Report on the investigation into the flooding

and foundering of the fishing vessel

Elhanan T

about 110 miles east-north-east of Fraserburgh

on 14 August 2003

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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.

NOTE

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

CONTENTS

GLOSSARY OF ACRONYMS, ABBREVIATIONS AND TERMS

ARCC	-	Air Rescue Co-ordination Centre
CG3	-	HM Coastguards' Operational Procedures
Clear communications	-	Voice communications on frequencies that may be accessed by others
CPSO	-	Counter-Pollution and Salvage Officer
DTI	-	Department for Trade and Industry
EPIRB	-	Electronic Position Indicating Radio Beacon
FRC	-	Fast Rescue Craft
HF	-	High Frequency
HRU	-	Hydrostatic Release Unit
IAMSAR	-	International Aeronautical and Maritime Search and Rescue
kHz	-	Kilohertz
kW	-	Kilowatt
MAIB	-	Marine Accident Investigation Branch
MCA	-	Maritime and Coastguard Agency
MF	-	Medium Frequency
MoD	-	Ministry of Defence
MRCC	-	Maritime Rescue Co-ordination Centre
OIM	-	Oil Installation Manager
OSC	-	On-scene Co-ordinator
RAF	-	Royal Air Force
RCC	-	Rescue Co-ordination Centre
RNLI	-	Royal National Lifeboat Institution
ROV	-	Remotely operated vehicle
SAR	-	Search and Rescue
SOSREP	-	Secretary of State's Representative for Pollution and Salvage
SRR	-	Search and Rescue Region
SRU	-	Search and Rescue Unit
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency
Z	-	Greenwich Mean Time

SYNOPSIS

All times are UTC (unless stated otherwise)

At about 1000 on 14 August 2003, the engine room of the 23m long twin rig trawler *Elhanan T,* began to flood. At 1140 an emergency call was made to Aberdeen Coastguard and, as a result, search and rescue units were tasked to stand by the vessel which was about 110 miles east-north-east of Fraserburgh. At about 1600 she capsized and sank, throwing two people into the water. The sea conditions were rough; there was a 3 to 4.5m sea and 40 knots winds.

Weak compression fittings in a salt water pipe had caused the flooding. The initial source of the flooding had been traced, and a repair had been made, but, a little time later, flooding resumed from another joint on the same pipe. This time the pipe could not be isolated because of problems associated with poor maintenance of valves.

The flooding, though mostly contained within the engine room, was found to be slowly spreading to an adjacent compartment. The skipper and crew abandoned the vessel and, using one of her liferafts, they safely transferred to another fishing vessel. They were later lifted to a rescue helicopter.

Elhanan T was drifting in the vicinity of undersea pipelines and rigs, the nearest being about 6.5 miles away. This was a concern to the coastguard and the helicopter crew, who had been asked to consider assisting in connecting a tow if, in their opinion, it was safe to do so. Because of the distance of the accident site offshore, there were no direct communications between the helicopter and the coastguard operations room.

To connect a tow, the helicopter lowered two aircrew to the abandoned fishing vessel. The operation proved more complicated than envisaged, and it later proved necessary to recover one of the aircrew and put the skipper of the fishing vessel back on board to assist in releasing the fishing gear that was still trailing astern. As soon as the nets were cut away, *Elhanan T* began to list, and she capsized and sank moments later, throwing the skipper and the helicopter winchman into the water.

The helicopter, which had been refuelling at a nearby platform, quickly returned to the site, and the two casualties were safely lifted to the aircraft. The helicopter then returned to RAF Lossiemouth with the fishing vessel's skipper and crew. Nobody had been injured.

Recommendations have been made which will help to prevent similar flooding, and which will improve communications and command and control of search and rescue and salvage operations.

Elhanan T (previously named *Arrivain III*)

SECTION 1- FACTUAL INFORMATION

1.1 PARTICULARS OF *ELHANAN T* AND ACCIDENT

Vessel details

Vessel name	:	*Elhanan T*
Skipper and owner	:	Andrew Third
Other owners	:	James Third and Melantic
Port and number	:	Fraserburgh - FR255
Flag	:	UK
Type	:	Fishing vessel - twin trawl
Built	:	1981 – Sandhaven
Classification society	:	None
Construction material	:	Wood
Length overall	:	23.20m
Gross tonnage	:	141
Engine power and type	:	Kelvin TBSC8 - 184kW

Accident details

Time and date	:	Approximately 1600 UTC, 14 August 2003
Location of accident	:	Approximately 110 miles ENE of Fraserburgh
Injuries/fatalities	:	None
Damage	:	Vessel lost

1.2 NARRATIVE

All times are UTC (unless stated otherwise).

Elhanan T left Fraserburgh at about 2100 on Sunday 10 August 2003, for fishing grounds 70 miles to the east-north-east. Fishing began at about 0600 the following day. Three trawls were undertaken every day, with each tow lasting about 7 hours.

On Thursday 14 August, the vessel was about 110 miles east-north-east of Fraserburgh. At about 1000, the gear had just been shot away and the deckhands were processing the catch from the previous haul. The deck hose was being used to wash the fish, but the supply of water suddenly stopped. A deckhand informed the skipper of the problem, and, as the vessel had no engineer on board, the skipper went down into the engine room to investigate.

A compression fitting on the discharge side of the deck wash pump, which supplied the deck water and also doubled as the bilge pump, had failed, and the water which should have been supplied to the deck hose was being discharged into the engine room (**Figure 1**). The pump was declutched from the main engine, and the appropriate valve (A **in Figure 1**) on the valve box was closed to stop any water flow caused by static head from the sea. The pipe in this position was below the waterline. The skipper wound plumbers' tape around the olive (**Figure 2**), which was his usual practice, and then re-connected the compression fitting, tightening it firmly. He then opened valve A and "rapidly clutched in the pump" to pulse-test the coupling. The coupling appeared tight, so he returned to the wheelhouse.

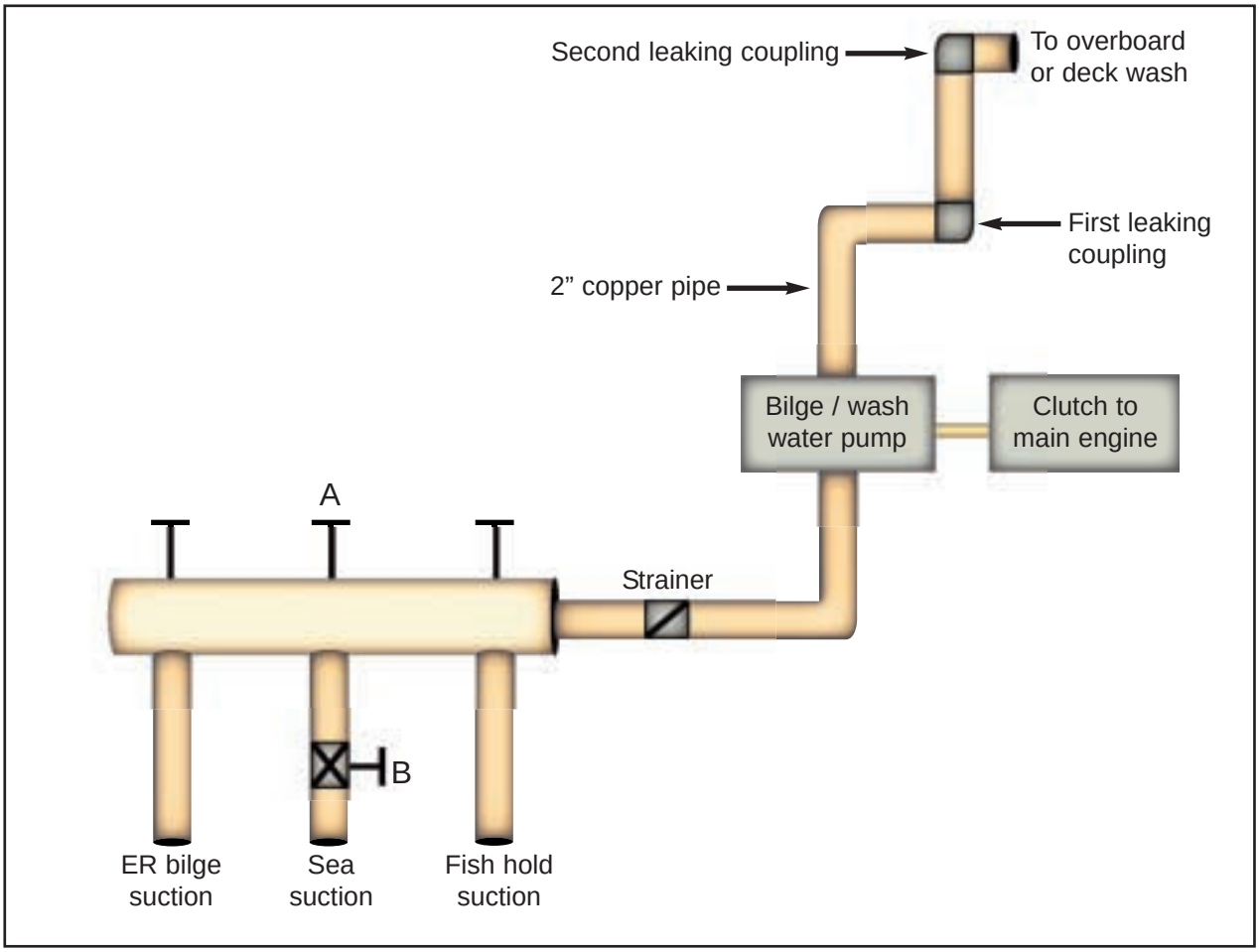
About 30 minutes later, electrical systems in the wheelhouse, including the fish plotter, started to fail. Once again, the skipper went below to the engine room. He found that the next compression fitting to the one just repaired had burst open (**Figure 1**). This time, water sprayed across the entire engine room. Some of the electrical fittings, including fuse boxes, were being soaked. The pipe and its joints had caused problems in the past, and had been replaced 3 years previously.

