MARINE ACCIDENT INVESTIGATION BRANCH

Summary of Investigations No 1/94

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This summary contains facts which have been determined up to the time of issue. This information is published to inform the shipping industry and the public of the general circumstances of accidents and must necessarily be regarded as tentative and subject to alteration or correction if additional evidence becomes available.

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INTRODUCTION

Deciding on a theme for the introduction to any edition of the Summary of Investigations can come about in a number of ways. Sometimes it requires a lot of brain-storming while on other occasions a germ of an idea has been slowly developing, possibly since the time the previous edition was published. Occasionally the idea for a theme is generated from a passing remark. The theme for the introduction of this edition came about in exactly that way, though to be more precise this arose from remarks made by different persons in totally different surroundings.

The first remark was when one of the Inspectors in the Branch was playing in a golf competition. One of his playing partners, who was a complete stranger to him, happened to be a marine engineer. When he realised the type of work the Inspector carried out he told him that the company he worked for provided copies of the Summary of Investigations to their ships. Thankfully, his comments about the Summaries were complimentary though he did have one "complaint": he would like to see more engineering related summaries.

The second remark was made a few weeks later when, during a presentation about the work of MAIB followed by a question/answer session, a recently retired Chief Engineer was surprised to learn that hazardous incidents (near misses) of an engineering nature were of interest to the Branch and that we have always recommended the voluntary reporting of such incidents.

From these two remarks it seemed appropriate that the theme for this edition should be engineering related, particularly because it includes three engine room incidents and at least three others with an engineering connotation.

Good engineering practices are just as important as good seamanship, for the safe and efficient operation of vessels. It is particularly important that corners are not cut to save time and that all the right safety precautions are taken, whether they concern the operation of equipment or the maintenance of that equipment. It is sad to say that many accidents are the result of not having taken time to consider properly the hazards associated with the job which is to be carried out. Some classic examples are the likelihood of residual pressure in a pipeline which requires to be opened up; proper isolation (electrically or from other power sources) before starting work on a piece of equipment; ensuring that lifting tackle is of the correct safe working load; selection of the correct tools for the job; working knowledge of the piece of equipment; and so on. This might all seem obvious to any self-respecting engineer; but unfortunately the obvious is all too often neglected.

Turning now to the reporting of hazardous incidents of an engineering nature. A hazardous incident is defined as "any incident or event, not being an accident, by which the safety of a ship or any person on board is imperilled, or as a result of which serious damage to any ship or structure or damage to the environment might be caused". Obviously there are many engineering incidents that occur on board which have potential to be accidents and a lot of lessons can be learnt from those incidents. However, it is important that the details are not kept quiet for this clearly prevents others from becoming aware of the potential for an accident which is present in their

own operations. In Merchant Shipping Notice No M.1383 Owners and Masters are strongly urged to report such incidents voluntarily, and though the wording is perhaps not very clear it includes engineering related hazardous incidents. Perhaps also the retired Chief Engineer was not aware of this advice because M Notices, unless they are clearly addressed to the Engineering Officers on board, tend to be considered the responsibility of the Master and are not always brought to the attention of all those concerned on board. Please remember that if the information and advice contained in M Notices is to be put to the best use, the Notices need to be given as wide a circulation on board as possible and need to be discussed, not just kept in a file.

Chief Inspector of Marine Accidents
April 1994

1. BURN INJURY DURING LOADING OF INCINERATOR

Narrative

Garbage was being incinerated in a 9,158 gross registered tonnage offshore support vessel. Four bags of garbage had been partially incinerated. A motorman was in the process of loading additional bags into the furnace of the incinerator using a long-handled broom. A blow-back occurred which caused burns to his face and particles to enter his eyes.

Observations

1. The incinerator incorporates a double door loading chamber. The chamber inlet door is manually operated. The chamber outlet is closed by a counter-balanced steel flap which is pivoted at the top. The flap opens to allow the free passage of garbage and automatically closes after the garbage has passed. The furnace inlet door is pneumatically operated by manual push-buttons.

2. In order to load solid garbage into the incinerator, the following procedure is required to be followed:

    2.1 press the door "OPEN" push-button. (This initially causes the auxiliary burner and forced draught fan to automatically stop and then the furnace door to open);

    2.2 ensure the rotary arm is rotating and that the loading ram is pulled back to the outer end of the loading chamber;

    2.3 open the loading chamber inlet door;

    2.4 load one full bag of garbage into the chamber;

    2.5 close and latch the chamber inlet door;

    2.6 push the loading ram firmly towards the incinerator to the full extent of travel;

    2.7 return the loading ram to its original position;

    2.8 repeat the loading operation up to a maximum of three bags;

    2.9 press the door "CLOSE" push-button, (this initially causes the furnace door to close and then the forced draught fan and burner to start).

3. The management company has reported the following:

    3.1 a full face visor was available at the incinerator but was not used;

3.2 aerosol cans have been known to explode in the incinerators in the past. The company has now stopped providing aerosols for sale from ship's bonds;

3.3 an Internal Safety Notice has since been issued incorporating the following instructions:

(a) appropriate safety equipment, including face visor, must be used when operating incinerators. A sign to this effect shall be displayed at the incinerator position;

(b) incinerators shall only be used strictly in accordance with manufacturer's instructions. Chief Engineer is to ensure that personnel using the incinerator are instructed in its safe use. An instructional sign is to be displayed at the incinerator showing the correct mode of operation;

(c) all vessels should address the subject of the safe disposal of pressurised aerosols, this includes those vessels without rubbish incinerators.

Comment

1. The incinerator was fitted with an interlock such that, with the furnace inlet door open, at least one of the loading chamber doors should have been shut. The deliberate action of the motorman caused the interlock to be overridden. Such action was contrary to the manufacturer's loading instructions.

2. The injury sustained by the motorman was a direct result of him being exposed to the furnace without any form of facial protection.

3. It is considered that the action since taken by the management company will contribute to preventing a recurrence of the incident.

2. CARGO SHIFT CAUSES VESSEL TO LIST

Narrative

A 299 gross registered tonnage general cargo vessel was loaded with a cargo of 467 tonnes of anchor chain. As the tank top was constructed in steel, wooden dunnage was arranged to prevent the first layer of chain moving. Bundles of chain were loaded into the hold by crane, but no further securing was carried out. The Master and Mate were satisfied with the stow. She departed in fine conditions with wind Force 2 - 3. The forecast was Force 8 southerly, so some double bottom tanks were ballasted. Over the second and third days of the voyage the winds increased to Force 7 - 8, with a long swell. At 0500 hours on the fourth day the cargo shifted and the vessel listed heavily to port after being hit by two huge waves on the starboard quarter. It was estimated that the angle of list was 25 ° to 30 °. The crew prepared the liferafts and put on their survival suits. No 1 ballast tank starboard side was filled and VHF contact was made with the Coastguard. There was an increase in wind which produced a further cargo shift and the list increased to 40 °. Water was over the deck but not up to the hatches. At 0620 hours the rescue helicopter arrived and by 0640 all the crew had been airlifted from the starboard bridge wing. The machinery remained operational during the incident.

The crew were safely landed ashore and the vessel was later towed into sheltered water. The cargo was re-stowed and the vessel continued her voyage.

Observations

1. It was the first time the Master and Mate had taken a cargo of this type.

2. The severe weather conditions caused the unsecured bundles of anchor chain to shift.

Comment

1. This incident put the persons on board at risk. Had the Master and Mate followed the guidance set out in the IMO "Code of Safe Working Practice for Cargo Stowage and Securing" Annex 8 - Safe stowage and securing of anchor chains - this incident would not have occurred.

