DETR
ENVIRONMENT
TRANSPORT
REGIONS

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

Marine Accident Report 4/98

Report of the Inspector's Inquiry into the loss of the Fishing Vessel

WESTHAVEN AH 190

with four lives on 10 March 1997
in the North Sea

MAIB
is an
INVESTOR IN PEOPLE

November 1998

Marine Accident Investigation Branch
of the Department of the Environment
Transport and the Regions: London

Department of the Environment, Transport and the Regions
Eland House
Bressenden Place
London SW1E 5DU
Telephone 0171 890 3000
Internet service http://www.detr.gov.uk/

Further copies of this report are available from:
The Stationery Office bookshops
or alternatively

Department of the Environment, Transport and the Regions
Publications Sale Centre
Unit 21
Goldthorpe Industrial Estate
Goldthorpe
Rotherham S63 9BL
Tel: 01709 891318
Fax: 01709 881673

ISBN 1 85112 104 8

Printed in Great Britain. Text printed on material containing 100% post-consumer waste.
Cover printed on material containing 75% post-consumer waste and 25% ECF pulp.
November 1998

Marine Accident Investigation Branch
Department of the Environment, Transport and the Regions
Carlton House
Carlton Place
Southampton SO15 2DZ

27 July 1998

The Right Honourable John Prescott MP
Deputy Prime Minister and Secretary of State
for the Environment, Transport and the Regions

Sir

I have the honour to submit the report of Mr O Brown, an Inspector of Marine Accidents, into the circumstances which led to the loss of four lives and the sinking of the Arbroath registered fishing vessel WESTHAVEN AH190 while fishing the Fladen Grounds in the North Sea on 10 March 1997.

I have the honour to be
Sir
Your obedient servant

J S Lang
Rear Admiral
Chief Inspector of Marine Accidents

Extract from
The Merchant Shipping
(Accident Reporting and Investigation)
Regulations 1994

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

CONTENTS

Glossary of Abbreviations

ADAS	Action Data System
ARCCK	Air Rescue Co-ordination Centre Kinloss
ATC	Air Traffic Control
CSO	Coflexip Stena Offshore
DERA	Defence Evaluation Research Agency
EPIRB	Emergency Position-Indicating Radio Beacon
ETA	Estimated Time of Arrival
FRC	Fast Rescue Craft
FV	Fishing Vessel
FVSC	Fishing Vessel Safety Certificate
GRP	Glass Reinforced Plastic
HRU	Hydrostatic Release Unit
IMO	International Maritime Organization
kHz	kilo-Hertz
km	kilometre
kN	kilo-Newton
LUT	Local User Terminal
m	metre
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MCC	Mission Control Centre
MHz	Mega-Hertz
mm	millimetre
MMSI	Maritime Mobile Station Identification number
MRCC	Maritime Rescue Co-ordination Centre
MSA	Marine Safety Agency (Now the Maritime and Coastguard Agency)
NFFO	National Federation of Fishermen's Organisations
NIFF	Northern Ireland Fishermen's Federation
nm	nautical mile (1852 metres)
OIM	Offshore Installation Manager
RAF	Royal Air Force
ROV	Remotely Operated Vehicle
SFIA	Sea Fish Industry Authority
TCA	The Coastguard Agency
UKFVC	United Kingdom Fishing Vessel Certificate
UKMCC	United Kingdom Mission Control Centre
UKOOA	United Kingdom Offshore Operators Association
VHF	Very High Frequency

N.B. In April 1998 the Marine Safety Agency and The Coastguard Agency merged to form the The Maritime and Coastguard Agency (MCA)

Synopsis

This accident was notified to the Marine Accident Investigation Branch (MAIB) by the Maritime Rescue Co-ordination Centre (MRCC) at Aberdeen at 0115 on 11 March 1997, and an investigation commenced the same day. It was carried out by Mr O Brown, Inspector, with contributions from Mr K Dixon, Principal Inspector, and experienced fishing vessel skippers.

On 10 March 1997, the 19m wooden fishing vessel WESTHAVEN AH190 was fishing the Fladen Grounds in the North Sea with a crew of four. Weather conditions were good and a slight swell was running.

She capsized at about 1010 while attempting to pull her port trawl door clear of a seabed obstruction which was subsequently found to be the PIPER to Flotta 30" pipeline.

The Coastguard was alerted to an emergency by the transmissions of an Emergency Position-Indicating Radio Beacon (EPIRB). This beacon was registered, incorrectly, to a fishing vessel called WESTHAVEN FR375. When this vessel was found safe and well at 1209, the MAYDAY was lifted. However, distress signals continued to be received from the beacon at irregular intervals, (determined by the frequency of satellite passes) and, at 1551, the MAYDAY was reinstated when it became evident that the transmissions were coming from another source. Later that same afternoon the existence of another WESTHAVEN, registration number AH190, became known. Only then did it become apparent that this was the missing vessel.

A search was begun and continued throughout the night and into the next day. On 11 March the wreck was located on the seabed and positively identified by remotely operated vehicle (ROV). This survey also showed that the port trawl door had become fast on the pipeline. One body was seen and saturation divers recovered the body of the Skipper. The search for survivors was abandoned when the liferafts were discovered still attached to the wreck.

On 1 May the MAIB carried out a further survey of the wreck to help determine the cause of the accident and establish why the liferafts failed to operate. The survey vessel and the remotely operated vehicle were provided by Elf Exploration UK PLC whose willing help is acknowledged.

The Inquiry found that WESTHAVEN capsized as her crew attempted to free the trapped port trawl door from the PIPER to Flotta 30" pipeline. Excessive force exerted by the port trawl warp on the port gallows, caused by a combination of winch pre-tension, swell and propeller thrust, pulled the vessel over.

In May 1997 the MAIB issued a Safety Recommendation to the fishing industry advising skippers of the dangers involved when fishing close to pipelines and recommending them to contact the Coastguard should their fishing gear become fast on the seabed.

In March/April 1998 a Fatal Accident Inquiry into the deaths of the crew was held in the Aberdeen Sheriff Court and the fresh evidence to emerge during this Inquiry has been incorporated into the report.

The report contains 14 recommendations.

Figures 1 and 2: **WESTHAVEN – seen under her original port number FR375**

Vessel and Incident Particulars

The Vessel

Name	:	WESTHAVEN
Port number	:	AH190
Official number	:	A13258
Registered owners	:	Mr George David Birse Pattison, 46 Millfield Road, Arbroath
Built	:	G Thompson & Sons, Buckie in 1974
Construction	:	Wooden hull, steel casing, steel whaleback and a steel three quarter length gutting shelter
Type	:	Trawler, twin rig
Length registered	:	19.05 metres
Breadth	:	6.25 metres
Depth	:	2.34 metres
Expiry of FVSC	:	1 July 2000
Main engine	:	Kelvin TASC8 rated 310 kW at 1200 rpm
Trawl winch	:	GF110 model 1, three barrel North Sea winch, manually applied brakes and dog clutches
Other equipment	:	Hydraulic net drum on aft deck, hydraulic crane, fish washer, prawn washer and fish hopper

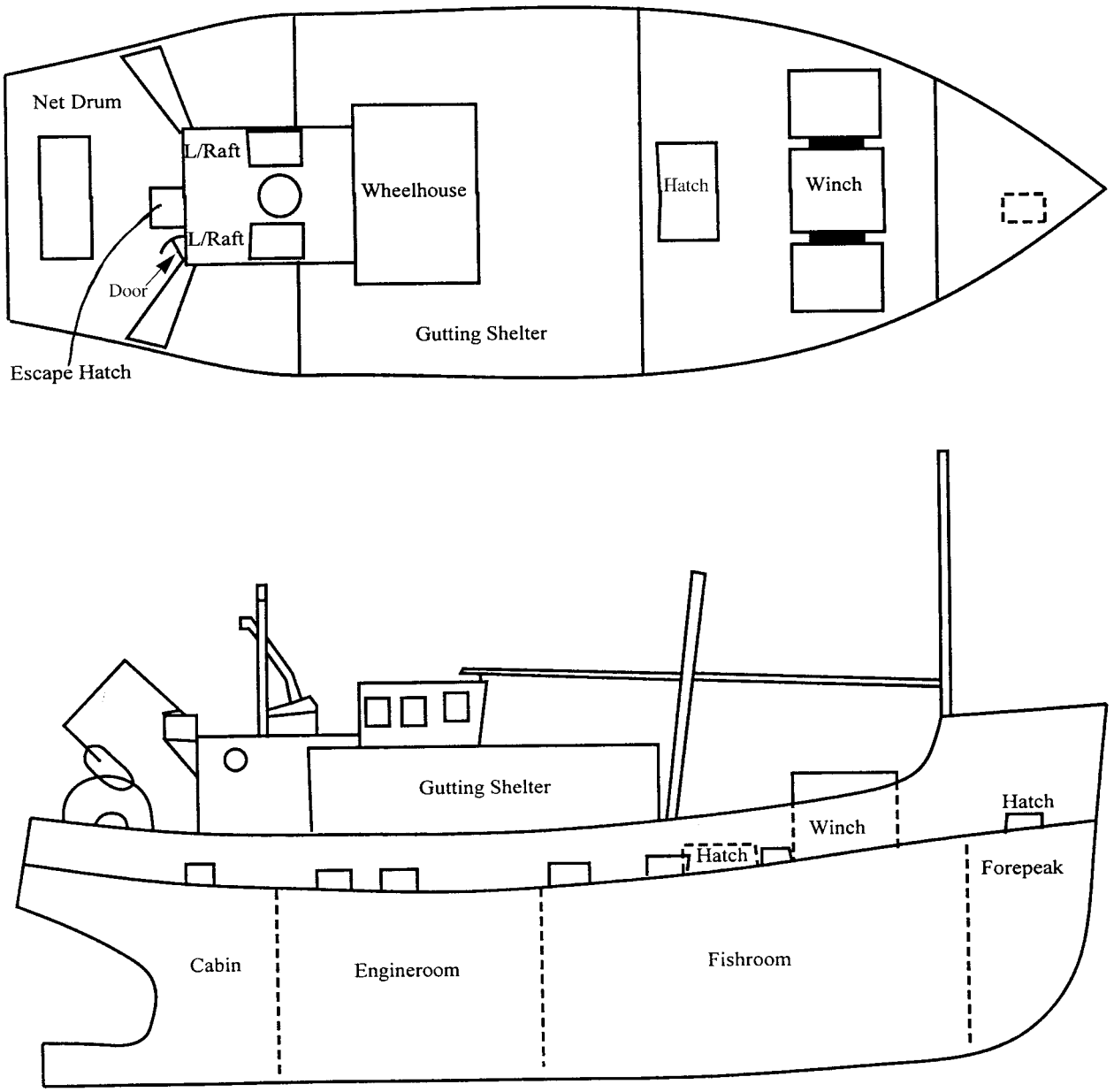
Incident

Position of accident	:	58°28'N 00°001'E
Date and time	:	10 March 1997 at approximately 1010
Casualties	:	All four of her crew lost their lives

The vessel is shown under her previous port number in FIGURES 1+2.

A sketch of her general layout is shown in FIGURE 3.

Figure 3: **General layout: plan and profile**



SECTION 1
Factual Information

1.1 BACKGROUND TO THE FINAL VOYAGE

WESTHAVEN was purchased by her current owners in December 1996. Her previous owners had operated her without incident for some 4½ years and sold her in order to purchase a larger vessel which would enable them to fish further afield.

During 1996 WESTHAVEN was re-engined with one of the same type and model. The bilge piping and trawl warps were renewed.

The Marine Safety Agency surveyed the vessel for the renewal of her Fishing Vessel Safety Certificate in July 1996. This showed the hull to be in good condition. Her stability was checked by a rolling test at the same time and produced a satisfactory result.

A pre-purchase survey of the vessel carried out while she was afloat in Fraserburgh harbour on 17 November 1996 found her to be in good condition.

WESTHAVEN had been registered originally under the number FR375. The new owner, Mr Pattison, re-registered her with the number AH190, but the name WESTHAVEN was retained.

The previous owners of WESTHAVEN purchased a vessel called CRYSTAL RIVER FR178 which they re-named WESTHAVEN, and re-registered her with the number FR375. Two fishing vessels called WESTHAVEN were therefore at sea, and fishing, on 10 March 1997.

WESTHAVEN AH 190 cut short her penultimate fishing trip to return to Arbroath to repair a hull leak. It was not serious, but the presence of water in the crew cabin caused some inconvenience and discomfort. It was repaired between tides early in the morning of Friday 7 March.

1.2 DETAILS OF THE FINAL VOYAGE

All times are UTC.

WESTHAVEN AH 190 left Arbroath at about 0900 on Sunday 9 March and headed for the Devil's Hole fishing ground. Her normal crew of four, all experienced fishermen, were on board.

In a radio conversation that evening with his brother, the skipper of DEEJAY, another fishing vessel, WESTHAVEN's skipper said he had decided to go north to the Fladen Grounds because of the poor fishing at the "Holes".

Radio conversations between WESTHAVEN and DEEJAY the following morning suggest that WESTHAVEN had begun fishing in this new location at around 0800 on Monday 10 March.

WESTHAVEN was again in radio contact with DEEJAY at about 0930, when WESTHAVEN's skipper informed his brother that his trawl gear had become fast on the bottom but could find nothing on the chart to account for it. This was the last known occasion when contact was made.

1.3 THE SEARCH AND RESCUE OPERATION, 10-11 MARCH 1997

In view of the criticism expressed by the relatives of the crew of WESTHAVEN that the search and rescue operation had not been undertaken effectively or with sufficient urgency, it is important that this report should present a full account of what occurred. This is, as far as it has been possible to do so, reconstructed in the correct time sequence of events. The times shown against each event should in all cases be accurate to within 15 to 20 minutes and, in many cases to within 1 or 2 minutes. Much of the data has been extracted from the Coastguard's Action Data System (ADAS).

An extract from the Admiralty chart covering the area of interest is shown in FIGURE 4. Also plotted on this chart are the positions of the Emergency Position-Indicating Radio Beacon (EPIRB) hits received by the MRCC Aberdeen between 1124 and 1551 (when the MAYDAY was re-initiated) on 10 March, and the positions of significant vessels.

Background information on the handling of EPIRB alerts by the UK marine rescue services is contained in ANNEX 1.

10 March 1997

1019 The UK Mission Control Centre (UKMCC) received a telex from the Mission Control Centre (MCC) in Algeria to the effect that a 121.5 MHz transmission had been detected by the satellite COSPAS 6 at 1010. The two unresolved position fixes computed for the source of the transmissions were: 58.3820N 00.2730E and 58.8800N 03.8950W. The UK Local User Terminal (LUT) had been monitoring this satellite between 1003 and 1017 and did not receive the signal. The UK LUT was tracking another satellite, SARSAT 4, between 0948 and 1001, again without receiving any distress signal.

1102 The UKMCC sent a telex to the Maritime Rescue Co-ordination Centre (MRCC) at Falmouth notifying them that an EPIRB hit, without a position fix, had been detected on 406 MHz frequency at 1049 by satellite SARSAT 6. Falmouth was informed that the unique identification number of the beacon, 132132, identified the vessel as WESTHAVEN FR375 owned by Mr D Buchan. His contact details were also passed across. This was logged by MRCC Falmouth at 1118.

1106 A further telex was sent from UKMCC to MRCC Falmouth notifying them that an EPIRB hit had been detected on 121.5 MHz at 1050 by satellite SARSAT 6. The two unresolved position fixes were within about 6 miles of each other (58°27.9'N 00°00.7'W and 58°31.4'N 00°02.8'E).

At this stage insufficient data existed to be sure that both the 406 MHz and 121.5 MHz EPIRB hits related to the same incident as only the 121.5 MHz hit had resulted in a position fix.

1124 MRCC Falmouth informed MRCC Aberdeen of the EPIRB hits following a telephone call at 1118 from the Air Rescue Co-ordination Centre at RAF Kinloss (ARCCK) of the 121.5 MHz frequency hit.

1129 ARCCK informed MRCC Aberdeen that several high flying passenger air liners had reported a 121.5 MHz signal near air route point *FORTY* (57°57.1'N 00°35.8'E, some 30 miles south of the position indicated by the EPIRB hits).

MRCC Aberdeen requested PIPER BRAVO platform to try and contact WESTHAVEN FR375 on either VHF channel 16 or the fishing vessel working frequency. PIPER BRAVO complied with the request but failed to elicit a response. Similar action by CLAYMORE ALPHA platform was equally unproductive.

UKMCC notified MRCC Falmouth that an EPIRB hit had been detected on 406 MHz at 1115 by satellite SARSAT 2, which gave a most probable position fix close to the two already received (58°30.2'N 00°09.8'W) and confirmed the EPIRB hits were all from the same incident. Aberdeen MRCC was advised of this at 1133 by telephone and at 1143 by telex.

1134 ARCCK informed MRCC Aberdeen that a Nimrod Maritime Patrol Aircraft was in the area on a training exercise and would try to "home" on the 121.5 MHz signal. The Nimrod climbed to 4000' in an effort to detect the signal on her radio direction finding equipment. Nothing was heard and the aircraft resumed her training.

Attempts by MRCC Aberdeen to contact WESTHAVEN FR375 on 2226 kHz were unsuccessful.

1141 The incident category was changed to MAYDAY by MRCC Aberdeen. This was broadcast on 2182 kHz at 1146 and by Portishead radio on NAVTEX at 1157.

1149 The standby safety vessel VEESEA STORM, in position 58°16.6'N 00°27.79'E, informed MRCC Aberdeen she had sighted a fishing vessel called WESTHAVEN towing south east of the drilling rig STENA FORTH about half an hour previously. The Master of VEESEA STORM was given permission by the Offshore Installation Manager (OIM) on STENA FORTH to suspend her standby duties to try and make contact with the WESTHAVEN.

1150 MRCC Aberdeen received a message from ARCCK: *two Nimrods who picked up the 121.5 MHz hit earlier can no longer hear it*. The message originated from London Distress and Diversion Air Traffic Service.

1155 The Nimrod callsign RESCUE 11, was tasked to check out the sighting reported by VEESEA STORM. Flying at 4000' and in position 56°42'N 00°09'W, the aircraft was instructed to fly to 58°16.6'N 00°27.9'E, some 96 nautical miles to the north east.

By 1200, enquiries with the owners and agents of WESTHAVEN FR375 had established she should be fishing and that her EPIRB was a McMurdo Locat LDT61, serial number 213157.

1202 PIPER BRAVO platform notified MRCC Aberdeen that their standby safety vessel EMERALD BAS had detected a radar target at 3.8 miles in reduced visibility which they believed to be a fishing vessel. They had tried, unsuccessfully, to contact it by radio and were launching a fast rescue craft (FRC) to make a visual identification.

1208 VEESEA STORM came alongside a fishing vessel which they identified as WESTHAVEN FR375 and spoke to her by loudhailer. A VHF conversation between the masters then took place and was intercepted by CLAYMORE ALPHA platform and the Nimrod, RESCUE 11.

1209 MRCC Aberdeen was informed that WESTHAVEN FR375 had been found. VEESEA STORM reported that WESTHAVEN FR375 would be turning off her EPIRB and contacting MRCC Aberdeen on 2182 kHz.

HMS GUERNSEY, an offshore patrol vessel in position 58°10.3'N 00°51.9'W and some 45 miles away, contacted MRCC Aberdeen to ask if they wanted her to close WESTHAVEN FR375 but were told that this was not necessary.

The MAYDAY radio silence was lifted and Nimrod RESCUE 11 and the FRC from EMERALD BAS were released. RESCUE 11 was, at this time, in position 57°31'N 00°05'E at 15400', some 60 nautical miles south of the latest 406 MHz frequency position fix on the EPIRB. She did not detect the beacon's 121.5 MHz signals at any time.

1219 WESTHAVEN FR 375 contacted MRCC Aberdeen and reported her position as 58°16.21'N 00°28.97'E, some 25 nautical miles from the latest 406 MHz satellite fix and that her EPIRB type was Locat LDT61. She added that the wind was SW3 and the weather conditions were generally good.

1234 MRCC Falmouth informed MRCC Aberdeen that the EPIRB transmission had once again been detected on 121.5 MHz at 1157 by satellite COSPAS 6.

1241 MRCC Aberdeen were notified by ARCCK of another EPIRB hit detected on 406 MHz at 1231. UKMCC confirmed the EPIRB was still transmitting.

1248 WESTHAVEN FR375 was contacted again and asked to check her EPIRB was switched off. She confirmed it was, whereupon she was requested to standby on 2182 kHz in case further EPIRB transmissions were intercepted.

1309 MRCC Aberdeen were notified by ARCCK that further EPIRB transmissions had been detected at 1255. UKMCC was contacted for an update and confirmed the transmissions were continuing and that the beacon COSPAS-SARSAT number was 132132.

1322 MRCC Aberdeen contacted WESTHAVEN FR375 once again and requested her to check there were no other EPIRBs onboard. WESTHAVEN FR375 was also requested to remove the beacon's batteries.

1342 WESTHAVEN FR375 reported the batteries had been removed from the EPIRB.

1420 Mr Thornton, of Caley Fisheries, informed MRCC Aberdeen that WESTHAVEN FR375 used to be called CRYSTAL RIVER FR178 but she was not to be confused with the current vessel of that name and port number which had a steel hull. He also told them that the Buchan family had sold the previous WESTHAVEN to new owners.

1438 MRCC Aberdeen received further reports from UKMCC that EPIRB transmissions had been detected by satellite SARSAT 6 at 1411 on both 406 MHz and 121.5 MHz and had given a position as 58°27.3'N 00°00.21'E.

1446 Through CLAYMORE ALPHA, HMS GUERNSEY was requested to contact MRCC Aberdeen on 2182 MHz to assist in the search for the source of the ongoing EPIRB transmissions.

1454 Once more WESTHAVEN FR375 was contacted and asked to give her position which was passed as 58°14.12'N 00°21.16'E (some 18 nautical miles from the latest EPIRB fix). She also reconfirmed that her EPIRB batteries had been removed and had not been replaced.

1509 Throughout the preceding hours neither the CLAYMORE ALPHA or PIPER BRAVO platforms nor the standby safety vessel EMERALD BAS had detected any transmissions on 121.5 MHz, but did report the presence of fishing vessels in the vicinity.

1512 EMERALD BAS sent a daughter craft to identify the fishing vessels and to establish that their EPIRBs were switched off. None of those fishing vessels had responded to VHF calls from PIPER BRAVO.

1515 HMS GUERNSEY contacted MRCC Aberdeen who requested her to close the EPIRB transmission position and investigate. She reported she was 35 miles from the datum, with an ETA of about 1745.

1528 Air traffic control (ATC) informed MRCC Aberdeen that two helicopters operating within 25 miles of the EPIRB datum had detected nothing on 121.5 MHz.

1530 UKMCC told MRCC Aberdeen that nothing had been detected on the satellite pass at 1524.

1534 ARCCK informed MRCC Aberdeen that another high flying airliner had picked up 121.5 MHz signals about 110 to 115 miles north east of Aberdeen.

ATC reported to MRCC Aberdeen that a helicopter near the SALTIRE Platform had picked up 121.5 MHz signals.

1544 The helicopter reported she had lost the signal which had been strongest about 95 miles north east of Aberdeen.

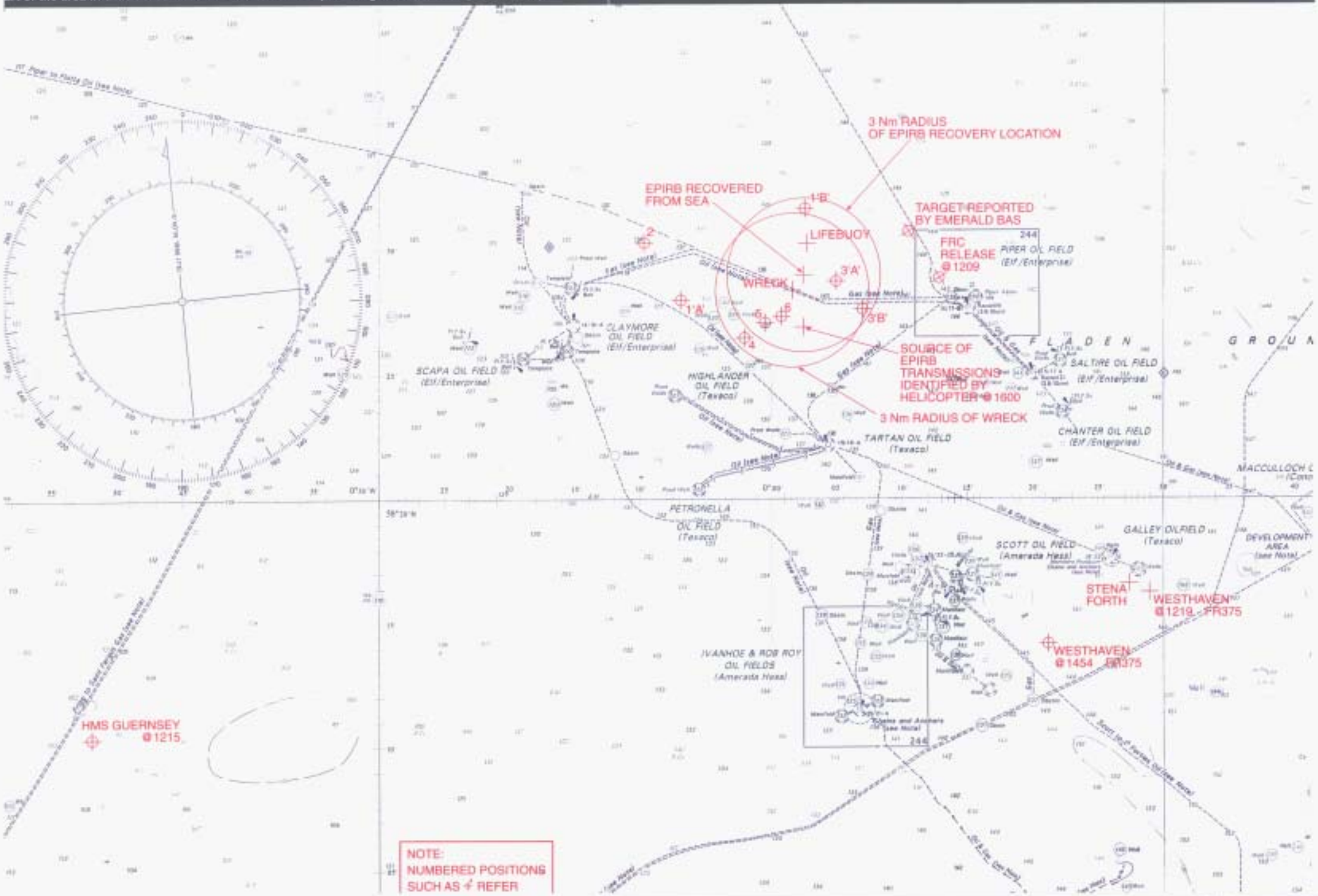
1551 The MAYDAY was re-initiated with broadcasts on 2182 kHz and on Inmarsat A, B, M and C.