The pump was disengaged from the main engine; this reduced the flow. The open end of the pipe was below the waterline, and the consequent static head on the line meant that water continued to spray out.

To stop the flooding, the skipper tried to shut valve A once again, but failed.

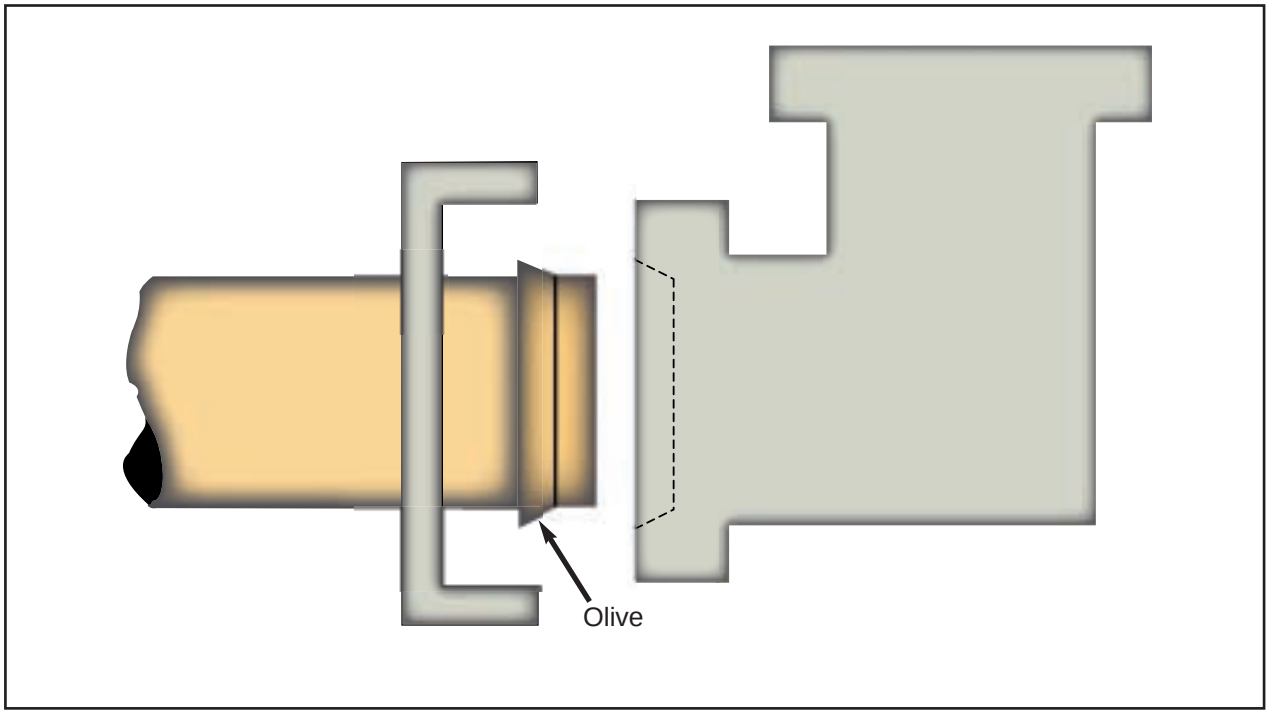
The skipper then attempted to halt the flow of water by closing the relevant seacock (B on **Figure 1**), but it was seized in the open position.

Figure 1



Diagrammatic illustration of the primary bilge and deck wash pumping system

Figure 2



Diagrammatic illustration of the compression coupling arrangement on *Elhanan T*

The skipper then started the other bilge pump (**Figure 3**), which was powered from the auxiliary engine. He took suction from the sea to prime it, he then opened the engine room bilge suction, and shut-in the sea suction so that only one turn remained open (C on **Figure 3**), (this was normal practice when the vessel's bilges were pumped out, because it prevented possible damage to the pump if the bilge ran dry). The skipper did not close the sea inlet valve fully at the time of the accident. Had he done so, the pump might have been more efficient. He tried to shut the jammed valve on the valve box again, but without success. The flooding could not be stopped, and the skipper realised the problem was serious. Bearing this in mind, he returned to the wheelhouse and, using the portable VHF radio, he called the skipper of the vessel *Deliverance*, which was fishing nearby, and told him about the situation. The skipper of *Deliverance* called the coastguard on his medium frequency (MF) radio and, at 1140, the coastguard designated the incident a "Mayday".

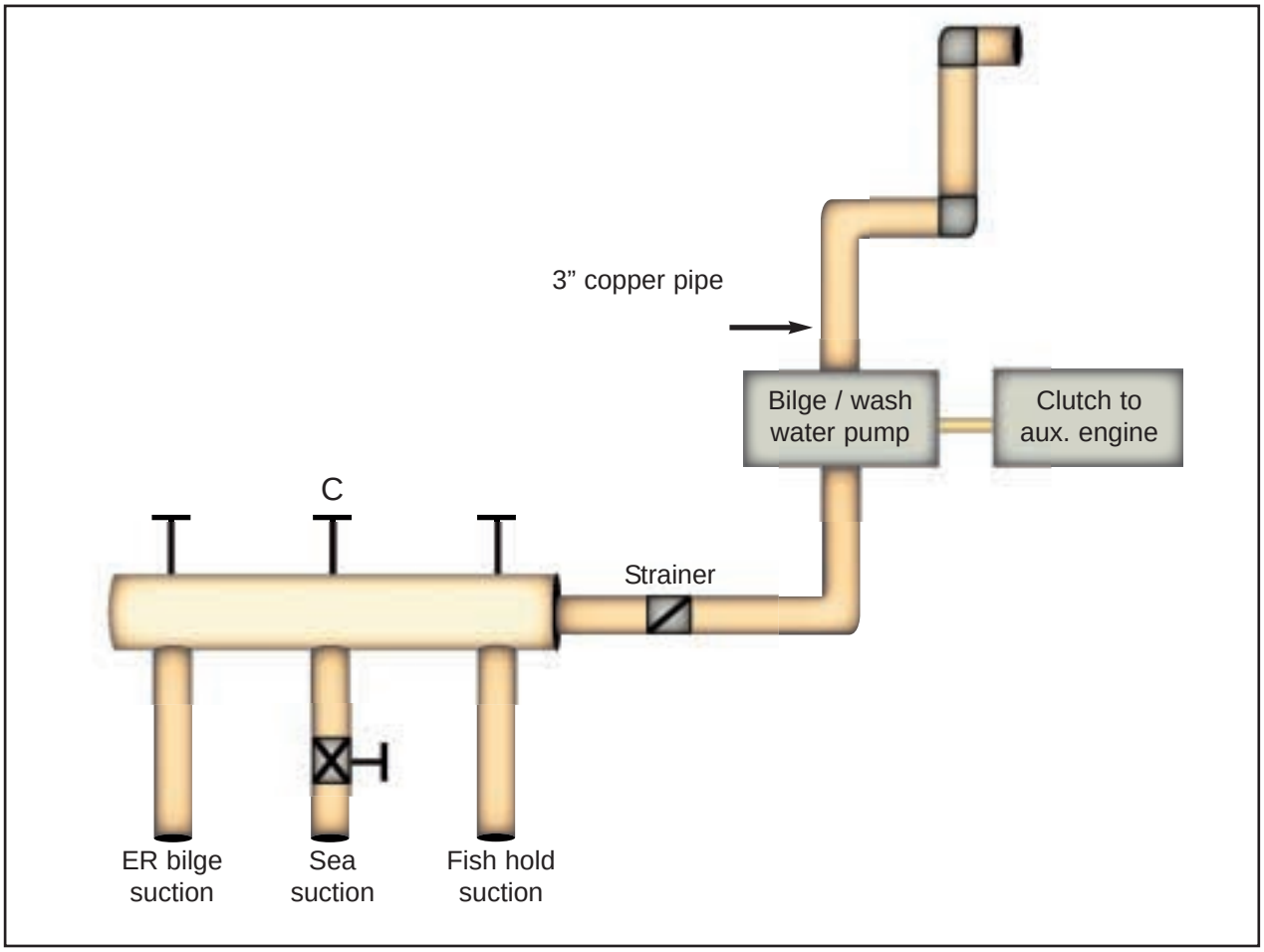
Immediately, the coastguard arranged for two oil rig supply vessels, and a stand-by safety vessel, to proceed to *Elhanan T*'s assistance. They also began sourcing search and rescue units (SRUs). *Deliverance* joined the other vessels to stand by *Elhanan T*. Rescue Helicopter R137 was tasked to proceed to the accident site at 1144.