2. The aim of the code is to provide an international standard for the safe stowage and securing of cargoes. It gives advice on ways of securing and stowing cargoes and gives specific guidance on cargoes which are known to create difficulties or hazards. It also gives advice on action to be taken in heavy seas and to remedy cargo shift.

3. FALL OVERBOARD OF PILOT IN DISEMBARKING

Narrative

A cargo vessel was outward bound from a United Kingdom port under pilotage, and the pilot was to disembark into a launch in relatively open estuarial waters. It was night-time, with good visibility; the wind was south by east Force 4 (broad on the cargo ship's starboard bow) with a wave height of 1 - 1.5 metres. The ship's freeboard was about 4.5 metres.

The pilot ladder was rigged on the starboard side, and as the launch approached the pilot climbed part way down. As the launch came alongside it was lifted by a wave and came up under the ladder causing the pilot to fall on to the launch's deck, and before he could gain a secure hold he fell again, into the sea between launch and ship.

When he surfaced he was astern of the launch. A lifebuoy was thrown from the ship but out of reach of the pilot; however the launch kept him in sight with the aid of the searchlight, turned and picked him up using the recovery platform fitted aft. He was in the water for less than five minutes, and suffered no serious injury; but as a result of hypothermia and sea water ingestion he was kept in hospital for some 2½ days.

Observations

1. At the time of disembarking the ship was steaming at some 6 - 7 knots and had not yet reached the recognised pilot station. The ladder was rigged on the weather side and no attempt was made to make a lee for the pilot launch. There was no communication between the ship and the launch as to the disembarkation arrangements.

2. The pilot climbed part way down the ladder before the launch was alongside.

3. The local pilotage authority had issued pilots with high visibility jackets with self-inflating buoyancy, reflective tapes and lights. The pilot involved in the accident was however wearing a black anorak with neither reflective tapes nor light, and no life-jacket or buoyancy aid.

4. The man-overboard recovery platform fitted to the launch proved its value, though some difficulty was experienced in its operation.

Comment

1. The pilot was fortunate to be recovered quickly; the incident occurred in January when the sea water temperature was low and this, combined with the failure to wear the proper safety jacket, might very easily have led to a fatal outcome.

2. "The Boarding and Landing of Pilots by Pilot Boat Code of Practice", produced by British Ports Federation in conjunction with Pilots and Harbour Authorities, includes the following:

> "VHF radio contact should be established between the pilot boat and vessel ... the pilot boat coxswain should liaise with the vessel in order to make the best lee for safe transfer ..."
>
> "All pilots ... should wear appropriate protective clothing and buoyancy equipment ..."
>
> "Before stepping on to the ladder the pilot should check that the pilot boat is laying alongside and has not fouled the pilot ladder ..."
>
> "Retrieval drill for pilot boat crews ... should be carried out on a regular basis ... pilots should all be familiar with the recovery equipment of their pilot boats ..."

3. The Code of Practice has now been supplied to all pilots and launch crews in the district where this accident occurred. It contains in plain terms much advice in addition to that quoted, and adherence to it will do much to reduce the risk of accidents to pilots during transfer.

4. MAIN ENGINE FAILURE WHILST LEAVING HARBOUR

Narrative

A 475 gross registered tonnage general cargo vessel engaged in a regular coasting trade was fitted with a marine diesel driving through a fixed ratio gearbox and clutch to single shaft and a fixed pitch propeller. The main engine was air started manually in the engine room with control then being passed to the bridge, the engine room being unmanned whilst at sea. The normal engine safety devices were fitted including a mechanical overspeed trip.

The vessel left her berth at 0630 hours and proceeded down river on the ebb tide towards the river mouth, passing the breakwater at about 0730 hours. The bad weather which had prevented an earlier departure was moderating at this time and was forecast as decreasing to northerly Force 4 - 5.

On leaving the shelter of the breakwater, the vessel experienced rough water together with a moderate to heavy swell causing the vessel to pitch a number of times. Noting that the main engine was slowing down, the Master sent a crew member below to find the cause of the trouble. By this time the main engine had stopped. Despite various attempts by the crew, they were unable to re-start the main engine with the result that the harbour authorities were informed and a tug requested. The vessel drifted towards the south-west under the influence of the weather, striking the ground hard before eventually grounding on a sandy beach. Shortly after the vessel grounded, the port anchor was dropped to try and prevent the vessel being driven further ashore. With no further action possible and with a lifeboat and helicopter in attendance, the Master ordered the evacuation of the vessel at 0755 hours.

Continued bad weather delayed the salvage although easy access to the vessel was possible at low tide. The sand was banked up to prevent further movement ashore whilst both anchors were laid out to seaward. Eventually a trench was dug to seawards from the vessel, the ballast was pumped out, and on a high tide, the vessel refloated. After testing of the main engine and steering gear the vessel proceeded into dry dock where some plate damage to the bottom was found although the hull remained intact and watertight. No damage was found to either the steering gear or the main engine.

Observations

1. The main engine was a standard marine diesel fitted with various safety devices including an overspeed trip. The function of this trip is to safeguard the engine in the event that the load is suddenly removed from the engine whilst under way, such as when the propeller comes clear of the water or the shaft fractures. Any sudden reduction of load whilst the fuel pumps are operating at a high level causes the engine to race and overspeed. On this engine an overspeed of 20% could be accepted by the safety mechanism before the trip operates.

2. On this occasion whilst negotiating the harbour entrance, the vessel pitched severely causing the propeller to either come clear of the water or sufficiently close to the surface to reduce significantly the load on the main engine. This resulted in an overspeed condition in excess of the 20% engine speed, and the operation of the overspeed trip. Once operated, the fuel racks were locked into the shut mode until the trip was manually reset.

3. As no crew member on the vessel was apparently familiar with this safety feature, they were unaware that it had operated and that a mechanical re-set was necessary. As a result the main engine remained locked out. During the subsequent company investigation whilst still aground, the overspeed trip was found still in the "tripped" position. This trip was re-set and the engine briefly run without difficulty.

Comment

1. This incident highlights the need for Owners to ensure that <u>all</u> crew on vessels that do not carry an engineer are familiar with the safety devices fitted to their vessels' main engines.

2. In this case it was fortunate that the crew were rescued without difficulty but in different circumstances, a lack of knowledge on the part of the crew as to how to re-set a safety device and to restart the main engine could result in injury, loss of life or the loss of the vessel.

5. HEAVY WEATHER DAMAGE TO WHEELHOUSE WINDOWS

Narrative

Three recent accidents highlight the vulnerability of wheelhouse structures situated near the bow due to wave damage.

Case 1

A ro-ro cargo vessel of 104 metres length was travelling at reduced speed with the weather on her port bow. The wind was Force 10 and the sea was rough with a heavy swell.

She took a heavy sea which struck the front face of the superstructure with considerable force shattering the extreme port side, front, wheelhouse window and forcing a considerable quantity of water into the wheelhouse area. The water knocked out the port radar unit, one VHF radio, the bridge/engine room telephone and the fire detection system.

The vessel was immediately turned stern on to the weather and a PanPan message was broadcast from the second VHF set which was located in the radio room. A steel cover was fitted over the shattered wheelhouse window and the PanPan was cancelled after an assessment of the extent of the damage. The vessel maintained her new course, stern on to the weather and returned to her port of departure.

Once back in port close inspection of the damage showed that the bridge front structure had been distorted. It was this distortion which had caused the wheelhouse window to shatter.

