Report on the investigation of the loss of

Crimond II

30 miles north-east of Scarborough

on 24 April 2001

Marine Accident Investigation Branch
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Report No 8/2002
February 2002

Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1999

The fundamental purpose of investigating an accident under these Regulations is to determine its circumstances and the cause 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.

CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

DSC	-	Digital selective calling
EPIRB	-	Emergency position indicating radio beacon
ETS	-	European Telecommunications Standard
HRU	-	Hydrostatic release unit
IEC	-	International Electrotechnical Commission
IMO	-	International Maritime Organization
km	-	kilometre
m	-	metre
MCA	-	Maritime and Coastguard Agency
MF	-	Medium frequency
MGN	-	Marine guidance note
OAL	-	Overall length
RL	-	Registered length
UTC	-	Universal co-ordinated time
VHF	-	Very high frequency

SYNOPSIS

Crimond II capsized and foundered at about 0630 on 24 April 2001, as a result of flooding which the crew had discovered a couple of hours earlier. The MAIB was informed that the crew of two had been rescued at 1007 that day.

On the afternoon of Monday 23 April 2001, *Crimond II* left Scarborough to fish at Ground Edge, about 35 miles to the north-east. Fishing began that evening, but at 2200 the vessel came fast on an underwater obstruction. While attempting to release the trawl by heaving with the winch, a hydraulic pipe burst. Attempts to repair the pipe failed. Shortly afterwards the vessel came free of the obstruction, but because the winch was not working, the trawl could not be hauled. Fearing they may lose their gear, the crew steamed slowly back to Scarborough with the gear out.

After a while, the deckhand went below to get some rest, but when he opened the hatch to the trunk leading to the accommodation, he discovered that the space was flooded. He called the skipper, who, assuming that the flooding had spread from the trunk to the engine room and accommodation, went to the wheelhouse to switch on the electric bilge pumps. At this stage the skipper felt that the flooding could be controlled, so he did not summon help.

About 30 minutes later the floodwater disabled the electrical supply, causing the bilge pumps to stop working. Realising the situation was becoming dangerous, the skipper tried to contact the coastguard using the fixed radios, but these too had failed because there was no electricity supply.

Crimond II capsized and foundered, pulling the liferaft down with it. The two men found themselves in seawater of temperature 8°C to 9°C, clinging on to various buoyant items, including two lifebuoys and a gas bottle. More than an hour later they were rescued by helicopter, after the coastguard had received a signal from the EPIRB. Both men were taken to hospital, suffering from hypothermia. Both made a full recovery.

This report makes a recommendation to the skipper and the other owner, to ensure that in the future, all the crew that they employ have attended basic safety training courses, if required.

The other owner, who has interests in a number of fishing vessels, is recommended to apply the MCA's proposed enhanced requirements for bilge alarms as soon as possible.

A recommendation has been made to the MCA regarding the specification of EPIRBs.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *CRIMOND II* AND ACCIDENT

Vessel details

Skipper and part owner	:	Thomas McEwan 13 St Stephens Road, Bridlington YO16 4DW
Part owner	:	Fredrick Normandale 30 Castlegate, Scarborough YO11 1QY
Port and number	:	KY246
Flag	:	British
Type	:	Fishing vessel (trawler)
Built	:	Fraserburgh in 1973
Classification society	:	None
Construction	:	Wood
Length registered	:	15.73m
Gross tonnage	:	23.67
Engine type and power	:	Caterpillar 3406 D.I.T.A. (231kW)

Accident details

Time and date	:	0630 UTC 24 April 2001
Location of incident	:	54° 38.92’ N 000° 12.37’ E About 30 miles north-east of Scarborough
Persons on board	:	Two
Injuries/fatalities	:	One severe case of hypothermia One mild case of hypothermia
Damage	:	Vessel lost

General views of *Crimond II* are shown in **(Figures 1, 2, 3 and 4)**. A general arrangement, before the fitting of the shelter, is shown in **(Figure 5)**.

Figure 1

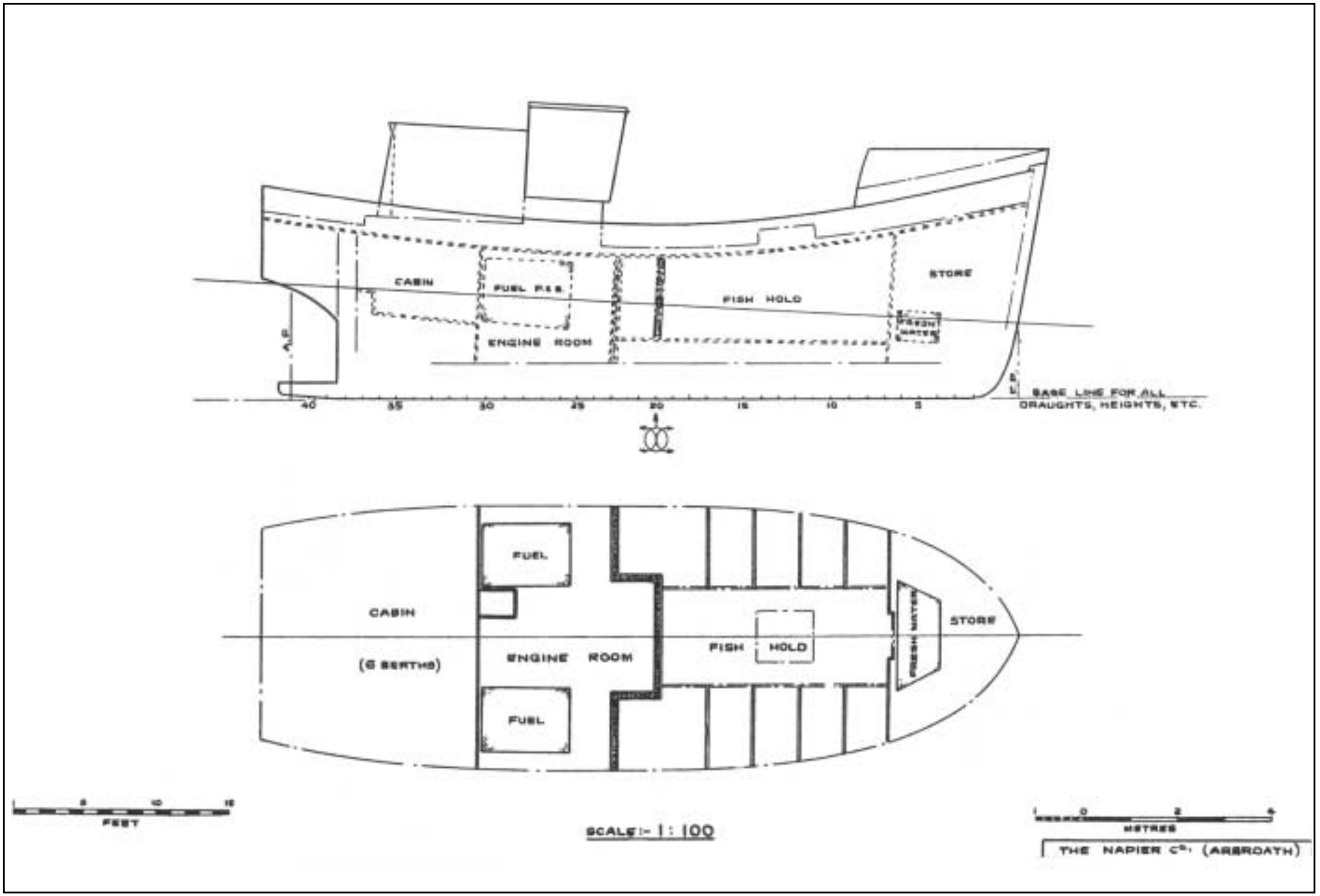
Figure 2

Crimond II - General views

Figure 3

Figure 4

Crimond II - General views



Crimond II - General arrrangement before fitting of the shelter deck

Figure 5

1.2 NARRATIVE

All times are UTC.