1555 PIPER BRAVO reported the daughter craft from EMERALD BAS had identified the two fishing vessels close to PIPER BRAVO as SPEEDWELL and ATLANTEAN. Both confirmed their EPIRBs were switched off.

1600 Bristow Tiger Helicopter callsign 48B, having just lifted off from the SCOTT platform, was requested to "home" on the 121.5 MHz EPIRB signal. It reported an initially weak signal which increased in strength to a maximum in position 58°26.964'N 00°02.208'E.

1631 EMERALD BAS again launched a daughter craft to investigate the location reported by the helicopter as the source of the EPIRB transmissions but found nothing. Operating in the company of another daughter craft from SUNBAS, she carried out a sweep of the area. Again, nothing was found. The craft returned to their respective vessels at about 1800.

art of the area in which WESTHAVEN AH 190 was lost (including location of early EPIRB hits)



1706 MAYDAY broadcast on Inmarsat.

1713 FV BUDDING ROSE PD418 responded to the Inmarsat broadcast to become the first fishing vessel to respond to a MAYDAY transmission that day.

MRCC Aberdeen searched their database of fishing vessels for all occurrences of the name WESTHAVEN. A second vessel, WESTHAVEN AH190, was identified.

1735 The owners of WESTHAVEN AH190 were contacted by the Coastguard and said their vessel was probably fishing the Devil's Hole, (some 110 nautical miles to the south of the latest 406 MHz EPIRB position fix).

1739 MRCC Aberdeen contacted MRCC Falmouth for further information about the EPIRB onboard WESTHAVEN AH190. After accessing their database they responded by saying they only held information on WESTHAVEN FR375.

1803 HMS GUERNSEY reported she was about to commence a box search of the area around the EPIRB datum. She was detecting intermittent signals on 121.5 MHz frequency and attempting to locate the source of these signals.

Nothing of significance occurred after this until:

1912 FV BUDDING ROSE contacted MRCC Aberdeen offering her assistance with the search as she passed through the datum area. At 1958, she reported she had seen nothing and was leaving the area.

1918 HMS GUERNSEY reported sighting an object with a flashing white light in position 58°29.1'N 00°02.4'E and was attempting to recover it with their sea boat.

1929 EPIRB labelled "Radio call sign UK 1060FH/132132" and "Serial number 321762" was recovered from the sea, the details were passed to MRCC Aberdeen.

2010 A lifebuoy with WESTHAVEN FR375 painted on it was picked up by HMS GUERNSEY in position 58°30.05'N 00°002.9'E.

2045 After further prolonged discussions with the skipper of WESTHAVEN FR375 and the vessel's agents, it was realised by the Coastguard that WESTHAVEN AH190 had previously been WESTHAVEN FR375.

2054 MRCC Falmouth informed MRCC Aberdeen of the details for WESTHAVEN AH190 held on the EPIRB database: serial number 512; COSPAS-SARSAT number 131584.

2100 HMS GUERNSEY was requested by MRCC Aberdeen to conduct a search with FV BUDDING ROSE and assumed the role of on scene commander. Other vessels, including FVs MARIGOLD and SCOTIA and standby safety vessels SUN BAS and EMERALD BAS headed to join the search.

2126 In a radio conversation with the FV ALTAIR, the skipper of FV DEEJAY first became aware of a search being mounted for WESTHAVEN. He immediately contacted MRCC Aberdeen and was able to tell them that he had been speaking to his brother, the skipper of WESTHAVEN AH190, at about 0930 that morning and had been unable to contact him

since. He was also able to give an estimated position of WESTHAVEN when last contacted. DEEJAY headed to join the search.

2235 The skipper of DEEJAY contacted the skipper of BUDDING ROSE and told him that WESTHAVEN AH190 had been fishing in position approximately 58°31.78'N 00°00.1'W and had come fast. This information was passed to HMS GUERNSEY and relayed to MRCC Aberdeen.

2229 A helicopter, callsign RESCUE OSCAR CHARLIE was scrambled. She arrived on scene at about midnight and left to re-fuel on PIPER BRAVO platform at 0143.

11 March 1997

The search continued throughout the night and into the next day. By 0052 on 11 March nine vessels, including HMS GUERNSEY, were involved. Small items of debris including aluminium floats and fish baskets were recovered. By 0505 the number of vessels involved had increased to 15.

0635 The helicopter, RESCUE OSCAR CHARLIE, re-joined the search at first light. Nimrod RESCUE 11 came on task at about 0727.

0814 RESCUE OSCAR CHARLIE reported an oil slick in position 58°29'N 00°01.46'E. BUDDING ROSE was asked to use her echo sounder to search the area where oil was seen rising to the surface. She reported an echo on the seabed about 2½ fathoms high, in position 58°28.27'N 00°01.34'E, and classified it as a possible wreck.

0956 ELF Exploration UK informed MRCC Aberdeen that they would be diverting the diving support vessel CSO ORELIA, in transit to the Scapa template, with the intention of using her remotely operated vehicle (ROV) to investigate the possible wreck and check the integrity of the nearby pipeline.

1205 CSO ORELIA on scene.

1326 The ROV was deployed and encountered fishing nets.

1335 The wreck of WESTHAVEN AH190, lying on the seabed at a depth of 140m, was positively identified. The skipper of DEEJAY boarded CSO ORELIA at about 1515 to help with the ROV survey of the wreck.

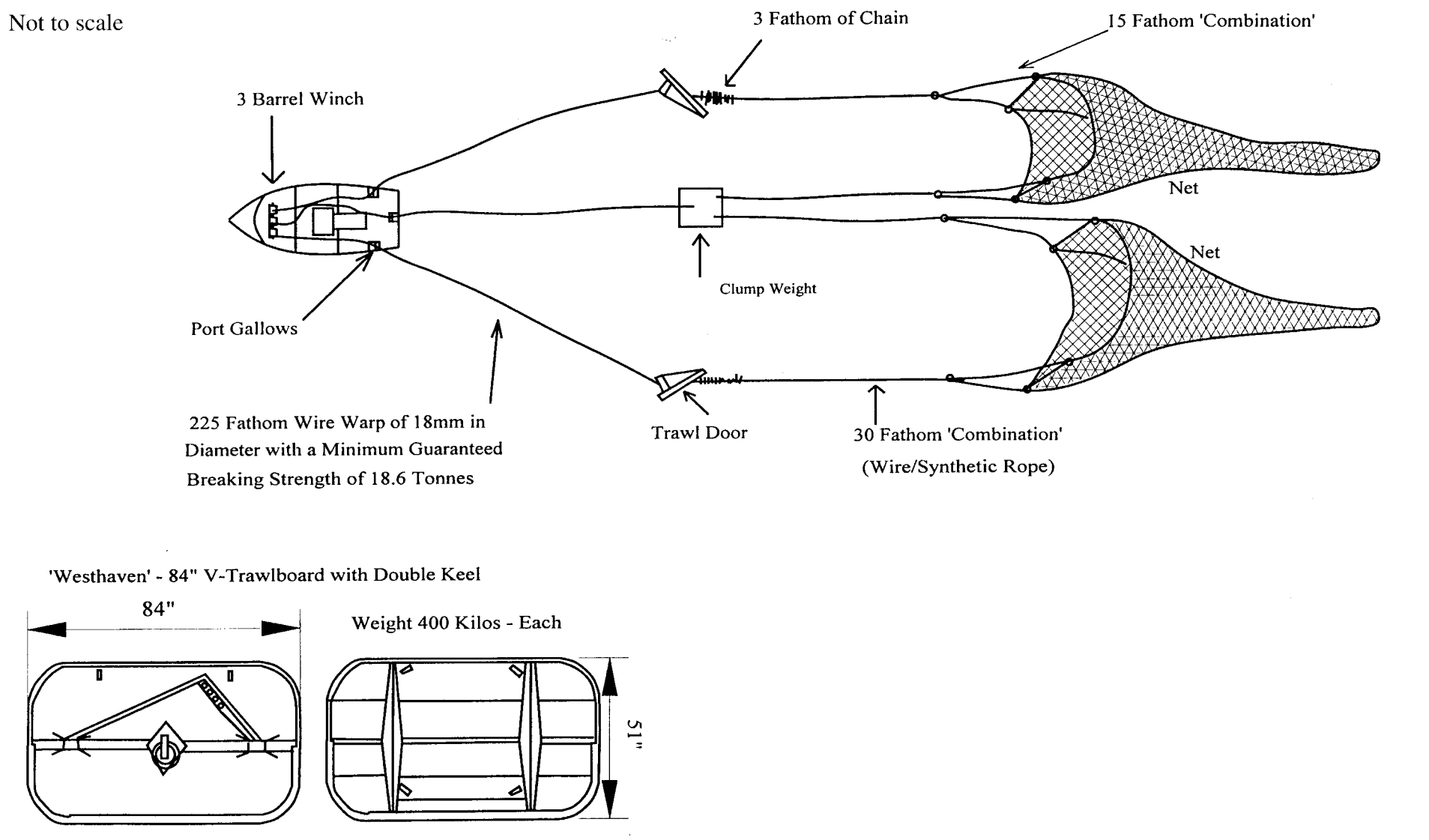
By 1641 it had been confirmed that both liferafts were still attached to the wreck. A body was seen in the wheelhouse.

After the second liferaft had been found and there was no further possibility that any of the crew could have survived, the search was terminated.

Three saturation divers onboard CSO ORELIA volunteered to recover the body from the wheelhouse of WESTHAVEN. This humane task was accomplished safely by 2108. The body was transferred to HMS GUERNSEY at 2134 and taken to Aberdeen where it was subsequently identified as the skipper of WESTHAVEN.

[On 10 September 1997 the remains of Mr Alan Cunningham, one of the deckhands, were recovered by a fishing vessel in the general area of the wreck of WESTHAVEN].

Figure 5: **A Diagram of the Fishing Gear Layout**



1.4 THE VESSEL

1.4.1 LIFE SAVING APPLIANCES

The vessel met the applicable statutory requirements on life saving appliances. These are set out in The Fishing Vessels (Safety Provisions) Rules 1975 and The Fishing Vessels (Life-Saving Appliances) Regulations 1988.

Seven life-jackets were carried and were probably located in the crew cabin. They were recorded as being stored there during the safety certificate survey in July 1996.

Four lifebuoys were carried. Two, fitted with self-igniting smoke markers, were located either side of the casing while the other two were positioned on the forward structure of the gutting shelter.

Two six person capacity liferafts were carried. Both were Seafarer Mk4s, manufactured by Dunlop-Beaufort. They had been maintained in accordance with the requirements of both the manufacturer and the regulations. Their annual inspection and service had been carried out in November 1996 in Fraserburgh.

The liferaft containers were located on either side of the casing top abreast the main engine exhaust pipe. This placed them partially within the area enclosed by the four feet of the main mast structure. The straps securing the liferaft containers to their cradles were fitted to Hammar H20 hydrostatic release units. The hydrostatic release units were fitted in June 1996 and did not require replacement until June 1998.

1.4.2 EPIRB DETAILS

In accordance with The Fishing Vessels (Life-Saving Appliances) Regulations 1988 WESTHAVEN AH190 was equipped with an Emergency Position Indicating Radio Beacon (EPIRB) capable of operating on a frequency of 406 MHz.

The beacon was a KANNAD 406FH, UK type approval number KM 512. Originally manufactured in France by Information Electronique Securite Maritime (IESM), the beacon was supplied by the UK agents Sullivan Marine.

The beacon was housed in a GRP case which was located on top of the wheelhouse. The lid of the case was fitted with a hydrostatic release unit (HRU) to allow the beacon to float to the surface in the event of the vessel sinking. The HRU was fitted in June 1996 and did not require replacement until June 1998.

The batteries for the beacon were well within date, and in the normal course of events would not have required replacement until July 2000.

The unique identification number (COSPAS-SARSAT number) which the beacon would transmit on 406 MHz frequency when activated was 132132. This number was programmed into the beacon's electronic circuitry by the manufacturers.

1.4.3 STABILITY AND FREEBOARD

An explanatory note on the basic concepts of ship stability is contained in ANNEX 2.

The vessel met the applicable statutory requirements on stability. These are set out in The Fishing Vessels (Safety Provisions) Rules 1975.

In common with many fishing vessels of her type and age, WESTHAVEN had been exempted by the MSA from meeting the standard of minimum freeboard set out in Merchant Shipping Notice No M.975 FREEBOARDS OF FISHING VESSELS. The exemption was granted on the basis that the vessel had a long history of safe operation and that a satisfactory GM was obtained from a rolling test.

1.5 TWIN RIG FISHING GEAR

The mode of fishing being pursued by WESTHAVEN is commonly known as twin rig trawling. As the name implies, the vessel would be towing two trawl nets when fishing. A diagram of the arrangement of the trawl gear on WESTHAVEN is shown in FIGURE 5, together with an inset giving the dimensions of one of the trawl doors.

1.6 THE CREW

There were four crew on board WESTHAVEN at the time of her loss. All were experienced fishermen.

The skipper of WESTHAVEN, Mr George David Birse Pattison, was 38 years old and had been a fisherman since he left school. He had been skipper of his previous vessel, RELENTLESS AH136, for about 20 years until she was de-commissioned in 1996. Between Christmas 1996 and 8 March 1997 Mr Pattison would have completed about eight trips as skipper of WESTHAVEN. In March 1996 Mr Pattison obtained a Certificate of Service as a Skipper (Fishing), number 207.

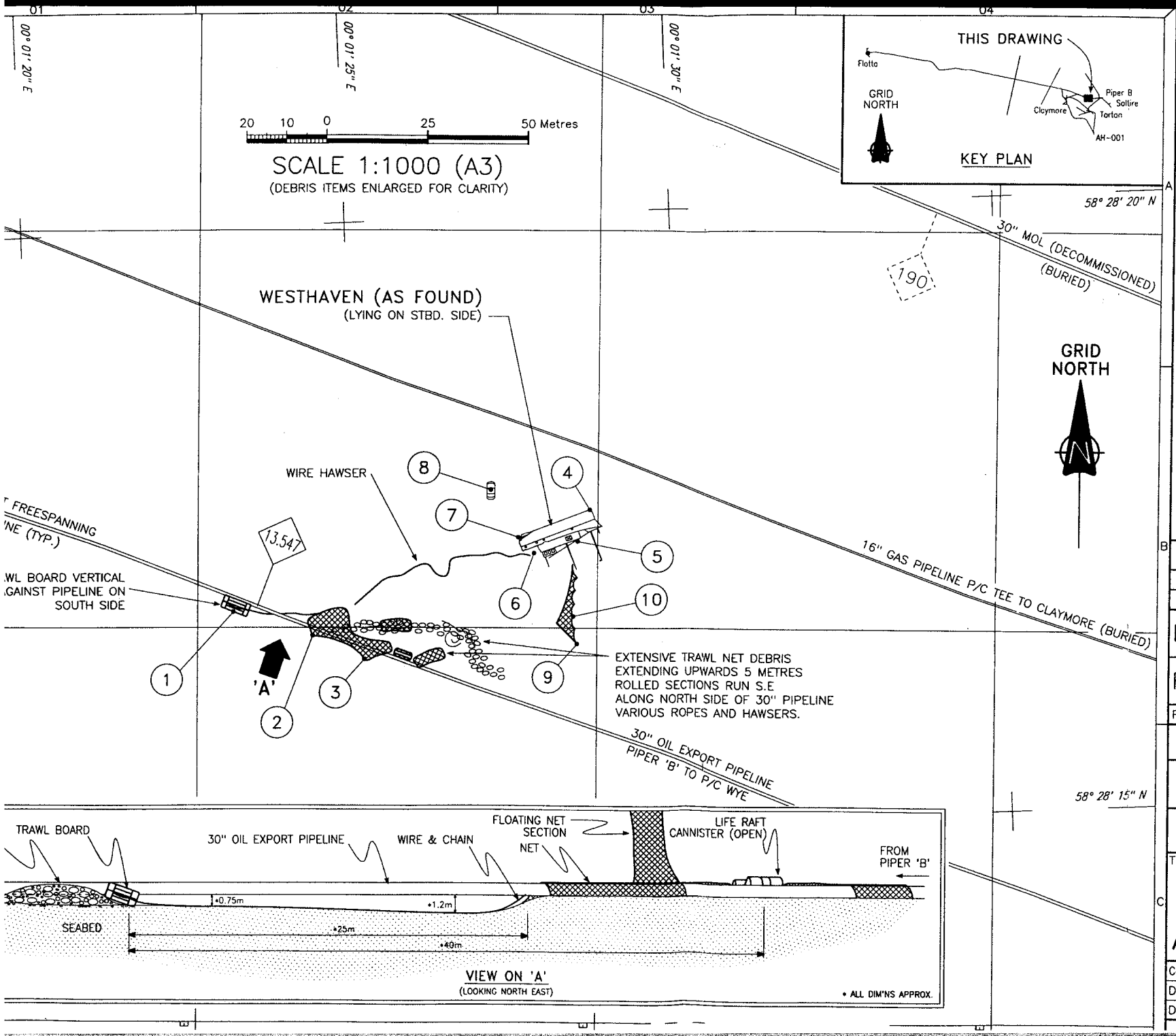
Mr Mark Hannah, the deckhand/winchman, was 30 years old and had been a fisherman for some seven or eight years. His fishing career started on SILVER CREST, before joining Mr Pattison on RELENTLESS and transferring with him to WESTHAVEN.

Mr Alan Cunningham, the second deckhand onboard, was 28 years old and had been a fisherman for about 13 years since he left school. He had sailed on DEEJAY and several other local fishing vessels. At one time he was skipper of SILVER CHORD, a 14 metre traditional Scottish fishing vessel.

Mr Christopher Prouse, the third deckhand, was 24 years old and had been a fisherman for about seven years after leaving school. His recent experience included about one year on DEEJAY and another on RELENTLESS.

All members of the crew of WESTHAVEN were required to undergo basic safety training, including basic sea survival techniques under the Fishing Vessels (Safety Training) Regulations 1989. With the exception of Mr Pattison, who had completed a basic sea survival course in 1981, SFIA have no record of any member of the crew having completed the basic sea survival training course. All were good swimmers.

ge scale chart of the area around the wreck of WESTHAVEN



Notes :

1. This drawing is not to be used for construction until signed by the responsible engineer.
2. UTM CO-ORDINATES ARE IN METRES BASED ON UNIVERSAL TRANSVERSE MERCATOR (U.T.M.) PROJECTION, CENTRAL MERIDIAN 3°W, INTERNATIONAL SPHEROID, EUROPEAN DATUM 1950 (ED50).
3. COORDINATE INFORMATION

ITEM	DESCRIPTION	UTM C.M. 3°W	GEOGRAPHICALS
1	TRAWL BOARD	676309.0 E 6485304.0 N	58° 28' 16.88" N 06° 01' 23.07" E
2	NET (PIPE-FOULED)	676329.0 N 6485298.0 N	58° 28' 16.66" N 06° 01' 24.28" E
3	NET (TOP OF FLOATING NET)	676342.0 E 6485292.0 N	58° 28' 16.45" N 06° 01' 25.07" E
4	BOW KEEL	676398.0 E 6485330.0 N	58° 28' 17.59" N 06° 01' 28.62" E
5	MIDSHIPS (SALTIRE FLAG)	676395.0 E 6485322.0 N	58° 28' 17.34" N 06° 01' 28.42" E
6	PORT STERN CORNER	676384.0 E 6485319.0 N	58° 28' 17.26" N 06° 01' 27.73" E
7	RUDDER	676380.0 E 6485323.0 N	58° 28' 17.39" N 06° 01' 27.50" E
8	LIFE RAFT	676373.0 E 6485335.0 N	58° 28' 17.79" N 06° 01' 27.10" E
9	END OF NETS	676395.0 E 6485296.0 N	58° 28' 16.50" N 06° 01' 28.34" E
10	NET (TOP OF FLOATING NET)	676394.0 E 6485303.0 N	58° 28' 16.73" N 06° 01' 28.30" E

Drg. No.	Title
Reference Drawings	

Rev.	Date	ER No	Revision	By	Chk	Disp. Eng.	Snr. Eng.
R2	18 MAR 1998	– – –	DRAWING UPDATED	MR	GS	DR	
R1	25 JUN 1997	– – –	ISSUED 'AS-FOUND'	MR	GS	DR	

CAD PRODUCED DRAWING
NOT TO BE CHANGED MANUALLY

elf exploration uk plc
1 Claymore Drive, Bridge of Don, Aberdeen, AB23 8GB tel. 01224 233000

KVÆRNER KVAERNER OIL & GAS LTD
KIRKHILL INDUSTRIAL ESTATE, DYCE

Title
BLOCK 15/16
WESTHAVEN FISHING INCIDENT
AS FOUND SURVEY, 15/5/97

Contract/AFE No.	–	Scale	1:1000 (A3)
Drn. MReynolds	Chkd.	Eng.	D.RENWICK
Date 12/3/97	Date	Date	26/6/97

1.7 WEATHER CONDITIONS

The local weather conditions reported by PIPER BRAVO platform at 0900 on 10 March were winds SSW 18-22 knots, seas 1.5 metres, visibility 4 nautical miles in sea mist/fog.

The safety standby vessel EMERALD BAS, in the same area, had recorded in her log for 1000, winds SSW 12-16 knots, seas 1 metre, visibility 4 nautical miles.

1.8 EPIRB REGISTRATION

The registration of EPIRBs is voluntary. It is strongly recommended by the MSA.

The information supplied on an EPIRB registration form is entered to a computer database for easy retrieval in an emergency. Until 24 February 1997, when it was transferred to TCA, this function was carried out by the MSA. UKMCC also has a copy of the database. Before 24 February this was updated on receipt of EPIRB registration details passed on from MSA. Since then, UKMCC work from a direct copy of TCA's database.

EPIRB 132132 was already fitted to WESTHAVEN when the vessel was purchased by Mr Pattison. Mr Pattison sent a form to the MSA notifying them of the changed ownership of the EPIRB. This was received by the MSA on 15 January 1997.

Because it contained an error, the form was not entered on the database. Instead, it was added to a number of other registration forms requiring additional information.

When the EPIRB registration database became the responsibility of TCA, the form was one of 267 passed to them by the MSA. (Section 2.8 covers the EPIRB registration procedures in detail).

The information supplied on the form was entered onto the EPIRB database on 9 March with the number 131584.

The owners of the second WESTHAVEN FR375 had also sent their EPIRB registration form to the MSA where it was received on 13 February 1997. There were no errors on the form, which was transferred to TCA as part of the backlog. It was entered to the EPIRB database on 12 March 1997.

TCA staff had worked overtime to clear the backlog of EPIRB registration forms from the time the database was transferred to their keeping on 24 February 1997. The backlog was cleared on about 17 March 1997.

1.9 DETAILS OF THE UNDERWATER SURVEYS

The wreck site has been surveyed by ROV on two occasions. The first survey, on 11 March, identified the wreck found close to the pipeline as WESTHAVEN and confirmed the pipeline was undamaged. The second, on 1 May, provided important information as to the reasons why the liferafts failed to inflate on the surface.

A large scale chart of the area around the wreck of WESTHAVEN is shown in FIGURE 6. This was produced on behalf of Elf Exploration UK PLC and is reproduced here with Elf's kind permission.