Case 2

A safety standby vessel of 49 metres length was staying close to its rig by steaming alternately into the wind and with the wind. At the time the wind was Force 9 and the sea was rough with an estimated 7 to 9 metre wave height.

The vessel was coping well with the conditions until, during one of its legs into the wind and seas, the vessel was struck by a wall of water. The force of the water on the front of the wheelhouse pushed in four windows on the port forward side. A deluge of water entered the wheelhouse with sufficient force to push out another window on the starboard side. It also tore a deckhead mounted radar display out of its bracket as well as the magnetic compass periscope. Water flooded the wheelhouse to a depth of about 30cm. The flooding extended into the accommodation area immediately behind the wheelhouse.

The five glass window panels were forced out without breaking. One of the displaced windows, or the radar scope, hit the watchman on his head, causing a fractured skull, jaw and cheekbone. He was bleeding profusely.

Steering, engine controls and navigation lights kept functioning but all other wheelhouse equipment was put out of action or malfunctioning, including the second radar, the gyro, together with the fixed and portable VHF sets.

Immediately following the incident the vessel was turned before the wind. Steel shutters were placed against the four window openings. Shutters were also placed behind the remaining intact windows leaving only one central window to see out of for navigational purposes. A bed mattress was used to plug the starboard window for which there was no steel shutter provided.

Radio contact with the rig was re-established, initially by using one of the fast rescue craft portable VHF sets and later, more satisfactorily, by jury rigging one of the fixed VHF sets in the wheelhouse by using a VHF handset from the hospital space, the battery from the fast rescue craft set and the portable battery charger. A helicopter was requested to airlift the injured seaman to hospital and this was accomplished satisfactorily.

The vessel was relieved and returned to port for repair. It was discovered that the window glass had only a bearing area of 3mm, much less than the 7 to 9mm recommended for windows of a similar size by the British Standard BS MA 25.

Case 3

Whilst on standby duties alongside a drilling rig a 61 metre standby vessel with a crew of 12 sustained serious damage to her wheelhouse windows. Sea conditions were considered to be very rough with a heavy swell, but not sufficient to raise the storm shutters. A very large wave hit the vessel pushing in all the forward windows and some side windows, also inflicting structural damage to the bulwark. The vessel lost steering control from the wheelhouse. The crew managed to raise the storm shutters around the wheelhouse and reinstate steering control to the wheelhouse. A request made for a tow was cancelled and she made port safely under escort.

Observations

1. The weather in each case, although severe, was thought to be well within the capabilities of the vessels. The vessels were being handled in a manner appropriate to the prevailing conditions, and up until the actual incident they were experiencing little difficulty.

2. Although the ships were of completely different size they all had bridge structures situated within about 10% of the ship's length of the bow.

3. The vessel in Case 3 was built 20 years ago to work in the Gulf of Mexico and was typical of such vessels. She was fitted with 6mm thick laminated glass wheelhouse windows. The photograph shows the damaged laminated glass panel still in one piece after being pushed out of its seal. It indicates the importance of having laminated toughened glass to prevent splintering. Splinters of glass can be extremely dangerous to crew members in these circumstances.

Comment

1. These cases illustrate the particular vulnerability of wheelhouse windows to damage on those ships with bridge structures which are located near the bow. Designers and builders should pay particular regard to the construction of both the windows and the surrounding structure when dealing with vessels with such characteristics.

2. Owners of such vessels should have the windows inspected for compliance with BS MA 25 including measuring the glass thickness with a gauge. This is particularly important when a vessel, built to operate in a region of generally less severe weather, is transferred to an area such as the North Sea when bad weather is frequent. Also see Merchant Shipping Notice No M.712, Shattering of Windows in Heavy Weather.

3. These cases also illustrate the value of having back-up equipment (such as portable VHF sets) stored separately from the main communications equipment.

6. SCALDING DUE TO UNCONTROLLED RELEASE OF STEAM

Narrative

The turbo-alternator in a container ship of 56,822 gross registered tonnage was in service supplying the vessel's entire electrical requirements. To avoid having to run the diesel alternators it was necessary to supplement the steam supply to the turbo-alternator by running the auxiliary boiler continuously.

The water level control on the auxiliary boiler started to behave erratically, the problem being identified as a fault in the "level-trol" float chamber. Attempts were made to clear the problem by blowing down but this failed, indicating that the drain line was blocked.

The boiler was shut down, taken off line and the float chamber isolated from the boiler. The drain line was disconnected, and by means of a bent wire it was established that the blockage was either within or above the drain valve. The valve spindle was then removed and further unsuccessful attempts, using a bent wire, were made to free the blockage. It was then decided that the drain valve body should be removed but on the body being unscrewed approximately ½ turn, the blockage cleared and the residual steam and water within the float chamber escaped out of the valve spindle hole.

The engineer carrying out this procedure was standing adjacent to the float chamber and suffered scalding to his hand.

Observations

Although the float chamber had been isolated from the boiler, the float chamber would have retained sufficient residual heat to maintain the temperature of the water within the chamber well above boiling point. On release to atmosphere, the steam component would flash off giving rise to both steam and water discharge.

Comment

1. Whilst accepting that circumstances may well have dictated the course of events, extra care is always needed when dealing with high temperature steam and water. In this case, there was no cooling down period and it should have been expected that a discharge of steam and hot water would occur once the blockage was cleared. The replacement of the valve spindle prior to attempting to unscrew the valve body from the float chamber would have directed the steam/water discharge downwards and away from the engineer.

2. A Senior Engineer who was also present at the time should have exercised greater supervision and given instruction on preventive measures to minimise the risk of scalding.

7. FATAL ACCIDENT DURING AN UNBERTHING OPERATION

Narrative

A ro-ro cargo ship of 5,925 gross registered tonnage was secured alongside with her port side to the berth. On completion of cargo operations, the Second Mate and a rating proceeded to the after mooring platform in preparation to let go. The after moorings consisted of a stern rope, two breast ropes and a backspring. Each mooring rope was led from an independent hydraulically-powered winch. A remote control box was located at the port side of the mooring platform.

On instruction from the Master, the two breast ropes were let go and recovered on board. The stern rope and the backspring were then let go. The Second Mate was standing between the aft end of the control box and the fairlead through which the stern rope was led. The rating was standing between the forward end of the control box and the fairlead through which the backspring was led. The Second Mate was leaning over the bulwark and was looking forward while operating the backspring winch by means of the after control lever. The rating was looking aft while operating the stern rope winch by means of a forward control lever.

The rating turned around in order to check that the stern rope was stowing on the winch drum correctly. He then turned back to see the eye of the stern rope rotating rapidly above the Second Mate's head. He shouted a warning, released the control lever and tried to pull the Second Mate out of the way. However, the eye of the rope became entangled with the Second Mate's upper body and pulled him over the side of the ship resulting in his death.

Observations

1. The Second Mate was very experienced in unberthing operations at the after mooring platform of the ship.

2. On arrival at the after mooring platform, the Second Mate set the local winch speed controls to maximum. This action was consistent with his nature of wishing to get things done quickly and efficiently.

3. The rating was unaware that the speed of the winch could be controlled by adjustment of the remote control lever.

4. The location order of the control levers inside the remote control box was such that both the Second Mate and the rating were unable to give adequate attention to the mooring rope from which they were most at risk.

5. The location of the remote control box was such that both the Second Mate and the rating were particularly vulnerable to the whip of a mooring rope during its recovery.

