

Marine Accident Investigation Branch (MAIB) - Safety Digest 2/1995

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1. OBSTRUCTION AT TIDAL BERTH CAUSES POLLUTION

Narrative

A 60 metre coastal tanker arrived at a tidal berth to load 1176 tonnes of light crude oil. Loading was completed in the afternoon and it was then necessary to wait for the next tide and sufficient water for the tanker to sail. Low water occurred in the early evening, during which time the vessel took the ground.

Shortly before midnight, about an hour before high water, the crew turned out to prepare for sailing. It was then noticed there was crude oil on the water surface around the vessel. A report was made to the harbour authority and the Department of Transport Marine Pollution Control Unit was notified. While the source of the leak was being investigated, the crew deployed the buoyant mooring ropes as an emergency containment measure. Oil booms were placed downstream of the berth to prevent pollution of other parts of the harbour. At about 0100 hours it was established that the oil had leaked from No 4 starboard cargo tank. The shore hose was connected and discharge of No 4 tank was commenced. This was completed at about 0400 hours.

The tank was opened up and water was seen to be leaking in to it, evidently through a hole in the bottom. The remainder of the cargo was transferred ashore, this being completed by about 1000 hours. After gas freeing No 4 starboard tank, an internal inspection of it revealed a rounded and cracked indentation in the bottom plating. The ship was moved to a nearby slip for repairs.

Observations

1. Fortunately the pollution was not serious. It was calculated that less than two tonnes of the cargo was lost and it was all successfully contained in the vicinity of the berth. Much of it was recovered by skimming equipment.
2. A search was made off the berth during the following low water. A large lump of concrete about one metre square with a length of steel rail protruding from it was found. This was without doubt the cause of the holing and consequent pollution.
3. The berth had been in use for the loading of crude oil cargoes for only six months prior to the incident, although 37 loadings had taken place during that time. Prior to the first loading the berth had been cleared of debris and cleaned up.
4. Following the incident the entire berth and swing basin was dredged, but no further debris was found. The berth operator also set up a procedure of routine visual inspections of the berth at low water spring tides and amended the loading procedures to ensure that, whenever it is practical to do so, vessels take the bottom in the light condition only.

Comment

1. There are many tidal berths in United Kingdom ports and it is common for coastal vessels of all types to take the ground at low water. However, extremely careful consideration needs to be given before allowing a loaded vessel to take the ground. Excessive stresses will be exerted on the hull if the ground is irregular or fouled and a dangerous loss of stability can occur in certain circumstances.
2. All operators of tidal berths should have a system for checking that as far as possible the berth is clear of debris, and follow that system regularly.
3. So far as coastal tankers are concerned, in particular those carrying dangerous and polluting cargoes, the cargo operations should be carefully planned so that the vessel lies on the bottom for the

minimum amount of time. Should it be necessary to commence loading before the vessel grounds, the amount of cargo so loaded should be the minimum quantity as dictated by operational needs. It should be loaded into all the cargo tanks in order to minimise local stresses when the vessel takes the bottom.

2. INCORRECT SETTING OF GENERATOR RUNNING SEQUENCE CAUSES POWER FAILURE

Narrative

The engineers of a large Ro-Ro vessel had been performing routine maintenance on No 3 of the vessel's three main generators. Nos 1 and 2 generators were running. On completion of the work No 3 generator was started and put on the board; No 2 was then taken off load and shut down. Several minutes later No 3 generator started to shed its load and shut down, so placing an excessive load on No 1 generator which then tripped on overload.

The vessel remained without main electrical power for about one hour. This time was spent investigating possible causes of fuel starvation, however none was found. Power was restored after about an hour and the vessel safely reached port a few hours later.

The emergency generator functioned properly.

Observations

1. The main generators were arranged to start automatically and sequentially as load demands changed, a multi position switch for each generator being used to select whether it should be the first, second or third machine in the sequence.
2. In shutting down No 2 generator the engineer inadvertently turned the selector switches for both Nos 2 and 3 generators so that they were both the third machine in the sequence.
3. Although No 2 generator was stopped, and therefore could properly be the third machine, No 3 was running with only one other generator running. The control logic of the sequential loading system recognised that No 3 generator was one of two on load and yet had been instructed, via the selector, to be the third on load. The control system thus commenced to shut down No 3 generator, so leading to an overload of No 1 and complete black out.

Comment

1. This incident demonstrates the great care that needs to be taken when selecting the automatic start and stop sequences of vital machinery such as main generators.
2. Clear and unambiguous instructions, placed adjacent to selector switches, are always of assistance with these operations. With some installations these can be in the form of a 'matrix' showing switch positions for desired sequences.

3. INADEQUATE PASSAGE PLANNING LEADS TO LOSS OF A TOW

Narrative

A pontoon of 15 metres length had been employed for several decades as an unpowered vehicle ferry on a narrow river crossing. The hull was subdivided and of riveted steel construction but with a wooden main deck. For vehicle access purposes there was a large hinged ramp at each end of this deck.

In order to employ the vessel at another location, preparations were made to tow it to another port several miles along the coast. Suitable arrangements were made to satisfy mandatory requirements for this operation, including the issue of a Load Line Exemption Certificate which specified limiting weather conditions, and a tug was hired to perform the tow. The pontoon was to be unmanned during the tow. Two hours after the tow commenced it was observed that one of the pontoon's ramps had partially broken from its securing arrangements. The weather at this time was good and the tow was returned to its port of departure in order to undergo a temporary repair.

Once these repairs had been completed towing started again and proceeded without incident for several hours. However, shortly after clearing a headland, which had been offering shelter, the pontoon started to pitch and roll significantly. The deterioration in conditions, probably coupled with rather too high a towing speed due to the tug Skipper's wish to compensate for the time lost earlier in the operations, caused seas to break over the pontoon's main deck.

After several hours of these conditions the pontoon capsized and eventually sank.

Observations

The lack of any previous seagoing service on the part of this pontoon made the assessment of its ability to withstand sea-induced motions rather difficult. Even the moderate motions produced during the first tow, when weather conditions were good, were sufficient to generate dynamic loads on one of the ramps which caused it to break free from its securing arrangements.

Comment

1. This incident reinforces the importance of careful preparation for a tow, and the responsibility of the person in charge to assess all dangers. Satisfying the minimum conditions set out in a Load Line Exemption Certificate may not guarantee a successful conclusion to an operation; prudent seamanship remains a fundamental requirement.
2. Advice on planning, preparing and performing a tow, together with emergency advice, is contained in Merchant Shipping Notice No M.1406 "Safety of Towed Ships and Other Floating Objects".

