Report on the investigation

of the foundering of the

fv *Jasper III* PD174

90 miles north-east of Fraserburgh

on 10 September 1999

Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1999

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

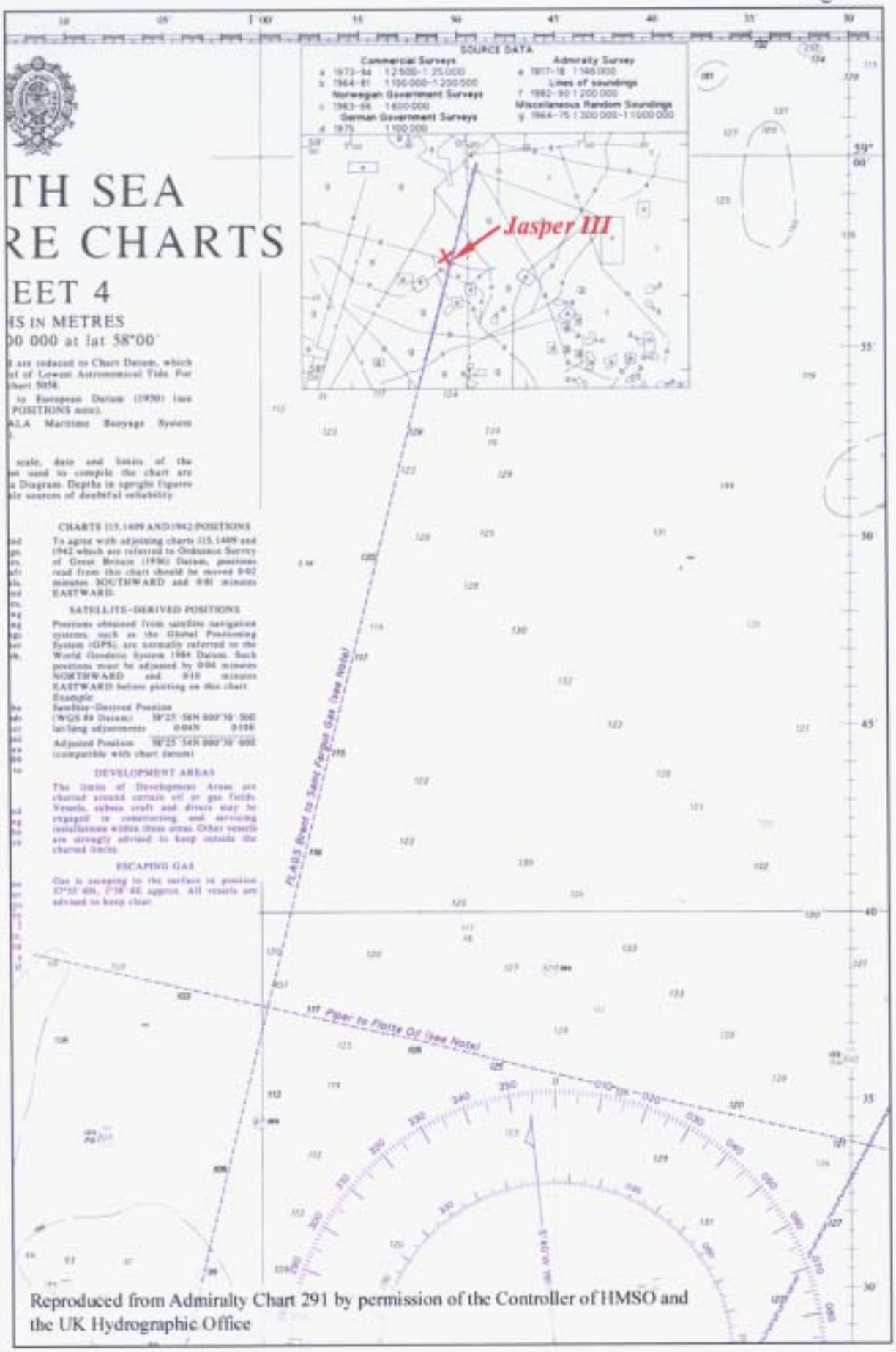
CONTENTS

GLOSSARY OF ABBREVIATIONS

HRU	Hydrostatic release unit
kHz	kilohertz
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
mld	moulded dimension
mm	millimetre
MRCC	Maritime Rescue Co-ordination Centre
MSA	Marine Safety Agency (now MCA)
RSS	Register of Ships and Seamen
UKFV	United Kingdom Fishing Vessel
UTC	Universal Co-ordinated Time

Reproduced from Admiralty Chart 4014 by permission of the Controller of HMSO and the UK Hydrographic Office

Figure 1



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SYNOPSIS

During the evening of 10 September 1999, the Marine Accident Investigation Branch (MAIB) was informed that a steel fishing vessel had sunk 90 miles north-east of Fraserburgh earlier that day. An investigation began the following day, and on 15 September an inspector interviewed her crew in Peterhead.

