead-registered fishing vessel, *Shamarah II*, and two Norwegian fishing vessels, to proceed towards *Elegance.*

By 1810, the coastguard helicopter at Sumburgh had been scrambled, the Aith lifeboat had left her moorings, and the SARIS plan activated. The coastguard requested the fire and rescue service to attend the Shetland MRSC office to advise on fire-fighting options.

By now, the fire alarms were enunciating in the wheelhouse. The skipper ordered lifejackets to be brought to the bridge, and the crew to don their sea survival suits. He further ordered the liferaft to be launched and secured to the starboard ladder adjacent the wheelhouse.

The engineer suggested that he should visit the engine room to ascertain the situation. The skipper was adamant that he should not go at that point.

Meanwhile, the skipper kept the crew in the wheelhouse. Despite the increasing smoke levels, his attention was drawn away from the fire, to the possibility of flooding in the engine room. At about 1810, he visited the engine room with the engineer. The skipper noticed that the engine room door handle was hot. Nevertheless, they cautiously entered and saw a glow coming from the centre of the engine. The smoke and intense heat forced them to leave the space.

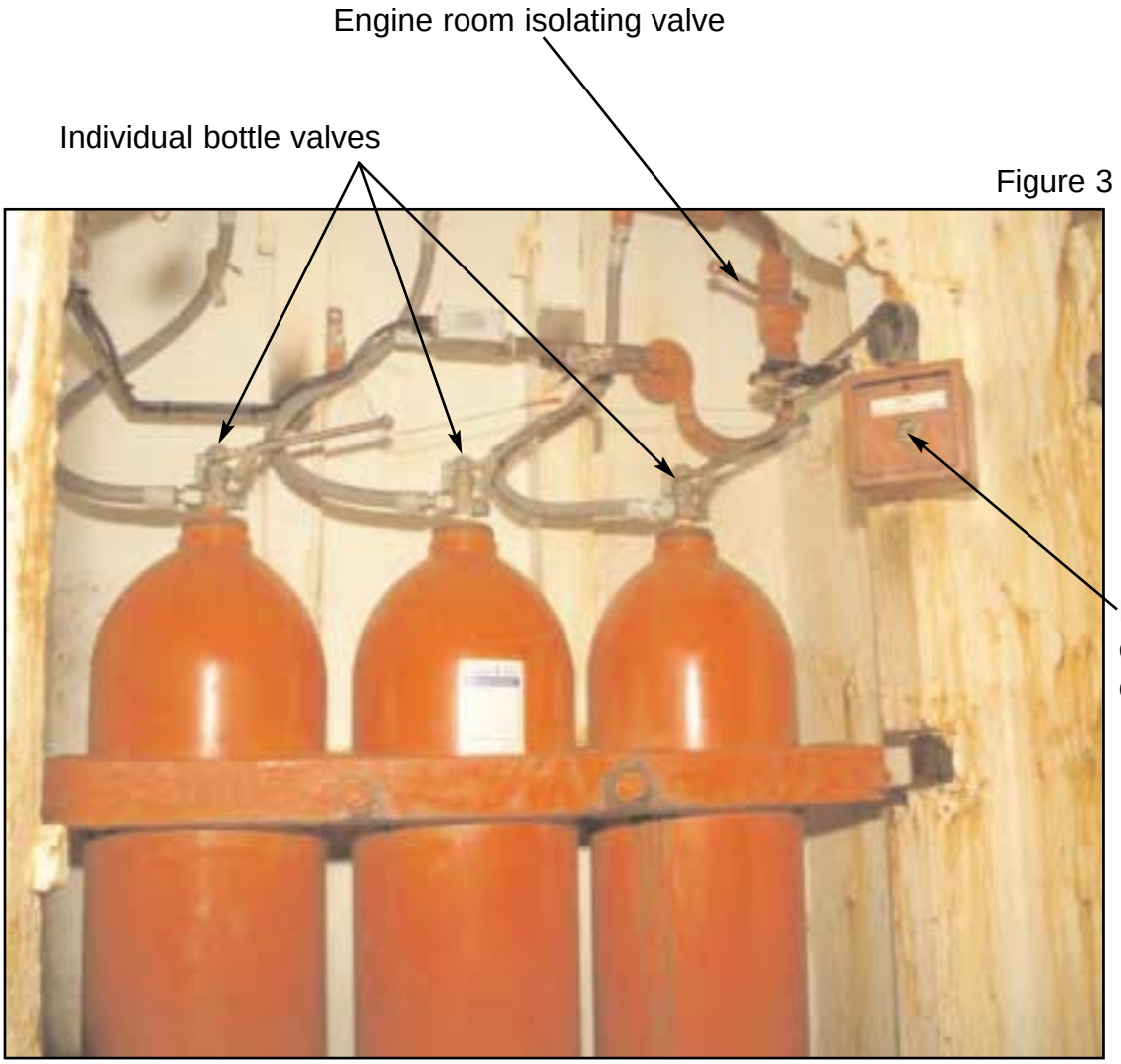
Both men returned to the wheelhouse, and the engineer believes that it was at this point that he operated the main engine emergency stop in the wheelhouse.

At approximately 1825, the skipper went to the CO_2 compartment and attempted to operate the fixed fire extinguishing system by the emergency pull wire. He then opened each of the individual bottle valves by hand, believing this would discharge the CO_2 into the engine room. However, he did not open the engine room isolating valve, also located in the CO_2 compartment, which therefore prevented the CO_2 from entering the engine room **(Figure 3)**. An attempt to close the engine room ventilation flaps, to isolate the air supply to the engine room, was not considered.

Some time between 1830 and 1845, the engineer reported that the smoke from the engine room exhaust ventilation terminal had reduced. The skipper and engineer entered the engine room shortly afterwards and, although the atmosphere was found to be smokey, it was tenable. As both men proceeded aft along the starboard top floor plates, the engineer noticed fuel issuing from an exposed ventilation plug hole on the after fuel duplex filter supplying the main engine **(Figure 4)**. He immediately closed the filter supply valve to isolate the leak. Feeling the effects of smoke, both men then left the engine room.

At 1856, the skipper reported to Shetland MRSC that the fire was out, that there was a lot of fire and smoke damage, and that there was a considerable amount of fuel in the bilge.

Figure 3



CO_2 bottle and operating arrangement

Figure 4

Replicated fuel leakage from main engine duplex fuel filters

1.2.3 Post-fire: sequence of events

At 1858, the coastguard rescue helicopter arrived on the scene and the pilot discussed options for evacuation with the skipper. *Elegance* was in a stable condition, the fire was extinguished, and the crew decided to remain with the vessel and prepare for a tow. The helicopter remained overhead, illuminating the forecastle area, where the crew were preparing the towing bridle. During this period, the vessel's trawl nets remained on the seabed, effectively anchoring the vessel. While this reduced the vessel's rolling motion, and assisted the towing vessel in getting alongside, there was considerable slamming, making it difficult to prepare the tow.

At approximately 1905, the engineer and the mate went back to the engine room to check that the fire had not re-ignited. There was no indication of re-ignition but, while searching the space, the engineer noticed that an 8cm rubber flexible joining pipe, fitted to the salt water supply to the hydraulic cooler, was leaking. This prompted him to stop the after generator and to shut the sea water suction and discharge valves. This stopped the leak.

At 1917, Shetland MRSC agreed that *Shamarah II* should tow *Elegance* to Colla Firth Pier on Shetland mainland in Yell Sound. *Shamarah II* connected the tow and, at 2030, the engineer cut the trawl wires. At 2040 the helicopter left the scene to refuel, with the intention of returning, to stand by until the lifeboat arrived. At 2059, *Shamarah II* reported that she was underway and towing at 3.5 knots and had 30 miles to run to Colla Firth Pier.

The tow passed without incident, and the vessel berthed alongside Colla Firth Pier at 0812 on 31 January 2004. The Shetland MCA surveyor, Shetland fire service station officer and the police attended the vessel on arrival. Following a satisfactory inspection of the ship's lifesaving appliances and hydraulic power system, the MCA surveyor approved a proposal to tow *Elegance* from Colla Firth to Fraserburgh.

At 1700 that day, *Elegance* departed Colla Firth under tow by *Shamarah II.* The vessel arrived alongside at Fraserburgh at 1710 on 2 February, and was met by an MAIB investigating team.

1.2.4 Actions by the emergency services

The Aith lifeboat left her moorings at 1810 on 30 January, and headed towards *Elegance*, whose position was about 44 miles from the lifeboat station. The lifeboat encountered heavy seas off Aith Voe, and while approximately 5 cables from Muckle Roe, the port engine failed. The lifeboat advised Shetland MRSC that they would continue to the scene at a reduced speed of 11 knots while the defect was being investigated. As the sea conditions worsened the lifeboat's speed was further reduced to 8.5 knots. The lifeboat arrived on scene at 2218, and the engine defect was rectified at 2325. She stood off *Elegance* for the duration of the tow.

The coastguard rescue helicopter, Oscar Charlie, was scrambled at 1755 and arrived on scene at 1858. In case the situation deteriorated, the intention was to stand by *Elegance* until the arrival of the lifeboat. At 2040 the helicopter returned to re-fuel, landing at Sumburgh at 2110. The aircraft was unable to return to *Elegance* due to a higher priority medical evacuation tasking in the Ninian Oilfield.

The ETV *Anglian Sovereign* arrived on scene at approximately 0005 on 31 January, and stood by, 5 cables astern of *Elegance*, throughout the night and the following morning.

1.3 FIRE DAMAGE

Examples of smoke and heat damage are shown at **Annex A**.

The upper areas of the engine room suffered extensive smoke damage. It extended from a line about 1½ metres above the bottom floor plate level to the deckhead.

There was considerable heat damage to the pipe insulation and paintwork directly above the engine centreline and to the adjacent ventilation supply trunking. The heat detectors and light fittings sited near the engine had also melted.

The numerous electric power supply cables, and the main engine surveillance and management wiring loom situated on the starboard side of the engine, were also damaged **(Figure 5)**.

The seat of the fire was in the centre and to starboard of the main engine towards the exhaust gas supply to the turbo chargers **(Figure 6)**.

1.4 REPAIRS AND TRIALS

Details of the repairs undertaken while in Fraserburgh between 3 February and 1 March 2004 are at **Annex B**.

1.4.1 Fuel oil purifier

Throughout the recommissioning period, the fuel oil purifier failed to function correctly. It was found that the water seal could not be maintained because of fuel supply problems, initially thought to be due to a faulty float-operated valve which closed off the fuel supply. Despite changing this, neither the crew nor the marine engineering contractors were able to identify the defect to enable the unit to be set up correctly.

The unit should have been capable of an output exceeding the maximum fuel demand of both the main engine and the generator. The output on sailing was described as a “fast drip” – indicating that the unit was barely discharging fuel.

1.4.2 Fuel system

A description and drawing of the fuel system is at **Annex C**.

Setting up the fuel oil system also proved difficult. No 6 fuel tank, from which the oil transfer pump took its suction, was found to contain very little oil. Consequently, a contractor tried to use the fuel transfer pump to transfer fuel to No 6 fuel tank via the overflow from the engine room daily tank. On starting the pump, the discharge pipework compression fittings failed because the pump was running backwards, and fuel was discharged into the bilge. Contractors later repaired the discharge pipe and the fuel transfer pump was then run for about 1½ hours without incident.

Figure 5

Damage to main engine surveillance and management system electrical loom

Figure 6

Main engine showing heat damage

1.4.3 Commissioning

During the afternoon of 1 March, the skipper started to recommission the engine room systems following the extensive post-fire repair work. With the exception of the fuel transfer pump and fuel oil purifier, the after generator and other equipment, which had been rewired during the repairs, were satisfactorily tested. Main engine dock trials, and sea trials, were planned for 2 March. It was planned to then sail to the north-west of Shetland, where they would try to recover the trawl gear released on 30 January.

On 2 March, the dockside trials proved successful. Contractors continued to work on the fuel oil purifier, but failed to fully identify the fault. The investigation was abandoned at 1500, and the skipper decided the daily tank should be filled using the fuel transfer pump.

Because of the delays caused by the fuel oil transfer pump pipe repair and overrun of the refurbishment of the CO_2 fixed fire-fighting system, the engine contractors decided not to attend the sea trials on 2 March. Contractors completed the refurbishment of the CO_2 system at 1900, and the vessel sailed at 2000, with the skipper and two crew on board.

A fourth crew member failed to arrive before *Elegance* sailed.

For the first 2 hours after sailing, the engine was set at low power, and regular checks of the propulsion plant were made. All engine temperatures and pressures were normal and there were no obvious fuel, oil or water leaks. Later, when the vessel was about 14 miles off Fraserburgh, the skipper increased engine power and, although there was an apparent increase in propeller pitch setting, there was no corresponding increase in speed. The skipper decided to change the gearbox oil as it appeared to be emulsified. Insufficient oil of the correct grade was carried, and the skipper made up the shortfall by adding oil of an incorrect specification. The vessel's speed showed no improvement, however the skipper persevered with his passage to Shetland, at times only managing to make 2-3 knots against the wind and tide.

