Report on the investigation of the fire on board the fishing vessel

Vision II

Alongside at Fraserburgh

1 August 2008

resulting in three fatalities

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Carlton House
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Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2005 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

NOTE

This report is not written with litigation in mind and, pursuant to Regulation 13(9) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

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CONTENTS

GLOSSARY OF ABBREVIATIONS, ACRONYMS AND TERMS

AC	-	Alternating Current
Amp	-	Ampere
BST	-	British Summer Time
CO	-	Carbon Monoxide
EPIRB	-	Emergency Position Indicating Radio Beacon
EU	-	European Union
GRP	-	Glass Reinforced Plastic
HCN	-	Hydrogen Cyanide
HSL	-	Health and Safety Laboratory
IMO	-	International Maritime Organization
kV	-	kilovolt
kW	-	kilowatt
LOA	-	Length Overall
m	-	metre
mA	-	milliampere
MCA	-	Maritime and Coastguard Agency
MCB	-	Mini Circuit Breaker
mg/l	-	milligrams per litre
mm	-	millimetre
MOU	-	Memorandum of Understanding
MSN	-	Merchant Shipping Notice
OAN	-	Operational Advice Note
RCD	-	Residual Current Device
RL	-	Registered Length
SFIA	-	Sea Fish Industry Authority
v	-	volt
VAT	-	Value added tax

A class divisions - those divisions formed by bulkheads and decks that are:

i. Constructed of steel or other equivalent material;

ii. Suitably stiffened;

iii. So constructed as to be capable of preventing the passage of smoke and flame to the end of the 60 minute standard fire test; and

iv. So insulated where necessary with suitable non-combustible materials such that, if the division is exposed to the standard fire test, the average temperature of the unexposed side of the division will rise not more than 139º centigrade above the initial temperature nor will the temperature at any one point, including any joint, rise more than 180º centigrade above the initial temperature within the time listed below:

A-60 standard	60 minutes
A-30 standard	30 minutes
A-0 standard	0 minutes

Share fisherman - a person not under a contract of service who is ordinarily employed in the fishing industry as a master or crew member of a British fishing boat manned by more than one person and is paid in whole, or part, by a share of the profit or gross earnings of the boat

Targeted Inspection - an inspection carried out by an MCA surveyor over and above statutory periodic inspections. Such an inspection may be carried out at a surveyor's own discretion to satisfy himself, and therefore the MCA, that a vessel continues to operate safely and in accordance with relevant legislation during the intervening period between statutory inspections.

Times: All times used in this report are BST unless otherwise stated

Vision II

SYNOPSIS

On 1 August 2008, fire broke out on the 18.6m fishing vessel *Vision II*. There were three people on board the vessel at the time of the fire, all of whom lost their lives.

Vision II was a twin-rig prawn trawler built by Macduff Shipyards Limited. The vessel had been issued with its fishing vessel certificate in December 2004 and entered service early in 2005. The accident occurred while the vessel was alongside in Fraserburgh undergoing repair and modifications following change of ownership 3 days earlier. As part of the repair work three defective electric heaters, including one from the galley, were removed from the vessel. The heaters were examined, repaired and refitted the day before the accident.

At 0115 on 1 August a port security guard saw smoke rising from the vessel, and after unsuccessfully trying to gain access he raised the alarm. The Grampian fire brigade arrived on scene and by 0330 the fire had been extinguished and smoke clearance operations commenced. Two bodies were found lying on bench seating in the galley and a third body was discovered lying on the deck of the wheelhouse adjacent to the access hatch.

The resulting investigation identified a number of concerns regarding: the fitting out of the vessel; its operation; self-certification; and inspection. It also highlighted the increased number of foreign crews living on board fishing vessels in harbour, without the consequent safety aspects being assessed.

The Maritime and Coastguard Agency has been recommended to broaden the scope of its review of the safety issues associated with crews living on board fishing vessels in port.

Recommendations have also been made to: the Sea Fish Industry Authority to review its survey procedures; to Macduff Shipyards Limited to review its quality management procedures; and to MB Vision LLP to develop work instructions.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *VISION II* AND THE ACCIDENT

Vessel details

Registered owner	:	MB Vision LLP
Manager	:	Melantic Limited trading as Westward Fishing Company
Port of registry	:	Banff
Flag	:	United Kingdom
Type	:	Twin rig prawn trawler
Built	:	December 2004 at Macduff Shipyard
Construction	:	Steel
Length overall	:	18.6m
Gross tonnage	:	163 tonnes
Engine type and power	:	Caterpillar 3412, 402 kW de-rated to 217 kW
Service speed	:	9.0 knots

Accident details

Time and date	:	0115 on 1 August 2008
Location of incident	:	Alongside Provost Pier, Balaclava Inner Basin, Fraserburgh.
Persons on board	:	3
Fatalities	:	3
Damage	:	Fire damage to galley, main passageway and washroom. Smoke damage to wheelhouse, shelter deck, cabin, and store room.

1.2 BACKGROUND

Vision II, originally named *Amethyst,* was built by Macduff Shipyards Limited in 2003/4. The vessel completed survey in accordance with the Code of Safe Working Practice for the Construction and use of 15 metre length overall to less than 24 metre Registered Length Fishing Vessels on 23 December 2004, and was subsequently issued with a United Kingdom Fishing Vessel Certificate.

Ownership of *Amethyst* was shared between three companies:

- Laurelbank Fishing Ltd, owned by the skipper – 44 shares
- Johnstone Fishing Ltd, owned by the mate – 16 shares
- Morlan Fishing Ltd, owned by the skipper's brother – 4 shares

On 29 July 2008, *Amethyst* was sold to MB Vision LLP, a partnership between:

- Zander Jack Fishing Ltd, owned by the new skipper – 75%
- Melantic, part of Westward Fishing Company – 25%.

Change of ownership was administered by the Westward Fishing Company, the vessel's name was changed to *Vision II,* and the fishing number was changed to *BF 190*.

Although change of ownership was completed on 29 July 2008, the sale had been agreed by the two companies several months earlier following a successful pre-purchase survey, which had been conducted in February 2008. Change of ownership had been due to take place in October 2008, but was brought forward to 29 July, due to the early delivery of a vessel originally being built for the outgoing skipper by Macduff Shipyards Limited. The new date coincided with a long-term holiday commitment made by the new skipper.

A considerable part of this report deals with events prior to the change of ownership; to avoid confusion, the vessel's original name *Amethyst* has been used when appropriate.

1.3 NARRATIVE

1.3.1 Previous voyage

Amethyst had been employed on a regular fishing schedule; sailing from Fraserburgh on a Sunday evening and returning the following Saturday or Sunday morning. Her planned out of service time during any one year was three weeks, and consisted of a one-week period in May for docking and painting, and two weeks over the Christmas and New Year period for maintenance of the main machinery.

On Sunday 20 July, *Amethyst* sailed from Fraserburgh with the prospective new owner on board as crew to acquaint himself with the vessel. He was accompanied by a crew member from his existing vessel, whose task was to familiarise himself with operations on deck.

During the voyage, the prospective owner produced a list of defective equipment requiring repair and tasks for the local ship repair yard to undertake after the change of ownership had been completed. He had asked the current skipper whether the vessel complied with MCA requirements but did not physically check any of the safety equipment himself.

On Sunday 27 July, *Amethyst* returned to Fraserburgh. The prospective owner was pleased with the vessel, believing it to be in good overall condition, more straightforward to operate, and safer on deck than his existing vessel. Once the catch had been landed, *Amethyst* berthed stern to at Provost Park Jetty, Balaclava Inner Harbour prior to being transferred into new ownership and renamed. Power was provided by the vessel's own generator. A list of repairs and modifications was presented to Macduff Shipyards Limited in Fraserburgh by the new skipper **(Annex A)**, for completion before the vessel's planned sailing as *Vision II* on 19 or 20 August 2008.

With the exception of *Amethyst*'s second engineer, Rimants Venckus (deceased), the original crew left the vessel. As previously agreed between the two skippers, the nominated engineer for *Vision II*, Ramilito Calipayan (deceased), joined the vessel to become familiar with all of the engineering and electrical systems on board before Rimants Venckus left the vessel later that week. The two men were living on board and were expected to undertake maintenance work during the handover period.

The prospective owner proceeded on an overseas holiday with his family later that same day, leaving the current owner to oversee the work package during his absence.

1.3.2 Change of ownership and shipyard work

On Monday 28 July, Westward Fishing Company commenced the final stages of the sale. In the afternoon, with the engine and auxiliary machinery shut down, Rimants Venckus connected the vessel to shore power.

The agreed work package was commenced by Macduff Shipyard Limited, and concurrently an independent service engineer attended to repair the autopilot and chart plotter in the wheelhouse. Finding that there was no 24v supply to the equipment, the service engineer informed Rimants Venckus, who went below and activated the appropriate electrical circuit breakers. The former skipper visited a local electrical contractor to arrange for the attendance of a service engineer to repair an electric fan heater fitted in the galley and a fan motor in the main cabin.

On Tuesday 29 July, new fishing numbers were welded on, the name *Amethyst* was blanked off at the stern, and a number of protective paint coatings were applied.

On Wednesday 30 July, the sale of the vessel and transfer of ownership were completed by Westward Fishing Company; a new certificate of registry was received, and the vessel was officially renamed *Vision II*.

Two electricians visited the vessel to survey the electrical work package, which included the repair work to the electric fan heater in the galley and the ventilation fan motor in the cabin space, and fitting a 24v socket in the wheelhouse **(Annex B)**. The crew informed them that another two electric fan heaters were defective, one in the wheelhouse and one in the cabin space. Both electricians were content with the job and intended to commence work the following morning.

That day, welding operations continued and a new side number 'zero' was welded onto the starboard side, outboard of the galley. An assistant was used to monitor for any hot spots in the galley, but there was no indication of burning inside the vessel. At about 1600, once the welding operation was complete, *Vision II* was fully refuelled.

On Thursday 31 July, the former skipper was absent from the vessel due to personal reasons.

At approximately 0945, the two electricians boarded *Vision II* and isolated the electrical supplies to the three fan heaters, which were then removed and taken ashore to a workshop.

The ventilation fan motor in the cabin space was checked for continuity and left running for about 1 minute. It was found to be satisfactory and was then switched off at the main circuit breaker in the wheelhouse.

Examination of the fan heaters found a defective on/off switch in the wheelhouse heater, and faulty thermostat controls in the galley and cabin heaters. All heaters were repaired before being tested in the workshop, found to be satisfactory, and returned to the vessel. There, they were refitted, tested briefly, and confirmed to be operating correctly. On completion, they were switched off using the heaters' on/off switches, but the individual circuit breakers supplying the heaters were left switched on. The crew witnessed the heaters being replaced and were aware that they were now operational. At approximately 1500, the electricians left the vessel.

At 1745, an ex-crewman from *Amethyst* visited the vessel to agree arrangements for Rimants Venckus to leave the vessel the following day, and to take him clean clothing. As he was leaving *Vision II,* the ex-crewman observed Rimants Venckus showing Ramilito Calipayan how to lock the wheelhouse and main accommodation doors.

1.3.3 Events preceding the fire

Shortly after 1800, Ramilito Calipayan went ashore and visited friends on board the fishing vessel *Millburn*.

At approximately 2100, after supper on board *Millburn*, Ramilito Calipayan proceeded ashore with a friend, Benjamin Potot (deceased), and the two were later seen socialising at a bar in Fraserburgh with a third friend.

As the three men walked back towards *Vision II* on Provost Park Quay, they were seen by a number of witnesses who considered them to be under the influence of alcohol. Ramilito Calipayan and Benjamin Potot boarded *Vision II*, and the third man boarded fishing vessel *Faithful* which was secured along the starboard side of *Vision II*.