Elhanan T's skipper spent a few more minutes rushing between the wheelhouse and the engine room, attempting to shut the valves, before deciding to haul his gear to make her easier to handle. The trawl winches were powered by a hydraulic pump, which, in turn, was driven by the main engine, which was still running. The gear was hauled until the trawl doors were stowed; this took about 15 minutes. The main engine then stopped. With the nets still streamed astern, the skipper went below to the engine room once again. He tried to close the valve on the valve chest once more, but it remained jammed. By that time, the water level was higher than on his previous visit. The bilge pump powered by the auxiliary engine was still running, but unable to cope with the inflow of water.

The situation was becoming dangerous, so the skipper left the engine room and told the deckhands to don their survival suits and lifejackets, and to prepare a liferaft for launching. Returning below, he opened up the auxiliary bilge pump strainer and cleaned it (**Figure 3**). By that time, the engine room was lit by only a single small lamp powered by the vessel's batteries. The open door also provided a degree of light. However, it was very difficult to work in the restricted light, with water spraying and washing across the engine room owing to the vessel rolling in the swell.

The auxiliary bilge pump was not coping with the ingress, so the skipper left the space and instructed the deckhands to deploy the liferaft. He then called *Deliverance*, and requested that the deckhands be taken off *Elhanan T*. However, when this intention was relayed to the coastguard, they advised that either everyone should stay on board or they should all abandon ship. This advice was passed to *Elhanan T*.

Figure 3



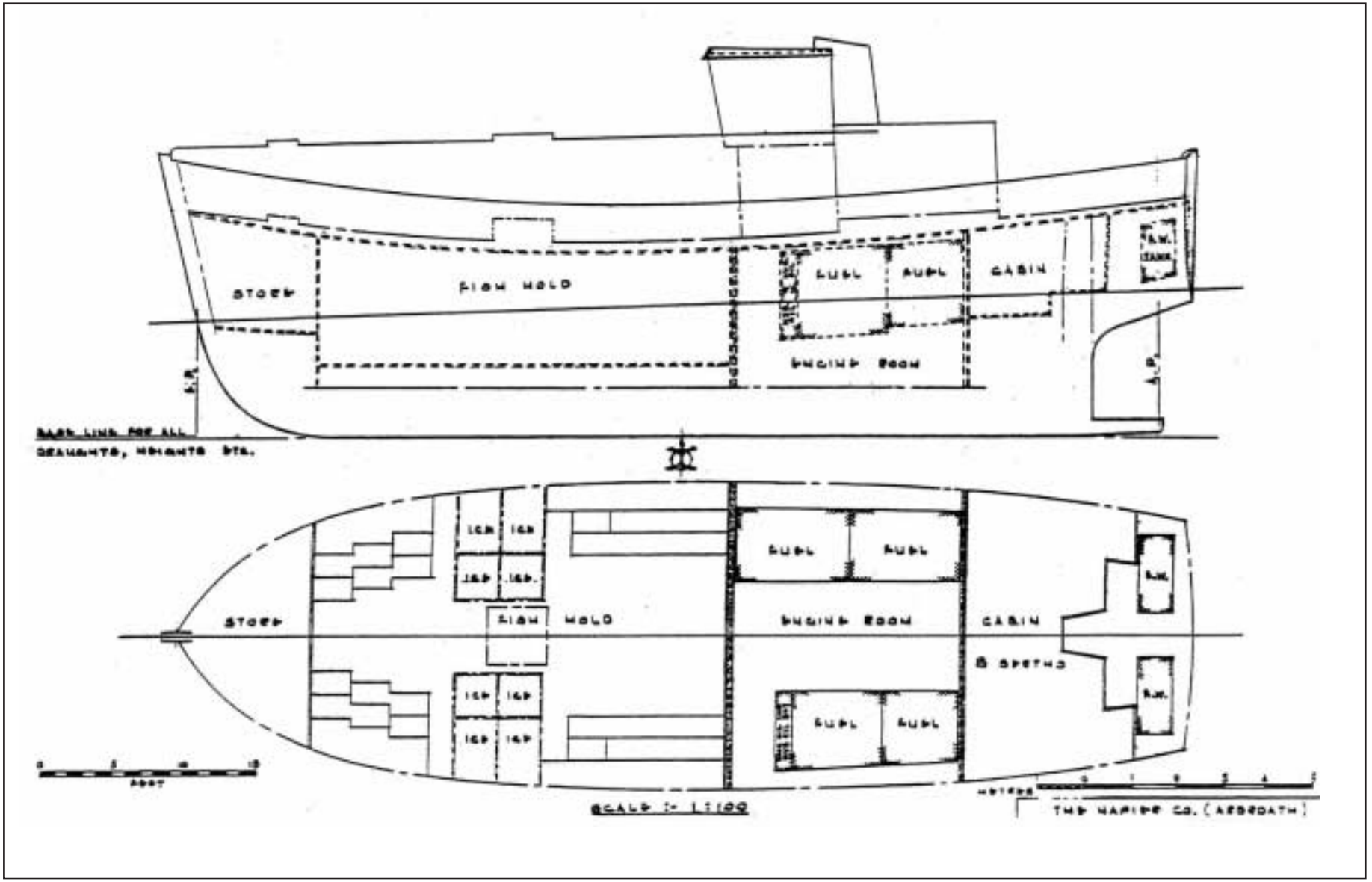
Diagrammatic illustration of the secondary bilge and deck wash pumping system

The skipper checked the engine room again. Although the auxiliary bilge pump was still running, the water level appeared to be continuing to rise. However, with the vessel rolling heavily at times, this was difficult to gauge. The fish room was checked and found not to be flooding. There was some water ingress into the accommodation space aft of the engine room, which indicated a failure in the watertight bulkhead between these two spaces (**Figure 4**). With the water level in the engine room rising, the flooding spreading aft, and the rescue helicopter still more than an hour away, the skipper decided it was too dangerous to remain on board, and made the decision to abandon the vessel.

The skipper and his crew abandoned at about 1230. Using the liferaft, they safely transferred to *Deliverance*.

Meanwhile, the coastguard paged the MCA’s counter pollution and salvage officer (CPSO).