The initial ROV survey of the wreck position (the vicinity of 58°28'N 00°01'E) carried out on 11 March produced the following data:

i The vessel was lying intact, on her starboard side with her deck vertical, and some 45m to the north of the 30" oil export pipeline connecting the PIPER oil field to Flotta, Orkney Islands. She had sunk in 140m of water.

ii The port trawl door was upright and caught against the south side of the oil pipeline some 70m to the west of the wreck. The warp to the trawl door was still connected to the vessel's winch via the port gallows. The warp ran forward from the gallows and diagonally down the side of the hull, passing under the keel to emerge from underneath the starboard side.

iii Protruding from the strands of the port trawl warp, where it ran down the vessel's port side, were three tags; which marked the point where 137m (75 fathoms) of warp were still to come.

iv Less than 20m to the east of the trawl door the pipeline was shrouded in trawl net.

v The clump weight had been recovered and was hanging off the aft deck of the vessel, between the transom and the net drums.

vi The combination wires from the clump weight had passed over the transom of the vessel and had been drawn into the propeller, with the propeller running astern.

vii The escape hatch from the accommodation space was ajar.

viii The liferafts were floating at the ends of their painters in a partially inflated condition. The port liferaft was still partly within its GRP container.

ix The painter from the starboard liferaft had passed between the stays of the gantry mast. This indicated that at some point in her descent to the seabed WESTHAVEN had been sinking by the stern.

x The starboard gallows were buried in the sediment on the seabed and were hidden from view.

xi The head of the main mast was encumbered with a mass of chain which had clearly fallen to that location when the vessel had turned upside down.

The survey by the divers, carried out after the body of Mr Pattison had been recovered, revealed the following additional information:

1 There were no bodies inside the gutting shelter.

2 The engine throttle control lever in the wheelhouse was set at half astern.

3 The fishroom hatch was open and no bodies were visible when viewed from immediately inside the hatch.

4 The hatch to the forward space was open.

With the assistance of ELF Exploration UK Ltd a second survey of the wreck was carried out by the MAIB on 1 May and revealed:

a The painter to the port liferaft had been connected directly to a strong point and not through the weak link.

b The remains of a second liferaft attachment point was observed in the same location as the port liferaft connection.

c The securing point for the starboard liferaft painter could not be examined.

d The positions of the dog clutch levers on the winches indicated that all three winch clutches were out.

e There was no sign of the starboard trawl door.

f The starboard and centre winchdrums were found full of warp

g The one trawl warp leading from the wreck led to the port trawl door.

1.10 THE POSSIBILITY OF AN EYE WITNESS ON PIPER BRAVO

The Inspectors were alerted by the next of kin to strong rumours circulating in Arbroath, that a worker on the oil platform PIPER BRAVO had actually seen WESTHAVEN capsize. Given the distance from PIPER BRAVO to WESTHAVEN was about seven miles, and the relatively poor visibility that prevailed on 10 March, it was thought this rumour was unlikely to have any substance in fact. Nonetheless, it was followed up by sending a questionnaire to every person who had been working on the platform on 10 March. Of the 124 questionnaires sent out, 99 were returned but nothing materialised to add substance to the rumour. The inquiry concluded there was nothing to substantiate anything more positive.

SECTION 2
Analysis

The Inquiry examined in detail the circumstances in which the vessel sank. It has also highlighted several issues important to the safety of fishing vessels and their crews: the correct installation of liferaft hydrostatic release units; equipment for instantaneously releasing or severing trawl warps; trawling in the vicinity of pipelines; and listening watches on the radio distress frequencies.

2.1 THE CIRCUMSTANCES OF THE ACCIDENT

There are no surviving eye witnesses to the accident. An analysis of the available evidence suggests it could have occurred in the following manner:

At about 0930 the fishing gear being towed by WESTHAVEN AH 190 came fast on the pipeline. This occurred during a radio conversation between the skipper of the vessel and his brother, the skipper of DEEJAY.

Immediately prior to the gear coming fast, WESTHAVEN would have been to the north of the PIPER to Flotta 30" oil pipeline. She was probably heading north-west on a course parallel to, or slowly convergent on, that pipeline. This course would bring the trawl door close alongside the pipeline. At some point the port trawl door passed underneath the pipeline and emerged on its far side. The underwater video of the wreck site shows that the seabed fell away from the pipeline, opening up a clear gap of about 1.2m in height which would have allowed the trawl door to pass underneath it. As the seabed rose to meet the pipeline, the port trawl door inevitably became trapped on the opposite side of the pipeline to WESTHAVEN. The underwater video clearly shows the trawl warp passing underneath the pipeline to the trawl door on the far side.

In these circumstances the skipper of WESTHAVEN would have followed the normal and well established practice for handling fouled gear. This involved recovering any items which were free first, and then attempting to clear the rest. As the warp to the fouled gear was hauled in, the vessel would be pulled astern to a point directly over the fastener. When this point was reached the warp would have become almost vertical and taut. No more warp could have been recovered from this point onwards unless the fouled gear had come free.

The twin rig gear in use by WESTHAVEN was connected to the vessel by three warps: one each running through the port and starboard gallows and the third through a centre block (see Figure 5). The underwater video shows that the clump weight between the two nets, which was connected to the central warp, had been recovered and was hanging off the aft deck, between the transom and the net drums. It is believed the starboard trawl door had also been recovered and was hanging at the starboard gallows. This last assumption could not be confirmed as the gallows was buried in silt and hidden from the underwater camera.

During the second underwater survey several circuits of the wreck failed to find any trace of the starboard trawl warp; and since the starboard winch drum was found to be full of warp, it was assessed the starboard trawl door had been hauled back to the vessel.

At this stage of the freeing operation the only item still to be recovered was the port trawl door.

The port trawl warp would have been hauled tight leaving about 143m (78 fathom) of the port trawl warp extending from the port gallows to the trapped port trawl door. Since the water depth was approximately 140m, the port trawl warp would have been taut and all but vertical as it led to the trapped trawl door.

The skipper of WESTHAVEN could not have known that the port trawl door was trapped in such a way that it would have been virtually impossible to release. It would have been the normal practice for any fishing skipper to try almost every conceivable manoeuvre to pull the gear free. Unfortunately, in this case it is probable that some combination of swell and propeller thrust put such a tension into the warp that WESTHAVEN completely and suddenly capsized. Her EPIRB would have floated clear at this point and begun transmitting. It is believed this occurred at about 1010, the time of the isolated 121.5 MHz transmission which has not been attributed to any other incident.

The capsize occurred so quickly that the Skipper was unable to radio a distress message, and the crew were unable to release or sever the trawl warp. The vessel turned completely upside down and would have filled with water within minutes and sunk.

The Skipper did not escape from his position in the wheelhouse. The sole means of exit from the wheelhouse was through the galley/mess area to the door in the aft bulkhead of the deckhouse.

Whether any of the three crew survived the capsize and sinking is not known and would have depended to a large extent on where they were at the time. Since the crew had just recovered the clump weight and starboard trawl door, and were waiting to recover the port trawl door when it became free, they would most likely have been on the working deck. This would have been almost certain had the accident occurred in the early stages of the manoeuvres to break the gear free of the obstruction. (The winch controls on WESTHAVEN were operated from the winch position on deck). It was suggested to the Inspector by one of the next of kin that the Skipper might have sent the crew to the galley for a cup of tea while he persisted in his attempts to free the gear. The possibility cannot be ruled out.

The skipper of WESTHAVEN was a fisherman of considerable experience and skill. During his career he would have faced the problem of freeing gear snagged on the seabed many hundreds of times. Occasionally the gear would have been lost, or the attempt to pull it free would have been abandoned. More frequently greater effort or a different approach would have freed the gear successfully.

The more strenuous the effort to free gear the smaller the margin of safety against capsize becomes. Fine judgement, and a "feel" for the vessel, determines how far a skipper can safely take these actions. The Skipper took command of WESTHAVEN less than three months before the accident and after twenty years in his previous vessel RELENTLESS. Research within MAIB has identified that a major change such as this often precedes a fishing vessel accident, indicating that the changed circumstances, possibly, reduce the value of previous experience.

The relatively calm sea conditions which prevailed on 10 March 1997 would have allowed the crew of WESTHAVEN to heave the port trawl warp to an unusually short length, causing the pull on the port gallows to be closer to the vertical than might normally have been the case in the rougher conditions more frequently encountered in the northern North Sea. Thus WESTHAVEN was probably exposed to a significantly greater degree of danger than normal in such circumstances. (The angle of the trawl warp to the vertical determines how great is the force tending to capsize the vessel; the smaller the angle the greater that force. This is examined in detail in the next section of the report).

If a vessel has been pulled over to the point of capsize she can only be saved by immediately releasing the pulling force. Either the winch must drop the load or the warp has to be cut. The former is a practical possibility providing the winch is fitted with pneumatically operated brakes and clutches. The winch on WESTHAVEN, in common with many traditional fishing vessels, was not so fitted. Modern twin beam trawlers are fitted with this equipment for the express purpose of dropping their gear should it become heavily unbalanced. Severing the warp at the last minute with an explosive cutter now (but was not when WESTHAVEN was lost) appears to be a practical possibility, providing one has been fitted to the warp in anticipation of the emergency.

2.2 CAPSIZE AND STABILITY

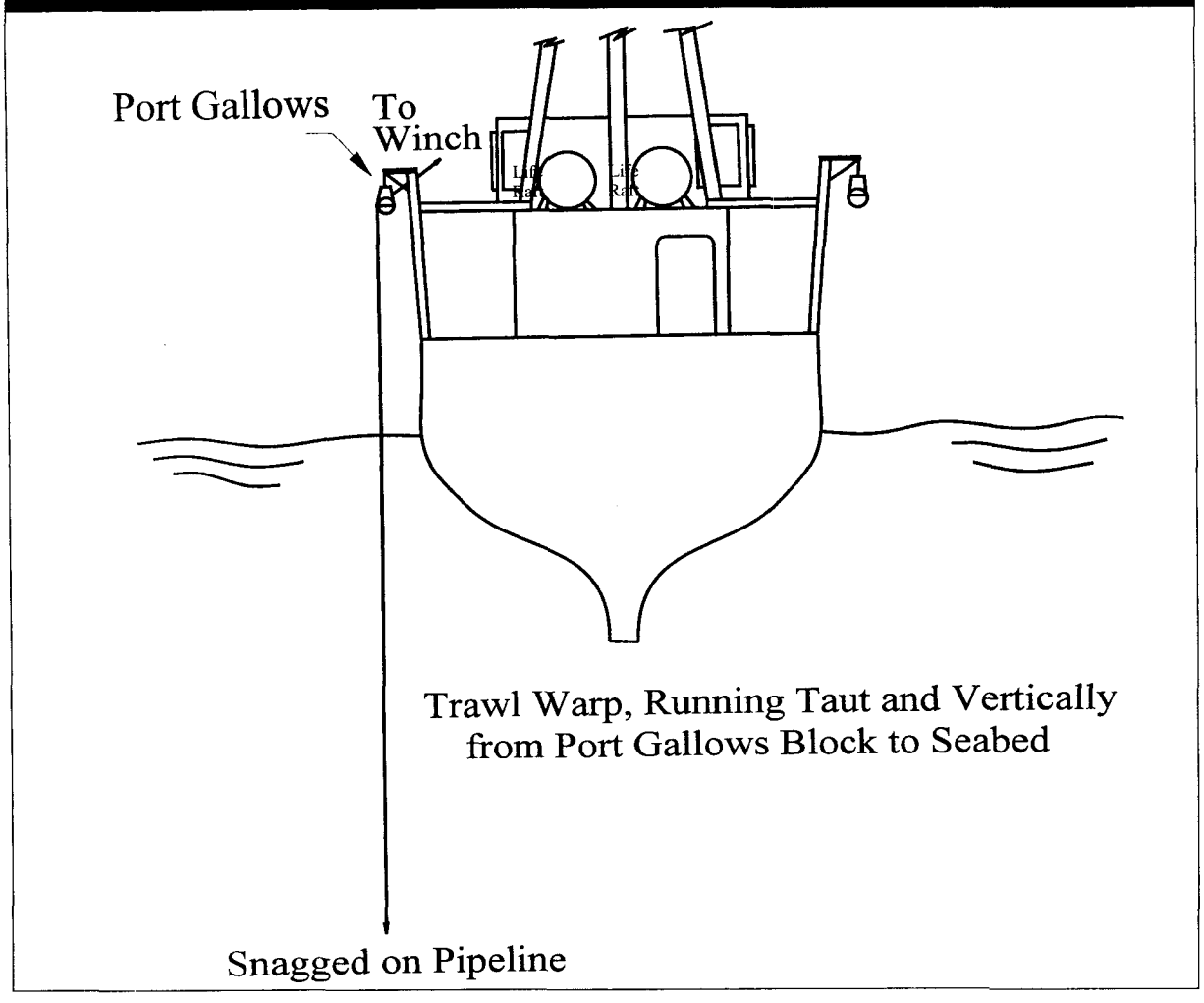
The tension in the port trawl warp, caused by the efforts to pull the gear free, would have exerted an almost vertical pull at the port gallows block, as shown in FIGURE 7. Calculations have indicated that a vertical force of about 10 tonne, acting at the port gallows, would have been required to capsize WESTHAVEN. This force is considerably less than the breaking strength of the port trawl warp.

The port trawl warp connected the port trawl door to WESTHAVEN's winch. It was 18mm in diameter with a manufacturer's guaranteed minimum breaking load of 18.6 tonne. Since the warps had been renewed within the previous 12 months they were probably in good condition and would have withstood a tension close to their minimum breaking load.

The tension in the trawl warp would have been caused by several factors acting together: pre-tension caused by hauling the warp taut against the buoyancy of the vessel; the tension in the warp which resisted the thrust of the propeller as the vessel pulled against the warp; and the tension resisting the rise of the vessel relative to the "anchor" point on the seabed which would occur in even the slightest of swells. It is impossible to know what precise combination of these three factors caused the vessel to capsize. Calculations have been carried out to determine their relative effects.

Diagrams linking the effects of winch pull, propeller thrust and swell, are shown in FIGURES 8 to 11. It can be seen from FIGURE 9 that until the point where the edge of the main deck becomes immersed, the angle of heel increases roughly in proportion to the pull on the warp. However, as soon as the deck edge becomes immersed the angle of heel increases rapidly. At the same time, and with escalating effect, the pull on the warp reduces the angle at which the maximum righting lever (maximum GZ) occurs. The point at which these two curves cross is the point at which the heel of the vessel would increase uncontrollably under only the slightest additional pull on the warp, in effect the point at which a capsize is inevitable. At this point the righting lever becomes zero – the point of vanishing stability. For WESTHAVEN the point of vanishing stability would have occurred when the vertical pull from the warp was about 10 tonne.

Figure 7: **Trawl and Gallows Arrangement**



WESTHAVEN had about 443m (242 fathoms) of warp on her port winch drum when she capsized. The manufacturer of the winch has estimated that the port barrel of the winch could produce a maximum pull of about 3.7 tonne with this length of warp on the drum. Referring to FIGURE 9 it can be seen that through the use of the winch the vessel could possibly have been heeled to about 6°, leaving a margin of about 18° to the angle of maximum righting lever.

WESTHAVEN's engine could produce a maximum thrust from the propeller, at zero forward speed, of between about 1.1 and 1.5 tonne. This is sufficient to produce a downwards force from the taut trawl warp, acting at the port gallows block, of about 8 to 10 tonne. This is explained in FIGURE 12.

Reports on the weather conditions in the vicinity of PIPER BRAVO oil platform for the morning of 10 March record swells of between 1 and 1.5m. The sources of this data are: PIPER BRAVO oil platform and the standby safety vessel EMERALD BAS. WESTHAVEN FR375 reported a slight swell. It is reasonable to assume therefore that during her efforts to free the snagged port trawl door WESTHAVEN experienced a swell of about 1m.

Even the effects of a slight swell would have become significant as the angle of vanishing stability was approached. The effect of an additional 1 tonne of pull on the warp, which could perhaps have resulted from the vessel rising about half a metre in the one metre swell, may have just been enough to tip the balance and precipitate the capsize.

Figure 8: **The effect of winch pre-tension and applied propeller thrust on the vertical pull at gallows**

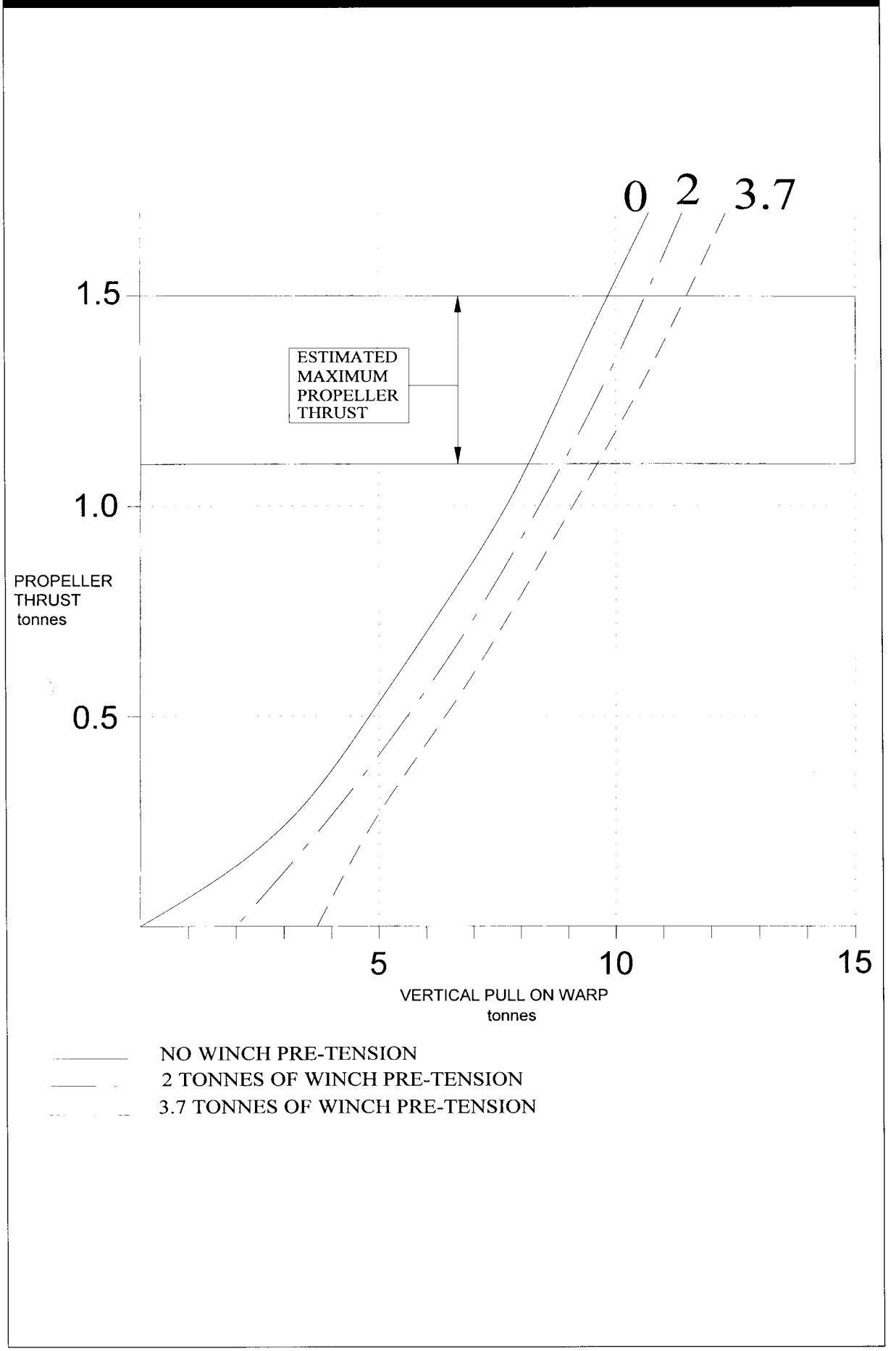


Figure 9: **The increase in angle of heel with increasing vertical pull at the gallows**

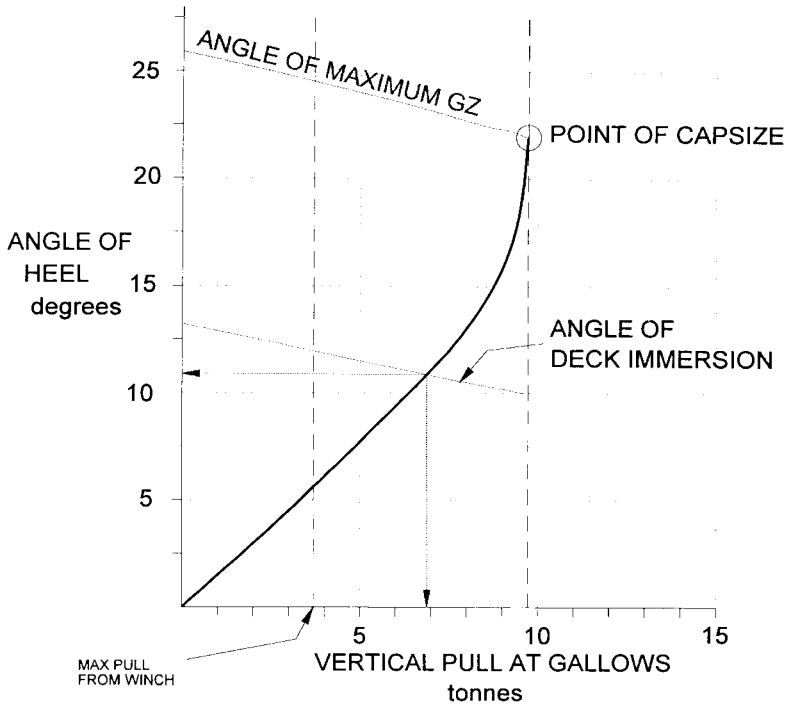


Figure 10: **The decrease in maximum righting lever with increasing vertical pull at the gallows**

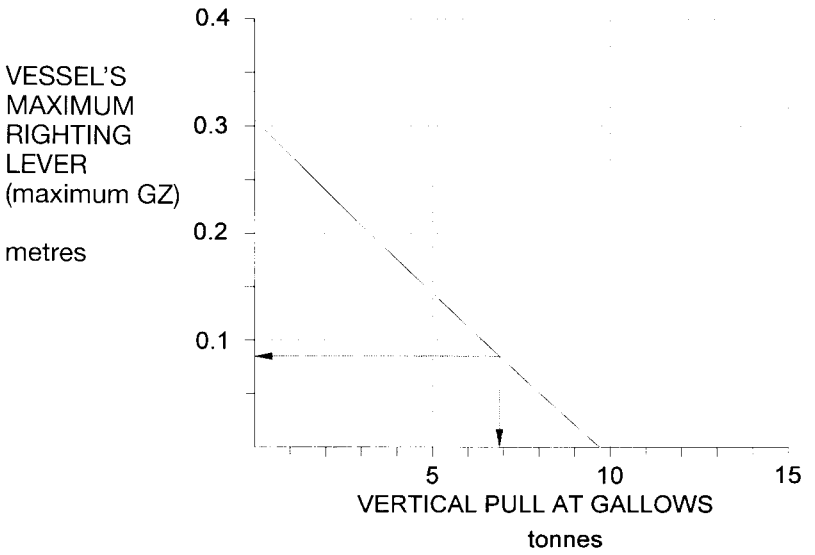


Figure 11: **The effect of vertical movement at the gallows upon the vertical pull to cause capsize**

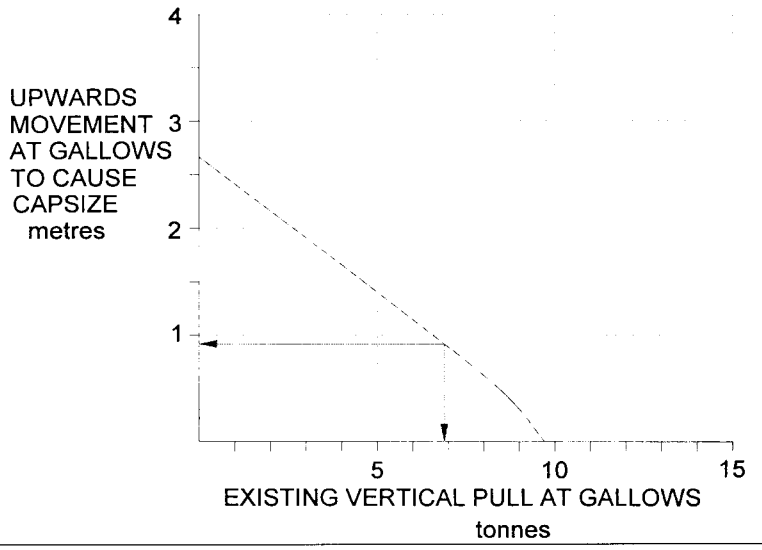
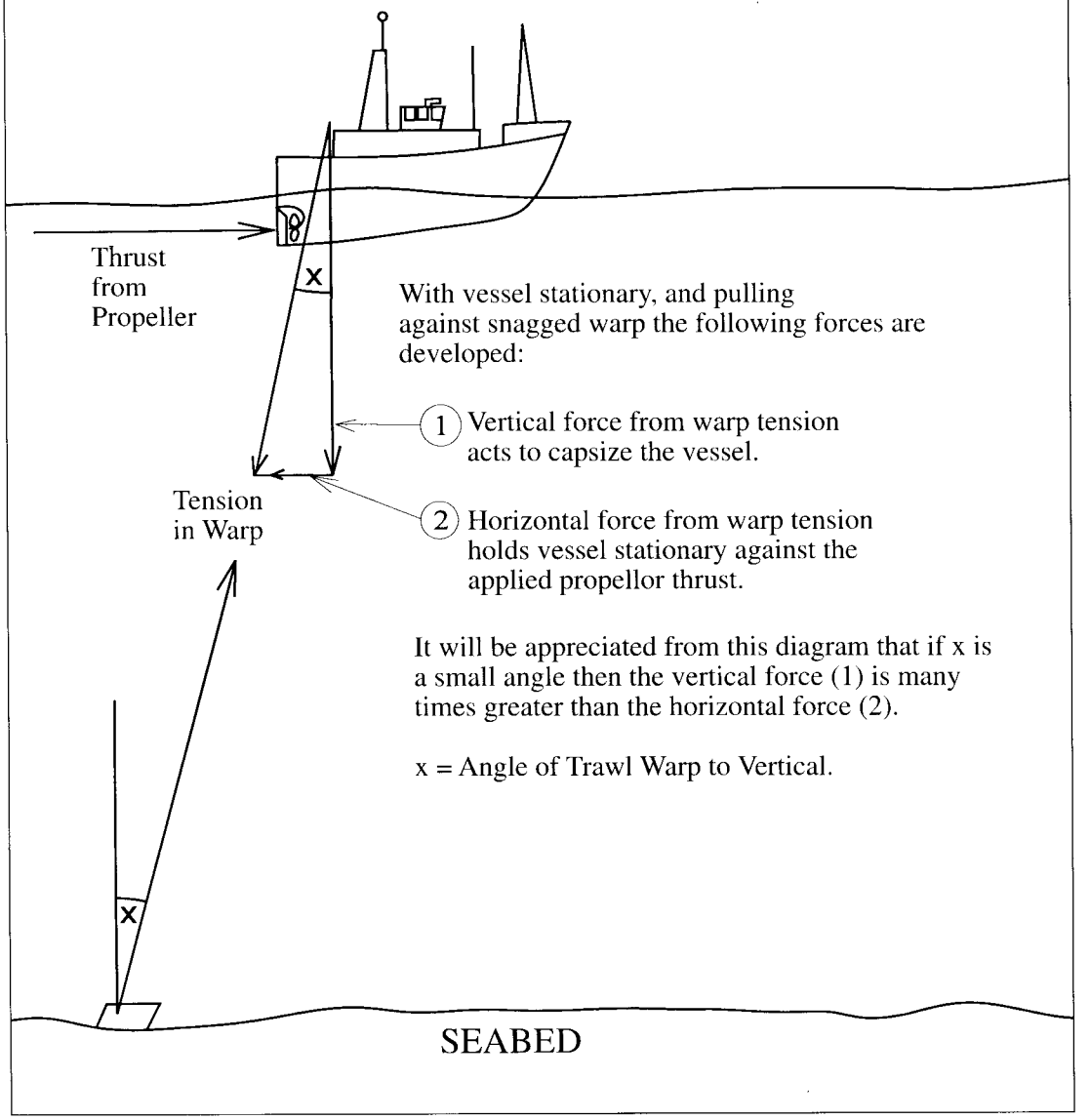


Figure 12: **The relationship between propeller thrust and warp tension**



The estimated loading condition of the vessel on the morning of her loss is presented in ANNEX 3. In this condition the vessel met the stability requirements of the Fishing Vessels (Safety Provisions) Rules 1975.