1.3.4 Discovery of the fire

On 1 August at approximately 0030, the Fraserburgh harbour security guard parked his van at the end of Provost Park Jetty facing seaward. While he was talking to two men in an adjacent car, they pointed out to him that there were three Filipino men walking along the jetty. The security guard glanced into the wing mirror of his van and noted three men boarding *Vision II;* about 5 minutes later he continued with his harbour patrol.

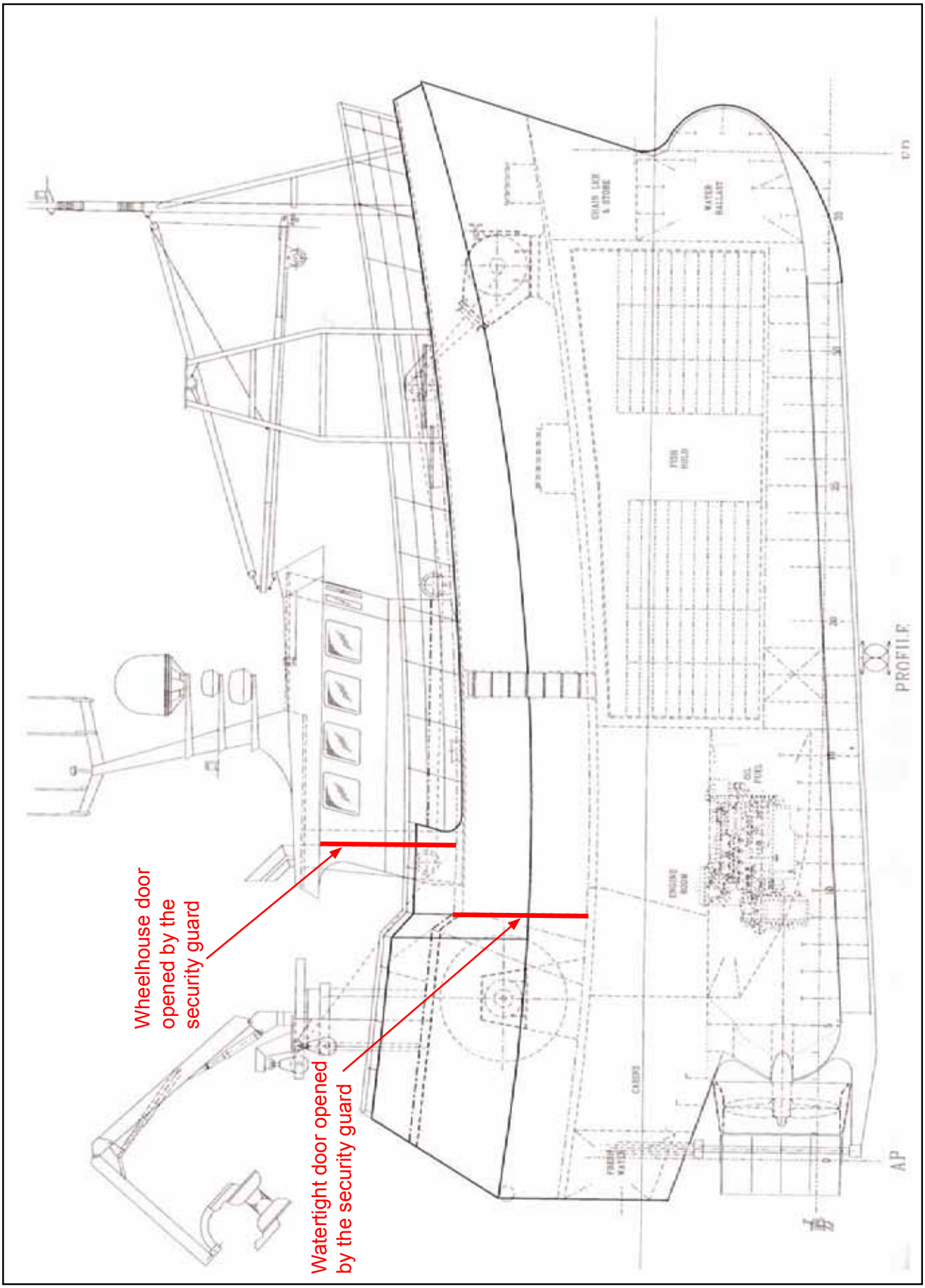
At about 0120, the security guard returned to the head of Provost Park Jetty and noted a plume of grey smoke rising from the aft end of *Vision II*'s wheelhouse. He initially thought that the smoke might be a result of someone cooking or exhaust gas from a generator but, on driving further down the jetty, it became apparent that there was more smoke than he had first thought.

Knowing that people had returned to the vessel earlier, the security guard boarded and made his way to the watertight door at the aft end of the accommodation on the main deck **(Figure 1)**. He lifted the middle dog, opened the door, and was immediately engulfed in thick black smoke. He then closed the door and secured it, again using one dog. The security guard then climbed up the adjacent vertical ladder and opened the wheelhouse door to see if there was anybody inside. He was engulfed by black smoke so shut the door and used his hand-held radio to raise the alarm.

At 0130, the watchkeeper in the harbour control office acknowledged the radio call. He was advised that there was a fire on board *Vision II*, that three people had been seen boarding the vessel earlier, and was requested to contact the fire and ambulance services.

The security guard attempted to raise the alarm on the two fishing vessels berthed alongside *Vision II*, *Faithful* to starboard and *Sardonyx* to port. On receiving no response from either vessel, he proceeded ashore and waited at the head of the pier to brief the emergency services on their arrival.

Figure 1



Vision II - Profile

1.3.5 Actions post discovery of the fire

At 0138, the ambulance arrived and the crew saw flames 2m in height emanating from a galley vent, and black smoke billowing out of the main deck watertight door and the wheelhouse. The density of the smoke made it difficult for them to see the aft end of *Vision II*.

At 0145 the local pilot boat coxswain was contacted and advised of the fire on board *Vision II*. He was requested to attend immediately, and advised by the assistant harbourmaster, who was already on scene, to tow *Faithful* clear in case the fire spread. Fishing vessel *Sardonix,* secured on the port side, was pulled clear from the quayside by the assistant harbourmaster.

At 0147, two fire appliances from Fraserburgh arrived at the scene. Due to the intense heat, boundary cooling was commenced around the stern and aft accommodation bulkhead. A fire-fighting team used a ladder to gain access to the vessel and, after cooling the immediate area around the watertight door, entered the accommodation. Inside, they observed that the galley, which was red hot, appeared to be the source of the fire. The fire was extinguished approximately 40 minutes later. A search of the vessel found two badly burned bodies in the galley and one body in the wheelhouse.

The local lifeboat crew were paged and the lifeboat launched at 0155 as a precautionary measure in the event of survivors jumping overboard.

Vision II's new owner was informed of the accident by text message and telephone, and he made immediate arrangements to return to Fraserburgh.

1.4 FIRE INVESTIGATION

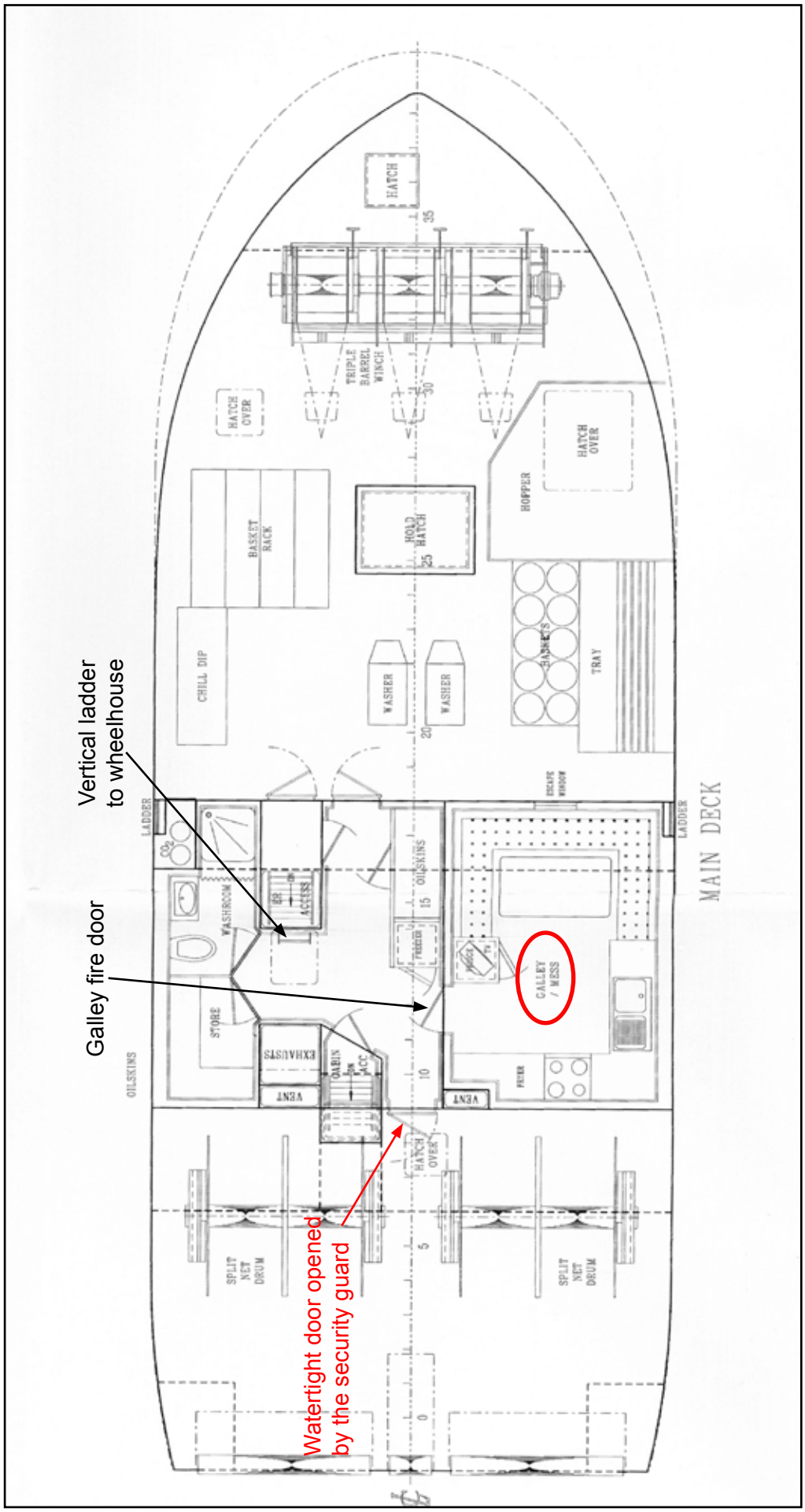
1.4.1 The victims

On 1 August at 0930, the fire investigation commenced on board *Vision II*, focussing predominantly on the galley and adjacent areas **(Figure 2)**.

Three bodies were found and later identified:

- Ramilito Calipayan was found clothed, lying face down, facing aft on the port side fore and aft galley bench seat. He was in a position that indicated he had died in his sleep.
- Benjamin Potot was found clothed, lying face down and to starboard, on the athwartship galley seat. He also was in a position that indicated he had died in his sleep.
- Rimants Venckus was found dressed only in underwear, lying on the deck of the wheelhouse, face up, adjacent to the hatch opening.

Figure 2



Vision II - Main Deck

1.4.2 Fire damage

- The galley

  The galley had suffered severe fire damage. The majority of the fittings within the compartment were of wooden construction; they included:

  - A seating area and table.
  - Storage lockers under the bench seats.
  - Storage and wall units on the starboard side.
  - A storage locker on the port side.
  - Battens used for securing internal bulkheads.

