Marine Accident Investigation Branch (MAIB) - Safety Digest 3/2000

Contents

About The Marine Accident Investigation Branch

The Marine Accident Investigation Branch (MAIB) is an independent part of the Department of the Environment, Transport and the Regions and is completely separate from the Maritime and Coastguard Agency (MCA). The Chief Inspector of Marine Accidents is responsible to the Secretary of State for the Environment, Transport and the Regions. The offices of the Branch are located at Carlton House, Carlton Place, Southampton, SO15 2DZ.

This *Safety Digest* draws the attention of the marine community to some of the lessons arising from investigations into recent accidents. It contains facts which have been determined up to the time of issue.

This information is published to inform the shipping and fishing industries, the pleasure craft community and the public of the general circumstances of marine accidents and to draw out the lessons to be learned. The sole purpose of the *Safety Digest* is to prevent similar accidents happening again. The content must necessarily be regarded as tentative and subject to alteration or correction if additional evidence becomes available. The articles do not assign fault or blame nor do they determine liability. The lessons often extend beyond the events of the incidents themselves to ensure the maximum value can be achieved.

The *Safety Digest* is only available from the Department of the Environment, Transport and the Regions, and can be obtained by applying to the MAIB. Other publications are available from The Stationery Office bookshops and the DETR Publications Sale Centre, Unit 21, Goldthorpe Industrial Estate, Goldthorpe, Rotherham, S63 9BL (Tel: 01709 891318)

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Summaries (pre 1997), and Safety Digests are available on the Internet:
www.maib.detr.gov.uk

Extract from
The Merchant Shipping
(Accident Reporting and Investigation)
Regulations 1999

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

Glossary of Terms and Abbreviations

AB	Able Seaman
ARPA	Automatic Radar Plotting Aid
CO_2	Carbon Dioxide
CPA	Closest Point of Approach
DZR	De-zincification resistant
FRC	Fast Rescue Craft
GPS	Global Positioning System
GRP	Glass Reinforced Plastic
GT	Gross Tonnes
HRU	Hydrostatic Release Unit
IMDG	International Maritime Dangerous Goods Code
m	metre
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Notice
MoD	Ministry of Defence
OOW	Officer of the Watch
RIB	Rigid Inflatable Boat
RNLI	Royal National Lifeboat Institution
Ro-ro	Roll-on, roll-off
RYA	Royal Yachting Association
TSS	Traffic Separation Scheme
VHF	Very High Frequency
VLCC	Very Large Crude Carrier
VTS	Vessel Traffic Services/System

Introduction

The *Safety Digest* has a single aim, to prevent marine accidents by learning from other people's experiences. It is almost impossible to quantify the success of these Digests, but several people have been gracious enough to tell us that they find them useful.

We have, furthermore, been particularly encouraged to receive requests for bulk orders so that copies can be distributed to every vessel in a particular company, or every fisherman in a local fisherman's association. There has been a steady trickle of requests for individual copies to be sent to leisure sailors, and we hope that they too find them helpful. I am also pleased to see that many articles are either duplicated or discussed in various magazines, trade journals, or club newssheets. I encourage this approach, and am always pleased when editors feel able to use our material for the purpose of improving safety at sea. I only ask that they acknowledge the source.

By distributing the *Safety Digest* free of charge I hope to remove any restriction on those likely to benefit from them, and I continue to encourage people to contact the Branch for copies to be sent. We have also responded to numerous requests to have the Digests made available on the Internet. This has now been done. If we can save just one life, or prevent any of the accidents that seem to feature so regularly, we will feel we have made a modest contribution to improving safety at sea.

But learning from the mistakes of others is not the only way to prevent accidents. Seafaring is by its very nature unusually demanding. It doesn't matter whether you are the mate of an Aframax tanker, a stewardess in a cruise ship, the second engineer in an anchor handling tug, the deckhand in a fishing vessel, the navigator of a BT Global Challenger, or the midshipman of the watch onboard a frigate, you share an unforgiving environment: the sea. The person who instinctively checks things in the normal course, who puts right the things that are wrong when first noticed, and who also keeps half an eye on his ship mate, is likely to be part of a safety conscious team, and doing much to prevent the accident happening in the first place.

One of the most glaring common denominators in all the accidents investigated by the MAIB is that nearly every single one was preventable, and would never have occurred had someone done something different in the hours leading up to it. This edition of the *Safety Digest* contains a number of examples where human error played a part, not only in the initiating cause of what happened, but in the underlying reasons. The articles are produced to invite discussion, to underpin training, to lodge in the subconscious and, above all, to prevent accidents.

John Lang
Rear Admiral
Chief Inspector of Marine Accidents

Part 1 Merchant Vessels

This section of the *Safety Digest* has an essentially engineering flavour. Many accidents occur because of problems that originate in the machinery spaces. Very often a very small error in an operating procedure, or an unnoticed defect, can be the initiating cause of something much more serious such as a fire, flooding or even a collision if it affects propulsion or steering.

While many are quick to categorise these events as technical, they are often preventable by people going about their normal business who not only notice that something isn't right, but do something about it. Conscientious watchkeeping is a process of constant vigilance. It involves using ones ears, eyes, nose and touch. All the senses play a vital part in spotting the potential problem but, to be really effective, they necessitate an in-depth awareness of the normal state.

For several decades now main machinery has been controlled and monitored from control rooms divorced from the machinery. Very often they will be unmanned outside normal working hours. While recognising the obvious advantages of such an arrangement, it also means that today's engineers can lose the machinery monitoring skills that earlier generations developed by keeping watches in the spaces and absorbing the atmosphere. Today's engineers must try and achieve this by being even more conscious about the normal state.

Turning to specifics, the most common cause of fire in a machinery space is oil impinging on to a hot surface. Any leaking oil be it fuel, lubricating, hydraulic or thermal heating is a potential fire hazard, and anyone working in the machinery spaces must be alerted to the potential dangers of such leaks, and told to look out for them.

From time to time, an inexplicable set of circumstances will arise to challenge even the most experienced engineers. Apart from relying on their accumulated knowledge, they should not underestimate the importance of checking back through the historical records of the system concerned, examining the detailed drawings, and adopting a methodical approach to identifying the root cause of whatever the problem is.

Finally, accident investigations often reveal practices that are either ad hoc, or undertaken without thought for the consequences. Such practices, which are rarely recorded or set out as standard operational procedures, are often passed on as 'the way we do it'. When things begin to go wrong, a frequently observed shortcoming has been the failure to think through what needs to be done to rectify a particular problem and resort, instead, to the poor practices of the past. They are then faced with a far greater predicament which, when combined with other factors, can often result in a serious accident.

Education, training, and thinking through problems before they happen, remain key elements in sound engineering practice.

Case 1
Close Quarters Situation in Dover Straits TSS

Narrative

A container vessel and five other vessels were proceeding in the SW bound lane of the Dover Straits TSS. A passenger ferry was crossing from Calais to Dover. It was a situation that might occur several times every day.

The OOW on the ferry was maintaining a normal lookout and was, initially, aware of five vessels on his starboard bow. But he had not yet plotted on his radar the container vessel, which was coning up astern of the others. Unaware of her presence he decided to pass ahead of the first vessel in the group, astern of the next two and ahead of the last two.

While crossing ahead of the leading vessel, the OOW first began plotting the container vessel tracking down the northern edge of the SW bound lane. He decided to continue as planned. Once he was clear of the first five vessels he proposed altering course to port to pass ahead of the container vessel.

The container vessel, which had a North Sea pilot on board, became concerned about the small CPA of the ferry and, when about 2.0 miles distant contacted her on VHF Channel 6. The ferry's OOW informed the container vessel that the projected CPA was 0.8 miles, and suggested the container vessel "helps" the situation by altering course to port.

The container vessel altered course to port and the ferry crossed about 0.6 miles ahead.

The Lessons

1. The Dover Straits is one of the busiest waterways in the world, and transiting it requires concentration, anticipation and a high degree of "situational awareness" at all times.

2. Alteration of course to starboard and/or slowing down is preferable to crossing a vessel ahead. (Rule 15 COLREGS).

Footnote

This incident was reported as a hazardous incident. To encourage further such reports, the identities of the two vessels concerned are not revealed.

Case 2
Another Leak + Heat = Fire

Narrative

The Luxembourg registered high-speed craft *Diamant* suffered an engine room fire while on passage from Ostend to Dover during August1998. The fire was quickly extinguished using the drencher system.

Securing bolts on a main engine high- pressure fuel pump were found to have fractured. This allowed the pump to move, disturbing pipework, and resulting in fuel impinging on a hot surface, most probably an indicator cock.
The engine was a Ruston RK27 Mk2.

Because this problem had been experienced on previous occasions, the vessel's engineers had been monitoring the pumps regularly. One precautionary step already taken had been the fitting of uprated pump-securing bolts just three months before this latest incident.

The engine's manufacturer carried out further investigations and concluded that correct tightening procedures were an important element in the satisfactory performance of these bolts. Access using normal spanners and torque wrenches had been a problem, so to overcome these difficulties they designed a tool to ensure that specified torque could more easily be applied to all securing bolts.

The manufacturers also issued a service bulletin setting out tightening torque and procedures. The bulletin also stressed the importance of using new nuts and flat washers whenever a pump was refitted.

The Lessons

1. The value of water spraying fire-extinguishing systems was shown in this incident. The fire was quickly extinguished without the need to close down the engine room.

2. This case is one of a long line of engine room fires on all types of vessels, caused by leaking fuel. Eternal vigilance is necessary to prevent their occurrence or to reduce their consequences.

3. When applying torque, follow the manufacturer's instructions very carefully. If you find you can't because of access or some other difficulty, record it and tell someone. This can be an important ingredient to identifying and overcoming a problem.

Case 3
Working in the Dark

Narrative

The dredger, *City of Westminster,* was on the Thames on passage from Charlton to North Sea dredging grounds when she suffered a total electrical failure. As a result, she lost steering control and collided with an inbound vessel, *Dart 2,* causing some damage but no injuries.

Shortly before the collision, the watchkeeping engineer had begun to change over main generators. A main engine drove each of the two main generators, but electrically they could not be run in parallel. To perform the changeover, it was necessary to unload the outgoing machine on to the independently-driven auxiliary generator, then transfer the load on to the incoming main generator before shutting down the auxiliary generator.

It was normal practice to carry out this procedure before arrival at the dredging area in open water. The engineer was relatively new to the vessel. Although there were written procedures requiring him to wait until reaching open water before making the changeover, he assumed the vessel was clear of confined water.

The engineer decided to finish the task early in his watch. He had reached the stage where the auxiliary alternator was taking the load when its breaker tripped. All electrical power was lost. Propulsive power was maintained but not the control of steering and propeller pitch. The vessel veered to port.

Thinking there was a problem with the auxiliary generator, the engineer began to check it. Meanwhile the Chief Engineer had arrived in the engine room and attempted to close the auxiliary generator's breaker. Because he did not operate the synchronising override, he was unsuccessful. After operating the override, his second attempt was successful.

At this stage the collision occurred.

Each vessel was able to make its own way to a berth for inspection and repair.

The Lessons

1. Crew recollections suggest that the auxiliary generator's breaker may have opened involuntarily on an earlier occasion, but the incident was neither reported nor recorded. This reduced the chances of identifying whether this latest incident was the failure of the breaker or human error. No matter how trivial an incident might be, record it. Such information can become a useful diagnostic tool when trying to identify the origins of a new problem.

2. Losing essential power supplies in a restricted navigation channel is highly undesirable, and is guaranteed to upset those on the bridge. Taking any action that might initiate such a failure should be avoided unless absolutely necessary.

3. This vessel had a written procedure of not changing generators in confined waters. However, there was no associated guidance on what should be considered as confined waters, and the engineer made his own erroneous assessment. Clearly, engineers should never attempt to navigate!

4. There was a slight delay in restoring electrical power, even though three generators were running, and the breaker on any of them could have been closed. In situations such as this where power has to be restored with the minimum of delay, procedures must be drawn up to achieve this. Watchkeeping engineers must, furthermore, be able to carry them out without hesitation. They can only do so if they practice them. The owners have introduced drills with this objective.

Case 4
Mixing Oil and Water!

Narrative

The 1,646gt oil tanker *Blackrock* was on loaded passage to Limerick on 21 April 2000 when she began to lose power at 0800. This developed into a complete engine failure at 0830. The return of earlier microbial contamination problems in the fuel supply was suspected.

Following several unsuccessful attempts to restart the main engine, the owner's technical staff and the coastguard were requested to assist. Tug assistance was arranged.

The main engine was restarted at1030, and an hour later the vessel rendezvoused with tugs. After escorting her to an anchorage the tugs were released.