Comment

1. The main contributory factors to the accident were:

    1.1 the setting of the local winch speed control to maximum;

    1.2 the exposed location of the remote control box at the side of the after mooring platform;

    1.3 the location order of the control levers inside the remote control box relative to the mooring ropes which they controlled; and

    1.4 the rating's unawareness as to the availability of proportional winch control by adjustment of the remote control lever.

2. The following action has since been taken by the management company in an attempt to prevent a recurrence of the accident:

    2.1 all mooring ropes have been marked at about 10 metres from the end to provide a warning to the winch operator;

    2.2 operational procedures have been implemented with respect to controlling the speed of the winches;

    2.3 large danger notices have been placed on the mooring platform bulwarks and inside the remote winch control boxes;

    2.4 the location order of the control levers inside the remote control boxes has been altered and now reflects the relative positions of the winches,

3. Although the location of the remote winch control box satisfied the need for good overall visibility during mooring operations, an appropriate form of structural protection should have been provided in view of its exposed nature. However, such protection would probably not have extended outboard of the ship's side and, therefore, would not have prevented the Second Mate from being struck by the mooring rope.

8. COLLISION CAUSED BY FATIGUE

Narrative

A coaster of 794 gross registered tonnage departed her berth and proceeded seawards, having loaded a full cargo of coal. The Master and Mate were both on the bridge with the Master in overall charge and the Mate monitoring the track of the vessel both visually and by radar. After clearing the entrance to the port, the Master handed over the con to the Mate and then went to bed. The vessel was steering a course by auto-pilot.

The Mate sat in the fixed wheelhouse chair from which he could conveniently maintain a visual lookout ahead as well as monitor the gyro compass repeater, the auto-pilot, the radar screen and the radio position indicator.

While seated in the wheelhouse chair, the Mate fell asleep. The vessel subsequently collided with an oil tanker, which was at anchor. The bow of the coaster was substantially damaged and holed above the waterline forward of the collision bulkhead. The oil tanker, in ballast with tanks inerted, sustained indentations to her shell plating. There were no injuries to personnel.

The Master of the coaster determined that his vessel was in no immediate danger and decided to resume passage to the intended port of discharge.

Observations

1. It was daytime. The prevailing weather conditions were a slight to moderate sea with visibility restricted to about one mile.

2. The manning level of the coaster, comprising a Master, a Mate and three Category 1 seamen, was in accordance with the provisions of her Safe Manning Certificate.

3. The Mate was medically fit and held a valid Medical Certificate. He had not taken alcohol for at least two days prior to the incident.

4. The Mate had slept for a single continuous period of just over two hours during the 33 hours prior to the incident. During the last 13 hours, he had been actively involved in shifting ship, de-ballasting, loading and navigating the vessel.

5. On taking the con from the Master, the Mate had felt tired but no more so than on previous occasions. He was confident that he could keep a safe navigational watch and gave no indication to the contrary.

Comment

1. The immediate cause of the collision was that the Mate, being the sole person on watch, fell asleep and consequently failed to ensure a proper lookout. A

major contributory factor was inadequate rest. The tendency for the Mate to fall asleep was probably exacerbated by his use of the fixed wheelhouse chair.

2. Neither the Master nor the Mate himself appreciated the extent to which the latter was fatigued and, consequently, the extent to which the safety of the vessel was jeopardised in allowing the Mate to take charge of the first watch. The Master had worked less hours and it would have been prudent for him to have taken the first watch or to have delayed departure until the Mate was adequately rested.

3. The Master failed to recognise his obligation to communicate with the oil tanker after the collision and to stand by her until it was confirmed that she required no assistance.

4. The fitting of a watch alarm on the bridge of the coaster might have prevented the collision. However, it would not have prevented the Mate from becoming sufficiently fatigued so as to endanger the vessel and her crew prior to the watch alarm being activated.

5. As the vessel was proceeding in restricted visibility, an additional lookout should have been posted in accordance with Merchant Shipping Notice No M.1102. The presence of an additional lookout might have prevented the collision. However, the collision might equally have occurred in clear visibility when an additional lookout may not have been deemed necessary.

9. EXPLOSION IN ENGINE ROOM AT SEA

Narrative

On purchasing a 16.49 metre stern trawler the Owners had a new trawl winch fitted and a number of running gear modifications made. The hydraulic power system was flushed through and the existing filters renewed. Approximately two months after purchase, problems were experienced with both the main engine gearbox and the hydraulic power system - both the result of debris in the oil systems. After cleaning both systems, new bearings were installed in the gearbox whilst an additional water and fine debris filter was fitted in the hydraulic power system.

Some seven months later the vessel left harbour in the early hours of the morning for the fishing grounds where she arrived some nine hours later. The nets were shot, the normal 3 - 4 hour trawl sequence completed without difficulty, after which a second trawl was commenced.

When the trawl was completed preparations were made to haul the nets aboard. The Skipper was in the wheelhouse operating the winch controls, the Mate was on the aft deck whilst the two deck hands were under-deck forward. The cook was also under-deck, port side forward, just outside the forward engine room door. After approximately 5 minutes into the hauling operation, there was an explosion in the engine room and all power was lost. Almost simultaneously with the loss of power, the forward engine room door blew open emitting a fireball into the under-deck space forward. The engine room vents were shut and the engine room effectively shut down.

The Coastguard were alerted immediately after the explosion by the Skipper and arrangements made to airlift the cook, who had suffered burns to the face, neck and hands, to hospital. This operation was completed approximately one hour after the explosion.

The engine room was entered and it was found that damage was limited to minor heat and smoke damage together with the rupture of a hydraulic hose pipe. The main engine was re-started and the hydraulic system was checked, adjusted due to the broken feed pipe, and re-started. The nets were hauled in successfully and the vessel proceeded back into harbour. During the passage in, hourly updates were passed to the Coastguard as a precautionary measure.

Observations

1. The hydraulic system supplies power to the main winch forward, cargo winch, net drum aft and the aft crane. The hydraulic power pack fitted on board comprised two electrically driven hydraulic pumps, with the system pressure set to operate at a maximum pressure of 175 bar (2538 psi). The new filter was installed between the system relief valve and the header tank. The ruptured flexible hydraulic hose pipe connecting the system relief valve and the new filter installation was subsequently examined and found to be outside manufacturing tolerances - the diameter being 13.8mm whereas the minimum diameter should be 14.5mm.

2. Examination and pressure testing of the hose and connections confirmed that high pressure leaks would occur at or near the system working pressure. The type of pressure seal used for these pressurised systems relies on a standard hose being compressed between the inner male fitting and the outer female connection. Any reduction in the outside diameter will reduce the compressive force exerted between the male and female couplings when tightened. This reduction in the compressive sealing pressure is likely to bring the normal hydraulic fluid working pressure up to, or very close to the equilibrium point. Any degree of maladjustment in the coupling or minor damage to the piping is likely to be "worked" by the fluctuating hydraulic pressures. This "working" will eventually further reduce the effectiveness of the pressure seal until the hydraulic pressures becomes the dominant factor. From then on, it is only a matter of time before failure will occur.

3. The probability is that in the initial phase of the hose failure, the developing fault lines in the hose allowed hydraulic oil under pressure to be forced out as a very fine oil spray. Given the available pressure, this oil spray is likely to contain droplet sizes less than 100 microns plus a high concentration at deckhead level. The proximity of a main engine exhaust plus an operating transformer motor would provide a source of ignition.

Comment

1. The actions of the Skipper and crew after the explosion were correct and followed the recommended procedures of shut down and isolation of the effected space **except** that the emergency fuel trips were not operated. Although no fire was visible from the engine room door, the smoke was of sufficient intensity to prevent access and for a true assessment to be made. Fortunately the explosion was of short duration and flame life not sustainable.