At 1238, a discussion took place between the Aberdeen maritime rescue co-ordination centre (MRCC) and the CPSO, including, among other things, whether there were any pipelines in the area. The CPSO contacted the Department of Trade and Industry (DTI). During the next few minutes, many calls were made between the MRCC and various oil company officials, with regard to the ownership of pipelines in the area.



General arrangement

Figure 4

At 1245, *Grampian Shield*, a 789gt emergency rescue and recovery vessel, arrived at the scene of the accident and began relaying information to the MRCC using medium wave radio communications.

At 1246, the MRCC informed the rescue helicopter that the four crew were safely on board *Deliverance*. Additionally, the MRCC told R137 that they did not want the pumps put on board the fishing vessel, and requested the helicopter to bring the four crew ashore. The helicopter agreed, subject to confirmation from ARCC Kinloss. At about that time, VHF communications between the shore and the helicopter deteriorated because of the distance between the stations.

At about the same time, the MRCC watch manager sought advice from an experienced ex-fisherman and ex-coastguard watch manager, now a trainer, and who happened to be in the building at the time. Following their conversation, they decided it would be a good idea for the trainer to speak to *Elhanan T*'s skipper.

Via satellite communications, the trainer then spoke to *Elhanan T*'s skipper, who was on board *Deliverance*. The skipper informed him that the nets were still out, but that the trawl doors were secured on board. He gave a detailed account of the situation and condition of the vessel, including the extent of flooding, the weather, the quantity of fish and ice on board, and the condition of the onboard machinery. From this conversation, the trainer believed *Elhanan T* to be in a very unsafe condition. The trainer advised the skipper that the coastguard did not want anyone going on board at that time, as the vessel could sink suddenly, and, therefore, they should wait until the arrival of the aircraft on-scene, when all parties would re-assess the situation. The trainer informed the watch manager of the conversation, and told her that the vessel was in an unsafe condition and could sink at any time. He also said that a fishing vessel in that condition was likely to capsize with little warning.

Bearing in mind the conversation between the trainer and the skipper, the watch manager attempted to call the helicopter using VHF radio. However, she was unable to do so, as the helicopter was beyond the range of this equipment.

At 1308, *Grampian Shield* informed the MRCC that *Elhanan T* was close to an underwater pipeline. The MRCC replied that it was already aware of that.

The watch manager then called the ARCC, and asked them to tell the helicopter to go to the *Tiffany* platform, which was close to the scene of the accident. She also requested them to call MRCC using a landline telephone, because the situation had changed and she wanted to prevent any misunderstandings between the MRCC and the helicopter.

Using the SAR frequency of 5680kHz, ARCC passed on the above message to the helicopter, and then, at 1313, confirmed to the MRCC that they had done so.

The unusual request to land on a platform and contact the MRCC by landline telephone, led to some speculation among the helicopter's crew about why the call had to be made via "private" landline, as opposed to the usual "clear" communications via the ARCC at Kinloss using 5680kHz. The consensus of opinion was that the coastguard wished to communicate over a "safe" medium (ie not clear), owing to some sensitive issues; perhaps safety of oil platforms or security considerations.

At about 1322, the helicopter landed on the *Tiffany* platform, and began refuelling. The winchman, and the extra radar operator, proceeded to the platform control room to call the MRCC via landline, as requested.

At 1335, ARCC asked the MRCC for a situation report, and this was relayed to them via their designated landline. During this call, the MRCC confirmed that the operation was then one of salvage, and not SAR, and they did not want the pumps or fishing crew put back on board *Elhanan T*. ARCC confirmed that the helicopter winchman would go on board *Deliverance* and talk face-to-face with *Elhanan T*'s skipper, and that the winchman would then "take it from there".

Also at 1335, the winchman called the MRCC via landline from the control room of the *Tiffany* platform, and was told that the MRCC did not want either the salvage pumps or the crew put on board *Elhanan T*. The watch manager then said that they had a potential problem with the abandoned fishing vessel floating about the North Sea, and that putting a tow on the vessel, and towing her into harbour, would be "ideal". This comment was then countered by the watch manager, who stated they were not asking the helicopter crew to do this, and it was "their call" if they undertook to help. The winchman then confirmed that no pumps or fishing crew were to be put on board and his understanding that whether a tow was connected was "their call".

At 1349, MRCC updated the CPSO of the situation.

At 1352, the CPSO informed MRCC that he was going to inform the Secretary of State's Representative (for pollution and salvage) (SOSREP) of the situation.

At about 1354, the MRCC appraised *Grampian Shield* of the situation and requested information on *Elhanan T*'s visual condition. *Grampian Shield* informed MRCC that she appeared to be the same as when they arrived. They further reported that the helicopter was winching the crew from *Deliverance*, and that the wind was 40 knots with seas of 3 to 4.5 m in height.

At 1408, the skipper of *Deliverance* confirmed to MRCC that the crew had been airlifted off and, when asked his intentions, replied he would attempt to get a line on her once the weather had improved. This information worried the MRCC personnel, as they were aware that this kind of action could end in another emergency situation.

At 1416, MRCC called *Balmoral* platform and told them of the situation.

At 1424, the CPSO passed a message from SOSREP to MRCC, that SOSREP believed someone should go on board, if the risk was not too great.

MRCC replied to the CPSO, stating that the vessel was predicted to pass 2.5 miles from *Balmoral* platform, that the situation was being monitored continually, and that the stand-by safety vessels would ensure *Elhanan T* did not put any rigs at risk. The CPSO confirmed he was happy with the situation, and passed this information on to SOSREP.

Deliverance's skipper called MRCC at 1430, and informed them he was going to attempt to tow *Elhanan T*, and that the helicopter was intending to put two crewmen on to her to arrange the tow. MRCC replied that this was news to them, and asked to be kept informed. MRCC then informed their duty manager of the situation, saying they were not happy with this action. The duty manager agreed, but said that if the helicopter decided to put anyone on board, it was at their own risk. MRCC then informed the duty manager of the previous communication with the CPSO, and the duty manager stated that if the *Balmoral* platform crew were happy, the situation was all right, and that, in any case, the stand-by vessels would not allow the rig to be put at risk.

At 1436, the DTI requested *Elhanan T*'s position and the distance to the nearest rig. MRCC gave the position and a distance of 6 miles from *Balmoral* platform.

MRCC believed it was possible that of the two people being put on board, one was a member of *Elhanan T*'s crew. This was against their wishes. They asked ARCC to confirm the helicopter's intentions, as they appeared to conflict with what was previously agreed. ARCC stated they had not been in contact with the helicopter for a while, and that they would call the helicopter to determine the situation.

At 1453, ARCC informed MRCC that the winchman and a crewman had been lowered on to *Elhanan T* to effect the tow. MRCC then requested ARCC to find out who was on *Elhanan T*, and whether any pumps were being used.

At 1454, ARCC asked the helicopter crew whether the crew members deployed were helicopter crew or boat crew.

At 1501, *Grampian Shield* called MRCC, and informed them that *Deliverance* had a line on *Elhanan T*, and confirmed that the two people effecting the tow on the vessel were helicopter crew.

At 1503, ARCC relayed a message from the helicopter, stating they intended to put a tow on *Elhanan T*, and to cut her nets free in accordance with instructions received from MRCC. They also confirmed the four fishing crew were still safely on board the helicopter. The watch manager was happy with that.

At 1519, MRCC received a request from the operators of the *Balmoral* platform, requesting an update of the situation. A situation report was passed to them.

The two helicopter crew on board *Elhanan T* attempted to release the fishing gear. However, it was a complicated procedure on this vessel and, despite instructions being passed from her skipper, who was in the helicopter, they were unable to do so. The skipper then volunteered to be lowered down to help.

At 1537, *Grampian Shield* called MRCC using MF radio and informed them that *Deliverance* had *Elhanan T* in tow, that one of the helicopter's crew was on board her, and the intention was to also place the skipper on board.

The skipper was lowered down on to the vessel. He first adjusted the tow-line, as each side of the bridle was a different length. The skipper released the nets, and then went below to the engine room to assess the level of the water there.

At 1540, *Grampian Shield* informed MRCC that one helicopter crewman, and *Elhanan T*'s skipper, were on board *Elhanan T*, and that the helicopter had returned to the *Tiffany* platform.

The watch manager at MRCC had been busy giving ARCC a situation report, and had been unaware of these latest events.