When in the Pentland Firth, the main engine agent advised the skipper to return to Fraserburgh for defect investigation and repairs. *Elegance* arrived in Fraserburgh at 0200 on 4 March. The investigation found that the controllable pitch propeller actuator in the gearbox was faulty, and the main engine management system control boards had suffered water damage. The latter was due to the wash down of the engine room during the repair period. These units were replaced.

On completion of the work, *Elegance* sailed for a short sea trial, during which the main engine and control systems functioned satisfactorily.

1.5 SECOND ENGINE ROOM FIRE, FLOODING AND FOUNDERING – 5 MARCH 2004 (all times are UTC)

1.5.1 Events prior to discovery of the fire

At 1600 on 4 March, *Elegance* sailed to recover the trawl gear that had been abandoned following the fire on 30 January. Formal watch routines started at about 2000, after machinery checks and tidying of the vessel had been completed.

A crew member took over the watch from the skipper at 2000. The vessel was upright, and making about 9.5 knots. No alarms were sounding. The weather conditions were good, and the sea very calm with a light easterly swell, giving the vessel a pleasant, slight rolling motion. At about 2130, the skipper found the engine room conditions normal before going up into the wheelhouse. He then went to his cabin.

At 2255 the skipper was called for his watch change. At the handover, the watchkeeper did not report anything unusual to the skipper, although he had not visited the engine room during his watch. The skipper had not given any instructions that he should do so. The watchkeeper regularly checked the engine monitoring data and the fuel status from the wheelhouse position.

During his watch, the skipper then visited the engine room a number of times. He also regularly scrutinised the engine room camera monitor and checked the main engine parameters from the wheelhouse position.

1.5.2 Fuel supply arrangements

During the skipper's watch, the vessel steadily adopted a 1 - 1½° list to port. This was because the daily tank was not filled continuously by the fuel oil purifier because it was defective. The daily tank, situated on the starboard side of the engine room, was at approximately 800 litres, instead of the normal level of 2800 litres. The skipper decided to transfer fuel from No 5 storage tank (situated on the port side), to the daily tank. At 0135 he configured the fuel system and started to fill the daily tank using the fuel transfer pump.

The skipper returned to the wheelhouse, intending to stop the fuel transfer pump after the high level alarm in No 6 fuel storage tank sounded. At this point, both the daily tank and No 6 tank would have been at their maximum levels of 2800 litres and 12000 litres respectively, as the overflow from the daily tank returned to No 6 storage tank.

1.5.3 Discovery of the fire and actions taken

At about 0145 on 5 March, the engine room fire alarm sounded in the wheelhouse. The skipper immediately went into the engine room and managed to get part way down the steps from where he saw a fire roughly in the vicinity of the after end of the main engine. He later described the flames as being “quite high” but with little smoke.

On the way back to the wheelhouse, the skipper met the crew, and instructed them to shut the engine room ventilation flaps on the gallows. The skipper stopped the main engine using the wheelhouse emergency stop. He confirmed that the engine revolution meter was at zero. He then went aft to help close the ventilation flaps where light bluish/grey smoke was seen coming from the exhaust vents.

The skipper then went directly to the CO_2 compartment, situated immediately aft of the starboard gallows. Both crew members went to the wheelhouse. One crew member watched the fire on the engine room camera wheelhouse monitor. The flames were seen at the bottom left of the screen **(Figure 7)**, which coincides with the vicinity of the starboard turbo charger, fuel oil purifier and fuel transfer pump. The flames which could be seen were yellow, about 1.25 metres high with black smoke, but not extending to the port side of the engine.

Figure 7

Engine room monitor showing fixed coverage

At approximately 0155, the skipper operated the CO_2 system. Both crew in the wheelhouse heard the release of gas and saw, on the monitor, the flames being dampened down. Immediately afterwards, at about 0158, one of the crew went to the fuel valve remote shut off operating position. He operated all the levers and closed all the fuel valves. He then returned to the wheelhouse.

At this point, the skipper decided to conserve as much electrical power as possible while the generator was still running. He switched off the engine room monitor and radar. This left the VHF set tuned to channel 16 and the 2182 MF set as the only equipment live in the wheelhouse. One of the crew advised that the vessel was close to the rocks off Reef Dyke **(Annex D)**. He suggested that the radar should be switched on again. This was done, and in the meantime, the skipper instructed him to monitor the water depth using the echo sounder.

On returning to the engine room, the skipper and a crew member cracked open the door, but the smoke and CO_2 prevented them from entering the space. However, they heard a "hissing" sound, which they thought might have been leaking refrigerant gas or escaping water.

1.5.4 Immediate post-fire actions

At 0213, the skipper transmitted a "Pan Pan" alerting Shetland MRSC that *Elegance* had suffered an engine room fire at position 59° 20'N 002° 20'W **(Annex D)** and that a tow may be necessary**.** On the basis that the engine room door was cool, and no sound of fire could be heard from within the compartment, he believed that the fire was extinguished.

A short while later it was noticed that the previous "hissing" was replaced by the sound of water ingress. Immediately afterwards, the generator stopped, having exhausted the fuel supply contained in the pipework between the daily tank quick shut off valve and the generator. The vessel then lost normal electrical power. At about that time, the battery-powered engine room high-level bilge alarm sounded, although the significance of this was not realised.

The skipper did not give any consideration to the risk of re-ignition. He instructed that the ventilation flaps and the engine room escape hatch should be opened in an attempt to purge the compartment of smoke and CO_2. On opening the ventilation flaps, the effect was such that the crew had to face into the wind to avoid inhaling the toxic gases discharged from the ventilator openings.

The skipper's priority at this time was to identify the source of the obvious flooding in the engine room. The source was not identified. The ingress of water into the engine room could not be limited because there was no method of closing the sea valves from outside the engine room. Neither could the water level be reduced because the electrically-driven salvage pump was stowed in the flooded engine room, and there was no electrical power.

1.5.5 Actions by the emergency services

Shetland MRSC tasked the Kirkwall lifeboat at 0215. It was underway at 0226 with an ETA at *Elegance* of 0400. At 0230, the coastguard helicopter at Sumburgh was tasked, and this arrived at the scene at 0341. The Fishery Protection Vessel *Norna* overheard the “Pan Pan” transmission, offered assistance, and was tasked by Shetland MRSC at 0254 with an ETA of 0700.

There was a possibility of *Elegance* grounding on the rocks at Reef Dyke. In case a tow was necessary, Shetland MRSC tasked the ETV, *Anglian Sovereign*, to get underway at 0303 and proceed towards *Elegance*. The vessel’s ETA was 0800.

1.5.6 Flooding situation – actions by the crew and abandonment

The skipper and one crew member made several attempts to enter the engine room but, as indicated earlier, were thwarted by the toxic gases. During one attempt, they noticed water had covered the gearbox. The skipper checked the fish hold, which was free of water, but he did not check the net store. The skipper also opened the two tonnage valves on the net handling area of the main deck to drain away any accumulated water. The vessel’s general arrangement and positions of the tonnage valves are shown at **(Annex E)**.

Meanwhile *Elegance* adopted an increasing port list and rolled slowly and regularly through 15 – 20°. As time progressed, the roll period became much longer. At 0333, with the situation on board the vessel becoming progressively worse, the skipper transmitted a “Mayday”. Throughout this time the engine room high level bilge alarm sounded.

At 0340, the vessel was in close proximity to rocks at Reef Dyke, off North Ronaldsay, so the need to connect a tow became more urgent. The latest ETA for the lifeboat and the ETV was 0400 and 0800 respectively.

At 0341, the helicopter arrived on scene and stood by to evacuate the crew if the situation worsened before the lifeboat arrived. The skipper requested the transfer of breathing apparatus from both the helicopter and lifeboat to enable safe access into the engine room. He was advised that neither carried the equipment. Meanwhile, the crew rigged the towing bridle in preparation for the lifeboat’s arrival.

At 0400 the lifeboat arrived on scene and attached a towing line to Elegance. At 0406 the tow began to move *Elegance* to a safer area. At 0414 the helicopter returned to Sumburgh to refuel and was back on scene at 0508. The lifeboat’s salvage pump was eventually transferred to *Elegance* by the helicopter at 0530. The pump was immediately rigged to take a suction from the engine room via the escape hatch **(Figure 8)**. Just prior to the pump being transferred, the skipper entered, and went part way down the engine room escape trunk. He saw that the water level was now above the top floor plate level, this being well above the engine.

The salvage pump took about 10 minutes to start. Unfortunately the suction pipe was repeatedly blocked by rags and other debris, causing the pump to fail frequently. At 0612 the vessel adopted a 6-8° list to port and trimmed by the stern.

The situation was clearly deteriorating and, at 0614, the lifeboat went alongside and the crew abandoned *Elegance.* The tow was dropped before the crew abandoned the vessel, but the salvage pump was left running. With the crew safely on board the lifeboat, FPV *Norna* was released at 0608 and the helicopter at 0617. At 0703 the lifeboat reported that the salvage pump had stopped and that *Elegance* was “heavier” in the water, but with now only a slight list to port of 1-1½°.

Figure 8

1.5.7 Salvage

The ETV arrived on scene at 0800. The wind was southerly, force 4 to 5 with a south-easterly swell of over 3m. At 0845 the ETV recovered the lifeboat's towing line while approximately 5 miles off Ronaldsay **(Annex D)** and began towing *Elegance* at about 5 knots towards Kirkwall. At that point the list increased to approximately 4-5° to port, but the vessel appeared stable. In the meantime, the lifeboat left the scene at 0818 and arrived at Kirkwall at 0939 to land the crew of *Elegance*.

At 0936, following discussions between the owners of the ETV and the insurers of *Elegance*, approval was given by the SOSREP to continue the tow under a 'Lloyd's open form' agreement. A salvage team was not put on board *Elegance* at this time because of the poor sea conditions and the risk this posed when transferring personnel.

At 1100, the ETV reported that the list had reduced to 2° to port, weather conditions remained virtually unchanged, and that its ETA to a position 1.5 miles from Kirkwall's harbour limits was 1400. At 1200 the list was reported as more than 4° to port, and by 1330 this had increased to more than 6°.

The ETV was now in more sheltered waters, so the master attempted to recover the situation. A three-man salvage team, under the control of the chief officer, was transferred to *Elegance* together with two, 36m^3/hour salvage pumps.

The salvage team entered the wheelhouse and then the accommodation areas. All were clear of water. No attempt was made to enter the engine room because of the CO_2 warnings posted on the access door. One pump was rigged to take a suction from the engine room emergency escape hatch. The water level in the engine room was just below deckhead level with the vessel listing to port. The salvage team rigged the second pump to take a suction through a hatch which the team thought led to the fish hold, which appeared to be full of water. The salvage team had mistaken the net handling deck area as the fish hold **(Annex E)**.

At 1420 *Elegance* suddenly heeled over further, and settled with a list of 15-20° to port. The master of the ETV immediately ordered the salvage team to leave their pumps and abandon the vessel. At 1425 the list increased to about 25° - 30° to port. The ETV turned towards deep water and informed Shetland MRSC and the Orkney Harbour Authority of the situation. *Elegance* took on an increasing list to port and settled by the stern and, at 1428, the towing bridle parted. *Elegance* finally sank by the stern **(Annex F)** at 1455, in position 59° 01.57'N 002° 42.4'W, in about 35m of water **(Annex D)**.

The ETV remained on scene until 1730, to deal with any pollution. Although *Elegance* contained 40,000 litres of marine gas oil, and 1500 litres of hydraulic oil, there was only very minor pollution. The two liferafts carried by *Elegance* were released, then inflated as the vessel sank. These were subsequently recovered by the ETV.

1.6 VESSEL HISTORY

Elegance was owned by the Elegance Fishing Co Ltd. Her skipper, who has 25 years of fishing experience, owned the 80 percent majority share. This was the second *Elegance* owned by the skipper: the first, a wooden hulled trawler, was sold on after 10 years of ownership, and is still in use.

From delivery in October 1998, until March 2002, the vessel operated without major concern. In March 2002 *Elegance* capsized at her moorings in Peterhead, having settled on the bottom at low water and then flooding on the rising tide. The flooding was thought to be due to seized tonnage valves allowing back-flooding to the net handling area.

The vessel was repaired in Hull. The repairs included a complete overhaul of the main engine and auxiliary equipment, and rewiring of the vessel. A number of post-repair defects occurred. These were:

Incorrect electrical phase connections resulting in a number of electrical fires predominantly on wheelhouse equipment.

Fuel tank contamination.

Severe main engine vibration for about 6 months due to engine misalignment.

1.7 FIRE AND SMOKE DETECTION

First fire

The engine room was fitted with three thermal alarms which sounded at the wheelhouse alarm indication and test panel. The skipper usually tested the alarms on sailing. There were no smoke alarms fitted in the engine room. When activated, the system automatically stopped the fuel oil purifier and the ventilation supply fan situated in the engine room, but not the fuel transfer pump. It is clear that the first indication of the fire was when smoke was seen issuing from the exhaust ventilation terminal.