The trip leading up to the accident started on the afternoon of Monday 23 April 2001, when *Crimond II* left Scarborough, the port she normally operated from. After steaming for about 35 miles in an east-north-easterly direction, fishing began at about 1930. Once the trawl had been established, the skipper left the deckhand, the only other person on board, on watch and then retired to his bunk. At about 2200 they came fast on an underwater obstruction, so the deckhand throttled back on the engine. This woke the skipper. They had probably come fast because their trawl had become caught in an unmarked wreck.

The crew started hauling back the gear. This is normal practice to try to release a trawl caught on the seabed. When a vessel is pulled back directly over the fastener the gear usually comes free. The water depth was about 65m; they hauled until there were about 75m of gear out, when the winch stopped. The skipper tried to find out what was wrong with the winch. He went to the engine room to check that the winch hydraulics were clutched into the main engine. He did not notice any flooding in the engine room at this time. The skipper then opened the fish hatch, looked into the fish hold, and was able to identify the problem with the winch as a burst hydraulic pipe. They did not have a spare pipe, and the Belzona* on board had hardened. He then called the fishing vessel *Allegiance* on the radio, and asked them to steam towards *Crimond II* to provide assistance. When *Allegiance* arrived at about 2300, some Belzona was passed across. *Allegiance* then left the area.

The crew of *Crimond II* were trying to repair the hydraulic pipe in the fish room for about 4½ hours, during which time they could hear water sloshing in the bilges. Several times they attempted a repair using Belzona, but each time the winch was used, the pressure caused hydraulic oil to burst through the repair. While undertaking the repair, the skipper went to the wheelhouse two or three times to collect tools and to check if any other vessels were in the area. During these brief visits he neither looked at the bilge alarm indicator lights, nor heard the engine room bilge alarm sounding.

Eventually *Crimond II* came free of the fastener, but because the winch was not working, the crew could not recover the trawl. The time was about 0330 on Tuesday 24 April 2001. Not wanting to lose their gear, they started steaming back to Scarborough at slow speed with the gear out. After they had been steaming for a while, the skipper told the deckhand to go below and get some rest. When the deckhand opened the hatch to the trunk leading to the accommodation, he found that the space was flooded. The skipper also looked at the floodwater; he estimates that the time then was between 0400 and 0430.

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* Belzona is a two part adhesive, suitable for temporarily sealing leaks in hydraulic systems

The hatch in the main deck just aft of the wheelhouse accessed a trunk; in the aft side of this trunk there was a door to the accommodation, and in the forward side of the trunk there was a door to the engine room. Both doors were closed; the level of the floodwater was about halfway up the trunk, level with the engine room door handle. There was no effective subdivision between the trunk, the accommodation, and the engine room, and therefore it was assumed that the flooding had spread to both these spaces. Normally, the door to the engine room was kept closed to minimise noise. There was a diesel-burning heater in the accommodation, so the door was normally kept closed to retain the heat. Both doors were made from wood.

The engine-driven pump was not switched to pump the bilges. To have altered the appropriate valve setting, someone would have had to enter the engine room, but neither of the crew felt inclined to do this, because of the depth of floodwater. The floodwater in the trunk also prevented the crew from entering the engine room to close the seacocks. The skipper, therefore, went to the wheelhouse and turned on the electric bilge pumps. While there he did not notice either bilge alarm light being on, and the engine room bilge alarm was not sounding at that stage. The skipper looked again at the flooding in the trunk; he felt that the flooding could be controlled and there was no need to summon help. The electric bilge pumps seemed to be reducing the amount of floodwater, but, after about half an hour the main engine stopped. The main engine drove a generator, which supplied power to the electric bilge pumps. Because power had been lost to the electric bilge pumps, the crew rigged a manual pump. When this pump was in operation, the skipper left the deckhand with it and went to the wheelhouse to send a distress message. He tried to send messages by VHF, MF and telephone, but was unable to, because there was no electrical power. It didn't occur to the skipper to use the hand-held VHF radio.

The skipper took his turn on the hand pump, but it did not seem to be pumping much. During one of the skipper's trips to the wheelhouse to try to send a distress message, the deckhand shouted: "I think she's going". The vessel was, by then, listed to port, but there was no noticeable trim. The deckhand abandoned the pumping and went forward on to the shelter to launch the liferaft, which was situated on top of the wheelhouse. He released the senhouse slip and untied the painter. When the skipper joined the deckhand he noticed the loose end of the painter, so wound it around a guardrail with a couple of turns, to stop the liferaft drifting away. His intention was to throw the liferaft canister into the water, but there was insufficient time.

At this stage the seawater level had risen to the shelter, so the deckhand pushed himself from the vessel and floated away. The skipper stayed on top of the wheelhouse, but about 30 seconds after the deckhand had abandoned, the vessel capsized to port. As she rolled, the skipper walked around the hull on to the bottom. The deckhand shouted to the skipper to jump, because he was worried that the suction would pull the skipper under as *Crimond II* sank; so the

skipper dived in. The deckhand reached the liferaft canister, and pulled out the painter. This took some time as it was quite long. When all the painter was out he jerked the final part and the liferaft inflated. Shortly after, *Crimond II* sank, and the liferaft was pulled down with the wreck.

1.3 RESCUE

After the vessel sank, the skipper and the deckhand were able to get together in the water. Two lifebuoys, a gas bottle and three or four pound boards surfaced, so the two crew members used these to help stay afloat. Each of them had a lifebuoy around them, and they held on to the boards and the bottle. They each put an arm through the other's lifebuoy so that they were held together. There was some chop on the water, but the buoyancy provided by these items enabled them to keep their heads above the water level. The skipper was wearing a boiler suit, tracksuit bottoms and a sweatshirt; he had lost his sea boots when he dived in. The deckhand had on trainers, jeans, a T-shirt, a fleecy jacket, and a coat. They also seized the EPIRB, which had surfaced. Neither had been able to don lifejackets, as these were stowed in the accommodation which the floodwater had made inaccessible before the accident.

As time passed, the crew started shivering with cold, and were affected by cramp. It was difficult to hold on to the gas bottle, the pound boards, and the EPIRB. They tried to keep talking, but both had a strong desire to go to sleep. The skipper appeared to remain conscious, but he remembers nothing from the time he was in the water until he woke up in hospital. His speech became incoherent.

The first indication that the EPIRB was transmitting was received at 0638, so *Crimond II* probably capsized a few minutes before, at, say, 0630. The crew were in the 8 to 9°C sea for over an hour before the helicopter arrived. The helicopter had been dispatched, because the signal from the EPIRB had been received by the coastguard. The incident record for the rescue helicopter from RAF Leconfield shows that *Crimond II*'s crew were rescued at 0748. Initially, the coastguard gave the helicopter a position to head for, but it revised this position while the helicopter was en route. As the helicopter approached, it was able to home-in on the EPIRB signal.

