

Report on the investigation
of the foundering of the
fv Radiant Star III PD251
60 miles north-east of Fraserburgh
on 6 August 1999

Marine Accident Investigation Branch
First Floor, Carlton House
Carlton Place
Southampton
SO15 2DZ
☎ 023 8039 5500

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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 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.

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GLOSSARY OF ABBREVIATIONS

DSV	Diving Support Vessel
FV	Fishing Vessel
GPS	Global Positioning System
HRU	Hydrostatic Release Unit
(M+F)	Merchant Ships and Fishing Vessels
MAIB	Marine Accident Investigation Branch
MCA	Maritime and Coastguard Agency
MRCC	Marine Rescue Co-ordination Centre
ROV	Remotely Operated Vehicle

GLOSSARY OF TERMS

driver	the engineer on Scottish fishing vessels
pair trawling	when the trawl net is towed by two vessels
propeller settings	it is important when pair trawling that both vessels are pulling equally and the propeller settings are the propeller pitches for both vessels which will produce this effect
propeller pitch	the angle of the propeller blades



Location of accident

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SYNOPSIS

The accident was reported to the Marine Accident Investigation Branch on the evening of 6 August 1999. The investigation began the following day and an inspector interviewed the crew in Peterhead on 12 August 1999.

Radiant Star III, a traditional wooden fishing vessel of 24m registered length, left Peterhead with her partner vessel *Constant Faith* on a pair trawling trip at 1130 on 6 August 1999. After they had travelled about 30 miles it was realised that the record of propeller settings for both vessels could not be found (**Figure 1**). The skipper decided that as the weather was favourable, they should continue on to the fishing grounds some 60 miles north-east of Fraserburgh, and carry out a towing test for the propeller settings there.

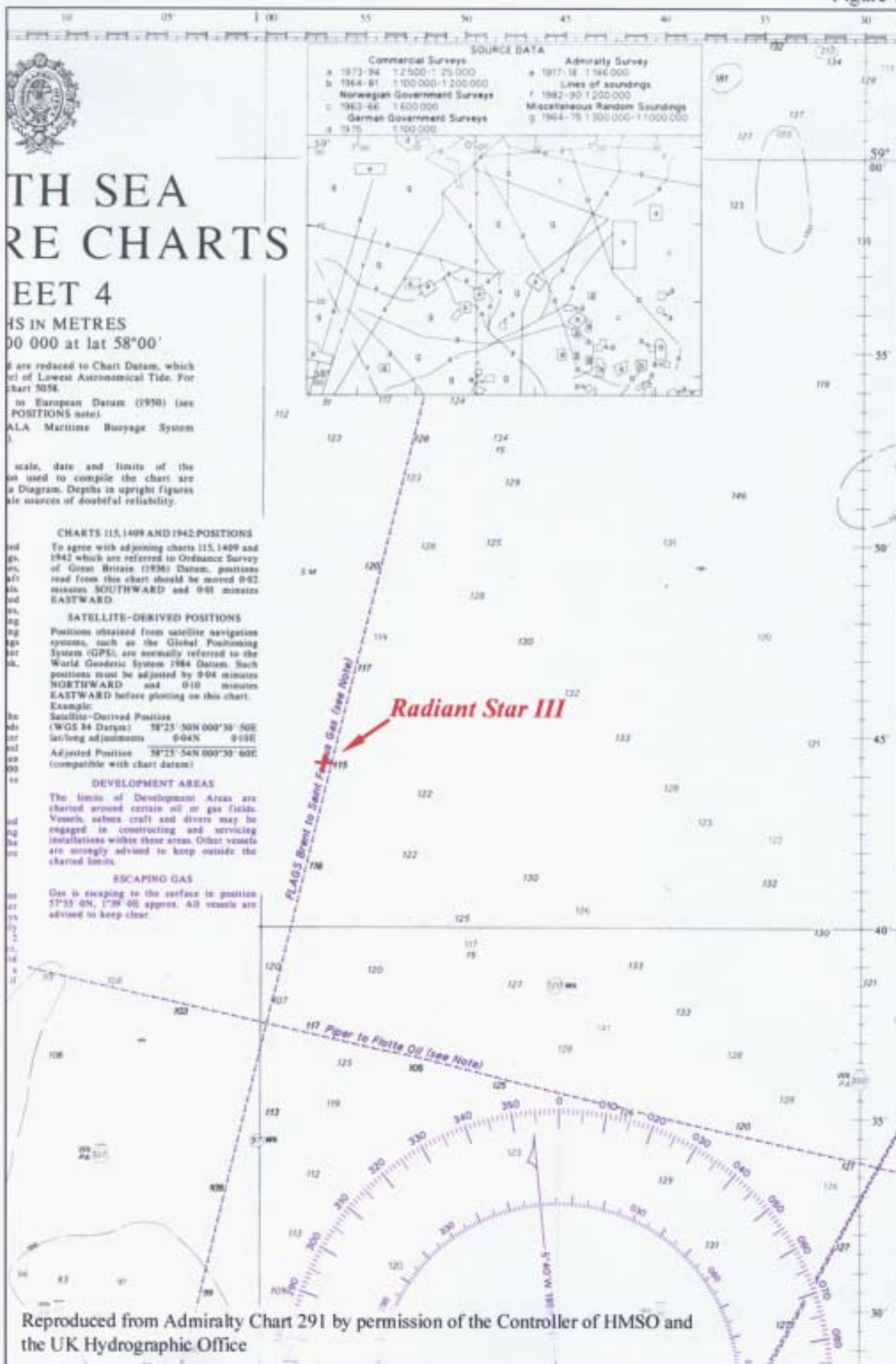
As *Radiant Star III* manoeuvred close to the stern of *Constant Faith* to pick up the towing warp, the two vessels touched lightly. Nothing was thought of this slight contact and the test began. Twenty minutes later the lights in the galley on *Radiant Star III* began to dim. The driver went down into the engine room to investigate and found it flooding rapidly.