Second fire

During the repair period following the first fire, the skipper had fitted smoke detectors in the engine room, to supplement the thermal detectors.

1.8 CO_2 SYSTEM

A description and diagram of the CO_2 system is at **Annex G**.

Despite the complete overhaul of the system in August 2002, the overall condition of the compartment and components was poor. There were many defects, including: faulty electrical alarm interlocks, a corroded operating cable

which parted when pulled, a seized engine room isolating valve, and no operating instructions. The compartment was not locked and there was no frangible key box on the outside of the compartment. Accordingly, there was a risk that the system could have been operated while a member of the crew was in the engine room.

The CO_2 system, operating routines and safety procedures were not fully understood by any of the crew, and none had any specific training on the system

It was reported that during the overhaul of the system following the first fire, the pipework was found to be contaminated by corrosion scale. This could have influenced its effectiveness had the system been correctly operated.

1.9 ENGINE ROOM CAMERA

A surveillance camera was situated on the starboard side of the engine room covering the main engine. The monitor for this camera was placed at the forward end of the wheelhouse and slaved into a normal television, which could also be used for commercial terrestrial viewing.

To view the engine room, the television had to be switched over, but, in practice, this seldom happened and the monitor was normally set to display a terrestrial television channel.

1.10 CREW EXPERIENCE

The vessel usually operated with a crew of five: the skipper, engineer (who also acted as a deckhand), mate and two deckhands. The skipper holds a Class 2/Full Special certificate and has undertaken a number of additional courses covering risk assessment and safety awareness. In 1986, he attended a one-day fire-fighting course accredited by Aberdeen Technical College.

The mate, who holds a mates Full and Special Certificate, has been fishing since 1980 and joined *Elegance* in January 2003. The engineer has been in the industry for 18 years and holds a Fishing 2nd Engineer's Certificate.

1.11 TRAINING

The skipper's responsibility for conducting monthly safety drills is laid out in MSN 1707(F) Chapter 8 and states:

8.1 EMERGENCY PROCEDURES

8.1.1 Inspections

8.1.1.1 Inspections of the life-saving equipment and fire appliances should be made at intervals of not more than one month.

8.1.2 Drills

8.1.2.1 The skipper should ensure that the crew are trained in the use of all life-saving and fire appliances and equipment with which the vessel is provided and should ensure that all members of the crew know where the equipment is stowed. Such training should be carried out in drill, held in port or at sea, at intervals of not more than one month.

8.1.2.2 The drills referred to in section 8.1.2.1 should ensure that the crew thoroughly understand and are exercised in the duties which they have to perform with respect to the handling and operation of all life-saving, fire fighting and survival equipment. Flooding drills should also be incorporated.

8.1.2.3 If a vessel carries 5 or more crew, a muster list should be provided with clear instructions for each member of the crew, which should be followed in case of emergency.

8.1.2.4 The times, dates and particulars of inspections and drills should be recorded and available for future inspection.

Only one of *Elegance*'s crew members had not completed the mandatory fire prevention course, but there is little in the Seafish training syllabus which covers precautions for re-entry following the use of CO_2 fixed fire-fighting systems. A time guideline of 3 minutes is suggested to cover gas smothering and halon installations. A copy of the syllabus from MSN, M.1367, Annex A and the Seafish Training syllabus is at **Annex H**.

1.12 MCA CERTIFICATION

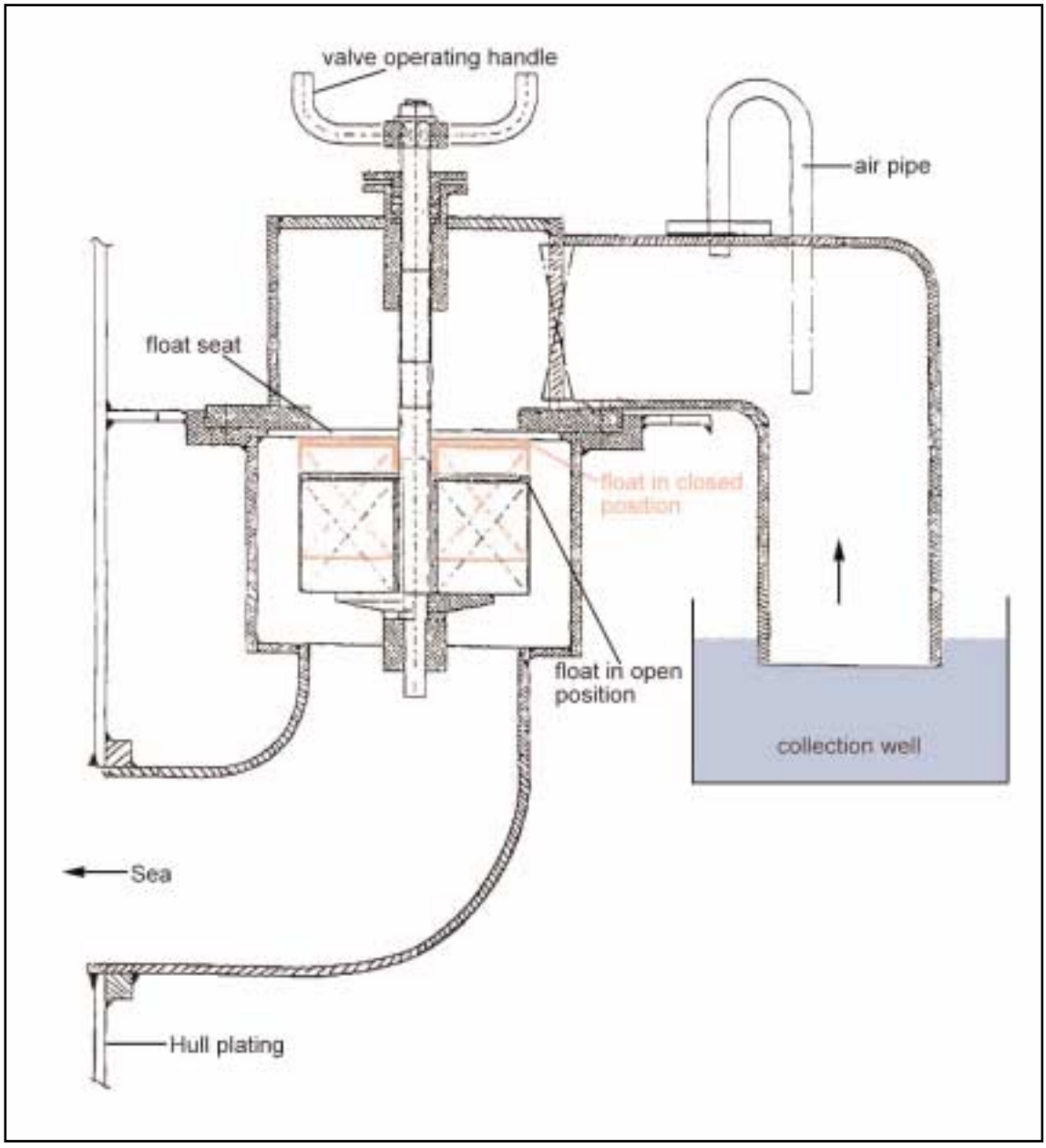
Elegance was subject to a periodic 5 year survey, with an interim inspection being conducted at the 2½ year point. The inspection was due in February/March 2004.

A targeted inspection was conducted on 31 January 2004 as recorded at **Annex I**. This required the skipper to notify the MCA when the repair work had been completed. The requirement was reiterated by the attending MCA surveyor while the vessel was in Fraserburgh. On 2 February 2004, a further United Kingdom Fishing Vessel Certificate was issued, valid until 31 May 2004 **(Annex J)** while the vessel was undergoing repairs. This short-term certificate was issued on the basis that the stability booklet was still being developed. However, there are no codicils indicating this.

1.13 TONNAGE VALVES

The purpose of the tonnage valves is to evacuate water from deck wells through the action of the internal float, which creates a siphon and discharges the water overboard **(Figure 9)**. When the valve is in the closed position, the float is hard up against the valve seat; this prevents any passage of water. In the open position, the float is free to operate, when water attempts to travel back from the sea, the float rises and shuts the outflow back to the well.

Figure 9



Tonnage valve arrangement

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes of, and the circumstances surrounding, the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

ENGINE ROOM FIRE - 30 JANUARY 2004

2.2 PROBABLE CAUSE

The probable cause of the fire was fuel oil leakage from a displaced ventilation plug on the main engine, after fuel oil duplex filter, which came in contact with a hot surface. The sequence of events, including the means by which the fuel came in contact with the heat source, is discussed below.

2.3 FUEL CONTACT WITH IGNITION SOURCE

Prior to the fire, the engine room was last visited by the engineer, at approximately 1430, some 3 hours 20 minutes before the accident. No defects were evident.

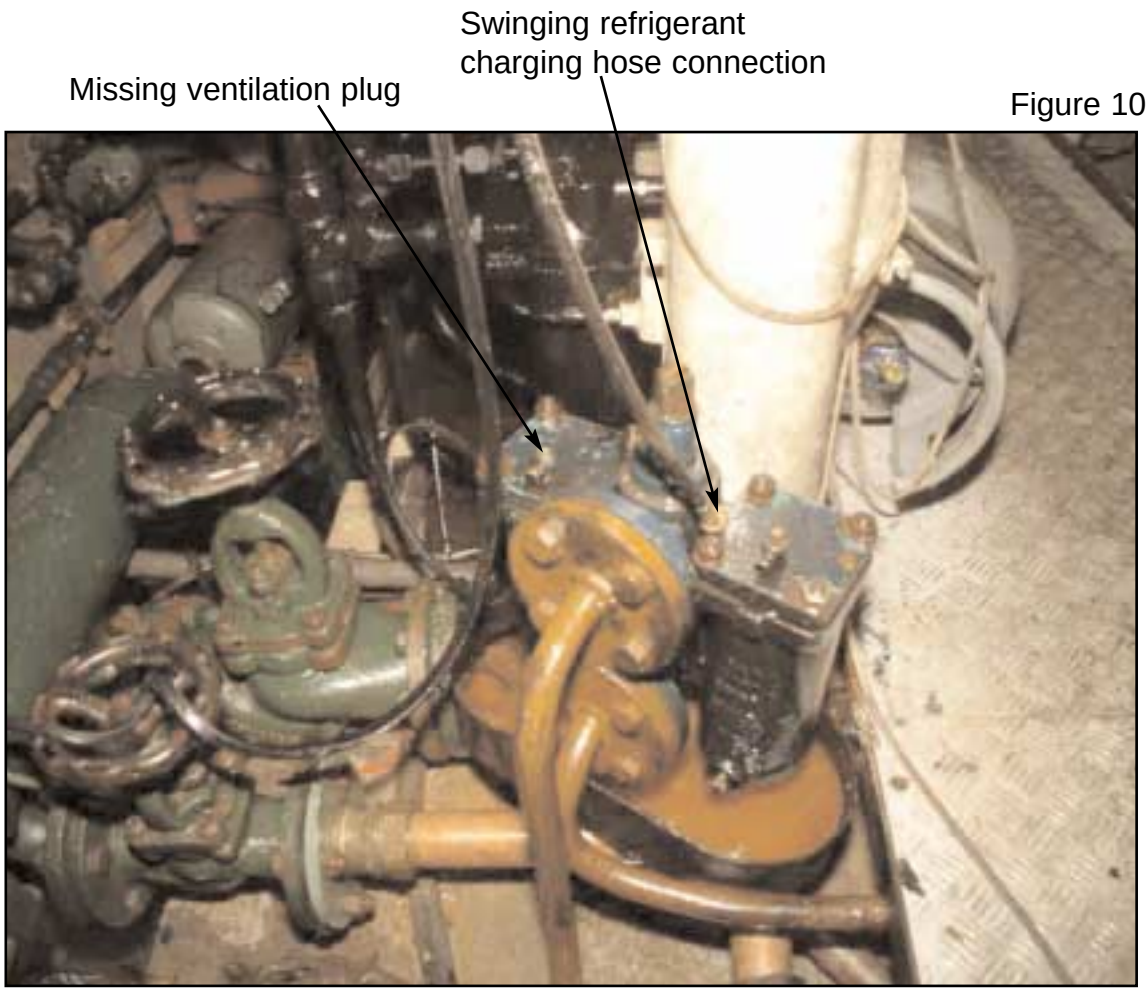
When, subsequent to the fire, the skipper and engineer entered the engine room, they saw fuel discharging from a missing ventilation plug on the after duplex filter. The filter was situated about 1 metre aft, and slightly to starboard of the rear of the main engine.