The suspected fuel contamination was investigated further. Although suspicion still centred on microbe growth, it was found that water from a slop tank was able to leak into a bunker tank.

Fuel lines and tanks were flushed through and drained of water. The leakage path from slop tank to bunker tank was found to have been due to perforated plating by the balance weight on a non-return valve. Vibration had caused the weight to rub continually on the plate, resulting in wear. The plating was repaired and the balance weight re-secured.

Engine power was restored and the vessel resumed its passage the following morning.

The Lessons

1. Suspecting microbe contamination was understandable given earlier problems of this type, but anyone charged with diagnosing a fuel problem must keep an open mind when trying to locate its source. Water in a bunker tank could have come from a number of places, and the hole worn in the slop tank by the loose balance weight was clearly one of those rather freakish causes of contamination. Finding it must have been a real headache, but was the result of careful and methodical inspection.

2. Even apparently innocuous items can cause problems, but loose gear and equipment in machinery spaces are often found to be the root causes of material defects.

3. At the earliest practicable time it is worthwhile re-securing anything that has worked loose, be it machinery, spare gear, stores or whatever. Otherwise it just might result in the most unexpected problem.

Case 5
Pilot Falls Overboard during Disembarkation

Narrative

As *Nedlloyd Djibouti* approached the Sunk pilot station from the north on a December evening, the Harwich pilot discussed his disembarkation intentions with the pilot boat. To gain maximum protection from the heavy north-easterly swell, it was agreed he would reduce speed and turn the vessel to port before disembarking via the starboard ladder.

When the vessel approached the disembarkation point, the engines were rung to slow ahead and course altered to bring her round to port and on to a heading of100°. The pilot estimated it would take him approximately two minutes to get to the pilot ladder, so he left the bridge before the alteration was complete. He anticipated the vessel would be on a steady course, and reduced to about 7 knots by the time he had made his way to the pilot ladder.

When he arrived at the top of the ladder, the pilot boat was already alongside, and he began to climb down. There were approximately nine rungs to negotiate. As he approached the bottom, he heard the crewman waiting to receive him say: one more step and you will be there. The pilot turned around, let go with his right hand and moved to step on to the boat. As he did so, the pilot boat fell away in the trough of the swell with her stern canted away from the vessel as the bow dropped. Having twisted his body to face towards the pilot boat, he was unable to retain his hold on the ladder, and fell into the water between the ship and the pilot boat.

The pilot was wearing a Sea Safe coat which automatically inflated on immersion. Its fixed white light activated. His efforts to swim clear of *Nedlloyd Djibouti* were, however, impeded by his bag, which the inflated coat bladder prevented him from removing over his head. It could only be detached by releasing a strap clip.

Following the fall, the crew of the pilot boat successfully maintained visual contact, while the coxswain circled the boat to starboard. A Matesaver pole was then used to secure the pilot at the bow before moving him to the recovery area at the stern. The pilot was then hauled onboard by the crewman and two other pilots. The time taken to recover the pilot in difficult conditions at night was only six minutes. During the recovery the coxswain tried, unsuccessfully, to call *Nedlloyd Djibouti* three times to inform him that the pilot had fallen overboard.

The Lessons

1. Personnel transfers while underway are potentially hazardous, especially in high sea states at night. Whenever possible, time should be taken to monitor the conditions on the chosen heading, and to gauge the relative movement of the vessels involved before attempting to carry out the transfer.

2. Personnel crossing from one vessel to another must wear appropriate clothing and equipment. Most pilots in UK waters will be adequately dressed, and this provides a ready reminder that anyone can fall into the water. On this occasion the Sea Safe coat kept the pilot afloat and would have done so had he lost consciousness, but the bag strap around his neck hampered his efforts to swim. Unless necessary to get out of the way of something, remaining relatively still is the best way to retain both heat and energy.

3. The importance of a reliable light was also amply demonstrated. The fitted white light provided the means whereby someone could keep him in sight. The use of a water-activated strobe light as back-up to the white light fitted to a Sea Safe coat will enhance detection, and is recommended.

4. Nothing that restricts movement or impedes buoyancy should be worn or attached. Following this incident, the Harwich Haven Authority is seeking an easier to release and discard alternative to the pilot bag used.

5. When wearing coats of the Sea Safe type, the use of the crotch strap is recommended to prevent the coat from riding up the body when inflated. Ensuring the coat does not ride up will help retain water around the body, giving a wetsuit effect.

6. Adequate clothing must be worn to increase the survival time in cold water. On this occasion the pilot was wearing thermal underwear and, although he was rescued very quickly, this would have enhanced his chances of survival had it taken longer. Although the evidence is very limited, there are recorded instances of people falling in the water who have suffered breathing difficulties because their ties contracted when immersed in water.

7. Masters of ships involved in personnel transfers at sea should ensure someone is keeping an eye on what is going on until the process is complete. Situations like the one described do occur from time to time, and when they do, it may be possible to do something quickly that can be the difference between life and death of the man in the water. Although it is usually easier for the smaller vessel to recover the man, its coxswain is likely to be fully preoccupied in the process. The other ship may, for example, be much better placed to raise the alarm and summon help.

8. Had the pilot not been visible, the pilot boat would have had difficulty in locating him. It is recommended that at least one marker man overboard be dropped as close as possible to the person who has fallen overboard. This will provide a valuable visual reference, and is particularly important at night or in a seaway when a small white light can be hard to see.

9. The use of the Matesaver pole was extremely beneficial and enabled the crew to secure the pilot at an early stage, and put him at ease prior to recovery. So too was the Hadrian rail, which enabled the crewman to remain securely attached to the pilot boat while using two hands to operate the Matesaver.

10. The crew of the pilot vessel had regularly conducted man-overboard recovery drills. This undoubtedly helped them to recover the pilot quickly and efficiently, and proves that training does pay dividends when a real incident occurs.

Footnote

Safety Digest No 2/97 also contains lessons to be learned from a pilot overboard incident.

Case 6
Collision Between a Barge and a Fishing Vessel

Narrative

After dumping spoil at the Roughs Dumping Ground, the split hopper barge *Expo* was returning to the Harwich main channel when she collided with *Paula Maria,* a10m grp rod fishing vessel, at anchor in the Shelf anchorage just outside the main channel. It was dark and the shore lights were clearly visible.

The route taken by the inbound barge lay to the west of the deep water channel, and was commonly used by small, shallow draft commercial vessels as an alternative to the main channel. It passed through an area where small fishing craft often anchored. The barge was making about 7.5 knots on a northerly heading, and was being steered by the skipper via one of two Aquamaster units from a position where he was also able to monitor the radar periodically. The second hand was also on the bridge acting as the lookout, while the skipper navigated by keeping the port hand buoys fine in the star board bow.

Paula Maria was, meanwhile, at anchor lying to the flood tide (bows to the south) with seven anglers fishing from aft. The skipper was keeping an eye on them. She was equipped with two radar reflectors, was monitoring VHF Channel 16 and also displaying a masthead light and a red fishing light. Her wheelhouse lights were switched on, as were her deck lights.

Neither skipper was aware that the barge was closing the anchored fishing vessel. The range at which the fishing vessel was first seen by anyone on the barge was 2m on the starboard beam. The first time the barge was seen from the fishing vessel was when it was 20m away.

The barge struck the fishing vessel a glancing blow with her starboard bow or shoulder, and snagged several fishing lines before passing clear. Nobody was injured, but the fishing vessel sustained minor damage.

The Lessons

1. There is no reason why water other than the main channel should be used for navigation, but if it is known that small craft frequently anchor there, it might persuade the prudent mariner to keep to the main channel or be even more vigilant as he proceeds.

2. All vessels, whether underway or at anchor, must maintain a proper lookout using all means available to them. When passing through an area where small craft are operating, or where lights can easily be lost among background lighting ashore, a proper radar lookout is equally as important as a visual one. It is not sufficient to rely on other vessels to make their presence known.

3. When at anchor in a busy area, even small craft in a designated anchorage should maintain an all-round lookout, especially if traffic is known to pass through it. If a risk of collision appears possible, do not assume the other vessel has seen you. Prepare to warn an approaching vessel of your presence (any sound or light signal that cannot be confused with any other elsewhere in the COLREGS). Even though you think you are lit up like a Christmas tree, and couldn't possibly be missed by an approaching vessel, bear in mind you can be difficult to see if there are shore lights behind you.

4. Radars should be checked periodically to ensure they are working correctly, and that small objects are being detected at an adequate range. Sea state, weather, and the range scale in use all affect radar performance.

5. The outcome of this collision was relatively minor, but skippers of angling craft should give thought to how they might react if they find themselves in similar situations and the damage is more substantial. This is not the first time a collision has occurred involving an angling boat and, despite everyones best endeavours, it may not be the last. Saving life remains the highest priority.

Case 7
Grounding of Tug

Narrative

The tug *Towing Wizard* was transiting the Thorn Channel in the Solent, inbound to the Hook anchorage, Southampton. It was dark and she was proceeding at 9 knots against a strong ebb tide; the sea state was calm, visibility was good and the wind variable force1. The chief officer was on watch, but the AB lookout had been sent below to make a cup of tea.

The tug had moved to the western edge of the channel to give the maximum sea room for an inward bound tanker to overtake. As a result, Southampton VTS called the chief officer on VHF to advise him that he was to the west of the radar reference line. While talking to both the VTS and the inbound tanker, the chief officer lost sight of Calshot Spit light-float, which marked the western side of the channel and was his main visual reference. The Calshot Spit is one of a number of marks in the approaches to Southampton Water and, when viewed from the south, is backed by a number of shore lights.

Shortly afterwards *Towing Wizard* passed to the west, and wrong, side of the light-float and grounded.

The Lessons

1.When navigating in a busy shipping area with a high concentration of navigation marks and heavy VHF traffic, it is easy for a sole watchkeeper to become distracted, particularly at night. With a lookout on the bridge, the workload can be shared, and the chances of an incident like this happening are much reduced. Sending a lookout down to make a cup of tea in one of the most confined parts of the Solent, with a much larger vessel overtaking and shallow water close by, is not recommended.

The effects of tidal stream should not be ignored, particularly in confined waters. One of the basic tenets of safe navigation is that unless you know *precisely* where you are, the conscientious navigator will always double-check his assessed position from eyeball navigation with something else, such as radar, a visual fix or known transits. Nowadays it could be GPS. But one of the oldest, and still most reliable aids of all, is the echo sounder. Grounding involves hitting the bottom, and very embarrassing it can be too, especially on a falling tide. A continual awareness of how much water you have under the keel will save you from the ignominy of going aground.

2. If a VTS operator calls you on the radio to comment on your position, (perhaps in the most courteous and charming of tones), you can bet your bottom dollar it is because he is concerned. Assume there is something wrong and double-check your position or, more importantly, where you are going. If need be, and it is safe to do so, slow down or take the way off until you know where you are.

3. Although it is most unlikely that a navigation mark as important as the Calshot Spit will be out of position without anyone knowing about it and doing something about it, never place total reliance on the relative position of buoys alone.

4. One of the main aims of a *Safety Digest* article is to encourage discussion about what you might have done had you been in the situation described. The skipper of this tug decided to

keep to the west of the channel to avoid impeding the passage of an inbound and, we assume, overtaking tanker. Knowledge of Southampton Water might have suggested to the skipper that the main tanker terminal lay on the western side of the Water and, by keeping to that side himself, he could well have found he was being squeezed by the vessel he was trying to avoid. Had he opted to move over to the eastern (and starboard) side of the channel, he would have kept out of the tankers way throughout the manoeuvre. He would also have been on the correct side of the channel as required by the Rules (Rule 9a), been well placed to avoid any outbound traffic and, given the depth of water available on the other side avoided going aground. Hindsight is wonderful but so is anticipation!

Case 8
Crewman Falls Overboard During Fast Rescue Craft Recovery

Narrative

Grampian Warrior, an offshore support vessel, was recovering a fast rescue craft (FRC) when a crewman fell overboard during hoisting. She was making way through the water at a speed of 3 knots.

While carrying out stand-by duties at the East Brae Oil Production Platform, the vessel conducted a casualty recovery exercise involving the rescue of four dummy casualties from the water. Using her two Avon rigid inflatable boats (RIBS) as FRCs the casualties were rescued without incident. Following the exercise the first RIB was successfully recovered on the port side using an A type davit. The starboard RIB was to be recovered using a single-arm hydralift crane which operated at a slower speed than the A davit, and where the controllers visibility of the area beneath the fall wire was restricted.

Once alongside *Grampian Warrior* the bowline was attached and the FRCs coxswain eased back on the throttle to allow her to settle into position for recovery. The bowline was, however, too long and the FRC drifted astern by about one metre and aft of the intended position directly under the fall wire. The fall wire was hooked on, however, and the coxswain ordered the crane controller to hoist. But, because she was so far aft, the boat left the water stern-first, causing the bows to bury and the RIB to start listing heavily to port.