Jasper III, a steel fishing vessel of 24m registered length, left Peterhead with her partner vessel *Crystal River* on a pair trawling trip at 0930 on 10 September 1999. The weather was southerly winds force 5/6 with a moderate sea running.

Part way through their first tow, at about 2000, the bilge alarm on *Jasper III* sounded. On investigation, the engine room was found flooded up to the propeller shaft. The bilge pumps were started and the driver searched for the source of the leak. The vessels began to haul the fishing gear.

The source of the leak could not be found and the rate of flooding exceeded the bilge pumps' capacity. Flooding spread aft into the accommodation, and forward into the fish hold. *Jasper III* cut her end of the fishing gear away and pulled clear of her partner vessel while she still had engine power. Shortly afterwards the main engine and auxiliaries stopped. A "Mayday" was sent at 2041 and the crew prepared to abandon ship.

At about 2100 the crew abandoned to the liferafts from where they were rescued by *Crystal River*. By 2130 all the crew had been safely recovered. At 2232, *Jasper III* sank. Her Emergency Position Indicating Radio Beacon (EPIRB) did not surface and transmit.

The cause of the flooding was not found, but was probably the sudden failure of a pipe or small area of hull plating, weakened by advanced corrosion.

Jasper III did not meet the requirement of the Fishing Vessel (Safety Provisions) Rules 1975 for the engine room on a steel fishing vessel to be contained between watertight bulkheads. The flooding spread aft of the engine room because the aft bulkhead was penetrated by two open drain pipes from the accommodation. It is not known how the flooding spread forward, or if *Jasper III* would have survived had her engine room bulkheads been watertight. In any case, with non-watertight bulkheads, her chances of sinking would have been substantially increased.

One recommendation has been made to Caley Fisheries (Peterhead), agents of *Jasper III*, to circulate copies of this report to the owners and skippers of steel fishing vessels for which they are agents. One recommendation has been made to the Maritime and Coastguard Agency (MCA), to review the existing procedures for the survey of steel fishing vessels.

VESSEL AND INCIDENT PARTICULARS

Vessel

Name	:	*Jasper III*
RSS Number	:	A10065
Port of Registry	:	Peterhead
Type	:	Fishing vessel (pair/stern trawler)
Crew	:	6
Fishing number	:	PD174
Registered length	:	24.20m
Overall length	:	26.03m
Breadth mld	:	6.40m
Depth amidships mld	:	2.53m
Construction	:	Steel
Built	:	In 1971 at John Lewis & Sons Ltd, Aberdeen
Registered owners	:	MV Jasper Ltd, 11 Buchan Terrace, Peterhead

Incident

Position of accident	:	59° 00.2'N 000° 50'W
Time and date	:	2232 on 10 September 1999
Injuries	:	None

A general arrangement of the vessel is shown in **Figure 2**.