4. PREMATURE RELEASE OF LIFERAFT LIFTING HOOK

Narrative

An exercise involving the preparation of a davit-launched liferaft was conducted on board a passenger/Ro-Ro cargo ferry while the vessel was berthed alongside in port. On completion of the preparation procedure, the Bosun entered the liferaft which was suspended over the side, in order to insert three deflation plugs in readiness to lift the liferaft back on board. Still in the liferaft, he was instructed by the Second Officer, who was in charge of the exercise, to indicate the hook cocking wire.

The prevailing force 5 wind conditions caused the liferaft to move and to unbalance the Bosun, who then grabbed the liferaft suspension ropes with both hands for support. In doing so he inadvertently pulled both the hook cocking wire and the remote brake release wire which caused the hook actuating mechanism to operate and the winch brake to lock in the OPEN position.

The winch lowered the liferaft until the load was taken fully on the bousing lines and caused the hook to automatically release. Fortunately, the Bosun was able to scramble back on board the vessel without injury.

Observations

1. The liferaft davit lowering mechanism was so arranged that it could be actuated by one person on the ship's deck or, alternatively, by one person from within the liferaft.
2. Actuation of the lowering mechanism from within the liferaft was achieved by means of a remote brake release wire which, when pulled, effectively locked the winch brake in the OPEN position. It was intended that the remote release wire should only be used when launching the last of a number of assigned liferafts.
3. The liferaft hook could be released either manually or automatically. Operation of the actuating mechanism, which allowed the liferaft to be released automatically when the hook was relieved of its load, was achieved by means of pulling a hook cocking wire from within the liferaft.
4. Although the position of the hook cocking wire rendered it unlikely to be pulled inadvertently by personnel boarding the liferaft, the remote brake release wire was positioned in close proximity to the liferaft entrance.

Comment

1. The incident was caused by the inadvertent operation of both the hook actuating mechanism and the winch brake locking arrangement when the Bosun attempted to support himself using the liferaft suspension ropes.
2. A major contributory factor was that the Bosun became unbalanced at a time when he was reaching upwards in order to indicate the hook cocking wire.
3. The close proximity of the remote brake release wire to the liferaft entrance rendered the winch brake liable to inadvertent release by personnel boarding the liferaft or by the remote release wire becoming fouled by the liferaft suspension ropes during the inflation process.
4. The management company concerned has since taken action to prevent a recurrence by installing a short length of line for the purpose of keeping the remote brake release wire clear of the liferaft entrance until required.

5. SHIFT OF CARGO ON RO-RO VESSEL DURING BAD WEATHER CONDITIONS

Narrative

A Ro-Ro cargo vessel had loaded a total of 37 trailers and one articulated vehicle. A weather forecast predicted winds of force 6 - 7, occasionally 8. In anticipation of a rough passage, units were selected as being suitable for the voyage and none contained hazardous goods. Each unit stowed on the lower vehicle deck was secured using 8 chains; those on the upper deck had 10 chains.

The vessel left port at 0815 hours and by 1300 hours the wind had increased to force 9 giving very rough seas and heavy swell. Course was adjusted to keep rolling to a minimum and cargo lashings were inspected regularly. At 1550 hours course was altered for the final leg of the voyage. During this turn the vessel experienced a series of exceptionally violent rolls. As a result two trailers fell onto their sides when the lashings failed and cargo shifts occurred in four other trailers. The affected units were stowed on both the upper and lower decks.

The vessel suffered no significant heel and safely made port at 1830 hours.

Observations

1. The lashings employed for securing these cargo units were equal to, or in excess of, the recommendations contained in the "Code of Practice for Roll-on/Roll-off Ships - Stowage and Securing of Vehicles".
2. The majority of the affected units suffered from shift of their cargo. This is indicative of inadequate arrangements for securing cargo to the trailer.

Comment

1. This incident again highlights the difficulty of performing an accurate assessment of the efficacy of securing arrangements of cargoes in trailers.
2. It should be recognised that problems only occurred when weather conditions were significantly worse than predicted and whilst the vessel was altering course.

6. CORROSION CAUSES FLOODING TO A STANDBY SAFETY VESSEL

Narrative

A standby safety vessel with a crew of 12, was on duty in the North Sea. The wind condition was force 7 and the sea swell 6/7 metres. Whilst on his rounds the Chief Engineer noticed that there was more water than normal in the bilge system. The cause was traced back to a leak from the starboard machinery cooling sea chest into internal tanks. It was decided to leave attempting any repair until the morning when the weather was due to moderate. At 0730 hours and before repair had commenced, there was a rapid increase in the flow rate. One ship's party tried to stem the flow while the other put the salvage pump into action: this was in addition to the ship's bilge pumping system. This action was successful.

At 1300 hours the vessel received permission to break off her duties and proceeded to Lerwick. During this 15 hour voyage she reported her progress to HM Coastguard every two hours and she made port safely.

Observations

1. The vessel was 14 years old and of steel construction.
2. She had been dry docked for survey ten months before the accident, when no significant defects to the steel hull had been found.
3. The port and starboard keel coolers were removed and it was found that about 50% of the nylon insulators were missing from the studs securing the bronze tube plate to the steel mounting plate on both coolers.
4. The absence of these insulators had allowed very high galvanic action to take place causing extremely heavy corrosion of the sea chest.
5. The plating within the cooler recess area on the sister vessel is to be inspected.

Comment

1. This incident illustrates the benefits of officers' rounds, and having a portable/salvage pump on board and in working order.
2. The Merchant Shipping Notice No M.1361 on "The Dangers of Flooding" provides useful advice.
3. All inlets and recesses should be thoroughly examined during the five years periodical hull survey. The cooler should be removed and plating within the recess examined and if in doubt an ultrasonic test on the plating should be carried out. It goes without saying that on replacing the cooler all the insulators should be correctly refitted.