One of the FRC crew, thinking the boat was about to capsize, rolled outboard. The coxswain managed to wedge himself between the seat console and the starboard sponson, while the remaining crewman held on to the fall wire and mother ship handrail. He was pulled inboard.

Realising that the FRC was leaving the water stern-first, a watching deckhand shouted to the crane controller to stop hoisting. This was done immediately. The crane wire was then lowered, and the FRC returned to an upright condition.

In response to the emergency, the master stopped the main engine and activated the man overboard alarm. The mate ordered the launch of the port FRC and the crewman was recovered alive from the water.

All three crew of the starboard FRC were treated for mild hypothermia.

The Lessons

1. While safety is everybodys concern, one person must have overall responsibility for launching and recovery operations, and should be positioned to oversee and direct proceedings.

2. It is the person in charge on deck who should ensure it is safe to begin each stage of the operation, and have sole control over the crane/davit operator, not the coxswain. In this case hoisting should not have commenced until the FRC was in the correct position.

3. To ensure the safe launch and recovery of any ships boat while underway, the bowline must be the correct length to allow the boat to settle immediately beneath the fall wire. The bowline should be clearly marked to show this.

4. Cranes and davits vary considerably regarding their suitability for boat operations. Due regard must be given to the speed of operation, together with the control position in determining the conditions (ships speed and sea state) for launch and recovery. In this case the owners are investigating the replacement of the hydralift crane or an increase in its operating speed.

5. Consideration should be given to the rigging of lifelines for use by the crew in similar emergencies.

6. While rescue craft crews are among the most suitably attired people afloat, the incident presents a ready reminder that drowning is not the only hazard. Hypothermia is just as much a problem, and the wearing of suitable clothes to prevent it happening should you land up in the water, is essential.

Case 9
The Value of Sound!

Narrative

Mv Whitide a 1,146gt oil tanker, was on passage from Cork to Milford Haven in ballast and was, at 0500, about 35 miles short of her destination.

The chief engineer, who was on watch at this time, became aware of a change in the normal sound of the main engine.

The engine speed was reduced and an investigation carried out.

This found that the drive coupling between the fuel pump and the camshaft was apparently misaligned. The vessel changed course, and made for a sheltered anchorage where the main engine was stopped for a detailed inspection and repair. The coastguard and owners were informed. On examining the drive, it was evident the damage could not be repaired at sea, and a tow to port would be necessary. This was arranged at 0730 the same day, and she was towed to Milford Haven where she berthed at 0200 the following morning.

Once alongside, an examination showed that after the coupling fixing bolt had sheared, the machined insert between the coupling had fretted, causing play between the fuel pump and camshaft.

A new flexible spacing drive disc insert was supplied, and four new bolts fitted to the fuel pump side of the coupling with six new line bolts fitted to the camshaft drive side. The fuel pumps were refitted, reset, and the engine test run under load. The actions taken were successful and *Whitide* returned to service.

The Lessons

1.LISTEN to the sound of operating machinery. Despite technological advances in monitoring devices and instruments, touch, smell, and sound are still among the most effective means of detecting something that isnt right.

2. As you go about your routine business, use all your senses to monitor what is happening. When something doesnt sound, smell or feel right, think through the possible reasons. If there is a change in sound, check it out. It may be nothing, but an early investigation could prevent a minor irritant becoming a major disaster. This chief engineer did with great effect.

Case 10
The Application of Logic to Crane Failure

Narrative

The *CSO Wellservicer,* a 9158gt offshore service vessel, was alongside in Dundee loading concrete mattresses using the ships crane. The load had been raised 3m and was being swung inboard when it started to drop despite the operator operating the control lever to raise it. The lifting speed was increased, but the load continued to drop. The operator then activated the emergency shut down which applied all the brakes. Although the load had by now reached the ground, the spreader frame stopped about 2m above it. There were no injuries to any staff.

An immediate check showed that:

- Apart from the emergency shut down, no alarms had been recorded.
- All hydraulic system checks were satisfactory and showed that there were no oil leaks.

With no obvious defect evident, further tests were carried out. These showed that the crane winch functioned correctly, that all the hydraulic pump settings were within limits, and that when a load was applied and the oil pressures monitored, the settings were correct and the high pressure alarm sounded as designed.

Further study of the system drawings suggested the solenoid operated by-pass hydraulic valve might have caused the problem. Normally energised to remain closed, it is de-energised during the start up of the crane power pack to prevent pressure build-up. Once the power pack is running, it is automatically energised to allow the hydraulic pump output to feed the winch motors. This theory was taken further, and tests were carried out using a 5 ton load. These showed that when electrical power was shut off during the hoisting operation, the load dropped instantly to the ground.

Four possible reasons are given for this crane failure:

1. The relay operating solenoid failed/faulty.

2. There was a cable break between the cab and the operating relay inside the jib.

3. There was a cable break between the operating relay and the solenoid inside the jib.

4. There had been vibration, or movement, of the relay and its base.

To avoid further trouble, a spare relay was installed and a new cable was fitted between it and the cab. The cable between the relay and the solenoid was found to be in good condition, while vibration tests showed that this was not the cause of the power failure.

Although the crane now functioned as originally designed, the chief engineer decided to remove the risk entirely by either permanently energising the solenoid, or by mechanically locking it in the operating position. He chose the latter, and fixed a steel plate over the solenoid to keep it permanently in the energised position.

The Lessons

1. All accidents can, and should, be thoroughly investigated by qualified and knowledgeable staff as soon as possible after the event. Everyone involved in the incident should be interviewed, the state of the equipment in use noted, the position of the controls confirmed, and any unusual circumstances recorded. Photographs or video pictures taken as soon as possible after the event can be extremely helpful.

2. The value of having a complete set of up to date drawings and technical information immediately available cannot be over emphasised. Detailed system drawings are immensely helpful in diagnosing complex engineering problems.

3. Identifying the cause of an event accurately has one of two purposes. It either allows the problem to be eliminated completely, or it is possible to reduce the risk of reoccurrence by taking appropriate measures and introducing certain safeguards. This process can be helped by carrying out an in-depth examination of the elements that contributed to the original cause.

Case 11
Major Oil Spill in Sydney Harbour

Narrative

The1991-built Italian tanker *Laura D'Amato* was alongside in Sydney, Australia, discharging a cargo of crude oil from some cargo tanks and the two slop tanks using No 2 pump. During the course of events the mate thought the level of the slop tanks was falling too slowly and decided to expedite the process by opening the crossover valves on the main sea line to connect No 3 cargo line to No 2 pump. Five minutes later one of the shore workers smelled hydrogen sulphide, and saw an oil slick between the ship and the shore. The mate stopped the cargo, initially expecting a burst hose or some other trouble in the shore terminal.

The mate went ashore to see if he could locate the source, and was shown where oil was welling to the surface on the vessel's port side. Back on board he checked all the valves in the pump room, and found both the sea-chest valves unexpectedly open. An attempt was made to shut them, but because the large manually-operated butterfly valves were "back seated" open, it needed two men using a large wheel spanner to do so. Once done the leak stopped.

The investigation focused on finding out why the sea-chest valves were open.

A month before the accident, *Lauro D'Amato* had loaded her cargo in Jebel Dhanna, where an independent cargo surveyor inspected her. During the inspection he was shown two 'sealed' valves, and was told they were the closed sea-chest valves. He tried to turn them in a clockwise direction and, finding they didn't move, assumed they were shut. His attention was not drawn to the valve indicator, nor did he look for it. He re-sealed the valves and left the pumproom. The ship sailed for Sydney once loading was complete.

On arrival at Sydney, the ship/shore checklist was completed as normal and the discharge started. A vetting inspector, acting on behalf of a leading oil company, recalls seeing the sea chest valves sealed with a loop of twine joined by a red plastic seal connecting the two valve handles. He, like several others, assumed they were shut and sealed. They were all mistaken and Sydney Harbour suffered a major oil spill.

Procedural and mechanical safeguards failed to prevent the accident.

The most likely source of oil pollution in tanker operations is from overfilling cargo tanks, the valves at the ship's loading manifold and sea valves connected to the ship's cargo pipeline system. On board Laura D'Amato the sea crossover line was also part of the cargo pipeline system, and on this occasion the two sea-chest valves were open.

The Lessons

1 . *Laura D'Amato's* pump room piping system had no positive means of isolating the sea chest from the cargo system. This accident would not have happened had a spectacle piece, blank or removable spool piece been used to isolate the cargo system.

2. The assumption that valves are closed because a seal has been attached can be flawed. In this case the investigation found that in all probability a seal which had supposedly been in place for four months, had in fact been temporarily removed during a ballast passage. Forensic evidence shows that this seal had been tampered with. The valves had been hard

opened and the seal replaced - with the valves still in the open position. The surveyor in Jebel Dhanna assumed they were shut, and resealed them without further checking.

3. The ship's staff should not have perpetuated the assumption that the valves were shut just because of the seal. The mate and the pumpman should have made a proper inspection, the valve indicators should have been checked, and an air-pressure test should have been carried out on the sea chest valves before any cargo was loaded.

Footnote

This article is based on an Australian Marine Incident Investigation Unit's report and features in this Safety Digest with the kind permission of the Australian Transport Safety Bureau.

Case 12
A Fire Alongside Caused by Water!

Narrative

The 3,795gt cable vessel *C S Iris* was lying alongside Q pier in Portland, having been on stand-by for the previous six weeks waiting to enter dry dock in Falmouth. During this period, various contractors had been working aboard preparing her for docking. On 22 September, contractors were cleaning the forward deep tank using high-pressure water guns. While doing so they blasted a hole in the vent pipe which protrudes into the tank from the log compartment. The chief engineer and chief officer inspected the hole, and decided that repairs could be left until the dry dock. The deep tank would be filled for the voyage to Falmouth, as would the log compartment from the hole in the vent pipe. It was not seen as a problem.

Two days later the deep tank was ballasted. The chief officer told the carpenter to sound the tank, while the second engineer detailed a fourth engineer to operate the ballast pump. The normal procedure was for the engineer to start the pump and leave it running until told to stop it by the carpenter.

On this occasion the carpenter, who had other things to do, left it to another crewman to inform him as soon as the tank was full. There was a breakdown in communication and this information was never passed. The carpenter was not told that the tank was full, and without any instructions to stop the ballast pump the fourth engineer left it running. The tank overflowed, and it was not until the chief officer noticed the overflow that the pump was stopped.

Shortly afterwards the fire alarm sounded. It had been activated by a contractor who noticed sparks and smoke coming from an empty cabin on C deck, port side, forward. The fire brigade was called while the crew and contractors were mustered ashore. The onboard fire team investigated the scene of the fire, extinguished a small fire, and electrically isolated the area. The fire brigade arrived, checked the situation and, once satisfied the fire was out, left.

The cause of the fire was electrical.

On filling the deep tank, water had leaked into the log compartment vent pipe through the hole made by the high-pressure water guns during the tank washing. As the tank filled under pressure from the ballast pump, the deck rating appointed by the carpenter monitored the water level. When he saw it was full, he screwed the sounding pipe cap on and left, unaware that he should have told the engineer to stop the pump. As a result the tank pressurised, causing water to be forced up into the damaged vent pipe. A split weld further up the vent pipe allowed water to spill out on to an electrical conduit and into desk sockets in a cabin on C deck. The result was a short circuit, sparks and smoke.

The Lessons

The company fully investigated this incident and has issued a number of recommendations to its fleet as a result. The main lesson to emerge from this event is the importance of clear and unambiguous communication.

1. Whatever course of action is decided upon, it is ESSENTIAL that everyone involved is made fully aware of what is required.

2. Everyone should be fully briefed on what action to take, when to take it, and what to do if things appear to be getting out of hand. If you do not know, or do not understand, ASK. Far better to lose face than be the cause of an accident.

Two responsible members of the crew, the carpenter and the fourth engineer failed to think their actions through. The carpenter did not pass the correct instructions on to the deckhand, and the fourth engineer failed to monitor the operation at regular intervals. Fortunately, there was no great harm done, BUT it could have had a far different outcome. A fire onboard a ship is a frightening thing, so THINK your job through, and measure up to the RESPONSIBILITY.

This accident also shows how one relatively small error in one activity can have unexpected consequences elsewhere.

Case 13
Collision Between a Tanker and a Vessel Alongside

While entering La Goulette, Tunisia, the merchant vessel *British Tamar* collided with the general cargo vessel *El Kef,* which was berthed alongside.