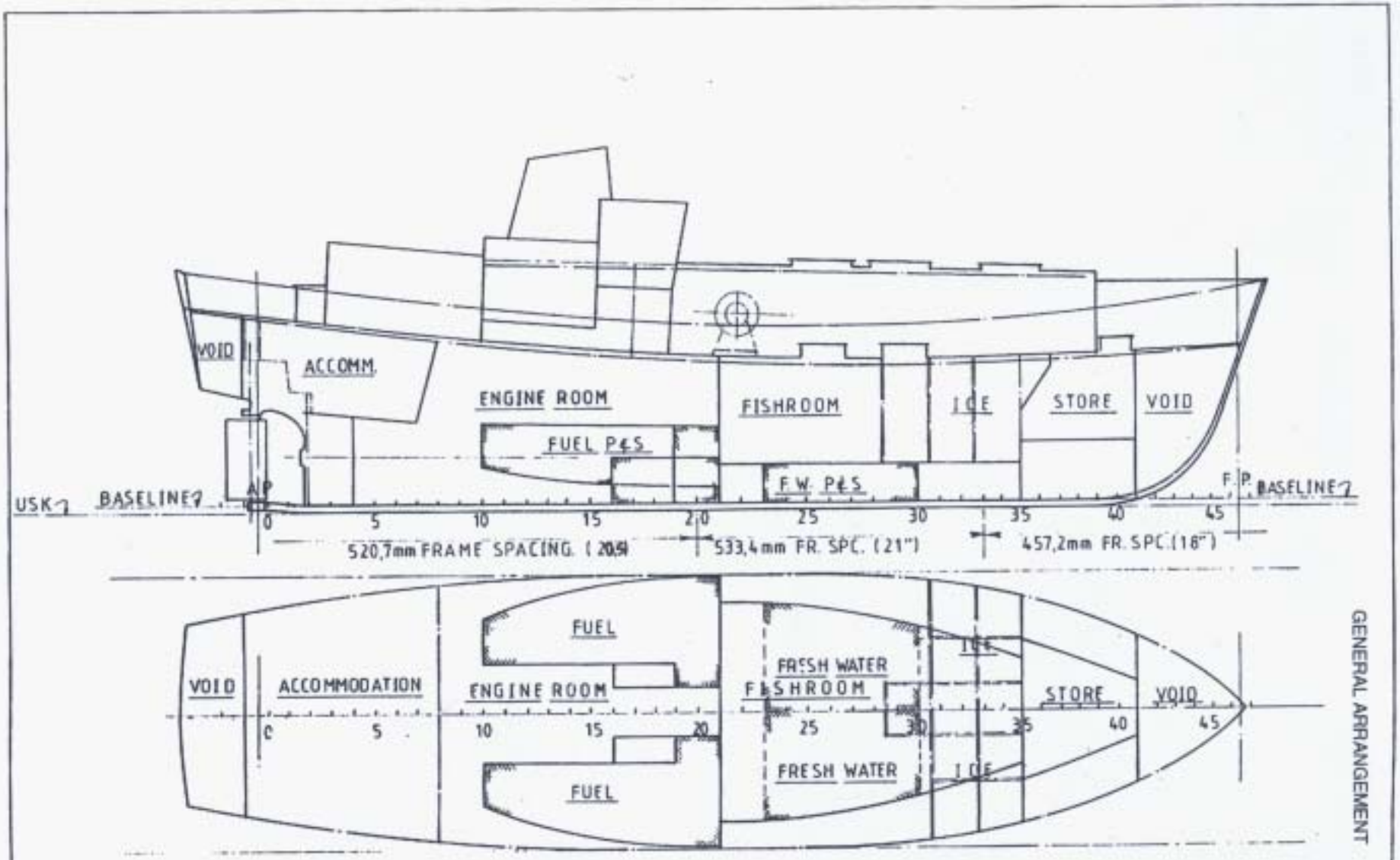

VOID
ACCOMM.
ENGINE ROOM
FISHROOM
ICE
STORE
VOID
FUEL P&S
F.W. P&S
USK
BASELINE
A.P.
F.P.
0
5
10
15
20
25
30
35
40
45
520,7mm FRAME SPACING. (20.5)
533,4mm FR. SPC. (21")
457,2mm FR. SPC. (18")
VOID
ACCOMMODATION
ENGINE ROOM
FUEL
FUEL
FRESH WATER
FISHROOM
FRESH WATER
ICE
ICE
STORE
VOID
NOTE:- ALL DRAFTS MEASURED ABOVE UNDERSIDE OF KEEL (USK)
ALL HEIGHTS, VCGs, MEASURED ABOVE BASELINE
SCALE 1:125
GENERAL ARRANGEMENT

Figure 2

SECTION 1 - FACTUAL INFORMATION

All times are Universal Co-ordinated Time (UTC) + 1 hour.

1.1 Narrative

Jasper III PD174 left Peterhead at about 0930 on Friday 10 September 1999 with her partner vessel *Crystal River FR178*, to pair trawl on the fishing grounds some 80 miles to the north-east. They had returned to port at about 2100 the previous evening at the end of a "half trip", and landed their fish at about 0400. After taking on fuel, water, ice and boxes, the vessels returned to sea.

At about 1730 they shot away for the first tow. About two hours into the tow the bilge alarm on *Jasper III* sounded. The skipper left the wheelhouse to look in the engine room. Looking down from the top of the ladder he saw water spraying off the propeller shaft as it turned. He immediately woke the driver.

The driver went down into the engine room which was flooded over the shaft and very nearly to the top of the gearbox. The shaft was spraying water everywhere. He started the port and starboard Desmi electrical bilge pumps; the Cummins generator on the port side was producing the electricity. He then left the engine room to check the discharge from the pumps.

When the skipper returned to the wheelhouse, he heard the gearbox alarm sounding. He pointed this out to the driver, who was going outside to check the discharges from the pumps; the driver told him it was because the water was up to the gearbox. The skipper radioed *Crystal River* to inform them of the problem, and asked them to heave the net. Heaving began just as it was getting dark, probably about 2000.

The driver saw the pumps' discharges were strong on both sides. Looking into the fish room he saw that it, too, was beginning to flood, then only about 0.5m deep. By the time he returned to the engine room the water had risen to halfway up the main engine and it was knee-deep. He searched for the leak but could not find it; and tried to gather up the rags and debris floating on the surface, which he feared would choke the bilge pumps. He returned to the deck to check the fish hold, and found it to be about 2m deep in water. He went on top of the shelter to check the pumps' discharges and saw they had stopped. Looking into the aft cabin on the way back to the engine room, he saw it was flooded up to the level of the lower bunk.

The skipper decided that heaving the net was making the flooding worse. By now they had recovered the 225 fathom of warp and 100 fathom of heavy wire, and were heaving the four cables of rope. The rope was cut with about two cables still out. *Jasper III* was taken well clear of *Crystal River* to avoid any likelihood of drifting down on her while she was still heaving the net. The skipper took a quick look in the engine room and saw the floodwater sloshing with the motion of the vessel, sweeping up the vessel's sides and hitting the deckhead then crashing back down. The water level was about 0.5m above the plates. He also saw that the water in the aft cabin had reached the lower bunks. He went back to the wheelhouse and called *Crystal River* by radio.