7. LOSS OF CREW MEMBER OVERBOARD

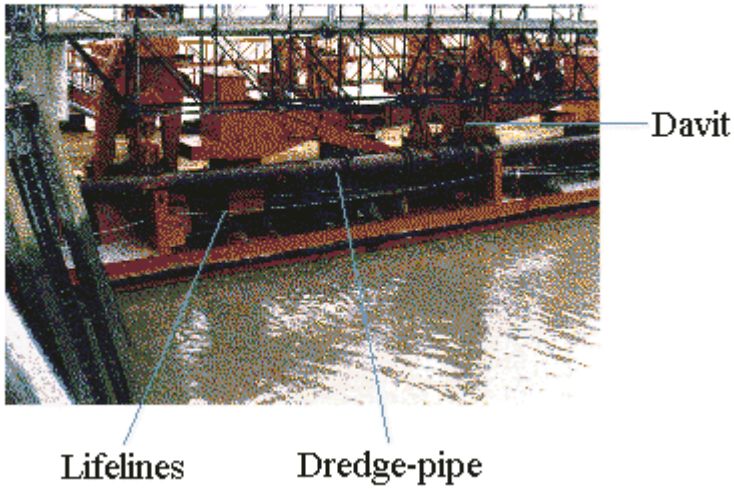
Narrative

A dredger, with a full cargo of sand, having weighed anchor at about 0945 hours was on passage up river making for her discharging berth. The weather was overcast, force 5, fresh breeze with a moderate swell. At approximately 0920 hours, the Fourth Engineer and the Assistant Engineer discussed details of repair work to be carried out on the aftermost hopper spillway on the starboard side of the vessel. Subsequently, the Assistant Engineer went aft to the steering gear compartment to collect some steel bar and to assemble the tools necessary to complete the work. Amongst the tools was an electric welding set. The Fourth Engineer passed the Assistant Engineer on the catwalk at about 0940 hours where he was fitting the lead for the electric welding set into the supply socket.

At about 1215 hours it became apparent that the Assistant Engineer was missing. The vessel was immediately searched and all working spaces and accommodation areas were inspected. The welding equipment and a steel bar were found on the starboard deck aft of the spillway but there was no trace of the Assistant Engineer. The vessel was by this time in the process of manoeuvring alongside the berth and once secure the Master immediately informed the Thames Navigation Service and the Coastguard. A thorough search of the river was carried out starting at 1254 hours and continuing until 1508 hours, but no sign of the missing man was found.

Observations

1. The area in which the repair work was to be carried out was on the main deck just forward of the accommodation on the starboard side. To reach this point it was necessary to climb down onto the well deck, move forward to No 3 dredge pipe davit, pass outboard of this and then forward again underneath the dredge pipe to the work area. Lifelines were normally fitted between the aft side of the dredge pipe davit and the accommodation, and between the forward side of the davit and the aft side of the next davit forward. The dredge pipe davits were about 460 mm wide and to go forward it was necessary to go outboard of the lifelines using grab points.
2. The equipment to be used during the repair was found on the aft side of No 3 dredge pipe davit. No scuff marks were found on either the deck or hull in the vicinity of the davit although a light covering of sand debris was present. At the time of the incident, lifelines in three sections should have been fitted between the aft and middle davits, some 1500 mm inboard. On inspection, the centre section was missing with the other two very slack. Additionally, access to the repair point required the engineer to either crawl under or climb over the fixed dredge pipe.
3. When in the loaded condition, the vessel's freeboard in way of the davits was very small with the result that in any kind of seaway, waves were likely to come inboard. Two safety harnesses were carried on board the vessel but neither were in use on the day of the incident.



Comment

1. Taking into account the evidence found, there seems no doubt that the Assistant Engineer was lost overboard whilst negotiating his way forward to his place of work. Access was difficult with limited space. Lifelines were in place although slack and the advice contained within the "Code of Safe Working Practices for Merchant Seamen" Chapter 15 regarding safety when working outboard was not heeded.
2. Subsequent to this incident, the company has issued instructions that when emergency work is required on the open deck whilst at sea, two men will work together and both will wear life-jackets and safety harnesses.

8. ESCAPE OF FREON 22 GAS

Narrative

A passenger vessel was in dry dock for her annual overhaul and maintenance period. She had been in dry dock for approximately five days with the air conditioning system shut down. The system consisted of four self-contained chiller units operating on refrigerant FREON 22. At the time of the incident, due to high ambient temperatures, the system gas pressure was in the order of 10 bar.

During the early evening, a shipyard safety officer noticed that "frosting" had occurred on a connection between the evaporator and a filter dryer. This was brought to the attention of an engineer cadet who was in the vicinity. The cadet tried to tighten the connection but, in the attempt, caused the pipe to shear releasing freon gas into the compartment. The alarm was raised and the compartment evacuated. Two senior engineers quickly donned self-contained breathing apparatus sets, entered the compartment and confirmed that nobody was inside. Both then re-entered the compartment, one making a further confirmatory search whilst the other re-made the pipe connection.

A test of the atmosphere within the air conditioning machinery compartment and shaft tunnel below revealed traces of the freon gas. Entry to these spaces was therefore prohibited and the area ventilated overnight. Sampling next morning confirmed that both areas were clear and that safe access was possible.

Observations

The failure occurred at a "flared" compression connection between a 12 mm OD copper pipe and a filter/dryer. This connection would have been prone to stressing and work hardening each time the filter assembly was renewed. The risks of soft metal pipe fittings failing whilst attempting to prevent leaks by further tightening is well known. "Flared" connections are particularly at risk due to the thinning of the metal during the flaring process.

Comment

1. Approximately 200 kg of FREON 22 escaped from the system. Due to the gas's density it gravitated to the lower compartments (shaft tunnels) and resulted in significant concentrations of the gas collecting in these areas. The toxicity of FREON 22 is relatively low but because it is heavier than air, it will seek the lower levels, displacing air in the process. It is this process of displacement that can lead to the danger of asphyxiation in inadequately or unventilated areas.
2. The dangers of working with refrigerants are clearly identified in the "Code of Safe Working Practices for Merchant Seamen" - Chapter 20, Section 20.4 and Chapter 22, Section 10.

9. THE VITAL IMPORTANCE OF KEEPING AWAKE WHEN ON A BRIDGEWATCH

It is disappointing that many accidents are continuing to happen because the watchkeeper had fallen asleep. Four recent cases are briefly described in this summary.

Case 1

A small fishing vessel with a crew of two hit rocks after the watchkeeper had fallen asleep. She was not fitted with any watertight bulkheads and the pump was unable to cope with the flooding. She quickly sank. Fortunately the crew had time to take to their liferaft and they were later rescued by an RNLI lifeboat.