The stability of a fishing vessel is assessed by the MSA (now MCA) against the criteria contained in The Fishing Vessels (Safety Provisions) Rules 1975 for a variety of seagoing conditions. These seagoing conditions apply to the vessel in transit to, or from, the fishing grounds. Her stability is neither assessed for the actual fishing operations nor against the overturning moments which could be generated when trying to free snagged fishing gear.

Merchant Shipping Notice No M.1657 "Hazards Associated with Trawling and use of Lifting Equipment" provides general safety advice to fishing vessel skippers and crews in, amongst other matters, the recovery of fouled or fastened gear. This notice is reproduced in its entirety in ANNEX 8.

2.3 THE PIPER TO FLOTTA 30" OIL PIPELINE

The pipeline is the main oil line from the PIPER BRAVO oil platform to the Flotta terminal in the Orkney Islands. It was originally laid in 1974. As part of a redevelopment plan following the PIPER ALPHA disaster, a replacement 30" pipeline was laid in 1992 between PIPER BRAVO and the MOL WYE and then on via the Claymore spur line to join up with the original pipeline. The incident occurred on the new section of pipeline. The pipeline is constructed from 30" diameter steel piping encased in a weight coating which is resistant to damage by trawl doors. The pipeline is not buried. Its position is shown on Admiralty and Kingfisher charts.

The Health and Safety Executive (Chemical and Hazardous Installations Division) is responsible for determining whether there had been any breach of the Health and Safety legislation by the pipeline owner, ELF Exploration UK PLC; this is outside the jurisdiction of MAIB.

The Pipeline Works Authorisation (the consent/approval issued on behalf of the Secretary of State, under which the relevant section of pipeline was laid and maintained) includes the following clause which is relevant to the safety of fishing vessels:

"*Any part of the pipe-line (excluding risers and associated apparatus) not trenched following pipe-laying shall be trenched if at any time the Secretary of State (having regard to actual interference by the pipe-line with fishing or with other activities or evidence that such interference is likely to occur) requires that those parts should be trenched. Any parts of the said pipes not supported by the seabed shall be provided with suitable support if at any time the Secretary of State (having regard to the matters aforesaid) requires that such support be provided*".

The pipeline was neither damaged by the impact of the trawl door nor by the subsequent efforts to pull it free.

2.4 THE FISHING OPERATION

The Admiralty chart for the area in which WESTHAVEN was lost, North Sea Offshore Charts Sheet 4, shows clearly the position of the PIPER to Flotta 30" oil pipeline. This chart was carried by WESTHAVEN. It contains the following navigational advice:

"Gas from a damaged oil or gas pipeline could cause an explosion or some other serious hazard. Pipelines are not always buried and their presence may effectively reduce the charted depth by as much as 2 metres. Where pipelines are close together, only one may be charted. Mariners should not anchor or trawl in the vicinity of a pipeline; they may risk prosecution if damage is caused".

The pipeline was also shown on an electronic chart carried in WESTHAVEN.

It is concluded that the skipper of WESTHAVEN should have known that he was fishing in the vicinity of an oil pipeline, and that such activity was contrary to the advice given on the Admiralty chart.

In his last radio conversation with his brother, the Skipper said that he could see nothing on the chart to account for the trawl gear coming fast. Assuming his navigation was accurate, his reply would suggest he did not identify the pipeline as being hazardous to his gear.

The Skipper had little experience of fishing the Fladen Grounds, having probably only fished it once before over a five day trip. His usual fishing grounds, The Devil's Hole, is relatively free of seabed pipelines.

The Skipper could not have known that the port trawl door was trapped in such a way that it would have been impossible to release. The possibility of a trawl door passing underneath a pipeline to emerge on the other side would not have been contemplated by any experienced skipper.

2.5 FISHING VESSELS AND UNDERWATER PIPELINES

A pragmatic approach has developed over the years to enable both fishing vessels and pipelines to co-exist at a relatively low level of hazard to each other. The accident to WESTHAVEN necessitates a re-assessment of the risks, and their management. This re-assessment is the business of the fishing and offshore industries, it is not the purpose of this report. However, MAIB has a statutory responsibility to make what observations it considers appropriate and consistent with the overriding goal of improving the safety of life at sea. It is in this context that the following observations are made:

- It is common knowledge that pipelines are trawled over and along. The extent of this activity is not known. The MAIB has no record of any UK fishing vessel, prior to WESTHAVEN, being damaged or lost as the result of an incident with a pipeline.

- No pipeline in the North Sea has been ruptured by the actions of a fishing vessel.

- WESTHAVEN did not capsize through the action of her trawl door catching on the pipeline, but by the efforts to free it. The hazard to both the integrity of a pipeline, and the safety of a fishing vessel, is greatest when the vessel is trying to free gear caught on the pipeline. In these circumstances a fishing vessel can exert a vertical pull on the pipeline which is many times the bollard pull from her propeller. Another hazard to the pipeline is that a vessel may be capsized and sink directly onto it. It is therefore highly desirable for a fishing vessel coming fast on a pipeline, to refrain from applying excessive force to clear her gear. It is equally important that both the Coastguard (for the safety of the vessel and her crew) and the pipeline operator (to check for any damage to the pipeline) are informed of the incident at the time it occurs.

The factors likely to influence a fishing skipper to report when his vessel is fast on a pipeline and to avoid exerting excessive force to clear the gear, are: concern for the safety of his crew, and the prospect of damage to the pipeline.

Several factors may however influence a fishing skipper to do the opposite. These include:

- The absence of any requirement to report the incident at the time.
- The value of the fishing gear which would have to be replaced if lost.
- A reluctance to admit fishing close to a pipeline.
- The risk of prosecution if the pipeline is damaged (MAIB have identified no instances where such a prosecution has been pursued).
- The loss of gear could curtail the fishing trip.

BT International Networks, whose operations cover submarine cable systems, have a clearly defined approach to a similar problem. (In the late 1980s three fishing vessels, GAYLORD, MHARI L and GREY FLAMINGO were lost in separate accidents when their gear probably became fouled on submarine cables).

The system currently run by BT International Networks in conjunction with Kingfisher Charts consists of three elements:

i A submarine cable awareness chart.

ii An emergency desk manned 24 hours a day.

iii Compensation for those who contact BT to advise them that their gear is fast on a cable, and who release their gear to remove the hazard from their vessel and to avoid damage to the cable.

The Submarine Cable Awareness Charts which are circulated widely amongst the fishing fleet contain the following information:

a A standard warning on the dangers, both physical and legal, which could result if a submarine cable were to be damaged.

b An information sheet illustrating the various types of hazard which can be encountered, and basic advice on how these situations might be handled.

c A large scale chart of the proposed cable route.

d A list of the actions which should be taken if a fishing skipper suspects that his gear has fouled a submarine cable; this includes an instruction to alert the nearest Coastguard station.

e Contact telephone numbers and addresses.

An example of the type of information given on a typical Submarine Cable Awareness Chart features at ANNEX 6 (the chart itself has been omitted).

Most of the precautions outlined in the preceding paragraph, already feature in the offshore sector's dealings with the fishing industry; items ii), iii), b), d) and e) do not appear. The UKOOA Fishermen's Compensation Fund provides a source of compensation where fishing gear has been lost or damaged as a result of an incident involving oil related debris, in those cases where the operator responsible for the debris cannot be identified. It does not cover incidents involving charted pipelines.

UKOOA Fisheries Liaison Committee has produced a booklet "Guidelines for Fisheries Liaison" to assist operators in their contact with the fishing industry. This comprehensive booklet covers in detail the UKOOA Fisherman's Compensation Fund, and includes sections on: fishermen snagging their gear; and, dealing with claims from fishermen for damage or loss of gear.

Whilst there are significant differences between the interaction of fishing vessels with submarine cables, and fishing vessels with seabed pipelines, a common framework could be developed for the handling of incidents involving fishing gear fouling.

2.6 THE LIFERAFTS

WESTHAVEN's liferafts did not inflate on the surface. It cannot be established that lives would have been saved had the liferafts deployed, but the crew of WESTHAVEN would have had little chance of survival without them. The prime reason for conducting the second underwater survey of the wreck was to establish why the liferafts had not floated free and inflated as they were required, and designed, to do.

The video from the underwater survey carried out on 11 March showed both liferafts tethered to the wreck by their painters and floating some 20m above it. The starboard liferaft had shed its GRP container and was partially inflated. The port liferaft was still inside its partially opened container. The partially open, and buoyant, container indicates the liferaft had begun to inflate. The evidence shows there was no intrinsic fault with the liferafts' inflation mechanisms which prevented them deploying as designed. The reasons for their failure to deploy lie elsewhere.

The Fishing Vessels (Life-Saving Appliances) Regulations 1988 require:

- *"Liferafts . . . shall be secured in such a way that they are automatically released and be float-free if the vessel sinks"*. This is achieved by securing the liferafts to the vessel by a hydrostatic release unit (HRU).

- *"The liferaft painter system shall provide a connection between the ship and the liferaft and shall be so arranged as to ensure that the liferaft when released and in the case of an inflatable liferaft, inflated, it is not dragged under by the sinking vessel"*. This requirement is met by including a weak link between the liferaft's painter and the vessel.

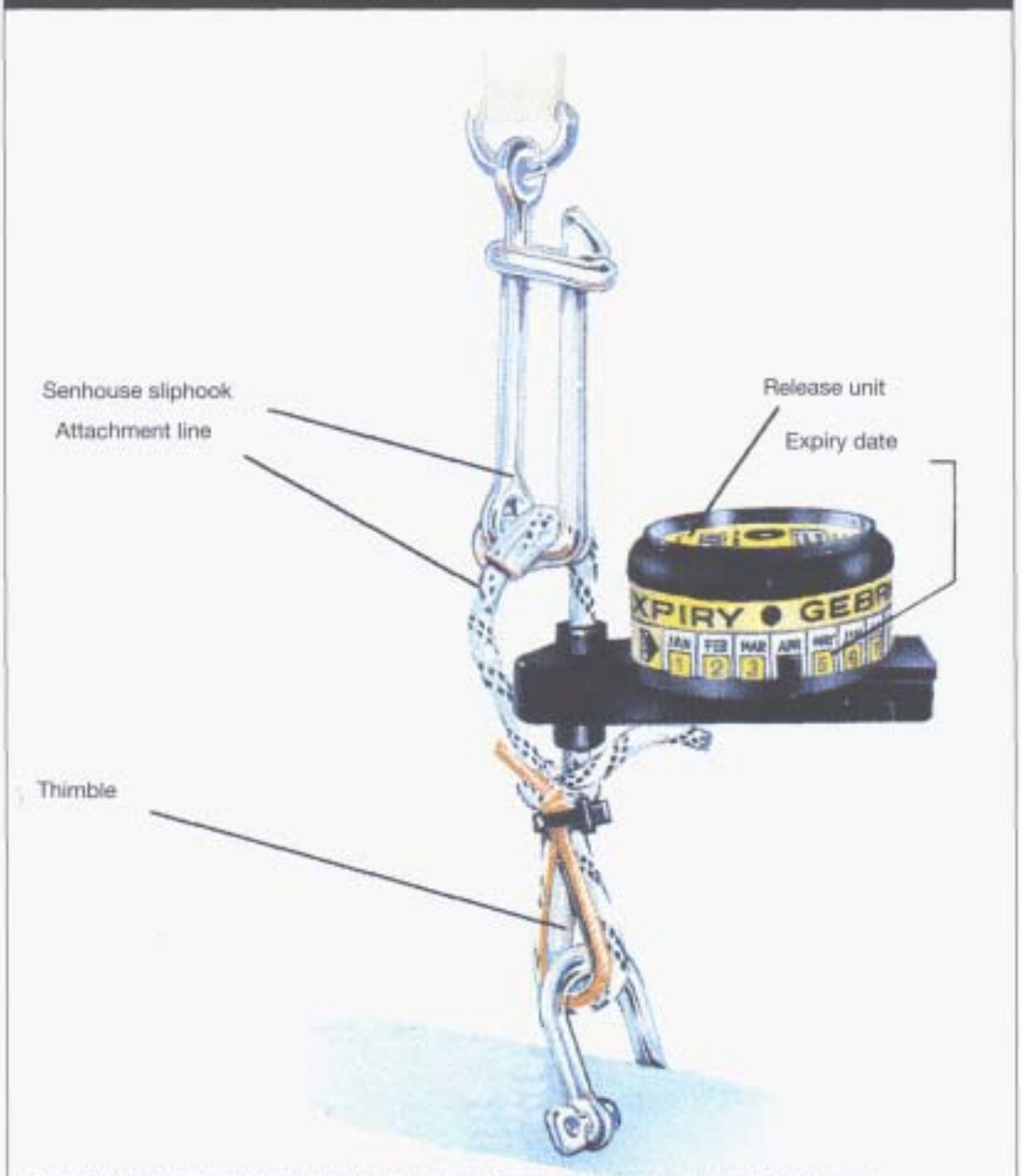
- *"A weak link shall be of sufficient strength to – 1) pull the painter out of the liferaft container; 2) operate the liferaft inflation system; 3) break under a tensile force of between 1.8 and 2.6 kN" (0.18 and 0.27 tonne).*

The Weak Link

WESTHAVEN's liferaft containers were secured to their cradles in the manner shown in FIGURE 13. They could have been released in one of two ways; manually by the opening of

the senhouse slip, or automatically by the operation of the HAMMAR H20 hydrostatic release unit (HRU) at a depth of between 1.5 and 4.0m.

Figure 13: **Hammar H20 hydrostatic release unit**



Note: The liferaft painter, and its attachment, is not shown. [Reproduced by kind permission of C. M. Hammar]

Due to the suddenness with which WESTHAVEN capsized there would have been insufficient time to release the containers manually. Following their automatic release as the vessel sank, the buoyant containers should have risen rapidly to the surface. Since the ends of each liferaft's painter were attached to the vessel, they would have been drawn out of their containers as they rose through the water. Eventually the full length of the painters would have been reached and come taut to trigger the inflation mechanisms of the liferafts. As the liferafts expanded under the pressure of the inflation gases the containers would burst open and drop away. Once the liferafts had inflated fully, the weak links by which the painters should have been connected to the vessel are designed to part. The sequence of events described in this paragraph is well illustrated in the manufacturer's advertising literature, a copy of which is shown in FIGURE **14.**

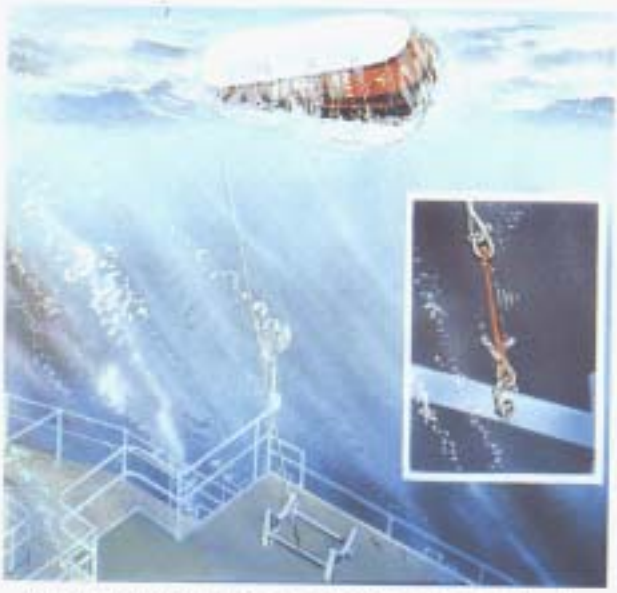
Figure 14: **Hammar H20 hydrostatic release unit installation and operating instructions**

Ready for action ...

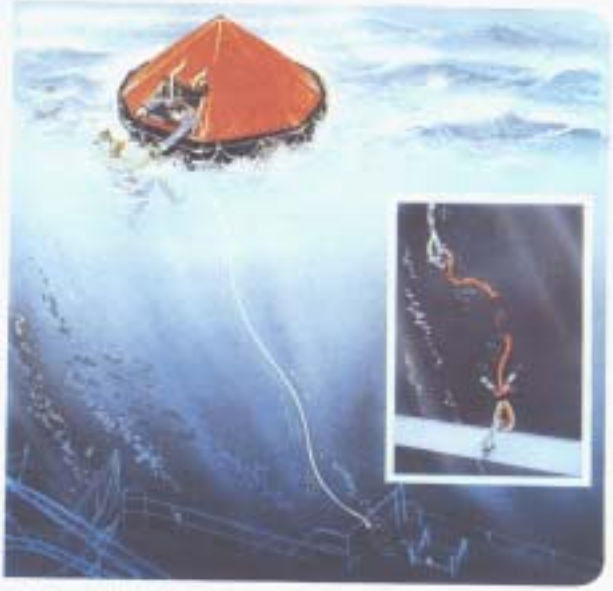
White strong rope of HAMMAR H20 secured to deck or liferaft-cradle and attached to liferaft lashing with a sliphook.
Liferaft painter line shackled to weak-link and around strong white rope.

If the ship sinks, the water pressure will activate the sharp knife which cuts the strong rope and the liferaft will float free.

Go!



As the ship sinks,the liferaft painterline will be stretched and the liferaft starts to inflate.



Red weak link breaks and survivors can board the inflated liferaft.

Reproduced by kind permission of C. M. Hammar

The underwater survey conducted on 1 May enabled a close examination to be made of the means by which the port liferaft had been attached to the vessel. It was established that the painter had been secured directly to the vessel, bypassing the weak link in the process. Therefore, the weak link was not able to fulfil its correct function. A photograph taken from the underwater video record showing the connection of the port liferaft painter, is shown in FIGURE 15. The point of attachment of the starboard liferaft painter could not be examined by the ROV.

Figure 15: Close-up of the point of attachment of the Port Liferaft Painter

The HRUs which were in place on WESTHAVEN during the survey for the renewal of her United Kingdom Fishing Vessel Certificate (UKFVC) in June 1996 had an expiry date of June 1998. Since the HAMMAR H20 has to be replaced every two years, it is reasonable to assume it was these same units which were on WESTHAVEN at the time of her loss and had been newly fitted for the survey. The HRU is an important survey item. Its installation would have been thoroughly checked to ensure it was correct when the vessel was surveyed. It is concluded the liferafts were correctly secured and fitted in June 1996.

In November 1996, some five months after the survey, the liferafts were removed from WESTHAVEN for their annual service. This would have required the liferafts' painters to be disconnected from the HRUs. When they were returned to WESTHAVEN it is probable the crew would have re-secured them and re-connected the liferafts' painters. The vessel was sold to her new owners in December 1996 when it became their responsibility to ensure the liferafts were correctly installed. The investigation concluded that whoever re-secured WESTHAVEN's liferafts on the last occasion before her final voyage, failed to secure the painters correctly. Furthermore no-one had noticed they were incorrectly secured to a standing part of the vessel and not the weak link.

Figure 16: **Hammar H20 Notice**

HAMMAR H20

The Hammar H20 hydrostatic release unit consists of a double looped ropeline, a release mechanism, and a weak link (red). The Hammar H20 is designed for liferafts carrying from 4 up to approximately 90 persons. It does not need servicing but MUST BE REPLACED AFTER TWO YEARS.
The Hammar H20 fulfils the requirements of the IMO resolution A521 and the 1983 Amendments to SOLAS 1974. D.O.T. (UK) approved.

HYDROSTATIC RELEASE UNIT FOR LIFERAFTS

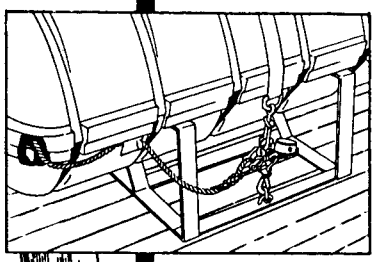
INSTALLATION
The Hammar H20 is supplied complete including a weak link. The whole unit must be installed in accordance with the manufacturers instructions. The installation is simple and should be fitted as illustrated in the sketch and according to the following:

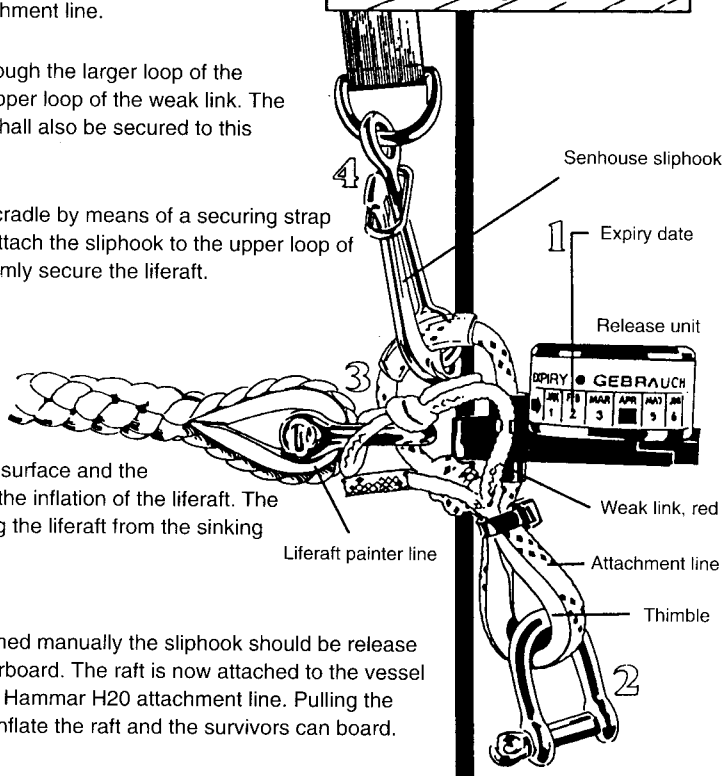
1 Check the unit for proper marking of year and month of expiry.
PLEASE NOTE THAT THE UNIT HAS TO BE CORRECTLY MARKED TO BE ACCEPTABLE TO THE VARIOUS MARINE AUTHORITIES.

2 The Hammar H20 is to be installed with a shackle to a strong point on the deck or on the cradle. The shackle shall be fed through the thimble containing the "weak link" and the lower loop of the attachment line.

3 Fit another shackle through the larger loop of the attachment line and the upper loop of the weak link. The painter line of the liferaft shall also be secured to this shackle.

