Marine Accident Investigation Branch (MAIB) - Safety Digest 2/2000

Contents

Glossary of Terms and Abbreviations

ARPA

Automatic Radar Plotting Aid

CCTV

Closed circuit television

CO_2

CarbonDioxide

CPA

Closest Point of Approach

EBM

Electronic Bearing Marker

EPIRB

Emergency Position Indicating Radio Beacon

GRP

Glass Reinforced Plastic

GT

Gross Tonnage

kW

kilowatt

LPG

Liquefied Petroleum Gas

MAIB

Marine Accident Investigation Branch

MCA

Maritime and Coastguard Agency

PEC

Pilotage Exemption Certificate

RNLI

Royal National Lifeboat Institution

Ro-ro

Roll-on, roll-off

SCBA

Self-contained Breathing Apparatus

VHF

Very High Frequency

VTS

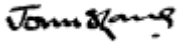
Vessel Traffic Services/System

While every accident at sea has its unique characteristics, certain features tend to repeat themselves again and again. My staff do their best to identify these and propose remedies to prevent others from making the same mistakes. There is rarely a single solution, but very often just identifying the problem can do much to draw awareness to certain factors and ensure greater care is taken in future. My attention has been drawn recently to the number of accidents that have occurred when a mariner, for whatever reason, suddenly departs from a previously formed plan and fails to assess the risks involved with the alternative course of action.

The word 'risk' is often used in a maritime context. By its very nature seafaring is a risky business and we face potential dangers and pitfalls on a daily basis. Even putting to sea in the first instance has its attendant risks but, by identifying what they are in advance, making appropriate plans and taking suitable precautions to overcome them will do much to ensure a safe outcome.

Yet we all face the unexpected from time to time: the fairway is blocked ahead of us, the gangway lighting fails an hour after sunset and the electrician has already gone ashore, or you are asked to carry an extra passenger in an already well-laden dinghy. Any group of mariners can have fun by posing likely, and perhaps less likely situations for colleagues, and asking what they would do if faced with an unexpected predicament. Most of us would like to think we had enough knowledge, common sense or experience to propose workable solutions, but the reality from a marine accident investigator's point of view is that too often the selected course of action is not thought through sufficiently, and an accident occurs.

Given that an unexpected situation has suddenly developed, a decision often, but not always, has to be taken quickly to overcome it. On what basis do you judge the new course of action to be safe? There are no golden rules, but if with someone else it can pay handsome dividends to say what you are going to do out loud. Your colleague may well be in a position to assist in ensuring the alternative action is safe or, could draw your attention to some feature that you had overlooked which makes the plan unsafe. So when the master tells you that he proposes to cut inside the buoy marking the bend in the channel to give a wider berth to the inbound ferry, you can remind him it is low water springs and the draft on sailing matches the predicted depth of water where he intends going. He might give you a dirty look but he should have the grace to thank you as he selects Plan C.



John Lang
Chief Inspector of Marine Accidents
August 2000

Part 1 - Merchant Vessels

One dictionary defines seamanship as 'skill in seafaring'. According to the textbooks its elements include the need to keep water out of a vessel, keeping from hitting anything and the work of the seaman onboard ship. It is an ancient skill, part science, part art and part instinct borne out of long experience. Many of our forefathers were experts. They had a natural affinity with the sea in all its forms and could handle ships and the gear on board with great skill no matter what the conditions.

MAIB inspectors see a wide range of accident reports. Most come to us direct, others originate from a wide range of sources from around the world. We keep a permanent weather eye open for common causes, or for incidents where the same factors repeat themselves again and again. There are many such examples and a selection has featured in past editions of the Safety Digest. Important lessons can, and should, be drawn from them.

It would seem that in the prelude to many accidents the practice of good seamanship is waning. We hear about gangways that are incorrectly rigged and lead to people being injured or even killed. We learn of instances of badly secured cargo that leads to delays and damage. We know of cases where those on board a vessel have failed to investigate the source of an unidentified leak, or the officer of the watch who, on being confronted with a complex rule of the road situation at night, resorts to hoisting the not under command lights. We have seen reports of people falling over the side because of an incorrectly rigged stage, and ships grounding because nobody had remembered to switch on, and look at, the echo sounder. And many others.