The cause of the flooding was found to be at least one broken plank on the port side of the hull. The leak could not be stopped and the pumps could not cope with the rate of flooding. The coastguard was informed and a request made for assistance. As a precaution, the crew were transferred to the partner vessel, leaving the skipper and mate on board *Radiant Star III*. It soon became apparent that the vessel would sink before help arrived, so the skipper and mate were also taken off.

After *Radiant Star III* sank, her Emergency Position Indicating Radio Beacon (EPIRB) floated to the surface and was recovered, but the liferafts did not appear. An underwater survey by Shell UK Exploration revealed that the port liferaft container was unopen and lying against the guardrails; the starboard liferaft was not seen.

It has been concluded that the contact between *Radiant Star III* and her partner vessel, *Constant Faith*, probably broke an already weakened plank in the hull of *Radiant Star III*, resulting in uncontrollable flooding. Contributory factors were: a lack of preparation for the pair trawling operation; the skipper's unfamiliarity in manoeuvring this particular fishing vessel; and the non-watertight, aft boundary to the engine room.

The MAIB makes no recommendations.



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VESSEL AND INCIDENT PARTICULARS

Vessel

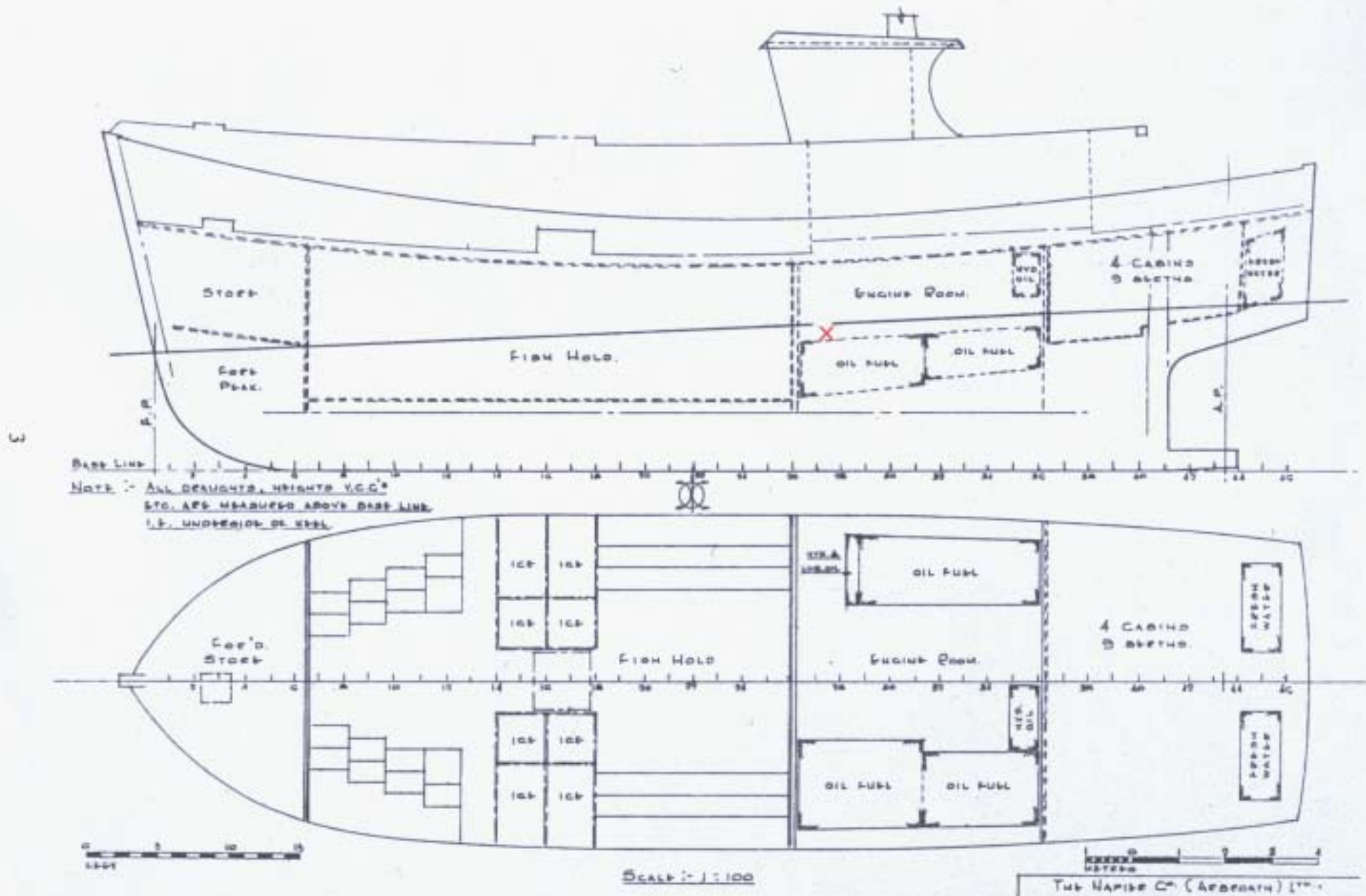
Name	:	<i>Radiant Star III</i>
RSS Number	:	A11615
Port of Registry	:	Peterhead
Type	:	Fishing vessel (pair/stern trawler)
Crew	:	6
Fishing number	:	PD251
Registered length	:	24.38m
Overall length	:	26.21m
Breadth mld	:	7.00m
Depth amidships mld	:	3.60m
