Report on the investigation of

the capsize and foundering of

Radiant **PD298**

about 45 miles north-west of the Isle of Lewis

with the loss of one life on

10 April 2002

Marine Accident Investigation Branch
First Floor
Carlton House
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United Kingdom
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Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1999

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

CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

EPIRB	-	Emergency position indicating radio beacon
fv	-	Fishing vessel
HRU	-	Hydrostatic release unit
ISO	-	International Standards Organisation
kW	-	kilowatt
m	-	metres
Nm	-	Newton metres
PTS	-	Programmable trawl system
SAR	-	Search and rescue
UTC	-	Universal co-ordinated time

SYNOPSIS

In the late evening of 10 April 2002, the fv *Radiant* was fishing about 45 miles north-west of the Isle of Lewis. While trying to free the fishing gear from an underwater obstruction (fastener), the vessel capsized and foundered at about 2225 UTC. An MAIB investigation began the following day.

Radiant became effectively anchored to the seabed when her port net snagged on a seabed obstruction. During hauling back, which was the usual procedure for getting free of a fastener, power was lost to the winches, the winches stopped and the winch brakes came on. There was now a heavy load on the port warp, causing a large list to port. The vessel rolled either side of the list, such that the port engine room air intakes started dipping below the waterline. The engine room flooded, and, eventually, the vessel capsized.

During the abandonment, one of the crew was lost, the other five were successfully rescued. Five of the crew were wearing lifejackets, but only one inflated properly. The crewman who was lost was wearing one of those that was defective.

Corrective action has already been undertaken on inflatable lifejackets, but a recommendation has been made regarding a better way to attach release units to gas cylinders.

The suppliers of the winch control system (the PTS Pentagon system) have been recommended to put more emphasis on the emergency start facility when training fishermen in its use. Users must be aware that they should use the emergency start if the hydraulics fail and this is putting the vessel in danger. The suppliers have also been recommended to enable the safety brake when configuring PTS Pentagon systems.

The port engine air intakes were not taken as a downflooding point when assessing the vessel's stability. For operational reasons this is not considered practical, so a recommendation on this has been made to the MCA. *Radiant* was fitted with powerful winches, which were capable of seriously compromising stability if fishing gear became snagged. For similar vessels, a notice should be shown in bold print, near the front of the stability book, warning skippers of this danger. A recommendation has been made to the MCA addressing this point.

Radiant's sister vessel *Resplendent* is fitted with port engine air intakes in a similar position. A recommendation has therefore been made to her owner to consider raising them and/or moving them further inboard.

The positioning of openings that affect watertight integrity, is an important part of a vessel's design. A recommendation has been made to the builders of *Radiant* and *Resplendent* to consider this carefully when they are constructing fishing vessels in the future.

Figures 1 and 2 - General views of *Radiant*

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *RADIANT* AND ACCIDENT

Vessel details

Main owner	:	Riverview Investments Alexandra Buildings, Fishmarket, Peterhead
Skipper and part owner	:	William Lawson 6 Mile End, Peterhead
Relief skipper and partowner	:	Graeme Soutar 13 Chancellor Road, Buckie
Port and number	:	Peterhead – PD298
Flag	:	UK
Type	:	Fishing vessel – twin trawl
Built	:	2001 - Asturias, Spain
Classification society	:	Built to Bureau Veritas rules, but not maintained in class once in service
Construction material	:	Steel
Length overall	:	33m
Gross tonnage	:	622
Engine type and power	:	Caterpillar 3606, 1937kW

Accident details

Time and date	:	2225 on 10 April 2002
Location of incident	:	058° 42.2'N 008° 22.8'W About 45 miles north-west of the Isle of Lewis
Persons on board	:	Six
Injuries/fatalities	:	One fatality
Damage	:	Vessel lost

General views of *Radiant* are at **Figures 1 & 2**. A general arrangement drawing is at **Figure 3**.

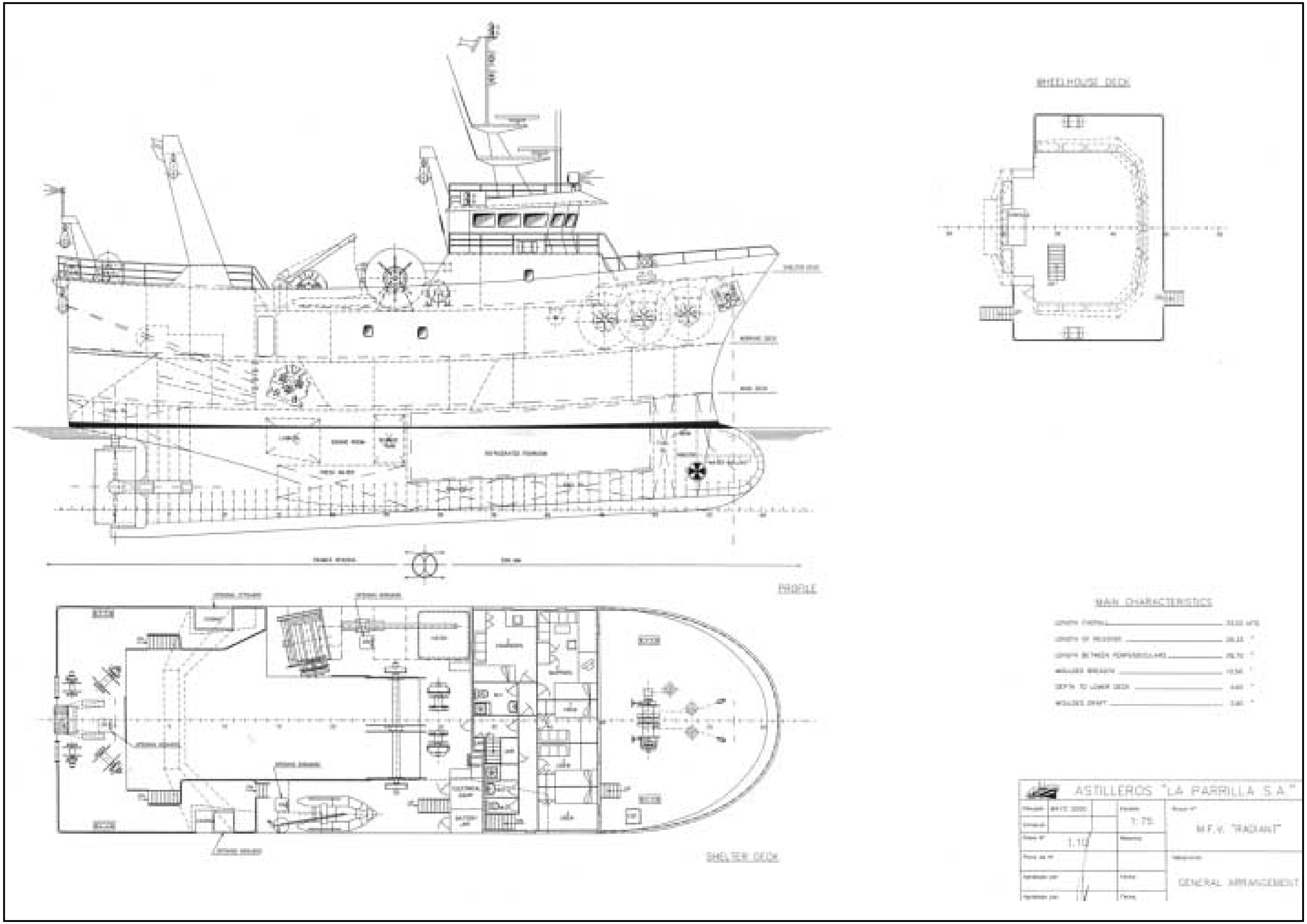
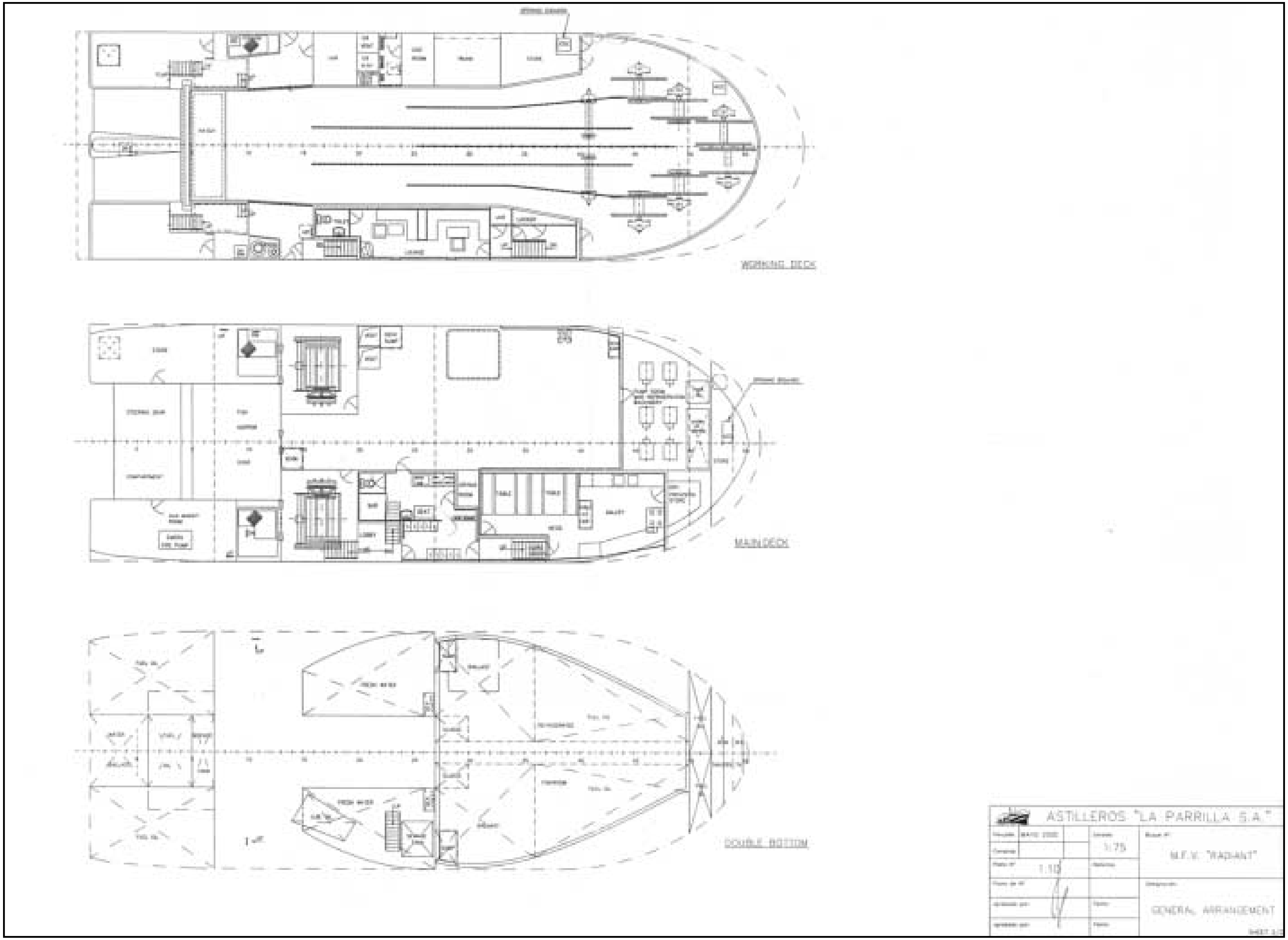


Figure 3

General arrangement sheet 1/2

Figure 3 cont



General arrangement sheet 2/2

1.2 NARRATIVE

All times are UTC.