  Additional equipment and fittings included:

  - A galley range against the aft bulkhead.
  - Vinyl covered foam cushions over the bench seats.
  - An electric fan heater fitted under the starboard bench seat.

  A 'V' shaped burn pattern was observed directly above the seating area where the electric fan heater was fitted. The pattern indicated that the fire originated in this area, started at a low level and spread upwards. Although the heater was severely damaged by the fire, the contents of the locker around it remained semi intact **(Figure 3)**. This was the only area of galley seating destroyed in the fire.

  The galley range had a pan in position on the left hand plate. The pan had partially melted in line with the electric heater **(Figure 4)**.

- The galley fire door

  The galley had an A60 rated fire door which was fitted with a self-closing mechanism that had been disconnected **(Figures 5 and 6)**. The door was secured in the open position by a permanent hook and eye holdback **(Figure 7)**. The burn pattern on the door indicated that the galley door was in the open position during the fire. The open door allowed the fire to spread into the adjacent main passageway.

  Fire damage occurred throughout the main passageway and the crew washroom.

- The wheelhouse

  The hatch to the wheelhouse from the main passageway was found in the open position. *Amethyst*'s crew indicated that they had never seen the hatch closed, and there was no evidence to show that the hatch had been closed or that someone had attempted to open it on this occasion. The hatch seal was in good condition.

The wheelhouse suffered moderate smoke damage throughout, but there was no evidence of direct fire damage.

- The cabin space

  The cabin space, which was protected by an A60 fire door with an operational self-closing mechanism, suffered only minor smoke damage. The side of the door, external to the cabin space, showed significant fire and smoke damage to the upper part. The escape hatch inside the cabin showed that no attempt had been made to use it. Closer inspection of the escape hatch revealed the securing dogs were seized, and several blows from a sledge hammer were required to free them in order to open the hatch **(Figure 8)**.

- The external watertight door

  The external watertight storm door from the main passageway on to the net drum deck was partially open and was reported by the firefighters on scene to be '*issuing flames*'. Smoke damage to the upper section of the door supports this theory. An empty cigarette packet was found close to the door on the drum deck **(Figure 9)**.

Figure 3

Seat of the fire in the vicinity of the electric heater

Figure 4

Galley range showing partially melted pan

Figure 5

Galley fire door self-closing mechanism

Figure 6

Galley fire door frame

Figure 7

Galley fire door - open position

Figure 8

Emergency escape hatch from the main cabin

Figure 9

Empty cigarette packet on drum deck

1.4.3 Electrical distribution

No electrical drawings were ever produced for *Amethyst / Vision II*, and the power distribution diagram system shown in **(Figures 10 and 11)** was derived from post fire examination and advice from the electrical contractor responsible for the vessel's original fit out.

The vessel was fitted with two generators, each supplying 415v alternating current, both located in the engine room. The port generator, rated at 126kW, was used to supply the vessel's main 240/415v switchboard and, when required, to drive the main hydraulic pump. The starboard generator, rated at 54kW, was used solely to supply the vessel's main switchboard and to satisfy the domestic demand for power. The generators were not designed to be run simultaneously.

The main switchboard fed two 6kW transmotors that provided 24v direct current to the vessel's 24v battery banks. The system ensured that the batteries were maintained at full charge for supplying the vessel's 24v equipment via two 24v switchboards. The main engine starting batteries were charged directly from the main switchboard, and each generator charged its own independent starting battery. An emergency battery bank was located in an external watertight compartment on the wheelhouse deck. Power to the fire alarm and detection panel was fed directly from the 24v emergency battery supply.

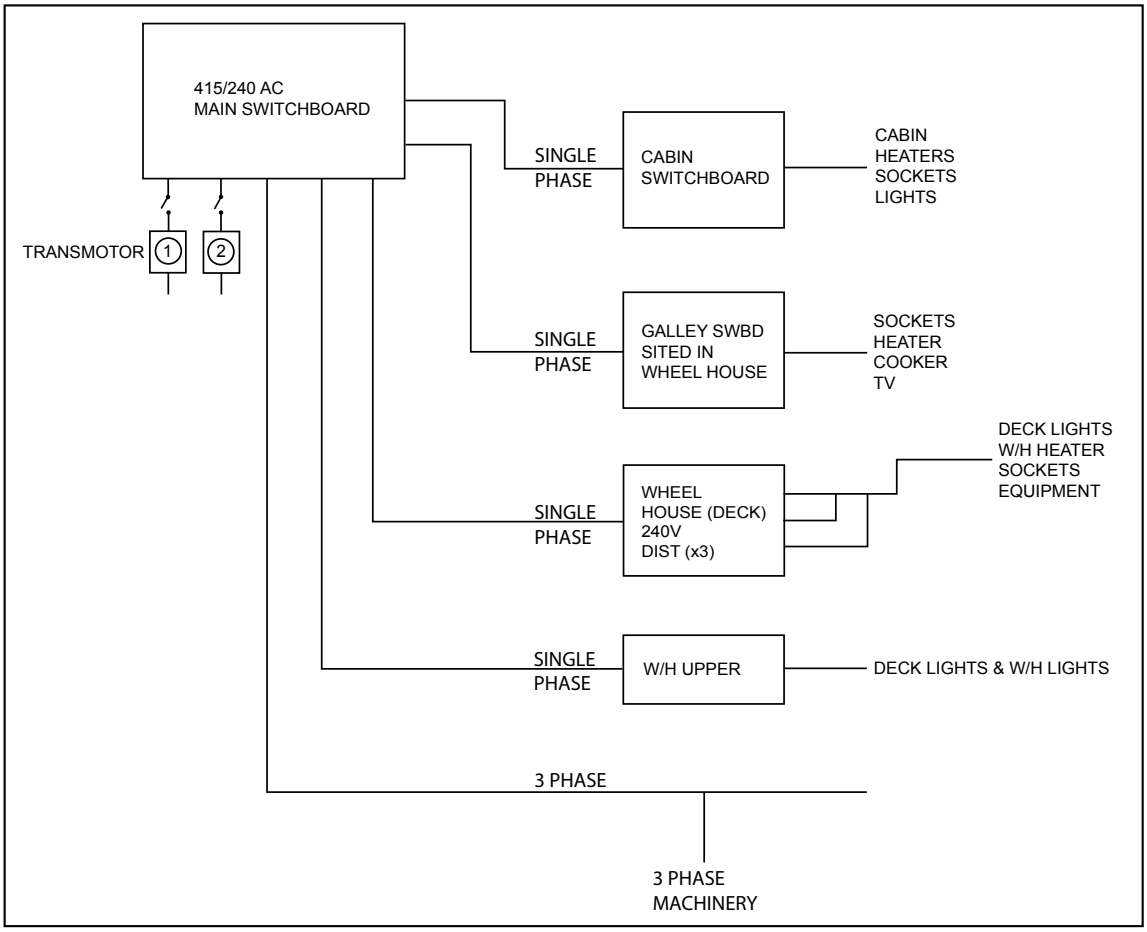
All switchboards were found to be in good condition and were fitted with appropriately rated three pole mini circuit breakers (MCBs) for the 415v supply, and two pole MCBs for the 240v and 24v supplies. All MCBs were labelled with the names of the equipment they were protecting and the main switchboard was fitted with an earth fault indicator. There was no electrical power distribution schematic diagram provided on board the vessel, nor were there any instructions displayed for the operators.

Fraserburgh Harbour Authority provided a shore power facility for vessels in the harbour. Received from the main grid at 11kV, the power was transformed down to 415v three phase, and made available to vessels via 32 amp and 63 amp sockets positioned around the harbour **(Figure 12)**.

Vision II was connected to No.1 socket on Provost Park Jetty using a 5 pin, 32 amp three phase neutral and earth industrial plug. The supply was protection rated at 32 amps and fitted with a Residual Current Device (RCD) rated at 30mA.

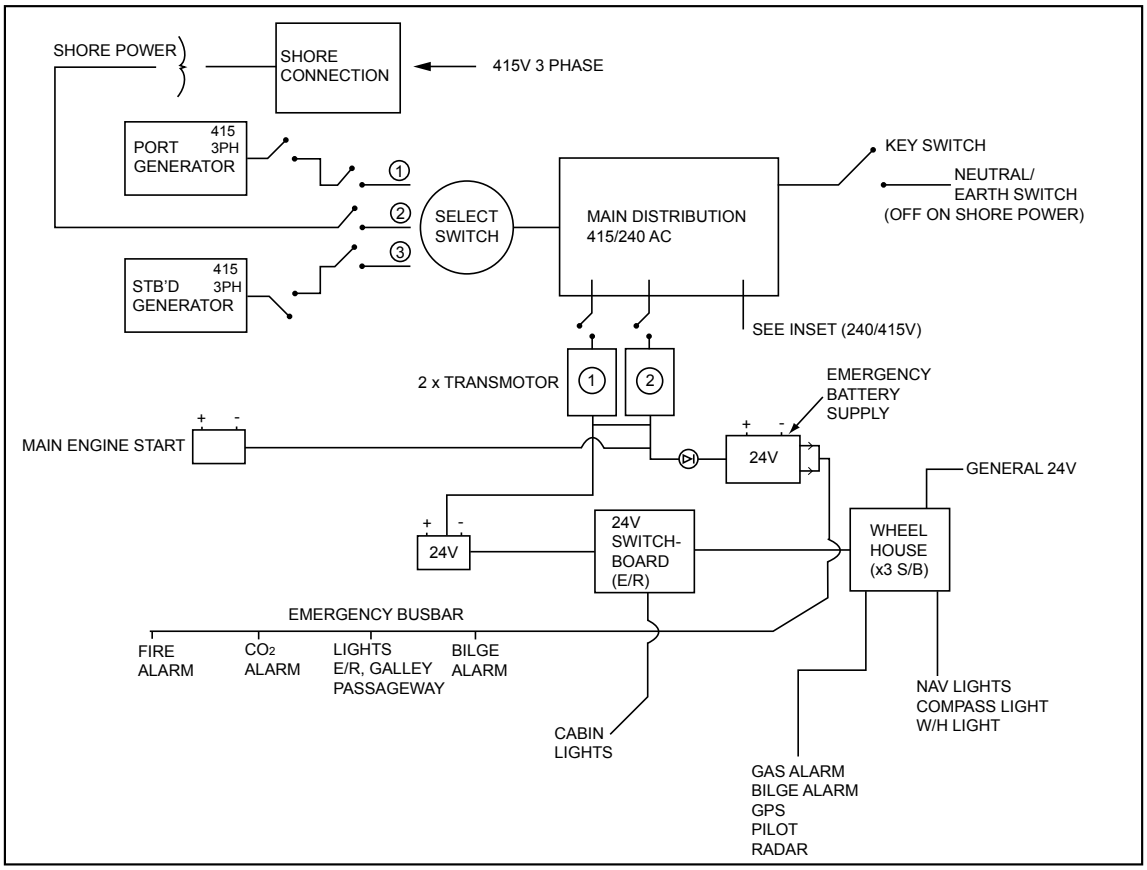
The vessel's shore power lead was disconnected from the supply box by a member of the local lifeboat crew on his arrival at the scene of the fire. A qualified electrician, he noticed that the RCD had tripped, and he switched off the power and removed the plug.

Figure 10



Electrical distribution

Figure 11



Electrical distribution

Figure 12

Shore power supply - Provost Park Jetty

1.4.4 Heater examination

The remains of the galley fan heater, the wheelhouse and port side cabin heaters, all of which had been repaired the day before the accident, were removed from the vessel for examination by the Health and Safety Laboratory at Buxton. The purpose of the examination was to determine whether there was any evidence to suggest the galley heaters had caused the fire.