4 Install the liferaft in its cradle by means of a securing strap and senhouse sliphook. Attach the sliphook to the upper loop of the attachment line and firmly secure the liferaft.





RELEASE DEPTH
The Hammar H20 will release the liferaft at a water depth between 1.5 and 4 meters.
The liferaft will float to the surface and the stretched painter activate the inflation of the liferaft. The weak link will break freeing the liferaft from the sinking vessel.

MANUAL RELEASE
If the liferaft is to be launched manually the sliphook should be release and the liferaft thrown overboard. The raft is now attached to the vessel by the painter line and the Hammar H20 attachment line. Pulling the stretched painter line will inflate the raft and the survivors can board.

THIS NOTICE MUST BE PLACED ABOARD THE VESSEL IN A CONSPICIOUS POSITION ADJACENT TO THE LIFERAFT STOWAGE

Reproduced by kind permission of C. M. Hammar
Also published in other languages

The literature supplied with a new HAMMAR H20 HRU is accurate, clear and sufficient to enable any literate adult to install it correctly. The instructions are reproduced in FIGURE 16. Such instructions are normally readily to hand when the liferafts are first installed but are less likely to be available when the painter has to be re-connected at some later date. It is then that errors are likely to occur. A competition run by the MSA at the Fishing Exhibition in Aberdeen in 1997 revealed that only about 20% of contestants were able to rig the unit correctly.

There is strong evidence to show that the incorrect installation of liferafts on fishing vessels is common. Article 17 of the MAIB's publication Summary of Investigations No 2/95 (which is reproduced in its entirety in ANNEX 4) reported that only 2 out of 23 liferaft installations examined at random on various small fishing vessels had been carried out correctly. Other fishing vessel losses in 1997 have also produced liferaft system failures: STARLIGHT (lost 1997), ALLIANCE (lost 1997) and VALIANT (lost 1997). On each occasion the crews had sufficient time to release one liferaft manually but the second liferaft, carried below the surface as the vessel sank, never appeared. Since the manually inflated liferafts operated entirely satisfactorily it is likely the failure to function as designed lay with the incorrect installation of the hydrostatic release units.

Unless the weak link is installed correctly, an inflating liferaft cannot break free of a sinking vessel by virtue of its buoyancy; the liferaft painter and its point of attachment to the liferaft are sufficiently strong to resist this force.

Liferafts have to be removed from fishing vessels at least once a year to be serviced. At other times the hydrostatic release units may have to be replaced or removed for servicing. It is the responsibility of fishing vessel owners and skippers to ensure that the liferafts on their vessels are, at all times, correctly installed. The incorrect installation of liferafts remains a major safety issue which the owners and skippers of UK fishing vessels have yet to address effectively.

Other Important Factors

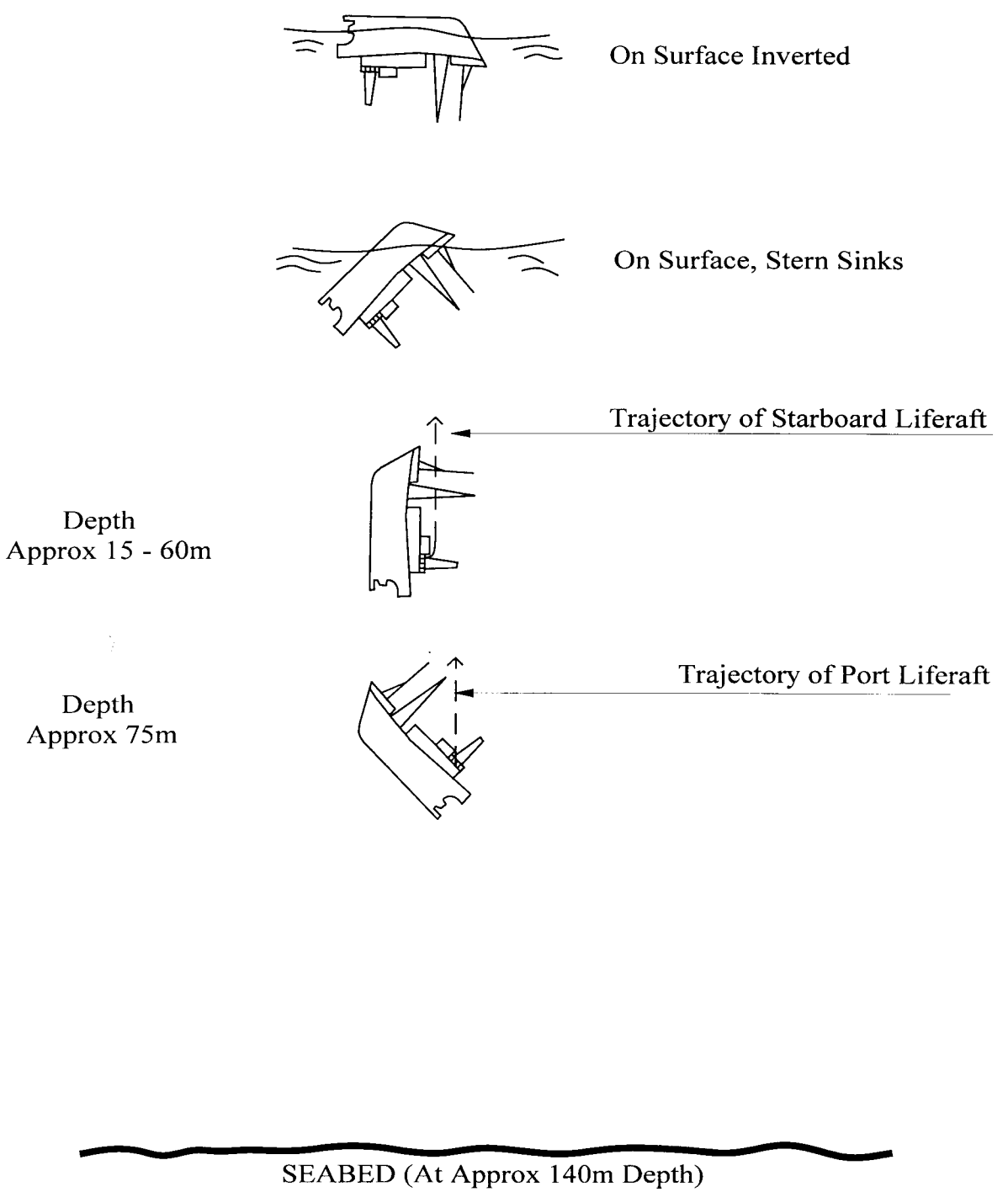
There is strong evidence that one, and possibly both, liferaft containers became trapped as the vessel sank and were carried to a considerable depth before finally floating clear. The port liferaft had not inflated sufficiently to shed its container while the starboard liferaft container had passed through the rigging of the gantry mast.

One consequence of the liferaft containers floating free at depth would be the restriction imposed by water pressure on the volume and buoyancy of the inflating liferafts. This could render the weak link (if correctly installed) ineffective, if (due to the lack of buoyancy in the liferaft) the painter tension did not exceed the critical 1.8 to 2.6 kN required to break it.

There are several possible reasons why the liferaft containers were unable to float clear as WESTHAVEN began to sink, and why they were carried towards the seabed. The most significant was the unsuitable location for storing the liferaft containers, partially beneath the main mast structure of four tubular steel members. The casing top between the wheelhouse and the aft mast support was bounded by a low rail on each side. Mast and rail would have prevented the liferafts from floating free when the vessel inverted.

With the vessel inverted, the buoyancy of the liferaft containers would tend to hold them into their cradles or against the top of the casing. As WESTHAVEN sank, probably by the stern with the bow still above the surface, the liferafts could have remained trapped by the

Figure 17: **Vessel sinking and liferaft release**



aft face of the wheelhouse – it is possible that the starboard liferaft container came free at this point. The underwater video shows the starboard liferaft had floated between the rigging wires of the gantry mast as a consequence of the vessel sinking by the stern. Eventually the sinking vessel would begin to return to a level keel, which would allow the remaining liferaft to float clear of the main mast and pass over the top of the wheelhouse. This is illustrated in FIGURE 17. (This interpretation is based upon the results of model tests into the behaviour of sinking fishing vessels).

There is also the possibility that the painter of the starboard liferaft had caught in the rigging of the gantry mast which, in itself, could have rendered that weak link (if installed correctly) ineffective.

Assessment

The decisive factor in the failure of the liferafts to inflate on the surface cannot be established. It was probably either the incorrectly installed weak links, or the liferaft containers were taken too deep before they floated clear of the vessel.

It is essential that liferafts can float clear of a sinking vessel as soon as they are released from their retaining straps by the HRU even if the vessel is inverted. When positioning or designing the stowage arrangements for liferafts, account must be taken of this fundamental requirement, which is of equal importance to the correct installation of a liferaft HRU.

2.7 THE SEARCH AND RESCUE OPERATION

The search for the missing vessel was initiated as soon as the EPIRB alert was received. It did not converge on the source of the transmissions until some six and a half hours after WESTHAVEN had capsized. The investigation has carefully analysed why this happened.

An extract from the Admiralty chart covering the area of interest is shown in FIGURE 4. The chart refers to FIGURE 18, which contains a list of all the EPIRB hits received by the MRCC Aberdeen between 1124 and 1551 on 10 March. An explanatory note on the expected accuracy of EPIRB position fixes is given in ANNEX 5.

The First MAYDAY Relay

At 1141 on 10 March the MRCC Aberdeen raised the incident category to MAYDAY within 17 minutes of receipt of the initial EPIRB hit. This followed a period of intense effort to contact WESTHAVEN on radio and mobile telephone. The text of the MAYDAY message broadcast on 2182 kHz and NAVTEX was:

"Attention all stations. Attention all stations. Attention all stations. MAYDAY relay MAYDAY relay MAYDAY relay. This is Aberdeen Coastguard, Aberdeen Coastguard, Aberdeen Coastguard. Distress beacon signals detected on 406 MHz at 101050 UTC indicate distress within 3 nautical miles radius of position 58°27.9'N 000°00.7'W. Beacon is registered to the fishing vessel WESTHAVEN FR375, all vessels in the area are to respond."

The MRCC had no doubt that they were dealing with an emergency situation.

Almost immediately the standby safety vessel VEESEA STORM responded to the MAYDAY transmission and informed the MRCC she had seen WESTHAVEN shortly before. This sighting was followed up and a Nimrod was diverted to the scene. When the vessel was confirmed to be WESTHAVEN FR375 at 1209, the MAYDAY was lifted. Until

this time the MRCC Aberdeen had received notification of one 406 MHz EPIRB hit giving a position, which was some twenty-five miles from the reported location of WESTHAVEN FR375.

Given the circumstances, the actions taken by MRCC Aberdeen up to this point fulfilled all expectations and were entirely reasonable. Although WESTHAVEN was found well outside the "expected" accuracy of a single 406 MHz EPIRB hit, of three nautical miles radius, Coastguard officers know that occasional inaccurate hits occur. Their decisions were also influenced by the knowledge that most (98% in 1996) EPIRB transmissions are false alarms. There was nothing to suggest that a second vessel called WESTHAVEN was in the area.

Figure 18: The EPIRB hits reported to the MRCC Aberdeen on 10 March 1997

No	Time	Event	Satellite	Merged Solution	'A' Solution	Prob %	'B' Solution	Prob %
1	1049 – TCA 1124 – RAB	406 MHz detect only no position	sarsat 6					
	1050 – DET 1124 – RAB	121.5 MHz			58°27.9'N 000°00.7'W	99	58°31.4'N 000°02.8'E	99
2	1115 – TCA 1133 – RAB	406 MHz 121.5 MHz	sarsat 2		58°30.2'N 000°9.8'W	69	59°9.3'N 003°40.9'W	31
	1129 – RAB	121.5 MHz signal reported by high flying airliners			Near 57° 57.1'N 00° 35.8'E			
3	1157 – DET 1234 – RAB	121.5 MHz	cospas 6		58°28.6'N 000°04.6'E	99	58°27.6'N 000°07.0'E	99
4	1230 – TCA 1241 – RAB	406 MHz	sarsat 6	58°26.4'N 000°2.0'W				
5	1255 – TCA 1309 – RAB	406 MHz	sarsat 2	58°27.1'N 000°0.5'W				
6	1411 – TCA 1438 – RAB	406 MHz	sarsat 6	58°27.3'N 000°0.4'E				
7	1429 – 1440	nothing detected	sarsat 3					
8	1442 – 1451	nothing detected	cospas 7					
9	1515 – 1524	nothing detected	cospas 4					
	1534 – RAB	121.5 MHz signal reported by high flying airliners			110 to 115 miles NE of Aberdeen			
	1544 – RAB	121.5 MHz signal reported by helicopter			95 miles NE of Aberdeen			

TCA – Time of Closest Approach of satellite to EPIRB transmissions
RAB – Received by MRCC Aberdeen
DET – EPIRB signal detected on 121.5 MHz
Prob – The theoretical percentage probability that the EPIRB location is in the vicinity of the "A" or "B" solution

Notes:

i) Where both 406 MHz and 121.5 MHz transmissions resulted in a position fix, only the 406 MHz position fix is shown in the table.

ii) EPIRB hits continued to be reported throughout the day. The data presented in this table has been arbitrarily stopped at 1544, this being roughly the time at which the Coastguard decided to re-broadcast the MAYDAY; and consequently the time beyond which EPIRB transmissions did not influence their decisions.

iii) Each satellite hit has been plotted in Figure 4, where they are identified by number.

iv) Expert testimony at the Fatal Accident Inquiry confirmed that the EPIRB was found to be in good working order, when tested some time after the accident.

When the MAYDAY was lifted, the assets tasked to assist with the search (a daughter craft from EMERALD BAS, VEESEA STORM, and the Nimrod RESCUE 11) were immediately released. Although the overwhelming probability was that the EPIRB transmissions were a false alarm emanating from WESTHAVEN FR375, this had not been confirmed at that time.

RESCUE 11 did not pick up the signals from the beacon's 121.5 MHz "homer" at anytime during the operation because she was never close enough to detect them. Her closest point of approach to the EPIRB was about 60 miles, her radio direction finding equipment has a maximum range of between fifteen and twenty miles.

The message received by MRCC Aberdeen at 1150, "*two Nimrods who picked up the 121.5 MHz hit earlier can no longer hear it*", led the MRCC Aberdeen to believe RESCUE 11 was within range of the EPIRB's "homer" but had lost the signal. Unfortunately, the message was incorrect, instead of Nimrods it should have referred to the "high fliers" (civilian passenger airliners), who had reported picking up the signals earlier.

The Interval between the First and Second MAYDAY Relays

Having established contact with WESTHAVEN FR 375, effort was concentrated on stopping the apparent transmissions from her EPIRB. The hit received by the MRCC Aberdeen at 1238 had originated at 1157, some 24 minutes before WESTHAVEN had contacted them and her skipper had been requested to check his EPIRB was switched off. The transmissions were assessed, quite reasonably, to have come from WESTHAVEN's EPIRB.

Despite all attempts to disable the beacon on WESTHAVEN, hits continued to be received at 1241, 1309, and 1438. Other vessels in her immediate vicinity were also requested to check their EPIRBs were switched off. The MRCC continued to think the hits were false alarms.

At around 1446 the MRCC perception began to change and HMS GUERNSEY was contacted to help locate the source of the continuing EPIRB transmissions. The emphasis had shifted to locating an EPIRB in the water since WESTHAVEN could no longer be considered as the source of the transmissions, following the removal of the batteries from her beacon after the 1309 hit.

Between 1146 and about 1530 no high flying airliners had reported detecting 121.5 MHz signals. During the course of the day between 0940 and 1440, seven helicopters had flown over, or within 5 miles of, the EPIRB but none had detected 121.5 MHz signals.

At 1551 the MAYDAY was re-broadcast, following a re-appraisal by MRCC that they were, after all, dealing with a true emergency. A high flying air liner, and a helicopter near the SALTIRE platform, both reporting that 121.5 MHz signals had been picked up, probably influenced this decision. The history of events leading up to the transmission of the second MAYDAY is summarised in FIGURE 18A.

No attempt is made to speculate on how quickly the MRCC might have registered they were handling a real emergency and not a false alarm. The watch officers at MRCC Aberdeen had been given erroneous information on the EPIRB registration. About two hours elapsed before they seriously questioned its validity, and a further one hour elapsed before they decided to re-broadcast the MAYDAY. The circumstances in this case were so unusual and of such a remote possibility that it could not reasonably have been anticipated. The investigation is satisfied that the senior watch officers on duty during this emergency acted to the best of their ability.

Figure 18a: **Sequence of events leading up to the second MAYDAY broadcast**

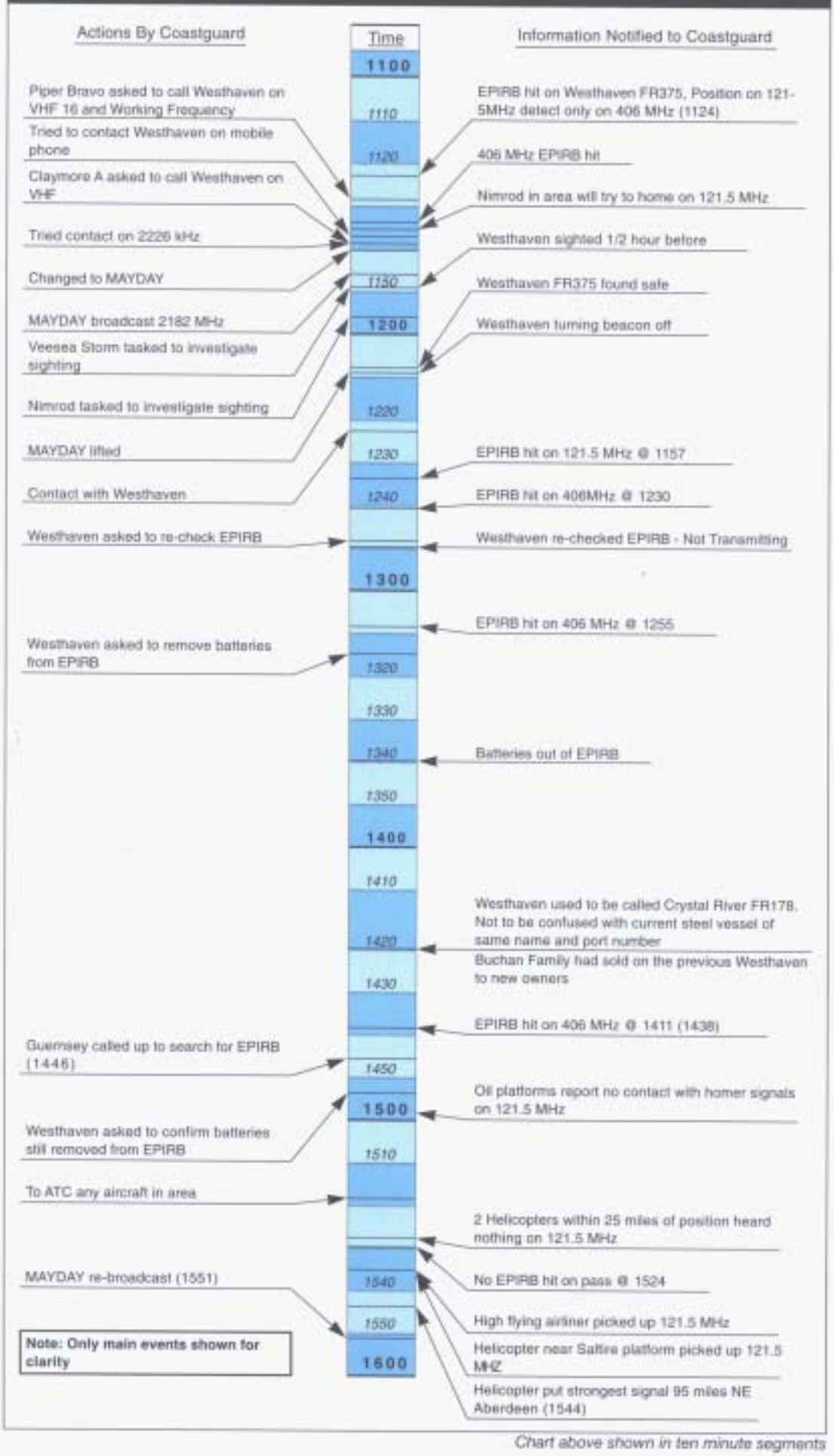


Chart above shown in ten minute segments

Evidence was presented at the Fatal Accident Inquiry that on two occasions, between noon and 1400 on 10 March, MRCC Aberdeen had been advised that Mr Buchan's previous vessel (registered as WESTHAVEN FR375) had been sold some months before. This information did not appear in the ADAS log. It was concluded that whoever received this information did not consider it of significance at that time and neither logged it nor passed it to others in the MRCC. Had that information been acted upon and become known in the MRCC it would not have saved any lives but would have undoubtedly prevented further confusions, lessened the distress to the relatives and ensured the search for WESTHAVEN AH190 was commenced earlier.

One difficulty facing the MRCC staff when checking the authenticity of the alarms was the time between hits which do not give continuous coverage. Consequently, when WESTHAVEN FR375 was asked at 1248 to confirm her EPIRB was switched off, the Coastguard had to wait until 1309 before they knew whether the transmissions were still being received. Further checks necessitated having to wait for even longer. As hits are dependent on satellite passes, eliminating false alarms can be very time consuming.

By 1309 MRCC Aberdeen had received notification of five EPIRB hits (two on 121.5 MHz and three on 406 MHz). Two of these had been received since the WESTHAVEN FR375 had checked her beacon was switched off. All the hits were within a 5 mile radius, the closest was about 16 miles from WESTHAVEN FR375. This data did not alter the perception that it was a false alarm. The significance of the relatively close grouped hits was not recognised.

Another difficulty facing the Coastguard was the complete lack of response from any fishing vessels to the MAYDAY broadcasts on 2182 kHz and NAVTEX, the calls on 2226 kHz, or VHF from the PIPER and CLAYMORE oil platforms. This deprived the MRCC of crucial information regarding the existence, or last known position and activities, of WESTHAVEN AH190; information which might have avoided the delay to the start of the close search. Of equal importance, it unnecessarily prolonged the physical checks which then became necessary to identify and discount, as a source of the EPIRB transmissions, those fishing vessels which had been picked up on the radars of the oil platforms and their standby safety vessels.

The MAYDAY broadcasts on 2182 kHz (the international distress frequency) were preceded by a warning signal (two tone alarm) to alert the recipient that a MAYDAY message was imminent. This signal also overrode the volume mute control on radio receivers so that the MAYDAY could be heard. The Merchant Shipping (Radio) (Fishing Vessels) Rules 1974 require that: "*At all times while a fishing vessel ... is at sea, continuous watch on 2182 kHz shall be maintained at the place on board from which the fishing vessel is normally navigated. Such watch may be kept by means of a loudspeaker watchkeeping receiver provided with a selective response ....*". The range of the 2182 kHz transmissions extends some 150 to 200 miles from shore. The complete lack of response from fishing vessels to these broadcasts indicates a widespread disregard for continuous radio watches on 2182 kHz. This is a major safety issue which the owners and skippers of UK fishing vessels have to address.

The Coastguard relies totally on the response of those at the scene to provide them with the information from which they can identify the positions, types and names of all the vessels which are in the vicinity. Without this information they are "blind" to the true situation. The skippers of fishing vessels are strongly advised to alert the Coastguard if they find themselves in circumstances which could be hazardous to the safety of their vessel. Had the Coastguard been forewarned that WESTHAVEN was snagged and attempting to pull

her gear clear they could have maintained regular radio communications with her. When she failed to respond to their calls the Coastguard would have been prepared to make immediate plans to conduct a search.

The Second MAYDAY Relay

The MAYDAY was re-broadcast at 1551. A helicopter on transit from the SCOTT platform was requested by the MRCC to overfly the location of the EPIRB transmissions. It was reported that the signals were strongest in the position 58°26.9'N 00°02.2'E, about one and a half miles to the south of the position where the wreck of WESTHAVEN was later found. A search around this position was started at 1631 for 90 minutes by the daughter craft from EMERALD BAS and SUN BAS, but failed to find anything. The daughter craft were not equipped to home in on the 121.5 MHz transmissions, so locating the beacon would have been very difficult.

This was the first occasion that a search had been conducted in the immediate area of the EPIRB transmissions, some 5 hours after the MRCC had received notification of the first hit at 1124.

The Delay to the Close Search

The isolated 121.5 MHz transmission which was picked up at about 1010 on the morning of 10 March probably indicates the approximate time when WESTHAVEN capsized.

Had the EPIRB database provided accurate and up to date information the search and rescue operation could have identified the source of transmissions as WESTHAVEN AH190, and established her position with reasonable accuracy far sooner than actually occurred. The balance of probability is that a search in the vicinity of the sinking would have commenced by 1300.

Survivability

It is not known whether any of the crew escaped alive and uninjured when the vessel capsized. Had any survived the immediate capsize they would have been in the water without a liferaft, life-jackets or survival suits. How long an individual could have survived in this situation in water at a temperature of 8.5°C is highly dependent upon the characteristics of the individual concerned. Based on an analysis of several MAIB investigations the view held within the Branch is that survival times for fishermen in water, without life-jackets or other means of support, are measured in minutes rather than hours. The Determination in the FAI shared this view.