UKFV certificate	:	Issued on 27/01/97, valid to 31/12/2000
Construction	:	Wood, larch on oak
Built	:	In 1986 at J&G Forbes & Co, Sandhaven
Registered owners	:	Caley Fisheries Ltd, 11 Harbour St, Peterhead

Incident

Position of accident	:	58° 44.25'N 000° 57.13'W
Time and date	:	2228 on 6 August 1999
Casualties	:	None

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

X Approximate position of damage



General arrangement

SECTION 1 - FACTUAL INFORMATION

All times are UTC+1.

1.1 Narrative

Radiant Star III PD251 left Peterhead at about 1130 on Friday 6 August 1999 with her partner vessel *Constant Faith* PD344 to pair trawl on the fishing grounds some 60 miles north-east of Fraserburgh. This was the first occasion for about two years that the vessels had pair trawled together; then *Radiant Star III* had been under different ownership. Before they left port the skippers discussed how to obtain the propeller pitch and power settings necessary for a good, well balanced tow. They had several options: before they left harbour they could carry out a towing test; or while towing over the fishing grounds they could match the hydraulic pressures on the towing arms; or use the data from previous trips when they had worked together, if this could be found. Since *Constant Faith's* skipper was confident that he had the settings used on previous trips on board his vessel, they decided to rely on that data.

After they had travelled about 30 miles, the skipper of *Constant Faith* discovered he only had the towing data for his vessel and nothing on *Radiant Star III*. The weather conditions were good, and improving, so they decided to press on, and carry out a towing test in the evening when it would probably be calm.