While the skippers were conversing, the main engine and generator stopped, and the deck lights went out. The skipper of *Jasper III* said, "That's it, the engine's gone I'm sending a "Mayday". He sent a "Mayday" on 2182kHz. This was logged by MRSC Shetland at 2041. Coastguard rescue helicopter G-BCLC was tasked to render assistance. The skipper told the crew to don their lifejackets and flotation/thermal suits, and launch the two liferafts. This was done without incident and the liferafts were pulled aft and secured alongside the port quarter. The crew assembled on top of the shelter.

The driver, meanwhile, had returned to the engine room to find the electric motors of the Desmi pumps completely submerged, which explained why they were no longer working. However, the generator and main engine were still going. He went up to the wheelhouse to tell the skipper they had lost the pumps, but while he was there the generator and main engine stopped. The driver returned to the engine room with a torch, but stayed on the ladder as the water was then up to his chest. He could feel the vessel listing heavily to port, and left the engine room to collect his lifejacket and flotation/thermal suit, and joined the rest of the crew on the shelter.

The skipper of *Jasper III* decided it was time to abandon ship. It was too rough for *Crystal River* to come alongside to take the crew off and it was agreed that the crew would be recovered from the liferafts. The crew filed aft to board the liferafts. *Jasper III* was low in the water and the aft deck was awash, which made boarding the liferafts easier. The skipper became caught up in a length of liferaft painter which was washing about the aft deck and had to call to the crew for a knife to be thrown to him so he could cut himself free. The painter of the nearest liferaft parted before he could board it, so he got into the second liferaft which was empty. The liferafts were tied together and the crew tried to paddle away from the sinking vessel, but, because they were unsuccessful, *Crystal River* closed in and threw a heaving line to the rafts. A towline was connected and the rafts were pulled clear of *Jasper III*.

The rafts were brought into the lee of *Crystal River* and, one at a time, their occupants grabbed the bulwark rail as it dipped with each roll and were hauled onboard by *Crystal River*'s crew. All of *Jasper III*'s crew were recovered safely and without injury. This was reported to the coastguard at about 2130 and the rescue helicopter was recalled.

Jasper III gradually settled by the head. She sank bow first at 2232 in about 72 fathoms of water. *Crystal River* stood by to recover the EPIRB, but it did not surface and no transmissions were received from it.

1.2 The vessel

Jasper III was built four years before the Fishing Vessels (Safety Provisions) Rules 1975 came into force. Nonetheless she was constructed with five watertight bulkheads. When she was first surveyed under the Rules in July 1980 she was granted a number of exemptions, but was not exempted from Rule 2(2) which required a watertight engine room.

At the time of the accident, *Jasper III* was part way through the survey for the renewal of her UK Fishing Vessel Certificate. A number of deficiencies needed to be rectified but

none of these had any effect on the loss of the vessel. In late July 1999, she was slipped in Peterhead and all the hull valves were surveyed. The hull plating was also inspected for wastage with an ultrasonic thickness gauge, and found to be in a satisfactory condition.

Before the ultrasonic inspection, one bottom plate on the port underside of the fish hold was replaced, to make good a temporary repair. About 12 months previously, the crew had noticed that the fish room needed pumping after every tow. When the vessel was slipped for gearbox repairs, the yard was asked to check the plating underneath the fish hold for wastage. A pin-prick hole was found at the centre of an area of pitting about 25mm across. Water sprayed out of this hole when the vessel was slipped. The plating around the pitting was checked with a hammer and found to be sound, so a patch was welded over the hole. The skipper wanted to make good this temporary repair before the hull was surveyed, so he had the plate renewed. The original leak was in the bottom of the bilge well on the port side. In December 1995 two plates on the starboard side of the bilge well were replaced, after ultrasonic testing, for the renewal of the UKFV certificate, showed that their thickness had reduced to about 6mm from 9mm.

In May 1999, *Jasper III* was inspected for electrolysis problems. This followed a series of corrosion failures on the heat exchanger of the Cummins generator, and rapid wastage of the vessel's zinc anodes. The inspection report recommended 18 items of electrical bonding and further tests after the work had been completed, to ensure that the electrolysis levels had fallen to acceptable limits. The work was done, and subsequent inspection showed that the electrical potential differences were within acceptable limits.

In February or March 1999 a seawater cooling pipe to the main engine burst as *Jasper III* was approaching the harbour. The vessel continued on her way and once alongside, the driver simply closed the sea-cock to stop the leak. That pipe was replaced. At the time of the accident none of the pipes had temporary repairs or "bandages". Bandages were used as a temporary repair at sea, but damaged pipes were replaced in port.

Two drains from the accommodation passed through the aft bulkhead of the engine room. These pipes did not have closing devices.

The fish hold could be drained into the engine room bilge through a 32mm pipe in the forward bulkhead of the engine room. This pipe was fitted with a screw-in plug to close it when not in use.

When she left port, *Jasper III* was full of fuel, water and ice. Her displacement was about 209 tonnes, giving a mean draught of 2.79m and a trim of 1.66m. This resulted in a minimum freeboard near amidships of about 0.73m.