The winchman from the helicopter retrieved the skipper first, as his condition was worse. Initially, the skipper did not want to let go of his lifebuoy, but when he was persuaded to leave it, he was lifted up. Once the skipper was on board the helicopter, the winchman returned for the deckhand. After the rescue, the skipper appeared to be afraid of the helicopter crew, but he recognised the deckhand, who was able to reassure him that everything would be all right. The skipper's body temperature was down to 25°C when he was first admitted to hospital. The deckhand, who was more heavily built than the skipper, remained conscious throughout the ordeal.

Eventually the liferaft surfaced, and was recovered by a merchant vessel. The six-person liferaft had been serviced on 20 September 2000, 7 months before the accident. The ship which recovered the liferaft wanted salvage for it, but the owners and their insurers declined this request, so it was not returned. This meant that the MAIB could not inspect the liferaft.

1.4 WEATHER

The wind was from the south-east, force 3. The skies were mainly clear, and the visibility was 4 miles. The sea was slight.

1.5 FISHING OPERATION

Crimond II used a single trawl, which was deployed from the stern. The net was stowed on the aft deck. Handling of the net on board was achieved mainly by using a crane, on the end of which was a rotating drum; referred to as the power block. The net was deployed over the side using the power block. Once the net was streamed aft, it was controlled by the winch, to which were attached the two trawl warps. The trawl was usually towed for about 6 hours. When the tow was finished, the gear was hauled using the winch. When the gear was on the surface, the power block was used to move the cod end from aft to the starboard beam. The gilson was then attached to the cod end, and the gilson derrick was used to lift the cod end and position it over the hydraulically-operated fish hatch. When the cod end was opened, the fish were allowed to spill into the hopper. The trawl was then shot again. While the next trawl was underway, the fish were taken from the hopper, gutted, cleaned, and put in boxes. The boxes were then passed down from the working deck, to the fish hold, where ice was shovelled on top of the fish to keep the catch fresh before the boxes were stowed.

The deckwash hose was located on the working deck, and was used for washing fish etc. It was normally left running. The pump driven by the main engine could supply either the deckwash hose or the bilge pump; it nearly always supplied the deckwash pump. There was a valve in the deckwash supply pipe, which could be closed, but it was normally left open, and the flexible hose was poked out through one of the freeing ports, so the water discharged directly overboard. Even if the hose was left on the working deck, the water would have run out through the freeing ports. The working deck was fitted with open freeing ports on the starboard side and flapped freeing ports on the port side.

Crimond II normally operated with a crew of three, but on this trip the third crew member did not turn up for work. It was often difficult to get crew. Fishing trips normally lasted 3 to 5 days, depending on the fishing. Trips could be cut short if the weather deteriorated.

1.6 CREW

The 35 year old skipper, Thomas McEwan, had been fishing since he was 16. He had always fished on trawlers out of Bridlington or Scarborough. Other vessels he had worked on included *Regal Star*, *Sarb J*, and *Optimistic* (formerly *Marcia-Rose*). He had been *Crimond II*'s skipper for about 6 years.

The skipper did not hold a certificate of competency, but he was not required to, because *Crimond II* was less than 16.5m in length. He had attended all three basic safety training courses in 1988 i.e. basic survival at sea, basic fire-fighting and prevention, and basic first-aid.

The deckhand, 26 year old Major Clark, had been fishing since 1990. He had always worked on trawlers operating from Scarborough. Other vessels he had worked on included *Faith* and *Pioneer*. He had joined *Crimond II* shortly before the accident on 29 March 2001. He had not attended any basic safety training courses.

1.7 ELECTRICITY GENERATION AND SUPPLY

Electricity was generated by two transmotors driven by the main engine. These generators were located at a low level in the engine room; almost in the bilges. There were two sets of batteries in the engine room. One set was used solely for starting the main engine, the other set for all other services. The arrangements for electrical generation and supply met the requirements of Regulation 42(2) of *The Fishing Vessels (Safety Provisions) Rules 1975* provided the batteries could supply the lights, communications and navigation equipment for at least three hours. No auxiliary engine was fitted.

1.8 RADIOS AND TELEPHONE

The skipper tried, using three methods, to send a distress message: on channel 16 using the fixed VHF radiotelephone transceiver, by pressing the button and holding it for over five seconds on the fixed VHF DSC unit, and by using 2182kHz on the fixed MF set. The telephone operated on the mobile telephone network, but it did not have its own independent battery. The skipper tried calling several fishing vessels, whose numbers he had set up on the telephone as speedcalls. The set of batteries in the engine room provided for other services, supplied the power for all these methods of communication. This source of electricity had failed, so none was working when a distress needed to be sent.

It did not occur to the skipper to use the portable VHF radio to send a distress. This unit was attached just below a window on the port side of the wheelhouse. The primary purpose of this radio is to provide a means of communication in the liferaft. When a vessel is evacuated, the crew should take this radio with them. Schedule 4 of *The Merchant Shipping (Radio) (Fishing Vessels) Regulations 1999*, requires that "a spare fully-charged battery must be available in case of emergency", for this unit.

1.9 BILGE ALARMS

The requirement to fit an engine room bilge alarm comes from Regulation 12(2) of *The Fishing Vessels (Safety Provisions) Rules 1975*. The second sentence of this regulation states: "*In unmanned machinery spaces suitable warning devices shall be installed to indicate leakage of water into the space or leakage from any other system*".

On *Crimond II* the engine room bilge alarm initially showed a light in the wheelhouse when there was flooding. If no action was taken, an audible alarm sounded, but this could not be heard outside the wheelhouse when the main engine was running. There was no bilge alarm in the accommodation, because there was no effective subdivision between the engine room and the accommodation, so the engine room bilge alarm served both spaces.

There was also a bilge alarm in the fish room. When this was triggered a light showed in the wheelhouse.

The bulkhead between the engine room and the fish room was not fully watertight, although it probably delayed the spread of floodwater. This was why a bilge alarm was fitted on both sides.

Because she was a wooden vessel, *Crimond II* tended to leak a little water. This water built up slowly until one of the bilge alarms activated, at which time one of the crew turned on the bilge pumps. This usually happened several times during a fishing trip, and it served as a test of the bilge alarms. If the weather was rough, and the hull was being "worked", the vessel leaked water more quickly than when the conditions were calm. The bilge alarm in the fish room could also be set off by water building up owing to melting ice.

The skipper does not remember either of the bilge alarms activating during the final trip. The weather was fairly calm.

While the crew were working in the fish room, trying to repair the hydraulic pipe, they could hear water sloshing in the bilges. However, they assumed this was caused by melting ice; a normal occurrence. There was a deck in the fish room, under which the bilge space was over a metre deep. Access to the bilge space was through a hatch in the deck of the fish room.

1.10 BILGE PUMPS

The main bilge pump was an eductor, with the trade name Giljector. The Giljector could evacuate water from the engine room or the fish room **(Figure 6)**. The Giljector was powered by water supplied from a pump driven by the main engine, with the trade name Gilmec. The Gilmec pump also supplied the deckwash hose. The changeover valve for Giljector/deckwash was located at the forward end of the engine room. The Gilmec could not be declutched from the main engine, so it was running all the time the main engine was running.