All three heaters were photographed and subjected to external and internal examination. In addition, the undamaged heaters were internally examined in order to determine the generic design so that an informed examination could be carried out on the remains of the galley heater. On completion, a number of experiments were conducted using the undamaged heaters to establish the operation of the thermal cut outs. Tests were conducted to establish the effectiveness of the safety devices, and the output and radiated temperatures of the heater under normal conditions and when the airflow to the heater was blocked or partially blocked.

No direct evidence indicating that the fire was ignited due to a fault in the galley heater was found. However, the examination was able to confirm that the main power switch of the heater was turned on and that both elements were turned on.

1.5 CREW

1.5.1 Overseas workforce

Over the past 10 years, there has been a significant increase in the number of contract workers from Eastern Europe and the Far East, particularly the Philippines, employed in the United Kingdom fishing industry.

At the time of this accident it was estimated that there were 100 overseas crew sailing on Fraserburgh based vessels, and a further 100 sailing on Peterhead based vessels. A consequence of using an overseas workforce has been an increase in the numbers of crew living on board the vessels when they are in port.

1.5.2 Contracts of employment

Ramilito Calipayan and Benjamin Potot were engaged through different manning agencies based in the Philippines. Their contracts were for 10 and 6 months respectively, with their basic pay and overtime negotiated within the contract of employment. Rimants Venckus worked a routine consisting of 14 weeks on board *Amethyst*, followed by 4 weeks at home in Latvia. After 9 months, he took a 3-month holiday. Rimants Venckus had recently been made a share fisherman by the skipper of *Amethyst*.

1.5.3 Skipper / owners

- *Amethyst*

  The skipper of *Amethyst* was 44 years old. He commenced his seagoing career at the age of 16, gaining his Skipper (Full) certificate[1] when he was 21. He had been a skipper for 23 years, most of which were on vessels he had owned, or part owned.

  In 2004, he gained a Class 4 certificate of competency and sailed for three trips as the second mate on board rig stand-by vessels. He then returned to fishing and skippered his own vessel. He had owned several new vessels, operating them on the principle that a new vessel would be more reliable, could be worked harder and, over 3 or 4 years, would probably incur fewer maintenance and repair bills. His concept was to sell the vessels on before they required their 5-year fishing vessel survey. The skipper spared no expense ensuring that the vessel was operating at maximum efficiency.

  Just before this accident he had made a decision to take early retirement from fishing, a decision that resulted in him also selling a new vessel almost ready for delivery from Macduff Shipyards Limited.

[1] Equivalent to Deck Officer Certificate of Competency (Fishing Vessel) Class 1.

- *Vision II*

  The skipper of *Vision II* was 47 years old and had been at sea since the age of 15. He had gained his Second Hand (Full) certificate at the age of 21, shortly followed by his Skipper (Full) certificate. He had experience in both engineering and deck disciplines. He purchased his first vessel at the age of 29, and had been a skipper since then.

  He intended to operate the vessel using seven men, one more than the previous owner, to provide more flexibility to cover leave commitments. The vessel was to be manned using a combination of local and overseas crew.

1.5.4 The deceased

- Ramilito Calipayan was a Filipino national. He had attended the Far East Maritime Foundation in May 2001 and successfully obtained certification in Personal Survival Techniques, Fire Prevention and Fire Fighting, Elementary First Aid and Personal Safety and Social Responsibility.

  More recently, he had obtained certification in:

  - Ship Security Awareness
  - Engine Watchkeeping
  - STCW III/4 Marine Engineering at the support level
  - Marine Engineering Theory.

  He had not undertaken the UK fishing vessel Basic Safety Awareness course.

  Ramilito Calipayan had joined the fishing vessel *Vision* on 03 November 2007 at Fraserburgh and had transferred to *Vision II* on 27 July 2008. He was described as an intelligent and hard working young man, keen to develop his engineering knowledge and skills. With a good command of English, the owner's intention was for Ramilito Calipayan to become the chief engineer on *Vision II*.

- Benjamin Rosillo Potot was also a Filipino national. He had attended the Philippine Seafarers Training Centre in 2001 and had successfully obtained certification in Personal Survival Techniques, Elementary First Aid, Fire Prevention and Fire Fighting.

  In addition to the safety courses, he had obtained certification in:

  - Personal Safety and Social Responsibility
  - Proficiency in Survival Craft and Rescue Boat
  - STCW II/4 Navigation at the Support level

- Hazardous Material Familiarisation
- Maritime English
- MARPOL 73/78
- Prevention of Alcohol and Drug Abuse – Maritime Sector
- Tanker Familiarisation

He had not undertaken the UK fishing vessel Basic Safety Awareness course.

Benjamin Potot had joined fishing vessel *Orion* on 27 April 2008.

- Rimants Venckus was a Latvian national. The skipper of *Amethyst* confirmed that Rimants Venckus was in possession of all the necessary certification, but no evidence was available to support this.

  Rimants Venckus was employed as the second engineer on board *Amethyst,* having been recommended to the owner by a Latvian chief engineer working on another fishing vessel in Fraserburgh. He had sailed on *Amethyst* since it was new in 2005 and was described as competent, hard working and capable. Rimants Venckus had a moderate grasp of English, checking when necessary that his understanding of an instruction was correct.

  He had not undertaken the UK fishing vessel Basic Safety Awareness course.

1.5.5 Living on board

Habitability conditions for crew permanently living on board *Vision II* were good and were, at the time of the accident, in the process of being further enhanced.

Although the vessel had connected to shore power previously when alongside, the ship's own generators were more usually used.

In respect of ship security for those living on board, Rimants Venckus was described as '*paranoid*', and he apparently felt the need - like many other crews living on board fishing vessels - for robust overnight security. The security measures he adopted included locking the wheelhouse door, for which each crew member had a key, and securing two dogs internally on the net deck watertight door with a section of scaffolding tube **(Figure 13)**.

Figure 13

Example of the scaffolding tube used to secure two internal dogs

1.6 POSTMORTEM AND TOXICOLOGY RESULTS

The cause of death for both Ramilito Calipayan and Benjamin Potot was recorded as '*death caused by fire on a fishing vessel*'.

The cause of death for Rimants Venckus was recorded as '*smoke inhalation*'.

Toxicology results for all three of the deceased were recorded as:

Name	Carbon Monoxide (%)	Cyanide (mg/litre blood)	Blood Alcohol (mg/100ml blood)	Remarks
Ramilito Calipayan	23	1.16	180	
Benjamin Potot	20	0.44	101	Known to smoke cigarettes
Rimants Venckus	68	6.94	0	

1.7 SHIP DESIGN AND BUILD

1.7.1 Shipbuilder

Amethyst's hull was fabricated by Richards Dry Dock and Engineering Limited in Great Yarmouth.

In April 2004, the MCA was notified of the intended new build and was provided with two copies of the general arrangement and one copy of the lines plan.

In June 2004, the MCA appointed the Sea Fish Industry Authority (SFIA) to act on their behalf to carry out survey work on *Amethyst* during build. SFIA was to be satisfied that the vessel complied with the requirements of The Code of Safe Working Practice for the construction and Use of 15 metre length overall to less than 24m Registered Length Fishing Vessels (MSN 1770 (F)).

On completion of fabrication, the hull was moved to Macduff Shipyards Limited in Macduff for fitting out.

1.7.2 Fitting out

Macduff Shipyards Limited has more than 60 years experience building both wooden and steel vessels of all descriptions including fishing vessels, pilot boats and workboats.

The company did not hold ISO 9000 or ISO 14000 accreditation, and did not operate an 'in house' quality assurance system, but the company had a reputation for delivering a high quality of finish and reliability. The standard and quality of build was achieved by producing craft of similar characteristics and using the same suppliers of materials and equipment. By employing tradesmen with appropriate qualifications, the workforce had become familiar with the fit out requirements without the need for referring to detailed drawings. Standards of work were monitored by a 'hands on' approach taken by the company's directors and the onboard presence of trade supervisors.

For the past 40 years, Macduff Shipyards Limited has sub contracted all electrical work to R.D.Downie Limited, a reputable local company. The sub contractor provides its own workforce and electrical equipment. Macduff Shipyards Limited assumed that the equipment fitted by the sub contractor was suitable for the marine environment.

1.7.3 Galley design and materials

The galley of *Amethyst* was constructed with steel deck, deck head and bulkheads to the A30 standard. All boundaries, including stiffeners, were insulated using approved 40mm Rockwool Firebatt 2000, overlaid with wire mesh.

Seat coverings around the galley table were manufactured using Ambla flame retardant fabric, which conformed to IMO Resolution 652(16)[2].

The seat cushioning was manufactured from Kay-Metzeler combustion modified conventional polyether polyurethane foam. The material had undergone, and passed, the Furniture and Furnishings Fire Safety Regulations 1988 test, in January 2007.

Bulkhead and furniture fascias were manufactured using Formica laminate. The material had been tested in accordance with the IMO A635(16) fire test procedure code, which it passed.

Through-bulkhead cable glands incorporated the approved Geaquello sealing system, which fulfilled the requirements of the A60 class fire tests.

Wooden bulkhead and deck head battening was coated with fire retardant paint. Common to the majority of fishing vessels less than 24m in length, furniture and fittings were predominantly wood based.

The door to the galley was an A60 rated fire door, originally fitted with a self-closing mechanism. The galley door opened outward and was fitted with a hook-back arrangement. A sliding glass escape window, which opened onto the shelter deck, was fitted in the forward facing bulkhead.

Smoke and heat detectors were fitted to the galley deck head on the starboard side, just forward of the electric toaster. The detectors alarmed remotely in the wheelhouse.

An electric fan heater was fitted in the locker beneath the starboard bench seat.

1.7.4 Fire detection system

An approved fire detection system, the ED 820 manufactured by Electronic Devices Limited, was fitted in the wheelhouse **(Figure 14)**. The system served three zones: galley, engine room and cabin space. Smoke and heat detectors were fitted in each of the three compartments. The system was designed to indicate heat or smoke detection by sounding an audible alarm in the wheelhouse, and a light indication on the control panel to identify the respective zone.

Zone fault-finding and power supply indicators were also fitted.

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[2] This test procedure prescribes methods for assessing the ignitability of material combinations, eg covers and filling used in upholstered seating, when subject to either a smouldering cigarette or a lighted match as might be applied accidentally in the use of upholstered seats.

Figure 14

Fire detection panel

1.7.5 Fire extinguishing

The galley was equipped with one dry powder extinguisher.

1.8 HEATING

Historically, fishing vessels were fitted with electric element radiators, but pressure to utilise space more effectively led to the fitting of smaller cast iron 'black' lower temperature electric heaters. Poor availability of 'black' heaters and a customer requirement for compact heaters with a greater output, subsequently drove contractors to fit electric fan heaters or space heaters.

MSN 1770(F) paragraph 5.1.8.1.1 refers to space heaters, specifically:

> '*Electric space heaters, where provided, should be constructed and fitted to reduce the fire risk to a minimum and where such heaters are situated on decks or bulkheads the structure of such decks or bulkheads should be protected by non-combustible material. Heaters with exposed elements and open flame heaters should not be provided'*

There were five electric fan heaters fitted on board *Vision II*:

- Two in the wheelhouse
- Two in the cabin space
- One in the galley

Of the five heaters, three had been defective, but were repaired before the fire.

1.8.1 Specification

Vision II was fitted with 'Heatstore Base Unit Fan Heaters' that complied with European Safety Standard EN60335-2-30 **(Annex C)**. The heaters were specifically designed to fit in the space behind the plinth of domestic floor standing kitchen units **(Figures 15a, b and c)**.