There are any number of underlying causes for poor seamanship and they include inadequate training, poor supervision, inexperience and, increasingly, too few people onboard to carry out the tasks required of them. One of the most common reasons for things going wrong is when people on board decide, often on the spur of the moment, to take a shortcut to tackle a particular problem. Although there might be a sensible, or seamanlike, way of tackling it, or clearly laid down procedures to follow, they decide to do it 'their way' and then find they are confronted with a situation they cannot handle.

Good seamanship is safe seamanship, and if anyone ever contemplates taking the shortcut to solving a problem there is every prospect that something unsafe is about to happen. In nearly every instance the subsequent accident could have been avoided had the instigator stopped to think what he was about to do (or not do). It only needs someone to say 'Stop, this isn't sensible' and take stock of the situation to avoid an accident. Much falls on the shoulders of the person in charge to ensure the seamanlike action is taken but, equally, there are instances when a subordinate might see something going badly wrong but, because of his status, feels he can't intervene. But he should; good seamanship is just as much about effective teamwork as individual skills.

Bon Voyage!

Case 1
Collision between Stand-by Vessel and Fishing Vessel

Narrative

The 782gt stand-by vessel *Toisa Puffin* was on passage from Bessamar gasfield to Aberdeen Bay to await orders. She had also been told to remain within mobile telephone range.

After making landfall off Flambourgh Head, *Toisa Puffin* paralleled the coast and headed north-west. It was daylight and the weather conditions were good.

In a position11miles south-east of the Tyne she was steering 335°at a speed of 9 knots. The mate, who was alone on watch, detected a target on his ARPA fitted radar. Because he judged there was no risk of collision, he did not plot it. He estimated the target was bearing north easterly at a range of approximately 4 miles.

The North Shields fishing vessel *Luc* was trawling and displaying the correct shape to indicate she was doing so. She was steering 315° and making good a speed of 2.5 knots.

As the distance between the vessels closed, *Toisa Puffin*'s mate eventually decided to plot the target on the ARPA and noted the bearing as 034°, distance 2.6 miles, CPA 1.2 miles and TCPA18 minutes.

He altered course by15°to starboard, and prepared to plot his position on the chart and to transfer it onto the next chart.

By now *Toisa Puffin* and *Luc* were closing. When the distance between them had reduced to less than1mile and no avoiding action had been taken by *Toisa Puffin*, *Luc*'s skipper became concerned. He called *Toisa Puffin* on VHF channel16 but received no reply. This was not an entirely new situation to him, having had previous experience of close encounters with this type of vessel before. Some deliberately come close to observe fishing operations. He assumed *Toisa Puffin* was following this precedent on this occasion and decided to maintain his course and speed. The range continued to close.

When the skipper realised that *Toisa Puffin* was getting far too close for comfort, he called once again on VHF, and slowed down. The distance between the vessels was less than 200m, and in a last attempt to avoid a collision the skipper de-clutched the propeller in the hope that the weight of the fishing gear would pull his vessel astern. He then sounded the whistle to attract attention.

The mate on *Toisa Puffin* looked up from the chart table and realised a collision was imminent. He hurried forward to the helm control and altered course hard to port. An alteration to starboard was impossible, it was where *Luc* was.

As *Toisa Puffin* came hard to port, her starboard quarter collided with *Luc*'s port bow, before she eventually passed ahead.

Fortunately, only minor damage was sustained. After details were exchanged between the vessels, contact made with Tynemouth Coastguard and damage assessments carried out, *Toisa Puffin* continued on passage towards Aberdeen, and *Luc* returned to her home port of North Shields.

The Lessons

1. This is another example of two ships managing to collide in good weather with someone on watch in both. Most people would think it could not possibly happen, but it can. Keeping a good lookout remains the most fundamental responsibility of anyone entrusted with keeping a bridge watch. The Mark One eyeball is still the most efficient, and ultimately, the most reliable tool available to a watchkeeper. It must be used. It not only readily sees other vessels, but can identify them and make an assessment of their course and, sometimes, speed. It can also instantly spot any changes to their heading. All it requires is a commitment to look.