The two electrical Desmi bilge pumps had a combined capacity of about 44 tonnes/hr.

1.3 Ultrasonic testing

A draft guidance note on the conduct of ultrasonic thickness surveys of fishing vessels was sent to CAN (Offshore) Ltd by the Aberdeen Marine Office of the MCA (then MSA) in March 1997. The purpose of the guidance was "in order that some uniformity of ultrasonic

testing is achieved". It set down the minimum requirements for the survey of a fishing vessel, which included, for vessels older than 4 years:

a) *"Areas around slush wells ..... must be tested to a minimum of one test point every quarter metre square".*

b) *"All watertight bulkheads, are to be tested in three horizontal bands, of top, middle and bottom".*

c) *"Ultrasonic testing is only to take place for survey purposes when the attending Surveyor is present on the vessel".*

None of the above three requirements were met on *Jasper III*.

In all other respects the testing was carried out to the requirements of MCA, and five points on all plates were tested, one in the centre and one at each corner.

The technician who carried out the survey was competent in the use of ultrasonic thickness gauges and had ten years experience in non-destructive testing. However, he was a radiographer and would not normally have been employed on the ultrasonic testing of a fishing vessel unless, as in this instance, nobody else was available to do the job. *Jasper III* was the second fishing vessel he had surveyed.

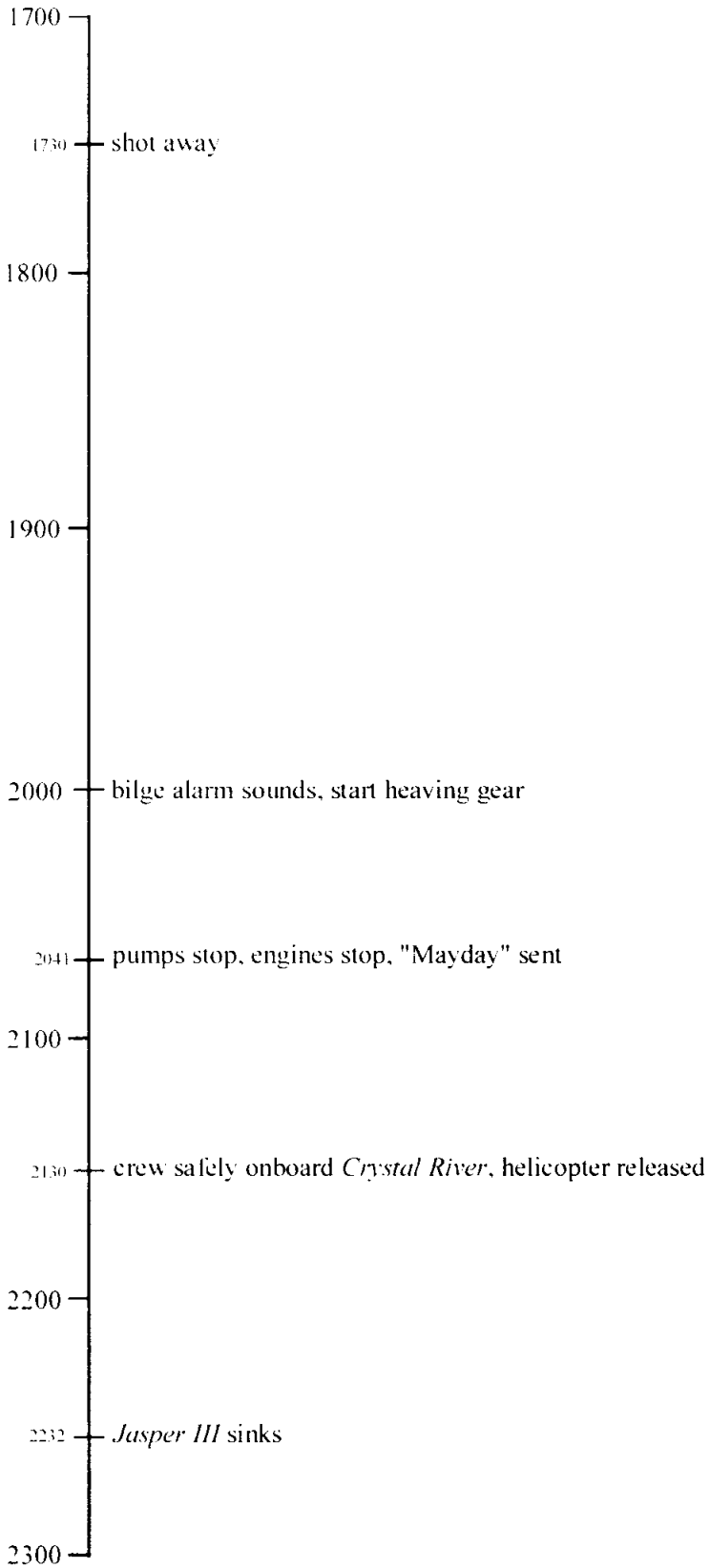
1.4 Crew

Mr Kevin Buchan was an experienced fisherman who had been skipper of *Jasper III* for the last 6 years. The driver, Mr Graham McKnockiter, was also an experienced fisherman. He had been driver on *Jasper III* since returning to fishing about 12 months before the accident, after a 2 year break ashore. Before then he had been the vessel's driver for 3 or 4 years.