Case 2

The crew of an 18 metre stern trawler worked all day on fishing operations and then had a meal at about midnight before heading for port. The Skipper, who had been up for at least 24 hours, took over the watch at about 0200 hours and he fell asleep soon afterwards. The vessel ran ashore. She refloated but flooded and quickly sank. Fortunately the crew were able to abandon in time and were rescued from their liferaft.

Case 3

A 21 metre trawler left port in the early hours, bound towards fishing grounds. About two hours later the watchkeeper, who was the Skipper, fell asleep. While he was asleep the vessel turned back towards the coast and fetched up on the shore. Fortunately none of the crew was injured, they were able to transmit a Mayday and were later rescued. The vessel became a total loss and there was pollution from her fuel tanks.

Case 4

A 19 metre wooden trawler left port at about midnight for fishing grounds, in good weather and visibility. About two hours later she ran ashore. It is again fortunate that there were no injuries, the flooding was confined to the forward compartment and the vessel was successfully refloated. The fisherman who was on watch had fallen asleep, probably because he had not had any adequate rest within the previous 24 hours and there was no watch alarm in the wheelhouse.

Comment

1. Two of the cases described above happened because the watchkeeper had not had adequate rest before taking the watch, but a watchkeeper may tend to fall asleep at any time when he is seated in a comfortable watchkeeper's chair - whether he is fatigued or not. It is the Skipper's responsibility to ensure that anyone taking over a bridgewatch has been adequately rested and it is the watchkeeper's own responsibility to ensure that he keeps awake.
2. Merchant Shipping Notice No M.1190 contains useful advice on bridge manning, watchkeeping and the command of fishing vessels. It was issued because of the number of collisions and groundings involving fishing vessels that have taken place and unfortunately continue to do so. Skippers and watchkeepers of fishing vessels should take heed of the advice contained in this notice.

10. LOSS OF A 54 YEAR OLD WOODEN FISHING VESSEL

Narrative

A 1940 built, wooden, 18.5 metre gill netter was operated with a crew of four. Towards the end of the first full day of fishing all the crew were on deck recovering nets. Darkness had set in, hence deck lights were in use, but the weather was good with the vessel beam on to a swell and rolling slightly.

Suddenly the engine stopped, then the lights dimmed and went out. An immediate inspection of the engine room found water almost to the top of the engine; and clearly still rising rapidly. Attempts were made to pump out the engine room using hand pumps but these proved unsuccessful. A Mayday was broadcast on Channel 16 using the vessel's main VHF set but no response was received.

The vessel started to list and the situation was clearly deteriorating rapidly. The crew then started to launch the liferaft, however, difficulty was experienced freeing the liferaft's container from its securing straps. These straps were eventually cut and the liferaft successfully launched. Once all the crew were safely in the liferaft a further Mayday call was broadcast on a portable VHF set. This message was received and acknowledged by HM Coastguard and another fishing vessel. Further, an accurate position for the sinking vessel was obtained from the EPIRB which had floated free as the vessel sank. All the crew were safely recovered by the second fishing vessel within an hour of their evacuation.

Observations

1. The vessel had been slipped for a hull survey about 6 months before this incident.
2. No inspection of the engine room had been made for a substantial period before the flooding was found.
3. The high level bilge alarm did not function to give early warning of the flooding.

Comment

1. No cause for the sinking has been established. However, due to the rate at which flooding occurred, the most likely cause is considered to be failure of the wooden hull in way of the engine room.
2. Advice is offered in Merchant Shipping Notice No M.1327 on the dangers of flooding.

11. GALLEY FIRE WHILST ALONGSIDE

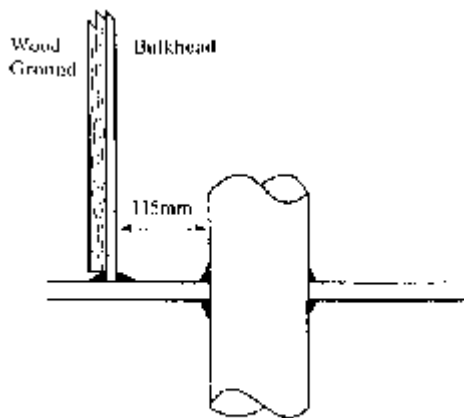
Narrative

A 22 metre fishing vessel was steaming home at full speed when about seven miles from port, the main engine exhaust temperatures suddenly rose to about 700°C and the engine slowed down. No problem was identified and the vessel continued home at reduced revolutions. Once alongside discharge started but shortly afterwards smoke was seen to come from the galley area. When this was investigated the galley burst into flames and the vessel was evacuated.

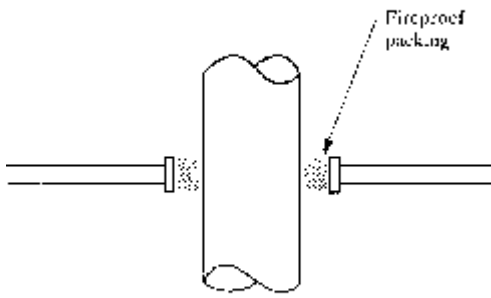
The local fire brigade arrived and spent one and a half hours putting out the fire. There were no injuries to persons but the galley, wheelhouse and wheelhouse equipment were severely damaged.

Observations

1. On investigation, the fire was found to have started behind the galley bulkhead amongst the bulkhead groundings. The cause of the fire was the excessive heat generated by high exhaust temperatures being transmitted directly from the engine exhaust pipe to the steel structure via welds. A heat barrier had not been fitted between the exhaust pipe and the support structure. The steel bulkhead onto which the wooden grounds had been secured was about 115 mm from the exhaust pipe.
2. The cause of the high exhaust temperatures was probably due to a restriction round the propeller or propeller shaft. Such a restriction, possibly from fishing gear or a rope, would have caused overloading of the engine and exhaust temperature rises.



INCORRECT



CORRECT

Comment

The fixing of any exhaust pipe support direct to steel structures without any heat barrier is a very poor and potentially dangerous practice. Heat transfer will take place and if there is wood adjacent, ignition could eventually follow. Good constructional practice calls for the fitting of a heat barrier between an exhaust pipe and its support. This barrier should consist of fireproof packing which is not liable to movement because of vibration or expansion.