At 1556, *Grampian Shield* confirmed that the nets had been cut away and the winchman and skipper were still on board *Elhanan T*. The watch manager was, by then, aware of the situation. As the skipper was already on board, and the helicopter was elsewhere, she said that MRCC did not want anyone left on board while the vessel was being towed. *Grampian Shield* passed this information to *Deliverance*.

Additionally, the watch manager called ARCC, asking them to pass the message not to leave the skipper on board once the helicopter left the scene, and to return him to *Deliverance*. She stated her view that if the vessel went down, she would do so very quickly.

At 1607, *Grampian Shield* informed MRCC that *Elhanan T* had overturned. MRCC immediately requested ARCC to get the rescue helicopter back to *Elhanan T*.

The helicopter was refuelling, rotors turning, when they received information from the winchman that *Elhanan T* was sinking. They stopped refuelling and lifted off immediately.

The FRC from *Grampian Shield* was launched quickly, and MRCC was informed at 1610. Those on board *Deliverance* cut the tow rope and kept a lookout for anyone in the water. The winchman and the skipper were in the water. Just before the vessel had capsized, the winchman had inflated the skipper's lifejacket, and had hooked the two of them together. The winchman waved the FRC away as it approached, as his survival suit was leaking and he believed they would be unable to lift him from the water because of the added weight. At the same time, about 1615, the helicopter returned, and airlifted the two people.

At 1616, MRCC passed a situation report to their duty manager, and requested her to call the regional manager.

The helicopter returned to the *Tiffany* oil installation and completed refuelling. The skipper was given dry clothes, and the helicopter then returned to its base with the four rescued people on board.

At 1650, the DTI asked MRCC if the owners of the pipeline had been informed. MRCC replied that they had, and agreed to pass on the vessel's position.

Some light diesel oil was leaking from the sunken vessel.

The helicopter arrived back at its base at 1810.

At 1835, the CPSO informed MRCC that no further action regarding diesel pollution was required, as the oil was expected to disperse quickly. He asked to be informed if any installations in the area expressed concern.

Further communications continued for the next hour, as various control rooms and installations became aware of the accident.

1.3 ENVIRONMENTAL FACTORS

At the time of the initial flooding, the wind had been from the north-west, force 5, and the sea was rough. However, as the accident developed, the wind increased in strength. There was also a large north-westerly swell present. Visibility was good throughout.

1.4 THE CREW OF *ELHANAN T*

The skipper had worked in the fishing industry for 14 years. He was qualified as a deck officer on fishing vessels, and had also received some training as an engineer.

Three deckhands made up the rest of the crew.

1.5 DESCRIPTION OF *ELHANAN T*

The keel of the wooden hulled *Elhanan T* was laid at Sandhaven on 16 September 1980. She was of traditional north-east of Scotland build, with a slightly raked stem and a transom stern (**Figure 4**).

The casing was constructed of steel, and the wheelhouse was of aluminium alloy.

The vessel was fitted with two Hall-type stockless anchors, with about 120m (60 fathoms) of 19mm (¾") chain.

A 5mm steel watertight bulkhead was fitted between the engine room and the fish hold, and the centre portion of the bulkhead was portable, for engine repairs, and was secured in place by bolts. A 5mm steel watertight bulkhead was fitted between the engine room and the cabin. A 5mm steel bulkhead was also fitted at the forward end of the fish hold.

The original seine net rope reels and winch were removed in November 1997, and a trawl winch, net drum and gallows were fitted.

The last time the vessel was taken out of the water for survey was August 1999.

Two Dunlop Seafarer 8 person liferafts were fitted just forward of the wheelhouse. One was new, the other was 21 years old. Both had last been inspected in April 2003. *Elhanan T* carried one Lokata 406(H)Y EPIRB.

She had a 370kW (495hp) main engine, and a 95kW (127hp) auxiliary engine. The main bilge pump was a Gilmec 250/700, and was clutch and belt-driven from the main engine. It had a capacity of 350 ltrs/min. The auxiliary bilge pump was a Gilmec 300/875, clutch and belt-driven from the auxiliary engine. It had a capacity of 600 ltrs/min.

1.6 THE ROLE OF THE COASTGUARD IN MARITIME SAR

The coastguard is responsible for the initiation and co-ordination of civil maritime search and rescue within the United Kingdom search and rescue region (SRR). This includes the mobilisation, organisation and tasking of adequate resources, to respond to persons either in distress at sea, or to persons at risk of injury or death on the cliffs or shoreline of the United Kingdom.

1.7 THE ABERDEEN COASTGUARD TEAM

At the time of the accident, the team at Aberdeen MRCC consisted of:

- a deputy watch manager, with 9 years experience in the coastguard as watch officer and deputy watch manager;
- one watch officer with 10 years experience;
- one deputy watch officer with 3 years experience; and
- two watch assistants with 5 and 3 years experience respectively in the coastguard.

A coastguard training official was also present in the MRCC during part of the operation. The training official had 15 years experience in the fishing industry, including some as skipper/owner. He also had 15 years experience, up to managerial level, in the operations rooms of the coastguard.

1.8 THE ROLE OF THE RAF IN MARITIME SAR

The Ministry of Defence (MoD) provides declared SAR facilities to cover military operations, exercises and training within the UK SRR. Although these resources are established for military purposes, it is MoD policy to render assistance during civil distress situations.

MoD assets, such as helicopters, are co-ordinated for the entire UK SRR by the ARCC at Kinloss in Scotland.

RAF Sea King helicopters have a maximum endurance of 6 hours. A normal crew consists of the pilot, the co-pilot, the winch/radar operator, and the winchman.

The helicopters are equipped with VHF (marine and air band), UHF radios, one HF radio, and mountain rescue radios.

1.9 SAR COMMUNICATIONS WITH SEARCH AIRCRAFT

A clear and rapid means of communication is of the utmost importance in SAR operations.

The HM Coastguard Operational Procedures (CG3) state the following.

The aircraft establishes communications with ARCC on HF 5680kHz or 3023kHz, or as directed by the ARCC Controller.

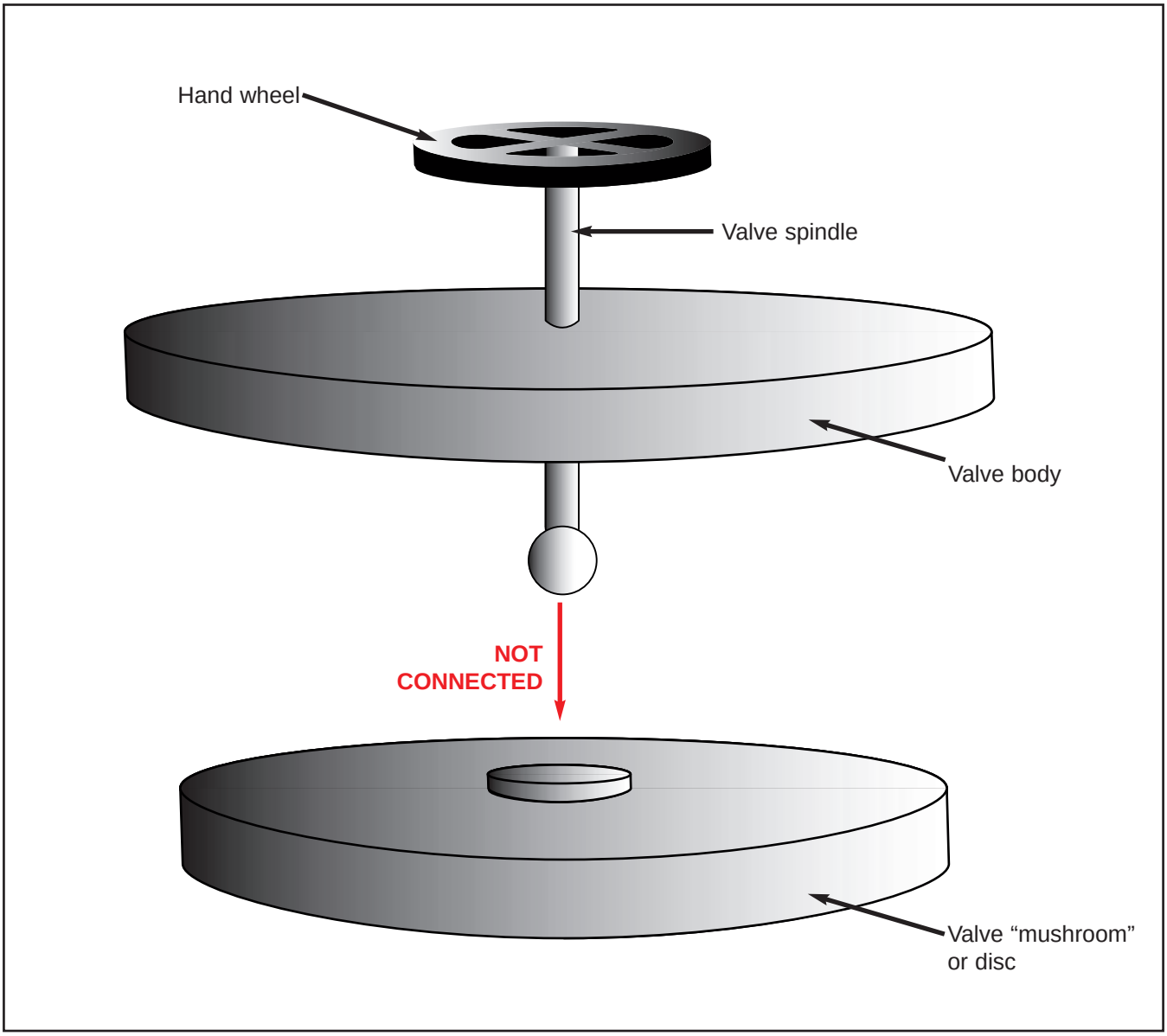
The aircraft communicates with the Coastguard on 156.0 MHz (VHF Ch. 0) while in range, which is line of sight. Once the aircraft is operating outside VHF range, the co-ordination centre will advise ARCC they have lost communications, and ARCC will assume communications responsibility on HF. During these operations taking place outside of VHF range, HF communications will normally be used on SAR primary or secondary frequencies. Because these frequencies may be in use for other casualties that you may be unaware of, the co-ordination centre should refer to ARCC before using HF frequencies 5680kHz, 5699kHz, 3023kHz or 3089kHz.