2. This incident does however illustrate graphically the importance of attention to detail when installing, changing or removing any item of equipment or machinery. The effect of modifications on an integrated system or design, the **quality** of the work and materials used, are **essential** considerations that **must** be addressed before, during and on completion of the work. These points are highlighted in Merchant Shipping Notice No M.1456 "Prevention of Fuel, Lubricating and Hydraulic Oil Fires in the Machinery Spaces of Merchant Ships and Fishing Vessels".

10. BATTERY BOX EXPLOSION CAUSES INJURY

Narrative

Repairmen were working in the vicinity of a steel box containing four heavy-duty radio batteries in a 24.28 metre fishing vessel. The box exploded which caused its lid to tear away from its hinges and closing turnbuckles. One of the repairmen received a glancing blow from a piece of flying debris.

Observations

The owner has reported the following:

1. Subsequent examination revealed that both of the two air pipe gauzes were partially blocked with paint and that the wooden balls, located inside the air pipe heads to prevent passage of rain or spray, had lost their freedom of movement due to an accumulation of rust scale.

2. On the previous day, the batteries had been found to be dry of electrolyte. The batteries had then been topped up and the battery charger set to the "boost" position.

3. It is presumed that the batteries were overcharged, thus releasing hydrogen which built up pressure inside the box because of the blocked air pipes.

4. It is not known whether the explosion occurred due only to the build-up of pressure or, additionally, to a spark from the welding operation being undertaken by one of the repairmen at the time.

5. Instructions have since been issued to have all fuel tank and battery box air pipes examined on all company vessels in order to ensure that they are operating properly. Painting contractors are also being asked to issue instructions to their workforce forbidding them from applying paint to air pipe gauzes.

Comment

It is considered that the following extracts from the "Recommended Code of Safety for Fishermen" are applicable:

> "6.6.12 Smoking or generating sparks should be prohibited near electrical batteries.
>
> 6.6.13 Adequate ventilation should be maintained in any compartment housing electrical storage batteries."

11. COLLISION BETWEEN TWO FISHING VESSELS IN FOG

Narrative

A 24 metre stern trawler and a 21 metre seine netter were approaching one another so as to involve a risk of collision. The trawler was steaming towards fishing grounds while the seine netter was returning to her home port. Both vessels were proceeding at 9 knots in fog with their radars operational.

The Skipper of each vessel was unaware of the presence of the other vessel until he observed her visually at close range. Although both Skippers then immediately reduced speed, such action failed to prevent a collision. Fortunately, there were no injuries to personnel and both vessels were able to proceed to port unaided.

Observations

1. The Skipper of each vessel was alone on watch.

2. Neither vessel was fitted with a radar reflector.

3. Neither vessel made the appropriate sound signals.

Comment

1. The immediate cause of the collision was that avoiding action was not taken by either vessel in sufficient time.

2. The main contributory factors were:

    2.1 the Skipper of each vessel was unaware of the presence of the other vessel until a collision was imminent; and

    2.2 the high closing speed of the vessels rendered any late avoiding action ineffective in preventing a collision.

3. The vessels might have detected each other earlier if they had both maintained a proper radar watch and if appropriate sound signals had been made in accordance with the International Regulations for Preventing Collisions at Sea 1972.

4. Merchant Shipping Notice No M.1190 strongly recommends that a second man should be on watch in restricted visibility.

5. The fitting of an approved radar reflector to both vessels, as recommended in Merchant Shipping Notice No M.1497, might have enabled an earlier detection by radar.

6. Rule 19(b) of the International Regulations for Preventing Collisions at Sea 1972 requires every vessel to proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility.

12. LOSS OF TRAWLER THROUGH FLOODING

Narrative

A stern trawler of 23.35 metres length was on passage to fishing grounds. The prevailing wind was Force 5 - 6. The high-level bilge alarm sounded and, on inspection, water was observed to be flowing into the engine room from the fish hold through an opening in the divisional transverse bulkhead. Bilge pumping operations were commenced and assistance was requested from the Coastguard. Salvage pumps were transported to the vessel by helicopter but attempts to stem the rate of flooding failed. Crew members donned life-jackets and then successfully inflated and boarded one of the two available liferafts. The second liferaft floated free and automatically inflated when the vessel foundered.

Observations

1. The vessel was 38 years old and was of wood construction. She had recently been slipped on a number of occasions for hull repairs following reports of leakage.

2. Bilge pumping was undertaken using two engine-driven pumps with the sea suction valves set partially open. No use was made of the available manual pumps provided on board.

Comment

1. The initial cause of flooding was not identified but probably resulted from a failure of the hull below the waterline. The condition of the vessel, as a consequence of her age, was a probable contributory factor.

2. The partially open condition of the sea suction valves and the failure of the crew to use available manual pumps prevented an optimum bilge pumping discharge rate being achieved. A higher pumping rate during the initial stages of flooding might have prevented the vessel being lost.

3. Merchant Shipping Notice No M.1327 provides advice on how to prevent the loss of fishing vessels through flooding. The following is an extract:

   "IN AN EMERGENCY

   DO try using the bilge pump or ejector and hand pumps when provided;

   DO close all sea valves (and other valves controlling the inlet and outlet of water through the hull) when the cause of the flooding is not known or cannot be controlled."

13. BILGE ALARM AND WATERTIGHT BULKHEADS SAVE FLOODING FISHING VESSEL

Narrative

A 21.3 metre wooden hulled fishing boat built in 1976 was engaged in pair trawling with another vessel north-east of Peterhead. There was a north-westerly wind Force 9 - 10 with very rough sea. At about 2030 hours, alerted by the bilge alarm, the engine room was found to be taking in water. Initially the on board pumps were able to cope with the flooding as the vessel proceeded to return to port. At 0236 hours the next day the pumps could not keep pace and the Coastguard were asked for a portable bilge pump. This was delivered by helicopter and used effectively by the vessel's crew.

The vessel arrived safely in Peterhead harbour at 0845 hours and there were no reported injuries. The cause of the flooding was failure of some of the deck and side plank caulking.

The vessel was fitted with a complete, though not fully watertight, bulkhead between the fish hold and the engine room.

Observations

The bilge alarm was tested regularly both using the in-built test button and by manually activating the float switches in the bilges. The bilge alarm was also connected to a red revolving light situated on the mast. The primary function of this light was to give warning if the vessel experienced flooding whilst in port but it would also be seen by the crew working on deck.

Comment

1. The cause of the flooding was ingress of water through failures of the caulking because of the working of the wooden hull in very heavy weather.

2. The bilge alarm gave early warning of flooding allowing effective action to be taken to rectify the situation.

3. The bulkhead between engine room and fish room, though not fully watertight, prevented the spread of flooding between adjacent compartments.

14. LACK OF MAINTENANCE RESULTING IN FLOODING OF A FISHING VESSEL

Narrative

A 21 metre, 35 year old, wooden fishing vessel with a crew of four, put to sea with the problem of persistent leaking from around the stern timbers in way of the rudder post. The main engine driven pump and the auxiliary engine driven pump were run continuously to keep the water level in the engine room bilge low.

Both pumps failed when the vessel was returning to port, and the water level in the engine room bilge began to rise. When she was some 12 miles from her home port, in a heavy sea and with winds of Force 6 - 7, the Skipper decided to alert the Coastguard. The lifeboat was launched and transferred a portable pump to the fishing vessel. This enabled the level of flood water to be reduced and the vessel made port safely.