12. HEAVY WEATHER FLOODING AND DAMAGE TO FISHING VESSEL

Narrative

A 22 metre side trawler ceased fishing operations and hove to in the North Sea after receiving a weather forecast for north-easterly force 8 - 9 winds. The wind subsequently increased to east-north-east force 11. The Skipper considered that it would be unsafe to run before the wind towards a port of refuge and, instead, decided to ride out the storm.

The vessel was being steered by auto-pilot at reduced speed which prevented her from pounding and from taking seas on board. However, the prevailing conditions caused the vessel to pitch heavily and to yaw.

During the night, the vessel was struck by a wave on the port bow, which caused her to list heavily to starboard. Seas broke across the main deck and the fishing gear was washed over the starboard side. The crew were able to recover the fishing gear on board and, having assessed that the vessel had sustained heavy weather damage, the Skipper set a course for land. HM Coastguard was advised of the situation and the vessel was subsequently escorted to a port of refuge.

Observations

1. The wheelhouse electronic equipment was extensively damaged due to water ingress through an open window on the starboard side. Damage was also sustained to the hull, deck fittings and engine room equipment.
2. The vessel was able to proceed under her own power although her fuel oil tanks were later found to be contaminated with seawater.
3. The forward cabin had not taken any water and any ingress to the engine room was effectively removed by the continual operation of the main engine-driven bilge pump and an automatically operated electrical submersible pump. Any ingress of water to the fishhold was effectively removed by the operation of an hydraulically-powered bilge pump.
4. The main engine-driven alternator and battery charger, located at the forward end of the engine room, became inoperative due to floodwater draining from the wheelhouse by way of the electrical cableways. The auxiliary engine was subsequently started and was able to charge the batteries by means of its own associated charger.

Comment

1. The Skipper's actions in monitoring the prevailing and forecast weather conditions and in ceasing fishing operations and heaving-to in good time were in accordance with established recommended practices.
2. However, as the weather conditions worsened, the Skipper failed to ensure that all openings into the vessel were closed. Appropriate advice is provided in the "Recommended Code of Safety for Fishermen", which is published by the Department of Transport.
3. The bilge pumping arrangement was effective in removing any resultant ingress of water to the vessel.

13. RAPID CAPSIZE AND SINKING OF A FISHING VESSEL WITH LOSS OF LIFE

Narrative

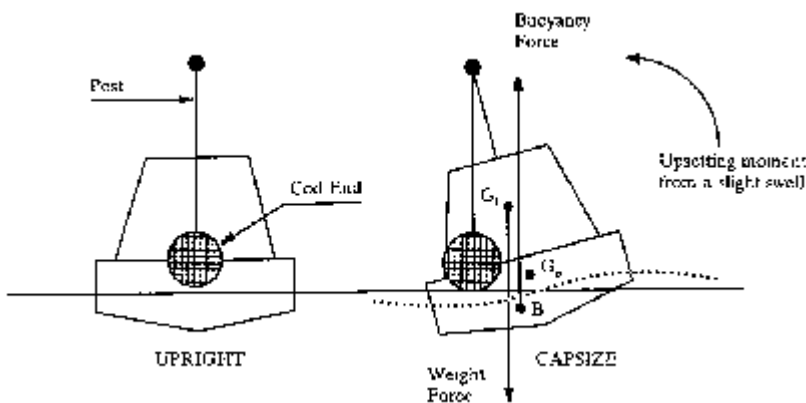
A two year old 8.10 metre steel hulled stern trawler had been trawling for about three and a half hours. The weather was fine with good visibility, a slight swell and a gentle breeze.

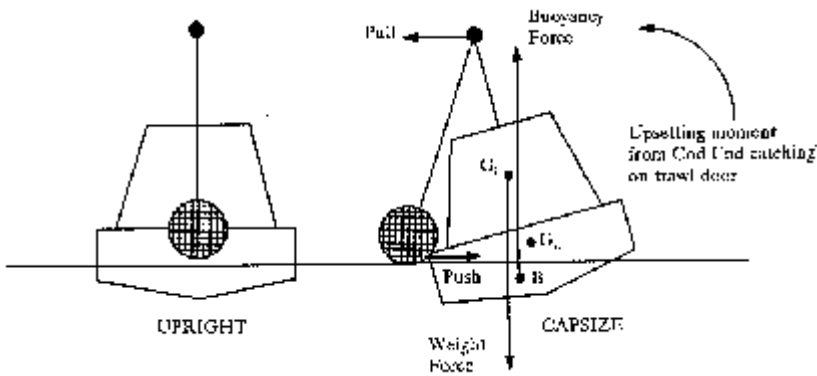
During the second tow the Skipper noted that his vessel was slowing down which indicated that the net might be filling with sand and debris. They began to haul in the net. The winch was struggling but the cod end was eventually hauled up as far as possible. The two hauling lines, leading through blocks at the top of the post (see Figure 1), were then tied off and the deckhand went aft to try and pull the cod end over the stern. While he was struggling with the cod end he heard the Skipper shout. He looked forward and saw that the vessel was heeled well over to port; the bulwark rail was under the water and the water level about a quarter of the way across the hatch cover. He rushed forward to let go of the hauling lines to release the cod end to allow the vessel to recover. He managed to free one and the Skipper joined him to help free the other but the vessel suddenly rolled over and both men were thrown into the water.

The capsizing was observed by the Skipper of another fishing vessel. He recovered the two men from the water, but the Skipper was unconscious. Despite continued attempts at resuscitation the casualty was pronounced dead on arrival at hospital.

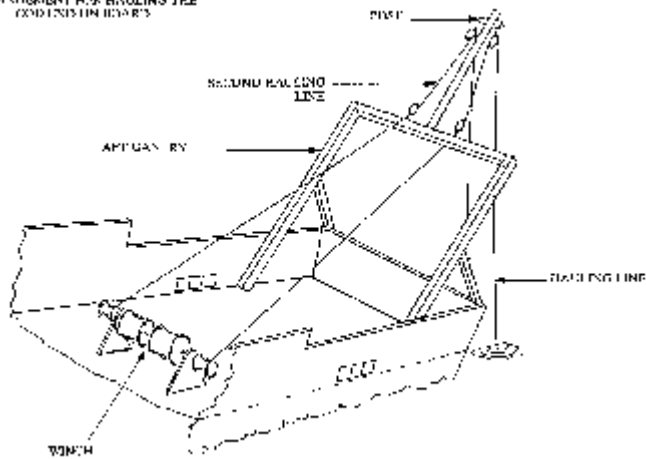
Observations

1. As this vessel was under 12 metres in length there was no statutory requirement for its stability to be established. Stability characteristics had never been determined.
2. The primary factor leading to the capsizing and loss of this vessel is almost certainly that the weight of the cod end, when lifted clear of the water, and suspended from the top of the post on the stern gantry, raised the effective centre of gravity to such an extent that the vessel's transverse stability was reduced to near zero.
3. With her stability reduced to near zero a small upsetting moment such as a roll in the slight swell would have been sufficient to cause the vessel to capsize. Alternatively the cod end could have caught on the port side trawl door and acted like a weight on the gunwale of the vessel (see Figure 2).
4. Neither crewman was wearing any form of buoyancy aid. The Skipper was a non-swimmer.