Narrative

Based on the radioed instructions of the local pilot, *British Tamar* entered the approach channel to La Goulette and passed the charted pilot boarding position at minimum speed. The speed made good at dead slow ahead was about 5 knots and, with a force 5 wind blowing on the port quarter, the helmsman was carrying up to10 degrees of starboard helm to maintain his heading

The pilot boarded about one mile from the harbour entrance, and immediately requested the master to increase speed to slow ahead.

The master informed the pilot about the helm being carried due to the wind, and offered him a pilot card. He did not refer to it, nor did he look at the wheelhouse-manoeuvring poster. But he did ascertain the horsepower of both the engine and the bow thruster, and established that the engine was in engine room control. He told the master he would be using two tugs: one secured forward with the second pushing aft, and that the vessel would be turning inside the harbour prior to berthing starboard side to.

During the short approach to the harbour entrance the pilot was focussed on completing his paperwork, as well as conning the ship. He had to be reminded of the helm orders he had given on several occasions, as the vessel appeared to be drifting off course.

The aft tug stood by as the vessel approached the entrance, and the forward tug took up a position on the bow as she entered the harbour. Four minutes later both the master and the pilot realised the vessel was going too fast and put the engine full astern, the helm hard to starboard, and the bow thruster full to starboard. The forward tug was then secured using a ship's line and began pulling the bow to starboard at full power. Although the master was informed by the pilot that the aft tug was also pushing on the port quarter, this was later refuted by the aft mooring officer.

Lying ahead of her and berthed alongside was another ship, *mv El Kef. British Tamar* began to close her. Watching this was the chief officer who was stationed forward. He warned the bridge that collision was imminent and ordered the mooring team to clear the fo'c'stle. Moments later *British Tamar's* bow glanced *El Kef 's* starboard quarter. Full control was re-established and she berthed alongside.

Both vessels were damaged.

The Lessons

1**. The prime cause of the collision was the use of excessive speed on entering harbour. Contributory causes included the late boarding of the pilot, his pre-occupation with paper work, shallow water effect, and the difficulties of turning out of wind.**

2. Effective pilotage involves good co- operation between the pilot and ships staff. This in turn is dependent on there being sufficient time for the pilot to brief the master on his intentions, and for the master to inform the pilot about the vessels manoeuvring characteristics and other relevant information. If, as on this occasion, a pilot does not board until very late, and

there is very little time to exchange information, masters should be doubly alert to anything untoward, and should not hesitate to query anything they are unhappy with. Intervention might be necessary if the performance of the pilot is in question.

3. Whereas a pilot will have a better knowledge of the port, the master should be more familiar with his vessels manoeuvring characteristics. The pilots berthing plan should be scrutinised to ensure it is feasible, and then monitored to check it is executed safely.

4. Ships speed, depth of water, wind speed and direction, tidal stream, the use of an anchor, the presence of other vessels and the employment of tugs are all factors that must be considered when planning to manoeuvre in a confined area. Tugs must be secured in good time if they are to be fully effective.

Part 2 Fishing Vessels

A recent review of the most serious flooding incidents in fishing vessels has identified that one of the most common underlying reasons why they sink is the failure of bilge alarms.

We have drawn this particular problem to the attention of the fishing community in the past and we do so again in this edition but, for all our endeavours, the message has evidently failed to reach many of you at sea.

We have tried to identify why this particular item of equipment receives such a low priority when the working alarm gives sufficiently early warning of flooding to enable remedial action to be taken, prevents expensive repair bills and may well save your life. It also prevents you from becoming another statistic in our foundering list, and denies you the opportunity to see the inside of a rescue helicopter after your source of income has taken its final plunge to the seabed.

An automatic bilge alarm won't actually prevent flooding, but it will alert you to a problem in, hopefully, sufficient time for you to contain or stop it. But despite its very evident value, (which we find pretty compelling) we keep finding skippers who ignore it and sail without it working. One of the most common reasons given for accepting such a situation is that "I was going to fix it next time we're in harbour." We might be forgiven for thinking that this is not an entirely convincing excuse as the evidence suggests that the time interval for this 'next' time in harbour is often measured in weeks if not months.

We have also found situations where an alarm has been declared defective for some unknown reason, and left in that state without any serious effort being made to rectify it. When independently checked at a later stage the problem has sometimes been found to be a blown fuse. Cost to repair: pennies. Time to fix it: seconds. It may even be that some of the fishing vessels that have sunk recently had similar defects and which might explain why the alarm failed to sound.

Most disheartening of all perhaps are those occasions when a defective alarm has been landed for repair and then left ashore for, sometimes, weeks on end. Without a working alarm you are putting your life, and that of your crew, at risk.

This message is one of a number that is better absorbed by the families and friends of fishermen. If you can persuade those who go down to the sea for the fishing that they had better check the bilge alarms are working before they set off, or else. ...

There is every chance that far fewer boats will sink.

Quite separate to persuading you to learn these important lessons, research is being undertaken to make bilge alarms more effective and it is hoped that this combined approach will lead to a substantial reduction in the number of vessels that are lost through foundering.

Case 14
Wheelhouse Exhaust FIRES!

Narrative

Stephanie, an 11.9m fishing vessel, was bottom trawling five miles off the North Devon coast when her crew of three smelt smoke in the wheelhouse. At about the same time the smoke alarm sounded. The crew checked the galley but found nothing, so opened the deck hatch to look into the engine room. They found it full of smoke and the deckhead on fire.

With the vessel anchored to the seabed by her trawl, the crew fought the fire using the engine room fixed Halon system, together with hand foam and CO_2 extinguishers. The coastguard,who had been alerted to the fire by the skipper, sent a helicopter, a lifeboat and the MoD salvage vessel *Salmaster* to the scene.

By the time *Salmaster* arrived the fire appeared to be out, but a team wearing breathing apparatus was nevertheless sent aboard to confirm this. The crew then entered the engine room and restarted the systems. The trawl was recovered, and she made her way safely and slowly back to port.

The damage consisted of burnt wood facing panels, wiring and electrical fittings, together with the effects of smoke.

The cause of the fire was never completely identified, but it is possible that diesel oil leaks from the injector fuel system had soaked the lagging on the engine exhaust pipe that led up behind the wheelhouse to the open air. There was no electrical wiring in the area where the fire probably started, and it is thought oil fumes from the hot oil soaked lagging had flashed off near the deckhead.

To prevent a recurrence the diesel oil pipe leak was rectified, the exhaust pipe lagging renewed with double thickness, and the area around it faced with rockwall in steel sandwich.

Narrative

The10.88m fishing vessel *Rosses Fisher* was trawling off Brixham with her crew of three when the engine room deckhead beneath the wheelhouse was found to have caught fire. With the trawl anchoring her to the seabed, the crew fought the fire using portable fire extinguishers. The engine room vents and hatches were sealed.

A helicopter and pilot boat came to *Rosses Fishers* assistance, and shortly after the pilot boat had come alongside another fire broke out beneath the wheelhouse console. With no extinguishers left, the wheelhouse was sealed and the crew disembarked to the pilot boat. The local lifeboat arrived, and the fishing boats skipper transferred to her to update the lifeboat crew on the situation. Together with some of the lifeboat crew, he re-boarded the burning vesselwitha salvage water pump. When this was operating a wheelhouse window was broken, and water was sprayed inside until the fire was extinguished. Once this had been achieved, the fishing gear was buoyed and the vessel was towed into Brixham harbour where the local fire brigade carried out an examination alongside and confirmed the fire was out.

Following this fire it was necessary to replace electrical wiring, navigational equipment, the console, and the damaged laminated surfaces completely. The smoke damaged engine room and accommodation also needed to be repainted. One engine room beam had to be replaced.

Once again the cause was not completely identified. The fire was believed to have started on the engine room deckhead where the engine exhaust pipe led up behind the wheelhouse. Restrictions found in the exhaust pipework under the wheelhouse were thought to have caused local overheating, that led in turn to ignition.

Measures taken to prevent a similar fire breaking out included running the main engine exhaust outside, and to the rear of, the wheelhouse. Steps were also taken to ensure that a qualified electrician checked the electrical systems.

Both these incidents involved fires that started in either the engine room deckhead or under the wheelhouse flooring. Both involved the main engine exhaust.

Although in both cases the original cause of the fire is unclear, the source of ignition was. The hot exhaust pipe.

Any opening at the top of an engine room will, over a period of time, become impregnated with diesel and/or lub oil fumes and oil soaked dust. These areas provide a ready conduit for flash fires, and will support a smouldering fire for some time.

The Lessons

1. Always ensure that the exhaust pipe is fully and completely lagged.

2. Lagging must not become impregnated with either fuel or lub oil.

3. The exhaust pipe should be well supported throughout, and well clear of any surrounding structure.

4. Regularly clean all surfaces of oil impregnated dust, debris, as well as repairing all fuel/oil leaks and cleaning up afterwards!

Main engine exhausts in the wheelhouse are a risk - if possible run them outside!

Case 15

Morse Cable Problems

Narrative 1

Fv Argosy, a 22.5m fishing vessel, was heading towards the harbour entrance, when a combination of wind and tide started to offset her to one side. The skipper tried to take the way off by putting the engine astern, but found he could not move the controls. With the vessel still going ahead at 3/4-speed and also by now, without any steering, the bow struck the breakwater. Both breakwater and vessel were damaged, but fortunately nobody was hurt.

The subsequent investigation found that the inner cable of the morse control would not, while extended, retract into the outer sheath when the engine control was moved. This prevented the skipper from controlling the engine speed or engaging the astern gear.

The soft nose of the fishing vessel was knocked back about two metres, but fortunately the collision bulkhead was not affected. The forecastle floor, some frames, the stem bar, and the whaleback were all damaged to varying degrees. The damage to the breakwater was not recorded.

The Lessons

1. Carry out regular visual checks.

2. Ensure that the morse outer cable is properly secured.

3. Ensure that the cable sealing cap is in place and undamaged.

Narrative 2

The16.35m fishing vessel *Nighean Donn* with a crew of three, was trawling off the north of Skye. The skipper had heard a noise intermittently over a number of hours since leaving harbour, but had been unable to discover what was causing it. He thought the gearbox clutch was developing a creep and would need attention on his return to harbour.

As the vessel continued to trawl, the skipper noticed from the wheelhouse gauges that the starting battery voltage was dropping. This he assumed was due to a failure of the engine-driven alternator - something else to get fixed on arrival back in harbour. In order to prevent the battery voltage dropping any further, he switched the output from the main transmotor to feed both the starting batteries and the lighting batteries.

Shortly after this, a fire broke out in the engine space, causing a loss of electrical power and control. The skipper immediately shut down the engine, sealed the engine space and operated the Halon fire-extinguishing system. This put the fire out. The coastguards, who had been told of the fire at the start, were then advised that the fire was out, and that although the vessel was unable to use her own engine, would be towed back to harbour by another fishing vessel that was to hand. There were no injuries to the crew.

On investigating the engine after the fire, it was found that the intermittent noise heard by the skipper, was the morse to the gearbox chaffing against the starter. This had caused the plastic covering of the morse cable to wear away until there was metal to metal contact between the starter

cable and the metal sheath of the morse cable. The subsequent short caused a fire in the engine space and the use of the Halon system.

The damage extended to the new starter, batteries, fuse board and wiring. There was also minor smoke damage to the space.

Preventive measures: New morse cable to be fitted under flooring and secured well clear of engine or any other machinery. To be inspected regularly to ensure clips are tight and in place.

The Lessons

1. Both these incidents involved a morse cable. One because of misalignment, and the other due to a lack of securing devices.

2. When installing morse cables, follow the manufacturer's instructions on the minimum radius of curvature to avoid operating difficulties. Make sure that the correct length of cable is selected and fitted.

3. Regular attention to the condition of the sealing caps on the ends of the morse cable is important. Entry of water through the caps into the interior of the cable leads to corrosion, and the build-up of debris is likely to cause difficulties in the free movement of the inner cable, forcing results in over-stressing, cable stretch and eventually cable failure.

4. Always secure the cables firmly to the structure and equipment that it is connected to, with the securing clips spaced at intervals recommended by the manufacturer. Lack of proper clips, or too large a distance between clipping points allows vibration to create chaffing and wear on the cable.

The essential lessons here are:

- **Fit the right size, and install it as recommended by the manufacturer;**
- **Ensure that the cable end caps are in place and in good condition;**
- **Check the cable throughout its length at regular intervals.**

One of the most telling indicators of impending trouble on board any vessel is an unexplained noise. If you hear something that cannot be explained satisfactorily, check it out. It might just be something that is about to give way and spoil your entire day.

Case 16
Wear & Tear!

Narrative 1

Girl Irene II, a 9.81m fishing vessel, was fishing in the North Sea off Coquet Island, when the skipper found she was not responding to the helm. On investigating, he found the hydraulic rams controlling the movement of the rudder had failed. Wear on the oil seals had developed to such an extent that they were no longer effective, and all the oil in the cylinder had spilled out. With no means of steering, he called the coastguard, and the Amble lifeboat launched to tow the vessel back to harbour.