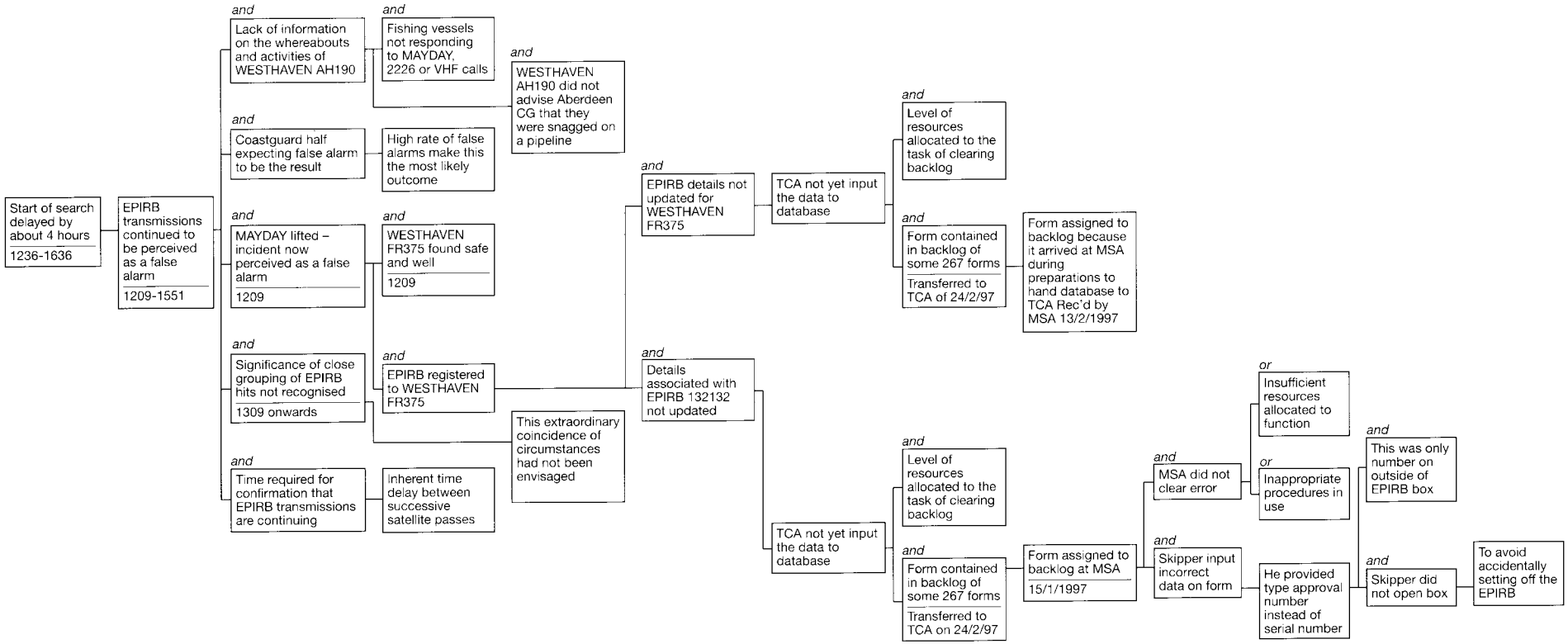
The delay to the start of the close search of the accident scene did not contribute to the loss of the lives of the three crew. Had the close search not been delayed and had started at 1300, any survivors would have been in the water for about three hours by then and succumbed to the cold.

2.8 EPIRB REGISTRATION PROCEDURES

Many factors combined to delay the start of the search in the right area, as FIGURE 19 shows, and especially the out of date registration data for EPIRB 132132.

There were two necessary and independent conditions which had to be met for EPIRB 132132 to have been incorrectly attributed to WESTHAVEN FR375. The first condition was the failure to update the database record for EPIRB 132132 to reflect the change of

Figure 19: **Factors contributing to the delayed start of the search**



ownership of WESTHAVEN. The second condition was the failure to reflect the change of ownership for the fishing vessel CRYSTAL RIVER and register her under the new name WESTHAVEN, and port number FR375. Had either record been updated correctly the initial confusion experienced on 10 March 1997 would not have occurred; since whenever a database EPIRB record is updated with a new vessel name and port number a check is made to ensure the details given are not duplicated.

Neither record had been updated because a backlog of some 250+ EPIRB registration forms had built up in the MSA. This comprised predominantly of registration forms requiring additional work prior to being entered to the database. Information was either missing from these forms, or was in error. Clearing these was potentially time consuming. Notwithstanding these difficulties, the MSA should have dealt with the matter promptly.

The registration of EPIRBs was (and is) voluntary. This may explain in part why clearing the backlog of registration forms was neglected in favour of other (mandatory) tasks. A means of ensuring the future effectiveness of the register would be to make EPIRB registration mandatory. IMO Resolution A764(18) *Establishment, Updating and Retrieval of the Information contained in the Registration Databases of Satellite EPIRBs*, which was adopted in November 1993, recommends: *"All 406 MHz and L-band EPIRBs should be registered. Every state requiring or allowing the use of 406 MHz or L-band EPIRBs should make suitable arrangements for the registration of these EPIRBs and appropriately enforce EPIRB registration, possibly as part of a wider communication facilities registration . . ."*

On 24 February 1997 responsibility for the EPIRB registration database passed from the MSA to The Coastguard Agency. It was TCA which, on 9 March, finally entered the data on WESTHAVEN AH190 originally received by the MSA on 15 January. The COSPAS-SARSAT number was computed on the basis of the incorrectly supplied data, thus an erroneous number was derived. This was the basis for the information passed to MRCC Aberdeen at 2054 on 10 March by MRCC Falmouth.

TCA staff did not recognise that the data supplied was incorrect due to their relative inexperience, and because the MSA had not highlighted the error on the form before it was transferred. Prior to the transfer of the database TCA staff had received 2 days training in the actual processing of EPIRB registration forms. TCA had treated the registration of EPIRBs as a data processing task. It is important that the data on the registration forms is checked by someone with sufficient experience to recognise misleading data.

On 3 January the Skipper of WESTHAVEN AH190, incorrectly entered the UK type approval number (KM 512) for his EPIRB on the registration form instead of the manufacturer's serial number (1060). The data was supplied to MSA on a standard registration form, (FIGURE 20).

The number given by the Skipper was the only official number on the outside of the EPIRB case (Figure 21). There were no instructions as to where he could find the correct serial number.

Understandably, the Skipper might have been reluctant to open the GRP case to access the EPIRB itself in case he activated it. It is unlikely he opened the GRP case, because had he done so, he would most likely have recorded the SERPE-IESM serial number 321762 (FIGURE 22), as it was labelled "serial number". This number would also have been incorrect. The number actually required was labelled Radio call sign or MMSI, and was part of the alphanumeric grouping: UK 1060FH/132132 (FIGURE 22). Very few people could

Figure 20: **406 MHZ EPIRB Registration Form**

ENTERED 15 JAN 1997

406 MHZ EPIRB REGISTRATION FORM

COSPAS/SARSAT NUMBER
Please leave blank 131584

==========

TO BE COMPLETED:-

NAME OF VESSEL WESTHAVEN

TYPE OF VESSEL (Please circle)MERCHANT/FISHING/PLEASURE

FISHING VESSEL IDENTITY NUMBER ~~ER375~~ AH 190 **CALLSIGN 2JPB**

MANUFACTURERS NAME AND BEACON TYPE (From beacons label)
KANNAD 406 FH MTI - 016

MANUFACTURERS SERIAL NUMBER (From beacons label)
No KM 512

DETAILS OF OWNER.

NAME MR GEORGE PATTISON

ADDRESS 36 GOWAN STREET,ARBROATH,ANGUS.

TELEPHONE NUMBER 01241 873292

SIGNATURE G Pattison

DATE 3/1/97

ALTERNATIVE CONTACT
(IE AGENT)

NAME ARBROATH FISHERMENS ASSOCIATION

ADDRESS 2 MARKETGATE,ARBROATH,ANGUS,DD11 1AY

TELEPHONE NUMBER DAY 01241 872928.NIGHT 01241 872243
FAX 01241 875442
BOATS CELLPHONE 0831 265637

NOTE;- IF NO ACKNOWLEDGEMENT RECEIVED AFTER TWO WEEKS CONTACT ADDRESS BELOW

RETURN COMPLETED FORM TO

MARINE SAFETY AGENCY
EPIRB REGISTRATION
SPRING PLACE
105 COMMERCIAL ROAD
SOUTHAMPTON
SO15 1EG
TELEPHONE 01703 329146
FAX 01703 329161

Figure 21: Top of EPIRB GRP case showing UK type approval number

Figure 22: Close up of EPIRB labelling

have provided the correct number for EPIRB 132132 to the MSA, because the category label on the registration form did not correspond with the labelling on the EPIRB itself. This anomaly was recognised by TCA immediately following the WESTHAVEN accident and a letter was sent out on 26 March to all manufacturers of UK type approved EPIRBs drawing their attention to the problem and suggesting additional labelling.

On this same aspect, IMO Resolution A764(18) recommends that: "*Means should be provided for the EPIRB licensee, owner or ship's master to easily and expediently update emergency information in the registration database*". A senior officer in TCA has suggested one long term solution to the problem would be for each EPIRB to have a registration document similar to that required for cars. A tear off slip with the new details would have to be returned to TCA on a change of ownership. The registration certificate could be a radio survey item and retained as part of the vessel's documentation. Such a system would, if implemented and maintained, significantly reduce erroneous EPIRB registration data. A review should be undertaken to identify the most appropriate means by which changes to EPIRB data can be reported.

The investigation was concerned about the general level of accuracy of information held in the database. IMO Resolution A764(18) recommends: "*Database maintainers should contact the EPIRB licensee or owner, or both, at least every two years to confirm the database information is accurate.*" The earliest records held in the EPIRB database extend back about 10 years. As far as the Inspector has been able to establish, this data has never been validated in the manner recommended by IMO. An attempt was made to establish a system of two-yearly updates in 1991/92. It was discontinued due to a lack of resources. This inability to validate the records did not, however, have any bearing upon this case. The database now holds details on over 7000 records. Unless the accuracy of the information held is properly maintained, the database could, as this tragic case has demonstrated, become a liability rather than an asset to saving life at sea.

Since the accident TCA are taking appropriate measures to address this concern. TCA has set up a two-year validation check and is in the process of validating the database information to ensure that it complies with the IMO resolution.

SECTION 3
Conclusions

3.1 FINDINGS

Capsize and Stability

1. WESTHAVEN AH 190-capsized at approximately 1010 on 10 March 1997, and sank shortly afterwards in position 58°28'N 00°01'E. All four members of her crew lost their lives. [1.9, 2.1]

2. The capsize occurred rapidly and without warning, allowing no time for a radio distress message to be transmitted. [2.1]

3. The vessel capsized during an attempt to free the port trawl door which was caught against the PIPER to Flotta 30" oil pipeline. [2.1]

4. The capsize was induced by the tension in the port trawl warp, caused by some unknown combination of winch pre-tension, swell and propeller thrust. [2.2]

5. The Skipper had been in command of WESTHAVEN for 3 months, following a period of about 20 years in another vessel. [2.1]

6. In preparation for the attempt to free the port trawl door, the warp had been hauled short, so that the vessel was almost directly over the point where the port trawl door was caught.[2.1]

7. A tension in the port trawl warp in excess of about 10 tonne, caused by the efforts to pull the gear free, and acting at the port gallows block, capsized the vessel. [2.2]

8. The crew of WESTHAVEN would have been unable to release the port trawl winch drum brake as the vessel capsized. [2.1]

9. The crew of WESTHAVEN did not have had time to sever the port trawl warp. [2.1]

10. The stability of the vessel on 10 March 1997 met the requirements of the Fishing Vessels (Safety Provisions) Rules 1975. [2.2]

11. The vulnerability to capsize of a fishing vessel, under the loads which could be imposed during an attempt to free snagged gear, are not explicitly tested by the Fishing Vessels (Safety Provisions) Rules 1975. [2.2]

Means of Escape

12. The skipper of WESTHAVEN was unable to escape from his position in the wheelhouse. [2.1]

13. The sole means of escape from the wheelhouse was through the galley/mess area to the door in the aft bulkhead of the deckhouse. [2.1]

Liferafts

14. The two liferafts carried onboard WESTHAVEN remained attached to the vessel by their painters. [2.6]

15. It is not known whether lives would have been saved had the liferafts inflated on the surface, but without them the possibility of survival on 10 March was extremely remote. [2.6]

16. The hydrostatic release unit to the port liferaft had been installed incorrectly, so the weak link could not function. [2.6]

17. The hydrostatic release unit to the starboard liferaft could not be examined. [2.6]

18. Both the port and starboard liferafts had partially inflated. [2.6]

19. The poor stowage location for the liferaft containers caused one, possibly both, to become trapped, preventing them floating free until the vessel had sunk to a considerable depth. [2.6]

20. The decisive factor in the failure of the liferafts to inflate on the surface cannot be established. It was probably either the incorrectly installed weak links, or the liferaft containers were taken too deep before they floated clear of the vessel. [2.6]

21. The evidence shows that there was no intrinsic fault with the liferafts' inflation mechanisms which prevented them deploying as designed. [2.6]

22. With the exception of the Skipper, SFIA have no record of any member of the crew having completed the mandatory Basic Sea Survival training course. [1.6]

PIPER to Flotta 30" Oil Pipeline

23. The route of the pipeline was charted on the navigation system in use by WESTHAVEN. [2.4]

24. The pipeline is not buried but laid on the seabed, with inherent free spans. [2.1, 2.3]

25. The pipeline was undamaged by either the impact of the trawl door, or by the subsequent efforts to free it. [2.3]

26. The maximum free span heights in the vicinity of the trapped port trawl door were about 1.2m. [2.1]

Fishing Operation

27. WESTHAVEN was found on the seabed some 45m to the north of the PIPER to Flotta 30" pipeline. [1.9]

28. The port trawl door had passed to the south side of the pipeline, through a gap between the pipeline and the seabed. [2.1]

29. Immediately prior to the gear coming fast WESTHAVEN would have been to the

north of the Piper to Flotta oil pipeline. She was probably heading north west on a course parallel to, or slowly converging with, the oil pipeline. [2.1]

30. The skipper of WESTHAVEN should have been aware that he was trawling in close proximity to the pipeline, and that such activity was contrary to the advice given on the Admiralty chart. [2.4]

31. The Skipper had little experience of fishing the Fladen Grounds. [2.4]

32. The Skipper's usual fishing ground was relatively free of pipelines. [2.4]

Fishing Vessels and Underwater Pipelines

33. A pragmatic approach has developed so that fishing vessels and seabed pipelines can co-exist with a low level of hazard. The accident to WESTHAVEN necessitates a re-assessment of the risks, and their management. [2.5]

34. There is no record of any UK fishing vessel, prior to WESTHAVEN, being damaged or lost as the result of an incident with a pipeline. [2.5]

35. There is no record of any pipeline rupture in the North Sea due to the actions of a fishing vessel. [2.5]

36. The hazard to both the integrity of a pipeline, and the safety of a fishing vessel, is greatest when the vessel is trying to free gear caught on the pipeline. [2.5]

37. It would be most desirable, should a fishing vessel come fast on a pipeline, for no excessive force to be exerted to clear her gear. [2.5]

38. It is important that the Coastguard (for the safety of the vessel and her crew) and the pipeline operator (to check for any damage to the pipeline) are both informed when fishing gear becomes caught on a pipeline. [2.5]

39. A common framework could be developed for the handling of fishing gear incidents involving submarine cables and pipelines. [2.5.]

SEARCH AND RESCUE OPERATION

40. Had the Coastguard been forewarned that WESTHAVEN was snagged and attempting to pull her gear clear, they could have maintained regular radio communication with her. When she failed to respond to their calls the Coastguard would have been prepared to make immediate plans to conduct a search. [2.7]

41. The search for WESTHAVEN FR375 was initiated as soon as the EPIRB alert was received by MRCC Aberdeen, at 1124 on 10 March. [2.7]

42. The actions of the Maritime Rescue Co-ordination Centre at Aberdeen, in lifting the MAYDAY at 1209 on 10 March when WESTHAVEN FR375 was found, were entirely reasonable in the circumstances. [2.7]

43. The incident was treated as a false alarm from about 1210 to 1450. [2.7]

44. In 1996 the false alarm rate on EPIRB transmissions was about 98%. [2.7]

45. The time taken to deduce that the EPIRB was actually signalling a distress and not a false alarm, probably delayed the start of a close search of the accident scene by about 3½ hours. [2.7]

46. The significance of the relatively close grouped EPIRB hits was not recognised. [2.7]

47. If MRCC Aberdeen had been given information on the existence, and likely whereabouts of WESTHAVEN AH190 early on, the delay to the start of the close search might have been avoided. [2.7]

48. The investigation is satisfied that the senior Coastguard watch officers on duty during this emergency acted to the best of their ability. [2.1]

49. The delay to the start of the close search of the accident scene did not contribute to the loss of the lives of the three crew. [2.7]

50. No fishing vessel responded to the MAYDAY relay broadcast at 1146 on 2182 kHz, and at 1157 on NAVTEX. [2.7]

51. No fishing vessel responded to the MAYDAY relay broadcast at 1551. [1.3]

52. One fishing vessel responded to the MAYDAY relay which was broadcast on Inmarsat at 1706. [1.3]

53. The widespread disregard for continuous radio watches on 2182 kHz amongst fishing vessels is a major safety issue which both owners and skippers have to address. [2.7]

54. The report commends the humane and brave actions of the volunteer saturation divers from CSO ORELIA: Mr S Silcock, Mr J Dixon and Mr P Ryan for recovering the body of Mr George Pattison from the wreck. It was a difficult operation, greatly helped by the careful planning and oversight of the team onboard CSO ORELIA. [1.3]

EPIRB Registration

55. The transmitting of the EPIRB was incorrectly attributed to WESTHAVEN FR375, primarily because the MSA had allocated insufficient resources to properly maintaining the database. [2.8]

56. The EPIRB registration form completed by the Skipper on 3 January 1997 was incorrect because of the mis-match between the EPIRB labelling and the category labels on the standard EPIRB registration form, issued by the MSA. [2.8]

57. The validity of the data held in the EPIRB database had not, at the time of the accident, been comprehensively checked since it was begun more than 10 years previously. IMO recommends that all records should be checked at least every 2 years. TCA has subsequently initiated a two-yearly validation check and is in the process of validating the database to ensure compliance with IMO resolution A764(18). [2.8]

3.2 CAUSES

The Immediate Cause of the Accident

WESTHAVEN capsized as her crew attempted to free the trapped port trawl door from the PIPER to Flotta 30" pipeline. Excessive force exerted by the port trawl warp on the port gallows, caused by a combination of winch pre-tension, swell and propeller thrust, pulled the vessel over.

Factors Contributing to the Capsize

The chain of events which resulted in the capsize of WESTHAVEN, with the loss of all four of her crew, was precipitated by two fundamental factors:

- WESTHAVEN was trawling close to a seabed pipeline on a course which was parallel to, or slowly converging with, the pipeline;

- The pipeline in question had free spans of sufficient height to allow the port trawl door to pass beneath, and become trapped on, the opposite side.

SECTION 4
Recommendations

Two sets of recommendations were made during the course of the inquiry; a MAIB safety notice, and those arising from the Fatal Accident Inquiry held in Aberdeen in March and April 1998.

In May 1997 the MAIB issued the following notice to the fishing industry:

"TRAWLING CLOSE TO PIPELINES CAN BE DANGEROUS"

"Do not underestimate the dangers involved when fishing close to seabed oil or gas pipelines. There is a risk that the fishing gear may become fast on the pipeline in a manner which is impossible to free. It is known that trawl doors can pass completely underneath a pipeline (between the pipeline and the seabed) and become fast on the side away from the trawler. In these circumstances a trawler can easily be capsized when attempting to free the gear. Contact the Coastguard whenever you come fast on the seabed so that they can keep in regular radio contact with you – if no response is received the Coastguard will initiate enquiries to establish the safety of the vessel."

The Determination in the Fatal Accident Inquiry into the deaths of the crew of WESTHAVEN also contained a number of safety recommendations. All are consistent with this report and are fully supported by the MAIB. The relevant section of the Determination, containing the full text of the recommendations, is reproduced in ANNEX 7.

This report makes further safety recommendations. Each contains a reference to the section(s) of the report which supports its inclusion. Where a supporting recommendation, or statement, has been made in the Determination in the FAI, reference is also made to this. For ease of reference they have been grouped together under generic headings.

4.1 CAPSIZE AND STABILITY

The **Maritime and Coastguard Agency** to consider incorporating within the fishing vessel regulations, a requirement that all trawlers are to be so equipped that the immediate relaxation or severing of their trawl warps is possible in extremis. [3.1.8, 3.1.9]

The **Maritime and Coastguard Agency** and **Sea Fish Industry Authority** to conduct an evaluation of explosive wire cutters and other devices, which could be installed on fishing vessels for the emergency release of trawl gear. [3.1.8, 3.1.9]

4.2 MEANS OF ESCAPE

The **Maritime and Coastguard Agency** to consider whether the existing requirements for means of escape on fishing vessels should be revised, to ensure that in the event of a capsize, the occupants of the wheelhouse have an escape route immediately close to hand. [3.1.12, 3.1.13]

4.3 LIFE RAFTS

The **Scottish Fishermen's Federation**, the **National Federation of Fishermen's Organisations,** and the **Northern Ireland Fishermen's Federation**, to conduct through their training organisations, a safety campaign on the correct installation of liferaft hydrostatic release units on fishing vessels. [3.1.17, Determination 12.1 (e)]

The **Maritime and Coastguard Agency:**

.1 To review as a matter of urgency, the most effective way of minimising the risk of liferaft hydrostatic release units being incorrectly installed on any fishing vessel. [3.1.17, Determination 12.1(e)]

.2 To take appropriate measures to ensure that liferaft containers on fishing vessels are not located within the confines of any constructions which could restrict their movement in the event of a capsize. [3.1.19, Determination 12.1 (h)]

4.4 PIPER TO FLOTTA 30" OIL PIPELINE

The **Health and Safety Executive** and the **Department of Trade and Industry** to consider whether the free spans under the pipeline should be removed by the pipeline operator, or reduced in their extent so that the possibility of a trawl door passing underneath the pipeline in the future is minimised. [3.1.26, 3.1.28, Determination 9.7 states: ... *now that the cause of this accident has been clearly established the stable and known free-span at this particular location must be considered in the light of the possibility of a trawl door becoming trapped underneath it.*]

4.5 FISHING VESSELS AND UNDERWATER PIPELINES

The **Maritime and Coastguard Agency**, the **Department of Trade and Industry**, the **Health and Safety Executive**, the **United Kingdom Offshore Operators Association**, the **Scottish Fishermen's Federation**, the **National Federation of Fishermen's Organisations** and the **Northern Ireland Fishermen's Federation**

To consider what improvements can be achieved to both the safety of fishermen and of oil/gas pipelines by adopting/adapting some of the methods used by the submarine cable industry, or by the introduction of entirely new practices. The issues to be addressed should include: free spans; procedures for fishermen to follow if they do come fast on a pipeline; information on vulnerable pipelines; information on hazardous pipelines; the nature of the pipeline warnings on charts; how to encourage the reporting of snagging incidents, which could give an early warning of the development of a situation potentially dangerous to both the fishing vessel and the pipeline. [3.1.33, Determination 12.1(b), (c), (f), and (g)]

4.6 SEARCH AND RESCUE OPERATION

The **Maritime and Coastguard Agency:**

.1 To review the training requirements for senior watch officers in the light of the WESTHAVEN incident. Improved procedures for discriminating between EPIRB false alarms and real alerts to be given a high priority. [3.1.46]

The **Maritime and Coastguard Agency**, the **Scottish Fishermen's Federation**, the **National Federation of Fishermen's Organisations** and the **Northern Ireland Fishermen's Federation**:

.2 To investigate how fishing vessel skippers could be encouraged to meet their statutory obligation to monitor the distress radio frequency of 2182 kHz. [3.1.53]

.3 To undertake a publicity/training campaign to encourage skippers to alert the Coastguard in the event of their trawl gear becoming seriously fast on the seabed to enable the Coastguard to monitor the safety of the vessel concerned. [3.1.40]

4.7 EPIRB REGISTRATION

The **Maritime and Coastguard Agency:**

.1 To undertake a complete validation of the data held in the EPIRB database. On the completion of this exercise each record should be re-validated at an interval of less than two years. [3.1.58]

.2 To consider revising the existing regulations to make the registration of EPIRBs mandatory. [3.1.55]

.3 To revise the existing arrangements and documentation for EPIRB registration, in order to eliminate any confusion of terms between the registration document and the EPIRB labelling and to provide an accurate and simple method of registering a change of ownership. [3.1.56, Determination 12.1 (a) and (i)]

Glossary of Terminology

Action Data System	The system used by TCA to maintain a communications log during an incident
COSPAS-SARSAT	A system of polar orbiting satellites for the detection of EPIRB signals
Emergency Position-Indicating Radio Beacon	A portable beacon device that floats free of a sinking vessel and transmits two radio signals to passing satellites. The intermittent signal on 406 MHz frequency contains a code identifying the country of origin of the vessel and its unique identification number. The continuous signal on 121.5 MHz can be "homed" onto by aircraft and some ships
Free span	A section of pipeline not in direct contact with the seabed
Gallows	The structure from which the block for the trawl warp hangs
INMARSAT	International Maritime Satellite communications network
Hydrostatic Release Unit	Releases the liferaft at a prescribed depth
kilo-Hertz	A measure of radio frequency, one thousand cycles per second
Local User Terminal	A ground station which tracks the COSPAS-SARSAT satellites
MAYDAY	Radio distress call
Mission Control Centre	Run by the RAF, it receives notification of distress signals from the LUT and distributes them to the appropriate rescue co-ordination centre
Mega-Hertz	A measure of radio frequency, one million cycles per second
NAVTEX	A radio communications system providing printed information on weather, navigation or safety. Range approximately 400 miles
Safety standby vessel	A vessel which attends at all times within a prescribed distance of an offshore platform for the specific purpose of rescuing survivors in the event of abandonment of the platform, or where personnel have fallen off it
Template	A seabed complex of valves around a well head

ANNEXES

ANNEX 1

The Processing of EPIRB Transmissions within the UK

The international co-operative search and rescue system which utilises satellites to locate and detect emergency radio beacons (which may be carried by ships, aircraft or individuals) is called COSPAS-SARSAT. The satellites are provided by the USA, Canada, France and Russia. Many other nations, including the UK, provide satellite monitoring sites termed Local User Terminals (LUTs) and Mission Control Centres (MCCs).