ARRANGEMENT FOR HAULING TEE
CONDITIONS IN BOARD'S



Comment

1. This accident could have been avoided if the vessel's stability characteristics had been assessed by a suitably qualified person and advice been given on any operational limitations required.
2. The Department of Transport publishes advice to fishermen regarding the stability of small fishing vessels and on the dangers of suspended loads.
3. Attention is drawn to Merchant Shipping Notice No M.989 "The Safety of Small Fishing Vessels" and the Department of Transport safety leaflet "Fishing is a Dangerous Business. Make it Your Business to Make it Safer".
4. Fishermen who understand the dangers of recovering a cod end heavy with sand will not attempt to lift it clear of the water. Instead they will tow it at speed behind the vessel for some time to wash the sand out of it and reduce its weight before attempting to lift it above the water surface.

14. LOSS OF A WOODEN FISHING VESSEL

Narrative

A 16 metre wooden fishing vessel was being operated by the Owner/Skipper and a crew of four. While on passage floodwater was noticed in the engine room but no bilge alarm had been heard. Initial attempts were made by the Skipper to arrest the flooding. None of the crew, other than the Skipper, was sufficiently familiar with the engine room systems to offer worthwhile assistance. These attempts proved unsuccessful and HM Coastguard was requested to assist.

A rescue helicopter and a lifeboat were on the scene very quickly and evacuated the Skipper and crew. The vessel sank shortly after the evacuation.

Observations

1. The following paragraph summarises two characteristics of this incident: The flooding had reached an extremely serious level by the time it was discovered. The high level bilge alarm had not been tested for many months and failed to function. Unfortunately this type of problem applies to a large number of cases where fishing vessels flood and subsequently sink.
2. The Owner/Skipper took great pride in maintaining an efficient engine room, performing all routine tasks himself. This practice had an undesirable consequence of preventing the crew from gaining any worthwhile working knowledge of the machinery; in particular the bilge pumping system. A substantial and unreasonable workload was thus placed on the Skipper during this accident.

Comment

1. The value of the advice contained in Merchant Shipping Notice No M.1327 is again reinforced by this accident.
2. High level bilge alarms can provide useful early warning of flooding. However, to be of any value **THEY MUST WORK!**

15. FLOODING AND FOUNDERING OF WOODEN FISHING VESSELS - OFFICIAL CONCERN AT NUMBER OF INCIDENTS

The Marine Accident Investigation Branch (MAIB) of the Department of Transport has noted with concern the rising number of accidents to wooden fishing vessels where flooding and foundering have taken place. Wooden fishing vessels account for almost 44% of the total fishing vessel fleet on the United Kingdom register.

During the five year period 1 January 1990 to 31 December 1994, 43 serious flooding incidents were investigated by MAIB inspectors. Of these reported cases 26 subsequently sank, often with a loss of life.

Most of the remaining 17 vessels were saved by the use of emergency pumps put on board by RNLI lifeboats or airlifted on board by HM Coastguard or MOD search and rescue helicopters. These surviving vessels were inspected to determine the cause of the flooding and in 11 instances it was found that the flooding had been due to the loss of caulking. This represents 65% of those vessels which survived and 25% of the flooding incidents as a whole. As some of the vessels which were lost may also have sunk due to this cause it is likely that there will be an increased percentage as far as the total number of incidents are concerned.

Other causes of flooding discovered on the remainder of the surviving vessels were as follows:

- One leaking stern gland;
- Two instances of collision with unseen underwater objects;
- Three instances involving piping systems.

These latter causes deserve special mention. They were namely:

1. Back flow of water from deck wash sea suction into the engine room bilge line by way of a valve which had been prevented from closing properly due to blockage by debris;
2. A burst pipe in the engine room;
3. Back flooding via the bilge system.

In some of the cases in which the 26 vessels were lost, the MAIB inspectors were able to establish the cause of flooding from statements given by survivors. However, 11 or 42% of the vessels lost, sank without the cause of flooding being established.

Where the causes of flooding were established, these were found to be:

- Vessel swamped (1);
- Damage to hull structure/failure of hull structure (6);
- Pipework failure (4);
- Loss of caulking (2);
- Failure of wet exhaust system (1);
- Failure to close a seacock during maintenance on the engine cooling water system (1).

The vessels which sank were, in many cases, lost unnecessarily due to one or more of the following factors:

- Failure of the vessel's bilge pumps;
- Blocked strums on bilge suction;

- Failure to operate valves correctly;
- Sea valves unable to be closed properly;
- Failure of high level bilge alarm to alert crew of danger;
- Non-watertight bulkheads allowing progressive flooding from one compartment to others.

The MAIB considers that Owners and operators of wooden fishing vessels can do much themselves, to reduce the risk of loss of their craft due to flooding by taking the following precautions:

- Ensure the hull is well maintained; in particular paying careful attention to the hull fastenings and caulking of seams, not only when the vessel is slipped for survey but whenever the opportunity arises, such as when the vessel is lying at a dry berth;
- Familiarise themselves with the various piping systems, their valves, and connections to the hull, machinery etc. All valves should be regularly operated to see that they open and close correctly, and be examined to check for secure fitting and freedom from corrosion;
- In the case of the bilge system, the suction strums should regularly be checked to see that they are free from obstruction and the various compartments, in particular the fish hold should be kept free of all debris, especially polythene bags;
- Propeller shaft stern glands, rudder stock, and wet exhaust systems should regularly be checked for watertightness;
- Bilge pumps, their prime movers and/or drive belts should be carefully maintained and regularly checked for correct operation;
- High level bilge alarms should be regularly checked; ie at least daily;
- Bulkheads should be made watertight as far as is practicable on existing vessels. All penetrations for pipes and cables should be fitted with watertight glands or otherwise sealed;
- It is strongly recommended that a portable diesel driven salvage pump of suitable output and fitted with an adequate length of suction hose should be carried, and stowed in a readily accessible position.