Observations

1. The watertight bulkhead between the engine room and the fish hold restricted the flooding to the engine room alone. At its worst point the flooding in the engine room was just over 1 metre above the bottom of the bilge.

2. The main engine driven bilge pump failed because of a problem with the clutch; this was known to occur when it had been running continuously for some time. It is believed that the impeller on the auxiliary pump had become ineffective through wear.

3. The vessel was equipped with working bilge alarms in both the engine room and the fish hold.

Comment

1. This incident was entirely avoidable and lives were unnecessarily put at risk. The vessel should not have put to sea with persistent hull leaks.

2. A further lack of corrective maintenance led to the failures of both engine driven bilge pumps. Merchant Shipping Notice No M.1327 recommends that the bilge pumping system is always kept in a well maintained condition, though it ought not to require an M Notice to point out anything so obvious and fundamental.

15. FISHING VESSEL FLOODS WHILE CREW SLEEPS

Narrative

A 53 year old, 19.5 metre, wooden fishing vessel was at anchor on the fishing grounds. At about 2330 hours the crew of three turned in, setting their alarm clock for 0400 hours. Nobody was left on watch.

When the Skipper was awakened the next morning by the alarm clock he found the boat in total darkness. He went on deck to find water was lapping over the aft end. Immediately he called to the other two crew members to get on deck. A torch was shone into the engine room revealing it to be full of water.

The crew were told to launch the two liferafts which were carried on board. The Skipper went back into the cabin to pick up some flares and he set off two or three flares in the direction of another fishing boat which he could see. All three then abandoned ship into one of the liferafts and hurriedly paddled clear of the vessel which sank straight away. The EPIRB floated clear of the vessel and this was retrieved by the occupants of the liferaft.

The crew were picked up by the fishing boat which had been alerted by their flares. They were subsequently transferred to shore by helicopter.

Observations

1. A bilge alarm was fitted. This sounded in the wheelhouse, but it was not heard by the crew who were asleep in the forward accommodation some distance away.

2. If the crew had maintained a proper anchor watch, in compliance with good seafaring practice, it is probable that they would have been alerted to the flooding early enough to save the vessel.

Comment

1. The sinking of this vessel was a direct consequence of the failure of the Skipper to ensure that a proper anchor watch was maintained at all times.

2. The incident also highlights the value of liferafts and flares.

16. FLOODING AS A RESULT OF SQUEEZING DAMAGE

Narrative

A 40 year old, 20 metre, wooden fishing vessel had completed pair fishing 60 miles out and was returning to port. The last catch was being cleaned on deck with the deckwash hose. The weather was forecast to deteriorate rapidly. On completion of the fish washing operation the man in the fish hold reported that the water level was up to the floor boards. Both the fish hold and engine room were pumped dry.

Just half an hour later it was found that there was water in the engine room over the top of the drive shaft. The bulkhead between the engine room and the fish hold was not watertight, and the fish hold was similarly affected, despite the fact that the engine driven bilge pump to the fish hold and an auxiliary pump in the engine room were both operating. The engine room bilge alarm had been disconnected and none was fitted in the fish hold. The engine was de-clutched to allow maximum revolutions to be achieved at the pump, but the rate of ingress of water was too fast to allow the spaces to be pumped dry.

Coastguard were informed of the flooding, and alerted a rescue helicopter and RNLI lifeboat, also her partner vessel was in close attendance. As the water level reached the generators and switchboard she began to lose electrical power.

A pump was lowered from the helicopter onto the vessel, and this was used to reduce the level of water. By this time the weather had deteriorated to Force 7 - 8 with a rough sea and heavy swell and all electrical power had been lost.

When still some 2 hours from port the vessel's own auxiliary pump had to be shut down because the exhaust pipe had broken, and the water level began to rise. However she finally made port, with some about half a metre of water above the fish hold floor boards.

The vessel was slipped and surveyed where it was found that the water had been coming in through the weather deck seams in the area of the filler chocks (outer strakes of deck planking between bulwark stanchions), which had been disturbed. The hull itself was found to be sound.

Observations

1. The vessel came within a whisker of being lost because of flooding of its engine room and fish hold due to water ingress through its weather deck, **not** its hull.

2. The lack of watertightness in the deck was attributed to the vessel having been 'squeezed' by other vessels moored alongside it whilst in harbour.

3. The failure of the exhaust pipe on the auxiliary engine, causing one pump to be shut down, again threatened the loss of the vessel just when it appeared to have been saved.

4. The bilge alarm was not working, which meant that the flood water was already over the drive shaft before the alarm was raised.

5. The lack of a watertight bulkhead between the fish hold and the engine room allowed unrestricted flooding to a level which threatened the loss of the vessel.

Comment

1. This incident was entirely avoidable. The vessel should not have put to sea with a damaged and non-watertight weather deck. When any part of the main structure of a wooden vessel is damaged its entire structure should be surveyed to determine the full extent of the damage.

2. It also highlights the vulnerability of wooden vessels to 'squeezing' damage when they are moored on the inside of a much heavier vessel or group of vessels, a situation which must obviously be avoided.

3. It is essential that bilge pumps and their auxiliary engines are kept in a well maintained condition so that they can be relied upon in times of emergency, as Merchant Shipping Notice No M.1327 recommends.

4. Merchant Shipping Notice No M.1327 also recommends that bilge alarms are tested regularly to ensure that they actually work and thus give the earliest possible warning of flooding.

17. CRABBER SINKS AND TWO LIVES ARE LOST

Narrative

A 15 year old, 8 metre wooden crabber which had been laid up for two years before this fishing trip failed to return to port at night and the alarm was raised. A search was mounted at first light and the wreck was located on the seabed. The bodies of the two crew, each supported by lifebuoys, were found floating some miles away from the wreck. The weather and sea were good at the time.

Divers were sent down to inspect the wreck.

Observations

1. The precise cause of the sinking is not known. A capsize was ruled out because the boat was found to be upright on the seabed with all her loose deck gear and pots in place. Flooding from the engine cooling water system was also ruled out since the pipework was found to be in a sound condition. It is believed that the boat foundered due to flooding: either through a leaking stern gland or through open seams between the planks just above the normal waterline. These seams would have dried out when she was laid up for two years, but since they were above the waterline they would not have taken up when the boat was re-launched. However, when she was loaded up with some 2 tonnes of lobster pots for that fateful first trip the increase in draught would have put these seams under water.

2. Since no MayDay was broadcast it is likely that the crew were unaware of the rising level of flood water until the electrical power failed. By this time the electrical bilge pump could not be operated and the manually operated bilge pump must have been inadequate to cope with the rate of flooding.

3. The incident occurred in the month of April off the south coast of England and the sea water temperature was about 9 ° C. It is estimated that the survival time in those temperatures without immersion suits would be about 1 hour.

4. None of the following life saving equipment was carried:

   - a liferaft
   - life-jackets
   - distress flares or rockets
   - an EPIRB.

Comment

1. If a bilge alarm had been fitted it would have given early warning of the flooding and provided the crew with the time to broadcast a MayDay, resulting in an immediate rescue effort; if a liferaft had been carried the crew could have abandoned ship into it to await their rescue; if insufficient time had been

available to send a MayDay, an EPIRB would have floated clear when the vessel sank and alerted the rescue services.

2. Although it is not a requirement that vessels of this size carry a liferaft, the Department of Transport make strong recommendations in Merchant Shipping Notice No M.1467, that they should do so. It is also strongly recommended that an EPIRB is carried on board and is registered with the Department of Transport.

3. If the vessel and crew had been prepared for emergencies, as detailed in the "Make it your Business to make it Safer" campaign leaflets, the crew would have had a very much better chance of surviving this sinking.