Radiant began fishing in April 2001. She was designed for bottom trawling in deep water such as the fishing grounds around Rockall and along the edge of the continental shelf to the west of Scotland. During the year the vessel had been in service she had snagged many times, typically once or twice a day while fishing. The procedure to break free was, therefore, followed frequently and well practised.

The trip leading up to the accident started on 5 April 2002 at about 1800, when *Radiant* left Ullapool. After a voyage heading westwards, fishing was started to the north-west of Rockall. After about 24 hours, the vessel left the area, as the fishing was poor. She steamed east to the edge of the continental shelf, where fishing began, with the gear being towed in a north-easterly direction. After a while, they backtracked in a south-westerly direction. The vessel bottom trawled back and forth in this way for the next few days.

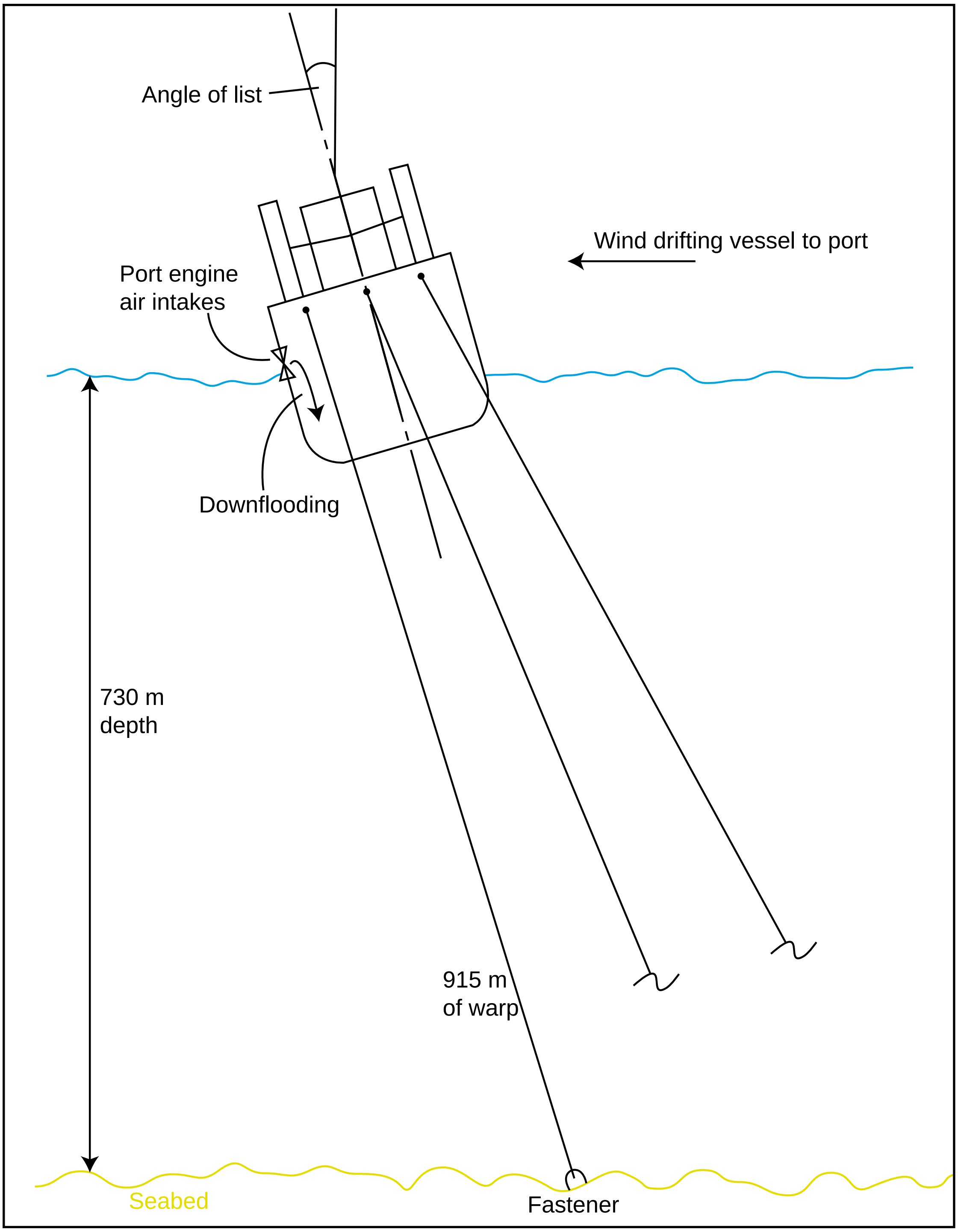
On the evening of 10 April, *Radiant* was towing in a south-westerly direction. Deckhand William Beedie was on watch, deckhand Shaun Downie was clearing up after the evening meal, and the rest of the crew were turned into their bunks. At about 2145, as they were nearing the end of a tow, the vessel snagged her port net on a seabed obstruction. The wind was north-west force 3, and there was a heavy swell.

The deckhand did not try to free the fishing gear from the fastener himself; instead he called the rest of the crew. William Lawson and the mate, William Ritchie, went to the wheelhouse. They were dressed in ordinary clothing as they were working inside. The three deckhands put on foul weather gear, inflatable lifejackets and hard hats, and then went on to the open deck aft in preparation for hauling. It was company policy that anyone working on an open deck must wear a lifejacket and a hard hat. The engineer, George Maskame, also donned foul weather gear, an inflatable lifejacket and hard hat, as he thought he might have some duties on the open deck, but, initially, he went to the engine room to carry out some routine checks.

On reaching the wheelhouse, William Lawson began the process of trying to get the fishing gear free of the fastener. William Ritchie was new to the vessel so he watched. About 1735m (950 fathoms) of warp was out and the water depth was about 730m (400 fathoms). It was apparent that only the port warp was fast, indicating that the port trawl door was snagged. William Lawson started hauling back. This is the usual procedure to try to get free of a fastener, because when a vessel is hauled directly over one, the gear will usually break clear.

The hauling was performed mainly using auto-heave, but occasionally William Lawson used manual heave to get the wires even ie an equal amount of wire deployed from each winch. The skipper was at the winch control panel facing aft at this time. Hauling back proceeded until there was about 915m (500 fathoms) of warp out. The wind was drifting the vessel to port. Although not directly over the fastener, there was a substantial load on the port warp, which caused a heavy list to that side. The drift prevented the warp coming to the plumb line **(Figure 4)**.

Figure 4



The effect of wind

At about 2215, when there was about 915m of warp out, the winches stopped. This prevented any further hauling; also the winch brakes came on, so the vessel was effectively anchored to the seabed. *Radiant* was rolling in the swell, either side of the list to port. William Lawson saw seawater washing on to the working deck through the scuppers on the port side of this deck. He was concerned about the port engine room air intakes, which were the lowest non-watertight openings on the port side.

Only one bridge light was on. The ambient light was kept low so that the crew could see outside in the dark. This light was not part of the emergency lighting system and it stayed on after the winches stopped.

William Lawson instructed William Ritchie to go and ask George Maskame about the problem with the winches. When the mate left the wheelhouse, the skipper could see from his control panel that none of the hydraulic pumps were running. William Ritchie passed on the message to George Maskame and then returned to the wheelhouse. After a while, it was possible for William Lawson to restart the six hydraulic pumps, but there was insufficient time to get the winches working before the pumps stopped again.

After receiving the message, George Maskame went to the forward hydraulic space where he could tell by the lack of noise that none of the six pumps were working. He cannot recall if the hydraulic-servo pump was running. He began to make some checks, but became alarmed by the list, so he left the compartment and went aft through the fish processing space on the main deck. As he closed the watertight door to the processing space behind him, he noticed there was no floodwater there. The lights were still on at this stage.

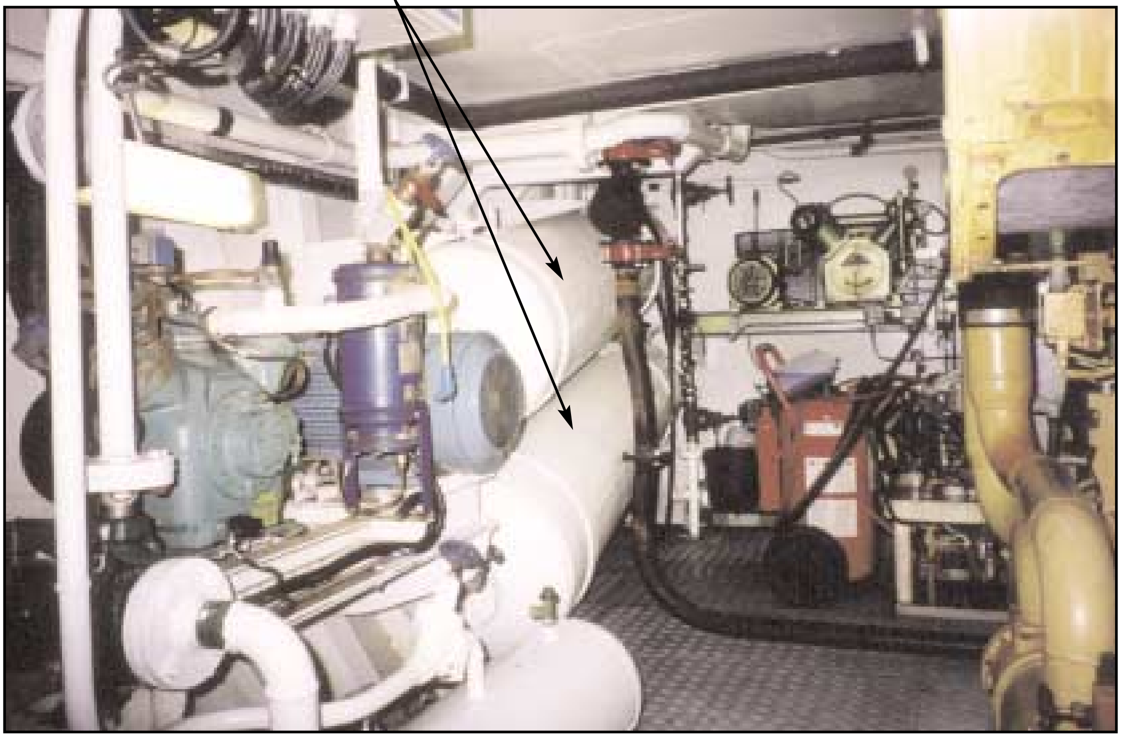
He went below to the engine room again and saw water flooding in by the air bottles, which were located below the port engine air intakes at the forward end of the engine room **(Figure 5)**. He believes that downflooding was occurring through these intakes **(Figure 4)**. He started one of the engine room bilge pumps, but had insufficient time to start the other two as the floodwater was rising so fast. He escaped from the space via the ladder on the starboard side, which was inclined back over him, because of the list. This made the escape difficult, but he made it up to the main deck.

After reaching the working deck he made his way forward to the wheelhouse. On the way, he noticed the nets were starting to float in the floodwater. The main engine stopped at about this time. The main lights went out, but the emergency lights came on. The main engine probably stopped because of the water ingress into the engine room.

William Ritchie went aft with the intention of cutting the port warp with a grinder or burner. As he made his way along the shelter deck he could see that the waterline was halfway up the door of the store **(Figure 6)** where the grinder and burning equipment were stowed. Realising it would be impossible to cut the warp, he returned to the starboard side of the wheelhouse, followed shortly after by George Maskame.