By 2015 the wind had dropped away, as expected, and the sea was almost flat calm. Both vessels reduced speed in readiness for the towing test. For this, they would be stern to stern and connected by about 100 fathom of trawl warp. The purpose of the test was to find engine powers and propeller pitch settings where the vessels were equally matched and stationary when they pulled against each other.

Radiant Star III's skipper manoeuvred his vessel to pick up the trawl warp from the stern of the stationary *Constant Faith*. *Radiant Star III* had the other vessel to port as she moved in closer. The intention was to stop *Radiant Star III* when her stern was a metre or two off the stern of the stationary *Constant Faith* and take on board a heaving line attached to the trawl warp. As *Radiant Star III* closed in on *Constant Faith* the vessels touched. *Radiant Star III's* port side near midships had bumped the transom of *Constant Faith*.

The contact between the two vessels seemed too light to have caused any substantial damage to either, and no inspection for damage was thought necessary or carried out. The trawl warp was passed across and the towing test began as planned. During the tests *Radiant Star III's* driver was in the wheelhouse to record the engine and propeller settings. The Global Positioning System (GPS) output showed when the vessel was stationary in the water.

During the third test, the cook called up to the driver that the galley lights were dimming. The driver asked one of the deckhands to take his place while he went below to the engine room to investigate. As he reached the bottom of the vertical ladder into the engine room he saw water gushing into the space from the forward end of the port auxiliary engine, which was mounted on top of the port fuel tank. He went back and told the skipper that the engine room was badly flooded and returned to the engine room with the mate. The

skipper radioed *Constant Faith* and Aberdeen Marine Rescue Co-ordination Centre (MRCC) at about 2040 to tell them of the problem.

The driver and mate started the starboard auxiliary engine and engaged the clutch to the bilge pump. Thinking it was a burst pipe, they closed the sea valves to the main engine cooling water system and called to the skipper to stop the engine. A deckhand was sent to check the overboard discharge from the bilge system. He confirmed that water was being pumped overboard. Having taken the necessary action to deal with flooding from a burst pipe they expected the water level to fall, but instead it rose rapidly. They therefore began a close examination of the port side to locate the leak. Behind the port auxiliary engine they found a broken plank bulging inwards about 100mm to 150mm. Water was pouring through the break and falling between the hull and the fuel tank.

Only with difficulty, by climbing on the fuel tank and getting behind the auxiliary engine, could the damage be reached. They tried to force the broken plank back into place, and when this failed they attempted to plug the hole with bundles of rag. They could not stem the leak. Because there was nothing further they could do in the engine room, they went up to the wheelhouse to discuss the situation with the skipper.

It was now clear to them that they would not be able to save their vessel without help. The skipper radioed a “Mayday” at about 2050 and a helicopter with a salvage pump was scrambled. He also decided to transfer four of the crew to *Constant Faith*, while he and the mate remained on board to receive the salvage pump from the helicopter. Lifejackets were donned and *Constant Faith* came alongside and took off four of the crew.

About 30 minutes later *Radiant Star* was noticeably deeper by the stern. The mate looked into the engine room and saw the water level was over the top of the main engine. He also saw that it was coming up through the deck of the accommodation aft of the engine room. The skipper decided to abandon the vessel. He and the mate transferred to *Constant Faith*. Aberdeen MRCC were told of this development at 2110 and the rescue helicopter returned to base.

Constant Faith stood by the stricken vessel. *Radiant Star III* slowly rolled on to her starboard side, revealing an area of white nylon sheathing (about 0.6m square) where the antifouling had been rubbed off (**Figure 3**), just below the waterline on her port side amidships. Air was venting from this location, which appeared to correspond with the damaged plank seen in the engine room.

She sank at about 2230 leaving little trace of her passing on the surface. Her EPIRB floated free and was picked up by *Constant Faith*. There was no sign of the two liferafts carried on board *Radiant Star III*.

Gradually she settled by the stern. Finally, briefly, only her bow was above the surface. It appeared that she was not quite vertical in the water, with her keel marginally closer to the surface than her deck.

Figure 3



Photograph of *Radiant Star III* as she was sinking

1.2 *Constant Faith*

On her return to port, *Constant Faith*'s transom was examined for any sign of damage from the contact between the two vessels. None was found, not even paint damage; nor were any traces of *Radiant Star III*'s black paint found on *Constant Faith*'s orange hull.