The repairs consisted of overhauling the hydraulic ram, fitting new seals and re-charging the system.

Narrative 2

Fin-Ar-Bed, a13.98m fishing vessel with a five man crew was off Troon harbour entrance when she suffered gearbox trouble. The coastguard was told at 0542, and arranged for the Troon lifeboat to be launched to tow the vessel into harbour. Meanwhile the skipper attempted to anchor to prevent his vessel drifting ashore. The lifeboat arrived within 15 minutes and took the fishing vessel in tow.

Within 50 minutes of informing the coastguard *Fin-Ar-Bed* was back in Troon.

The suggested cause of the failure was a worn out gearbox oil pump. A new oil pump was fitted and the vessel sailed again only to experience the same problem. This time she was towed in by another fishing boat. The repair this time also involved a new clutch. On sailing again, the same problem occurred. By now, the engineering firm carrying out repairs had run out of ideas and suggested to the owner that a new gearbox be fitted. In frustration, the owner stripped the gearbox down himself and found a shard of metal jammed in the oilways. This was removed, the gearbox re-assembled and the repair completed. No further trouble has been experienced.

Narrative 3

The 23.76m fishing vessel *Arkh-Angell* with a six man crew, was fishing off the Shetland Islands, when she suffered an engine breakdown at 1714. On investigating the engine failure, the crew found that the fuel pump was no longer working. The flexible coupling linking the engine drive shaft to the fuel pump had collapsed as a result of the coupling plates being worn out. With no engine, the coastguard was called and the Lerwick lifeboat launched to effect a tow. At 0112 the following morning, both vessels arrived safely back in Lerwick.

Repairs consisted of fitting new coupling plates to the fuel pump drive.

The Lessons

Fortunately the weather was good in all three cases, allowing the boats to be towed safely back to harbour. The lesson here is that if qualified and experienced personnel had followed good maintenance practices, with regular inspection of the machinery, all three of these breakdowns could have been avoided.

In the case of the "failed gearbox", the owner had used qualified engineering personnel, but unfortunately their diagnostic abilities were inadequate. Any failure requires a thorough examination as to the cause of the problem. Mere replacement does not necessarily remove that cause, as is evident in the case of the repeated gearbox failure.

Not only was the RNLI involved in three avoidable accidents, but each crew lost money by suffering a breakdown. Repair and replacement costs will be the same whether done now or next week, but by next week the weather may have turned ugly, and the outcome may well be very different.

DO maintain your machinery regularly and USE qualified and experienced people.

Case 17
A Chain of Events

Narrative

Sarah Louisa, an 8.20m GRP fishing vessel, was fishing in the English Channel off Dungeness, when the skipper suddenly saw the alternator light come on. This indicated that the engine-driven alternator was no longer charging the batteries.

One of the crew lifted the engine room hatch to investigate, and saw that the space below was full of water, with the engine almost submerged. Fortunately, the batteries were positioned high up in the engine room, so electrical power was still available. This enabled the VHF radio to be used to talk to the coastguard. At the same time the engine was stopped. While the vessel was waiting for the arrival of the Dungeness lifeboat, the crew attempted to empty the engine room using buckets.

When the lifeboat arrived, the engine room was pumped out using a mechanical pump. With the crew pumping as necessary, *Sarah Louisa* was successfully towed into Rye harbour.

When it reached the safety of the harbour, an investigation was conducted to find out what had caused the flooding. It was found that water had entered the vessel through the failure of a previous fibreglass repair on the exhaust muffler. This repair, which had been carried out by the previous owner, consisted of an attempt to seal the end of a burnt out Vectus exhaust muffler using fibreglass, and replacing the exhaust hose over the repair.

It was also found that the automatic bilge pump was defective due to an electrical failure. With no bilge alarm, water was able to start filling the engine room without any of the crew being aware of it.

Repairs consisted largely of making good the water damage. The engine required a service, while all electrical equipment needed cleaning, drying and a full service check. A new exhaust line had to be fitted, repairs to the auto bilge pump made, and a re-conditioned fuel pump fitted.

It all cost money.

The Lessons

1. The value of an operational bilge water alarm is graphically illustrated in this instance. The alarm would not have prevented the entry of water, but it would have given the skipper sufficient early warning to enable him to take some form of corrective action.

2. Although DIY repairs are cheaper than having them done by a yard or contractors, and are sometimes effective, any defect that affects the seaworthiness of the vessel must be 100% effective and reliable. It will usually involve replacing the defective part with new, or getting the repair carried out professionally.

3. As the MAIB has said many times before, pay particular attention to seawater services. If, for instance, you are buying a used boat, check and test everything yourself. It is your life, and that of your crew, that depends on your thoroughness. Trust nothing, test everything!

Case 18
Loss of Trawler due to Engine Room Flooding

Narrative

Sharona, PD185, was a19.72m twin rig trawler, constructed of wood and operated with a crew of five.

The vessel was fishing 80 miles north-east of Peterhead, and about to haul her nets, when her crew realised there was flooding in the engine room bilges. It was found to be coming from the main engine cooling water overboard discharge pipe, which had fractured. The engine room bilge alarm had failed to operate.

The main engine-driven bilge pump was engaged, but was unable to cope with the flooding. The skipper then eased back on the main engine and began to haul the fishing gear.

After further ingress of water the coastguard was contacted, and towing assistance requested. The portable salvage pump carried on board was put into operation and led to a reduction in the water level. At about this time all onboard electrical power was lost.

The fishing gear was run off on to the seabed in preparation for accepting a tow from the newly arrived *Maersk Challenger.* The tow was successfully established, and three of the crew were transferred. Unfortunately the action of being towed pulled Sharona's bow so that her stern was raised to cause further flooding of the engine room from the aft bilges. Around this time sparking and a strong smell of smoke were observed in the engine room, and CO_2 smothering was instigated. The remaining two crew were transferred to Maersk Challenger, and the tow recommenced.

After an hour the tow parted and two of the crew reboarded *Sharona* and found the water level in the engine room bilges had risen above the main engine casing. A portable pump was used from *Maersk Challenger,* and this temporarily stopped the ingress of water. Both crew were transferred back to *Maersk Challenger* and the tow resumed.

Sharona's freeboard was seen to be reducing, and eventually she took a list to port and her gunwales became immersed. The towline was released and the vessel sank.

Sharona's loss was caused by uncontrolled flooding to the engine room through a fractured main engine cooling water pipe because of erosion/corrosion or work-hardening of the copper pipework.

Contributory causes were: the decision to haul the fishing gear which meant, in turn, that the engine was not stopped immediately to prevent further flooding; the failure of the engine room bilge alarm; and above all the failure of anyone to detect defective pipework.

There had been a previous flooding incident on board *Sharona* due to a failure on the main engine cooling pipework by the inter-cooler.

The Lessons

1. The initiating cause of this accident had been present for some time before the incident. Every length of pipework in a fishing vessel is a potential source of a major leak unless it is regularly checked.

2. Skippers and owners should be aware that copper pipework can fracture due to work-hardening or corrosion/erosion, and of the measures that can be adopted to avoid work-hardening such as better supporting arrangements for pipework.

3. Faced with a predicament such as that related here, skippers should establish their priorities, with safety of the vessel and her crew taking precedence over commercial considerations. No matter where the natural instincts might lie, saving the fishing gear/catch should be a secondary consideration.

4. In small vessels it is essential that everyone on board knows where the hand bilge pumps are, and how to use them. They were available in this instance, but not used.

5. One of the most common features identified in many fishing vessel founderings is the failure of bilge alarms. At the most extreme it is because they have been removed completely and not replaced. More often it is because they are known to be defective and are going to be repaired next time in, or the fuse has blown and nobody realises it. Not only should the alarms be tested on a regular basis, but everyone on board (and also the families at home) should be confident they are working efficiently every time you proceed to sea.

6. This accident has once again demonstrated the value of watertight bulkheads in preventing the spread of flooding.

Case 19
Fishing Vessel Grounds due to Over-Reliance on the use of Navigational Aids

Narrative

The 16.25m long fishing vessel, *Rachel Harvey* was approaching the eastern end of St Marys Sound, Isles of Scilly when she grounded in poor weather. It was dark and a south-westerly force 7 was causing moderate to rough seas. She had six people on board.

The sole watchkeeper was navigating using a track control system. The system interfaced a Global Positioning System (GPS) navigator with the autopilot and enabled it to steer so as to maintain the vessel on a selected track. The skipper had set the system up to steer to a waypoint at the eastern end of St Mary's Sound.

The video plotter was not being used for navigation, and neither the intended track, nor the vessel's position, were plotted on the chart. The watchkeeper, who did not understand how the interface between the GPS and autopilot functioned, tried to alter course using the autopilot's course setting knob while the interface was connected.

The vessel grounded on Peninnis Head and foundered within two to three minutes. One of the crew lost his life.

Due to a lack of substantive evidence it is impossible to come to a firm conclusion on the reasons why use of the track control system failed to ensure the vessel remained in safe water. However, irrespective of the reason why she did not track as planned, the fact that the position of the vessel was not closely monitored, by plotting on the chart or by use of the video plotter, meant that the fault went undiscovered. This fundamental shortfall in basic navigation was the principal reason why she went aground.

The Lessons

1. Skippers must ensure that all watchkeepers are fully aware of how wheelhouse electronic equipment functions. If the equipment is too complicated for a watchkeeper to understand, it should not be used.

2. Skippers must ensure that all watchkeepers know how to switch from automatic to manual steering, and how best to alter course if necessary.

3. The watchkeeper must always monitor the progress of the vessel along a required track, and be ready to correct the course to maintain the track.

4. Skippers and watchkeepers must never rely totally on one piece of navigational equipment.

5. Do not use track control equipment in confined waters where a fault with the equipment, if undetected, could very quickly result in a collision or grounding.

6. All watchkeepers should be aware of fundamental navigational techniques and be able to plot the vessels position on a chart.

Case 20
Know How Much Catch You Can Load on Your Vessel

Narrative

Fraoch Ban, a15.12m long vessel, was fishing for sand eels to the east of the Shetland Islands in August. The trip had started in the morning and the fishing was good. Throughout the day the catch was loaded into the fish hold in bulk where pound boards had been arranged to reduce free surface. Most of these were, however, ineffective because gaps between the lowest boards and the deck allowed the catch to spread freely throughout the hold.

The certificated skipper had undertaken some stability training. He had also looked briefly at the stability book in1997 when he purchased the vessel, but was unable to make much sense of it. It showed that the bulk stowage of fish in the fish hold was not approved, and that such catches should be loaded into fish boxes.

The day passed, the weather was calm and by early evening the hold was just over half full with about 25 tonnes of sand eels. Another haul was made and a further1tonne of eels was released into the hold. No sooner had this been done than the vessel began listing to port. Within about 5 minutes she had capsized and shortly after this she foundered. There was just enough time for the skipper to radio for assistance.

The cause of the loss was the erosion of *Fraoch Ban's* stability by the free surface effect of the catch with enough of it sliding to one side to capsize her.

The crew managed to release the liferaft manually, but their problems were by no means over. Because the painter had not been secured to a strong point at the inboard end, the liferaft started to drift away and the crew were forced to swim to it. While doing so, one man became unconscious and had to be pulled to the liferaft, where he was hauled onboard by his colleagues and successfully resuscitated.

The survivors were eventually rescued by another fishing vessel and transferred to the Lerwick lifeboat. The man who had passed out was airlifted to hospital by a coastguard helicopter.

The Lessons

1. Among the several documents provided with a vessel of this size the Stability Book is crucial, and must be carefully read. It provides important information on loading and weight distribution and, if ignored, could lead to the vessel foundering with loss of life.

2. If for any reason the skipper has difficulty in understanding it, he should seek advice. To disregard the content could well lead to disaster.