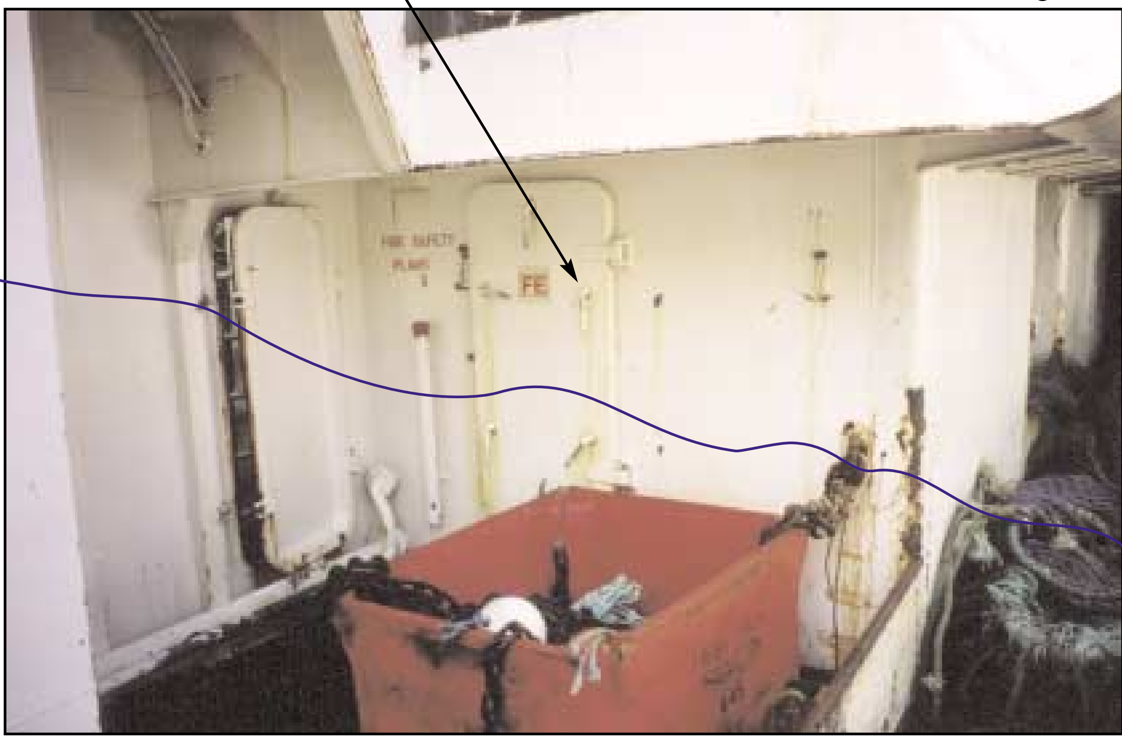
Before the main engine stopped, William Lawson considered applying full power to try to break the port warp, but decided against it. The water level was up to the guardrail of the shelter deck on the port side at this time.

Figure 5



Forward / port corner of engine room

Figure 6



Port / aft side of working deck

1.3 ABANDONING

When the angle of list became alarming, William Lawson instructed some of the crew to deploy the starboard liferaft. The liferaft canister was released from its cradle and thrown over the side. The water level by that time had risen to the port wheelhouse windows. As the canister deployed, it rolled around the bow.

William Lawson donned his inflatable lifejacket, which was stowed in the wheelhouse. William Ritchie's lifejacket was stowed below; he had insufficient time to collect it, so was forced to abandon ship without one. Deckhand Boguslaw Dziak offered William Ritchie his lifejacket, but the mate declined as he thought the deckhand would need it just as much. Before abandoning the sinking vessel, the five crew wearing lifejackets tried to inflate them manually by pulling the release toggles, rather than waiting for them to inflate automatically on entering the water. Only the lifejacket Shaun Downie was wearing inflated, the others did not. George Maskame could not inflate his jacket, so he took it off, together with his oilskins and boots, thinking these would weigh him down once he was in the water. He thought about going below to get an inherently buoyant lifejacket, but then realised that the floodwater would prevent this.

The painter was pulled and the liferaft appeared around the bow, inflated the right way up. William Lawson, George Maskame and William Beedie boarded it but, as *Radiant* capsized, it turned upside down. As the liferaft flipped over William Beedie was thrown out.

Boguslaw Dziak slid down the side of the vessel, followed shortly after by Shaun Downie. As the vessel sank alongside him Shaun Downie felt the suction dragging him down, but the buoyancy of his lifejacket counteracted this.

William Ritchie was the last person to leave the vessel. Just before he abandoned, he saw and heard steam issuing from the engine room air outlets on the inboard side of the gantry.

As *Radiant* foundered, she capsized to port and then sank by the stern. As the bow reared up, William Ritchie saw a forward hatch bulging, caused by trapped air pressure. He left the wheelhouse side, went forward and climbed the guardrail on the starboard side of the fo'c's'le, which was vertical at this stage. The water level chased him up what was, effectively, a ladder, until he reached the extreme forward end and then dived in. The mate heard *Radiant* sink with a thunderous roar.

William Lawson and George Maskame were inside the upturned liferaft. William Beedie had been thrown out, and he was the first crewman to climb on top of the upturned raft. William Lawson's legs were tangled in some rope or string, and this was trapping him, so he used the liferaft knife to cut himself free. To do this he had to put his head underwater. The knife was then passed to George Maskame, who used it to cut the painter. The skipper and engineer then ducked under water and got out of the liferaft doorway. William Lawson tried to inflate his lifejacket using the oral tube while he was in the liferaft, but his attempts were unsuccessful because of the darkness and the cold. After he got out of the raft he discarded the lifejacket as he thought it was weighing him down. William Ritchie and Shaun Downie had managed to swim to the liferaft. Boguslaw Dziak was also seen clinging to it. The water was very cold.

The crew in the water then started to board the upturned raft, assisted by William Beedie who was already on top; during this process Boguslaw Dziak lost his grip. The light on top of the liferaft was lit, but underwater. In the small amount of light provided, William Lawson believes that he saw Boguslaw Dziak floating nearby. It was very difficult to see, because it was dark and raining. The lifejacket worn by Boguslaw Dziak was one of those that did not inflate. The five crewmen on the liferaft were unable to recover him, and he was never seen again.

The survivors could see the light on the EPIRB flashing nearby. Its hydrostatic release unit must have activated, as it should. They also saw the light on the port liferaft, which also must have been deployed automatically by its HRU. While on the upturned raft, William Beedie, who was a non-swimmer, managed to inflate his lifejacket by blowing into the oral inflator.

The men tried to paddle towards the port liferaft, which was upright. Two of them re-entered the water and paddled with their feet, the others paddled with their hands. After a while they realised they were becoming very cold, and would not be able to reach the other raft. They took stock of the situation. William Lawson felt they should try to right the raft they were on and the rest of the crew agreed. They all, therefore, re-entered the water and began the operation. As the raft was being pulled over, William Ritchie was able to enter it. When it was the right way up, the rest of the crew were relieved to see him in the doorway, ready to help them in. The five all managed to board and then they began the consolidation procedure.

The sea anchor was deployed to help stabilise the raft. The rest of the equipment and supplies were unpacked. Seasickness tablets were distributed, and all the crew drank fresh water. The raft was bailed out, and the two thermal protective aids were cut up and divided among the three crew wearing the least clothing (William Lawson, William Ritchie and George Maskame). The two deckhands had managed to keep their oilskins on during the abandoning and found them helpful in keeping them warm, even though their clothing underneath was saturated. They could not find the liferaft paddles. Some of the flares were used.

The coastguard received the distress message from *Radiant*'s EPIRB at 2228 that day. It is believed the vessel had sunk minutes before at, say, 2225. The coastguard helicopter at Stornoway was scrambled. The coastguard emergency towing vessel *Statesman*, the Stornoway lifeboat, the fisheries patrol vessel *Norna*, and a number of fishing vessels all proceeded to the scene.

At 0149 the following day, the helicopter crew reported that they were on scene. The darkness and rain made locating the liferaft, and winching the survivors, difficult but, at 0246, the five men were on board. The helicopter reached Stornoway at 0323. The survivors were taken to hospital for check-ups. None had sustained any significant injuries, although all were shocked and cold when they were rescued. William Lawson and William Beedie took a breathalyser test administered by the police. Both tests showed that no alcohol had been consumed in the hours before the accident.

The search for the missing crewman continued until dusk on 11 April, but without success. The wind speed increased and the sea became rougher as the day progressed. The liferafts were recovered and taken to Stornoway.

1.4 WEATHER

The wind was north-west force 3, the visibility was moderate to poor in rain and it was dark. There was a heavy swell with a height of about 3m.

1.5 CREW

The 29-year-old skipper, William Lawson, had been fishing since he was 16 years old. He worked for 4 years as a deckhand, but when he obtained his mate's certificate he served as skipper. He worked on the fishing vessels *Rosebay*, *Shemarah*, and the previous *Radiant*. He had been involved in single, twin and pair trawling, and had always worked out of Peterhead. He served on the sister vessel *Resplendent* while the new *Radiant* was being built. He also undertook further training at this time. When *Radiant* was completed in April 2001, he skippered her on the voyage back from Spain, where she was built. He also served as her skipper until the time of the accident. He held a Class 1 Certificate of Competency as a Deck Officer on Fishing Vessels, dated 22 January 2001. He also held a Class 2 Certificate of Competency as an Engineer Officer on Fishing Vessels. He had gained various other qualifications, including basic safety training.

The 38-year-old mate, William Ritchie, had been fishing since 1980. He had worked on several vessels, including *Silver Harvest* and *Sirius*. It was only his second trip on *Radiant*. He had been involved in purse seining, including pair seining, twin and pair trawling, from Peterhead or Fraserburgh. He had a Mate's Full and Special Certificate of Competency on Fishing Vessels. He had various other qualifications, including basic safety training.

The 35-year-old engineer, George Maskame, had been employed mainly on fishing vessels for the last 12 years. He had always sailed as an engineer and had worked on the vessels *Pleiades, Solitaire, Marconn, Summer Dawn* and *Kincaid*. He had been involved in single, twin and pair trawling, on vessels based in Peterhead or Fraserburgh. He held a Class 1 Certificate of Competency as an Engineer Officer on Fishing Vessels. He had undertaken basic safety training.

The 26-year-old deckhand William Beedie had fished for about 10 years. He had served on several vessels including *Evening Star* and *Vicky B*. This was his first trip on *Radiant*. He had undertaken a variety of fishing types, from Peterhead, Fraserburgh and Skye and had undertaken basic safety training.

The 17-year-old deckhand, Shaun Downie, had been fishing for a couple of years. He had served on *Aurora* and the previous *Radiant*. It was his first trip on the new *Radiant*. He had only been involved in trawling from Peterhead. He had undertaken basic safety training.

The 54-year-old deckhand, Boguslaw Dziak, was Polish and had fished all over the world. He had served on *Radiant* since January 2002. As he was born before 1 March 1954 there was no requirement for him to have undertaken basic safety training, nor had he.

Radiant normally carried a crew of six, but sometimes seven were carried. Six crew could handle the vessel adequately. After leaving Ullapool, the vessel had been involved in routine fishing operations, and the crew were getting their usual rest periods. Before coming fast, most of the crew were off duty. There is no evidence that any of them were suffering from fatigue.