The ventilation plug on the after duplex fuel oil filter probably became loosened by the continued impact of the brass connection of a refrigerant charging hose. This was suspended above the plug, and swung freely under the influence of the rough sea conditions **(Figure 10)**. Once loosened, the combination of vibration, and further impact with the charging hose, finally caused the plug to come away from the filter top, dropping into the saveall under the filter, where it was later found. The threads of both the plug and filter top were found to be in good condition. There was nothing to suggest that the plug had been removed intentionally.

The fuel escaping from the after filter would have flowed into the bilge and accumulated across the top of the starboard fuel storage tanks. The fuel would have formed a large pool on the tank top constrained by the tank lip. As the weather conditions worsened, the fuel slopped against the tank lip, spraying onto the engine and down the starboard side, soaking the engine management and surveillance electrical looms.

The spray of fuel was ignited by the hot exhaust gas manifold which was at about 600°-620°C. As more fuel spilled on to the engine, it also ignited, feeding the fire.

Figure 10



Main engine duplex fuel oil filter arrangement

As the pitch was taken off the propeller, the trawl nets effectively anchored the vessel. The crew reported that the vessel's pitching and rolling reduced, which probably caused less fuel to be displaced from the tank top. This, together with the shutdown of the engine, and forced ventilation fan, resulted in the fire being extinguished.

The investigation found that the daily tank had lost about 900 litres of fuel from its normal operating level of 2800 litres. The flow from the vent cock amounted to about 10 litres/min or 600 litres/hour. On this basis, it can be assumed that the vent cock could have been leaking for up to 1½ hours, and this would account for the considerable amount of fuel found in the bilge.

Post-accident tests showed that the fuel issued approximately 1 metre vertically from the duplex fuel filter ventilation plug under daily tank gravity conditions. Some fuel drained into the bilge, with the remainder settling on the starboard tank tops adjacent the main engine.

It was possible that leakage had occurred from the main engine, generator low pressure fuel oil systems, or from the fuel oil transfer system. But these possibilities were dismissed following successful pressure testing. During commissioning, the main engine high pressure fuel system was also proven to be intact. No leaks were found on the engine lubrication oil system either. During overhaul of the turbo chargers, no evidence was found of oil starvation, indicating that there had been no loss of oil.

2.4 HEAT SOURCE

The fire damage was concentrated above the rear of the main engine above the turbo chargers. The extent of damage in this area indicates that the seat of the fire was probably the hot exposed surface of the exhaust gas manifold.

2.4.1 Main engine parameters

During the period before the accident, the skipper had concerns about the high exhaust gas temperatures. The temperatures regularly reached over 600°C when the engine was at maximum load during trawling, and it had been suggested that the turbo chargers and associated oil leaks were possibly the cause of the fire.

Scrutiny of the engine test bed data indicates that this temperature is well within the normal range and, indeed, temperatures up to 675°C will be seen under certain loading conditions. Interrogation of the engine management and surveillance system indicated no abnormal parameters had been recorded, and the warning threshold of 680°C had not been reached. Indeed, the last engine warning was recorded 700 hours previously, when the cooling water temperature had been exceeded.

Both turbo chargers were removed for overhaul following the fire. On inspection, the units were found to have normal wear patterns.

Following downloading of the engine monitoring software, it was clear that the engine did not shut down under any fault condition. Instead, the engine was stopped intentionally from the remote wheelhouse position. There is no evidence to suggest that an engine defect caused the fire.

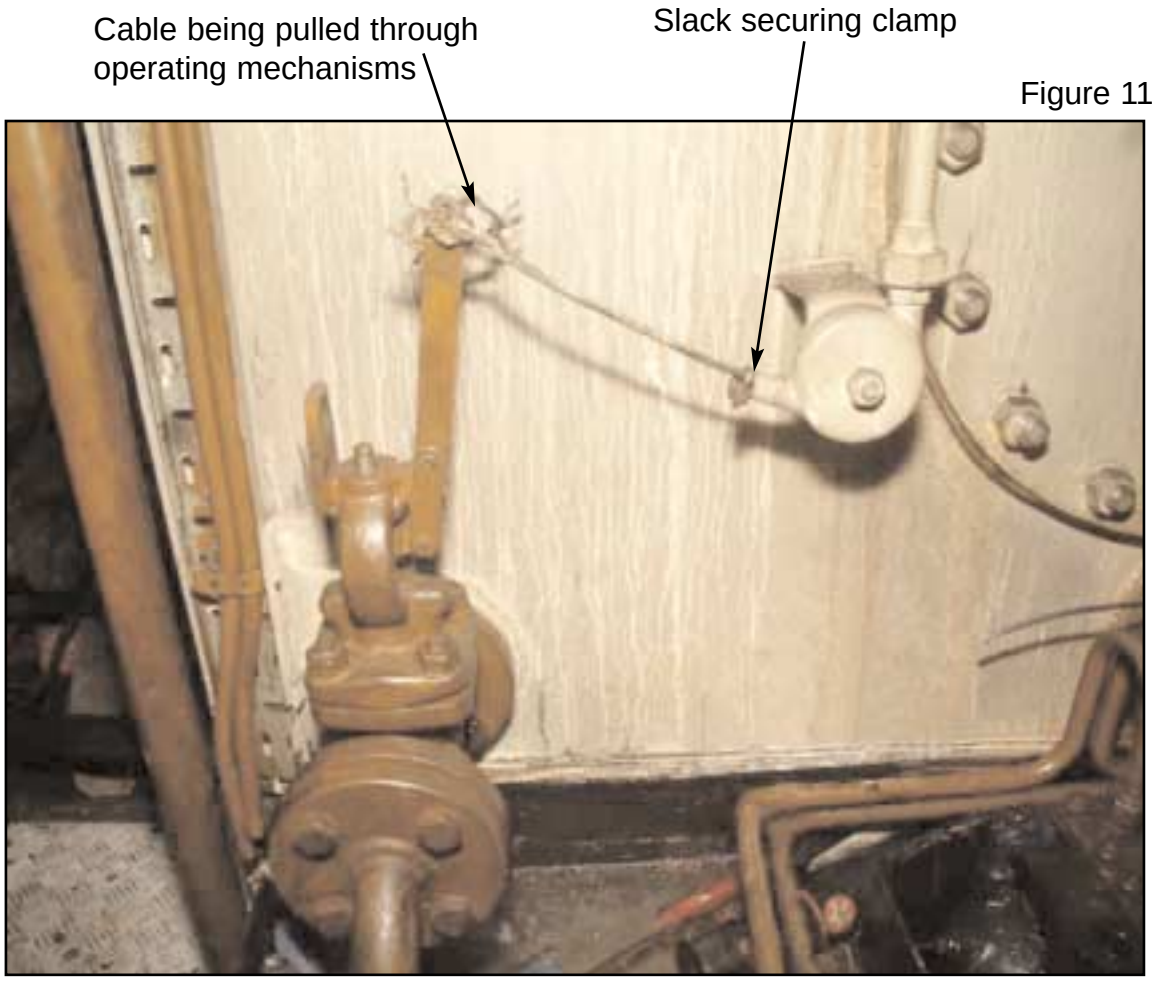
2.5 EFFECTIVENESS OF FIRE-FIGHTING

The purpose of any fire-fighting system is to detect the source of the fire, and to contain and extinguish it. The effectiveness of the system is dependent on the quality of maintenance, and the knowledge and skill of the operator. Poor maintenance, and lack of knowledge and skills, were significant factors which hindered the system's effectiveness.

2.5.1 Fuel supply isolation

The fuel oil supply to the main engine and generator was maintained, despite the skipper's attempt to close the quick shut off valve remotely. The clevis pin which should have connected the cable to the remote operating handle was missing. The skipper then attempted to close the valve by pulling on the loose cable; this was also unsuccessful because the clamp securing the cable to the shut off valve was loose **(Figure 11)**.

Figure 11



Daily tank quick acting fuel oil shut off valve arrangement

There was no evidence to show, and none of the crew were able to identify, the last time the fuel valve emergency operating arrangements had been tested. In this case, the main engine and generator continued to run, but none of the crew appreciated that this was because the fuel had not been isolated. It was not until late into the incident that the engineer stopped the main engine from the wheelhouse position.

Post-accident tests have shown that the valve operated correctly from the local engine room position, and was leak free. Therefore, if the operating lever and cable had been properly connected to the valve, the fuel supply would have been isolated and the source of the fuel for the fire removed.

2.5.2 CO_2 system

The CO_2 system did not operate effectively because it was badly maintained, the crew were unaware of the correct operating and compartment isolation procedures, and there were no system-specific operating instructions posted. Despite a recent inspection, these shortcomings were not identified.

Even if the smothering gas had reached the space, its effectiveness would have been severely reduced. Gas would have been lost because the ventilation flaps were left open and the main engine and generator were still running.

The crew were also unfamiliar with the safety procedures required for re-entry following use of CO_2, in particular the need to fully ventilate the engine room, and the need to confirm that the compartment had been fully purged of CO_2 and combustion gases.

This was a fundamental and extremely dangerous lack of knowledge. If the CO_2 had been successfully discharged, then it is highly likely that fatalities would have resulted when re-entry was made to the engine room.

2.5.3 Fire-fighting preparedness

MSN1303 requires skippers to conduct safety drills once a month, and any training conducted should be recorded in the vessel's official logbook. If it is not possible to conduct a safety drill at the specified interval, the reasons for this should also be recorded in the official logbook. There is no present requirement for on board crew training to be assessed by an external authority.

Although all except one crew member had completed the mandatory fire prevention course, they were unprepared to fight a fire effectively. No emergency drills had ever been conducted on board *Elegance*. Had training been undertaken, the crew would have been better prepared to deal with the fire and operate and understand the CO_2 systems and related precautions associated with re-entry.

2.6 EFFECTIVENESS OF ENGINE ROOM SURVEILLANCE

The skipper had no standing instructions for watchkeepers to visit the engine room during their watch. It was custom and practice for the skipper or engineer to be called to investigate alarms.

It was not routine practice for the watchkeeper to use the wheelhouse monitor connected to the engine room camera to check the state of the compartment. Instead, it was routinely used to watch terrestrial television channels. The crew did not appreciate the importance of using the facility to ascertain the status of the engine room during emergency situations.

2.7 THERMAL AND SMOKE ALARMS

Neither the Code under MSN 1770(F), nor Guidance to MCA Surveyors, gives definitive guidance on the type and number of detectors to be fitted in machinery spaces. This engine room was fitted with thermal detectors only. These will operate only when a fire has broken out and heat has built up in the engine room. Consequently, by the time the fire alarm sounds, damage to vital equipment will have already occurred.

The fitting of smoke detectors, to complement the heat detectors, gives some chance of earlier detection of a possible fire. Timely action can then be taken, which could reduce the likelihood of vessel disablement and loss.

ENGINE ROOM FIRE - 5 MARCH 2004

2.8 PROBABLE CAUSE OF THE FIRE

On this occasion, with smoke detectors having been fitted, the first indication of the fire was from the fire alarm. Because the evidence was lost with the vessel, it has not been possible to establish with certainty the cause of the second fire. It is known from the skipper's observation, and that of the crew, who watched the situation develop on the engine room camera monitor, that the fire was in the vicinity of the after end of the main engine.

A crew member also stated that the full extent of the flames seemed to be out of the camera's range, and the fire appeared to be around the engine and off to the starboard side of the engine room.

It is most probable that the fire was caused by either fuel, lubricating or hydraulic oil impinging on the hot surface of the engine. In this case it is unclear how the fuel supply leaked into the engine room.

The skipper was confident that the fuel system was configured correctly for the fuel transfer pump to discharge to the daily tank. It is feasible that 10 minutes after starting the fuel transfer pump a leak developed on the pump pipework (this had already been experienced during the commissioning work). Fuel oil might have sprayed onto the hot end of the engine and ignited due to the close proximity of the fuel oil transfer pump to the main engine **(Figures 12 & 13)**.

It is also possible that there had been a leak on the high-pressure side of the main engine fuel oil supply system, or on the lubricating oil pipe connections supplying the turbo chargers.

The skipper confirmed that when he started the pump there were no obvious leaks, and that he took special care to check the main engine fuel filter ventilation cocks to ensure that they were tight and leak free.

Figure 12

Fuel oil transfer pump pipework arrangement

Figure 13

Position of fuel oil transfer pump in relation to main engine

2.9 CREW INITIAL ACTIONS

The crew actions were far better co-ordinated on this occasion, than those taken when reacting to the fire on 30 January. The main engine was stopped, ventilation flaps were closed in quick time and the CO_2 system was operated correctly. However, the fuel valve shut off levers were operated after the CO_2 system was used; these should have been closed before the system was activated to ensure the best chance of success.

The skipper was given good advice by the crew member who watched the engine room camera monitor and saw the flames being beaten down under the influence of the CO_2

2.10 CO_2 SAFETY CONSIDERATIONS

The skipper risked his life in attempting to re-enter the engine room without it being properly purged and proven to be clear of gas. Although the drive to enter and attempt to find the cause of the "hissing" noise and, later, the water ingress, is understandable, he was almost overcome after taking only one or two steps into the engine room.