Safety warnings on the heaters included:

- *DO NOT COVER OR OBSTRUCT the air inlet or outlet grill.*
- *If the appliance is covered, there is a risk of fire.*
- *Do not touch or obstruct the grille areas when the heater is in operation.*

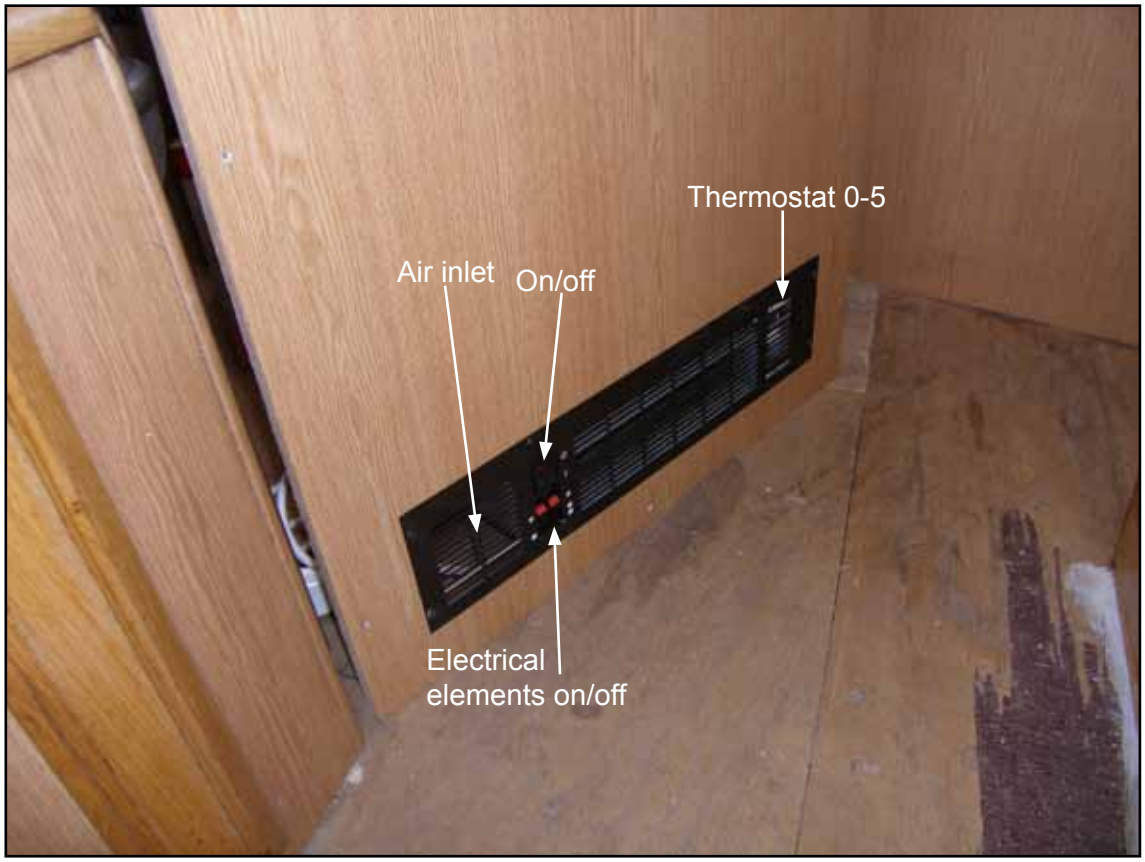
Figure 15a

Heater aperture

Figure 15b

Heater positioned through the aperture

Figure 15c



Heater secured by six wood screws

Operating on 240v, each heater had a maximum output rating of 2400 watts using 1600 and 800 watt heating elements. A variable thermostat control was capable of operating between the temperature limits of 5º and 30º Celsius. A clicking sound on the thermostat control indicated that the room would be maintained at that particular temperature setting. Operation of the unit was controlled using an on/off rocker switch, with two similar style switches for each of the heating elements. Dimensions of the fitting aperture and the location of adjacent fittings were critical to ensure safe operation.

The user was advised in the operating instructions to vacuum the heater occasionally to remove any internal dust. A thermal cut out was incorporated and designed to provide overheat protection at a temperature of 80º Celsius. Reset was automatic after a short cool down period. A rear support bracket, not fitted to the heaters on board *Vision II*, was designed to take the weight of the heater and keep it horizontal. Six screws held the face of the heater against the plinth. The air intake was not an integral part of the heater casing and relied upon the area behind the grill not becoming obstructed.

1.8.2 Fitting

At Macduff Shipyards Limited, the standard procedure was for an electrical contractor to fit the galley heater in a storage locker under a bench seat. The exact position of the heater was not defined by drawings, and fitting requirements were achieved by electrician and joinery supervisor dialogue.

Fitted just above deck level, it was intended that the body of the heater would be boxed in using marine grade plywood inside the locker. On *Amethyst / Vision II*, boxing in had not taken place and the chassis of the heater was lying exposed inside the locker **(Figures 16a and 16b)**. The heater was direct wired into a fused spur connection adjacent to the face of the heater.

1.8.3 Contents of the galley under-seat locker

Over the 2 years preceding the accident, during which the heater was defective, the seat locker had become used for storing items of equipment, including: a tablecloth, shopping catalogues, equipment handbooks, small medical items, plastic drink bottles, wooden plates and, more recently, some working gloves. The crew's recollection of the locker's contents was that the equipment was spread underneath and around the sides of the heater chassis.

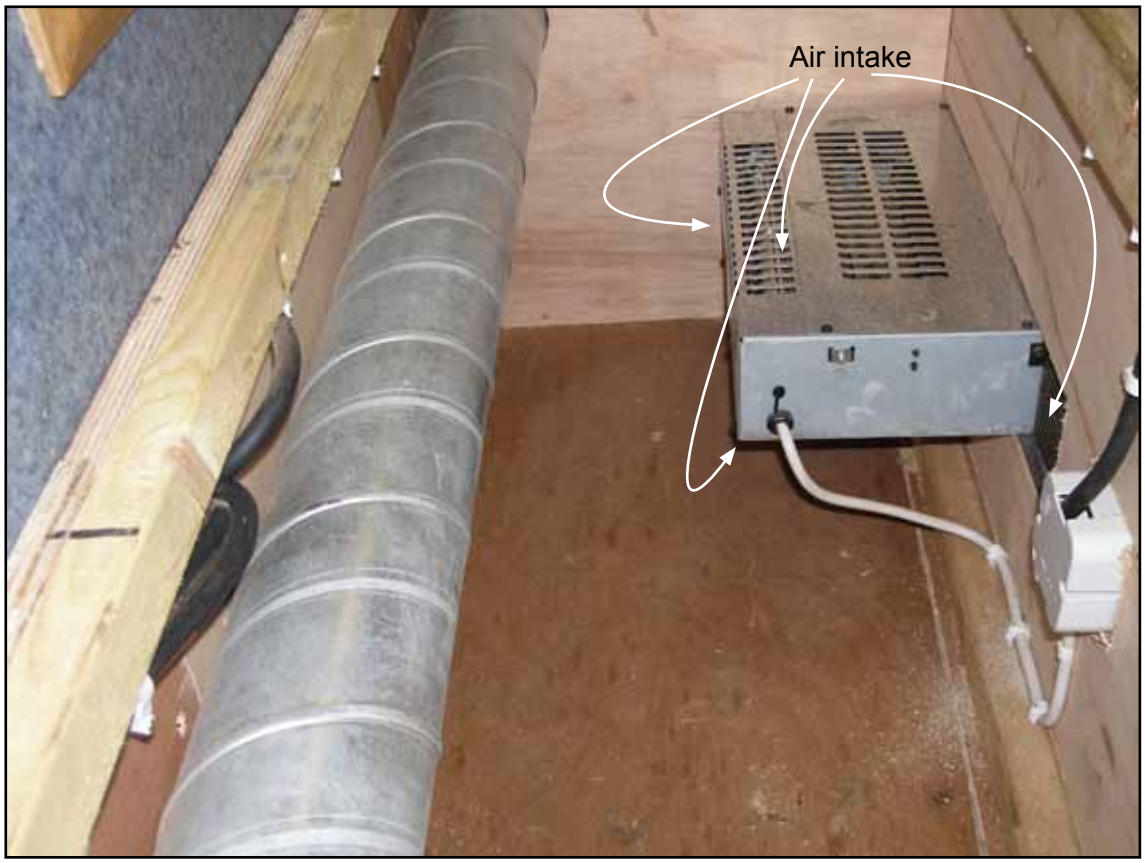
1.8.4 Alternative heat supply

Before the galley electric fan heater was repaired, Rimants Venckus had been known to use the galley range as a source of heat while living on board in port.

Figure 16a

Example of cabin heaters fitted inside seat lockers and boxed in

Figure 16b



Example of how the galley heater was fitted inside seat lockers

1.9 SEA FISH INDUSTRY AUTHORITY

1.9.1 Background

As a non-departmental public body, the SFIA represents the interests of the fishing industry in the following main areas: environment, legislation, marketing, economics, training and marine services.

Originally formed from the amalgamation of the Herring Board and the White Fish Authority, in 1981 the Seafisheries Act empowered SIFA to develop rules and standards for fishing vessels up to 24m LOA. By 1987 construction rules had been developed for glass reinforced plastic (GRP), wood and steel fishing vessels, and by 1995 the standards for under 15m vessels in GRP, wood and steel and 15m to 24m steel vessels were completed.

The SFIA construction standards exceed or are equal to the requirements of MGN 1770 (F), are reviewed annually, amended where necessary and have now been adopted by other nations. In 2006, the construction standards included structural fire protection for the first time. SFIA is ISO 9001-2000 accredited.

1.9.2 SFIA surveying

From 1987 to 1991, SFIA employed 35 surveyors who carried out general surveying and ensured that owners met the terms and conditions for award of government and EU assisted grants. From 1991 to 2003, the number of SFIA surveyors declined to just three, but has since recovered to five permanent and eight contract surveyors.

Current convention allows classification societies to conduct new build surveys on behalf of the MCA. In the case of fishing vessels, the SFIA fulfilled the role of the classification society, surveying to SFIA construction standards. The memorandum of understanding (MOU) between the MCA and the SFIA and an individual 'instrument of appointment' letter **(Annex D)** authorised an SFIA surveyor to act on behalf of the MCA. SFIA surveyors were required to visit vessels during build, providing stage certification on each occasion as appropriate. On completion of the final survey, if the surveyor was satisfied that the vessel complied with the requirements of MSN1770(F), he would complete a declaration of survey and a record of particulars, Form FV2.

In the case of *Amethyst*, the MCA appointed its own lead surveyor to the project, and the two parties defined their respective areas of responsibility with the SFIA conducting all survey work, except structural fire protection and lifesaving appliances.

The SFIA surveyor for *Amethyst* was responsible for surveying all new fishing vessels built in Scotland and Northern England and considered he had a good working relationship with Macduff Shipyards Limited. The yard built a significant

number of vessels: the surveyor was a frequent visitor to the yard, and was familiar with its standard of work. The surveyor did not always receive drawings for approval, as required by the construction standards. This made his task more difficult as he had to spend more time and effort trying to familiarise himself with various systems, and this had a detrimental effect on his other work.

The surveyor visited *Amethyst* on six occasions during build, providing stage certification as appropriate, but was absent when the electrical system survey fell due. He did, however, certify the vessel's tonnage and dimensions, in accordance with the Merchant Shipping (Tonnage) Regulations 1997, as amended.