1.5 The weather

Winds were southerly force 5 to 6 and increasing, and sea conditions were moderate.

KEY EVENT TIMES



SECTION 2 - ANALYSIS

2.1 Times

The estimated times for key events (**see Figure 3**) show that the vessel was abandoned between 2041, when the "Mayday" was received by the coastguard, and 2130, when the coastguard was informed that the survivors were safely onboard *Crystal River*. It was probably close to 2100, which allows 20 minutes for the crew to launch and board the liferafts and 30 minutes for *Crystal River* to recover the survivors.

The skipper estimated that the bilge alarm went off at about 2000.

2.2 Source and rate of the flooding

Jasper III did not normally suffer from leaks and the bilge pumps in the engine room were not run continuously. On the day of the accident they were started only when flooding was detected, so the possibility of back-flooding through the bilge system has been discounted.

The very high rate of flooding precludes a stern gland failure as its source.

Considering the above, and without any evidence to indicate that *Jasper III* had sustained damage from a collision, grounding or any other form of contact; it is reasonable to assume that the flooding was caused by the sudden failure of a pipe or area of hull plating. Piping failures cause 35% of all fishing vessel floodings, where the cause has been identified, and hull plating corrosion accounts for a further 4%. Corrosion is the most common cause of piping failures. Advanced corrosion, of either a small area of hull plating or, more likely, a length of piping, was probably the underlying reason why *Jasper III* flooded.. Piping corrosion was responsible for the loss of *Sharona PD185* and the flooding of *Ocean Hunter PD 787*, both in August 1999.

When the crew abandoned *Jasper III* the aft deck was awash, suggesting that it was very close to the waterline. A high estimate of the rate of flooding can be arrived at by assuming that the vessel sank bodily, without trimming, until the waterline was just level with the deck edge (**Figure 4**). The weight of floodwater to produce this effect is about 56 tonnes.

The 29 tonnes of water discharged by the bilge pumps between about 2000 and 2041, must be added to this 56 tonnes, indicating that, between the start of the flooding and 2100, about 85 tonnes of water flooded into the vessel. (This estimate would be substantially less if it was assumed that the vessel had trimmed further by the stern, as likely with the engine room flooding). Although it is not known when the flooding started, the skipper and driver saw water up to the shaft when they first investigated the problem at about 2000. At that depth, the engine room already contained about 27 tonnes of water, so, between 2000 and 2100, approximately 58 tonnes of water flooded the vessel.

The draught at the mid-length of the engine room was about 3.1m, giving the initial head of water acting at the leak probably greater than 2m.