The United Kingdom Table of Radio Frequency Allocations 9kHz – 105GHz state 5680kHz is a coastguard frequency from 20 locations within the UK, and an RNLI frequency currently assigned to 170 lifeboats. The carrier frequencies 3023kHz and 5680kHz may also be used … *“by stations of the maritime mobile service engaged in co-ordinated search and rescue operations”*.

The International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual states: … “5680kHz may be used for intercommunication between mobile stations (ship-aircraft) and participating land stations engaged in co-ordinated search and rescue operations”.

MRCCs routinely use 5680kHz for direct communications with Coastguard SAR helicopters, RNLI lifeboats and other SRUs when outside VHF range. It is only in the case of military (RN and RAF) SAR helicopters that ARCC is routinely used to relay information.

Figure 5



Diagrammatic illustration of the valve

SECTION 2 - ANALYSIS

2.1 AIM

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

2.2 FLOODING

The MAIB has investigated numerous flooding incidents involving fishing vessels, many of which have resulted in the loss of the vessel. The most common cause of fishing vessel losses is flooding, and the principal cause of flooding is defective pipework.

It is evident in *Elhanan T*'s case that the connections for the discharge pipe from the main engine bilge pump were not sufficiently robust. They had caused problems in the past, which resulted in the pipe being renewed. However, it was only about 3 years after the work had been undertaken that failures of the joints caused the loss of *Elhanan T*. Compression fittings were not suitable for such a critical pipe; bolted flanged joints should have been used.

The importance of engine room pipework cannot be overstated. Good quality materials should be used, and piping systems should be inspected regularly for damage, corrosion and leakage. It is recognised that pipework is often difficult to access, especially when it is sited below the engine room floor plates. However, fishermen should be encouraged to use their best efforts in carrying out these inspections. It is especially important to look at salt water pipes, because they are more liable to suffer corrosion, and a breach could cause dangerous flooding.

After the second compression coupling failure on board *Elhanan T*, the skipper tried unsuccessfully to isolate the pipe using the same local valve he had used previously; he found the valve was jammed. Each valve in the valve box consisted of a disc, referred to as a mushroom (**Figure 5**), which sat on the valve seat when the valve was closed. To open the valve, a wheel turned a threaded spindle, which allowed the mushroom to lift off the valve seat under the pressure head; water could then flow through the valve. The end of the spindle bore down on the mushroom, but was not connected to it. The mushroom was fitted in a guide on each side and, if the spindle was screwed too far out, the mushroom could tilt and jam at an angle in the guides. If this happened, screwing the spindle back down would not close the valve; it would merely jam the mushroom more firmly into the wrong position. When the mushroom was at an angle it did not seat properly. The skipper believed that he might have opened the valve too far, causing the mushroom to jam in the guides.

The skipper then tried to stop the flooding by operating the appropriate seacock. However, the seacock was seized. Seacocks on *Elhanan T* were not regularly operated and maintained. Seacocks are vital for safety. They should be operated regularly, to ensure that they are free. It is good practice to close all the seacocks when a fishing trip is complete. This will help to prevent problems while alongside. Pipework can fail in harbour; vessels have sunk as a result. The seacocks were not routinely operated on *Elhanan T* and, for this reason, it is not surprising that the seacock referred to earlier was seized shut. If it could have been closed, this vessel would have been saved.

The first flooding incident was indicated when the flow from the deck hose stopped, and the second incident was notified by electrical failures of wheelhouse equipment. Bilge alarms were, therefore, not so important in this case. However, the MAIB has investigated many cases where early indication of flooding might have enabled vessels to be saved. A bilge alarm should be fitted in each main watertight compartment. Good quality, robust units should be used. Bilge alarms should be tested at the start of each fishing trip, and each day while at sea. If a bilge alarm is not fitted with a fail-safe indication, another bilge alarm should be installed in the space as a backup.

The relevant regulations do not require the engine room on a wooden fishing vessel to be enclosed by watertight bulkheads. In this case, the aft engine room bulkhead was not watertight, as water was noted to be coming into the accommodation space. *Elhanan T* might have stayed afloat and been saved had this bulkhead not allowed the flooding to spread.

During the accident, the skipper spent much of his time rushing between the engine room and the wheelhouse. He was not only acting as the skipper of the vessel - communicating with *Deliverance*, checking on the vessel's condition, hauling the nets and looking after the crew – but he was also engaged in attempting to pump out the floodwater, and stopping/starting the main and auxiliary machinery. The MAIB does not suggest that all fishing vessels should have a designated engineer on board, however, it should be noted that in this situation, the skipper could have paid greater attention to his principal safety role if someone else on board had received some basic engine room training.

It should be noted, with the benefit of hindsight, the 50mm diameter copper pipe, which was the source of the flooding, could have easily been closed using a hammer. Such action would have stopped, or at least reduced, the flow to a manageable level. Had *Elhanan T* carried a simple damage control kit, containing a variety of wooden bungs, they, too, could have provided a simple temporary solution to the problem.

2.3 THE INITIAL SEARCH AND RESCUE RESPONSE

Aberdeen Coastguard responded efficiently and effectively to the emergency call from *Deliverance,* which was received at 1140. As well as *Deliverance* herself, two oil rig supply vessels, a stand-by safety vessel, and Rescue Helicopter R137 complete with salvage pumps, were quickly tasked to stand by the vessel, and other interested parties were informed of the situation. Just over an hour after the initial call to the coastguard, the four crew members safely transferred from the flooded vessel to *Deliverance,* and the immediate danger to life was removed.

2.4 SEARCH AND RESCUE COMMUNICATIONS

The *International Aeronautical and Maritime Search and Rescue Manual, Volume 1, Chapter 2, Paragraph 2.5.2 (a)* states: *An SRU must have rapid and reliable means to communicate by voice or message with the SMC, the OSC if assigned, other SRUs, and the distressed persons.*

The coastguard communicates with SRUs, including helicopters, via VHF radio, when within range. When outside VHF range, MF/HF radio is used for direct communications, except that all communications with military helicopters are then relayed through ARCC. Because of the geographical position of the Aberdeen MRCC, they have RAF SAR helicopters regularly operating outside VHF range. It is normal practice for the MRCC and the SRU to pass all communications through the ARCC at such times, with the inherent risk of a misunderstanding.