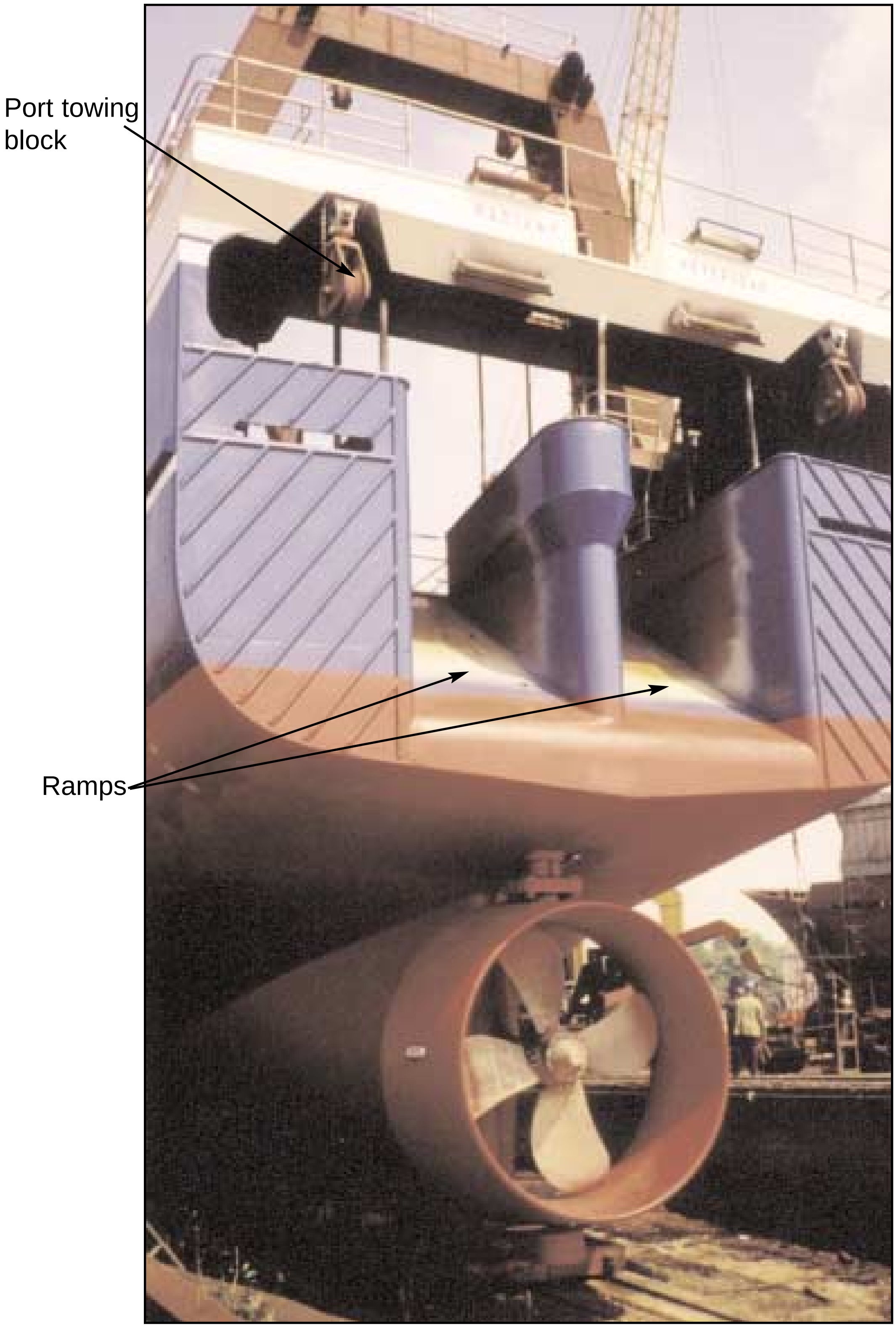
1.6 FISHING OPERATION

Radiant fished mainly to the west of Scotland. She had trawled the fishing grounds around Rockall, and the edge of the continental shelf to the north-west of the Isle of Lewis, many times during her first year of service. All the known wrecks at these locations were marked on the vessel's plotter and were avoided during trawling.

Radiant used a twin trawl arrangement. The nets were wound on sweep line winches situated at the forward end of the working deck. The aft part of each net, including the cod end, was laid out on the working deck when in the stowed position. Three identical nets were kept on board; only two were used in any one twin trawling operation, the third was a spare. There were also two single nets, stowed on drums, on the upper deck, but these were rarely used.

To begin shooting the gear, two trawls were pulled from their stowed positions aft along the working deck, until the cod ends slid down the ramps **(Figure 7)** into the water. Once the drag of the water was pulling the trawls out, the lines to the outhaul winches were removed. Shortly after, the trawl doors were attached, and the clump weight was deployed. The trawl doors were attached to warps, wound around the trawl winches situated below the working deck. The clump weight was attached to a warp, which was wound around a winch on the port side of the shelter deck. These three winches controlled the gear during trawling operations. The port and starboard trawl winches were contained in their own compartments, and small hatches were provided for the warps to pass through. The warps then ran to the towing blocks, which were positioned at the extreme aft end over the ramps.

Figure 7



Aft end

The gear was shot away until it trawled the bottom. The gear was towed using about 70 to 80% of the main engine power for between 5 and 6 hours. When the gear was hauled, the trawl winches and the clump winch were wound in until the trawl doors and clump could be detached and stowed. The forward ends of sweeps were then connected to the sweep line winches, and the trawl was hauled up the working deck until the cod ends were on the stern ramps. The cod ends were then lifted over the fish hatch and opened. The stern gate at the top of the ramps was always raised unless the gear was being hauled or shot. The fish hatch was always kept closed unless the catch was being emptied into the fish hopper.

A conveyer took the fish forward to the processing space, where they were cleaned and gutted. Offal was discharged overboard through a gutting chute **(Figure 8)**; this opening in the port side of the vessel could be closed watertight. The processed fish were then put into boxes, which were taken down and stowed in the refrigerated fish hold. The gutting chute was normally closed when there was no fish processing, so it should have been closed at the time of the accident.

Figure 8

Port side of processing space

1.7 SNAGGING AND WRECK

The crew of the fishing vessel *Crystal River* located the wreck of *Radiant* on the seabed at position 058° 42.2' N and 008° 22.8'W using sonar equipment **(Figure 9)**. This was just to the north-east of the sinking position used by the coastguard. There was a small current to the north-east, and this would have carried the vessel in that direction as she sank.

The scenario described by the crew, indicates that it was the port trawl door that was caught in the fastener. There are many coral reefs at the edge of the continental shelf where *Radiant* was fishing. It is possible that the port trawl door became caught on such a seabed obstruction. However, snagging a coral reef is quite common, and it is usually possible to break free reasonably easily.

Radiant was having great difficulty breaking free, this indicates that the fastener was something else, possibly a wreck. The French fishing vessel *Le Parrain* was lost in the area a couple of months before. *Le Parrain* had broken down and was being towed, while unmanned. The tow parted at night and she was never seen again, so it is believed that she sank. *Crystal River'*s skipper did not locate another wreck close to *Radiant*, however, he did say that he, too, had come fast in this position, before *Radiant'*s loss. The chart **(Figure 9)** does not show any wrecks in the area where *Radiant* sank.

1.8 LOSS OF ONE CREWMAN

Boguslaw Dziak was wearing a lifejacket at the time of the accident, but it failed to inflate manually or automatically. He was seen holding on to the liferaft after the abandonment. While the rest of the crew were struggling to board the upturned liferaft, he disappeared. It is possible that he suffered from cold shock. During the first two minutes of immersion in cold water, rapid cooling of the skin initiates a set of undesirable respiratory and cardiac responses, given the generic title 'cold shock'. These responses include: gasp, which is the uncontrollable rapid breathing that prevents breath holding; and an increase in both blood pressure and work required by the heart. The inability to control respiration can result in drowning, and the cardiac responses can cause susceptible individuals to suffer a stroke or heart attack. Boguslaw Dziak's age probably made him the most susceptible member of the crew, to cold shock. The temperature of the seawater was about 7 to 8°C.

1.9 LIFEJACKETS

Two types of lifejacket were carried on board *Radiant*. The fully approved SOLAS lifejacket for use in emergency, and an inflatable working lifejacket which met EN 396 criteria. The lifejackets which feature here were the latter type. It was the owner's policy that anyone working on an open deck should wear an inflatable lifejacket.

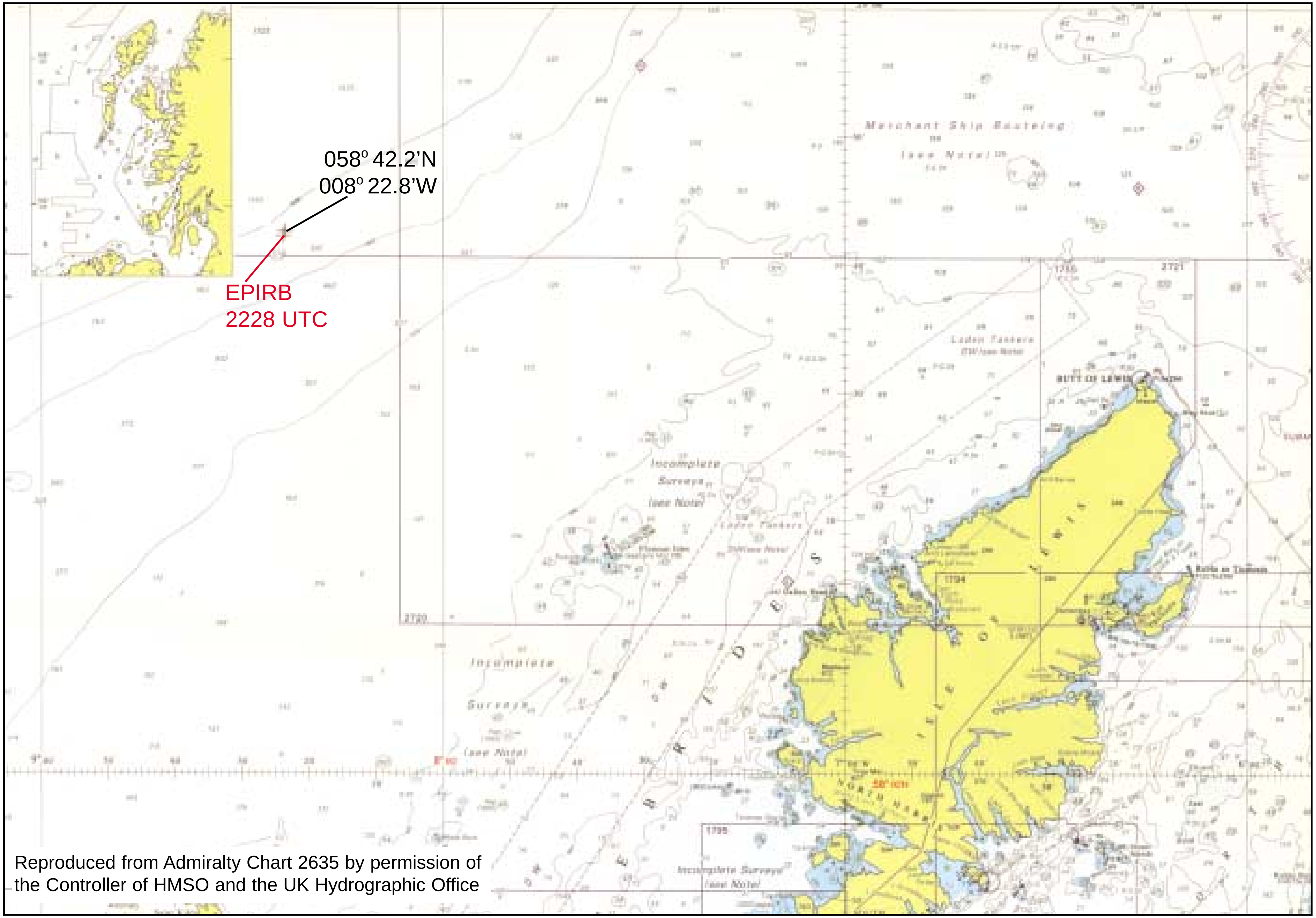

058° 42.2'N
008° 22.8'W
EPIRB
2228 UTC
Merchant Ship Routeing
(see Note)
Laden Tankers
Incomplete Surveys
(see Note)
Incomplete
Surveys
(see Note)
BUTT OF LEWIS
NORTH HARRIS
2720
2721
1794
1795
Incomplete Surveys
(see Note)

Figure 9

The accident raises a question about the effectiveness of at least one type of lifejacket being used at sea. Realising the importance of finding out what happened without delay, two of the lifejackets used in this accident were subsequently recovered and, together with 14 others of similar type, five of which were unused, were sent by the MAIB to an independent approved lifesaving appliance laboratory for inspection and testing. All were fitted with Hammar release units.