There is clearly a need to strongly reinforce the advice regarding the dangers and precautions to be taken when using the CO_2 system.

ENGINE ROOM FLOODING AND SUBSEQUENT FOUNDERING - 5 MARCH 2004

2.11 PROBABLE CAUSE OF THE FLOODING

How water ingress into the engine room occurred is not certain. However, there is no evidence to indicate water leakage through a breach in the hull or from back-flooding through the bilge system. Thus, leakage most likely occurred due to failure of the sea water piping system.

The sea water piping system was fitted with flexible rubber hoses to account for engine vibration and pipe misalignment. It is most likely that heat from the fire caused at least one of the rubber connections to fail, resulting in the flooding. It is clear that fitting rubber connections with a low melting point, in engine room sea water systems, is not good practice.

2.11.1 Flooding progress

The "hissing" sound heard by the skipper and crew soon after the fire, was unlikely to have been refrigerant gas escaping, because none of the low level gas alarms fitted in the engine room had sounded. There is no reason to doubt the integrity of the alarms, as these had been proven as part of the recommissioning work. The sound was probably the initial failure of one of the engine cooling water bellows pieces or a length of the sea water flexible rubber pipe. The "hissing" stopped, probably replaced by the sound of water ingress as the failure developed.

There was nothing the crew could do to prevent the rate of increase of flooding without entering the engine room, which was impossible due to the presence of CO_2. The sea water valves were not fitted with a remote operating facility. Had they been, it is possible the flooding rate could have been stemmed, increasing the likelihood of survival.

The vessel already had a list to port before the incident, and this worsened as the rate of flooding increased. As the water level increased in the engine room above the level of the tank tops, the vessel exhibited the classic signs of loll as the free surface took effect. As the engine room filled with water, the vessel adopted an increased trim by the stern.

2.12 FISHING VESSEL SEA WATER SYSTEMS STUDY

In the UK, flooding and foundering accounts for over 50% of the losses of Scottish fishing vessels. Flooding in engine rooms is a significant source of these losses. Consequently, the MCA is assessing the design aspects of sea water systems following the January 2003 study by Banff and Buchan College on the subject.

Further, to complement this initiative, and in consequence to the MAIB's investigation into the loss of the fishing vessel *Aurelia* in August 2001, a recommendation on the accessibility of sea water valves in the event of rapid flooding is being considered by the MCA.

The Banff and Buchan study does consider the risk of flooding due to the failure of sea water system components. However, the risk study does not consider the effect of low melting point of flexible sea water hoses.

Given the probable circumstance of this case, the MCA's consideration should extend to review the advice given on the melting point, fire retardant standards, and end fitting arrangements of flexible pipes in engine rooms.

2.13 FOUNDERING

It is known that the net handling area was flooded. This, together with the probable flooding of the net store, would have led to the reduction of stability to the vessel, and to the increasing trim by the stern.

The skipper had checked that the forward watertight doors and hatches were closed. However, he had not checked the after part of the vessel to establish that the hatch between the net store and the net handling area was properly secured. It is likely that either:

a. Water got on to the net handling area through faulty tonnage valves, and then down into the net store; or

b. The after engine room bulkhead was not fully watertight, and sea water flooded through to the net store and thence on to the net handling area.

In either case, there was sufficient ingress of water aft for the vessel eventually to plunge by the stern.

2.14 SALVAGE

2.14.1 On board salvage pump

Elegance held one portable salvage pump as required by the regulations. This was electrically-driven and stowed in the engine room. Because electrical power was lost, and the engine room space was flooded, the unit could not be used when required.

It is good practice to stow portable pumps in a readily accessible position for use in any part of the vessel. While the regulations (MSN 1770(F)) do not specify that a diesel pump should be carried, this type of pump does provide better flexibility than an electrically driven unit and, in this case, would have provided a better chance of success.

2.14.2 Lifeboat salvage pump

The priority for the lifeboat once on the scene, had been to tow *Elegance* away from Reef Dyke and avoid the risk of pollution. Therefore, the lifeboat salvage pump was not transferred until 0530.

Once the pump had been transferred it made little impact on the engine room flood because its suction pipe was frequently blocked by rags and other debris. Discipline in keeping equipment correctly and securely stowed and keeping spaces clear of debris will increase the chances of survivability in flooding situations.

2.14.3 ETV salvage attempt

The salvage team rigged a salvage pump to discharge water from the engine room space. The suction hose of a second salvage pump was placed down an access into, what the salvors believed, was the fish hold. They were mistaken, however, and the second pump was actually pumping from sea to sea from the net handling area. The effect of this error was to reduce the pumping capability of the salvage operation by 50%.

The skipper was keen to return on board *Elegance* to assist and advise on the salvage effort, but because the stability of the vessel was unclear he was not able to do so. However, it would have been useful if the salvage team had discussed the vessel's layout and extent of flooding with the crew of *Elegance*. This would have enabled the team to prioritise the salvage effort, especially on critical areas that needed to be pumped out.

SECTION 3 - CONCLUSIONS

3.1 FIRES

The first engine room fire on 30 January 2004 was probably caused by fuel leaking from the displaced ventilation cock of the after main engine duplex fuel filter. The resultant fuel leakage might then have accumulated on the starboard tank tops and, under the heavy rolling conditions, was sprayed onto the centreline and starboard side of the engine, where it ignited.

The cause of the second engine room fire on 5 March 2004 is uncertain.

It is likely that fuel oil sprayed onto the main engine from a leak on the fuel transfer system, which was in use at the time. Alternatively, the source could have been from a leak on the main engine fuel or lubricating oil system or from the hydraulic system.

3.2 FLOODING AND FOUNDERING

The flooding following the fire on 5 March 2004, was probably caused by sea water entering the engine room after either a sea water flexible rubber connecting pipe, or an on engine flexible pipe coupling, failed, due to the fire. The progressive engine room flooding resulted in loll and increased list. This probably allowed back-flooding through the tonnage valves, and possibly through the net store, onto the net handling area, eventually causing the vessel to founder.

3.3 SAFETY ISSUES

The following safety issues have been identified by the investigation. They are not listed in any order of priority.

1. The main engine fuel supply quick shut off valve failed to operate because the cable was detached from the operating lever, and the cable connection at the valve was not secured correctly. [1.2.2,2.5.1]

2. While the fish hold was checked for flooding, nothing was done to check the watertight integrity of compartments aft of the engine room. [1.5.6]

3. Poor husbandry in the engine room resulted in the lifeboat salvage pump suction hose frequently becoming blocked with debris including rags. This hampered the efforts to pump out the engine room. [1.5.6, 2.14.2]

4. The CO_2 system was badly maintained, warning interlocks were inoperative, the emergency pull cable so badly corroded that it failed when pulled, the engine room isolating valve was seized, and there were no operating instructions. [1.8,2.5.2]

5. The crew did not understand the need to shut down the main engine and isolate the engine room from external air supplies by closing the ventilation flaps prior to operating the CO_2 system. [1.8,2.5.2]

6. The crew had a fundamental and, potentially extremely dangerous, lack of knowledge regarding the use of the CO_2 system, and of the safety precautions to be taken prior to making a re-entry into a space which had been flooded with the gas. [1.8,2.5.2]

7. Contrary to regulatory requirements, no emergency drills had been conducted. [1.11,2.5.3]

8. The mandatory Seafish Fire Prevention and Fire-fighting at Sea course does not include an explanation of the safety precautions to be adopted following the use of a CO_2 fixed fire-fighting system. [1.11]

9. There was no established routine for testing the fuel emergency quick shut off valves. [2.5.1]

10. Despite the belief that all fuel quick shut off valves had operated, none of the crew appreciated that the main engine and generator fuel valve must have remained open because the generator continued to run. [2.5.1]

11. A recent inspection had failed to identify significant shortcomings in the CO_2 system. [2.5.2]

12. There is no present arrangement for on board crew training to be assessed by an external authority. [2.5.3]

13. There were no standing instructions for watchkeepers to visit the engine room or to monitor the space using the remote camera facility in the wheelhouse. [2.6]

14. There is no clear guidance on the type (thermal or smoke) or number of alarm sensor heads that should be fitted in machinery spaces. [2.7]

15. There was no method of remotely operating the engine room sea water valves. If there had been, it is possible that the flooding rate into the vessel could have been stemmed, increasing the likelihood of survival. [2.11.1]

16. A readily accessible, portable diesel-driven salvage pump was a practical alternative to the electrically-driven salvage pump, which was rendered useless because of its location in the flooded engine room and the loss of electrical power. [2.14.1]

17. Given that the crew of *Elegance* had first-hand knowledge of the vessel, an exchange of information between the crew and the ETV salvage team would have been beneficial. This might have provided the salvage team with a better appreciation of the general layout of the vessel, which would have helped the salvage attempt. [2.14.3]

SECTION 4 - ACTIONS TAKEN

4.1 MAIB SAFETY BULLETIN

The MAIB published a Safety Bulletin in March 2004 following the fire on 30 January. The publication was distributed to the fishing industry via fishing related media and to the Fishing Industry Group Training Associations. A copy of the bulletin is at **Annex J**.

The safety recommendations made in the bulletin focus on the need to have a thorough understanding of the operation and related safety precautions when using fixed CO_2 fire-fighting systems. The bulletin makes particular reference to the safety precautions which must be adhered to before entry to any space which has been flooded with CO_2, and of the need for proper maintenance and testing routines.

4.2 MCA GUIDANCE ON THE USE OF THE ETV

The MCA is conducting a review of the guidance to the coastguard on the use of the ETV. In particular, the review will cover procedures to be taken when the ETV is under MCA contract, and a vessel has been abandoned but does not present an immediate pollution risk or hazard to other shipping.

4.3 THERMAL AND SMOKE ALARM SENSORS

The owner of *Elegance* replaced the three fire damaged engine room thermal alarm sensors with two thermal and two smoke alarm sensors. This was undertaken as part of the post-30 January 2004 fire damage recovery work.

SECTION 5 - RECOMMENDATIONS

The installers of CO_2 smothering equipment are recommended to:

M2004/190 Ensure, when installing CO_2 gas fixed extinguishing systems in fishing vessels, that specific onboard operating instructions are posted and that the skipper/owner is fully briefed on the correct operation of the system.

The Maritime and Coastguard Agency, Seafish and International Association of Classification Societies are jointly recommended to:

2004/191
2004/192
2004/193 Develop best practice guidance and/or rules on the design of sea water systems for new build fishing vessels. These should include reducing the number of hull penetrations and access to/remote closure of sea valves.

2004/194
2004/195
2004/196 Develop best practice guidance and/or rules on critical pipework systems, to include flexible couplings, material melting point and fire retardant standards.

The Maritime and Coastguard Agency and Seafish are recommended to:

2004/197 Review their advice to fishermen on:

2004/198
a. The operation of fixed CO_2 gas fixed extinguishing systems.
b. Safety precautions to be taken post the operation of CO_2 gas fixed extinguishing systems.

The Maritime and Coastguard Agency is recommended to:

2004/199 Review its advice to fishermen on the importance of conducting routine functionality checks of remotely operated valves and ventilation dampers.

2004/200 Instruct surveyors of fishing vessels to verify that specific operating instructions for CO_2 gas fixed extinguishing systems are posted appropriately on board and to ensure that crews are fully conversant with the operation of the system.

2004/201 Review the regulations for fitting fire detection sensors and consider specifying the use of smoke detectors.

2004/202 Issue advice to owners of ETVs, stressing how important it is that crews of abandoned vessels are properly debriefed. The debrief should be structured to establish information on the general arrangement of the vessel, its stability condition and the extent of any damage or flooding.

The Seafish National Training Organisation is recommended to:

2004/203 Review the Fire Prevention and Fire-fighting at Sea course “Fixed Installations” syllabus to ensure greater emphasis on the maintenance of the system, its operation, and personal safety issues following the use of CO_2.

2004/204 Develop on board safety training, to include the use of safety equipment and risk assessment.

The International Salvage Union is recommended to:

2004/205 Issue advice to masters of salvage vessels, whose owners are members of the International Salvage Union, stressing how important it is that crews of abandoned vessels are properly debriefed. The debrief should be structured to establish information on the general arrangement of the vessel, its stability condition and the extent of any damage or flooding.