1.3 The crew

The skipper and mate of *Radiant Star III* were both very experienced fishermen with over 45 years experience between them. The skipper held a skipper's full certificate of competency and was very experienced in pair trawling and in the handling of vessels similar in size and design to *Radiant Star III*. It was his first trip on that vessel, where he was acting as relief skipper; the mate had served on the vessel for the last three years.

The driver (engineer) had spent 14 months at sea on *Radiant Star III*. He held a Scottish vocational qualification level II in mechanical engineering.

1.4 Bilge alarms

Radiant Star III was fitted with bilge alarms in both the engine room and the fish room. When the driver boarded the vessel, early on the day of her departure, he started the generator and switched on the electrics. The engine room bilge alarm sounded immediately, so the engine room bilges were pumped.

The bilge alarms did not operate when *Radiant Star III* flooded.

1.5 Underwater video

The operator of the Brent Alpha to St Fergus gas pipeline, Shell UK Exploration and Production, sent the diving support vessel (DSV) *Toisa Polaris*, to check that the pipeline had not been damaged when *Radiant Star III* sank to the seabed close by it. An underwater video survey of the wreck and pipeline was carried out by ROV. This showed that the vessel had not hit the pipeline, which was found undamaged. A close survey of the hull, for damage, was not carried out.

Radiant Star III was lying full on her port side. Both liferaft cradles, located on top of the shelter in front of the wheelhouse, were empty. The liferaft painters were still connected to the cradles, but the securing arrangements at the ends of the painters were not examined.

The closed port liferaft container, was lying against the guardrails on the port side of the shelter top (**Figure 4**).

Neither the starboard liferaft nor its container were seen. The liferaft's painter led from the cradle to the port forward corner of the wheelhouse. From there it appeared to be leading aft but was lost to sight. A thin rope, possibly the painter, led upwards from the aft deck and disappeared into the murk.

1.6 Vessel history

Radiant Star III was slipped two clear trips before the final trip. One item which was addressed on this occasion was a leaking rudder gland. Some caulking was also replaced. Inspection of its hull showed nothing untoward.

The first trip after being slipped, it was noticed that she was taking slightly more water than usual; but when, on the next trip, the fresh water tank lost all its water through a leaking valve it was thought that had been the cause. *Radiant Star III* sank during the next trip.

In harbour, between trips, the vessel did not seem to be taking any more water than usual.

Figure 4



The port liferaft container on the wreck of *Radiant Star III*

SECTION 2 - ANALYSIS

2.1 The cause of the damage

At least one strake of planking had been broken and forced inboard by about 150mm. This damage created a horizontal, triangular gap about 800cm² in area between adjacent planks (the frame spacing was 550mm). The rate of flooding, if this gap was about 1 metre below the waterline, is estimated to have been at least 6 tonnes per minute - which would have sunk the vessel within a few hours of leaving Peterhead. Since she actually sailed for over eight hours without a problem, the observed damage was not present when she sailed. A pre-existing weakness in the hull planking cannot be ruled out.

The flooding was noticed about 20 minutes after the contact between the two vessels. This strongly suggests that the contact caused the hull damage which was seen inside the engine room of *Radiant Star III*. This is supported by calculations, which indicated that even at relatively low closing speeds, the resulting impact could have fractured a sound plank. If the plank had been weakened by some previous, undetected damage then a fractured plank would have been an even more likely outcome.

A pre-existing weakness in the hull planking could reveal itself by an increase in bilge water. There is some evidence that *Radiant Star III* may have been taking more water than usual; but it is inconclusive since some of this water, perhaps all, could have been coming from a leaking fresh water tank. However a pre-existing weakness in the hull planking is a possibility that cannot be discounted on the available evidence.

When the vessel was on the slip a few weeks before the accident, the hull's exterior was inspected. No damage was found. So, if the hull planking had been weakened and damaged in some way, it is reasonable to assume that damage would have occurred after the vessel was relaunched.

Pair trawlers are bumping in this way daily without one or other of them sinking and the lack of damage on *Constant Faith* confirms that the impact was very light. However, calculations have shown that even a light impact, if concentrated on one spot and in the most adverse direction, could have fractured a plank. In the light of this result it would be prudent, after any contact, to inspect the inside of the hull for damage.