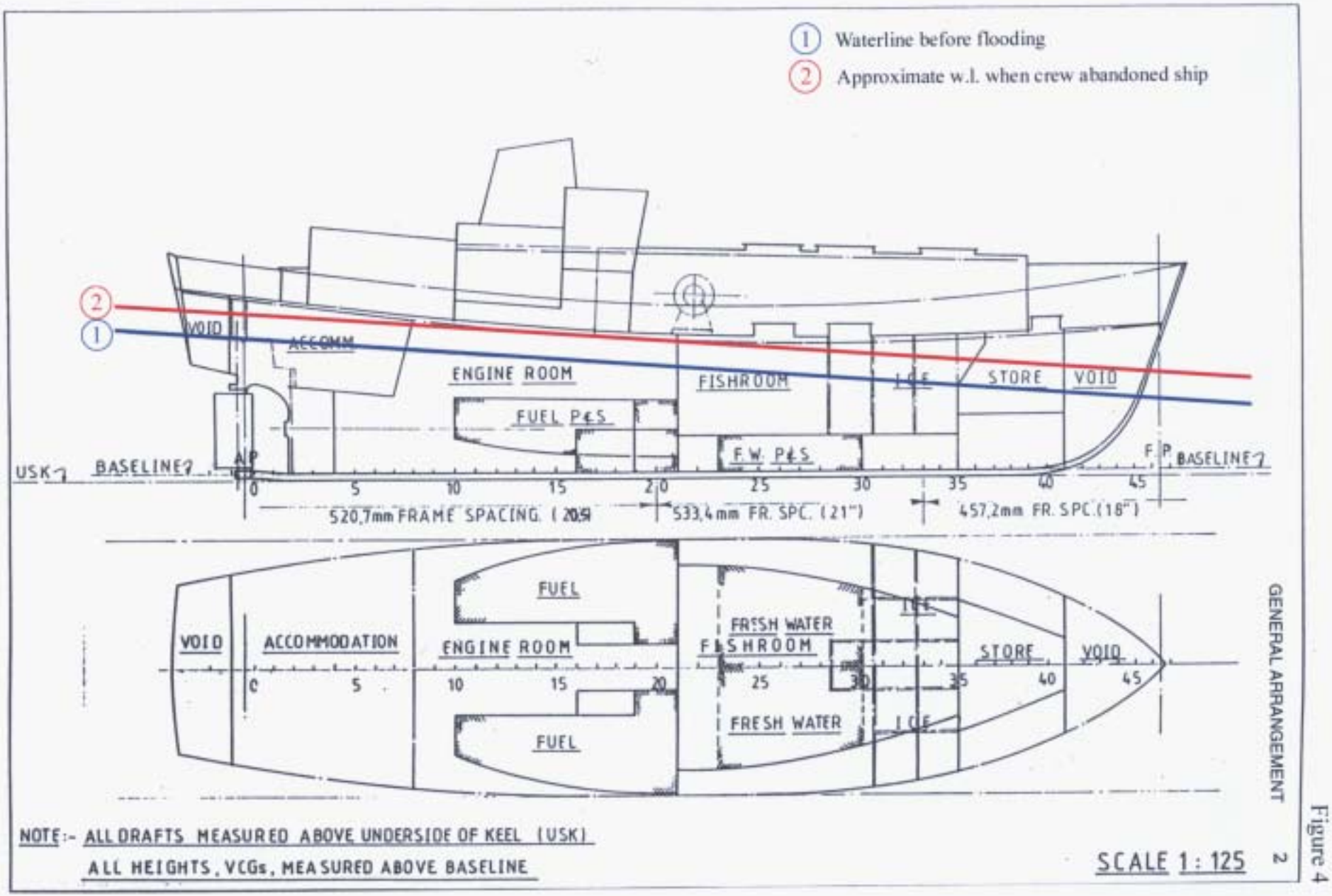

1 Waterline before flooding
2 Approximate w.l. when crew abandoned ship
VOID
ACCOMM
ENGINE ROOM
FUEL P&S
FISHROOM
F.W. P&S
ICE
STORE
VOID
USK
BASELINE
A.P.
F.P.
0
5
10
15
20
25
30
35
40
45
520.7mm FRAME SPACING. (20.5")
533.4mm FR. SPC. (21")
457.2mm FR. SPC. (18")
FUEL
VOID
ACCOMMODATION
ENGINE ROOM
FRESH WATER
FISHROOM
ICE
STORE
VOID
FUEL
FRESH WATER
ICE
NOTE:- ALL DRAFTS MEASURED ABOVE UNDERSIDE OF KEEL (USK)
ALL HEIGHTS, VCGs, MEASURED ABOVE BASELINE
SCALE 1:125
GENERAL ARRANGEMENT 2

Figure 4

Collating this information indicates that the hole causing the leak was probably no bigger than 80mm in diameter. The leak was either in the hull plating, or from a fractured pipe, probably starting less than 30 minutes before the bilge alarm sounded.

2.3 Damage control

The bilge alarm alerted the crew to the flooding. This early warning was undoubtedly a major contributory factor to the orderly evacuation of the vessel without loss of life. Unfortunately, the rate of flooding was so great that the early warning from the bilge alarm did not allow the crew to locate the leak.

The driver had considered shutting inlet and discharge valves when he first entered the flooding engine room but, because he could not identify the source of the leak and wanted to keep the engines and bilge pumps running, he decided against it. As the depth of floodwater increased rapidly, the option of shutting ship side valves quickly disappeared.

The engine room contained 17 inlets/discharges, of which 14 were fitted with screw down valves. Five of these, with a total discharge area of 56cm^2 (equivalent to a single pipe of about 84mm diameter) could have been closed without interfering with the running of the main engine, the Cummins auxiliary or the two bilge pumps. However, as four were to closed systems and each was of small bore, shutting them would not have affected the outcome.

No vessel can survive flooding where the ingress of water is greater than the capacity of her pumps, unless the flooding is prevented from spreading throughout the vessel by watertight bulkheads.

The Fishing Vessel (Safety Provisions) Rules 1975 as amended, require that the engine room on a steel fishing vessel is contained between watertight bulkheads. *Jasper III* did not meet this requirement as the flooding spread both aft and forward of the engine room. The flooding spread aft of the engine room because the aft bulkhead was penetrated by two open drain pipes from the accommodation. It is not known how the flooding spread forward.

The Rules do not require that a steel fishing vessel should be able to survive the flooding of her engine room. It is not known how the flooding spread forward, or if *Jasper III* would have survived had her engine room bulkheads been watertight. In any case, with non-watertight bulkheads, her chances of sinking would have been substantially increased.

In the circumstances, the crew did everything possible. The rate of flooding was too great for the vessel's pumps, the leak could not be found, and flooding spread beyond the engine room, sealing the vessel's fate.

2.4 EPIRB

The MAIB does not know why the EPIRB did not surface and transmit. It is unlikely to have been an equipment failure since the unit had been recently inspected, and both the hydrostatic release unit (HRU) and the batteries were in date.