Two electric bilge pumps were fitted. One pump had its suction in the engine room and the other had its suction in the fish room. Both were switched on and off in the wheelhouse.

The Gilmec pump, via the Giljector, was only used for pumping out large quantities of bilge water. Bilge water was normally pumped out using the electric pumps. The Gilmec pump supplied the deckhose, which was used for fish washing. If the Gilmec pump was used for bilge pumping, the valve had to be switched over, which meant a visit to the engine room. Another visit to the engine room was necessary to switch the valve back when fish washing was required. It was not normally necessary to visit the engine room very often. The main engine was fairly new, needed little attention, and did not burn much oil.

The skipper always pumped the bilges at the start of every fishing trip.

Figure 6

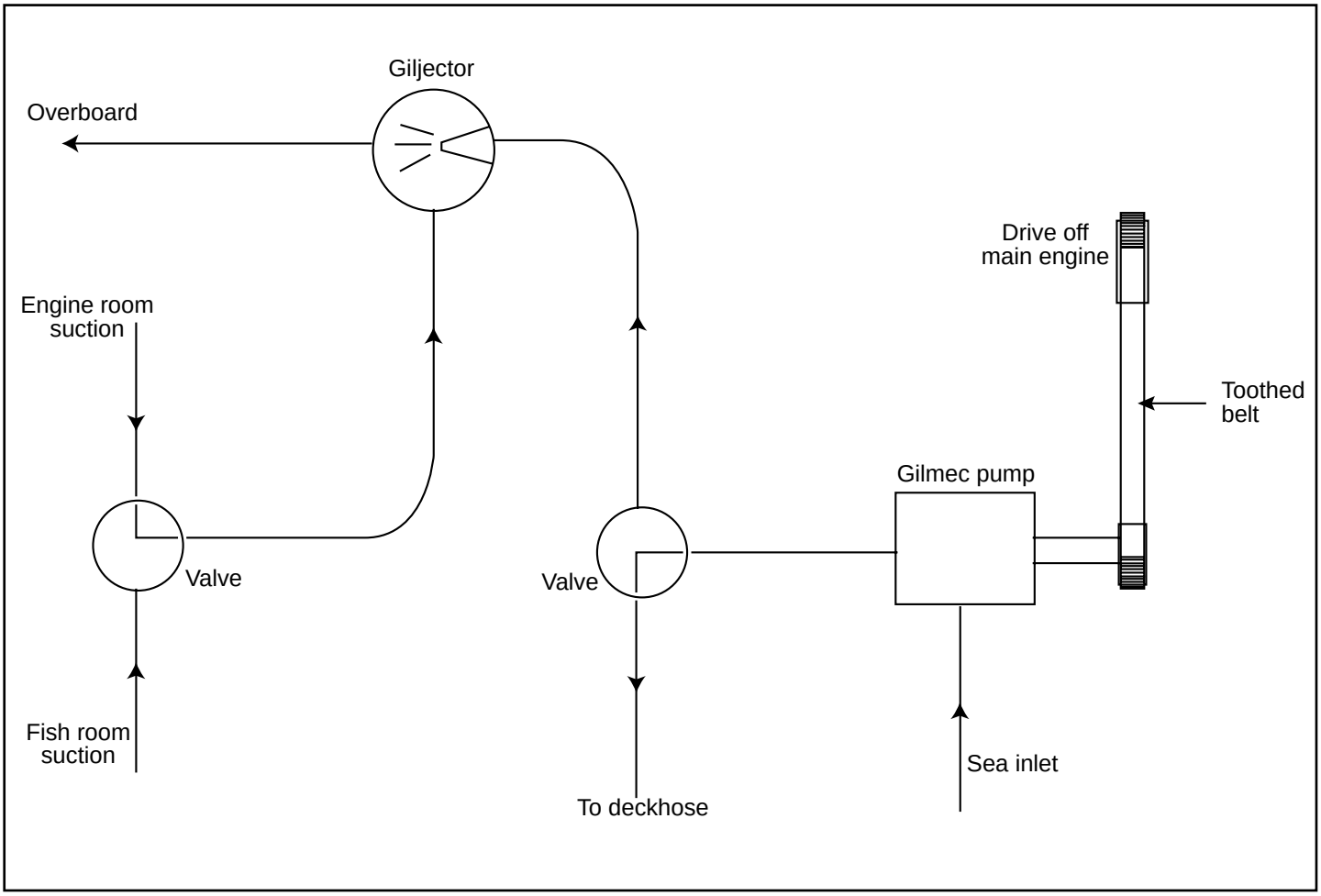


Illustration of bilge and deckhose system

1.11 EPIRB

The EPIRB was type TRON 30S Mk II **(Figure 7)**, manufactured by Jotron. It was attached to a post, which was about 750mm high on the starboard side of the wheelhouse top; the attachment included an HRU. The HRU must have activated when *Crimond II* sank, because the EPIRB floated to the surface. When the crew got hold of the EPIRB there was no clear indication that the unit was transmitting, apart from the pin being out. The skipper assumed that the pin had been pulled out when the unit was released. He thought that with the pin out the unit should be transmitting. The pin was still attached by a thin cord, so he tried replacing it briefly, to see if that made any visible difference. It did not. The doubt as to whether the EPIRB was transmitting caused the crew some distress, until the helicopter arrived.

Figure 7

Tron 30S EPIRB

GMDSS float-free satellite-operated

emergency beacon EPIRB

Global satellite-operating beacon which alerts identify and position down to a 200m radius [sic].

GMDSS satellite beacon operating on the SARSAT/COSPAS frequency 406MHz.

Transmits also on the air traffic emergency frequency 121.5MHz for homing.

Identifies the distressed with a pre-programmed data-code.

Minimum 48 hours operating time.

Equipped with internal intense lamps with daylight switch.

Independent unit with automatic (float-free) or manual release and activation.

The first beacon approved by SARSAT/COSPAS.

1.12 PREVIOUS FLOODING INCIDENTS

Crimond II had a flooding incident on 21 July 1999. MAIB records show that the cause was backflooding through the bilge system, but the skipper recollects that defective caulking was the problem. A bilge alarm gave no warning of the flooding.

The other owner of *Crimond II* (not the skipper) was also the owner of the wooden fishing vessel *Scoresby*, which was lost after a flooding incident on 8 June 2000. A bilge alarm provided no warning of the flooding.

1.13 FISHING VESSEL CERTIFICATE

The fishing vessel certificate for *Crimond II* expired on 1 November 2000, although the survey in anticipation of the renewal began before this date. The initial surveys found a number of defects, which were gradually rectified. All the defects had been put right, and the new certificate was about to be issued when the loss of the vessel rendered this exercise unnecessary.

If an owner applies for survey before the certificate expires, and then actively addresses the defects found, it is not MCA policy to detain the vessel after the certificate has expired, if none of the defects are serious.

SECTION 2 - ANALYSIS

2.1 SOURCE OF FLOODING

Three possible sources of flooding have been identified. Because the floodwater was deep when *Crimond II*'s crew first discovered it, the source could not been seen. The three possibilities are therefore speculative.