During this operation, the MRCC decided that “direct” communications would be needed to prevent any misunderstanding. To that end, the MRCC requested the helicopter to land on an oil platform before hoisting the crew from *Deliverance,* and to call them via landline. They did not communicate, nor make a request to the ARCC for permission for them to communicate with the helicopter directly on 5680kHz HF at any time, although an RCC is permitted to do so.

The unusual act of requesting the helicopter to land, and then contact them via landline before winching the crew on board, aroused much speculation among the air crew who were fully aware of security and safety issues regarding “clear” communications. The consensus of opinion was that the MRCC wished to communicate some important information which could not be sent via the ARCC at Kinloss on HF “in clear”. However, once the winchman had spoken to the MRCC via landline, and then relayed the communication from the MRCC, they believed the reason for the request to call via landline was to avoid any possible misunderstanding by the press, or anybody else listening on HF, and possibly causing undue alarm. These considerations, coupled with the fact that they had been given the option to attempt to put a tow on *Elhanan T,* caused them to assume this was necessary to protect the oil installations which they could clearly see in the vicinity. These were major deciding factors in their subsequent actions.

The information concerning the vessel's condition, which the skipper and the coastguard trainer passed on to the MRCC watch manager, led the watch manager to believe, at an early stage, that *Elhanan T* could sink quickly. However, these concerns were not passed on to the helicopter crew.

Rescue helicopter crews often have to make quick decisions based on the circumstances they find on scene. On this occasion, the pilot decided it was safe to proceed with actions to connect a tow, based on his observation of the vessel in the rough seas over a period of about an hour. In particular, she did not appear to have sunk lower in the water in that period and, although settled with a considerable stern trim, she seemed to be moving easily in the sea conditions. The pilot assessed that the situation had stabilised, and that it was unlikely to deteriorate. He made this "risk assessment" based on scanty information. The pilot did not have as much information as the MRCC, and had little knowledge or experience of fishing vessel stability. Only someone with up-to-date information on the extent and nature of the flooding, the loading of the vessel, and her intact stability, could have made an accurate risk assessment. The fact that the skipper and crew had abandoned the vessel should have been indication enough that there were considerable risks involved in the intended operation.

The Coastguard Operations Manual CG3, includes a requirement for helicopter pilots to make safety calls to the MRCC every 30 minutes, giving location and time. The manual adds that when not in direct contact with the controlling co-ordination centre, the pilot is to ensure that the authorities, with whom he is in contact, relay his position reports to the co-ordination centre. During this incident, no reports were relayed in this way, the only communications received by the MRCC, from the helicopter, were in response to specific questions asked.

Grampian Shield, a stand-by safety vessel, was on scene throughout the incident. Stand-by safety vessels are generally highly manoeuvrable, have good communications facilities, good local knowledge and crews that are trained to handle a variety of emergency situations. The master of *Grampian Shield* relayed some information, gained from his own visual observations, to the MRCC. But, bearing in mind the poor and indirect communications between the main SRU and the MRCC, it would have been beneficial to have given *Grampian Shield* an official role by appointing her to act as on-scene co-ordinator (OSC) for the incident.

2.5 THE LANDLINE COMMUNICATION BETWEEN THE MRCC AND THE HELICOPTER

The MRCC asked the helicopter crew to call them via landline, as previously stated. In all SAR operations, the MRCCs are primarily co-ordinators. The captain of any SRU remains in command of his or her vessel or aircraft at all times, so has the discretion whether to act as requested by the ARCC or MRCC. The MRCC's statement that it was "their call" only emphasised what was already

well known to the helicopter captain. Taking this into account, the only information imparted by the MRCC during the landline call to the *Tiffany* platform, was the instruction that they did not want pumps or fishing vessel crew put on board the vessel, and that they had a derelict vessel in the North Sea, which posed a problem.

The watch manager made it clear that pumps and non-aircrew should not go on board. The possibility of capsize, the chief risk faced by anyone going on board, was not addressed, even though the watch manager left open the option for aircrew to board the vessel. The lack of this critical piece of advice meant the aircrew were ill-equipped to make any decision about boarding. The combination of the explicit delegation of responsibility for such a decision, the concern expressed about a fishing vessel "floating about in the North Sea", and the suggestion that putting on a tow would be ideal, represented a failure in the co-ordination function. It also suggests that the training of MRCC personnel may warrant some examination.

At 1503, ARCC relayed a message from the helicopter that they were trying to establish a tow, and then cut *Elhanan T*'s nets, and that they were acting in accordance with instructions received from the MRCC.

Further, at 1504, the watch manager at MRCC, having had it confirmed that aircrew were on board *Elhanan T*, stated that she was happy with the situation because this was an option that had been given to the helicopter winchman. Her only concern was that none of *Elhanan T*'s crew should have gone back on board.

This makes explicit the assumption underlying previous communications that the safety of the helicopter crew is not the responsibility of the MRCC. This, in the opinion of the MAIB, is an inappropriate attitude, whose origins may lie in the difficulties in communicating with helicopters, the lack of control or influence MRCC has over helicopter operations, or in excessive respect for the capability of helicopter crews. The first of these is a real impediment to effective co-ordination of efforts. The second is, in principle, no different with respect to surface vessels, although aircrew may be regarded to be less responsive to advice than surface vessel crews. The last is a possibility that could be countered by adherence to clear objectives and principles of operation:

- First, a clear distinction between SAR and salvage operations should be maintained at all times, so that risks are not taken inappropriately.

- Second, a primary role of the MRCC must be to ensure that decision-makers have all the information and advice they need; aircrew are not exceptions.

SAR helicopters are renowned for being crewed by people who are used to "thinking on their feet", and reacting to situations which change minute by minute. They are people who, when confronted by a problem, will try all

available means to remedy the situation, as it can often mean the difference between life and death. The helicopter crew believed *Elhanan T* was a real danger to the oil installations in the vicinity, which, from their vantage point, could be clearly seen around the horizon. This was bolstered by the incorrect assumptions made concerning the reason behind the request to land on *Tiffany* and speak to the MRCC by landline. Because of this, they risked their own safety in attempting to put a tow on board *Elhanan T* in poor conditions. A tow was connected, but the operation was not completely successful because the drag of the nets was too much for the towing vessel. The aircrew were unable to release the nets, so the pilot took the decision to allow the fishing vessel skipper to go back on board to release them. This action was clearly in contravention of the expressed wishes of the MRCC, but was taken in the incorrect belief that *Elhanan T* was a real danger to the oil installations in the vicinity.

Soon after lowering the skipper on to *Elhanan T,* the helicopter left the scene to land on the nearby *Tiffany* platform to refuel. Despite refuelling with the engines running, and given that the aircraft was only a few minutes flying time from the drifting vessel, this was contrary to good practice, and added to the risks faced by those on board *Elhanan T*.

2.6 SEARCH AND RESCUE OR SALVAGE?

As the operation progressed, it changed from one of SAR to one of salvage. The change occurred when the crew were safely embarked on *Deliverance*. After this time, the thinking that underlay the decisions taken with respect to the vessel and her crew, should also have changed. There was no longer any danger to life.

At 1246, the MRCC informed rescue helicopter R137 that *Elhanan T*'s four crew members were safely on board *Deliverance*. Additionally, the MRCC told R137 that they did not want the pumps put on board the fishing vessel, and they requested the helicopter to bring the four crew ashore.

At 1335, during a conversation between the MRCC and the ARCC, the MRCC stated that the operation was now a salvage, and not SAR. However, the clear objective of recovering the vessel's crew to shore was undermined by the intention, stated in the same conversation, to open negotiations between the winchman and the skipper as to what action might be taken to avoid the nuisance of an abandoned vessel. From this conversation, and the one between the MRCC and the helicopter winchman on *Tiffany* platform, there appears to be general acceptance that the helicopter could get involved in salvage operations, and the responsibility for deciding how to proceed with the operation was handed to the helicopter crew.

A grey area exists between search and rescue, and salvage operations. In this operation, it applied at all levels, including the aircrew and the ARCC. Within the MRCC, there was an apparent willingness to engage in an unnecessary salvage operation and accept the risks to the aircrew.