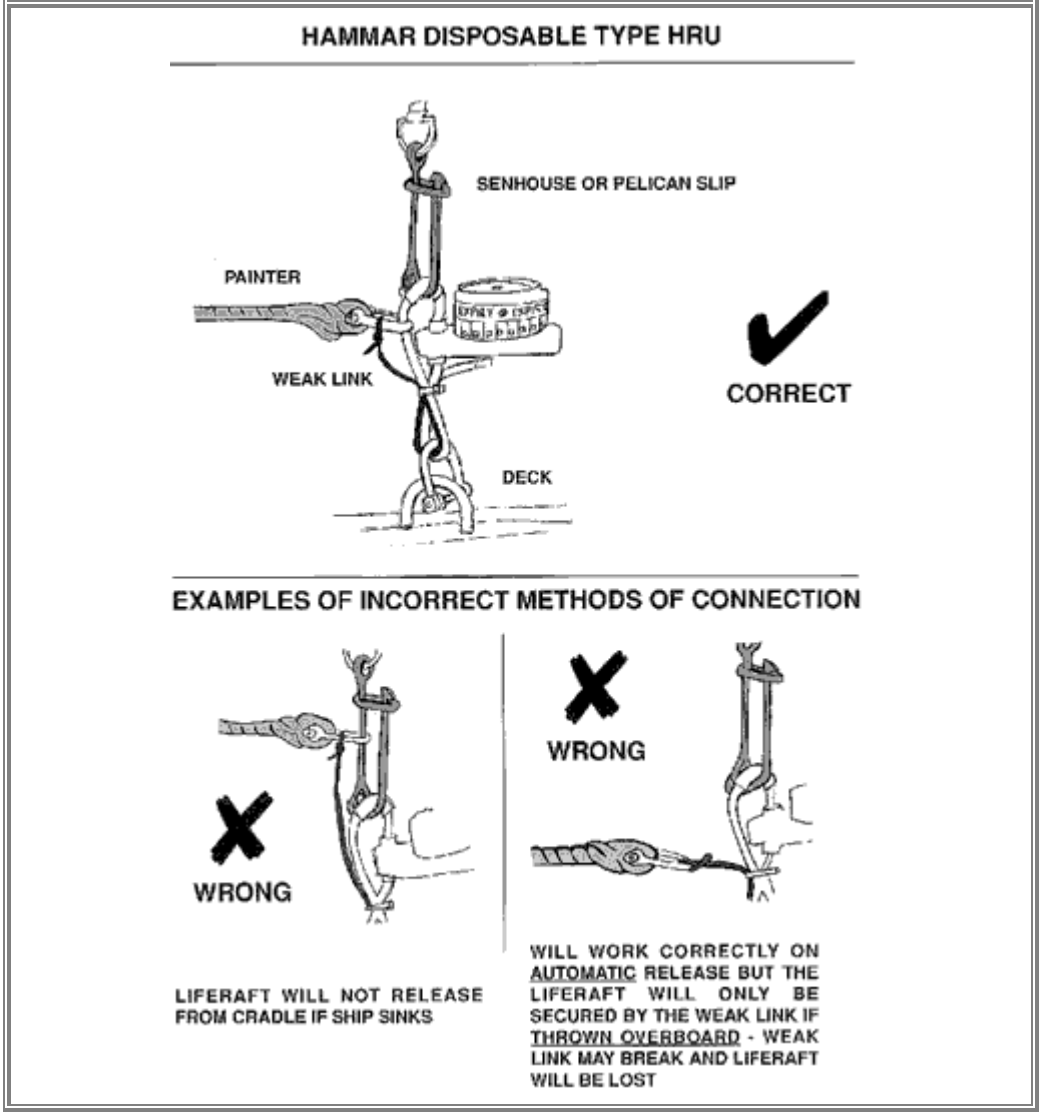
3. The liferaft saved the lives of the crew, but it was a close run thing. Failing to ensure the painter was correctly rigged was very nearly an oversight too many. To be effective, liferafts must be stowed and secured correctly, and every fisherman should be capable of looking at one and knowing instinctively whether it is or not. If not it will be useless when needed most.

4. The only way to appreciate the mechanics of a liferaft securing arrangement is to spend time consciously looking at the HRU either with the instructions to hand or, better still, by getting someone to explain it to you.

Footnote

Although manufacturers of HRU's provide diagrams that show correct installation, the MAIB is aware that many people have difficulty following them. Some may be unaware that the MCA produces a useful guidance note on the subject. An extract is reproduced here. Read it.

Figure 1: Extract from MCA guidance note on HRU installation



Part 3 Leisure Craft

Rigid Inflatable Boats

There can be few leisure craft sailors who remain unaware of Rigid Inflatable Boats (RIBs). They are used by the RNLI, the armed forces, the offshore industry, many safety organisations and the commercial sector. They are fine seaboats, stable, easily handled and, when fitted with a powerful engine, very fast. They are widely available as pleasure craft and their suitability for trailing makes them a popular choice for many.

In responsible hands they are safe and very forgiving. For the inexperienced, or the irresponsible, they can be lethal and the MAIB has become aware that many have voiced concern that there is an accident waiting to happen. It is not the Branchs role to sound censorious but, without prejudging one or two incidents under investigation at present, some examples of malpractice coming to our attention are worrying. We hear of RIBs being propelled at high speed in fog; of novices being exhilarated by the available power and manoeuvring violently at high speed in the vicinity of other craft; and others getting underway with helmsmen failing to attach themselves to lanyards and the engine kill switch.

Anyone contemplating using an RIB, should be very conscious that he or she will be handling a powerful craft capable of inflicting injury and even killing people. Those using them should not underestimate the importance of training, of wearing lifejackets and having the ability to contact the coastguard should anything go wrong.

It is far better to handle such craft carefully and with due regard to common-sense than ruing the consequences of a fatal accident.

General Safety The Last Resort

No matter what craft you are in, there are occasions when, despite taking every precaution, things go wrong. When it comes to the bottom line, only two things really matter: the ability to alert someone to your predicament without delay and, secondly, to survive immersion in the sea. The MAIB has noticed that the difference between life and death is often determined by how well a skipper has anticipated both requirements.

No matter how big or small your craft, there must be a means of alerting the authorities if you get into trouble. Owners and skippers should start to think beyond having in date flares and being familiar with emergency radio procedures. If they haven't done so already and are contemplating going offshore, they should consider equipping their craft with an Emergency Position Indicator Radio Beacon (EPIRB) and taking care to register it correctly. Individuals should also weigh up the merits of carrying mini flares or personal locator beacons (PLBs) at all times. The MAIB has noted that one or two people have survived potentially very serious accidents because they were carrying such devices.

While most leisure craft users naturally carry lifejackets as part of the standard equipment on board, it is clear that some people underestimate the importance of wearing them correctly or having them available at very short notice. Adjusting a lifejacket to fit the individual concerned is crucial and crotch straps will ensure the lifejacket does not ride over the head.

But very often the real killer is not so much drowning but the cold. Immersion suits are not often carried, but when they are, and put on in good time, they frequently ensure the survival of the unfortunate person in the water. It is just a thought.

Case 21
Three Tidal Near Misses

Narratives

Case 1- Close encounter with an anchored cruise ship

A Moody 31 with a family of four on board was outbound from Cowes for a days sail. It was a fine morning with a moderate easterly breeze, and the genoa had already been set. The flood tide was making strongly to the east, and the wind against the tide had set up a characteristic chop.

Once clear of the harbour entrance the decision was made to hoist the main with a single reef, and the skipper took an all-round look to make sure he was safe to do so. Apart from a small cruise ship lying tide-rode at anchor some way down tide, he judged he had ample room to manoeuvre, and would not embarrass anyone else while he came head to wind. He did so, and two of the family began to raise the main.

The evolution took much longer than expected and problems arose while trying to secure the reef. By now the yacht had drifted some way down tide and was closing the anchored cruise ship. The skipper was becoming mildly concerned by the delay, and was mentally reflecting that the cruise ship was beginning to look a trifle larger than he remembered it.

Still unable to resolve the problem, the skipper realised he was being set down on the anchored vessel and decided to bear away to keep well clear of it. As he did so, the weather genoa sheet caught on something, which his crew were unable to clear quickly. He decided the only option available to him was to go about and hope he had sufficient room to gather headway before becoming acquainted with the cruise ship.

He made it. Just.

The Lessons

1. Even the simplest task on board can take longer than expected, and skippers would be wise to anticipate the implications of delays. Among the most crucial considerations is to assess the amount of available sea room. Do your best to avoid any requirement to loiter up tide of an anchored vessel or other obstruction. Whether you like it or not, a strong set can be very difficult to counteract, and it has a habit of taking you where you dont want to go.

2. An anchored vessel lying to the tide, rather than the wind, indicates a strong set that the small boat sailor would be wise to note.

Case 2 In and out of the buoys

In anticipation of making an early start the following morning, several yachts had secured to two lines of mooring buoys off Yarmouth, Isle of Wight. Nearly all the seaward buoys were occupied, but several remained unoccupied on the landward trot. As darkness fell the ebb tide was setting strongly, but it was a fine, still night and unusually warm.

As the evening progressed, other craft joined the group and secured to unoccupied buoys. At about 2200 one particular yacht approached from the east, and with the tide underneath her was making good speed. It was dark, and her skipper was looking for a buoy to secure to, realising that the only unoccupied ones lay on the line of buoys farthest from him.

He decided to cut through the outer line, passing close astern of one of the moored yachts. By the time he was committed, he realised the ebb was setting more strongly than he had anticipated, and found he was being swept down tide on to the bows of the yacht moored next astern. Only by increasing speed at the last moment did he avoid making contact.

The Lessons

1. It is all too easy to be lulled into a false sense of well being when afloat on a fine, still, warm night and nearly secured at the end of a passage.

2. Tidal streams are unforgiving of errors of judgment, and make no allowances for such sentiments.

3. Cutting through a line of moored craft heading down tide is highly risky at the best of times, and doubly so at night when it may not be possible to accurately judge distances or lateral movement.

4. A more sensible approach would be to head down tide until reaching the end of the line, and then come round to pick up a vacant mooring by heading into the tide.

Case 3 - A tight squeeze with several onlookers

Several yachts had sought shelter from an overnight blow in the Channel and had secured port side to, and bows to, seaward alongside the quay in Weymouth harbour. One particular grouping was secured in two trots of six boats lying alongside each other.

Early next morning the wind had dropped and the skippers of the three inboard boats lying in the trot furthest from the harbour mouth decided to resume their passages without further delay and agreed to slip in turn and proceed. There were no craft lying in the berth immediately astern. The tide was ebbing.

The outboard yachts kindly lay off, while those departing let go, and left. The first yacht did so without any trouble. The second one also let go, and moved out astern against the ebbing tide before the skipper judged he could turn to starboard and clear the six abreast body of yachts ahead of him.

He took the stern way off and started to come ahead. His turn to starboard didn't take effect until he had headway on, by which time he realised he was being set down on the outboard boat ahead of him. By putting his engine full ahead, putting the wheel hard to starboard followed by hard to port, (and no doubt a bit of praying as well), he just, only just, cleared the starboard quarter of the yacht ahead.

The onlookers breathed a sigh of relief and had something to discuss over breakfast.

The Lessons

1. Departing from a crowded harbour is never easy, and the risks escalate when facing down tide.

2. What seems to be adequate space in calm conditions at slack water, or when heading into the tide, is very likely to be insufficient when there is very little room to manoeuvre down tide.

3. Allow extra space for turning in such conditions. For every second you remain stopped, or you are waiting for headway to come on, the tide will be taking you inexorably towards the hazard you are trying to avoid.

4. If watching such a manoeuvre from another craft which you feel could be vulnerable, and something is niggling you about the wisdom of what is being attempted, get hold of a fender. You might just need it before you settle down to the coffee, scrambled eggs and toast. Filling out the insurance claim form is a less productive way of spending a morning in harbour.

Case 22
Sightseeing on a Bend Invites Trouble

Narrative

After a day at sea in the English Channel a frigate was returning to Devonport, and was shaping up to enter harbour via the west entrance to Plymouth Sound. She was on track, all was normal and she had Plymouth Breakwater Light on her starboard bow. The navigating officer had the con, and was waiting for his wheel over bearing to come on before altering course to starboard to enter the Sound.

In accordance with established procedures, someone checked to see that everything was clear to starboard before course was altered. There was another hand on the port bridge wing keeping a lookout.

Just before course was altered, the man on the port bridge wing looked aft and saw that a fast motor cruise had taken station very close on the port quarter and was following the frigate in. The occupants looked extremely happy, and were waving to the matelots on the flight deck aft.

The commanding officer was informed straight away, and realised that a potentially dangerous situation had arisen. If he were to alter course to starboard as planned, his stern would swing out and, very likely, strike the cruiser only feet away from his port quarter. He slowed right down and told the officer in charge of the aft mooring station to tell the powerboat to keep clear.

An attempt to convey the message was made. The occupants waved back with even more enthusiasm. This was followed by more emphatic, and nautically embellished, instructions to keep clear. The penny eventually dropped, and the motor cruiser veered off just in time to allow the frigate to come round safely to starboard, having already overshot the wheel over bearing.

The Lessons

1. Many merchant ships have signs aft saying KEEP CLEAR OF PROPELLERS. Warships don't, but it shouldn't be necessary to warn any skipper of the danger of manoeuvring too close to another ship's stern.