The examination revealed that the gas cylinders were either not connected to, or were not fully tightened into, their release units. The gas cylinders in the five unused lifejackets were not fully tightened into their release units.

The two lifejackets recovered from *Radiant* were found to be a few days overdue for service.

The wearing of lifejackets when working on deck means that they are subjected to heavy use. It has been discovered that the fabric of a lifejacket rubs against the gas cylinder with the movement of the wearer, and this effect can cause the cylinder to unscrew from the release unit if it has not been fully tightened. The more the jackets are used, the greater the likelihood that the cylinders will become unscrewed.

Following tests on the lifejackets recovered, it is assessed that in all probability, the reason why four out of the five lifejackets used on *Radiant* failed to inflate was because the gas cylinders were no longer attached to the release units.

Fishermen and mariners who routinely wear inflatable lifejackets should check that the gas cylinders are firmly tightened into the release units. It is especially important that owners of lifejackets fitted with Hammar release units make this check. They should also carry out the safety checks listed in the booklet issued with every lifejacket fitted with a Hammar release unit:

- *Check that the single point indicator is green.*
- *Check that the expiry date has not been reached.*
- *Check that the red handle is attached.*
- *Check that the gas cylinder is firmly tightened by holding it through the jacket fabric.*

Any deficiencies should be dealt with as soon as is practicable, and no later than the next time the vessel goes to sea.

Users should remember that when all else fails, a lifejacket can be inflated using the oral tube provided, having first removed the dust cap.

It is also important to service inflatable lifejackets annually, or more frequently, in accordance with manufacturer's instructions.

The MAIB recognised the importance of getting the above safety information out into the industry as quickly as possible, so issued a safety bulletin at the end of May 2002 **(Annex 1)**. Most of the fishing industry press produced articles based on the bulletin, and the MAIB has received positive feedback on this safety message.

MGN 155(F) published by the MCA, and available free of charge, contains useful guidance on inflatable lifejackets and other buoyancy equipment for fishermen at work.

1.10 SUBSEQUENT CORRECTIVE ACTION ON LIFEJACKETS

After the lifejackets were tested, the MAIB went to the factory that made them. There, it was confirmed that the cylinders were not being screwed in tightly enough, although the latest instructions that this manufacturer had received from Hammar, were being followed.

After this visit, the managing director of Hammar accepted that there was a problem, and promptly undertook corrective action. In early July 2002, a package of information was sent to all manufacturers and service stations using Hammar release units. The package contained the instruction to use 8 to 10 Nm torque when screwing cylinders into release units. Hammar has arranged to distribute the tools necessary to carry out this operation.

Hammar has placed adverts in the marine press in the UK and overseas, warning users of the problem, and specifying the checks that should be undertaken to ensure their release units work properly. Hammar has also introduced a positive reporting procedure, which will ensure that lifejacket manufacturers and service stations which use their products have the latest technical information.

Hammar has recently supplied release units to the US coast guard with cylinders already attached, and glued in place. Some people in the industry think this presents a problem, because the cylinders cannot then be weighed on their own. Weighing of cylinders is the standard way of checking that a full charge of gas is contained inside. The solution to this problem is to weigh a fully charged cylinder with a release unit when the two units are first connected together. By recording this weight, the state of the cylinder can be checked in the future by weighing the combined item.

Gluing cylinders in place is considered by many to be a better solution, indeed, the ISO committee on lifejackets is discussing making this a requirement. However, if this is adopted, it will not be for a few years.

Since the MAIB visit, the factory which manufactured *Radiant*'s lifejackets has used 8 to 10 Nm of torque when tightening cylinders into Hammar release units. This manufacturer has recalled all the lifejackets which were made in the year before the MAIB visit, to ensure that cylinders are adequately attached. Lifejackets manufactured before this will be checked during the annual service. Hammar co-operated in the recall.

Since the accident, bearing in mind the heavy use that inflatable lifejackets can be subjected to, the main owner of *Radiant* has introduced a company policy of servicing inflatable lifejackets every six months, instead of the normal annual servicing.

1.11 RECOVERY OF LIFEJACKETS AND INSPECTION OF LIFERAFTS

On 14 April 2002, an MAIB inspector travelled to Stornoway to take possession of the two lifejackets from *Radiant*. This was considered necessary, as these items were vital to the investigation. One of the lifejackets had inflated properly when the toggle had been pulled (manual inflation); the other had not operated manually or automatically, but had been inflated using the oral tube.

William Lawson recalls that his lifejacket was unused; he took it straight out of its package before donning and trying to inflate it. However, as this lifejacket was not one of those recovered, its condition could not be confirmed.

While in Stornoway, the opportunity was taken to inspect the Zodiac 12-person liferafts. Everything seemed to be in order, except that the paddles were missing from one of them. The paddles were attached to the liferaft using string, but in one liferaft this string had been cut and the paddles were missing.

The relevant regulations were checked, and it was confirmed that only two thermal protective aids are required in a 12-person liferaft.

1.12 EPIRB

The crew had no time to send a distress message by radio, before abandoning *Radiant*. The crew in the liferaft were cold and wet, so it was very important that the Jotron EPIRB worked so that they would be located and rescued promptly.

1.13 WINCH CONTROL SYSTEM

The port and starboard trawl warps, and the centre warp, were each controlled by a winch. The three winches were identical, and were controlled by a PTS Pentagon Programmable Trawl System supplied by Rapp Ecosse of Ellon. Rapp Ecosse is a subsidiary of Rapp Hydema A/S, Norway.

PTS Pentagon is an advanced winch control system, which can be configured so that the winches automatically haul-in and pay out. This feature allows fishing over rough grounds. When the net snags, the winch automatically pays out to stop the net being torn. When the net comes free again the winch automatically hauls in until the trawl is properly balanced, and the warps are at a length set by the winch operator. The system comprises a hydraulic pressure equaliser between the port and starboard trawl winches which enables a balanced trawl to be undertaken when the vessel is being turned. There are many other features of the system, which provide improved trawling when compared to purely manual winch control systems.

The first vessels fitted with PTS Pentagon systems were able to catch more fish than similar sized vessels with manual winch control systems. When this became widely known, the demand increased significantly, and now many fishing vessels are fitted with this system. PTS Pentagon can be configured to suit individual vessels. For example, the system can be adapted to control different numbers and sizes of winches. There are many features that can be tailored to the preference of the skipper concerned.

The three trawl winches on *Radiant* were hydraulically-driven. The PTS Pentagon control system was powered by transformers fed from the vessel's electrical system. The main hydraulics were supplied by six electrically-powered hydraulic pumps, located in a space at the forward end of the main deck. An electrically-powered hydraulic servo pump was fitted in the space with the six main pumps. The servo pump supplied the hydraulic control system. Manual inputs in association with the computer in the PTS Pentagon system sent signals to electrically-powered solenoids in the hydraulic control system. This system controlled hydraulic solenoids in the main hydraulic pipes supplying the winches etc. The two-stage system was necessary, because it was not practical for electric solenoids to control the main hydraulics directly.

The vessel's electrical generators fed a switchboard in the engine room; the six hydraulic pumps each had its own breaker. The hydraulic system included a hydraulic oil tank. Oil from the tank was fed to the six main pumps. Once the oil had been passed through the winches etc it returned to the tank via a seawater cooler. As well as trawl winches, the hydraulics powered sweep line winches, the deck crane, the bow thruster, gilson winches, outhaul winches, etc. The hydraulic tank also supplied the hydraulic servo pump, which in turn fed the hydraulic control system.

The hydraulic tank was at the forward end of the hydraulic space with the six main pumps. The tank was fitted with an oil level alarm/cut out switch referred to as a "Murphy switch", which could be moved up and down **(Figure 10)**. On *Radiant,* the switch was set between the upper and middle sight glasses. The upper sight glass was level with the surface of the hydraulic oil, which was about 0.2m above the Murphy switch.

If there was an oil leak and the level fell below the Murphy switch, an audible alarm sounded, and the six main pumps cut out, effectively disabling all the hydraulics. However, there was a hydraulic emergency start switch **(Figure 11)** on the winch control panel. A plastic cover, to prevent inadvertent use, protected