2.5 Watertight bulkheads

Jasper III was probably lost because the engine room bulkheads were non-watertight, which allowed the flooding to spread throughout the vessel. Pumps are the first line of defence against flooding. But if the rate of flooding is greater than the capacity of the pumps the vessel will sink; unless the flooding is prevented from spreading throughout the vessel by watertight bulkheads.

During her life, numerous holes would have been made in the forward engine room bulkhead for changes to piping and cable runs. Each time the bulkhead should have been returned to a watertight condition. Possibly on some occasions it was not. Unless the skipper and owner of the vessel maintain a strict control over bulkhead penetrations, it is inevitable that, eventually, the integrity of the bulkhead will be compromised. This was probably the case on *Jasper III*.

The other possibility is that part of the lower edge of the engine room bulkhead was badly corroded, and if not actually holed before the accident, may have burst under the head of floodwater in the engine room. A common site for such wastage is the fish room slush well. On *Jasper III*, the aft face of the well was the forward engine room bulkhead.

Caley Fisheries (Peterhead), the vessel's agents, carried out annual visual inspections of the bulkhead, and an MCA surveyor inspected them in July 1999 during the four-yearly survey for the renewal of the UKFV certificate. The general level of inspection achieved by MCA fishing vessel surveys is unlikely to be sufficiently complete to uncover small areas of corrosion in less accessible areas of bulkheads.

Whatever the nature of the defect to the forward engine room bulkhead, maintenance and inspection of the bulkheads was inadequate.

A similar conclusion is appropriate for the aft engine room bulkhead. It contained two drain pipes from the aft accommodation. Originally these pipes were fitted with closing devices, but at sometime they were removed and never replaced.

2.6 Ultrasonic testing

The draft guidance note issued to CAN (Offshore) Ltd for the conduct of ultrasonic testing on fishing vessels, while never issued as a finished document, does indicate the requirements for a satisfactory survey. These requirements were not met in three important respects: the area around the slush wells was not examined in great detail; the watertight bulkheads were not tested; and the MCA surveyor was not in attendance. The thoroughness of the survey is questionable and perhaps localised corrosion in the hull plating or in the forward engine room bulkhead went undetected.

2.7 Human factors

The fundamental importance of watertight bulkheads to the safety of the vessel was not appreciated by the skipper and driver. Both were aware of the open drains from the accommodation, but the defect was not rectified.

Watertight bulkheads are the last line of defence but one sometimes neglected. It is easy to check if a pump is working, but checking the watertightness of a bulkhead is substantially more difficult and time consuming because it may involve considerable preparatory work to provide adequate access and lighting. It is a false economy to skimp in this area. The fishing industry must recognise that the periodic inspection of watertight bulkheads is important for the safety of steel fishing vessels and should allocate appropriate resources to see that it is done satisfactorily.

SECTION 3 - CONCLUSIONS

3.1 Findings

1. The source of the leak was probably no bigger than 80mm in diameter. [2.2]

2. It is not known if the leak was in the hull plating or piping, it could have been either. [2.2]

3. The leak probably started less than 30 minutes before the bilge alarm sounded. [2.2]

4. The early warning from the bilge alarm was undoubtedly a major contributing factor to the orderly evacuation of the vessel without loss of life. [2.3]

5. *Jasper III* did not meet the requirement of the Fishing Vessel (Safety Provisions) Rules 1975 for the engine room on a steel fishing vessel to be contained between watertight bulkheads. [2.3]

6. The flooding spread aft of the engine room because the aft bulkhead was penetrated by two open drain pipes from the accommodation. It is not known how the flooding spread forward. [2.3]

7. It is not known if *Jasper III* would have survived had her engine room bulkheads been watertight. In any case, with non-watertight bulkheads, her chances of sinking would have been substantially increased. [2.3]

8. The crew did all they could in the circumstances. [2.3]

9. It is not known why the EPIRB did not surface and transmit. [2.4]

10. The engine room bulkheads on *Jasper III* were not watertight because maintenance and inspection of the bulkheads was inadequate. [2.5]

11. The thoroughness of the ultrasonic survey was questionable, and the possibility cannot be discounted that localised corrosion in the hull plating or in the forward engine room bulkhead went undetected. [2.6]

3.2 Causes

Immediate cause

Jasper III foundered because of unrestricted and rapid flooding from an unidentified leak.

Contributory factors

An undetected weakness which was probably advanced corrosion in the hull plating or piping, led to her flooding.

The non-watertight boundary to the engine room allowed unrestricted flooding, which probably led to her sinking.

Maintenance and inspection of the bulkheads was inadequate.

SECTION 4 - RECOMMENDATIONS

Caley Fisheries (Peterhead), agents to *Jasper III* and several other steel fishing vessels, is recommended to:

1. Circulate copies of this report to all the owners and skippers of steel fishing vessels for which they are agents.

The Maritime and Coastguard Agency is recommended to:

2. Review the existing arrangements for the survey of steel fishing vessels with regard to the inspection of the condition of the hull, bulkheads and engine room piping; to reduce the possibility of serious defects being undetected during surveys.

May 2000