Finally, fishermen should make themselves familiar with the following publications which can be obtained free of charge from the Marine Safety Agency's local Marine Offices:

- Merchant Shipping Notice No M.989 - "The Safety of Small Fishing Vessels";
- Merchant Shipping Notice No M.1327 - "Losses of Fishing Vessels through Flooding";
- "Fishermen and Safety - A Guide to Safe Working Practices for Fishermen";
- "Fishing is a Dangerous Business - Make it Your Business to Make it Safer", a safety leaflet, also in self-adhesive poster form.

16. HYDRAULIC OIL LEAK CAUSES EXPLOSION ON FISHING VESSEL

Narrative

A 13 metre wooden stern trawler left harbour at 1130 hours. It was the intention of the two men on board to make one trawl before returning in the early evening. The weather was good with clear visibility and a fresh, force 4 - 5, north-easterly wind.

At 1500 hours they began the process of recovering the trawl. The Skipper slowed the engine and engaged the engine driven hydraulic pump by means of the "Morse" control from the wheelhouse. The crewman commenced recovering the trawl using the hydraulically driven trawl winch which was situated forward on the shelter deck. After about 6 metres of wire had been hauled the winch was stopped to allow the Skipper to unhook the towing strops.

Having unhooked the strops the Skipper instructed the crewman to continue heaving but the winch would not operate. The crewman put the control lever to veer. The winch responded, however on returning the lever to the haul position the winch still would not operate. The Skipper walked aft towards the wheelhouse with the intention of disengaging the hydraulic pump. He was just about to step up into the open door of the wheelhouse when an explosion occurred and he was engulfed in a ball of flame. The shelter deck rapidly filled with acrid smoke. Both men were able to reach the open after deck but the Skipper had sustained serious burns to his hands, lower arms and head. The explosion caused a fire to start in the engine room which rapidly spread to encompass the wheelhouse and shelter.

The two men were rescued and taken into harbour by a fishing vessel, the crew of which had seen the fire. Another vessel and an RNL lifeboat also proceeded to the aid of the fishing vessel. Using their own hoses and pumps they managed to put the fire out. The severely burned vessel was towed into harbour.

Observations

1. The vessel was well maintained and equipped.
2. There were no signs, other than the fault with the winch, that would have warned of an imminent fire or explosion.
3. The hydraulic pump served three winches: the trawl winch, a net drum winch and a line hauler. Flexible pipework was used between the pump, situated in the engine room, and the deck mounted winches.
4. A detailed examination of the vessel and, in particular, of the engine room pipework indicated that the explosion probably happened when a fine mist of hydraulic oil was ignited by contact with a hot surface. The hydraulic oil leak probably occurred where a flexible pipe had chafed against a steel deckhead stiffener. The engine exhaust manifold, which was close to this pipe, could have been the source of ignition.
5. The crewman had undergone training in basic first aid and his prompt action in treating the Skipper's burns by cooling them with water considerably reduced their eventual severity.

Comment

Merchant Shipping Notice No M.1456 provides advice on the prevention of fuel, lubricating and hydraulic oil fires in the machinery spaces of merchant ships and fishing vessels. Where possible hydraulic systems should not be placed in engine rooms. In cases where it is unavoidable the

systems should be well designed to limit therisks, be well maintained and frequently inspected for faults.

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

Narrative

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

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

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

Observations

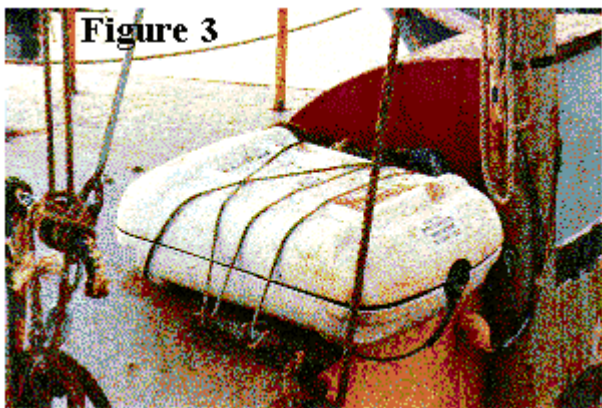
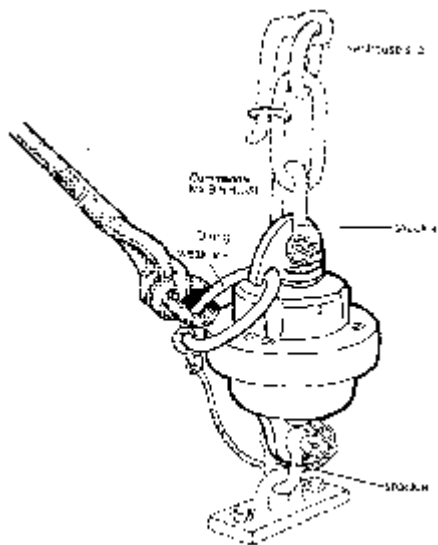
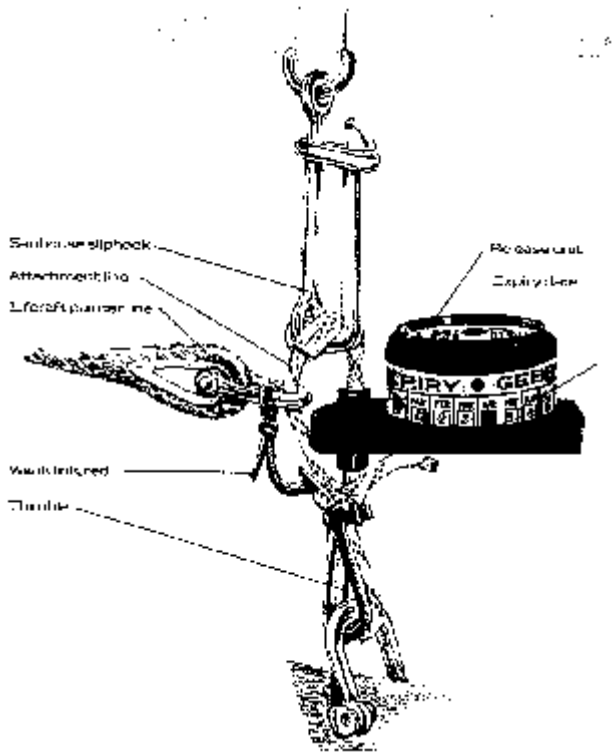
The vessel's EPIRB and inflatable liferaft had been fitted with new hydrostatic release units several months previously. Shortly afterwards the liferaft was repacked and reinstalled on the vessel. During this operation the free end of the liferaft's painter was secured to a handrail adjacent to the liferaft's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