2.1.1 Pipework

The MAIB accident database shows that defective pipework is the main source of flooding on fishing vessels. Some examples of this sort of flooding are: bolts in pipe flanges working loose, flexible joints bursting, and pipes corroding etc. Every 4 years the MCA surveys each fishing vessel over 12 metres in length, for certificate renewal. At this time the seacocks should be stripped down and inspected. The rest of the pipework is usually in the engine room under the floor plates, so much of it is very difficult to access, although MCA surveyors look at what they can in the time they have available. Vessels over 25 years old, such as *Crimond II*, can expect to have problems with pipework; quite often leaks occur from places where the access is most difficult. For vessels of this age it is most important that the engine room bilge alarm is kept in good repair and tested regularly, so that if the pipework does cause flooding it is detected early. If defective pipework is the problem, closing the seacocks should stop the flooding, giving the crew time to seek a solution. Seacocks should be easily accessible, and preferably be operable from above the floor plates.

The MAIB accepts that in this case the crew were unable to access the seacocks by the time the flooding was discovered. The seacocks on *Crimond II* were positioned in the bilges under the floor plates, and were difficult to access even when the engine room was dry, and the vessel alongside in harbour. If flooding is detected at a late stage, the source is usually difficult to ascertain, as was the case on *Crimond II*. If the source cannot be identified, it cannot be stopped; all the crew can do then is operate the bilge pumps in the hope that the pumping can keep pace with the ingress.

2.1.2 Hull damage

Crimond II was constructed of wood. The seams between the planks are caulked to provide a seal. The caulking material is usually oakum, which consists of tarred rope fibres which swell when wet. When seams are caulked, oakum is driven into the gaps between the planks. Pitch/putty is normally applied to the top surface of the seam to provide a smooth surface. It is quite common for caulking to come out when a wooden vessel is at sea. Sometimes when a wooden vessel is bumped in harbour, some of the caulking is loosened. Then when the structure is being "worked" at sea the caulking drops out, and this leads to flooding. The MCA does not require watertight bulkheads on wooden fishing vessels, because of the difficulties in construction. Therefore, if some caulking below the waterline does come out, flooding is likely to spread

throughout the vessel. Working bilge alarms will give early warning of such flooding, giving the crew more time to address the problem, and seek assistance. Seepage through caulked plank seams is normal when a wooden vessel is being "worked" at sea, and does not constitute a significant flooding risk.

2.1.3 Backflooding

This is the third possible source of flooding. There was a discharge outlet at waterline level on the port side of the transom. This was a bilge pump discharge, and was also the drain from the galley sink. The non-return valve fitted in this pipe might have become jammed open some time before the accident. This might not have been apparent when the vessel was floating normally, if the outlet was just above the waterline. Before the flooding was discovered on 24 April 2001, *Crimond II* had had her fishing gear hanging from the stern for an extended period. This meant that the aft end would have been lower in the water than when the gear was on board, possibly deep enough to immerse the outlet in the transom. This would have led to flooding if the non-return valve was jammed open. *Crimond II* had a previous flooding incident caused by back flooding in 1999.

2.2 BILGE ALARMS

Crimond II was stopped at about 2200, because of the obstruction. At about 2300 *Allegiance* passed over some Belzona, and for the next 4½ hours this was used to try to repair the hydraulic pipe in the fish room. The vessel got underway again at about 0330. While attending to the repair, the skipper popped to the wheelhouse two or three times, but did not notice either bilge alarm light showing, or the engine room bilge alarm sounding. The fish room bilge alarm light might not have shown if the bulkhead at the aft end of this space was delaying the spread of the floodwater.

The engine room bilge alarm must have failed. Recently, malfunctioning bilge alarms have been a factor in the loss of many large fishing vessels. The MCA is aware of the problems with bilge alarms. The current regulations are contained in *The Fishing Vessels (Safety Provisions) Rules 1975*. A code of practice for vessels 15-24m in length will supersede the 1975 regulations. Requirements for vessels of *Crimond II*'s size will be specified in this code, which at the time of writing this report, is in draft form. After formal consultation, it is due to be sent for approval by Parliament in January 2002. The draft code contains the following additional requirements when compared to the current regulations:

(a) A bilge alarm should be fitted in the fish hold(s) of the vessel.

(b) A bilge alarm should provide an audible and visual warning at the control position(s).

(c) Each bilge alarm should be provided with a fail-safe warning should the circuit become faulty; alternatively a second, separate, bilge alarm should be fitted.

The MAIB fully supports these proposals. If they are enforced, the sort of accident that happened to *Crimond II* will be far less likely to result in the vessel being lost.

The other owner has an interest in about five fishing vessels. In the two flooding incidents to *Crimond II*, and the flooding of *Scoresby*, no warning of flooding was provided by a bilge alarm. Therefore, this owner has been recommended to apply all the MCA's proposed requirements for bilge alarms to all the fishing vessels in which he has an interest, as soon as possible.

Bilge alarms should be regularly tested. As a minimum they should be checked at the start of each voyage, and then daily during the trip. Further guidance on bilge alarms and related issues is provided in MGN 165(F) titled "*Fishing Vessels: The Risk of Flooding*", which the MCA provides free of charge. Bilge alarms are especially important on wooden vessels, which are not required to have any watertight bulkheads.

2.3 FLOODING

The flooding in the engine room immersed the transmotors at an early stage. Once this happened no electricity was generated. When the electric bilge pumps were being used, the skipper assumed that electricity was still being generated, because he could hear the main engine running. The bilge pumps probably drained the batteries, which explains why the fixed radios and the telephone failed.

It is likely that the flooding spread to the fish room as well as the engine room and accommodation. The bilge space under the fish room deck was deep. While the crew were working on the hydraulic pipe, the flooding of the bilges could have been quite extensive. The crew could not see this floodwater, although they did hear it sloshing. The skipper did not think that the vessel was trimmed by the stern before the capsize, so this would indicate that the flooding had spread forward. If the flooding had spread to the fish room, the bilge alarm for this space should have shown a light in the wheelhouse. If this light did illuminate it was not noticed.

2.4 USE OF THE RADIOS

The skipper should have informed the coastguard, by radio, as soon as the flooding was discovered. The MAIB often finds that fishermen are reluctant to do this. If the crew are in any danger, the coastguard should be informed. There is no shame in doing this, quite the reverse; it shows a responsible attitude. The coastguard will listen to any problem, even if it appears to be trivial. If the coastguard is called, a lifeboat or helicopter is not automatically summoned. The coastguard can be relied upon to take appropriate action.

The skipper could have tried using the hand-held VHF radio to summon help, but this did not occur to him. The main purpose of this unit is to provide communication in the liferaft, but it can be used in this sort of emergency where electrical power is lost. A distress message might well have reached the coastguard if the portable VHF radio had been used.