Marine Accident Investigation Branch
August 2004

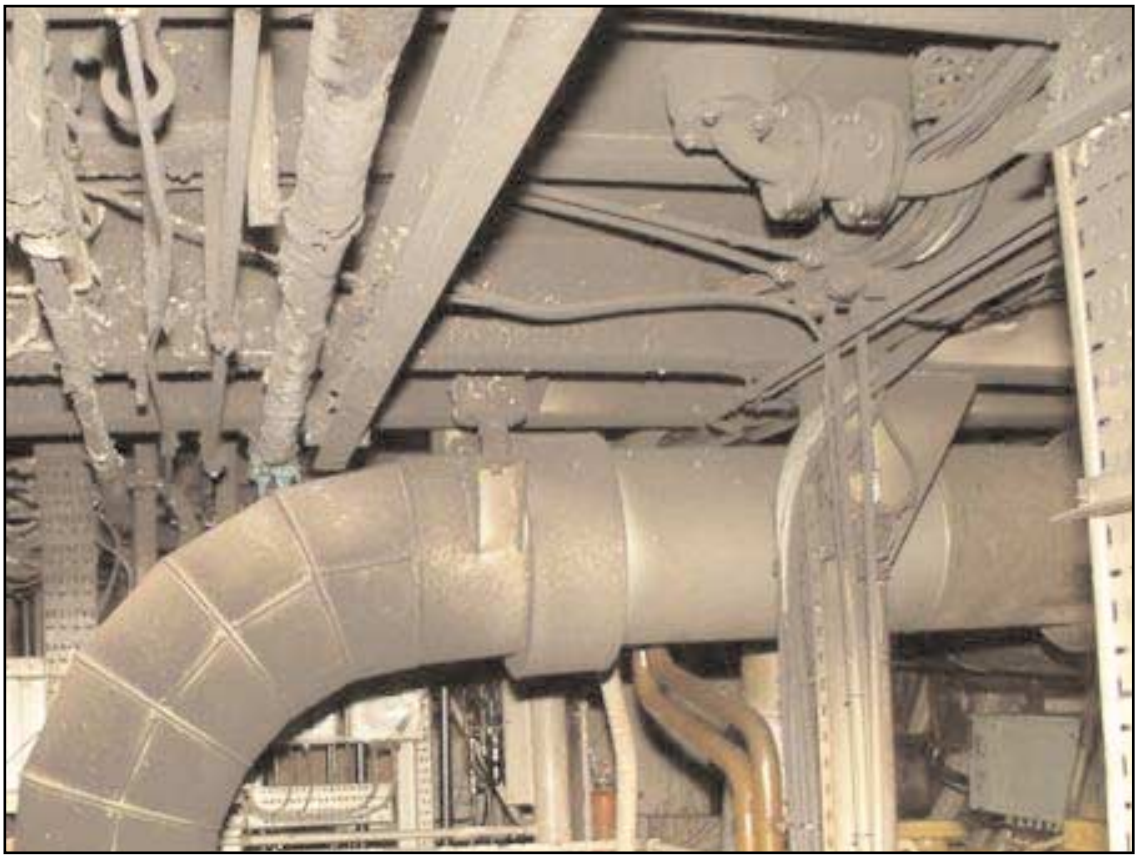
ANNEX A

Examples of deckhead smoke and heat damage
following the fire on 30 January 2004

Melted light fittings

Deckhead and lagging damage

Ventilation trunking and smoke detector damage



General deckhead damage

ANNEX B

Details of work conducted during the repair period 3 February – 1 March 2004

The following work was undertaken during the repair period following the engine room fire of 30 January 2004.

1. Complete wash down of the engine room to remove combustion deposits.

2. Complete engine room repaint.

3. Overhaul of both the main engine turbo chargers to check for heat-related damage.

4. Replacement of the main engine exhaust manifold lagging blanket.

5. Replacement of the main engine surveillance and management wiring loom.

6. Removal, overhaul and re-installation of the after generator.

7. Replacement of the three thermal fire detectors with two thermal and two smoke detectors.

8. Complete overhaul of the CO_2 fixed fire-fighting system including:
   - new bottles
   - new valves
   - replacement bottle valve operating mechanism
   - new instructions
   - electrical interlock system activation warning alarms

9. Rewiring of electrical supplies to:
   - the battery charger
   - steering gear control circuits
   - bilge high level alarm and refrigerant gas alarms
   - gearbox control circuits
   - bilge pump
   - engine room lighting circuits
   - alarm beacon circuits
   - fish hold freezing equipment power circuits
   - wheelhouse hydraulic controls up to the engine room junction box
   - daily tank fuel level float switch.

ANNEX C

Engine room fuel supply system and description

ENGINE ROOM FUEL TRANSFER AND SUPPLY ARRANGEMENTS

The main components of the fuel transfer and supply system are:

- Storage tanks
- Daily tank
- Fuel transfer pump
- Fuel oil purifier
- Hand semi-rotary pump

The fuel transfer pump was normally used to transfer fuel between storage tanks. The fuel oil purifier was configured to centrifuge fuel and discharge the cleaned fuel to the daily tank from where it was supplied to the main engine and generators.

It was normal practice to transfer fuel, with the fuel transfer pump, from one or more of the fuel storage tanks to No 6 centreline tank, which was used for settling purposes. Fuel was usually tested for water contamination prior to transfer.

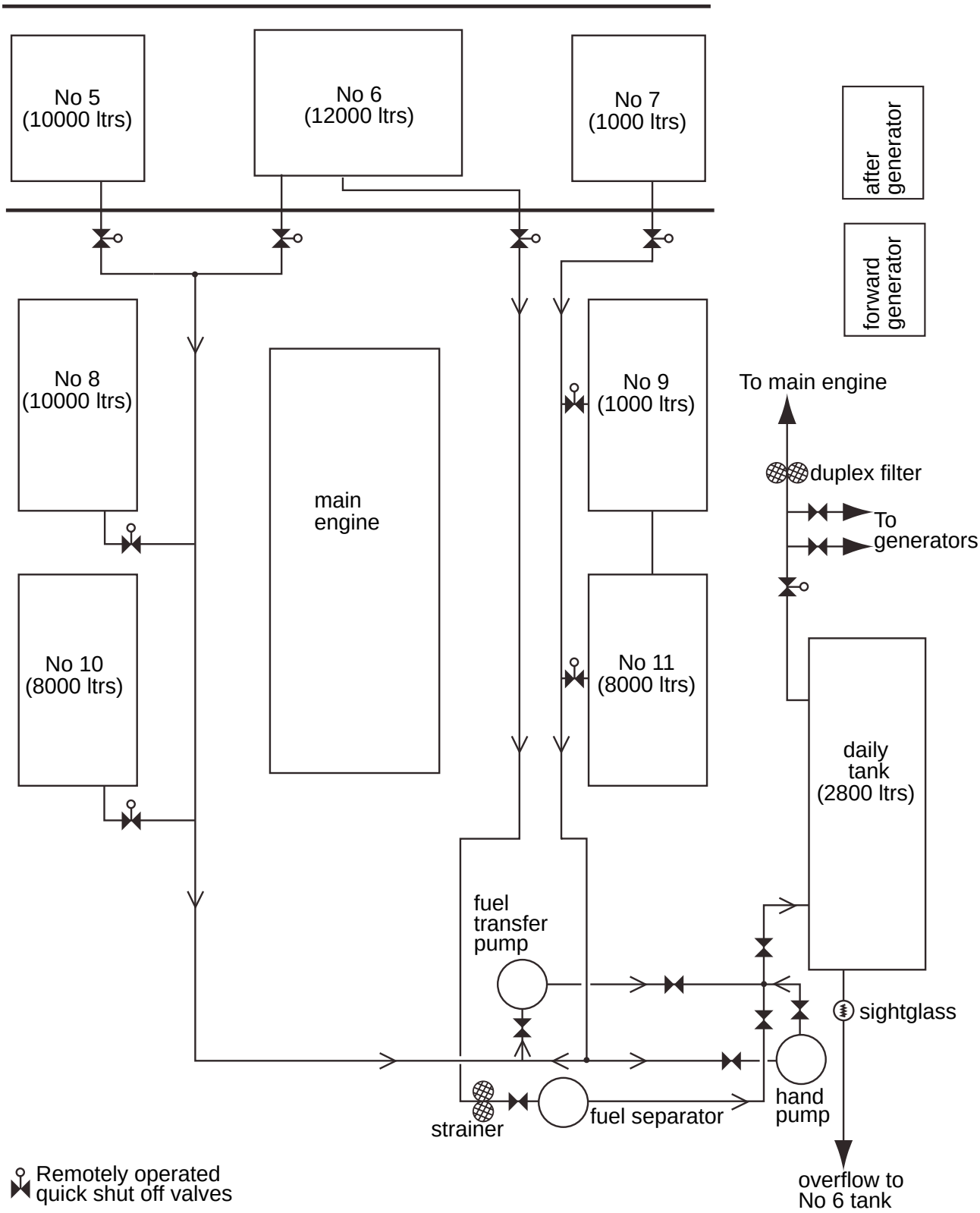
The fuel oil purifier was only designed to take a suction from No 6 fuel tank, discharging to the 2800 litre capacity daily tank located in the engine room. The fuel oil purifier output was normally set up to just provide a discharge visible in the daily tank, overflow sight glass. The surplus fuel was then returned to No 6 storage tank. The fuel oil purifier was capable of continually “polishing” the fuel while coping with the main engine and generator combined maximum fuel demands of 250 litres/hour typically seen during trawling.

In the event of a defective fuel oil purifier, fuel could still be supplied to the daily tank using either the electrically-driven fuel transfer pump, or the semi-rotary hand pump. When using these methods, it is not possible to remove any water present in the fuel.

The daily tank is situated at the top floor plate level in the engine room. It supplied fuel, under gravity to the main engine via dedicated duplex fuel filters and to the two generators also via independent filters.

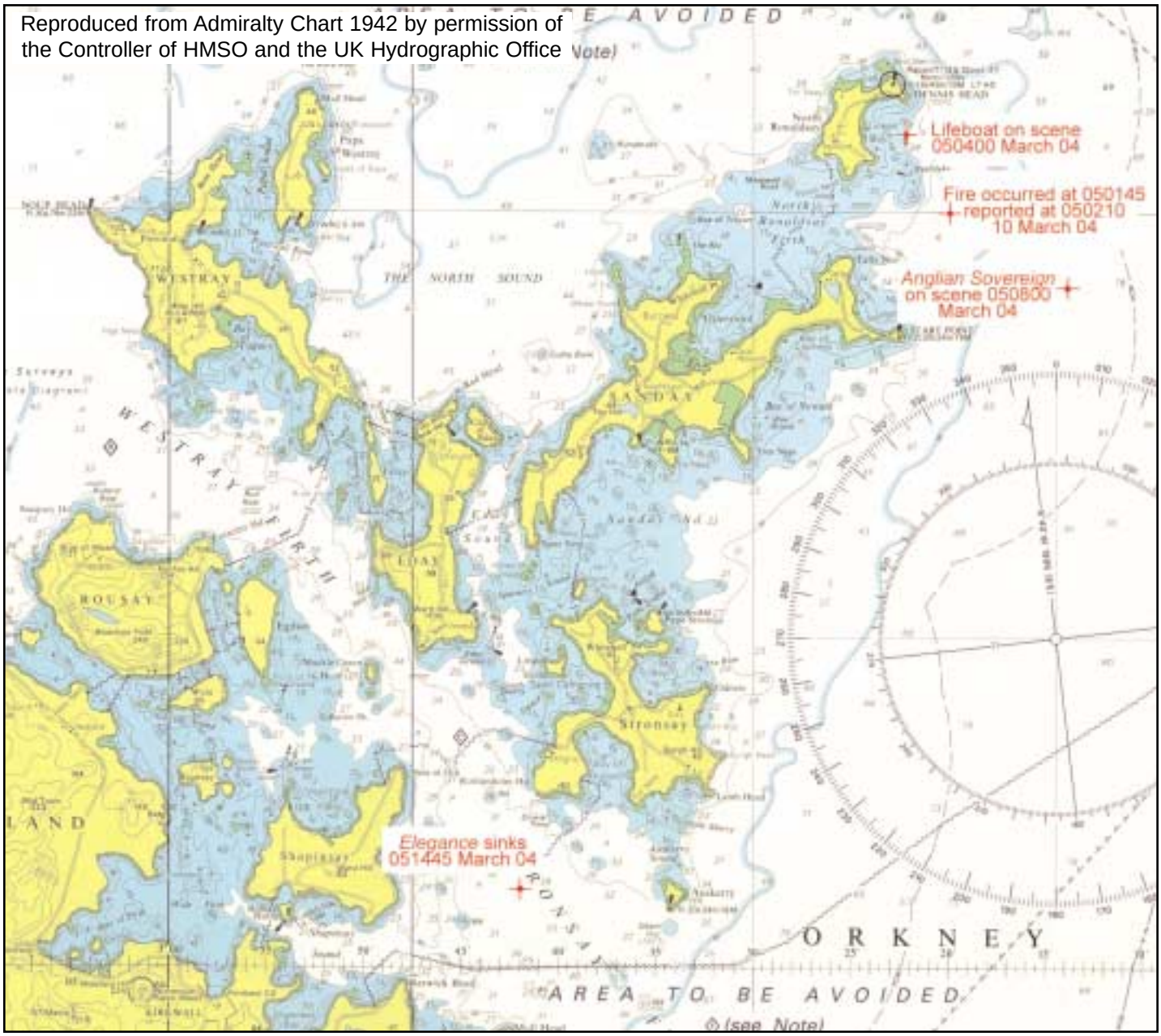
It should be noted that in the event of an engine room fire, the fuel oil purifier will be automatically shut down if the fire alarm system is activated. However, the fuel transfer pump is not connected to the fire alarm system in the same way. Therefore, in the case of a fire, the fuel oil transfer will continue to run with the possibility of feeding fuel to the fire.