The EPIRBs commonly installed on UK fishing vessels transmit on 121.5 MHz and 406 MHz when activated. The EPIRBs should, ideally, only be activated when a vessel is in distress and in need of immediate assistance. There is a high false alarm rate. During 1996 The Coastguard Agency (TCA) dealt with over 460 alerts from emergency beacons. Of these, 449 were false alarms; a rate of about 98% (false alarm rate on 406 MHz about 96%, on 121.5 MHz about 100%).

The fundamental reason why initial alerts on 121.5 MHz detected by a single satellite are not passed is because of the ambiguity in the Doppler positions produced by the satellite (referred to in Annex 5, paragraph 1). The real position and the mirror-image require to be resolved. The ambiguity cannot be resolved by a single satellite; additional information is required, usually a different satellite pass or information from alternative means. The alternative means could be a high flying aircraft detecting the beacon signals but, in this case, the relative positions of the A and B solutions from the aircraft must be such that one solution is definitely within range of the aircraft radio, the other definitely not. Generally, aircraft reporting beacon signals are at an altitude of over 30,000 feet, where the potential reception range of the beacon is over 100 miles. In the case of the 1010 alert reported by the Algerian MCC, ambiguity could not be resolved by this means.

The reason why a 406 MHz alert is transmitted on the first hit is because the encoded data enables the information on the database to be checked and investigations to be carried out accordingly. It is frequently possible at this stage to determine whether the alert is a false alarm or not. If there is a possibility that the beacon marks a real incident, planning may be commenced in anticipation of the next satellite pass confirming the location.

The 406 MHz transmission, which is intermittent, carries the unique identification number for the beacon. It can also allow the computers at the LUT to calculate the location of the beacon. The 121.5 MHz signal, which is continuous, carries no information about the identity of the beacon. However, since it is a continuous signal it can be "homed" on by aircraft or vessels with radio direction finding equipment. It too can allow the computers at the LUT to calculate the location of the beacon but with an accuracy of about 3 to 4 times less than that of the 406 MHz signal.

After an EPIRB is activated, its transmissions should be picked up at some time by one of the COSPAS-SARSAT satellites. Precisely when the transmissions will be picked up depends upon the location of the beacon relative to the satellites. The satellites orbit the earth from pole to pole and each can only "see" the beacon when it is in a direct line of sight. The average time between beacon activation and the signal being picked up by a satellite was found to be about 44 minutes in a worldwide exercise of the COSPAS-SARSAT system in 1990.

The transmissions are relayed to the LUTs, where computers calculate the estimated position of the beacon and de-code the unique identification number contained in the 406 MHz signal, if this has been picked up. The information is then passed directly to the UK Mission Control Centre (UKMCC), which is manned by Royal Air Force personnel. The UKMCC analyse the information and pass it on to the appropriate rescue co-ordination centre. In the case of a marine emergency it would be passed to the Maritime Rescue Co-ordination Centre at Falmouth, which is part of The Coastguard Agency. The UKMCC also use the unique identification number carried by the 406 MHz signal to look up in their database the identity of the vessel on which the beacon was carried. This information is also passed to MRCC, Falmouth.

Note: this was effectively the system which was in operation at the time when WESTHAVEN was lost. At that time the EPIRB database was updated by information contained on floppy-disks sent periodically by the MSA. Since April 1997, however, this system has changed. A PC with a modem was acquired by the UKMCC which enabled them to connect with the EPIRB database, by then maintained by MRCC Falmouth. A full database download is now carried out electronically each Monday to Friday night to ensure that the UKMCC copy of the database mirrors as closely as possible the original held at Falmouth.

MRCC, Falmouth then forward the information to the MRCC covering the area in which the distress has occurred. In the case of WESTHAVEN this was MRCC, Aberdeen.

The COSPAS-SARSAT satellite passes which were monitored by the UK LUT during the period from about 0930 to 1700 on 10 March 1997 are shown in FIGURE A1.1.

Figure A1.1: **COSPAS-SARSAT satellite passes monitored by UK on 10 March 1997**

Satellite	Time satellite acquired	Time satellite lost	Duration of tracking (minutes)
SARSAT 2	0929	0943	14
COSPAS 4	0943	0957	14
SARSAT 4	0948	1001	13
COSPAS 6	1003	1017	14
SARSAT 6	1044	1054	10
SARSAT 2	1109	1125	16
COSPAS 6	1147	1202	15
SARSAT 6	1221	1236	15
SARSAT 2	1251	1303	12
SARSAT 6	1402	1417	15
SARSAT 3	1429	1440	11
COSPAS 7	1442	1451	9
COSPAS 4	1515	1525	10
SARSAT 6	1547	1556	9
SARSAT 3	1606	1621	15
COSPAS 7	1620	1637	17
SARSAT 4	1623	1631	8

ANNEX 2

Stability Terminology and Principles

1. The centre of gravity "G", of a body or vessel, is the point through which the force of gravity is considered to act vertically downwards with a force equal to the weight of the body or vessel. The centre of gravity will move within a vessel as weights are loaded, discharged or moved within. Liquids within a vessel, if free to move around in their compartments, will cause the centre of gravity to move with the flow of the liquid. This has the same effect as raising the centre of gravity within a vessel (decreasing its stability) and is referred to as a "virtual rise in centre of gravity".

2. The centre of buoyancy "B" is the point through which the force of buoyancy is considered to act vertically upwards with a force equal to the weight of the water that the vessel displaces. It is the centre of gravity of the underwater volume of the body.

3. To float at rest in still water, a vessel must displace a volume of water equal to the weight of the vessel, and the centre of gravity "G" must be in the same vertical line as the centre of buoyancy "B" (see Figure 1). The letter "K" denotes the keel.

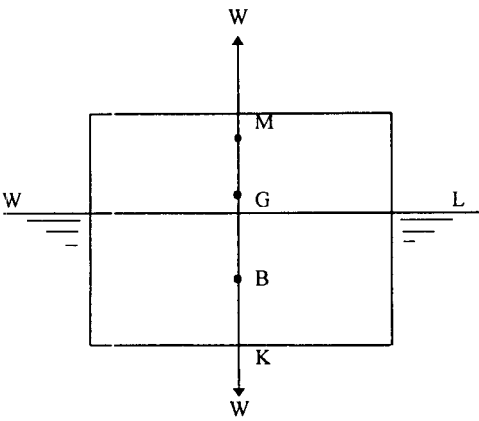


Figure 1

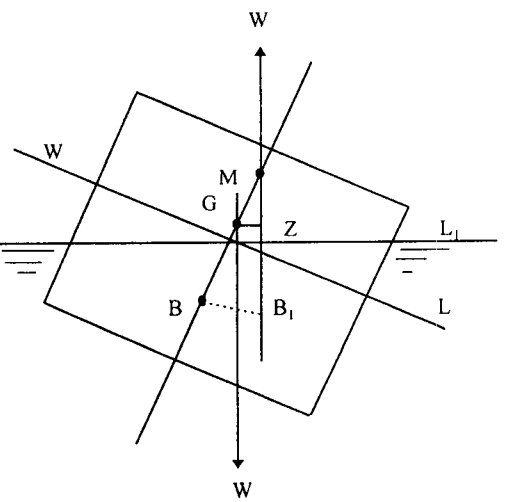


Figure 2

4. If the vessel is inclined by an external force to a small angle as shown in Figure 2 the centre of gravity G will remain static (assuming there is no internal shifting of weights) and the weight of the vessel "W" is considered to act vertically through this point. The centre of buoyancy "B", being the centre of gravity of the underwater volume, will move from B to B_1.

5. For angles of heel up to about 15°, the vertical through the centre of buoyancy may be considered to cut the centre line at a fixed point. This point is known as the initial metacentre "M".

6. The height of the initial metacentre above the keel depends on the vessel's underwater form and the surface water plane area. M is considered to remain stationary for small angles of heel. When a large angle of heel, or an excessive change in trim, significantly changes the underwater form and the water plane area, then the position of M will change and calculations are made using the more complicated "large angle stability" method.

7. The vertical distance between G and M is referred to as the metacentric height "GM". As long as G remains below M the vessel has a positive metacentric height, or positive "GM".

8. A ship is in stable equilibrium if, when inclined, it tends to return to the initial position. For this to occur G must remain below M.

9. Figure 2 shows the vessel inclined at a small angle. The centre of buoyancy moves from B to B_1 to take up a new centre of gravity of the underwater volume and the force of buoyancy is considered to act vertically upwards through B_1 and the metacentre M. If the forces acting around G are summed, then there is a force or moment acting to return the vessel to the upright position. This force or moment is referred to as "the moment of statical stability" and is equal to the product of the force W and the length of the imaginary righting lever GZ.

10. When a vessel, which was inclined to a small angle of heel tends to heel still further, it is in "unstable equilibrium" where the centre of gravity is above the metacentre and has a negative GM. The ship will not stop inclining until G and M coincide (see Figure 3). While G stays above M, the imaginary lever GZ now forms a capsizing lever.

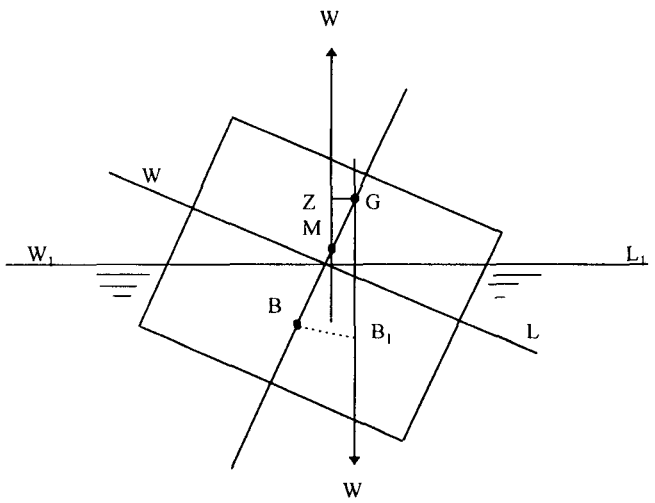


Figure 3

11. The distance GM or metacentric height is sometimes referred to as a measure of a vessel's stability but this will apply only to small angles of heel when GM can be considered to be constant. A better measure of stability is the GZ lever. For small angles of heel Ø, GZ = GM sin Ø and GZ is thus zero when the heel is zero. GZ increases as the heel increases (as long as the formula holds good) showing that the vessel's stability varies with angle of heel. GM, however, remains constant.

12. This measure of a vessel's stability can be represented by plotting a graph of the value of GZ, the righting lever, in metres, against various angles of heel in degrees. This plot is known as the "GZ curve" and the area under the curve, in metre-degrees, is used in various regulations as a parameter by which to specify requirements for a vessel's stability.

13. From the GZ curve can be determined:

- The range of stability and the angle of vanishing stability.
- The maximum GZ, the angle at which it occurs and the righting moment.
- The GZ and righting moment at any angle.
- The angle of deck-edge immersion.
- The initial value of GM.

14. The range of stability is the range over which the vessel has positive righting levers. The angle of vanishing stability is the angle of heel at which the sign of the righting lever changes from positive to negative.

15. The angle of heel at which the deck-edge becomes immersed provides a point of inflexion on the GZ curve. This is where the rate of increase, or slope, of the curve reaches its maximum value, i.e. where the slope (gradient or tangent) reaches its steepest.

Annex 2 reproduced by kind permission of the New Zealand Transport Accident Investigation Commission

ANNEX 3

The Estimated Loading Condition of WESTHAVEN AH190 on 10 March 1997

The Fishing Vessel (Safety Provisions) Rules 1975 prescribe the standard of stability that all UK fishing vessels of over 12 metres registered length must meet. A full stability hooklet for WESTHAVEN, which demonstrated that she met the regulations on stability, was approved on 27 November 1987 by the Department of Transport. Since this time, the stability of the vessel had hcen monitored at successive surveys by means of a roll test. The last roll test which had been conducted on WESTHAVEN took place on 18 June 1996.

A roll test is a fairly simple procedure: the vessel is presented in the fully laden depart port condition; she is inade to roll and by timing a number of rolls her roll period is determined. Her freeboard is also measured. The measured data is input to a standard set of forinulae to determine: i) an estimate of the metacentric height of the vessel (GM actual); and ii), the "book value" of the required metacentric height (GM required). The stability of the vessel is generally considered to be satisfactory if GM actual is greater than or equal to GM required.

The test conducted on 18 June 1996 determined that the GM required was 0.727m (recorded in error as 0.827m in the MSA's records), while the GM actual was 0.826m. This result indicated that the stability of the vessel was in excess of that required by the regulations.

Figure A3.1: Deadweight Table

DEADWEIGHT TABLE

Vessel....: WESTHAVEN AH190
Condition.: STEAMING CONDITION
State.....: Hull without added appendages
Water SG..: 1.025

Longitudinal dimensions about STATION 0, AP (-ve aft, +ve forward)
Vertical dimensions about UNDERSIDE OF KEEL (+ve above, -ve below)
Transverse dimensions about centreline (+ve Port, -ve Stbd)

	Deadweight Item	Weight tonnes	LCG metres	Longitudinal moment t.m	TCG metres	Transverse moment t.m	VCG metres	Vertical moment t.m	Free Surface moment t.m
1	O.F. TANK PORT	3.000	5.836	17.508	1.920	5.760	2.571	7.713	0.539
2	O.F.TANK STARBOARD	3.000	5.836	17.508	-1.920	-5.760	2.571	7.713	0.539
3	FW TANK	1.400	16.012	22.417	0.000	0.000	1.567	2.194	2.226
4	CREW & EFFECTS	0.500	5.000	2.500	0.000	0.000	4.000	2.000	0.000
5	PROVISIONS	0.160	5.000	0.800	0.000	0.000	4.400	0.704	0.000
6	SPARE GEAR	0.500	17.640	8.820	0.000	0.000	2.750	1.375	0.000
7	NET AND GEAR	2.000	1.700	3.400	0.000	0.000	5.200	10.400	0.000
8	MT BOXES DK	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9	MT BOXES HOLD 250	2.040	12.600	25.704	0.000	0.000	2.710	5.528	0.000
10	ICE	6.000	12.600	75.600	0.000	0.000	2.140	12.840	0.000
11	BOXED FISH AND ICE 10	0.500	12.600	6.300	0.000	0.000	2.710	1.355	0.000
	DEADWEIGHT TOTAL	19.100	9.453	180.557	0.000	0.000	2.713	51.822	3.304
	LIGHTSHIP	114.000	9.059	1032.726	0.000	0.000	3.016	343.824	-
	DISPLACEMENT	133.100	9.116	1213.283	0.000	0.000	2.973	395.646	3.304
	Free Surface Correction (Total Free Surface Moment/Displacement)						0.025		
	VCG fluid						2.997		

The estimated loading condition of the vessel on the morning of her loss is presented in FIGURE A3.1. In this condition the vessel met the stability requirements of the Fishing Vessels (Safety Provisions) Rules 1975, as shown in FIGURES A3.2 and A3.3.

Figure A3.2: **Sailing State**

SAILING STATE

Vessel....: WESTHAVEN AH190
Condition.: STEAMING CONDITION
State.....: Hull without added appendages
Water SG..: 1.025

DRAFT SUMMARY (DIMENSIONS IN METRES)	Maximum	Actual
Draft forward (about Base Line at FP)	-	2.314
Draft midships LBT (about Base Line)	-	2.745
Draft aft (about Base Line at centre-line rudder stock)	-	3.177

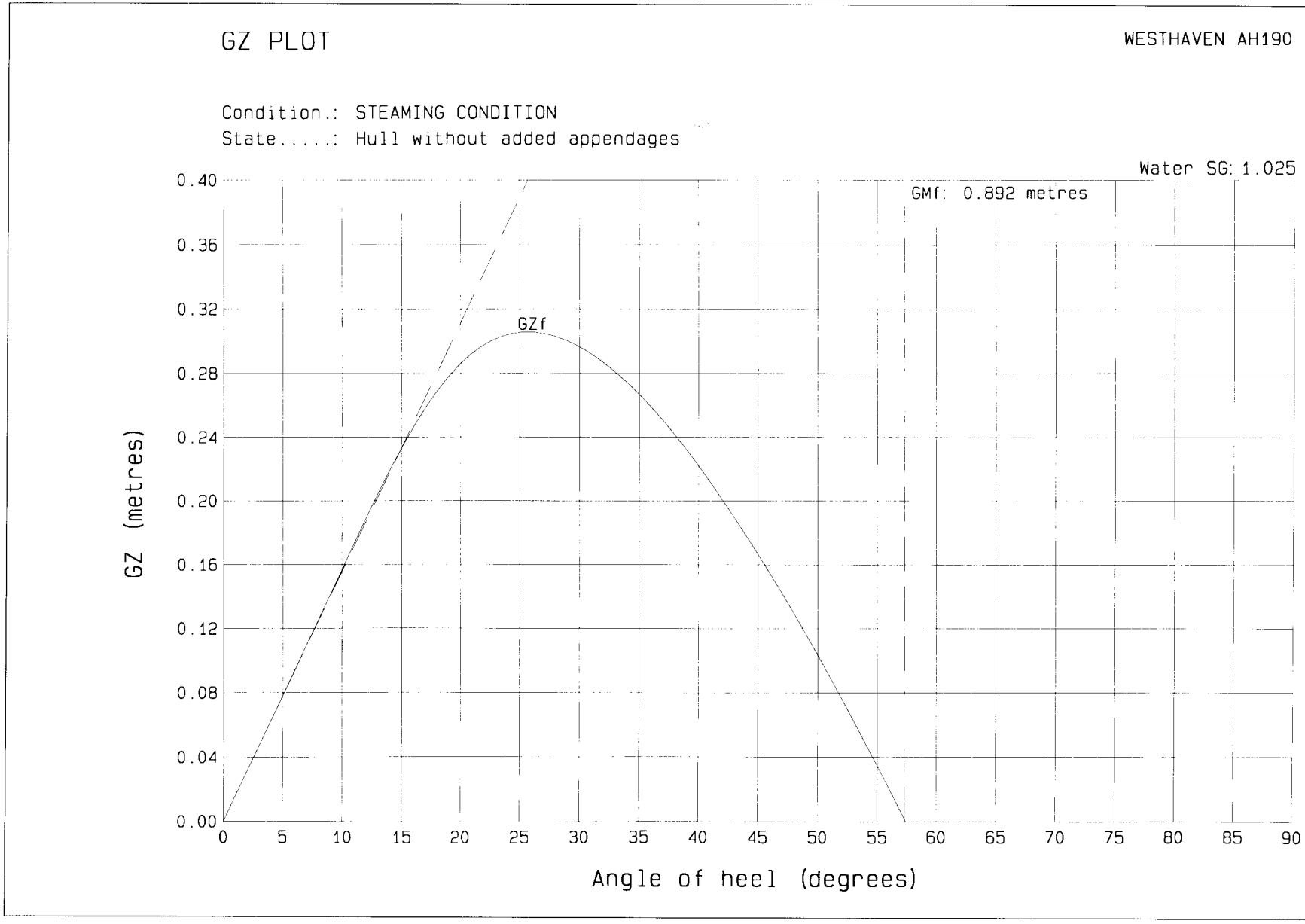
FREEBOARD SUMMARY (DIMENSIONS IN METRES)	Minimum	Actual
Freeboard at FP to main deck edge	1.340	2.441
Freeboard at midships LBT to main deck edge		0.851
Freeboard at centre-line rudder stock	0.915	0.839

STABILITY DATA

Heel angle degrees	Trim about Base Line metres on LBP	Draft at midships LBP about Base Line	KN metres	KGxSIN(Heel) metres	Righting moment tonne.metres	GZ fluid metres
0	0.899 by stern	2.763	-0.000	0.000	-0.000	-0.000
5	0.891 ''	2.750	0.339	0.261	10.384	0.078
10	0.876 ''	2.710	0.678	0.520	20.902	0.157
15	0.855 ''	2.644	1.009	0.776	31.065	0.233
20	0.840 ''	2.558	1.311	1.025	38.085	0.286
25	0.844 ''	2.459	1.572	1.267	40.670	0.306
30	0.861 ''	2.347	1.795	1.499	39.470	0.297
35	0.886 ''	2.220	1.986	1.719	35.507	0.267
40	0.911 ''	2.079	2.149	1.927	29.560	0.222
45	0.934 ''	1.926	2.286	2.119	22.174	0.167
50	0.951 ''	1.762	2.399	2.296	13.759	0.103
55	0.961 ''	1.587	2.490	2.455	4.600	0.035
60	0.970 ''	1.402	2.559	2.596	-4.901	-0.037
65	0.976 ''	1.209	2.608	2.717	-14.492	-0.109
70	0.974 ''	1.010	2.636	2.817	-24.007	-0.180
75	0.962 ''	0.807	2.646	2.895	-33.202	-0.249
80	0.935 ''	0.603	2.637	2.952	-41.931	-0.315
85	0.889 ''	0.401	2.612	2.986	-49.801	-0.374
90	0.836 ''	0.202	2.574	2.997	-56.404	-0.424

STABILITY SUMMARY	Minimum	Actual
Area under GZ curve between 0.00 and 30.00 degrees (metre.radians)	0.055	0.106
Area under GZ curve between 0.00 and 40.00 degrees (metre.radians)	0.090	0.152
Area under GZ curve between 30.00 and 40.00 degrees (metre.radians)	0.030	0.046
Maximum GZ (metres)	0.200	0.306
Angle of heel at which maximum GZ occurs (degrees)	25.000	25.915
Positive GZ heel range (degrees)	-	57.433
GM solid (metres) (at angle of equilibrium)	-	0.917
Free Surface correction (metres)	-	0.025
GM fluid (metres) (at angle of equilibrium)	0.350	0.892

Figure A3.3: **Plot of righting levers (GZ)**



ANNEX 4

Extract from the MAIB Summary of Investigations no 2/95

17. THE LOSS OF A FISHING VESSEL AND THE STOWAGE OF LIFERAFTS

Narrative

A 16 metre wooden fishing vessel was being operated by a crew of five. Several hours after leaving its home port, and whilst on passage to its chosen fishing grounds, floodwater was noticed in the engine room. Initial attempts to arrest the flooding were unsuccessful and HM Coastguard was requested to assist.

A rescue helicopter and an RNLI lifeboat were on the scene very quickly. Most of the crew were immediately evacuated by the lifeboat but the Skipper remained on his vessel until just before it sank, when he too was taken off by the lifeboat.

The vessel sank in deep water and it was clear to those who remained on the scene that its liferaft did not float free.

Observations

The vessel's EPIRB and inflatable liferaft had been fitted with new hydrostatic release units several months previously. Shortly afterwards the liferaft was repacked and reinstalled on the vessel. During this operation the free end of the liferaft's painter was secured to a handrail adjacent to the liferaft's cradle.

Comment

1. The crew of this vessel were very fortunate that search and rescue units were on the scene very quickly, giving them no need to rely on their own liferaft.