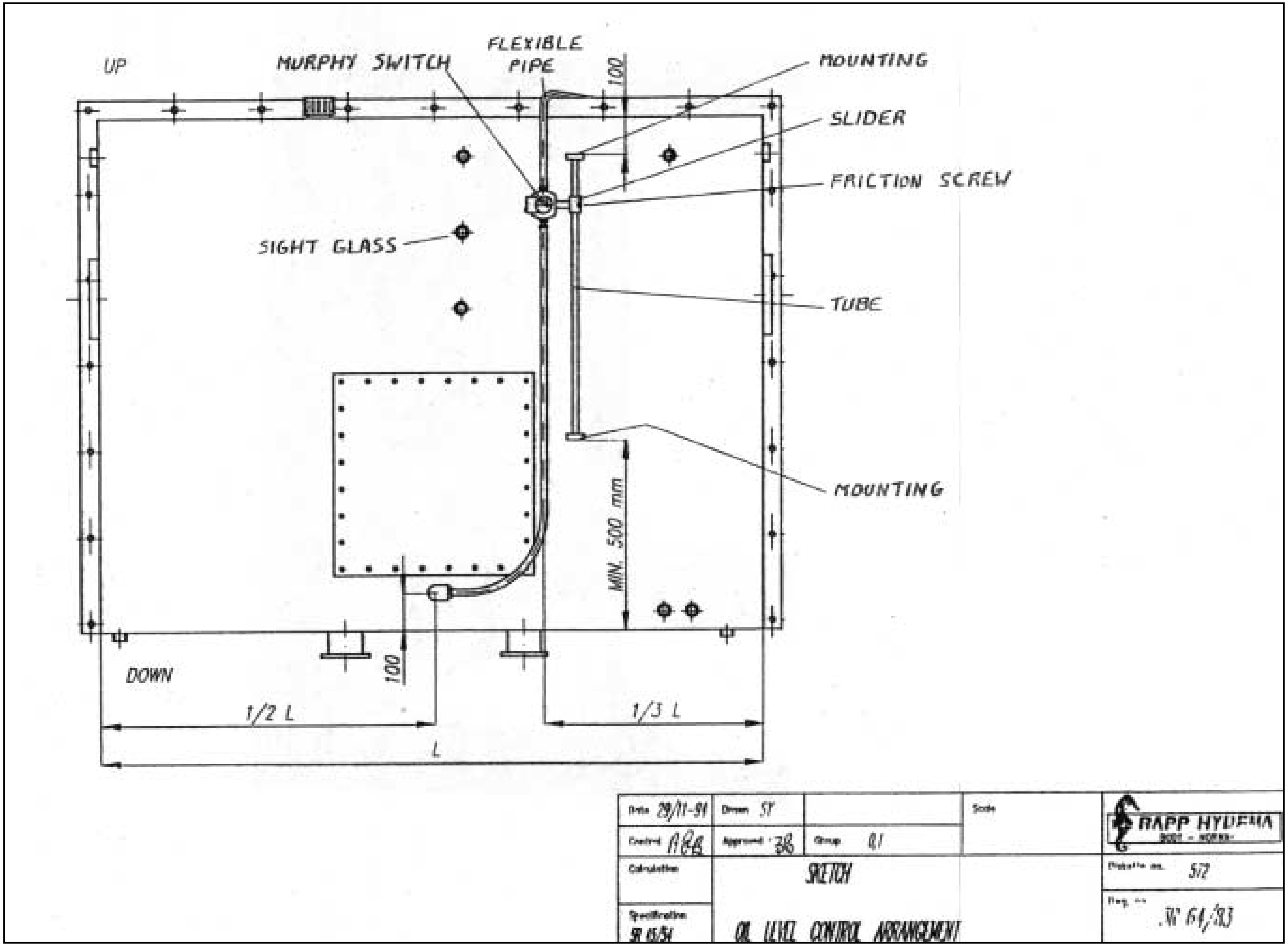

UP
MURPHY SWITCH
FLEXIBLE PIPE
100
MOUNTING
SLIDER
FRICTION SCREW
SIGHT GLASS
TUBE
MOUNTING
MIN. 500 mm
100
DOWN
1/2 L
1/3 L
L
Date 29/11-91
Drawn ST
Group 01
Scale
RAPP HYDEMA
SKETCH
OIL LEVEL CONTROL ARRANGEMENT
5/2

Figure 10

this switch. Opening the plastic cover, and depressing the switch, allowed the hydraulic pumps to be restarted. If the hydraulics were run in the emergency mode, a leak would allow most of the hydraulic oil to bleed from the system. If this was the case, the winches etc would eventually stop working and the pumps would burn out. The emergency start switch also enabled the winches to be controlled manually if the PTS Pentagon system failed for some reason.

The PTS Pentagon touch-screen **(Figure 11)** was located in a console at the aft end of the wheelhouse. The touch-screen was the main user interface with the system. Different pages could be called up on the screen to control various aspects of the system. The screen displayed any alarms, which were triggered. There was also an audible alarm. Before the loss, *Radiant*'s William Lawson is fairly sure that no alarms showed on the touch-screen; he was looking at this screen frequently while he was operating the winches. The audible alarm sounded a warning to the winch operator at the start and end of hauling, so William Lawson was familiar with the noise. If the audible alarm had gone off before the accident he is fairly sure he would have heard it. William Ritchie did not hear it sound either, while he was in the wheelhouse.

Figure 11

Winch control console

The winch control system did not include a facility whereby an audible alarm would have sounded if a certain tension was exceeded in one of the warps when hauling in. There was no high oil temperature cut-out. An audible alarm would have sounded if a certain oil temperature was exceeded, but the pumps would have kept running.

The main hydraulic pumps were controlled at the winch console. Each pump had a start and stop button **(Figure 11)**. A hand written label, showing the equipment supplied by each pump, had been taped to the console. About 10 to 20 seconds should have been allowed between starting each pump. Applying these delays meant that the electrical generation system had time to absorb the load. Starting the pumps more quickly could trip out the electrical supply. To start all six pumps, therefore, took about 1 to 2 minutes.

The PTS Pentagon system incorporated a safety brake feature. If the system was configured to operate this feature, it would prevent the brakes coming on if power to the winches was lost once 46m (25 fathoms) of cable was out. The feature relied on the servo pump running. It was designed to work when at least 46m of cable was out, to protect the crew. It is essential that the brakes stay on the winches when the crew are handling the trawl doors. The feature was intended to prevent the sort of problem that was encountered by *Radiant* ie being anchored to the seabed with a disabled winch. Rapp Ecosse recorded the system set-up of *Radiant'*s PTS Pentagon system on 27 March 2002, after a visit by one of their staff. The record shows the safety brake feature was disabled. William Lawson does not recall changing the set-up configuration after this time, he also believes that the safety brake feature was disabled at the time of the accident.

The decision as to whether or not the safety brake was configured was left to the owner/skipper. Sometimes the feature was not implemented, because the brakes were used to jig the gear free of a fastener. With the safety brake disengaged, the brakes were applied unless the winch was being used. A vessel could be hauled back over a fastener, and then the winch would be stopped. The brake would come on the winch and the sea swell would be used to jig the gear free.

On 9 July 2002, MAIB inspectors visited *Resplendent* in Peterhead harbour. *Resplendent* is the sister vessel of *Radiant*, and has the same winch control system. The safety brake feature on *Resplendent* had been disabled. All the photographs in this report showing internal views, or close-up views of parts of the working deck, were taken on *Resplendent.*

1.14 SYMPTOMS OF WINCH FAILURE

From the evidence collected, the symptoms of the winch failure on *Radiant* were:

1. The six main hydraulic pumps stopped, although after a while they were all restarted, before they stopped again.

2. No alarms were seen on the PTS Pentagon touch screen.

3. The audible alarm did not sound.

4. The light in the bridge, and other internal lights, stayed on after the hydraulic pumps stopped, which indicates that there was not a complete failure of the electrical generation system.

Rapp Ecosse believe that the winches stopped because of an electrical problem.

1.15 CONDITION OF LOADING

About 220 to 250 boxes of fish were on board. The maximum capacity was about 2000 boxes, so the vessel was lightly loaded. The weight of fuel used often exceeded the weight of fish caught, so the vessel could arrive lighter than she left. At the time of the accident there were about 60000 litres of fuel on board.

At the time of the loss, the condition of the vessel matched fairly closely Condition 6 in the stability book. The MAIB has undertaken stability calculations based on Condition 6.

1.16 STABILITY CALCULATIONS

The maximum pull of the port winch, the core pull, was 32.4 tonnes. The brake was designed to hold until the warp tension exceeded this value by 10 to 25%, when the hydraulic servo pump was not running. The brakes were designed to hold more than the warp breaking load when the servo pump was running. The minimum-breaking load for the warp was 52 tonnes.

At the time of the accident, a heavy swell was running. The skipper of *Crystal River*, which was fishing nearby, has reported that this swell was causing his vessel to roll more than normal. *Crystal River* was a similar size to *Radiant*.

William Lawson had been pulling hard with the port winch for nearly half an hour, to try to break free of the fastener. The winch was most likely to stop when the load was greatest; this would have occurred when the vessel was being lifted out of the bottom of a wave trough. If the port winch stopped at the bottom of a trough, the load on the port warp could have increased until the brakes on the port winch started slipping, provided the hydraulic servo pump was not running. This load could have been as high as 40.5 tonnes, but a load of 36 tonnes was chosen for the heeling lever calculation **(Figure 12)**.

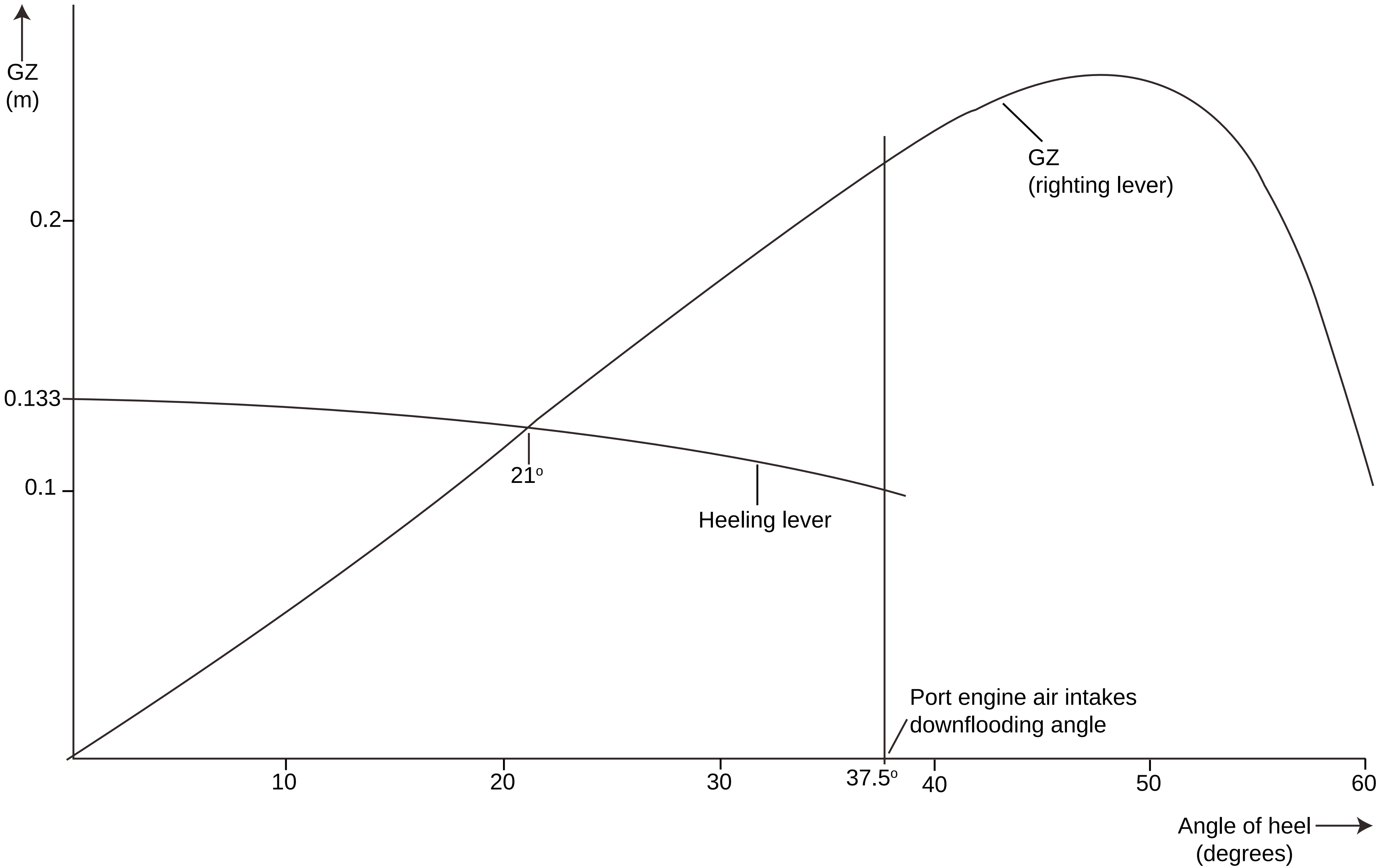
A stability case was run where *Radiant* was in Condition 6 and 36 tonnes was loaded on the port towing block **(Figure 7)**. In this situation, the steady angle of heel was 21° and the angle at which the port engine air intakes started to immerse was 37.5° **(Figure 12)**. These angles were calculated on the basis that there was no shift of loose gear. At such large angles of heel/list the shift of some gear is likely. This would degrade the stability even further. William Ritchie recalls that all the loose gear on the chart table fell on the deck when a large list developed. This would have happened in other spaces as well. The wind on the starboard side of the vessel would also have increased the list to port, but this was not considered in the calculations.