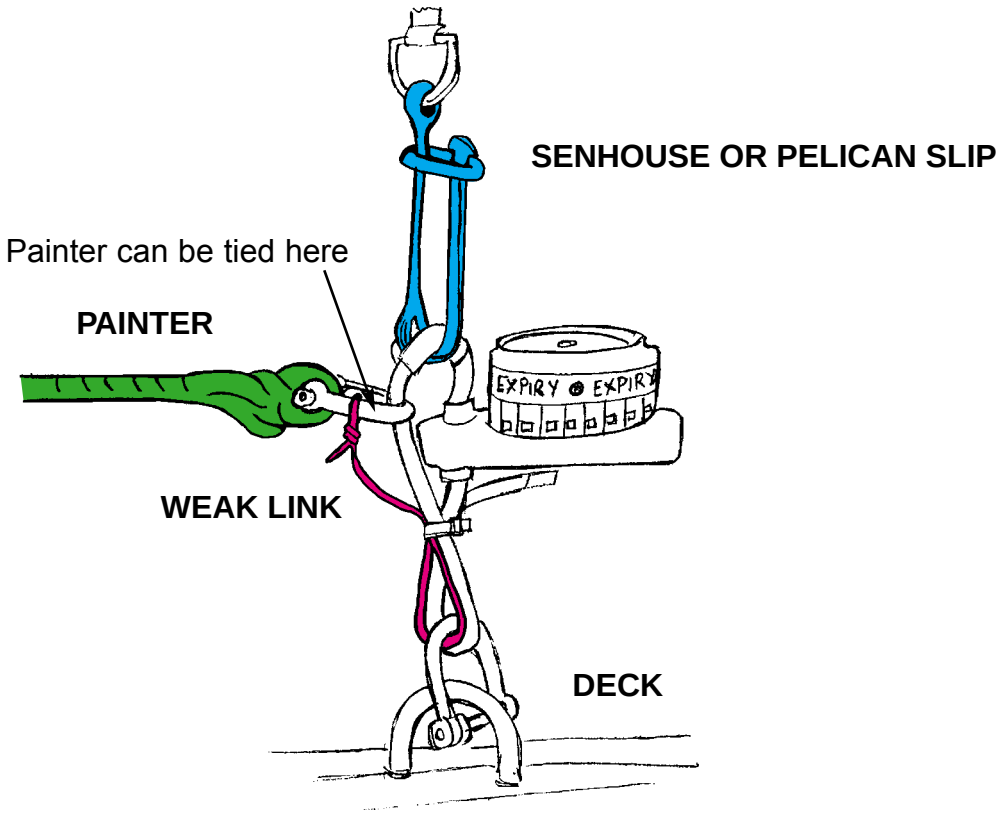
2.5 LIFERAFT

The liferaft was launched manually **(Figure 8)**. The releasing of the senhouse slip on the liferaft was an acceptable action, although not a vital one. The strap around the liferaft would have been disconnected after the vessel sank, when the HRU activated. However, in the unlikely event of it not working, the releasing of the strap manually ensured that the liferaft would float free from its cradle.

The deckhand should not have untied the painter. The end of the painter, if correctly fitted, is secured to the vessel by a weak link. After a vessel has sunk, the buoyancy of the liferaft canister puts enough load on the painter to initiate inflation, and once the liferaft is inflated there is sufficient buoyancy to break the weak link such that the liferaft floats to the surface. When the painter is untied, the liferaft canister can drift away once it is in the water. Also there is no automatic inflation.

Figure 8

HAMMAR DISPOSABLE TYPE HRU



When the skipper arrived at the liferaft he realised that the painter should not have been untied, so he wound the end around a guardrail to stop it drifting away. When the vessel sank, the liferaft was pulled down too, perhaps because of this. It is also possible that the painter got snagged around the mast, or another part of the vessel's structure.

The deckhand had not undertaken the statutory basic safety training. Had he attended the course in basic survival at sea he probably would not have made this mistake, and the two men might have had a liferaft to board.

2.6 TRAINING

A recommendation has been addressed to the owners that they ensure all the fishermen they employ have received basic safety training, except for those born before 1 March 1954 who do not require such training. The courses in basic survival at sea, basic first-aid, and basic fire-fighting and prevention, have been provided free of charge since April 2001, for new starters to the industry, born after 1 March 1954. This free training will be available for a limited period only.

2.7 MANNING

Crimond II normally operated with a crew of three on fishing trips lasting 3 to 5 days. There are no minimum manning requirements on fishing vessels, but a crew of three is considered to be the minimum for such trips on a vessel of this size. Fishing is an occupation that involves long hours and poor working conditions. Currently the rewards are not great and this is why it is often difficult to get crew.

The collision regulations require that a proper lookout is maintained at all times. This was not the case on *Crimond II* while both crew members were in the fish hold working on the hydraulics.

It is possible that the engine room bilge alarm sounded in the wheelhouse while it was unattended. If this was the case, this warning of flooding would have been missed.

2.8 EPIRB AND LIFEBUOYS

The positive aspect of this accident is that the EPIRB functioned as required. This is a clear example of a piece of safety equipment saving lives. Without it these two fishermen would almost certainly have perished.

The lifebuoys also played a significant part in helping the crew to survive.

When the skipper was unable to send a distress message using the radios, he could have pulled the pin out of the EPIRB while the vessel was still afloat, to alert the rescue services earlier.

The EPIRB gave no clear indication that it was transmitting when the crew had hold of it in the water; it was daylight at the time. The EPIRB on *Crimond II* was returned to the manufacturer for testing. The strobe lights worked, as they should, i.e. when it was dark and the unit was transmitting. The unit was also fitted with a small red light, which indicated when a signal was being emitted at all times. This small light was not very visible, and, therefore, it is not surprising that the crew did not see it when they were in the water.

The Jotron TRON 30S Mk II EPIRB, which was fitted to *Crimond II*, was type approved in 1991.

The current specifications for EPIRBs are IMO Resolution A.810(19) and ETS 300 062 (2nd Ed). The IMO standard contains the general requirements for EPIRBs, and the ETS standard specifies further details to the general requirements. The detailed requirements were developed by the IEC, and are shown in IEC 61907-2. ETS 300 062 (2nd Ed) is a European standard, which incorporates the International standard IEC 61907-2.

IMO A.810(19) states that EPIRBs should "be provided with a low duty cycle light, active during darkness, to indicate its position to nearby survivors and to rescue units". This has always been an IMO requirement for EPIRBs. The philosophy behind this was that the cycle light, or strobe light, would enable the EPIRB to be spotted at night, but during the day its high visibility colour would be sufficient to enable it to be seen. Since it only required the strobe light to flash at night, the drain on the batteries was limited.

Some time after 1991, improvements in technology meant that the strobe lights could illuminate continuously during the 48 hours EPIRBs were required to operate, without the need for large batteries. In 1993, some members of the IEC proposed that EPIRBs should have their strobe lights operating whenever they were transmitting, to reduce the problem of false alarms. This meant that if an EPIRB was activated accidentally during the daytime, it would be more likely to be noticed if the strobe light started operating at the same time. As a result, when ETS 300 062 (2nd Ed) was published in September 1996. It contained the following requirements:

"*If the satellite EPIRB is activated, the low duty cycle light shall begin flashing within 10 seconds, in any lighting condition*" and "*the satellite EPIRB shall be provided with either an audible or visual indication that signals are being emitted. The visual indication could be combined with the low duty cycle light*."

Most manufacturers have satisfied the original IMO requirement, and the new ETS requirement, by fitting lights that flash continuously for at least 48 hours after the EPIRB has been activated. Often two strobe lights are fitted, to provide back-up and if there is the possibility that the body of the EPIRB can mask one of the lights.