1.9.3 Form FV2 – Records of Particulars of a Fishing Vessel

Form FV2 for *Amethyst* was completed by the SFIA surveyor during build and fitting out and it had been forwarded to the MCA. The completed document did not record details of the vessel's steering gear, electrical and auxiliary systems, anchors and chain cable.

1.10 WESTWARD FISHING COMPANY

Based in Fraserburgh, the Westward Fishing Company part owned 12 fishing vessels and acted as an agent for a total of 18 of its own and other fishing vessels, providing a variety of services including: fish selling, manning, paying crew wages and accounting.

Under the previous ownership arrangement, Westward Fishing Company had acted solely as *Amethyst*'s agent, and the previous owner/skipper was responsible for operating the vessel.

Following sale of the vessel, although Westward Fishing Company held a 25% share in *Vision II,* this relationship did not change and the company only acted as the agent for the vessel. Westward Fishing Company had confidence and trust in the skippers it shared ownership with; no formal partnership contract was drawn up and running the business was very much left to the skipper. The company kept the skipper updated with information arriving at the office, but considered that all operational matters were his sole responsibility.

The administrative task involved in selling the vessel and transferring ownership was undertaken by Westward Fishing Company on behalf of both skippers.

1.11 SURVEY REGIME

1.11.1 United Kingdom Fishing Vessel Certificate

The United Kingdom Fishing Vessel Certificate (Form MSF 1321) for *Amethyst* was issued by the MCA on 30 December 2004 and was valid until 21 December 2009, subject to the vessel passing an intermediate inspection (see 1.11.3).

1.11.2 Annual verification checks

Accompanying the United Kingdom Fishing Vessel Certificate is the Annual Self Certification document (Form MSF 1323). The document formalises and provides the regulator with evidence that the requirement contained in MSN 1770 (F) section 1.3.7.1 has been complied with:

1.3.7.1 In addition to compliance with the survey and inspection requirements that are detailed in sections 1.3.5 and 1.3.6 above, the owner or a delegated representative should check the vessel annually, at intervals of not more than 12 months, to confirm that:

I. All fire fighting appliances, live saving appliances and safety equipment that are carried on board the vessel have been suitably maintained and are within date;

II. The Radio equipment is functioning correctly;

III. The shipborne navigational equipment, nautical publications and lights, shapes and sound signal appliances, that are required for compliance with the Merchant Shipping (Distress Signals and Prevention of Collisions) Regulations SI 1996, No 75, are carried on board and are functioning correctly;

IV. The risk assessment (see section 6.1.2) remains appropriate to the vessel's fishing method and mode of operation;

V. No known alteration, damage or deterioration to the vessel or its equipment has occurred in service that would affect the vessel's compliance with the requirements of the code or the vessel's stability;

VI. Weathertight doors and hatches are functioning correctly; and

VII. Crew training and certification are valid

1.3.7.2 On completion of each annual check, the owner should sign a declaration (in the format detailed in Annex 2) confirming compliance with section 1.3.7.1 above and retain the declaration for subsequent inspection.

There was no record of annual verification checks being conducted by the skipper or a representative on board *Amethyst* **(Annex E)**.

1.11.3 Intermediate inspection

As well as the annual verification checks conducted by the skipper during the 5 year life of the United Kingdom Fishing Vessel Certificate, the vessel should be inspected not less than 24 months and not more than 36 months from the recorded date of the vessel's initial or renewal survey. The purpose of the

intermediate inspection is to verify that the vessel complies with the code – MSN 1770 (F). Application for renewal survey or intermediate inspection should be made by, or on behalf of, the owner to the certifying authority.

The United Kingdom Fishing Vessel Certificate on board *Vision II* showed that an intermediate inspection had not been conducted.

1.11.4 Other inspections

Records showed that *Amethyst* underwent a radio inspection and two targeted inspections by the MCA between November 2005 and February 2008.

The radio survey identified the following deficiencies:

- Slight corrosion to the radio battery terminal
- New printer ribbon required for Inmarsat C printer
- EPIRB hydrostatic release unit just expired
- The MF/HF radio transceiver not tuning.

The two targeted inspections identified one deficiency:

- A fire extinguisher required servicing.

1.12 MAINTENANCE

1.12.1 On board

At the time of this accident, *Vision II* had been operated successfully for 43 months. The vessel's standard operating routine had allowed the chief engineer to progress routine maintenance tasks on a Saturday while the vessel was alongside. In an attempt to relieve the burden on the chief engineer, who lived locally, the skipper made the decision to employ a foreign second engineer who lived on board. Such a system allowed shore leave for local crew, while maintenance was progressed at the weekend.

There were no planned maintenance records on board the vessel, although the chief engineer kept a list of 'jobs to do' on his own note pad. The second engineer's tasks included oiling, greasing, cleaning sea cocks, changing filters and minor repairs prior to sailing the following day. The chief engineer progressed maintenance at sea, with the exception of electrical work, when time permitted. Towing and lifting wires were changed every 3 to 6 months.

1.12.2 Contracted

Routinely *Amethyst* had undergone an annual dry docking. This allowed for the replacement of anodes and a fresh coat of anti-foul paint on the underwater area.

The annual docking provided an opportunity for the skipper to arrange for manufacturers or approved contractors to attend the vessel and carry out maintenance considered to be beyond the capabilities of the crew. The skipper was aware that although he worked the vessel hard, it required appropriate maintenance to remain successful.

1.13 INFORMATION

The MCA produces a 'Fishing Vessel Certificates Wallet' to provide fishermen with a secure place to keep their vessel's certificates and documents. The wallet includes the 'Fishermen's Safety Guide', which provides a range of information including:

- Precautions and actions to take in the event of fire
- Actions to take in emergencies
- Training and qualification requirements

The wallet has been designed to assist skippers with the statutory administration of their vessel and the implementation of safe working practices and procedures.

A 'Fishing Vessel Certificates Wallet' was not found on board *Vision II*.

1.14 SIMILAR INCIDENTS

Since 1999, the MAIB has recorded 26 fatalities involving crew from fishing vessels of all lengths while secured alongside in port.

Including this accident, fire has accounted for five fatalities: In 1999, two crew returned to the vessel to sleep on board. While they were sleeping, a tea towel fell onto the galley stove; one person died and the second suffered serious injuries from smoke inhalation. In 2005, a crew member returned to sleep on the vessel overnight. He fell asleep in the cabin space with a lit cigarette. The resulting fire consumed oxygen from within the space, created toxic fumes and, consequently, resulted in the death of the crew member.

Carbon monoxide poisoning has resulted in a further three deaths while crew have been living on board. In 2000, an engineer died using a petrol generator to pump bilges in an enclosed space. In 2006, a crew member rigged a portable generator to provide power to supply an electric heater. The exhaust leaked into the cabin space while he was asleep, and killed him. This was followed in 2007 by the death of a worker involved in tank cleaning. The worker was not following the correct procedures for entering an enclosed space.

The remaining 21 deaths involved people falling overboard. Contributory to 11 of the deaths was the individual's consumption of alcohol prior to the accident.

SECTION 2 - ANALYSIS

2.1 AIM

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

2.2 FATIGUE

All three of the deceased had been working a day routine from approximately 0800 until 1800, which included a rest period for lunch. Two of the three deceased had been working this routine for 4 days, and the third for 2 days. There is no evidence to suggest that fatigue, caused by excessive working hours and insufficient hours of rest, played a contributory part in this accident.

That Ramilito Calipayan and Benjamin Potot were ashore prior to the accident, and that the accident occurred in the very early hours of Friday morning, indicates that tiredness might have played a contributory part in the accident.

2.3 CAUSE OF THE FIRE

2.3.1 Source

The pronounced 'V' shaped charring mark in the wooden bulkhead behind the galley heater, the burned out locker under the 'V', and the melted pan on the galley range, were key indicators that the source of the fire was located in or close to the electric fan heater fitted in the locker under the galley bench seat.

2.3.2 Probable cause

Given the presumed source of the fire, the investigation identified two potential sources of ignition: the electric fan heater or an unattended smouldering cigarette.

1. Electric fan heater

   The electrical examination of the remains of the fan heater undertaken by the Health and Safety Laboratories (HSL) did not find any direct evidence that the fire ignited due to a fault in the galley fan heater, but was unable to test those components badly damaged by the fire. The HSL examination did find that the heater's aluminium fan had melted, indicating that the heater's internal temperature had reached 660°Celsius at some point, and directly beneath the heater a shopping catalogue and wooden plate holder remained almost untouched by the fire. Notwithstanding that the tests carried out by the electrical contractor, both in the workshop and on board the vessel, make it unlikely that the fire started because of incorrect wiring or fitting incorrect spare parts, the possibility remains that either component failure or other malfunction within the heater caused the fire.

The post-fire investigation found the electrical breaker for the heater was switched 'on', and both of *Vision II*'s crew were known to be aware that the heater had been repaired and was operational. To provide a source of ignition, the fan heater had to have been turned on. Examination of the fan after the fire showed that the main power and both heater elements had been turned on at some point, possibly: earlier in the evening by Rimants Venckus; on return to the vessel by Ramilito Calipayan; or inadvertently by either Ramilito Calipayan or Benjamin Potot as the main power switch was close to deck level and easy to accidentally kick.

Once the heater was operating, ignition could be attributed to:

- Failure of the thermal cut out. *Amethyst*'s crew were able to confirm that 2 years previously, when the heater was operational, it was prone to overheating and tripping by the action of the thermal cut out. Although the thermal cut out had been replaced that day, had it failed to operate the unit could have overheated.

- Restricted airflow causing overheating. The contents of the locker or material in front of the heater might have restricted the airflow to the heater fan, causing overheating before the thermal cut out operated.

The heater's operating instructions indicated that there was a risk of fire if the heater was covered, and warned that the grill area should not be obstructed when the heater was in operation. If overheating occurred either due to failure of the thermal cut out, or before it could operate if the airflow was restricted, it is possible that combustible material stored inside the locker or dropped on the galley deck immediately by the heater grill could have ignited.

2. Unattended smouldering cigarette

   The seat of the fire was within an arm's reach of Benjamin Potot's final resting position, and he was known to smoke cigarettes. There is no evidence that he was smoking in the galley that night, and the discarded cigarette packet found on the net drum deck only indicates that a smoker had been in that area some time earlier. However, if Benjamin Potot was smoking, and had not extinguished his cigarette effectively, or had fallen asleep while smoking, it is possible that the lit cigarette could have started the fire. Although the seat above the heater was covered in approved flame retardant material capable of withstanding a lit cigarette, there might have been combustible material placed on top of it, or the cigarette could have ignited similar material lying on the deck.

2.3.3 Fuel

Once ignition had occurred, the fire required a supply of fuel. There was a plentiful supply of carbonaceous material in close proximity to the heater, including the contents of the locker and the adjacent wooden seating structure.

The shipbuilder had used wood for the seat and locker surrounding the heater because the alternative fire retardant material failed to provide sufficient strength.

2.4 FIRE DETECTION

Heat and smoke sensors were fitted to the deck head almost directly above the source of the fire. The sensors were connected to a wheelhouse alarm panel, which was fed from the vessel's 24v battery supply. The alarm detection panel, along with other equipment wired into the 24v emergency switchboard, had been electrically isolated by turning the individual breakers off **(Figure 17)**.

Figure 17

All equipment on the emergency bus bar turned off

With the detection system isolated, none of the crew on board could have been alerted to the outbreak of fire.

Notwithstanding that the galley sensors were reported not to have activated for some time, the intensity of the fire made it impossible to determine whether or not the sensors had been operational. However, the fire investigation was able to prove that by turning on the appropriate switchboard breaker, the system activated correctly and showed a short circuit, as expected, in the galley **(Figure 18)**.