With the heavy swell, and the large list to port, *Radiant* would have been rolling beyond the angle at which downflooding of the engine room occurred. Once the flooding started, *Radiant's* stability would have progressively reduced, which would have led to more rapid flooding. (If the servo pump had been running, the load on the port warp could have been any value less than the breaking load (52 tonnes) of the warp.)

The vessel had never flooded through the port engine air intakes before, although some spray had been ingested here. However, the conditions on the night of the loss were exceptional.

The stability book showed that *Radiant* met the stability requirements of the regulations. The MCA was in the process of checking the stability book to confirm this when the vessel was lost. The port engine air intakes were not considered to be a downflooding point, because the openings could be closed with hatches **(Figure 13)**. However, the intakes had to be open to supply air to the main engine, generators, and for engine room ventilation, when the vessel was fishing. There was a scupper **(Figures 14 & 15)** adjacent to these intakes, which was low on the port side **(Figure 2)**. If the vessel was heeled to a large angle to port, water could flood in through this scupper on to the working deck, and then down into the engine room via the intakes.

The stability calculations showed that with a heel to port, the engine air intakes on that side, were the first downflooding point. The next downflooding point occurred at an angle of about 44° through the port warp opening **(Figure 16)** into the port trawl winch space. This space would also have flooded during the latter stages of the accident, which would have hastened the capsize. As no bilge alarms were fitted in the trawl winch spaces, no alarm would have sounded in the wheelhouse to warn the crew of the problem. However, the flooding of the port winch space could not have caused the capsize on its own, because all its boundaries to other parts of the ship were watertight, and the space was small.



Stability curve (condition 6)

Figure 12

George Maskame did not notice any flooding when he passed through the processing space just before the capsize. This indicates that the gutting chute was closed. So, although this opening was low on the port side **(Figure 2)**, it was not a downflooding point.

The vent opening to the processing space was inboard of the port engine air intakes **(Figure 13)**. This was the next downflooding point after the port warp opening, but it did not immerse until the angle of heel was about 51°.

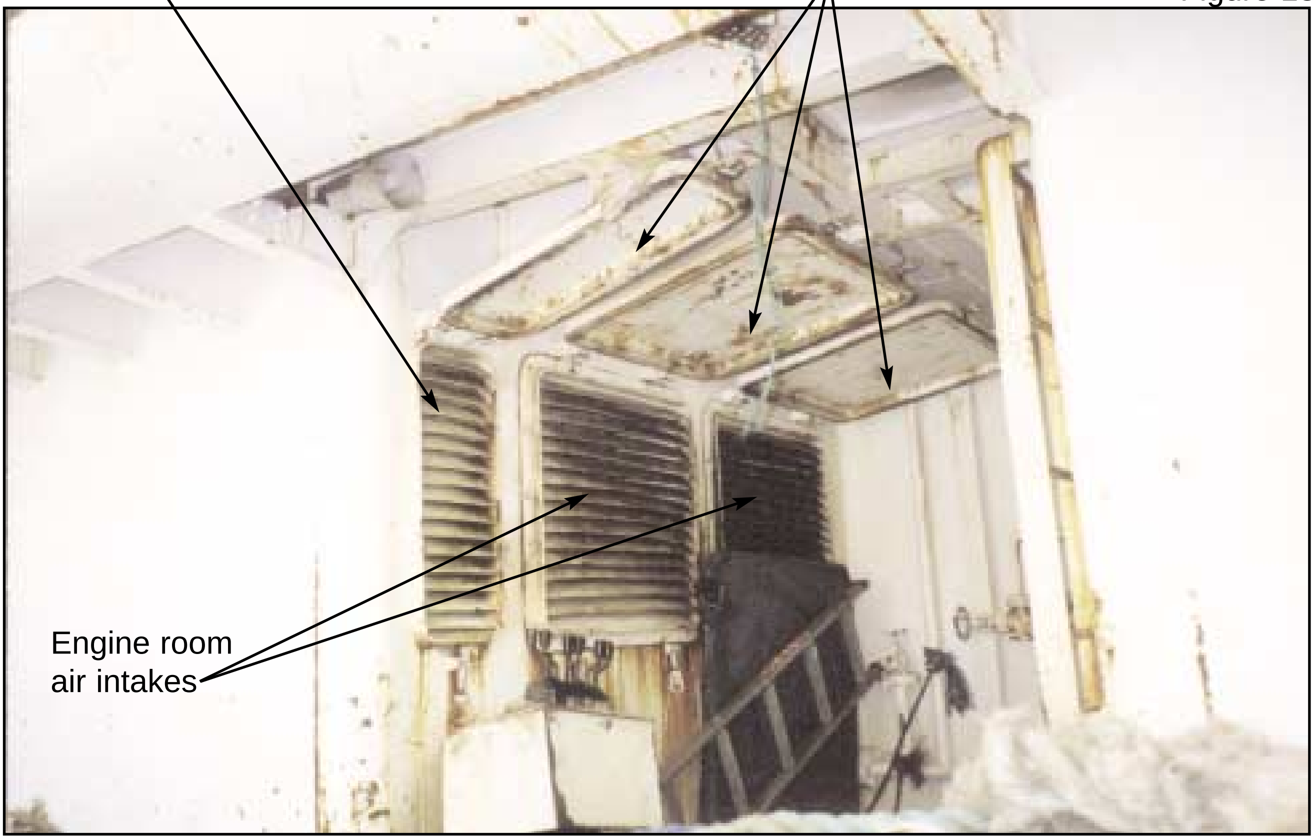
1.17 SUBMARINES

The MAIB contacted the Royal Navy after the accident, which confirmed that no submarines were in the area at the time. In any case, the scenario in no way indicated that a submarine was involved.

1.18 CERTIFICATE

Radiant carried a valid United Kingdom Fishing Vessel Certificate. The short-term certificate issued by the MCA on 1 November 2001 expired on 30 April 2002. The certificate was short-term, pending approval of the stability book.

Figure 13



Port air intakes

Figure 14

Port engine air intakes (downflooding point)

Figure 15

Scupper adjacent to engine air intakes

Figure 16

Warp hatch to port winch (downflooding point)

SECTION 2 - ANALYSIS

2.1 AIM

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

2.2 LIFEJACKETS

The owners' policy regarding the wearing of inflatable lifejackets on deck is commendable and might well have saved one life in this accident. The wearing of lifejackets when working on deck is very much encouraged, but it must be remembered that under these circumstances they are subjected to heavy use. The fabric of a lifejacket rubs against the gas cylinder with the wearer's movement, this can cause the cylinder to unscrew from the release unit if it has not been fully tightened. The more the jackets are used, the greater the likelihood that the cylinders will become unscrewed. The owners' new policy, of servicing inflatable lifejackets every six months, addresses this problem.

Four out of five of the lifejackets used by the crew failed to inflate because the cylinders were detached from the release units. This could have led to the death of Boguslaw Dziak, although he was seen to be holding on to the liferaft before he was lost. It is considered that he would not have let go of the liferaft if he had remained conscious. He therefore probably died as a result of cold shock, in which case his lifejacket would not actually have saved him.

Corrective action has been taken, so that gas cylinders are now tightened very firmly into release units. This is considered to be an acceptable solution to the problem. Any cylinders so tightened should not unscrew, although regular checks should, nonetheless, be made to ensure that they are, in fact, attached. So that this is not forgotten, Hammar suggests that this check be made each time a lifejacket is donned; the MAIB agrees.

The MAIB believes that gluing cylinders in place would be a better solution, especially for recharge kits. Under EN396 there is no requirement for service stations to fit lifejackets with new gas cylinders. If a lifejacket is inflated, the owner can carry out recharging. It is almost impossible to achieve the correct torque by hand screwing, so it is better to supply the base of the release unit with the cylinder already attached. A recommendation has been made to Hammar, to consider gluing-in cylinders, as standard practice for their product, as soon as possible.

While undertaking the investigation, it became apparent to the MAIB that other manufacturers of release units have also suffered with this problem. Therefore, it is important for users of inflatable lifejackets to check the security of cylinders, regardless of the type of release unit.

2.3 LIFERAFT AND EPIRB

The paddles in the liferaft used by the crew, were missing. The string that attached the paddles to the liferaft had been cut. William Lawson probably cut this string accidentally when he was trying to free himself inside the upturned raft. Once the connection had been lost, the paddles probably fell out of the raft, perhaps when it was being righted. They could have then drifted away in the darkness.

Only two thermal protective aids were required in the 12-person liferaft used by the crew. In the circumstances of this particular accident, a third thermal protective aid would have been very useful.

Apart from these two small problems, the liferaft used by the crew functioned satisfactorily. It almost certainly saved five lives.

The correct operation of the EPIRB also contributed to the saving of five people.

2.4 WINCH CONTROL SYSTEM

When the winches stopped, *Radiant* was effectively anchored to the seabed in a heavy swell. The gear was snagged on the port side, so most of the tension was in the port warp. The vessel was listed to port. The stopping of the port winch was the main reason for the loss.

When it became possible to restart the pumps, William Lawson could have started one of the pumps that supplied the port winch (either No 2 or No 5). This would have taken 10 to 20 seconds, instead of starting all six, which took 1 to 2 minutes. If he had started just one pump, he might have had time to take the load off the port warp before the system stopped again. However, it should be borne in mind that from the time the winches first stopped, until the abandonment of *Radiant*, was only 5 to 10 minutes, so there was very little time to consider the situation.

William Lawson could have tried to use the emergency start for the hydraulics, to get the port winch working. He seemed to be unfamiliar with this feature. Bearing this in mind, a recommendation has been made to Rapp Ecosse, to put more emphasis on this facility when it is training fishermen to use the PTS Pentagon system. Winch operators must be aware that they should use the emergency start if the hydraulics fail and this is putting the vessel in danger.

The system should have been configured so that the safety brake feature was on. Some skippers request that the feature is not enabled, so that the brakes can be used to help jig the gear free of a fastener. This practice is considered to be dangerous. Anchoring a vessel to the seabed in a heavy swell could lead to a capsize. There doesn't seem to be any good reason to disable the safety brake. This feature is designed to prevent the sort of accident that happened here. However, the safety brake did need to have the servo pump running; this might not have been the case on *Radiant* at the time of the accident. The MAIB believes that this feature could save vessels facing a similar situation. Rapp Ecosse, therefore, is recommended to enable the safety brake when configuring systems. If owners/skippers object, they should be made aware of the dangers of having the feature disabled. The example of *Radiant* can be quoted.

Rapp Ecosse staff were seen by the MAIB on three occasions. They also supplied all the information the MAIB requested. The PTS Pentagon system is very complex, and even though both Rapp Ecosse and the MAIB have spent a substantial amount of time analysing the case, it has not been possible to identify the fault which caused the winches to stop. Originally, it was thought that the Murphy switch triggered when the hydraulic oil dipped below it, possibly caused by the list, or a burst pipe. However, as there were no alarms, this is believed unlikely.

The lack of alarms indicates that the cause of the winch failure was probably electrical.