18. CAPSIZE OF SMALL FISHING VESSEL WITH LOSS OF LIFE

Narrative

Two 9.9 metre fishing vessels were engaged in pair trawling approximately 10 miles offshore. Each vessel was manned by a Skipper and a crew of one. While towing with a following wind and tide, the trawl gear came fast upon a sea-bed obstruction.

Each vessel, in turn, unsuccessfully attempted to pull the gear clear while the other vessel maintained a slack warp. The towing chains were then removed and both vessels turned in order to stem the prevailing wind and tide. The warp from each vessel was leading ahead from a lead block located on the starboard bow. Each vessel then commenced hauling the warp on board while proceeding ahead towards the sea-bed obstruction.

During the hauling process, the lead block of one of the vessels broke which resulted in the lead of the warp being transferred to a position on the starboard quarter of the vessel. The Skippers decided to stop hauling and wait for the tide to turn because the tide would then assist in unsnagging the gear.

The vessel with the broken lead block sank while awaiting the change in tide. There were no witnesses.

Observations

1. The accident occurred during the hours of darkness. The prevailing wind was Force 4 - 5. The predicted tidal stream was 1.4 knots.

2. The stability of the vessel which capsized was not assessed by the builder upon her completion.

3. The vessel was subsequently raised and towed into port. The body of the Skipper was discovered inside the cabin. His crew member has not been found. Upon investigation, the stability of the vessel gave rise for concern.

4. For this length of vessel, her freeboard and freeing port areas were considered to be adequate.

5. The vessel was fitted with an inflatable liferaft which was secured on top of the wheelhouse. The liferaft had no float-free capability and remained in its stowage position until the vessel was subsequently salvaged.

Comment

1. The vessel probably capsized in her snagged condition due to the effects of the prevailing weather and tidal conditions. Progressive flooding subsequently caused the vessel to founder.

2. The Department of Transport is considering the development of a code for fishing vessels of less than 12 metres registered length. Until this is completed, it is strongly recommended that, where doubts exist, vessels are inclined and the loading conditions checked with the minimum stability criteria set out in The Fishing Vessels (Safety Provisions) Rules 1975.

3. Merchant Shipping Notice No M.989 provides guidance with respect to the safety of fishing vessels of under 12 metres registered length. The Notice emphasises to boat builders and designers the importance of paying attention to the stability of the finished product.

4. Although compliance with the minimum stability criteria would have provided the vessel with an increased resistance to capsize, it would not have guaranteed her survival in the prevailing circumstances and conditions.

5. Merchant Shipping Notice No M.967 provides advice on the dangers which can arise when fishing gear becomes fouled on the sea-bed. In accordance with the recommended practice, both vessels attempted to recover the snagged gear while bow on to the prevailing weather and tide. However, when the lead block broke, the lead of the warp was transferred to the starboard quarter which caused the vessel to lie beam on to the weather and tide. Both Skippers failed to appreciate that, in such a condition, the vessel would be particularly vulnerable to capsize.

6. The provision of an emergency position-indicating radio beacon (EPIRB) on board the vessel would have automatically alerted the emergency services and the fitting of a float-free arrangement to the inflatable liferaft would have ensured its availability upon the vessel foundering. Although there is no mandatory requirement for EPIRBs and liferaft float-free arrangements to be provided on fishing vessels of less than 12 metres registered length, such provision is recommended by the Department of Transport in Merchant Shipping Notice No M.1467.

19. COLLISION BETWEEN TWO FISHING VESSELS AND THEIR SUBSEQUENT LOSS

Narrative

Two steel hulled purse seine net fishing vessels of 23.8 and 21.3 metres length arrived at fishing grounds off the coast of Norway at about mid-day and prepared for fishing operations. The weather was good with a north-west wind Force 4 - 5, a moderate sea and 3 - 4 miles visibility.

Before the fishing began the two vessels lay stopped starboard quarter to starboard quarter whilst fish baskets were transferred. When this operation was completed one vessel (B) remained stopped whilst the other (A) moved off intending to shoot her net. (See Figure)

Initially A went ahead until B was about 300 metres astern and then turned to port with the intention of passing down B's starboard side. When the turn was completed vessel A's skipper, who was alone in the wheelhouse whilst the rest of the crew were preparing the fishing gear, engaged the auto-pilot and set the engine to give a speed of about 9 knots. He monitored the auto-pilot, considered it was operating satisfactorily and turned his attention to setting up his plotting equipment. By this time vessel B was about three points (33¾°) on his port bow distant about 1 cable (185 metres) and the Skipper expected that he would pass her at a distance of about 80 metres.

Very shortly after this his vessel struck the bows of vessel B in way of her starboard side. Such was the force of the impact that the struck vessel sank within six minutes. Fortunately her crew were able to take to the liferaft and were pulled aboard vessel A without injury.

Unfortunately the collision had damaged vessel A so that 30 minutes after rescuing vessel B's crew she also sank. Before abandoning vessel A, her Skipper broadcast a MayDay signal and was able to include an accurate position. The crews on vessel A then took to the liferafts and were quickly picked up, all uninjured, by a Norwegian rescue helicopter.

Observations

1. The auto-pilot had a history of unreliable operation and was not fitted with an off-course alarm.

2. Vessel A had attained the intended speed of about 9 knots when the collision occurred.

3. The Skipper of vessel B was also engaged in the setting up of fishing gear and his first indication of the collision was when he looked through the wheelhouse window and saw the bows of A coming towards him.