Figure 18

Fire detection panel activated by switching on fire alarm breaker

The alarm was designed to alert someone on watch at sea. Thus, in accordance with MSN 1770(F), it was located in the wheelhouse. So even if it had sounded, it was remote from the crew's living quarters and was unlikely to have been heard.

If crews are to live on board fishing vessels in port, it is essential that such vessels are fitted with fully functioning alarm and detection systems that provide the living quarters with early warning of a potential emergency.

2.5 CONTAINMENT

Fires need a plentiful supply of oxygen. Consequently, the removal of oxygen, by cutting off the supply of air or by smothering, would assist in extinguishing the fire.

Although there was no fixed automatic fire smothering system fitted in *Vision II*'s galley, there were extinguishers on board capable of achieving the same result had the crew been awake, aware of their location, and familiar with their use.

The galley was fitted with an A60 fire door, which, as required by MSN 1770 (F), had been fitted with a self-closing mechanism designed to keep it closed at all times when not in use. In the event of a fire in the galley, such doors are intended to control the supply of oxygen, reduce the speed of the fire, and restrict the passage of smoke throughout the vessel.

On board *Vision II* the self-closing mechanism had been disconnected and a permanent hook-back had been fitted to hold the door open. These modifications removed important safety barriers designed to contain a fire in the galley space. On the night of the accident, the door was hooked open, and this allowed oxygen to feed the fire so that it spread into the main passageway, and the resultant smoke penetrated the main deck, shelter deck and wheelhouse areas.

Had the galley door been closed, the fire would have been contained, and Rimants Venckus would have been protected from the worst of the heat and smoke. This might have allowed him to use the shortest escape route, through the watertight door leading to the drum deck.

Hooking back fire doors and removing self-closing mechanisms is inherently dangerous. Unfortunately, the practice is becoming increasingly common, possibly because galley doors are frequently used and crews perceive that hooking them back saves time and effort and is safer in heavy seas.

If crews are to live on board in port and be better protected at sea, appropriate measures should be implemented to ensure that fire doors remain closed, or are capable of automatically closing in the event of a fire being detected.

2.6 FATAL EFFECTS

2.6.1 Ramilito Calipayan and Benjamin Potot

Both Ramilito Calipayan and Benjamin Potot had consumed alcohol during the course of the evening. Evidence suggests that within a short time of returning on board, both of them had fallen asleep in the galley.

Most people who die in fires succumb as a consequence of carbon monoxide (CO) and hydro cyanide (HCN), both of which are produced during the combustion process. HCN is approximately 35 times more toxic than CO.

Toxicology results showed that the CO levels were relatively low in both men, indicating that their survival time was brief. It is likely that HCN would have incapacitated them while they slept.

2.6.2 Rimants Venckus

Rimants Venckus, who had not been drinking, showed high levels of both CO (68%) and HCN (6.94 mg/litre) in his bloodstream. It is probable that he was asleep in the crew cabin when the fire broke out, and by the time he became aware of events the fire was fierce and the smoke concentration level was high. Given that he was attempting to escape from the vessel following the same route as the smoke, he became exposed to very large quantities of CO and HCN in a relatively short time, became incapacitated and collapsed before he could reach fresh air.

2.7 TRAINING

Although some of the crew had previously attended STCW fire prevention courses, none of them had attended the mandatory SFIA Basic Safety Awareness Course. The course helps fishermen to recognise dangers, consider risks, and develop their awareness of the need to reduce risks. Had the crew attended the Basic Safety Awareness Course it would not have guaranteed prevention of this accident. Nonetheless, the course content would have ensured that the men were aware of, and instructed in, the techniques for reducing the risk of fire. This might have led them to make better decisions about providing power to the fire detection and alarm panel and keeping fire doors shut when not in use.

2.8 ESCAPE ROUTES

2.8.1 Chosen escape route

Rimants Venckus's decision to escape across the main passageway, up the vertical ladder and into the wheelhouse, rather than double back past the open galley door and the fire to access the trawl deck, might have been influenced by three factors:

- His belief that the aft watertight door and shelter deck door could have been secured internally using steel tubes, which would have taken time to remove.
- He was unaware of, or insufficiently familiar with the designated cabin escape route.
- His natural instinct to escape in the opposite direction to the smoke and flames issuing from the galley doorway.

Whichever his reasoning, Rimants Venckus chose the route most affected by rising heat and dense smoke, and was overwhelmed.

2.8.2 Designated escape route

Having opened the cabin door to the main passageway and observed the fire, Rimants Venckus's safest course of action should have been to retreat into the cabin and close the fire door. By then climbing the vertical ladder adjacent to the door, removing the deck head panel, releasing the four securing dogs and pushing open the escape hatch, he would have been led outside the fire boundary and onto the drum deck.

That the deck head panel had not been disturbed indicates that Rimants Venckus did not attempt to escape by this route **(Figure 19)**. However, had he chosen to use the dedicated escape route, it would not have been successful as the escape hatch securing dogs were seized in the closed position **(Figure 20)**.

Figure 19

Internal deck head panel covering the escape hatch

Figure 20

Deck head panelling removed exposing the escape hatch

It was reported that the escape route had never been seen opened up or maintained, and there had never been any emergency drill or familiarisation brief for the crew on how to use it. Although the escape route had correct markings, and Rimants Venckus had walked past it at least twice a day, this is convincing evidence that without regular training and familiarisation drills, when crews are faced with stressful emergency situations they will fail to adopt the prescribed procedures.

2.9 ELECTRICAL SYSTEM

2.9.1 Drawings and schematic diagrams

The SFIA construction standards require that prior to construction commencing, in addition to several other drawings:

> '*two copies of the following construction drawings……are to be submitted to the surveyor:*
>
> - *Electrical generating and distribution diagrams (complying with IEE Regulations)*
> - *Electrical loading schedule*'

These drawings were not produced for *Amethyst*. By building vessels along broadly similar lines, the shipyard felt that its employees and contractors were sufficiently familiar and experienced with fitting electrical systems and cabling that vessel-specific drawings were not required.

Had the drawings for *Amethyst* been available to the SFIA surveyor, he would have been able to make an informed assessment of whether the plans were satisfactory. Subsequently, during build inspections, he would have been able to judge whether the electrical fit-out delivered conformed with the plans. Specifically, in this case, the surveyor might have identified that the fire alarm and detection panel did not have two independent power supplies. This shortcoming could then have been challenged, and rectification action taken before the vessel entered service.

Drawings, provided by the shipbuilder in accordance with the construction standards, should be available to the surveyor and are required before a vessel's United Kingdom Fishing Vessel Certificate is issued. However, these drawings are also needed by crews. Electrical generation and distribution on new fishing vessels has gradually become more complex such that system drawings are necessary if crews are to operate their vessels safely and effectively, and essential if they need to carry out faultfinding and repair without specialist contractor support.

The SFIA construction standards also require that:

> '*Wiring diagrams are to be included in all switchboards and distribution boards with each circuit, component and conductor identified*'

There was no evidence to show that wiring diagrams had been included within the switchboards fitted on board *Vision II*. Had appropriate switchboard wiring diagrams been available, Rimants Venckus might have had a better understanding of the electrical system and thus avoided isolating the fire and detection system when he switched the vessel over to shore power.

2.9.2 Changing over to shore power

Vision II was designed to accept a 415v, 32 amp shore power supply, which was available at several berths in Fraserburgh. The crew had previously experienced the shore power supply 'tripping out' on overload on several occasions, and they were wary of power consumption limits reducing the amount of equipment that could be used. In particular, when the transmotors were charging the 24v batteries, the system was prone to trip out whenever other equipment was turned on. Consequently, there were informal instructions to preserve the 24v battery supply by ensuring that instrumentation and lighting were switched off in port. It is possible that Rimants Venckus believed that by switching off all of the 24v system to preserve power, this would remove the need to charge the batteries by running the transmotors and so leave more power available for domestic use.

Whether he was aware that turning off all of the 24v breakers on the emergency bus bar disabled the main fire detection and alarm panel, cannot be established. However, it appears that he did not recognise the risks that such an action would impose.

Given that the electrical system was reasonably complex, a locally produced schematic diagram and procedure for the person changing to shore power would have:

- Identified those breakers considered safe to switch off.
- Highlighted the dangers of isolating any emergency system.
- Established a standard routine for changing over from ship's power to shore power.

Using the same procedure every time they changed to shore power would have increased the crew's familiarity with the system and ensured that essential alarm systems were not switched off.

2.9.3 Electric fan heaters

Electric fan heaters of the type fitted to *Vision II* have been installed in Macduff Shipyards Limited vessels, by the same electrical contractor, for a number of years. The heaters provided an instant, substantial heat source and required minimum space. However, the suitability of this type of fan heater for use on fishing vessels had not been formally considered by contractor or surveyors, and the heaters and their installation were accepted as fit for purpose by surveyors.

This type of heater had been fitted on fishing vessels for the past 10 years, and in the 3 years preceding this accident, approximately 250 units were fitted. These heaters have required approximately 50 switches and 40 thermostats to be replaced over the same period, indicating that component failure is not uncommon.

On *Vision II,* all of the heaters, except the galley heater, were 'boxed in' with plywood. The boxes were designed to prevent combustible material coming into contact with the heaters and ensure the airflow was unrestricted. *Vision II*'s galley heater had no such plywood box, and it was possible to cover the heater casing and restrict the air intake. That the galley heater on *Vision II* was surrounded with combustible material, which possibly also restricted the air intake, was probably a contributory factor to this accident.

Figure 21

Partial 'boxing in' of heater on new vessel subsequent to this accident

Checks conducted on a fishing vessel being built discovered a galley heater which had been partly 'boxed in' **(Figure 21)**, where it was possible to restrict the air intake, indicating a continued lack of clear installation requirements and quality assurance. If similar fan heaters are to be fitted on fishing vessels in the future, both the shipbuilder and the surveyor should determine that the fan heaters are:

- Suitable for their intended purpose including, if possible, the reason(s) for the high failure rate of components

- Fitted in accordance with the manufacturer's instructions
- Adequately protected to keep combustible material away from the heaters and the air intakes free.

2.10 BUILD AND SURVEY ARRANGEMENTS

2.10.1 Shipbuilder's procedures

This investigation has identified that *Amethyst* did not fully comply with MSN 1770(F) and SFIA construction standards in a number of areas specific to the accident, including:

- The galley electric fan heater required boxing in
- A permanent hold back was fitted to the galley fire door
- The fire alarm and detection system had only one source of supply; and
- No electrical drawings were provided for the vessel.

Individually, the above points might be considered fairly minor; collectively, they formed a link in the chain of events that led to this accident.

Builders of commercial fishing vessels are responsible for ensuring their products meet the requirements of MSN 1770 (F), whether the work is carried out by the shipyard's own tradesmen or outside contractors. In Macduff Shipyards Limited, the absence of a formal quality assurance system during the building of *Amethyst* left the yard's workers and subcontractors to use their own initiative when determining the construction standards to be used, with the result that a number of items were either missed out altogether, or fell short of the required standards.

2.10.2 Survey procedures during build

Amethyst passed survey inspections during build and was subsequently issued with a declaration of survey despite the shortcomings listed in paragraph 2.10.1 above.

The MCA and SFIA had agreed the SFIA would conduct all survey work during build except structural fire protection and lifesaving appliances. While the SFIA surveyor was generally clear of his responsibilities, this division of effort resulted in some ambiguity about who was to cover the fire protection aspects of the vessel's fit-out. The suitability and installation of the electric fan heaters and the hold back fitted to the galley door fell into this grey area, with neither organisation's surveyors checking these items.