The precise location of the damage on *Radiant Star III* is well documented. What is not known, is which part of *Constant Faith*'s stern she hit. Contact with the flat face of the transom could not have caused the damage. It was probably caused by contact with the transom's port edge, which would have been much stronger than the side planking of *Radiant Star III*.

It is concluded that the contact between the two vessels probably caused the observed damage to *Radiant Star III*, but, nevertheless, a pre-existing weakness in her hull planking cannot be ruled out.

2.2 Damage control

It is not known why the bilge alarm in the engine room did not operate, when it was in working order some eight hours earlier, but it is unlikely that this affected the outcome of the accident.

The fish room was not checked during the emergency, so it is not known when it flooded, or if its aft bulkhead was effective in containing the flooding to the engine room.

The crew did all they could in the circumstances. The rate of flooding was too great for the vessel's pumps, access to the leak was very difficult and it could not be stopped. Flooding spread aft and up from the engine room into the accommodation, sealing the vessel's fate.

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, does not require that the engine room on a wooden fishing vessel is contained between watertight bulkheads, but the bulkheads should be maintained as watertight as practicable.

2.3 Failure of the liferafts

The liferafts failing to inflate on the surface is of concern. If the weak links were installed correctly when the liferafts were returned from being serviced in June 1999, the failure was probably because the liferaft containers or their painters became entangled with the guardrails or rigging of the sinking vessel. Liferafts which are in areas bounded by guardrails, have difficulty escaping to the surface when the sinking vessel turns completely upside down. If they cannot escape to the surface immediately the vessel sinks, they are most unlikely ever to reach the surface.

The underwater video showed that the hydrostatic release units (HRU) freed the liferafts from their cradles. However, instead of floating free, the sealed port liferaft container had only moved about 2m across the shelter top, from the cradle to the guardrails against which it was lying. This indicated that the liferaft probably became entangled with the guardrails soon after it was released and could not escape from the sinking vessel. The starboard liferaft was not sighted.

The Maritime and Coastguard Agency (MCA) has carried out a series of model tests to investigate why liferafts often fail to surface from sinking fishing vessels. The guidance arising from this research is contained in Marine Guidance Note 130(F) "*The Stowage of Liferafts and EPIRBs on UK Registered Fishing Vessels*".

2.4 Human factors

The close quarters manoeuvring should have been left to *Constant Faith*, since her skipper was more familiar with his vessel.

The vessels were 30 miles offshore when it was realised that the record of engine settings for pair trawling could not be found. Had this been known at the outset, the towing test would probably have been carried out close to the harbour, in which case *Radiant Star III* would probably have been saved. The preparations for the trip were inadequate to ensure a safe and effective operation.

SECTION 3 - CONCLUSIONS

3.1 Findings

1. The contact between *Radiant Star III* and *Constant Faith* probably caused the hull damage to *Radiant Star III*; although a pre-existing weakness in her hull planking cannot be ruled out. [2.1]
2. The crew did all they could in the circumstances - the rate of flooding was too great for the vessel's pumps; and access to the leak was very difficult so it could not be stopped. [2.2]
3. Once the flooding spread beyond the engine room the vessel could not be saved. [2.2]
4. The fishing vessel safety regulations do not require that the engine room on a wooden fishing vessel is contained between watertight bulkheads. [2.2]
5. The hydrostatic release units freed the liferafts from their cradles. [2.3]
6. The failure of the liferafts to surface was probably due to the containers or painters becoming entangled with the guardrails or rigging of the sinking vessel. [2.3]
7. The relief skipper, although very experienced, was not practiced in manoeuvring this particular fishing vessel. This was probably the main contributory factor to the contact between the two vessels. [2.4]
8. The preparations for the trip were inadequate to ensure a safe and effective operation. [2.4]

3.2 Causes

Immediate cause

The balance of probability is that the contact between *Radiant Star III* and her partner vessel caused serious hull damage to *Radiant Star III* which resulted in uncontrollable flooding.

Contributory factors

The possibility of a pre-existing weakness in the hull planking.

Lack of preparation for the pair trawling operation.

The skipper's unfamiliarity in manoeuvring *Radiant Star III*.

The non-watertight aft boundary to the engine room.

SECTION 4 RECOMMENDATIONS

There are no recommendations.

Marine Accident Investigation Branch
May 2000