Everyone involved in SAR operations should be absolutely clear of their roles, responsibilities and objectives. The remit of the coastguard is clearly defined within their operations manual, CG3. The salvage industry is a specialised industry, whose personnel are highly trained in the necessary skills. It involves hazardous operations, and the disciplines and skills required are diverse. During this operation, what at first appeared to be a reasonably simple procedure of putting a tow on to a fishing vessel was, in fact, the first process in salving her. The aircrew's involvement should have been agreed after consultation between all parties involved, including the coastguard, organisations directly concerned with the accident and, not least, the helicopter pilot. Then, after an informed risk assessment, the decision should have been made as to exactly what course of action was required. In this case, as the operation had not been upgraded to a major incident, and there appeared to have been no immediate danger to any oil platforms, there was no reason to put anybody at risk by returning to the vessel to effect a tow.

Much of the information needed to make an informed judgment on the safety of actions necessary during the attempted salvage, was known and available to one or other of the parties involved. However, a failure in co-ordination meant that those making the decisions were not aware of key facts. These included:

- The watch manager's briefing to the winchman did not specify the principal risk facing anyone on board *Elhanan T,* that of the vessel's capsize and the speed with which this can happen. This was a significant failure, and one which influenced the aircrew's decision-making.

- During the salvage attempt, the result of releasing the nets on *Elhanan T* should have been foreseen, but it was not. Releasing the nets seriously altered the vessel's stability, to the extent that she capsized and then sank shortly afterwards. It is only when a competent person considers all the known facts about the vessel, and her situation, that an informed decision can be taken.

- The MRCC stated, on a number of occasions, that the stand-by safety vessels would not allow *Elhanan T* to drift on to the oil installations. Even if a vessel the size of *Elhanan T* had drifted, and made contact with a rig, this would have posed minimal risk. These considerations should have formed an important part of any decision taken to return to the vessel.

- There was a perceived risk to the underwater pipelines should the vessel sink and strike one. However, the risk was small, and did not warrant any risk of injury.

If the pilot of R137 had been fully aware of the dangers involved, and the minimal risk to the oil installations, he would probably not have got involved in the operation to salve the vessel.

2.7 THE NON-OPERATION OF A LIFERAFT AND EPIRB

One of the liferafts was successfully used to abandon *Elhanan T*. It operated as required. The sunken vessel was examined soon after the accident by a remotely operated vehicle (ROV) fitted with a camera. The video film revealed the other liferaft lying on the seabed in a depth of 142.8 metres, a short distance from the vessel. It was still in its container, with the painter running fairly tightly from the container back to the hull. It is impossible to ascertain from the pictures how the painter was secured to the hydrostatic release unit (HRU) or structure. However, it is probable that the HRU did release the raft but that the raft did not inflate.

Although the raft was 22 years old, it had been serviced about 4 months before the accident. Possible reasons for it not inflating are poor packaging or incorrect assembly after inspection, or that it had turned within the container. The latter reason is the most likely, and could have happened if the raft had been rolled on the deck during installation, or, as the vessel capsized.

Elhanan T's EPIRB floated to the surface after the vessel sank, however, it did not activate as required. It was recovered by the FRC from *Grampian Shield*, and brought back to the shore for investigation. It was found that the unit switch was in the "safe" position and not in the armed/alarm position. It is not known at which point the switch was thrown to the safe position, but this probably occurred after recovery. Further investigation has shown that the self-test unit indicated an electrical fault on the unit which has been impossible to identify precisely. It is concluded that this problem caused the EPIRB not to transmit after the accident.

Both these issues are indicative of poor safety equipment awareness. Great care needs to be taken in handling liferafts, and the correct operation of an EPIRB should be regularly checked using the self-test system.

2.8 CONTACT WITH NORTH SEA OIL INTERESTS

During, and after the accident, there appeared to have been confusion as to which operators controlled the subsea pipelines and installations. It is understood that the oil installations close to an incident would probably have been aware of the situation because of the local activity and the radio communications. However, the RCC must be able to ascertain, quickly and efficiently, who the operator of a pipeline or installation is, and to inform the relevant parties so they have as much notice of the incident as possible. This will enable them to take such action as they feel necessary.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES

The following safety issues have been identified from the foregoing analysis. They are not listed in any order of priority.

1. The compression fittings had previously failed and were therefore unreliable. Their failure caused the flooding and led to the loss of the vessel (2.2).

2. The seacocks were not routinely operated and maintained in good working order. As a result, when it was necessary to shut one for the safety of the vessel, it could not be moved (2.2).

3. The fact that the after bulkhead of the engine room was not entirely watertight probably caused the vessel to founder (2.2).

4. In an emergency involving engine room systems, having a member of the crew, other than the skipper, with some engineering knowledge, is a distinct advantage, as it allows the skipper to concentrate on the wider issues involved (2.2).

5. This vessel was lost because of flooding through one 50mm copper pipe. In extremis the pipe could have been closed with the use of a hammer. Alternatively, a simple damage control kit containing a variety of wooden bungs may have served the purpose (2.2).

6. The MRCC had gained key information regarding the vessel's condition and the inherent dangers. However, this information was not passed on to the helicopter crew, who had been delegated a decision-making role (2.5; 2.6).

7. There was a lack of clarity in some of the communications between those in the MRCC and the helicopter crew. All personnel in SAR co-ordination centres should understand that communications should leave no doubt as to what is required of the SRU (2.5).

8. The operation was not co-ordinated successfully, mainly because the MRCC did not have direct radio communications with the helicopter (2.4).

9. Despite the fact that the operation changed from one of SAR, to one of salvage, quite early during the incident, the communications problems and the lack of up to date information may have been improved if a capable "On Scene Co-ordinator" had been designated (2.4).

10. SAR and salvage operations can, and do, occur simultaneously, however, a grey area exists between them. A clear distinction should be maintained at all times, so that risks are not taken inappropriately (2.5; 2.6).

11. The helicopter crew carried out a rudimentary risk assessment of the operation to put people on board *Elhanan T*, on the basis of an aerial assessment of the abandoned vessel's condition. Such an assessment is extremely limited in scope. The stability of any flooded vessel is unpredictable, and an informed risk assessment should be carried out before any person is put at risk (2.4).

12. There was a lack of a clear understanding regarding what protection a rig has, and what constitutes a real danger to the rigs or underwater pipelines (2.6).

13. Cutting *Elhanan T*'s nets altered her stability condition, and she capsized and sank shortly afterwards. This risk had not been foreseen by those involved in the salvage (2.6).

14. One of *Elhanan T*'s liferafts did not operate correctly after the vessel sank possibly because it had been rolled while being moved during installation (2.8).

15. *Elhanan T*'s EPIRB did not operate after the accident probably because of a pre-existing electrical fault. The correct operation of EPIRBs should be regularly checked using the unit's self-test system (2.8).

SECTION 4 - RECOMMENDATIONS

The owners, Andrew Third, James Third and Melantic Ltd are recommended to:

Ensure that:

2004/140 Seacocks are regularly operated, to ensure freedom of movement on any fishing vessel that they own or operate in the future, additionally, seacocks should be shut off in port when the vessel is unattended. This discipline will have the added benefit of ensuring ships' staff are fully familiar with the location of these valves in the event of an emergency.

2004/141 All pipework and jointing on their vessels is appropriate and well maintained.

2004/142 Bearing in mind that the skipper was overstretched during the emergency, consider the benefits of ensuring that another crew member has sufficient engineering knowledge to be of assistance in any future incident.

They should also consider supplying all vessels which they own or operate with a simple damage control kit, containing a variety of wooden bungs.

The Maritime and Coastguard Agency and **the Ministry of Defence No 3 Group Royal Air Force** are jointly recommended to:

M2004/143 Establish procedures to ensure that each Maritime Rescue Co-ordination Centre is able to maintain direct communications with all military search and rescue units when they are operating outside reliable VHF range.

The Maritime and Coastguard Agency is recommended to:

2004/144 Consider, along with appropriate equipment manufacturers, how best to encourage users to improve the maintenance and housekeeping associated with vital lifesaving equipment, to ensure its correct operation in the event of an emergency.

The Maritime and Coastguard Agency, Royal National Lifeboat Institution, Royal Air Force and Royal Navy are jointly recommended to:

M2004/145 Issue a reminder to all search and rescue unit crews regarding the unpredictability of flooded vessels, and the inherent dangers involved with putting their personnel on board such vessels.

Marine Accident Investigation Branch
March 2004