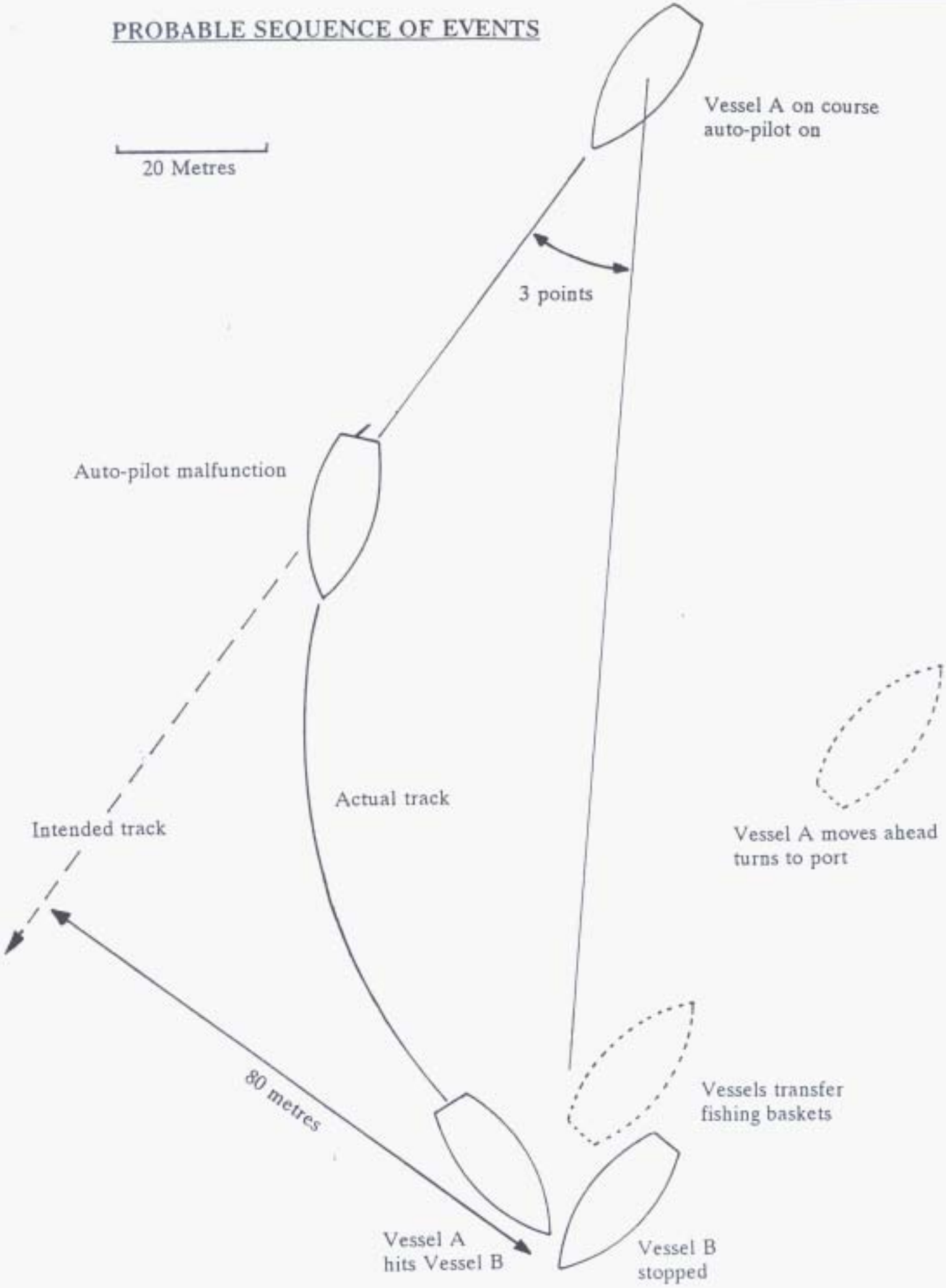
Comment

1. The most probable cause of this accident was malfunction of the auto-pilot which turned the moving vessel hard to port. This probably happened shortly after the auto-pilot was engaged but within sufficient time for the vessel to have attained nearly full speed.

2. This incident highlights the danger of relying on the auto-pilot when navigating close to other vessels or dangers and the need to keep a proper lookout at **all** times. It is even more dangerous to place reliance, especially in a close quarters situation, on any equipment known to be unreliable.

3. An off-course alarm would have given warning that the required course was not being maintained.

4. Merchant Shipping Notice No M.1471 gives guidance on the use of the automatic pilot and the testing of steering gear. This M Notice is based on the Merchant Shipping (Automatic Pilot and Testing of Steering Gear) Regulations 1981 (SI 1981 No 571) which carry penalties for non-compliance. Also Merchant Shipping Notices M.1020 and M.1190 emphasise the vital importance of keeping a proper lookout at all times.


PROBABLE SEQUENCE OF EVENTS
20 Metres
Vessel A on course
auto-pilot on
3 points
Auto-pilot malfunction
Actual track
Intended track
Vessel A moves ahead
turns to port
80 metres
Vessels transfer
fishing baskets
Vessel A
hits Vessel B
Vessel B
stopped

APPENDIX A

INVESTIGATIONS COMMENCED IN THE PERIOD 01/12/93 - 31/03/94

DATE OF ACCIDENT	NAME OF VESSEL	TYPE OF VESSEL	FLAG	SIZE	TYPE OF ACCIDENT
12/03/93	VOYAGER K	Fishing Vessel	UK	62.97m	Accident to Person
16/07/93	VAL DE LOIRE	Ro-Ro Passenger	France	31,395 grt	Hazardous Incident
16/10/93	GREEN CASTLE	Fishing Vessel	UK	24.05m	Accident to Person
24/10/93	BUFFALO	Ro-Ro Passenger	UK	10,987 grt	Dangerous Occurrence
01/11/93	SOUTHARDS	Fishing Vessel	UK	14.22m	Accident to Person
12/11/93	PHANTOM	Fishing Vessel	UK	9.76m	Accident to Person
21/11/93	DESTINY	Fishing Vessel	UK	19.02m	Foundering
22/11/93	GREEN CASTLE	Fishing Vessel	UK	24.05m	Accident to Person
01/12/93	DOROTHY GRAY	Fish Catching	UK	494 grt	Accident to Person
03/12/93	EVENING STAR	Fishing Vessel	UK	20.21m	Foundering
14/12/93	COPIA	Fishing Vessel	UK	10.56m	Foundering
15/12/93	SOUTHELLA	Fish Catching	UK	1,129 grt	Heavy Weather Damage
03/01/94	SEA HARVESTER	Fishing Vessel	UK	19.06m	Accident to Persons
06/01/94	GOLDEN WEST	Fishing Vessel	UK	9.80m	Accident to Person
07/01/94	GARROCH HEAD/ UN-NAMED	Misc Non-Trading Barge	UK -	2,808 grt -	Collision
08/01/94	LNG PORT HARCOURT/ REGINA MARIS OF NEWQUAY	Liquid Gas Carrier Fishing Vessel	Bermuda UK	78,915 grt 11.53m	Collision
11/01/94	ARGUS	Naval Craft	UK	26,421 grt	Fire
16/01/94	KATY	Fishing Vessel	UK	9.42m	Foundering
18/01/94	ARMANA	Fishing Vessel	UK	35.78m	Accident to Person
27/01/94	SIRIUS	Fishing Vessel	UK	21.10m	Foundering
28/01/94	VISHVA PARAG	General Cargo	India	12,810 grt	Flooding
28/01/94	DAWN WARBLER	Misc Non-Trading	UK	697 grt	Heavy Weather Damage
31/01/94	JANA	Container (FC)	Germany	3,125 grt	Accident to Person
03/02/94	CHRISTINAKI	Bulk Carrier	Malta	16,401 grt	Foundering
03/02/94	QUEEN ELIZABETH	Small Commercial Motor Vessel	UK	93.26 grt	Accident to Person
08/02/94	SPINNINGDALE	Fishing Vessel	UK	24.30m	Accident to Person
16/02/94	ACCORD	Fish Catching	UK	474 grt	Foundering
18/02/94	LEANDEL	Fishing Vessel	UK	15.26m	Foundering
20/02/94	GREEN CASTLE	Fishing Vessel	UK	24.05m	Grounding
21/02/94	SCOT TRADER	General Cargo	Germany	1,585 grt	Grounding
28/02/94	STAR WESTMINSTER/ OUR JOHANNA	Oil Tanker Fishing Vessel	UK UK	49,809 grt 24.95m	Collision
02/03/94	JOHANNA	Workboat	UK	-	Contact
04/03/94	KAREN MARIE II	Fishing Vessel	UK	6.55m	Foundering
08/03/94	CONFORMITY	General Cargo	UK	499 grt	Accident to Person

Cont.

INVESTIGATIONS COMMENCED IN THE PERIOD 01/12/93 - 31/03/94

DATE OF ACCIDENT	NAME OF VESSEL	TYPE OF VESSEL	FLAG	SIZE	TYPE OF ACCIDENT
09/03/94	HARVESTER H	Fishing Vessel	UK	11.88m	Hazardous Incident
21/03/94	SEACAT SCOTLAND	Ro-Ro Passenger	Bahamas	3,003 grt	Fire
28/03/94	KARMA	Fishing Vessel	UK	6.40m	Foundering
30/03/94	OUR ZOE ANNE/ LARGS BAY	Fishing Vessel Container	UK Liberia	28.65m 37,563 grt	Collision
30/03/94	AMBASSADOR	Fish Catching	UK	119 grt	Accident to Person