Engine room - fuel supply system



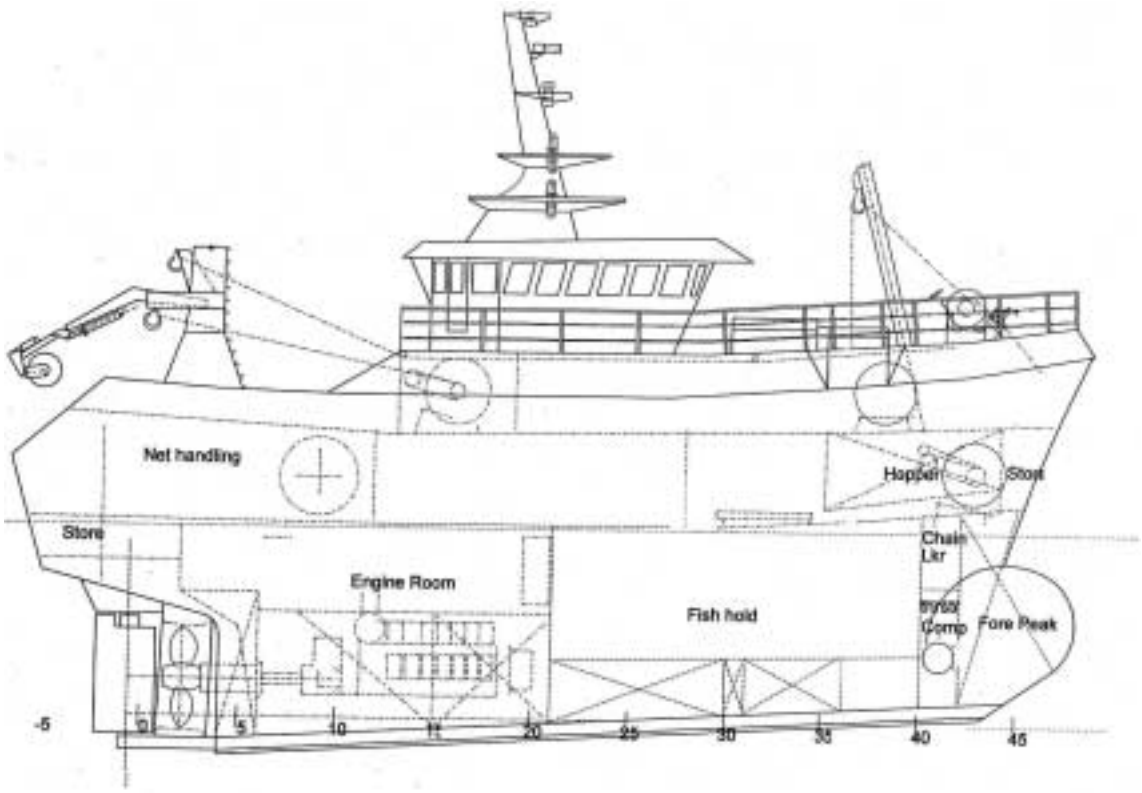
ANNEX D

Chartlet showing relevant positions during the fire and foundering on 5 March 2004

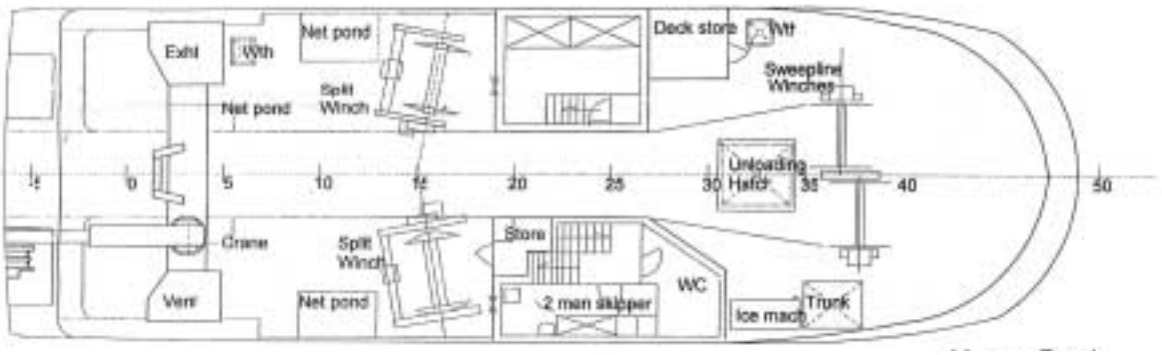

Reproduced from Admiralty Chart 1942 by permission of the Controller of HMSO and the UK Hydrographic Office
Lifeboat on scene 050400 March 04
Fire occurred at 050145 reported at 050210 10 March 04
Anglian Sovereign on scene 050800 March 04
Elegance sinks 051445 March 04
WESTRAY
THE NORTH SOUND
SANDAY
ROUSAY
Stronsay
ORKNEY
AREA TO BE AVOIDED

ANNEX E

Deck plans and position of tonnage valves



Main deck



Upper deck

General arrangement and position of tonnage valves

ANNEX F

Final stages of foundering


5 3:47 PM

ANNEX G

CO_2 fixed fire-fighting system and description

DESCRIPTION OF THE CO_2 FIXED FIRE-FIGHTING SYSTEM

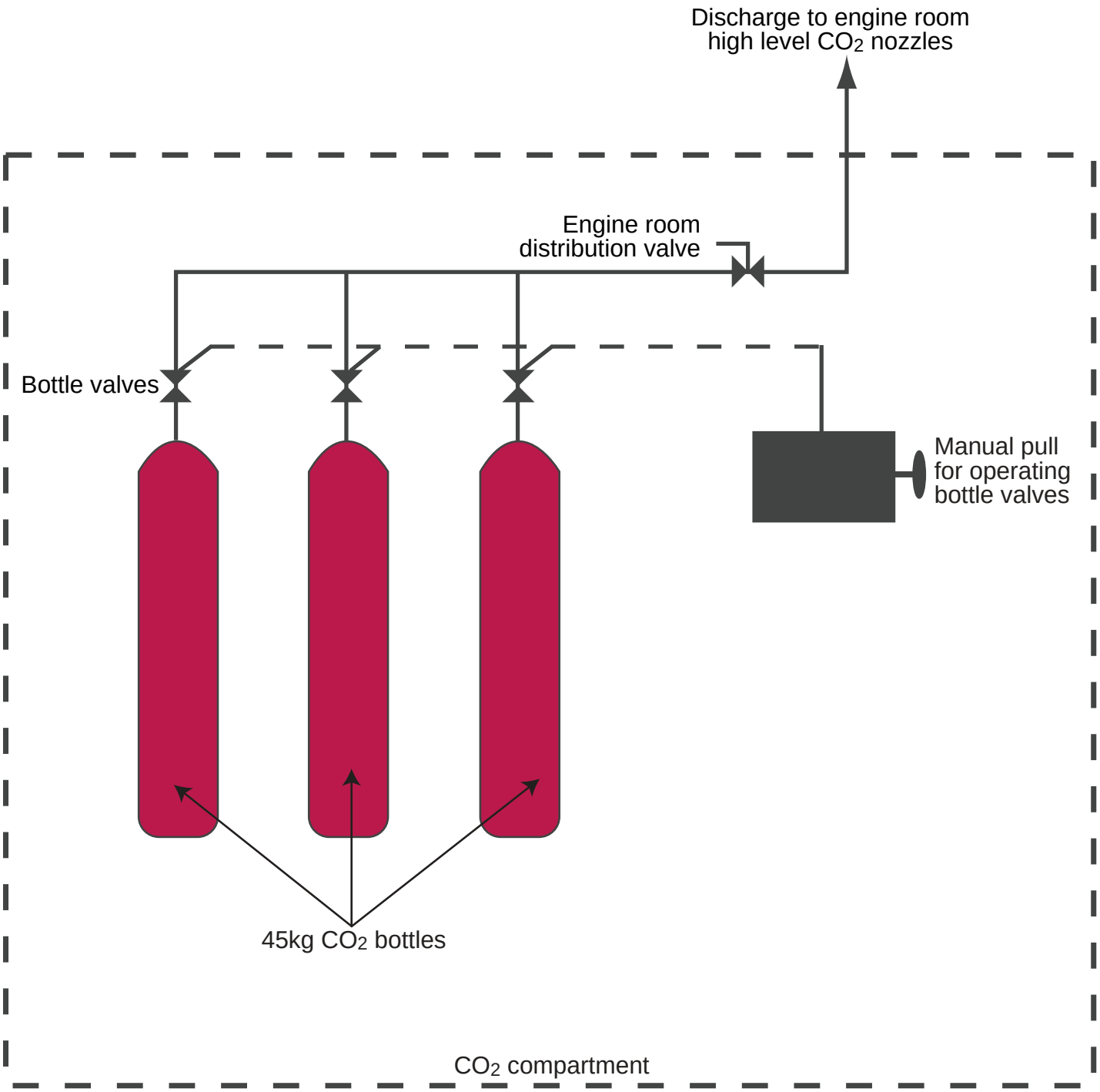
The CO_2 fixed fire-fighting system is operated from a dedicated compartment situated on the net handling deck, and only supplies the engine room. The compartment door and gas discharge pipework are fitted with an electrical interlock and pressure switch respectively. These are connected to a warning system of beacons and buzzers, which alert anyone in the engine room and wheelhouse of the imminent discharge of CO_2. All personnel are to vacate the engine room prior to usage.

The system comprises three, 45kg, CO_2 bottles. Each bottle is fitted with an isolating valve. All the bottle valves are connected via a cable to a remote manual pull arrangement. There is an engine room distribution valve which allows the gas to pass to the high level nozzles situated in the engine room.

For normal operation, the engine room isolating valve is opened, and the pull handle operated, which then allows gas to flow to the engine room. In the event of failure of the emergency pull arrangement, each of the bottle valves can be individually operated.

The CO_2 system extinguishes fires by reducing the oxygen content in the compartment. A reduction by about 6% is usually sufficient to put out the fire. It is, therefore, essential that the compartment ventilation flaps are closed prior to system operation, to ensure that the correct CO_2 concentration is achieved.

CO_2 fixed fire-fighting system



ANNEX H

Annex A to Merchant Shipping Notice No M1367

Syllabus for basic training in preventing and tackling fire at sea

and

Seafish training syllabus - fire prevention and fire-fighting at sea fixed installations

SYLLABUS FOR BASIC TRAINING IN PREVENTING AND TACKLING FIRE AT SEA

1. Theory of Combustion Explanation of combustion, ignition temperature, triangle of combustion and how combustion can be terminated by the removal of any one element.

2. Classification of Fires
   (a) Types of fires A, B, C and D.
   (b) Electrical fires.

3. Fire Prevention (a) Colour codes used for identifying pressurised cylinders, pipes and cables on fishing vessels; (b) the essential need for cleanliness and tidiness; (c) the particular fire hazards associated with: (i) engine rooms and other machinery spaces: (ii) fuels, liquids and gases
   (iii) electrical installations
   (iv) galleys
   (v) accommodation areas
   (vi) wheelhouses
   (vii) storage rooms and on deck;
   (d) (i) correct siting and appropriate fire appliances
   (ii) the need to correctly maintain all fire appliances in accordance with manufacturer's instructions; (e) familiarity with emergency procedures and regular fire drills; (f) means of escape from all enclosed spaces and the need to keep them free and unobstructed.

Principles of Fire Fighting (a) types of fire extinguishers carried on fishing vessels; (b) operation of each type of fire extinguisher; (c) selection of correct fire extinguishers for tackling different types of fire; (d) recharging fire extinguishers after use; (e) fire blankets; (f) (i) types of fixed fire fighting installations provided on fishing vessels (ii) operating procedures for fixed fire fighting installations
   (iii) maintenance of fixed fire fighting installations in accordance with manufacturer's instructions
   (iv) dangers associated with fixed fire fighting intallations, particularly $CO^{=}$; (g) (i) types of breathing apparatus supplied to fishing vessels (ii) correct use of breathing apparatus; (h) (i) fire pumps, hoses and nozzles provided on fishing vessels (ii) location of fire hydrants and hoses on fishing vessels (iii) use of water in tackling fires on fishing vessels (iv) boundary cooling by means of water; (i) Manoeuvring vessels to prevent fire spread.

FIRE PREVENTION AND TACKLING FIRE AT SEA

SESSION PLAN: SIX

General Subject: **Fixed Installations**

Total Time Indicator: 30 minutes

Time Indicator	Key Word/ Phrase	Points to Cover	Visual Aid
3 mins	**Fixed Fire Fighting Installations and Precautions**	Fixed Installations A vessel may be provided with one or more of the following Fixed Fire Fighting Installations: Fixed Pressure Water Spraying System Fixed Fire Smothering Gas or Steam System Fixed Foam Extinguishing System	SF31
	Water Spray	Water Spray Projector System Supplied by power pump, or hand operated pump, with sea connection and situated outside the Machinery Space. It is connected to a fixed pipe work terminating in projector heads sited around the machinery and capable of extinguishing oil fires.	