2. There are occasions when small craft deliberately accompany large vessels while under way. A welcome home after a long deployment is a typical example. But skippers of small vessels should be alert to the potential dangers involved. They should never, for example, impede the large vessel's progress.

3. It is just as important to appreciate the dangers of being too close to the stern, and most especially when the large vessel is about to alter course. This can happen at any time, and not only when following a predetermined track.

4. When a vessel alters course she pivots about a point roughly one third of her length from her bow. This means her stern will swing away from the direction she is turning. Never, ever, put yourself in such a position that you are so close that the swinging stern will hit you. Putting the same predicament another way, never come so close that the ship has to delay her course alteration so that she too places herself in an embarrassing position.

5. In short, keep well clear of large vessels.

6. This is another example of the benefits of keeping a good lookout, especially before altering course. A glance aft is just as important as the more conventional lookout ahead.

Footnote

This is another near miss report and is produced without naming the vessels involved.

Case 23
Flooding Caused by Faulty Hull Fittings

Narrative

Random Harvest, a 9.86m GRP boat was returning from an angling trip in the English Channel with eight people on board, including six anglers. Four miles south-west of Brighton the bilge alarm sounded briefly. The skipper lifted the hatch in the wheelhouse and saw the bilges filling with water. He could not identify the source, but started the electric bilge pump and diverted the engine cooling water intake to direct bilge suction. The deckhand operated the manual bilge pump.

The skipper tried to call other vessels in the vicinity, but found the VHF had failed because the batteries had already been covered by floodwater. He used his mobile phone to contact another fishing vessel, *Morning Breeze,* whose skipper relayed the distress to Solent Coastguard.

Fortunately, *Random Harvest's* bilge pumping arrangement was able to contain the flooding, and she made her own way towards Brighton, escorted by Morning Star and an RNLI lifeboat. Once alongside she was pumped dry and the cause of the leak was discovered: a brass, through-hull, 25mm diameter fitting to the toilet seawater inlet had failed.

In turn, this failure was caused by de-zincification. The fitting had been installed new only16 months before, so the de-zincification was probably accelerated by stray electrical currents from the vessel's batteries.

Brass is not accepted for use in underwater, through-hull fittings, either by classification societies or by the MCA because of its susceptibility to de-zincification.

During the course of the investigation it was found that some suppliers were unwittingly selling brass fittings incorrectly labelled as bronze. This was brought to their attention.

The Lessons

1. Always ensure that through-hull fittings and seacocks are of an approved material such as silicon bronze, gunmetal or de- zincification resistant (DZR) brass. Be wary of purchasing fittings made from a material that is described by a trade name and not a recognisable metal alloy ask for details of its constituent metals. Rather than lose your boat, and possibly lives, it is better to pay a few pounds more for an approved fitting.

2. Reduce the likelihood of stray electrical currents and the possibility of rapid electrolytic corrosion of underwater metal fittings by following good electrical installation practice such as isolating the positive pole of the battery when the vessel is left at her moorings.

3. The battery supplying electricity to the VHF radio and other emergency equipment should be placed in a position where it is less likely to be affected by flooding.

4. The bilge alarm gave early warning, and alerted those on board to the flooding. The outcome might have been very different had the flooding continued undetected especially as the VHF was disabled before it was discovered.

5. Although the use of mobile telephones as a means of alerting others to incidents and emergencies at sea creates genuine difficulties, it is an invaluable tool when all else fails.

Footnote

Dezincification was first identified as the cause of failure of condenser tubes on naval vessels in the 1920s. It is a form of corrosion in salt water (or fresh water containing other impurities), confined to brass, where the zinc is leached from the metal. The copper shell that remains is porous and fragile.

End of Year Think Piece
A collision at sea can spoil your entire day

Thucydides

At the end of last year the MAIB published a think piece called 'The Run Down Nightmare'. (Safety Digest 3/1999.[1]) It was written to draw attention to some of the problems the MAIB has identified when investigating collisions, and near collisions, between ships and yachts. Since the article was written there have been further such incidents, or suspected collisions. Although we can always learn from new experiences, we believe the lessons to be learned, and the observations made in last year's piece, still hold good.

We conclude 2000 by continuing the theme of preventing collisions at sea, and this 'think piece' widens the scope.

Few types of marine accidents attract quite as much attention as a collision. They occur every year and result in damage, delays, injuries, fierce legal arguments, the apportionment of liability, endless discussions about who was to blame, and the inevitable arguments as to whether the Rules are sufficiently effective.

The International Regulations for Preventing Collisions at Sea, the COLREGS, Rule of Road, or just the Rules embrace all of us at sea. You can be the officer of the watch in a VLCC, a cruise ship, a guided missile destroyer, an anchor handling tug, a beam trawler, a yacht out for a day's sail, or even the sole occupant of a small dinghy. The submariner patrolling at a depth of 100 metres is arguably exempt, but even he has to keep watch on the surface from time to time. We are all involved. But it is not the Rules that prevent collisions; it is the people on board who are responsible for making them work. It usually falls to one person, the watchkeeper, to observe them and take the appropriate action. While some may argue the Rules need revising, they are what we have, and we have to make them work. The sad reality is that some watchkeepers fail to do so, and MAIB inspectors spend much of their time trying to identify the underlying reasons why this should be.

Numerous books have been written on the subject. Nautical journals and yachting magazines feature well illustrated articles about them. Aspiring deck or seaman officers spend hours learning them; examiners manage to dream up the most unlikely circumstances to test a candidate's true understanding of them (Rule19 is a favourite), and marine lawyers can make even the most knowledgeable mariner feel extremely uncomfortable in the Admiralty Court. Study of case law can be revealing. And yet, when 'risk of collision is deemed to exist' the safety of everyone on board the vessels involved relies totally on the knowledge, understanding and correct implementation of the 38 rules and the four annexes by, usually, a single person, the watchkeeper. Sometimes the system breaks down and we have a collision. Why?

In carrying out an analysis of the reasons the first, but not very surprising, factor to emerge is that nearly everyone focuses on who was to blame. Ask those involved and you get an identical answer: the 'other' vessel. But the whole ethos of the Rules is that they place responsibilities on everyone involved, and watchkeepers should be in no doubt that they are there to prevent collisions happening. None of us are exempt. Even if you are the watchkeeper in a vessel over100m in length, which is aground at night in fog with the old man shaking like a leaf in his cabin below, you still have to ensure the right lights are being shown, and the correct sound signals are being made.

Of all the Rules, Rule 5 lies at the heart of preventing collisions. It is short and to the point. It is also uncompromising. It says that every vessel **SHALL AT ALL TIMES** maintain a proper lookout. And yet the failure to observe this rule is probably the most common reason why collisions occur. Keeping a good lookout is fundamental to good seamanship, but it is abundantly clear that there are a number of mariners who do not do so.

Watchkeeping in an apparently empty Indian Ocean can be a totally different experience to steaming up the English Channel on a bank holiday weekend in thick fog; but the responsibility is identical. With the advent of radar and ARPA many of the traditional skills of keeping an effective visual lookout are being lost. The Mk I eyeball, aided by a pair of good binoculars, has the advantage of identifying a vessel and inclinating on it with a single glance. The eye can also see small vessels that the radar might miss, such as a yacht made of GRP, or fishing vessels in a confused sea state. But too many watchkeepers devote their entire attention to ARPA, or some other activity on the bridge, and rarely look out of the windows. There is one recorded incident where a watchkeeper was so engrossed watching a football match on a portable TV that he totally failed to see the vessel anchored dead ahead of him. We understand he has since taken up gardening.

The traditional, and still extraordinarily effective, means of establishing whether collision exists involves taking a compass bearing of an approaching vessel. It is very often ignored nowadays on the grounds that the information is best derived from radar. In practice the means for taking visual bearings have often been removed, or are not available for some reason.

It is known that in a flagrant breach of the regulations many masters do not post lookouts at night. In others the lookouts are often employed doing other things, are sent below to 'rest', or have never been properly trained. Scanning the horizon is one thing, seeing things is another, especially at night or in reduced visibility. The dedicated lookout who merely stands on the bridge wing with his mind in neutral because he believes the officer of the watch has seen the several lights in sight ahead is not exactly helping.

An effective lookout regime seen in some vessels with well-trained and motivated crews involves using the rating to monitor the radar, while the officer of the watch maintains the visual lookout and makes the decisions. Providing the rating is of sufficiently high calibre, and properly trained, the technique can work surprisingly well. We have sympathy for masters of vessels where it would be virtually impossible to use a rating in this way.

In waters known to be very congested, especially in fog, the most safety conscious vessels will have two officers on the bridge. In addition to the officer on watch, the master or the pilot, or, in cruiseships, the staff captain can do much to relieve the pressure on a sole watchkeeper to ensure a safe passage. Embarking a deep-sea pilot can pay handsome dividends in a short manned vessel where the deck officers might be very tired.

Lookout standards are also known to suffer in other types of vessels. The fisherman will, for instance, focus his entire concentration on catching fish. He will do so in the confident expectation that his lights will indicate what he is doing, and that other vessels will see him and keep out of the way. Such optimism can be sadly misplaced.

The yachtsman can be very reluctant to look to windward, astern or under the foot of the Genoa. He must make the effort. A closing ship can creep up without anyone being aware of it, and there will be few leisure sailors who haven't mentally asked themselves over and over again "Where on earth did that ship come from?" It is strongly recommended that, wherever possible, amateur yachtsmen have at least two people keeping watch together at night in coastal or congested waters.

Maintaining a proper lookout is a challenging task. It can be stultifyingly boring or extremely demanding, but it must be done. Hour after hour after hour. A watch that is too long is unlikely to be efficient, especially if being conducted by one man. And many of the worst incidents occur between 0100 and 0600 while the man who thinks he can keep a seven or eight-hour watch efficiently is deluding himself.

While maintaining a proper lookout is at the heart of preventing collisions, a good understanding of the Rules, and the ability to take the appropriate actions at the right time, are fundamental requirements. Anyone who spends time at sea will face situations where 'the other ship' seems to conspicuously ignore them. The problem facing the watchkeeper is that he has no means of knowing how efficient the lookout in the other vessel is, or how competent its watchkeeper. He has to assume the other man is suitably qualified, competent and is maintaining an efficient lookout.

Too often such faith is clearly misplaced, and there are numerous example where the Rules are being deliberately flouted. There isn't a fishing harbour in the country that doesn't contain a number of boats lying alongside with their 'engaged in fishing' shapes permanently rigged. The fisherman might argue that it doesn't matter, and that everyone else does it without attracting any complaint, but such an attitude conveys an impression of indifference to the regulations. Displaying such shapes also introduces an element of uncertainty in the minds of the watchkeepers in other ships as to whether the fishing vessel concerned is engaged in fishing or not.

Many yachts motor sail without hoisting their cones, and this too leads to confusion by others.

We have even seen reports of vessels where the watchkeeper evades his responsibilities by rigging not under command shapes or lights in the expectation that everyone else will keep out of the way!

Confusion or, more accurately, uncertainty, features repeatedly in many collision reports. A watchkeeper believes he is in the 'stand on' vessel. He watches the other vessel carefully, but becomes increasingly uneasy if there is no sign of her giving way. The closer it gets without anything happening, the more the uncertainty. He should be guided by two factors: he must keep watching very carefully and must never assume the give-way vessel is going to keep clear. Remember Rule17 (b) - "When, from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision."

If you get it wrong and leave it too late, the lawyers will have a wonderful time arguing the matter in court.

In an ideal world you should spend your entire career at sea watching every vessel bound by the Rules to give way, doing so in adequate time and making their intentions clear. You will, theoretically, reach retirement with your heartbeat and adrenaline levels delightfully steady. Sadly this doesn't happen, and many an ancient mariner has seen his hair turn prematurely grey by the failure of others to give way. What can be said with unerring certainty is that the day you do not watch the give-way vessel on the assumption she will comply with the Rules, will be the one occasion when she does not do so.

Lack of understanding of the Rules is also commonplace, and many an amateur sailor has put to sea fully confident with the old adage that 'steam gives way to sail'. He must go further than merely knowing the rules and have a working knowledge of, for instance, the manoeuvring characteristics and handling limitations of large vessels in confined waters. And the yachtsman who stands on with a large merchant vessel bearing down on him, and insists on his 'rights', is likely to regret it.

The Rules governing the action to be taken to avoid collision are very clear, and every watchkeeper must have a full understanding of Rule 8 [2] supplemented by Rule 16.[3]Too many vessels leave the alteration too late, and far too many fail to provide a sufficient change of aspect so the other mariner knows he has been seen and the appropriate action is being taken. The old rule of thumb that avoiding action should be taken in the four to six mile range bracket still holds good for large ships in open waters. For small vessels, especially in confined waters, give-way action is, of necessity, taken at shorter ranges, but the same philosophy applies. Don't leave it too late and when you do give way, make your intentions crystal clear.