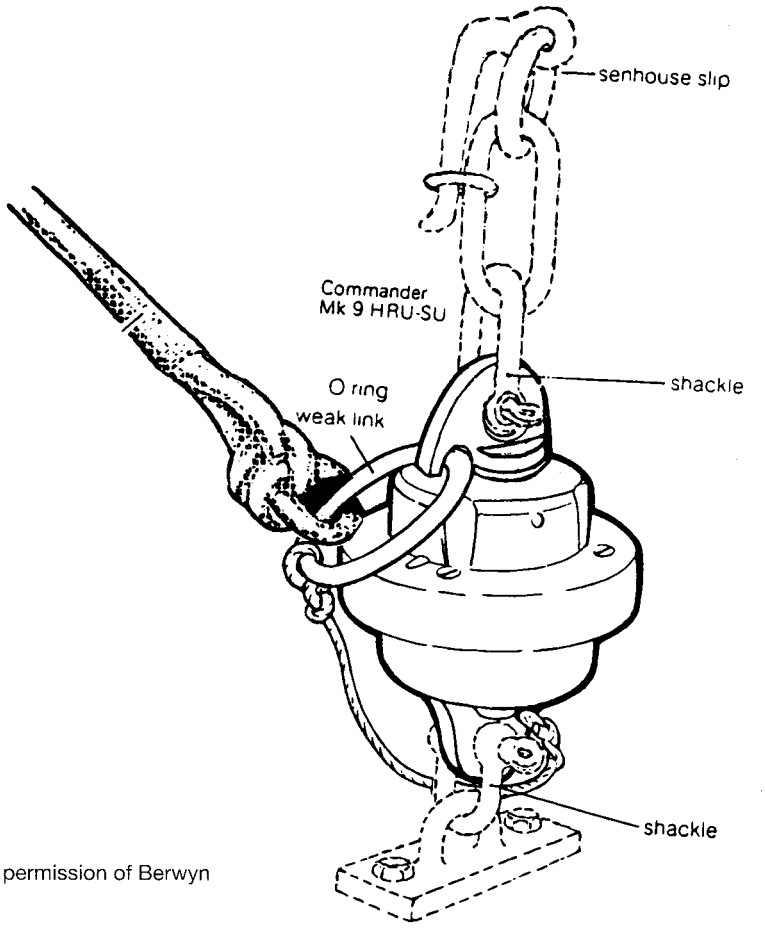
2. It is clear that incorrect re-installation was the most probable cause of the liferaft's failure to float free. This was an error of a type which is worryingly common. At the time of the relevant mandatory survey a vessel's life-saving equipment will be closely inspected. However, liferafts, and probably their hydrostatic release units, are likely to require overhaul or renewal before the next survey is performed. It is generally after these servicing periods that the errors of incorrect installation are likely to be made. It is thus vitally important that Masters, Skippers and Owners ensure that liferafts are correctly installed so that the equipment will operate as the manufacturer intended.

3. Two commonly encountered hydrostatic release units are shown in Figures 1 and 2. These arrangements show a weak link to which the liferaft's painter should be attached. It must be remembered that these weak links are carefully designed components, which are intended to break under a load which is sufficient to cause the liferaft to inflate, yet not so large as to cause damage to the liferaft or prevent it floating to the surface.

4. Advice on the stowage of liferafts is contained in Merchant Shipping Notice No M.1400.

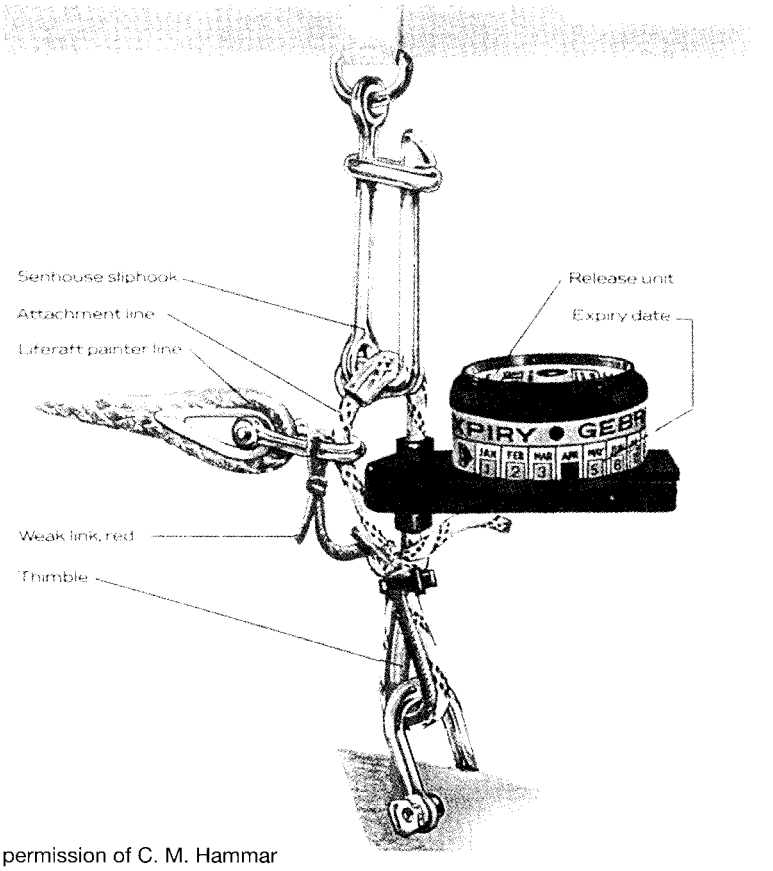
5. An independent sighting of 23 inflatable liferaft containers, on various types of small vessels, revealed that only two containers were correctly installed. Some of the more common errors of installation are shown in Figures 3, 4, 5 and 6.

Figure 1



Reproduced by kind permission of Berwyn Engineering Ltd

Figure 2



Reproduced by kind permission of C. M. Hammar

Figure 3

Figure 4

Figure 5

Figure 6

ANNEX 5

The Accuracy of EPIRB Position Fixes

The process used to calculate the position of a beacon cannot identify initially, from which side of the satellite's track the beacon's signal is coming. Consequently, two possible positions are identified with the first satellite pass. When another satellite picks up the EPIRB signals, a second estimate for the beacon's position can be calculated, thus the ambiguity relating to the beacon's position is resolved.

Disregarding the "mirror-image problem" discussed in the previous paragraph, the accuracy of the EPIRB position fix largely depends upon which frequency the satellite detects the EPIRB transmission. The generally recognised degree of accuracy of the position fixes is: +/- 20 km on 121.5 MHz and +/- 5 km on 406 MHz. Within TCA the watch officers generally work to the approximately equivalent nautical distances of 11 nautical miles and 3 nautical miles respectively. Many watch officers, however, can recall instances when EPIRB position fixes have been at a much greater range from the actual target.

The accuracy of an EPIRB position fix can be affected by a number of factors:

- where the satellite is poorly positioned relative to the EPIRB, either directly overhead or on the horizon;
- the signal from the beacon may be masked by some obstruction (the ship's structure, waves, etc.);
- radio interference can mask the signal from the beacon;
- if the beacon switches on part way through a satellite pass there may not be sufficient data captured by that satellite to allow an accurate fix to be computed;
- accuracy is also affected by instability in the frequency of the beacon signal, this might occur whilst the transmitter is warming up after being activated.

The accuracy of the COSPAS-SARSAT system is continually monitored by the satellites picking up and relaying the signals from a number of test beacons. Accuracy was also assessed during a global exercise in 1990. It was found that 84% of the 406 MHz position fixes were within 5 km (2.7 nm) accuracy, 90% within 10km (5.4 nm) and 94% within 20 km (10.8 nm). Improvements in technology since this time now allow the UK LUT to achieve 2 km (1.1 nm) accuracy in 95% of all detections (assuming that the accuracy is not degraded by the extraneous effects previously mentioned). In practice, extraneous effects will be present to some degree.

The foregoing information relates to a single satellite pass. If an EPIRB's 406 MHz transmission is picked up by other satellites as they pass over, the accuracy of the position fix is refined by the LUT computer software into a "merged solution". The merged solution is the best estimate of the EPIRB's position. The practical accuracy of the merged solution is currently being researched. In theory, it should improve in the following statistical manner:

- 1 satellite pass : within 2.0 km (1.1 nm) for 95% of cases
- 2 satellite passes : within 1.4 km (0.8 nm) for 95% of cases
- 4 satellite passes : within 1.0 km (0.5 nm) for 95% of cases
- 8 satellite passes : within 0.7 km (0.4 nm) for 95% of cases
- 16 satellite passes : within 0.5 km (0.3 nm) for 95% of cases

(This data will not be available to the UK's Maritime Rescue Co-ordination Centres until it has been validated by practical trials.)

The final "merged solution" for the position of WESTHAVEN's EPIRB, computed from a signal detected by COSPAS 4 at 1852, was 58°27.0'N 00°01.1'E. This was slightly over 2 miles from where the EPIRB was recovered at 1929. The accuracy of the merged solution in this case would have been affected by the drift of the EPIRB with the tidal current.

ANNEX 6

CABLE WARNING CHART

Please keep clear and do not damage submarine telephone cables
You risk the loss of your gear and catch and international communications can be disrupted. It is an offence to wilfully damage submarine cables
These cables carry high voltage and can be dangerous to life

The coast of the United kingdom and Ireland have a large number of submarine cable systems. When fishing gear fouls a cable the results can be expensive and dangerous. Many cables have high breaking strains, some over 20 tonnes. If gear is caught on these you may cause damage to nets and lines, as well as disrupting International Communications

IF YOU SUSPECT THAT YOU HAVE FOULED SUBMARINE TELECOMMUNICATIONS CABLE, THE FOLLOWING ACTIONS SHOULD BE TAKEN

(i) Do not endanger your vessel or crew by attempting to recover your gear if weights are excessive and you suspect you are fast to a submarine cable.
(ii) Carefully plot your ships position as accurately as possible
(iii) Advise your coastguard station of your situation, if the coastguard is unobtainable call BT Worldwide Networks direct (0800-1700 hrs Mon - Fri) on 0703 332107 or 071 492 2777 at other times 0703 334154 & ask for BT Worldwide Networks Marine Emergency Officer

This chart is provided to indicate the positions of the proposed CELTIC submarine telecommunications cable.
It is given for assistance and guidance. The Sea Fish Industry Authority, BT Worldwide Networks or Telecom Eireann accept no liability for any innaccuracies however caused.

KINGFISHER CHARTS
SPECIAL CHARTS SERVICES

Produced by the
Kingfisher Charts Department of the Sea Fish Industry Authority
on behalf of
BT Worldwide Networks & Telecom Eireann

USEFUL ADDRESSES

C Broadbridge, Fisheries Liaison
B T Worldwide Networks Global Networks, 18-20 Millbrook Road East
Southampton SO1 0HY

L Finlay, Service Quality Division
Telecom Eireann, St Stephens Green West
Dublin 2, Ireland

R McCormick, Irish Sea Fisheries Board
PO Box 12, Crofton Road, Dunlaoghaire, Co Dublin, Ireland

J F Doyle, Irish Fishermen's Organisation
Cumberland House, Fenian Sreet, Dublin 2, Ireland

M Lochrin, Irish Fish Producers Organisation Ltd
11 Elgin Road, Ballsbridge, Dublin 4, Ireland

M Moss, Kilmore Quay Fishermen's Coop Ltd
Kilmore Quay, Co Wexford, Ireland

E Fox, MAFF Fisheries Office,
46 Fore Street, Newlyn, Penzance, Cornwall TR18 5JR
Tel 073662805 Fax 0736 50429

M Townsend, Cornish Fish Producers' Organisation Ltd
1 The Coombe, Newlyn, Penzance, Cornwall TR18 4RT
Tel 0736 51050 Fax 0736 50632

HM COASTGUARD

MRCC SWANSEA
Tutt Head, Mumbles Swansea SA3 4ZL
Tel 0792 366534

MRCC FALMOUTH
Pendennis Point, Castle Drive, Falmouth, Cornwall TR11 4WZ
Tel 0705 552100

BT EMERGENCY CENTRE UK LINKLINE 0345 555999

EDITION MARCH 1994

SUBMARINE CABLE AWARENESS CHART

PROPOSED

SUBMARINE CABLE

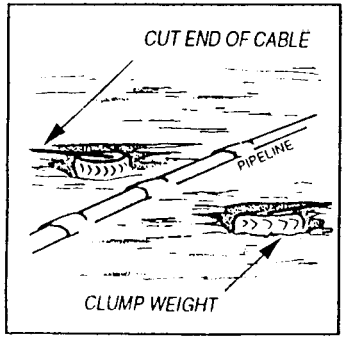
CELTIC

EDITION MARCH 1994

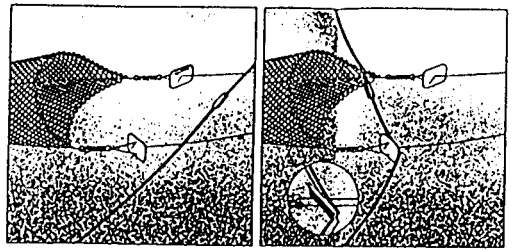
CABLE INFORMATION AND HAZARDS

Submarine communication and power cables have been laid on the seabed since the turn of the century, in most cases the cables are buried beneath the seabed to a depth of 40-90cm, unfortunately there remains a large percentage of cable unburied. Cables can be scoured out by tide and current or dragged out by anchors and fishing gear, or cables considered safe from subsea activities at the time of laying and not buried.

Out of use redundant submarine cables are perhaps the most dangerous obstruction to fishing operations, and many of these old cables are now lost completely. The differences in position fixing and navigation systems have resulted in unreliable cable tracks shown on charts. In fact a great many of these out of use cables are not even shown on new navigation charts. When new printing plates are made it is deemed practicable not to show these old cables unless they cross anchorages and other areas of seabed activity.



When it is necessary for an oil or gas pipeline to cross an old redundant submarine cable, one procedure is to cut the cable and secure a large size tractor tyre filled with concrete to each end and then slip them onto the seabed, the method is called "clumping". It has yet to be proved that this leaves them safe and clear of fishing warps and gear.

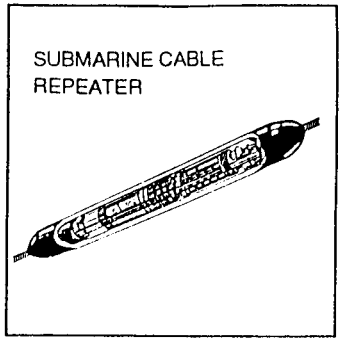


Often cable will be spanning hollows in the seabed like a tripwire or if repair work has been carried out on the system there will be loops and coils of cable and hawsers lying in wait for the unsuspecting trawl gear. Where cables have been buried, there may be seabed obstructions which can cause severe damage to nets and lines.

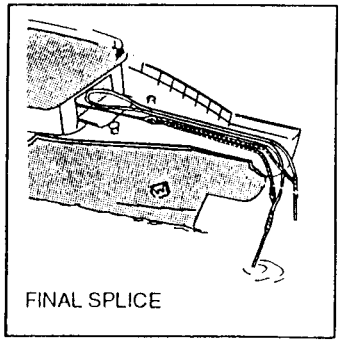
THE CLOSER TO THE SURFACE A SUBMARINE COMMUNICATION CABLE IS LIFTED WHEN FOUL OF FISHING GEAR, THE MORE DANGER THERE IS TO THE VESSEL.

IF IT IS THOUGHT PRUDENT TO SLIP OR CUT ONE OR BOTH TOWING WARPS OR BRIDLES IN AN ATTEMPT TO CLEAR A CABLE FROM THE FISHING GEAR, ALWAYS LOWER THE GEAR TO THE SEABED FIRST. NEVER ATTEMPT TO SLIP ANYTHING BEARING EXCESSIVE WEIGHT.

FISHING SKIPPERS ARE WELL ADVISED, IF THEY ARE USING ELECTRONIC TRACK PLOTTERS DURING THEIR FISHING OPERATIONS, TO TRANSFER ALL SUBMARINE CABLE POSITIONS FROM THEIR CHARTS AND NOTICES



Every few kilometres along a cable there is a repeater or signal booster. As the name implies these repeaters strengthen the signal as it travels along the cable. This ensures the calls are strong and clear. Damage or loss of a repeater can result in very expensive repair or replacement, not to mention breakdown in commercial business and communication.



Further hazards to fishing gear and the cable itself are repairs on cables, called **Final Splices**. After a repair has been carried out by splicing two ends together, the cable vessel has a large section or bight of wire leading from the seabed to the ship, this is stopped off on board by rope stoppers, the practice used is simply to slip both stoppers and let the bight of cable fall back onto the seabed, although all means are attempted to have it fall back flush to the bottom it usually finishes with a bight of cable standing proud of the seabed which is easily picked up or fouled by a trawl door.

ANNEX 7

THE SHERIFFDOM OF GRAMPIAN, HIGHLAND AND ISLANDS
AT ABERDEEN

DETERMINATION

by

ALEXANDER JESSOP
SHERIFF OF GRAMPIAN, HIGHLAND AND ISLANDS

IN

FATAL ACCIDENT INQUIRY

INTO THE DEATHS OF

GEORGE DAVID BIRSE PATTISON, CHRISTOPHER PROUSE,
MARK HANNAH and ALAN McROSTIE CUNNINGHAM

Aberdeen Sheriff Court
Castle Street
Aberdeen

Section 12 is copied below in its entirety from the Determination of the Fatal Accident Enquiry:

12. RECOMMENDATIONS

12.1 In former years the cause of this accident would have been completely unknown. The WESTHAVEN would merely have been overdue in port and no one would have known where or why she sank. Entirely because of modern technology the EPIRB beacon enabled the approximate location of the sunken vessel to be established and the remotely operated vehicle was able to find the wreck and by relating pictures to the surface enabled experts to reconstruct the tragedy. This revealed circumstances which had never previously been considered possible by the fishing industry, nor by the safety agencies, nor by the pipelines operators. It therefore seems appropriate that a review of the interaction of the fishing industry with the oil industry be carried out. Lord Cullen, in his comprehensive report following the Piper Alpha disaster, recommended that safety be considered not in isolation but as an overall package. It seems appropriate that a similar reconsideration of the safety of fishing vessels in the area of pipelines be considered as part of an overall package. I therefore recommend that the Health and Safety Executive, together with the Marine Safety Agency, the Coastguard Agency and representatives of appropriate fishing and oil industry organisations conduct an integrated review of all safety features of fishing vessels in the area of oil pipelines, including:

a) the registration and labelling of EPIRB sets so that, if possible, a simplified form of registration be introduced along the lines of the registration of a motor car and that the necessary information to complete the form should be clearly printed on the label attached to the EPIRB unit;

b) the dissemination of information regarding the dangers of trawlboards being caught under pipelines with the consequence that the gear could never be recovered to fishing organisations;

c) the wording of warnings on navigational advice on charts of the North Sea;

d) the location of emergency liferafts onboard fishing vessels;

e) the dissemination of information and the training of fishing vessel skippers to ensure that liferafts are correctly attached and that the weak link can operate and if necessary including this as a specific point in the survey of the vessel carried out;

f) The significance of free spans in any oil pipeline not just from a structural point of view but from the possibility of danger to fishing vessels;

g) whether any system of notification of fouling of gear on pipelines might be introduced with no risk of prosecution to the fishing skipper;

h) a review of the operation of emergency liferafts in the event of sudden capsize rather than gradual sinking; and

i) the procedures for intimation of change of ownership of fishing vessels and consequently of the EPIRB.

12.2 All of these were items which caused concern or anxiety at some stage during the Inquiry. I do not consider that I can make positive recommendations on such technical matters, but I strongly recommend that in accordance with the safety systems philosophy described by Lord Cullen a review be undertaken as a measure of urgency on those features above mentioned all of which depend on each other to some extent.

(Note: The findings of a Sheriff in a FAI Determination will be considered by the appropriate bodies but there is no obligation on them to act on the recommendations.)

ANNEX 8

MSA
MARINE SAFETY AGENCY

MERCHANT SHIPPING NOTICE

No. M.1657

Hazards Associated with Trawling and use of Lifting Equipment

Notice to Owners, Skippers and Crew of Fishing Vessels

This notice supersedes M699 and M967

1. INTRODUCTION

1.1 Since the issue of M699 in 1974, accidents have continued to occur onboard vessels, particularly those engaged in beam trawling and in dredging from derricks or related structures, with consequent injury or loss of life and, on occasions, loss of the vessel.

1.2 The nature of trawling and beaming operations in particular has resulted in accidents due to a combination of human error, failure of equipment, rigging or loss of stability.

1.3 This notice provides general advice on safety matters related to the operation of fishing vessels and maintenance of fishing gear. It is the responsibility of the skipper to ensure that all procedures used are suitable for the vessel and its mode of fishing.

2. BEFORE GOING TO SEA....

Know the vessel

2.1 The skipper should ensure that only persons fully experienced in handling the vessel and competent in the method of fishing are left on watch. All watchkeepers and engineers should be aware of conditions that would reduce the stability reserve of the vessel, including the use of fuel, stowage of fish and entrapped water when scuppers are restricted by debris or gear.

2.2 All new members of the crew should be made aware of emergency procedures, including the closing of weathertight doors and hatches which are needed to maintain the stability of the vessel and the operation of the safety release gear.

Maintenance of lifting gear

2.3 The selection and sizing of fishing and lifting gear is traditionally based on operating experience and when adequately maintained performs satisfactorily without undue risk. However, corrosion, fatigue, inappropriate repairs or modifications and poor maintenance all contribute to reduce safety margins.

2.4 When planning maintenance, the following safety matters should be considered:

- Structures should be examined frequently for tell-tale rust streaks indicating cracks, bending of tubes, and wear of pintles and securing points.

- A more rigorous examination of stress points should be considered at reasonable intervals.

- Modifications or repairs should be of equivalent strength, using compatible materials and take account of the adverse effects of heat arising from welded repairs.

- Shackles and blocks should be inspected and lubricated regularly. Shackles and links should be renewed when wear is noticed. Blocks, pintles and hinges should be stripped for examination and serviced annually.

2.5 It is desirable to eliminate parts which are difficult to examine. For example the use of swivel blocks should be avoided where possible and preventers used where they are unavoidable.

2.6 Tested shackles of adequate size and correct type should always be used for rigging. Only tested shackles should be used for lifting or pulling. Wires should be replaced at the first sign of splintering, collapse of heart or rusting.

2.7 Greasing should be thorough and frequent as dry bearings impose additional loads and can rapidly fail.

2.8 Winch controls and systems should be maintained regularly to ensure safe working.

2.9 Hollow structures such as gantries or masts should be checked for trapped water inside and drainage should be provided where necessary to avoid internal corrosion.

2.10 The condition of all ropes used for lifting purposes should be checked regularly for wear and contamination.

3. WHILST AT SEA....

3.1 Loose gear should be restrained or secured at all times. In particular, beams, nets, trawl doors and attached chains should always be lashed secure when not in use, even in fine weather. This safe working practice also helps prevent gear being unexpectedly washed overboard or movement which could result in the blockage of scuppers or freeing ports.

3.2 Weathertight doors and hatches should be kept closed at sea, except when they are in use for access. This reduces the number of vital tasks should an emergency occur. They should not be left open to assist inadequate ventilation which should be overcome by making improvements to the ventilation system.

4. WHEN SHOOTING AND RECOVERING GEAR....

4.1 Crew working on deck should be aware of the dangers of equipment failure and take simple precautions to minimise the danger to them, such as not working within the bight of a rope and keeping away from working machinery unless directly involved.

4.2 Sudden rolling of the vessel followed by a significant angle of heel could occur if hauling or towing equipment fails or a load is lost from one net, such as the loss of a haul of sand, stone or weed when the net is clear of the seabed. The precautions set out in paragraph 3 above should be followed to minimise the consequences of such an emergency.

4.3 Powerful vessels with heavy gear pose a particular risk to crews when shooting the cod ends off the side. The methods of restraining the net prior to release should not risk crew becoming fouled in bights of lifting ropes which are too stout to be made up on cleats. In such cases, a separate tailing or other suitable rope should be used. Sharp turning of the vessel should be avoided during lifting the cod end.

4.4 On vessels where the winch controls are on deck, care should be taken to ensure good communications are maintained between the skipper and the operator on deck, especially if the skipper has restricted visibility of the operator. This is of particular importance on smaller vessels with powerful winches where there may be less time to react to a dangerous situation. If a hazard arises the load should be lowered as quickly and safely as possible to the deck or into the water, as loads act from the *point of suspension*.

5. WHEN RECOVERING FOULED OR FASTENED GEAR....

5.1 Recovery of fouled gear can impose extraordinary loads on wires and machinery particularly in adverse weather conditions. Failure of either may result in excessive rolling or the vessel taking a dangerous angle of heel. In order to minimise the risk of such operations important precautions are set out below.

5.2 Unusual or potentially dangerous operations, such as those involving the use of the safety release gear on beam trawlers, should always be carried out under the supervision of the skipper.

5.3 On beam trawlers, every effort should be made to ensure that uneven loads are kept to a minimum during the recovery operation to avoid excessive heeling of the vessel. For example:

- Hauling snagged gear should always be carried out from *as low as possible and close to the vessel's side* and not at the end of the derrick.

- If the unfouled beam is lifted clear of the seabed, it should also remain in the water and be suspended from *as low as possible and close to the vessel's side* and not at the end of the derrick.

- Any loose catch should be stowed.

5.4 Recovery of gear should not be attempted during adverse weather conditions or where there is a significant swell or current as such conditions can impose sudden increases in the loads on the vessel. If snagged gear cannot be freed without hazarding the vessel, then the gear should be released, marked with a buoy and left until conditions are safer or a more capable vessel can take over.

5.5 The vessel should be kept bow or stern onto the sea in order to minimise snatching on the gear due to rolling, however care should be taken to avoid fouling the propeller.

5.6 The crew should be advised of the commencement and completion of the recovery operation. During recovery all non-essential crew should be on deck with lifejackets available.

5.7 It is vital that ALL weathertight doors and hatches are CLOSED and freeing ports OPENED BEFORE the recovery operation takes place. If this is not done and the vessel heels unexpectedly, water could be trapped on deck leading to rapid flooding through openings, with no time to take preventative action.

5.8 Means should be available of releasing the snagged gear in an emergency.

5.9 All crew taking part in the operation should be clear as to their role and be familiar with the equipment to be used. The loss of one vessel could have been avoided if the winch operator had known how to release a winch, which was restraining the vessel.

MSAS(c)
Marine Safety Agency
Spring Place
Southampton
SO15 1EG
March 1996