The SFIA surveyor did not consider the absence of electrical drawings for *Amethyst* to be exceptional. On previous vessels, the lack of drawings had meant more work as he had to trace the systems through, and he expected to do this for *Amethyst*. However, the surveyor was absent from the yard at the

time the survey of the electrical installation was due, and so he did not complete this survey item. Instead, he approved the electrical installation after receiving written self-certification declarations from the electrical contractor and shipyard stating that the work had been carried out in accordance with the Institution of Electrical Engineers' standards.

There was no detailed aide memoir to guide *Amethyst*'s surveyor during his stage inspections of the vessel during build, and therefore he used Form FV2 – Record of Particulars of a Fishing Vessel as a checklist as well as completing it as the main record of survey. The Form FV2 is not designed as a surveyor's checklist, and it did not provide sufficient detail to ensure that an appropriate level of survey was achieved. Given the importance placed on surveys during construction to confirm that the completed vessel is safe for use, a more robust method than using Form FV2 is required to ensure that the correct level of survey is achieved at each stage inspection.

Notwithstanding the utility of Form FV2 as a surveyor's aide memoir, the form completed for *Amethyst* did not have entries for the electrical and auxiliary systems fitted, the surveyor having been unable to provide these due to absence. Despite being incomplete, *Amethyst*'s FV2 was submitted as a declaration of survey, accepted by the MCA, and a Fishing Vessel Certificate for the vessel was issued.

At all levels, the individuals involved in the build and survey of *Amethyst* were reliable, experienced professionals who were trusted to carry out their work effectively. However, one purpose of the survey regime is to ensure that omissions and mistakes are detected so they can be rectified. Key to the effectiveness of the survey regime, are procedures robust enough to provide independent assurance that a vessel meets the required standards. Analysis of this accident indicates that the MOU between the MCA and SFIA needs review to identify and resolve any areas of ambiguity, and that more detailed guidance to surveyors is required to ensure that build surveys are conducted effectively.

2.10.3 Survey procedures during use

Key to monitoring a vessel's integrity and safe operating standards are the 5-yearly 'renewal' survey and midway through this period an 'intermediate' inspection, which is free of charge. Although there had been two targeted inspections on *Amethyst*, the intermediate inspection, which should have occurred between 24 and 36 months from the date of full survey, had not taken place. Had the intermediate inspection occurred it might have identified that:

- The owners had not conducted the annual self-certification checks required by MSN 1770 (F)
- The galley door self-closing mechanism was defective and the door was permanently open, held by a hook-back
- There was no official logbook on board **(Annex F)**

- No routine safety drills had been conducted
- The escape hatch from the main cabin was seized
- There were no formal written risk assessments on board.

While the targeted inspections did provide an opportunity to identify all, or some of these safety issues, the more extensive nature of the intermediate inspection would have provided a more likely opportunity for the safety deficiencies relevant to this accident to have been rectified.

At the time of this accident, it was the owners' responsibility to request the intermediate survey when this became due. However, the regulator was not checking that requests for survey were being received, or that vessels were being surveyed as required. Given the importance of the intermediate survey to ensuring the safe operation of fishing vessels, the regulator should consider notifying owners when an intermediate survey is imminent, and subsequently target those vessels that are overdue for survey.

2.11 LIVING ON BOARD

This investigation has highlighted that there are now significant numbers of foreign nationals employed as crew on board United Kingdom registered fishing vessels.

It is recognised that there are occasions when fishing vessels do operate away from their homeport and crew have to live on board even when alongside. Historically though, regular operating patterns have allowed fishing vessels to return to their home port, thereby allowing locally employed crews to live ashore.

The employment of foreign crews has changed this pattern, and there are now a considerable number of crew in semi-permanent residence on board fishing vessels in ports throughout the United Kingdom. Current regulation and design requirements for fishing vessels have not adapted to the increased use of vessels alongside as places of accommodation. There is therefore a need for a 'new approach' toward fishing vessel regulation, applicable to those vessels employing crew who will be expected to live on board in port. A review of the safety issues associated with crews living on board should be undertaken and, as a minimum, examine:

- The impact of security arrangements on emergency access and egress
- provision of fire, flood, gas and other detection and alarm systems
- limitations of operating on shore power and the requirement and procedures for reverting to ship's power in an emergency
- shore power requirements and limitations
- emergency training drills
- safe access requirements to and from the vessel.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT WHICH HAVE RESULTED IN RECOMMENDATIONS

1. Given that the electrical system was reasonably complex, a locally produced schematic diagram and procedure for the person changing to shore power would have:
    - Identified those breakers considered safe to switch off.
    - Highlighted the dangers of isolating any emergency system.
    - Established a standard routine for changing over from ship's power to shore power. [2.9.2]

2. If similar fan heaters are to be fitted on fishing vessels in the future, both the shipbuilder and the surveyor should determine that the fan heaters are:
    - Suitable for their intended purpose including, if possible, the reason(s) for the high failure rate of components
    - Fitted in accordance with the manufacturer's instructions
    - Adequately protected to keep combustible material away from the heaters and the air intakes free. [2.9.3]

3.2 OTHER SAFETY ISSUES IDENTIFIED DURING THE INVESTIGATION ALSO LEADING TO RECOMMENDATIONS

1. Had the crew attended the SFIA Basic Safety Awareness Course, it could have ensured they were aware of, and instructed in, the techniques for reducing the risk of fire, which might have led them to make better decisions about providing power to the fire detection panel and keeping fire doors closed when not in use. [2.7]

2. Drawings, provided by the shipbuilder in accordance with the construction standards, should be available to the surveyor and are required before a vessel's United Kingdom Fishing Vessel Certificate is issued. [2.9.1]

3.3 SAFETY ISSUES IDENTIFIED THAT HAVE BEEN ADDRESSED

1. The fire alarm and detection panel had been electrically isolated, it was therefore impossible for the system to detect heat or smoke. [2.4]

2. If the fire alarm had sounded, it was remote from the crew's quarters and it is unlikely they would have heard it. [2.4]

3. If crews are to live on board in port and be better protected at sea, appropriate measures should be implemented to ensure that fire doors remain closed, or are capable of automatic closure in the event of a fire being detected. [2.5]

4. The escape route had correct markings, and Rimants Venckus had walked past it at least twice a day. This is convincing evidence that without regular training and familiarisation drills, when crews are faced with stressful emergency situations, they will fail to adopt the prescribed procedures. [2.8.2]

5. Had an intermediate inspection been carried out it might have identified that:
    - The owners had not conducted the annual self-certification checks required by MSN 1770 (F)
    - The galley door self-closing mechanism was defective and was permanently held open on a hook-back
    - There was no official logbook on board
    - No routine safety drills had been conducted
    - The escape hatch from the main cabin was seized
    - There were no formal written risk assessments on board. [2.10.3]

6. Given the importance placed on surveys during construction to confirm that the completed vessel is safe for use, a more robust method than using Form FV2 is required to ensure that the correct level of survey is achieved at each stage inspection. [2.10.2]

7. Analysis of this accident indicates that the MOU between the MCA and SFIA needs review to identify and resolve any areas of ambiguity, and that more detailed guidance to surveyors is required to ensure that build surveys are conducted effectively. [2.10.2]

8. There is a need for a ‘new approach’ toward fishing vessel regulation, applicable to those vessels employing crew who will be expected to live on board in port. [2.11]

SECTION 4 - ACTION TAKEN

4.1 MARITIME AND COASTGUARD AGENCY

The MCA has conducted a review of the safety issues associated with crews living on board fishing vessels in port. As a result of the review, the MCA has:

- Issued a press notice **(Annex G)** drawing the immediate attention of owners, skippers, crews, agents, port authorities and marine offices to the dangers associated with a fishing vessel operating on shore power. The notice listed the questions and the considerations that need to be addressed when carrying out a vessel specific risk assessment for crew living on board in port.
- Promulgated a notice **(Annex H)** reminding owners of the requirement for vessels to undergo intermediate or mid term inspections and to complete annual self-declarations as appropriate. The notice reminded owners that failure to comply with the requirements means that the vessel's safety certificate is not valid.
- Sent a letter out to all United Kingdom shipyards reminding them that fitting unapproved fire door holdbacks contravenes the requirements of MSN 1770(F).
- Implemented a regime of inspections targeting fishing vessels in port.
- Clarified the designated areas of surveyors' responsibilities between the MCA and the SFIA with a view to incorporating any changes into their written agreement.
- Asked surveyors and inspectors to check that training drills are recorded in official logbooks. On larger vessels, surveyors will also witness an emergency drill.
- Compiled a list of outstanding surveys and inspections for over 15m fishing vessels and is targeting those vessels which are overdue.
- Issued an Operational Advice Note (OAN 654) to surveyors providing guidance on the areas to be assessed when considering whether it is safe for migrant workers to live on board the vessel in port **(Annex I)**, and intends to issue a further OAN dealing with crew certification and emergency drills on fishing vessels.
- Worked with the fishing industry in producing a draft code of practice for employment of non EEA fishing crew, which is to be considered at the next FISG meeting.
- Developed a leaflet giving guidance to fishing vessel operators on how they should prepare for an MCA survey.

4.2 MB VISION LLP

Since completion of the repairs following the fire damage, a number of actions have been taken by MB Vision LLP:

- Seven CCTV cameras have been installed covering the net drum/aft deck area, the forward deck and winch, the engine room and the fish room.
- The fire alarm system now sounds in the cabin, galley and passageway as well as the wheelhouse.
- The galley door is no longer tied back.
- A hand rail has been fitted inside and outside the galley window to help people haul themselves out in the case of escape.
- The escape hatch from the cabin is tested every week and is included in safety drills.
- A water-tight box has been constructed outside the door of the wheelhouse to contain life jackets, rockets, flares and other emergency equipment so that this is readily accessible in the case of an emergency which might prevent access to storage locations within the vessel.
- Portable and submersible pumps are carried on board.

4.3 SEA FISH INDUSTRY AUTHORITY

SFIA construction standards have, over the past few years, been reviewed and amended by the introduction of an ISO quality management system.

SFIA is in the process of implementing new procedures and guidance to surveyors that will further clarify the requirements and levels of inspection and reporting required for each vessel under survey.

SFIA is in the second phase of the development of new construction standards that will become available to the industry later in 2009. The electrical section of the construction standards is being completely reviewed to ensure compatibility with the latest regulations from the Institution of Electrical Engineers.

4.4 MARINE ACCIDENT INVESTIGATION BRANCH

In its Analysis of UK Fishing Vessel Safety 1992 to 2006, as part of Recommendation 2008/173, recommended that the Maritime and Coastguard Agency *ensure the current mandatory training requirements for fishermen are strictly applied*. The Maritime and Coastguard Agency has accepted the recommendation.

SECTION 5 - RECOMMENDATIONS

The Maritime and Coastguard Agency is recommended to:

2009/118 Broaden the scope of its review of the safety issues associated with crews living on board fishing vessels to include:

- The impact of security arrangements on emergency access and egress.
- Safe access requirements to and from the vessel.

The Sea Fish Industry Authority is recommended to:

2009/119 Review its survey procedures to ensure that they are effective in checking new build vessels comply with mandated construction standards, specifically that electrical systems are appropriately checked and approved.

Macduff Shipyards Limited is recommended to:

2009/120 Review its quality management system to ensure that the electrical system of new vessels fully complies with the relevant sections of the Sea Fish Industry Authority construction standards, and equipment is suitable for its intended purpose and is installed in accordance with manufacturers' fitting instructions.

MB Vision LLP is recommended to:

2009/121 Develop work instructions for crews tasked with connecting its vessels to, and disconnecting from shore power. The instructions should include, inter alia:

- Identification of those breakers considered safe to switch off.
- Highlight the dangers of isolating any emergency system.
- Electrical schematic diagrams.

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Marine Accident Investigation Branch