So why do people get it wrong? Lack of knowledge is one obvious explanation. It is seized on by many with the inevitable recommendation that better training is needed. But it isn't the only reason: some watchkeepers are very reluctant to take early avoiding action because they hope it won't be necessary. If you are the officer of the watch and you begin to suspect you should be taking avoiding action, the time has come to do so.

Others fail to take a compass bearing of an approaching vessel to see if risk of collision exists, and are taken by surprise when they suddenly find the other ship is very close indeed. Judging distance at sea by eye, and especially by night, is extremely difficult.

We have received a number of reports giving reasons why people do not comply with the Rules. There is the person who can't be bothered to adjust the automatic steering to alter course, or his ARPA indicates the closest point of approach as 4 cables which the watchkeeper thinks is acceptable, or the yachtsman close hauled on the port tack who finds he can't bear away because he forgets to ease the mainsheet. In each case, and for different reasons, the own vessel concerned doesn't give way and a close quarters situation follows.

Many Rules are broken in traffic separation schemes. We are aware that a number of watchkeepers are under the erroneous impression that the crossing rule does not apply in a TSS, or who are fixated by the perceived need to proceed from way point to way point without deviation. And many find anticipating the movement of other vessels in the same lane surprisingly difficult. Watchkeeping in a TSS requires a technique that is often overlooked; an awareness of ships closing from astern. Most people concentrate on what is happening ahead, and research shows that few mariners will habitually look behind them either visually or on radar.

Of even greater concern is the watchkeeper who does not have the confidence to take any action at all, and relies totally on the other vessel to do the giving way no matter what the Rules dictate. This is aggravated further by some young officers who feel they will lose face if they call the master when they are in doubt about what to do. Masters will know who these people are, and must do everything possible to encourage a sense of responsibility without conveying censure.

But most collisions occur in poor visibility where a different section of the Rules apply (Section III). It is here that many otherwise responsible mariners take the most extraordinary risks, and endanger both themselves and others.

If there is one aspect of the Rules that is broken time and again it is the use of excessive speed. Rule 19 [4] quite clearly states that every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. The wording is, however, curiously vague. Who defines safe speed? A container ship proceeding up channel at 22 knots in fog, with two radars working at optimum performance with both the master and officer of the watch closed up may, in their opinion, be proceeding safely. After all, they have been doing it successfully for years, there is no other ship within 6 miles, and they have got to pick up a pilot at a certain time to ensure they arrive at the berth at the pre-arranged time. If they then have a collision, or run down a

yacht which they never saw, the operations manager (and no doubt the lawyer) is likely to point out it was the master's fault, that he was under clear instructions not to compromise on safety, and should have slowed down. If however, he had slowed down and not been involved in a collision but had arrived late at the berth, the chances are that he would have been heavily criticised because of the commercial repercussions. Just occasionally the master may wonder if he can ever get it right.

He can, by following the Rules. Most responsible shipping companies will back their masters for slowing down in poor visibility, but we know of instances where some captains perceive the need to maintain the scheduled arrival time as paramount. If they fail to do so and the vessel is involved in a collision, the accident investigators will probe to determine how the perception arose. No accident is the result of a single event; it is caused by a series of apparently unconnected circumstances that come together to cause whatever happened. Implied pressures by the charterer might be very relevant to explaining why an accident happened.

The second most common reason for failing to slow down in restricted visibility is a reluctance to go to 'stand by' even though Rule19(b) states that every power-driven vessel shall have her engines ready for immediate manoeuvre. If the officer of the watch starts to think he is going too fast in such circumstances then he should, without hesitation, order 'stand by'. It is what he is paid to do and there should be no argument about it on board.

The most infrequently used method of avoiding collisions in poor visibility is to slow down, or even stop. Today's seafarer seems curiously reluctant to take either action, mainly because slowing down is not something you can do at the drop of a hat, and can take time to implement. But if the vessel is on 'stand by', he should use the facility available to him. Far better to arrive at the destination a bit late than not at all or with a large hole in the side. The owner is likely to be seriously cross if you have the misfortune to damage, or lose, a ship.

Among the more common features of near misses in poor visibility is the tendency for a single watchkeeper to have both his radars on the same range scale, often the 6 mile, rather than on different ones to ensure both long range detection and shorter range collision avoidance.

It is also very evident that a number of ships no longer make sound signals in fog or reduced visibility, often on the basis that the other vessel can't hear them because its watchkeeper is cocooned inside his warm, comfortable, heated, enclosed bridge. The reality is that there are still many vessels out there that still rely very heavily on proper sound signals being made, and go to great lengths to ensure they can hear them. Ask the small boat sailor.

Most masters provide standing orders, usually in writing, but always understood by those entrusted with keeping a lookout. The one that applies in virtually every vessel is something on the lines of, "If in doubt call me". The operative word is "if". One of the most curious observations the MAIB makes over and over again is the reluctance of an officer to call his master when in doubt. They all seem to think they can handle a Rule of Road situation, no matter how complicated. There are also clear signs that calling the master is tantamount to losing face. The definition of a good and trustworthy watchkeeper, is one who can be relied upon to inform the master or skipper whenever a potential collision situation is beginning to emerge. This is very different to abiding by the rules in normal circumstances, but recognising when things are starting to go wrong. The good master should never criticise you for doing so. Hemay have every faith in your ability to handle the situation and leave you to handle it, but at least he can sleep happy in the knowledge he will be kept informed when it matters, and before it is too late.

Finally, too many collisions are caused by the oldest shortcoming of all, making assumptions based on scanty information, especially scanty radar information. The point has been made already. Never, never, assume the other man is going to get it right.

And if you are 'the other man' don't keep the other ship guessing. Any action you take should be positive, in ample time and with due regard to the observance of good seamanship. And having done so, you can turn to your mentor with a grin and say Rule 8(a) sir. He would be proud of you.

[1] Safety Digest 3/1999 is available on request from the MAIB.

[2] Rule 8 - Action to avoid Collision.

[3] Rule 16 - Action by give way vessel.

[4] Rule 19 - Conduct of Vessels in restricted visibility.

Appendix A

Investigations commenced in the period 01/07/2000 31/10/2000

Date of Accident	Name of Vessel	Type of Vessel	Flag	Size	Type of Accident
01/07/00	Pride of Bilbao	Ro/ro	UK	37,583gt	Accident to Personnel
07/07/00	Inga	Oil tanker	Liberia	18,625gt	Accident to Personnel
10/07/00	Betty James	Fishing vessel	UK	184gt	Grounding
16/07/00	Fivla	Passenger	UK	single deck	Accident to Personnel
20/07/00	Coastal Bay	General cargo	Antigua	2,481gt	Grounding
02/08/00	Global Mariner	Misc non trading	UK	12,778gt	Collision
	Atlantic Crusader	General cargo-multi deck	Cyprus	7,366gt	
10/08/00	Dunan Star	Fishing vessel	UK	12,48gt	Accident to Personnel
14/08/00	Karianda	Fishing vessel	UK	24,55gt	Foundering
11/09/00	Baltiyskiy 107	General cargo-single deck	Russia	1,926gt	Accident to Personnel
22/09/00	Unamed	Pleasure craft	UK		Accident to Personnel
25/09/00	Kinsale	Bulk carrier	Cyprus	5,306gt	Collision
	Eastfern	General cargo-Single deck	Ireland	1,171gt	
03/10/00	Arosa	Fishing vessel	UK	248gt	Grounding
16/10/00	Vrouw Grietje	Fishing vessel	Netherlands	419gt	Collision
	European Tideway	Ro-ro cargo	UK	21,162gt	
21/10/00	Horizonte Claro	Fishing vessel	Spain	240gt	Grounding

Appendix B
Reports issued in 1999/2000 (Priced)

Sapphire - Sinking of fishing vessel on 1 October 1997 with loss of four lives
Published 18 March 1999
ISBN185112107 2
£10

Gaul - Report on the underwater survey of the stern trawler and supporting model experiments
Published 16 April 1999
ISBN1851121714
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Sand Kite - Collision of dredger with the Thames Flood Barrier on 27 October1997
Published 24 April 1999
ISBN185112108 0
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Margaretha Maria - Sinking of fishing vessel between 11 and 17 November 1997 with loss of 4 lives
Published 22 July 1999
ISBN185112109 9
£12

MAIB Annual Report 1998
Published 3 August 1999
ISBN185112184 6
£16

Green Lily - Grounding of cargo vessel on 19 November 1997 with loss of one life
Published 11 August 1999
ISBN185112183 8
£12

Rema - Sinking of cargo vessel on 25 April 1998 with loss of four lives
Published 17 February 2000
ISBN185112185 4
£20

MAIB Annual Report 1999
Published July 2000
ISBN185112186 2
£16

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A list of Stationery Office stockists and distributors outside the UK appears at Appendix D.

Appendix C
Reports issued in 2000 (Unpriced)

Amber Rose - foundering of fishing vessel with loss of one life off the Isle of Man on15 October 1998

Aquitaine - failure of lifeboat bowsing gear on vessel in Falmouth dry-dock on 29 October 1999. No injuries.

Arco Arun - grounding, off Broadness Point, River Thames on13 October 1998

Astra II - loss of two crewmen attempting to board the vessel while berthed at Carbost Pier, Loch Harport, Isle of Skye on 2 April 2000

Be Ready - fire on board the fishing vessel while fishing 30 miles north-west of the Orkney Islands on 22 January 2000

Bluebell Of Warsash - collision between the yacht and an unidentified ship 23 miles south of the Needles, IOW

Fv Beverley Ann II/Cypress Pass- collision on 9 March 1999

Dole America - collision with the Nab Tower in the eastern approaches to The Solent on 7 November 2000

Donna M - capsize of fishing vessel off the Orkney Islands with loss of two lives on 31 August 1999

Fraoch Ban - Capsize of fishing vessel off coast of Shetland Islands15 August 1999

Gradeley - manoverboard fatality off the west coast of the Island of Mull on 28 October 1999

Harbour Lights - loss of fv off Polperro, Cornwall on 8 January 2000 with loss of one life

Hoo Robin/Arklow Marsh - collision between cargo vessels on River Trent on 2 March 1999

Jasper III - foundering of vessel 90 miles northeast of Fraserburgh on 10 September 1999

Lord Trenchard - explosion on board vessel in Poole Harbour on 30 June 1999

Luc and Toisa Puffin - collision between the two vessels 8.5 miles due east of the river Tyne on13 June 1999

Multitank Ascania - fire on board vessel in the Pentland Firth on19 March1999

The Princess Anne - heavy weather damage to hovercraft GH-2007 while crossing from Calais to Dover on 29 February 2000

Purdy - man overboard fatality from angling boat at Shipwash Bank off Harwich, on 17 July 1999

Quiberon - grounding of passenger ferry in Plymouth Sound on 17 March 1999

Rachel Harvey - grounding and loss of fishing vessel off Peninnis Head on1October 1999

Radiant Star III - foundering of fishing vessel 60 miles north-east of Fraserburgh on 6 August 1999

Random Harvest - flooding of fv south-west of Brighton on 3 July 1999

Samphire Of Wells - foundering of dinghy off north Norfolk coast with loss of two lives on16 December 1999

Sea Centurion - fatal accident to a motorman on board the ro-ro cargo ship at Portsmouth Naval Base on18 May 1999

Sharona - flooding and foundering of fishing vessel 80 miles north-east of Peterhead on 3 August 1999

Silvery Sea/Merkur - collision between Merkur/ Silvery Sea which then foundered about 35 miles west of Esbjerg, Denmark, with the loss of five lives 14 June 1998

Sonia - flooding to the engine room of cargo vessel off Sandown Bay, Isle of Wight on 1 September 1999

Symphony - steering failure and subsequent collision with Lambeth Bridge on River Thames - 4 October 1999

Toisa Gryphon - engine room fire150 miles west-south-west of Isles of Scilly - 2 February 1999

Wahoo - a man overboard fatality from an Etchells 22 keelboat off Yarmouth, Isle of Wight on 14 May 1999

Willem B - the crushing and subsequent death of a bargehand at Nab Tower Dumping Grounds on 6 June 1999

Unio Arbo/Philomena - collision between Bahamian cargo ship *Union Arbo* and UK fv *Philomena* about10 miles south of Newlyn, Cornwall on 2 September 1999

Copies of the above reports are available free of charge on request from the MAIB (023 8039 5506).

MAIB *Safety Digest* 1/2000 Published April 2000

MAIB *Safety Digest* 2/2000 Published August 2000

SAFETY DIGEST
Copies of the *Safety Digest* publication can be obtained, free of charge, on application to the Marine Accident Investigation Branch (Mrs J Blackbourn (023 8039 5509)).

Appendix D
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