2.5 STABILITY AND WATERTIGHT INTEGRITY

Seawater accumulated on the working deck and then downflooded through the port engine air intakes. George Maskame observed the flooding of the engine room during the initial stages. William Ritchie saw and heard steam issuing from the engine air outlets just before the loss. This indicates that floodwater had got on to the hot machinery. The flooding of the engine room was well advanced at this stage.

The position of the port engine air intakes met the requirements of the current regulations. They did not have to be considered as downflooding points, because they were fitted with watertight hatches. However, the intakes had to be left open when *Radiant* was fishing, to supply air to the main engine and generators, and for engine room ventilation.

If the port engine intakes had been considered as downflooding points, it would have highlighted their vulnerability. It might even have been necessary to raise them, and/or move them further inboard, to pass the required stability criteria.

The MCA has already recognised this problem. The regulations for fishing vessels over 24m in length are currently under review. The MCA plans to produce a code for such vessels. This will come into force in about a year's time. The format of the code will be similar to the code for vessels under 24m ie *MSN 1770(F) The Code of Safe Working Practice for the Construction and Use of 15 metre Length Overall to less than 24 metre Registered Length Fishing vessels*. As regards downflooding points, the new code for vessels over 24m will probably follow the same requirement, as that adopted in the under 24m code. Paragraph 2.2.7.2 of the under 24m code states:

"Machinery space ventilators should be led as high as is reasonably practicable and preferably be fitted well inboard, the angle of initial downflooding to the machinery spaces should not be less than 40 degrees." There will be no dispensation from this requirement, even if watertight closures are fitted.

The MCA's intentions regarding engine air intakes and outlets (machinery space ventilators) is supported by the MAIB, and a recommendation to this effect has been made.

Radiant was fitted with powerful winches, capable of seriously compromising stability. A vessel's stability can be judged by the area under the righting lever curve **(Figure 12)**. At the time of the accident, this area was cut off at an angle of 37.5°. The heeling lever caused by the port winch uses up most of the area under the curve. The small area above the heeling lever curve was not sufficient to keep the vessel stable when she was rolling in the heavy swell. The MAIB has investigated similar cases in the past. The loss of *Heather Bloom* in 1994, and *Westhaven* in 1997 are examples.

For similar vessels, a notice should be shown in bold print near the front of the stability book, warning skippers of this danger. A recommendation has been made to the MCA to require such a warning notice, if the power of the winches is sufficient to seriously degrade stability. When stability books are checked, the MCA should require a suitable warning notice to be included, if the winch power poses a risk of capsize.

The port engine air intakes on the sister vessel *Resplendent* are considered to be too low, hence a recommendation has been made to her owner to consider raising these intakes, and/or moving them further inboard.

The positioning of openings, which affect watertight integrity, is an important part of a vessel's design. Engine air intakes and outlets should be considered as downflooding points, even if closures are fitted. As a minimum, openings should be positioned such that the stability criteria are passed, but preferably they should be fitted higher, so that downflooding does not occur until there is a very large angle of heel or list. A recommendation has been made to the builders of *Radiant* and *Resplendent* to carefully consider this during their construction of fishing vessels.

SECTION 3 - CONCLUSIONS

3.1 CAUSE

Radiant sank after seawater accumulated on the main deck and then downflooded into the engine room via the port air intakes. The intakes became immersed because the vessel was effectively anchored to the seabed when the port winch stopped, during attempts to free the fishing gear from an underwater obstruction. The sinking of the vessel resulted in the loss of one crew member. [2.2,2.4,2.5]

3.2 CONTRIBUTING FACTORS

1. Four out of five of the inflatable lifejackets used by the crew failed to inflate because the gas cylinders were not attached to the release units. [2.2]

2. A defective lifejacket could have led to the death of Boguslaw Dziak, although he probably died as a result of cold shock, in which case his lifejacket would not actually have saved him. [2.2]

3. If one hydraulic pump had been started, rather than all six, there might have been time to release the load on the port winch. [2.4]

4. If the skipper had been familiar with the hydraulic emergency start facility, he would have used this, and this might have enabled the load on the port winch to be released. [2.4]

5. The safety brake feature in the winch control system should have been configured to be on, as this might have prevented the brake locking the port winch when power was lost. [2.4]

6. The port engine air intakes should have been considered as downflooding points. This would have highlighted their vulnerability. [2.5]

3.3 OTHER FINDINGS

1. Apart from two small problems, the liferaft used by the crew functioned satisfactorily. It almost certainly saved five lives. [2.3]

2. The correct operation of the EPIRB contributed to the saving of five people. [2.3]

SECTION 4 - RECOMMENDATIONS

Hammar, manufacturers of the lifejacket release units, are recommended to:

1. Consider gluing gas cylinders into release units, as standard practice for future production.

Rapp Ecosse, suppliers of the winch control system on *Radiant*, is recommended to:

2. Put more emphasis on the hydraulic emergency start facility when training fishermen to use the PTS Pentagon system. Winch operators must be aware that they should use the emergency start if the hydraulics fail and this is putting the vessel in danger.

3. Enable the safety brake when configuring PTS Pentagon systems.

The Maritime and Coastguard Agency is recommended to:

4. Consider engine room air intakes and outlets as downflooding points if the angle of initial immersion is less than 40°. This requirement should be applied regardless of whether closures are fitted.

5. Require the inclusion of a suitable warning notice in the stability books of vessels where the winch power is capable of causing a risk of capsize.

Riverview Investments is recommended to:

6. Consider raising, and/or moving further inboard, the port engine air intakes on the sister vessel *Resplendent*.

La Parrilla Shipyard, Asturias, Spain, builders of *Radiant*, is recommended to:

7. Consider carefully, the positioning of openings which affect watertight integrity, when building fishing vessels. Openings should be positioned so that downflooding does not occur until there is a very large angle of heel or list.

Marine Accident Investigation Branch
January 2003

ANNEX 1

MAIB Safety Bulletin 2/2002

Safety Bulletin

MAIB

DTLR
TRANSPORT
LOCAL GOVERNMENT
REGIONS

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

MAIB SAFETY BULLETIN 2/2002

The loss of one crewman with
the sinking of the fishing vessel

Radiant

about 45 miles
north-west of the Isle of Lewis

10 April 2002

Issued May 2002

MAIB
is an
INVESTOR IN PEOPLE

MAIB SAFETY BULLETIN 2/2002

This document, containing Safety Recommendations, has been produced for marine safety purposes only. It is issued on the basis of information available to date.

The Merchant Shipping (Accident Reporting and Investigation) Regulations 1999 provide for the Chief Inspector of Marine Accidents to make recommendations at any time during the course of an investigation if, in his opinion, it is necessary or desirable to do so.

The Marine Accident Investigation Branch (MAIB) is carrying out an investigation into the sinking of the fishing vessel *Radiant* on 10 April 2002 and the loss of one crewman from, apparently, the failure of his lifejacket to inflate properly. The MAIB will publish its report on completion of the investigation.

While abandoning *Radiant*, the crew experienced problems inflating their lifejackets. This Safety Bulletin is for the attention of all mariners who wear inflatable lifejackets and recommends that they **check that the gas cylinder is firmly tightened into the release unit**.

J S Lang
Rear Admiral
Chief Inspector of Marine Accidents

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Background

While fishing to the north-west of the Isle of Lewis, *Radiant* snagged her port net on a seabed obstruction. Attempts were made to free it but, in the process, the winch stopped. Within five minutes the vessel capsized and sank. The wind was force 6, the sea was rough, and it was dark. The details of the capsize are being investigated and will be covered in the report.

Two types of lifejacket were carried on board; the fully approved SOLAS lifejacket for use in emergency, and an inflatable working lifejacket which met EN 396 criteria. The lifejackets that feature in this Bulletin were the latter type. It was the owner's policy that anyone working on an open deck should wear an inflatable lifejacket.

The Accident

This Safety Bulletin concerns the abandoning of *Radiant* and the lifejackets being worn by her crew.

Soon after the winch stopped, the vessel started to list heavily to port, prompting the six-man crew to muster on the starboard side of the wheelhouse. The three deckhands who had been working on deck were, in accordance with company policy, already wearing inflatable lifejackets. Both the skipper and the engineer donned theirs while the mate, who had also been working in the wheelhouse, realised that his was stowed below. There was insufficient time for him to collect it and he was forced to abandon ship without one. Such was the speed of events.

Before abandoning the sinking vessel, the five crew wearing lifejackets tried to inflate them manually by pulling the release toggles rather than waiting for automatic inflation on taking to the water. Only one of the five lifejackets inflated.

Three of the crew managed to board the starboard liferaft but, as *Radiant* capsized, it turned upside down. They all ended up in the water and tried to board the upturned raft. During this process one of them disappeared. Once the others had managed to board the upturned raft, they tried to locate their colleague, but without success. The missing man was one of those whose lifejacket had failed to inflate. He was never seen again.

While on the upturned raft, one man managed to inflate his lifejacket by blowing into the oral tube. The liferaft was eventually righted and the five survivors managed to board it. They were rescued by helicopter after the coastguard had been alerted by transmissions from the vessel's Emergency Position Indicating Radio Beacon (EPIRB).

Lifejacket Inspection

The accident raises a question about the effectiveness of at least one type of lifejacket being used at sea. Realising the importance of finding out what happened without delay, 2 of the lifejackets used in this accident were recovered. Together with 14 others of similar type, 5 of which were unused, they were sent to an independent approved lifesaving appliance laboratory for inspection and testing. They were all fitted with Hammar release units.

The examination revealed that the gas cylinders were either not connected to, or were not fully tightened into their release units. The gas cylinders in the five unused lifejackets were not fully tightened into their release units.

Comment

The owner's policy regarding the wearing of lifejackets on deck is commendable and may well have saved one life in this accident.

The wearing of inflatable lifejackets on deck is encouraged, and provided they are properly serviced, those who do so have every right to expect that they will function reliably when required.

An inflatable lifejacket being worn by fishermen is subjected to heavy use. It is too early to know precisely what happened in this instance, but it has been discovered that when the fabric of a lifejacket rubs against the gas cylinder with constant use, it can cause the cylinder to unscrew from the release unit if it has not been fully tightened.

Following tests on the lifejackets recovered, it is assessed that in all probability, the reason why four out of the five lifejackets used on *Radiant* failed to inflate was because the gas cylinders were no longer attached to the release units. The casualty had been wearing one of them.

Users should remember that when all else fails, a lifejacket can be inflated using the oral tube provided having first removed the dust cap.

It is also important to service inflatable lifejackets annually or more frequently according to manufacturers instructions. The two lifejackets recovered from *Radiant* were found to be a few days overdue for service.

MGN 155(F) published by the MCA, and available free of charge, contains useful guidance on inflatable lifejackets and other buoyancy equipment for fishermen at work.

Safety Recommendations

Fishermen and mariners who routinely wear inflatable lifejackets are recommended to:

1. Check that the gas cylinders are firmly tightened into the release units. It is especially important that owners of lifejackets fitted with Hammar release units make this check.

2. Carry out the safety checks listed in the booklet issued with every lifejacket fitted with a Hammar release unit:

   - Check that the single point indicator is green.
   - Check that the expiry date has not been reached.
   - Check that the red handle is attached.
   - Check that the gas cylinder is firmly tightened by holding it through the jacket fabric.

   Any deficiencies should be dealt with as soon as practicable and no later than the next time the vessel goes to sea.

Users, service stations and suppliers of inflatable lifejackets are recommended to:

3. Heed the updated information that Hammar is promulgating about tightening gas cylinders into release units.