The MCA's *Merchant Fishing (Radio) (Fishing Vessels) Regulations 1999*, which came into force on 1 January 2000, states that vessels should meet the requirements of IMO A.810(19) and ETS 300 062 (2nd Ed). However, EPIRBs fitted before this date do not have to meet these standards. Therefore there is no current requirement for all EPIRBs fitted to fishing vessels, to give a clear indication day and night, when they are transmitting.

The current general regulations are the *Fishing Vessels (Safety Provisions) Rules 1975*. These are due to be superseded in part by the MCA's *Code of Safe Working Practice for the Construction and Use of 15 metre (OAL) to 24 metre (RL) Fishing Vessels*. The length of *Crimond II* is within this range. This code is in draft form at the moment. The requirement to carry a float-free satellite EPIRB is included in the code, but there is no reference to IMO A.810(19) or ETS 300 062 (2nd Ed). It is considered that the continuous indication feature should be required when the new code comes into force, because, if a crew is in the water and they are relying on the EPIRB for their rescue, they need to know it is transmitting. This reassurance should bolster their spirits and extend their survival time. Therefore, a recommendation has been made to the MCA to specify IMO A.810(19) and ETS 300 062 (2nd Ed), in relation to EPIRBs in the draft code.

EPIRBs require battery changes every four years, and have to be undertaken by a manufacturer's agent who has received appropriate training. A new EPIRB, complete with a new battery, can usually be fitted by one of the crew of a fishing vessel, because this exercise does not involve opening up the unit. The cost of a manufacturer's agent attending to the EPIRB can be quite high; often the price of a new EPIRB is not much more. Therefore specifying modern EPIRBs in the new code should not be unduly onerous. All EPIRBs are now manufactured in accordance with IMO A.810(19), and ETS 300 062 (2nd Ed) or IEC 61907-2.

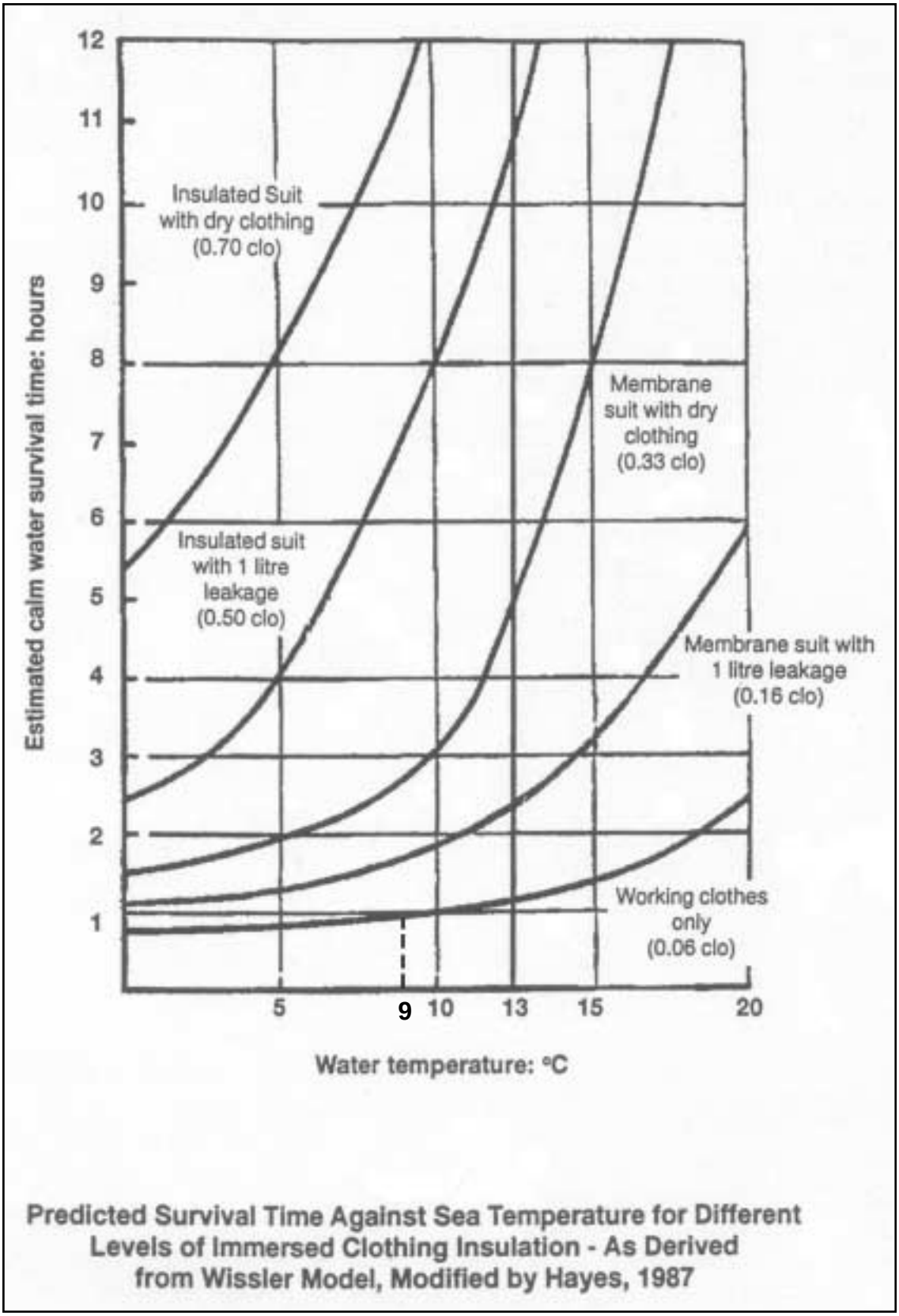
2.9 SURVIVABILITY

The crew were in the water for over an hour before the helicopter arrived. The deckhand resisted the difficulties better than the skipper, probably because of his heavier build, and the greater amount of clothing he had on. The skipper was wearing no footwear, so would have lost a lot of heat in this way. He only just survived the ordeal, if he had been in the water for another ten minutes he might well have perished. The crew were very grateful to the helicopter crew which saved them.

Estimated survival time versus water temperature is shown in **(Figure 9)**. The survival time in calm water at a temperature of 9°C, when working clothes are worn, is about 1 hour.