Comment

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

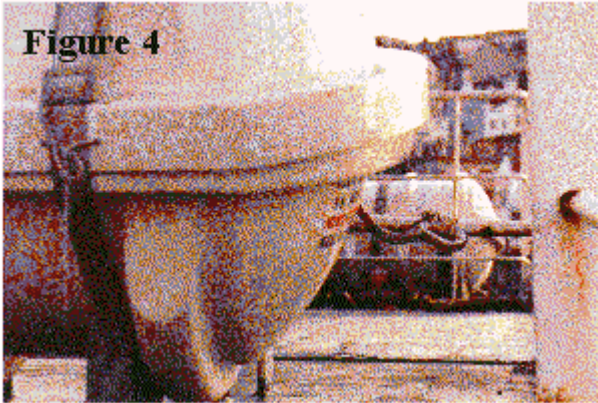
It is clear that incorrect re-installation was the most probable cause of the liferaft's failure to float free. This was an error of a type which is worryingly common. At the time of the relevant mandatory survey a vessel's life-saving equipment will be closely inspected. However, liferafts, and probably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

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



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

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



18. ANOTHER WOODEN FISHING VESSEL LOST THROUGH FLOODING

Narrative

A single-decked wooden fishing vessel of 24 metres registered length was engaged in pair trawling. The trawl gear snagged and both vessels turned into the weather and commenced hauling in an attempt to clear the obstruction. During the hauling operation, a flexible rubber section of hydraulic pipe ruptured in the wheelhouse. The hydraulic oil supply was isolated in the engine room and this section of pipe was then replaced, a job which took about 20 minutes. Towards the end of the repair, the engine room bilge alarm sounded briefly.

Upon completion of the repair the engineer returned to the engine room in order to restore the hydraulic oil supply and discovered that the engine room was flooding. Both of the electrically powered bilge pumps on board were started and the Skipper requested additional pumps by radio. However, the prevailing adverse weather conditions prevented additional pumps from being safely transferred to the vessel by sea or by air. The bilge pumps on board were unable to cope with the rate of flooding. The crew abandoned the vessel into inflatable liferafts and were air-lifted to safety by helicopter. The vessel was taken into tow but sank before reaching port.

Observations

1. The vessel was 17 years old and had not been formally surveyed for 3 years.
2. The wind was force 5 - 6, which caused the vessel to roll heavily.
3. The consequent surge of floodwater in the bilge caused the engine room plates, which were not secured in position, to move and so render the seacocks inaccessible.
4. The ability of the bilge pumps to stem the rate of flooding became impaired as the bilge suction strainers became choked with small pieces of debris which had been allowed to accumulate in the engine room bilge.
5. A maximum rate of bilge pumping was not achieved because these suction valves were not completely shut and no use was made of the manual pumps provided on board the vessel.

Comment

1. The source of flooding was not positively identified although it was probably caused by the failure of the stern tube gland or the hull, a seacock or an associated pipe in way of the engine room bilge.
2. Appropriate advice aimed at preventing danger to life and losses of fishing vessels through flooding is provided in Merchant Shipping Notice No M.1327 and the "Recommended Code of Safety for Fishermen". It is apparent that such advice was not fully heeded.
3. A lack of clear deck space, combined with the motion of the vessel in the prevailing adverse weather conditions, prevented additional pumps from being lowered to the vessel by helicopter. In this regard, it would be prudent for vessels of similar age and construction to carry a portable diesel pump for emergency use.

19. LOSS OF A FISHING VESSEL WITH LOSS OF LIFE

Narrative

A 14.7 metre steel fishing vessel was operating as a beam trawler, with a crew of three. Whilst fishing in darkness, in a heavy swell with wind force 4 - 5, flooding was discovered in the engine room and the fish hold. The crew started bilge pumping operations.

Once the flood level had been reduced in the engine room it became possible to operate the hydraulic power winch to recover the fishing beams from the sea bed. When both beams were recovered it was realised that they had become fouled by a static monofilament net (gill net). At this stage the engine was in neutral. After attempts were made to cut the gill netting from both beams, the vessel started to manoeuvre. However, the starboard cod end was thought to be seen going into the propeller, so the engine was again put into neutral. The procedure adopted to disentangle the cod end from the propeller was to lower the starboard beam only and put the propeller in reverse. Shortly after commencing to lower the beam, the vessel heeled to port. A wave came over the port side and before the water cleared from the deck a second wave came over the bulwark top. The vessel continued heeling until she was lying on her side.

The Skipper managed to inflate the liferaft and the other two crew members found their way to the outside of the starboard hull forward. One of the crewmen and the Skipper managed to swim to the liferaft, but the second crewman was lost in the darkness.

A flare was set off from the liferaft and the vessel's EPIRB operated automatically, resulting in a full scale search and rescue operation being initiated which led to rescue of the two men in the liferaft.

Observations

1. The vessel had approved stability for operation as a stern trawler only. She should not have been used for single or twin beam trawling or for scallop dredging.
2. The freeboard was well below that laid down for a fishing vessel of her size.
3. It was not possible to determine with certainty the cause of the flooding, but possible causes were; corrosion of the seawater system and/or failure of the propeller shaft gland. Additional flooding could have been due to the failure of the ice scuttles. With the low freeboard the aft deck would have been awash in most seaways, and if these flush deck scuttles leaked, sea water could have entered the ice store and melted the ice which may have increased the flooding effect.
4. Divers reported that her propeller and rudder were fouled by gill netting. This would have made manoeuvring difficult.

Comment

The cause of the capsizing was the combined effects of the asymmetric moment exerted on the port side of the vessel when the starboard beam was lowered, and waves breaking on to the port side of the after deck. With the vessel's derricks and beams raised she was probably in the worst operating condition with regard to stability. Flooding of the engine room and fish hold would have further reduced stability.