Time Indicator	Key Word/ Phrase	Points to Cover	Visual Aid
		Precautions The effect of water in fine spray form can cool and extinguish an oil fire depending on the position of the spray projector heads. It could, however, cause damage to certain machinery and should be kept clear of any live electrical circuits.	
3 mins	**Gas Smothering Installations**	Carbon Dioxide (CO_2) CO_2 extinguishes fire by reducing the oxygen surrounding the fire. For fires in flammable liquids a reduction of 6% oxygen usually results in extinction. The cooling effect is small and re-ignition is possible. The installation consists of a bank of cylinders filled with CO_2 and connected by pipe work to discharge horns situated around the machinery space. It is manually operated from outside the protected space where the gas is released to flood the area.	

Time Indicator	Key Word/ Phrase	Points to Cover	Visual Aid
		Precautions An automatic fire detection and alarm system should be fitted in machinery space to give warning of evacuation when compartment is to be flooded with CO_2. Ensure all personnel are evacuated before operating the system. Ensure the fire is completely extinguished before opening the compartment. Ensure all ventilation systems and any points of air ingress are closed down. Allow for gas smothering, stopping main engine.	
	Halons	Halon Installation (Use of Halon suspended) The system is similar to the CO_2 system except for the contents of the cylinders and the structure of the projector heads. Precautions When mixed with the products of combustion the gas can produce toxic vapours. It is therefore necessary to take added precautions as with CO_2.	

Time Indicator	Key Word/ Phrase	Points to Cover	Visual Aid
5 mins	**Foam Installation**	Foam Installations The principle is similar to water spray systems except that a foam compound is mixed with water and connected by pipe work to specially designed projector heads which aerate and project the produced foam. Precautions foam is a conductor of electricity.	
	Fixed Installations	Fixed Fire Fighting Installations Cylinders: contents checked regularly for any loss. Look out for corrosion. Piping: examine for faults in jointing or incipient corrosion. Projector Heads: regularly inspected. Pumping Equipment: regular visual inspection.	

ANNEX I

MCA Ship Investigation and Survey Report

fv *Elegance*

dated 31 January 2004

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

UNITED KINGDOM FISHING VESSEL CERTIFICATE

Issued under the Merchant Shipping Act 1995

PARTICULARS OF VESSEL

Name of Vessel	ELEGANCE		
Official (RSS) Number	C16354	Fishing Number	UL 540
Port of Registry	Ullapool	Date on which keel was laid	1998
Registered Length	23.92m	Overall Length	27.86m

THIS IS TO CERTIFY

1. that the vessel has been surveyed in accordance with section 1.3 of the provisions of the Code of Safe Working Practice for the Construction and Use of 15 metres (LOA) to less than 24 metres (L) Fishing Vessels;
2. that the vessel has been found to comply with the requirements of the Code that are applicable to the vessel, (for vessels that are **classed** see overleaf);
3. that the life saving appliances are sufficient for a total of **10** persons;
4. that the vessel is fitted with the lights, shapes and sound signals to comply with the International Regulations for the Prevention of Collisions at Sea and is fitted with navigational equipment and carries nautical publications in accordance with the Code;
5. that the vessel complies with the requirements of the (Radio)(Fishing Vessels) Regulations that are applicable to the vessel and is equipped for operation in sea areas) **A1 & A2** only.
6. that an Exemption Certificate ~~has been issued~~ / has not been issued.

Completion date of the survey on which this Certificate is based: 8 August 2002

This Certificate is valid until **31 MAY 2004 (Short Term)** subject to a satisfactory inspection in accordance with 1.3.6 of the Code being completed not less than 24 months and not more than 36 months from the completion date of the ~~initial~~ / renewal survey.

Place: Aberdeen Marine Office

Signed: ..... (Signature of Authorised Official issuing the Certificate)

Date: 2 February 2004

Name: W.P.Wood PMS(F)

INSPECTION (Code 1.3.6)

It is confirmed that the vessel continues to comply with the requirements of the Code that are applicable to this vessel and that annual self-certification declarations have been completed by the owner. The inspection should be completed between ..... and .....

Place: ..... (Place of Inspection)

Signed: ..... (Signature of Authorised Official)

Date: ..... (Date of Inspection)

Name: ..... (Name of Authorised Official)

VESSELS CLASSED WITH A CLASSIFICATION SOCIETY

For vessels which are classed at the time of survey, it is a condition of this Certificate that classification of the vessel is maintained throughout the certificate's validity.

EXISTING VESSELS CONSTRUCTED BEFORE 23 NOVEMBER 2002 (Code 1.3.1.4)

Record of previous exemptions to the Fishing Vessel (Safety Provisions) Rules 1975.

Rule	Valid until	Subject to the following conditions
NONE		

SPECIAL OPERATING CONDITIONS (IF APPLICABLE):

EXTENSION OF CERTIFICATE (Code 1.3.8.3)

The validity of this Certificate has been extended until _____

Place _____ Signed .....
(Signature of Authorised Official)

Date _____ Name _____

NOTES

- Any unauthorised modification to the vessel or its equipment may invalidate this certificate or endanger the crew
- This Certificate should be framed and posted in a conspicuous place on board the vessel

ANNEX J

United Kingdom Fishing Vessel Certificate for

fv *Elegance*

dated 2 February 2004

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

UNITED KINGDOM FISHING VESSEL CERTIFICATE

Issued under the Merchant Shipping Act 1995

PARTICULARS OF VESSEL

Name of Vessel	ELEGANCE		
Official (RSS) Number	C16354	Fishing Number	UL 540
Port of Registry	Ullapool	Date on which keel was laid	1998
Registered Length	23.92m	Overall Length	27.86m

THIS IS TO CERTIFY

1. that the vessel has been surveyed in accordance with section 1.3 of the provisions of the Code of Safe Working Practice for the Construction and Use of 15 metres (LOA) to less than 24 metres (L) Fishing Vessels;
2. that the vessel has been found to comply with the requirements of the Code that are applicable to the vessel, (for vessels that are **classed** see overleaf);
3. that the life saving appliances are sufficient for a total of **10** persons;
4. that the vessel is fitted with the lights, shapes and sound signals to comply with the International Regulations for the Prevention of Collisions at Sea and is fitted with navigational equipment and carries nautical publications in accordance with the Code;
5. that the vessel complies with the requirements of the (Radio)(Fishing Vessels) Regulations that are applicable to the vessel and is equipped for operation in sea area(s) **A1 & A2** only.
6. that an Exemption Certificate ~~has been issued~~ / has not been issued.

Completion date of the survey on which this Certificate is based: 8 August 2002

This Certificate is valid until **31 MAY 2004 (Short Term)** subject to a satisfactory inspection in accordance with 1.3.6 of the Code being completed not less than 24 months and not more than 36 months from the completion date of the ~~initial~~ / renewal survey.

Place: Aberdeen Marine Office

Signed: _____ (Signature of Authorised Official issuing the Certificate)

Date: 2 February 2004

Name: W.P.Wood PMS(F)

MCA ABERDEEN

INSPECTION (Code 1.3.6)

It is confirmed that the vessel continues to comply with the requirements of the Code that are applicable to this vessel and that annual self-certification declarations have been completed by the owner. The inspection should be completed between _____ and _____

Place _____ (Place of Inspection)

Signed _____ (Signature of Authorised Official)

Date _____ (Date of Inspection)

Name _____ (Name of Authorised Official)

VESSELS CLASSED WITH A CLASSIFICATION SOCIETY

For vessels which are classed at the time of survey, it is a condition of this Certificate that classification of the vessel is maintained throughout the certificate's validity.

EXISTING VESSELS CONSTRUCTED BEFORE 23 NOVEMBER 2002 (Code 1.3.1.4)

Record of previous exemptions to the Fishing Vessel (Safety Provisions) Rules 1975.

Rule	Valid until	Subject to the following conditions
NONE		

SPECIAL OPERATING CONDITIONS (IF APPLICABLE):

EXTENSION OF CERTIFICATE (Code 1.3.8.3)

The validity of this Certificate has been extended until _____

Place _____ Signed _____
(Signature of Authorised Official)

Date _____ Name _____

NOTES

- Any unauthorised modification to the vessel or its equipment may invalidate this certificate or endanger the crew
- This Certificate should be framed and posted in a conspicuous place on board the vessel

ANNEX K

MAIB Safety Bulletin 1/2004

Safety Bulletin

MAIB

Department for Transport

MAIB

MARINE ACCIDENT INVESTIGATION BRANCH

MAIB SAFETY BULLETIN 1/2004

Near lethal use of CO_2 onboard the fishing vessel

Elegance

30 miles north-west of the Shetland Islands

30 January 2004

Issued March 2004

MAIB

INVESTOR IN PEOPLE

MAIB SAFETY BULLETIN 1/2004

Near lethal use of CO_2 onboard the fishing vessel

Elegance

30 miles north-west of the Shetland Islands

30 January 2004

MAIB SAFETY BULLETIN 1/2004

This document, containing Safety Recommendations, has been produced for marine safety purposes only, on the basis of information available to date.

The Merchant Shipping (Accident Reporting and Investigation) Regulations 1999 provide for the Chief Inspector of Marine Accidents to make recommendations at any time during the course of an investigation if, in his opinion, it is necessary or desirable to do so.

The Marine Accident Investigation Branch (MAIB) is carrying out an investigation into the engine room fire onboard *Elegance* that occurred on 30 January 2004. The MAIB will publish a full report on completion of the investigation.

Stephen Meyer
Chief Inspector of Marine Accidents

Press Enquiries: 020 7944 3232/4691; out of hours: 020 7944 4292
Public Enquiries: 020 7944 3000
INTERNET ADDRESS FOR DFT PRESS NOTICES:
http://www.dft.gov.uk

Background

At 2300 on 29 January 2004, *Elegance*, a twin rig 23.92 metre trawler sailed from Scrabster to fishing grounds 30 miles north-west of the Shetland Islands.

The vessel had been towing her twin rig gear for about 3 hours when the skipper saw smoke coming from the outlet of the engine room exhaust ventilator. He went to the engine room immediately, where he discovered a fire. The skipper attempted to isolate the fuel systems, but without success. He then transmitted a "Mayday". About 30 minutes into the incident, he tried to operate the fixed CO_2 system. However, this failed because the system had been badly maintained, and the crew's knowledge of the operating procedures was, at best, superficial. At about this time, smoke from the engine room began to reduce, and the skipper was under the impression that CO_2 had been successfully discharged. A short time later, he, together with the ship's engineer, entered the engine room to see if the fire had been extinguished.

In this case, the fire died out without the use of the CO_2. However, the outcome could have been very different, and this case highlights the need for effective maintenance and testing, and knowledge of how to use the system.

Even more importantly, the skipper and ship's engineer were unaware of the potentially lethal dangers they faced when they re-entered the compartment. Had the CO_2 system been successfully discharged, the engine room would still have contained dangerous levels of CO_2 at this time, and it is highly likely that the decision to enter could have resulted in the death of both men.

Safety Recommendations

Skippers and crews are reminded that the Regulations require that all crew onboard UK registered fishing vessels have completed the compulsory one day "Fire Prevention and Fire-Fighting" training course. This course can be arranged by contacting SEAFISH on 01482 327 837.

In the event of a fire in the engine room, skippers and crews should ensure that they are fully conversant with the operation of the remote controls for the isolation of fuel oil, hydraulic oil and ventilation systems from the space. They must also have a good understanding of the operation of fixed CO_2 fire extinguishing systems.

In particular:

1. Whenever it has been necessary to release CO_2 into the engine room to extinguish a fire, ventilation of the space should not be resumed until it has been confirmed that the fire is out and the space has sufficiently cooled to prevent re-ignition.

2. Thereafter, entry into a space that has contained CO_2 should only be attempted by personnel using breathing apparatus. If breathing apparatus is not carried on board, and it really is impossible to wait for assistance from ashore, entry should only be attempted when the space has been thoroughly ventilated with clean air, and all residues of CO_2 have been removed. It is strongly recommended that this should include the need to obtain expert advice from ashore before any attempt at re-entry is made.

Additionally, all fishing vessel skippers and crews are recommended to:

1. Ensure remote controls for fuel oil and hydraulic pumps, quick closing fuel oil valves and closing devices for ventilators, emergency stops for ventilation fans and CO_2 fixed fire-fighting systems are tested regularly and maintained in good order.

2. Ensure clear instructions for operating CO_2 extinguishing systems are displayed near the distribution control valves and near the gas cylinders.

3. Ensure audible alarms for warning personnel within the engine room, that the CO_2 fire extinguishing system is about to be operated, are regularly tested and maintained in working order.