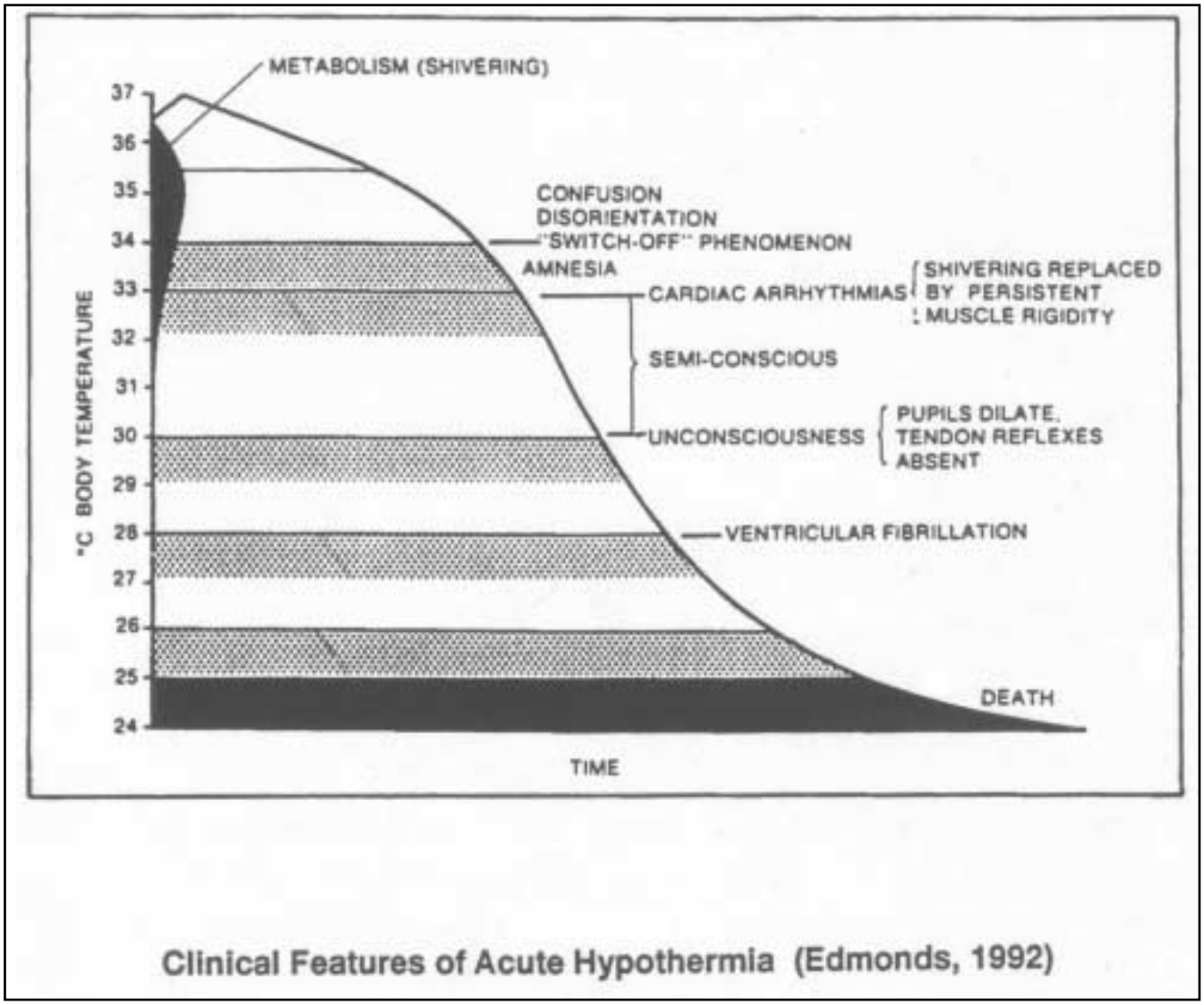
The effects of hypothermia are shown in **(Figure 10)**. The skipper's body temperature was reported to be 25°C when he reached hospital, but as he did not appear to lose consciousness, it might have been slightly higher than this.

Figure 9



Predicted Survival Time Against Sea Temperature for Different Levels of Immersed Clothing Insulation - As Derived from Wissler Model, Modified by Hayes, 1987

Figure 10



Clinical Features of Acute Hypothermia (Edmonds, 1992)

SECTION 3 - CONCLUSIONS

3.1 FINDINGS

1. *Crimond II* capsized and foundered at about 0630 on 24 April 2001, as a result of flooding which was discovered by the crew about 2 hours before. [1.2, 1.3]

2. The bilge alarms did not give warning that flooding was taking place. [1.2, 1.9, 2.2]

3. The helicopter from RAF Leconfield rescued *Crimond II*'s crew, from the water, at 0748 on 24 April 2001. [1.3]

4. At the time of the accident the wind was south-east, force 3; the skies were mainly clear, and the visibility was 4 miles; the sea was slight. [1.4]

5. The skipper had attended all three mandatory basic safety courses, but the deckhand had not. [1.6]

6. *Crimond II* suffered a flooding incident on 21 July 1999. The other owner had an interest in the fishing vessel *Scoresby*, which was lost after a flooding incident on 8 June 2000. [1.12]

7. Three possible flooding sources have been identified, but none of these can be verified. [2.1]

8. Defective pipework could have been the source of the flooding. By the time the flooding was discovered the floodwater was too deep to allow access to the seacocks, the closing of which would probably have stopped the flooding if pipework was the source. [2.1.1]

9. Hull damage might have led to the flooding. The plank seams on this wooden vessel had been caulked in the normal way. If some caulking had fallen out, this would have led to flooding. [2.1.2]

10. Back flooding through a discharge pipe could have occurred. Flooding from this source had happened before. [2.1.3]

11. If the MCA's proposals for additional requirements for bilge alarms are enforced, the sort of accident that happened to *Crimond II* will be far less likely to result in the vessel being lost. [2.2]

12. The flooding probably disabled the electrical generators at an early stage. After this it is likely that the bilge pumps drained the batteries, such that the fixed radios and the telephone could not be used to send a distress message. [2.3]

13. The skipper should have informed the coastguard as soon as the flooding was discovered. [2.4]

14. A distress message might well have got through to the coastguard if the portable VHF radio had been used. [2.4]

15. Before *Crimond II* sank, the liferaft was released from its cradle manually, but the deckhand made the mistake of untying the liferaft painter as well. [2.5]

16. When the skipper reached the liferaft, he realised the painter should not have been untied, so he wound the end around a guardrail. This attachment might have led to the liferaft being pulled down with the wreck. [2.5]

17. The deckhand would probably not have made the mistake of untying the painter if he had been trained in basic sea safety. [2.5]

18. A crew of three is considered to be the minimum for *Crimond II*. [2.7]

19. A proper lookout was not maintained while both crew members were in the fish hold working on the hydraulics. [2.7]

20. The EPIRB alerted the coastguard. Without it the crew would almost certainly have perished. [1.3,2.8]

21. The EPIRB gave no clear indication to the crew that it was transmitting. [1.11,2.8]

22. There is no current requirement that all EPIRBs fitted to fishing vessels, give a clear continuous indication, day and night, when they are transmitting. [2.8]

23. The skipper only just survived the ordeal. Had he been in the water for another ten minutes, he might well have perished. [2.9]

3.2 CAUSE

Immediate cause

Flooding, from an unidentified source, led to the capsize and foundering of *Crimond II.*

Contributory causes

The bilge alarms did not activate, or were not noticed.

Failure to inform the coastguard as soon as the flooding was discovered.

Failing to use the portable VHF radio.

SECTION 4 - RECOMMENDATIONS

Fredrick Normandale and Thomas McEwan, as fishing vessel owners, are recommended to:

1. Ensure that all crew that they employ have attended the basic safety courses, where they are required to have such training. [1.6, 2.6, 3.1.5, 3.1.17]

Fredrick Normandale, as an owner of fishing vessels, is recommended to:

2. Apply the MCA's proposed requirements for bilge alarms to all the fishing vessels in which he has an interest, as soon as possible. [1.12, 2.2, 3.1.6, 3.1.11]

The Maritime and Coastguard Agency is recommended to:

3. Specify that EPIRBs should conform to IMO A.810(19) and ETS 300 062 (2nd Ed) in the *Code of Safe Working Practice for the Construction and Use of 15 metre (OAL) to 24 metre (RL) Fishing Vessels*. [1.11, 2.8, 3.1.21, 3.1.22]

Marine Accident Investigation Branch
February 2002