2. *Toisa Puffin*'s mate apparently failed to 'see' *Luc* until her range was about 4 miles. He did not, apparently, take a bearing but made a mental assessment that there was no risk of collision. At that stage, his judgment was correct. But lesson No.1 is take a bearing of any contact that might develop into a close quarters situation; Lesson No.2, start plotting it; Lesson No.3, keep watching it. Fishing vessels are quite capable of being unpredictable.

3. Navigating is important, but when obviously clear of danger in the open sea, it should never be allowed to preclude the keeping of a good lookout and the avoidance of collision.

4. ARPA is a first class aid when properly used, and is in many situations, the best tool for assessing whether risk of collision exists. But it does rely on the human factor. Every time you change course or speed in your own ship, previous predictions on the CPA of a radar target will change. And of course the reverse applies. When the other ship alters course or speed so will the CPA. The solution is to keep watching the other vessel until it has passed and clear.

5. Maintaining a proper lookout at the same time as doing something else on the bridge is one of the oldest predicaments facing the officer of the watch. Of course one has to take a fix and plot the position, write up the log book, monitor instruments, answer the telephone (the mobile is here to stay in coastal waters, and incoming SATCOM calls are no respecters of shipping density worries). There is also the myriad of other tasks that can preoccupy us when on watch. But no task should ever be so consuming that it prevents keeping a good lookout. If you can't cope, seek assistance. And you must have a dedicated lookout at night in addition to the officer of the watch.

6. The skipper of *Luc* did what so many of us have either done, or are tempted to do in similar situations, call the 'other' vessel on VHF radio. It seems so easy, just call the other vessel, have a friendly chat and all will be well. It can work, yes, but time and time and time again, it doesn't. Valuable seconds were wasted trying to elicit a response in this instance.

7. The appropriate sound signals are designed to alert other vessels when there is a failure "to understand the intentions or actions of the other ..." It is very probable that had the correct sound signals been made at an early stage (on a whistle that was of course working) it would have alerted *Toisa Puffin*'s mate in sufficient time for him to take avoiding action.

8. An alarming feature of this incident was the apparent assumption by the skipper of *Luc* that many vessels, especially stand-by vessels, deliberately close fishing vessels to "have a look". If true, or if any officer of the watch feels tempted to repeat this practice, the lesson is short, sharp and very much to the point; don't.

9. One final thought: the thinking reader will note the number of times the word "assume" appears in this narrative. Whenever a mariner "assumes" anything at sea, part of his mind should be switched to caution.

Case 2
Autopilot Failure in Confined Waters

Narrative

The1,023gt oil tanker *Banwell* was in ballast and departing King's Lynn under pilotage.

The rudder indicator linkage had failed on the inbound passage, and a temporary repair had been effected while the vessel was in port.

However, as a precautionary measure against further problems with the rudder indicator, the master decided to use the autopilot wandering lead for the outbound passage.

During the passage, the autopilot failed and applied full port helm. The master immediately stopped the engine, changed to hand steering, turned the wheel hard to starboard, and then increased speed to full ahead. However, by the time full starboard helm had been achieved, the vessel had already swung out of the channel. She subsequently ran aground. Fortunately, she grounded on soft mud, and there was no damage or pollution.

The Lessons

1. The vessel departed King's Lynn using the autopilot wandering lead rather than hand steering for the sole reason that no reliable means was available to monitor the rudder angle. Hence, undue reliance was placed on the autopilot in an area restricted to the extent that effective action could not be taken to prevent the vessel grounding when the autopilot failed.

2. The autopilot should never be used in confined waters.

3. A reliable means of monitoring the rudder angle should always be available. Where this cannot be achieved remotely, the rudder angle should be monitored locally, and effectively communicated to the bridge.

4. The steering gear, autopilot, and associated systems should be regularly serviced. Any deficiencies should be properly rectified as soon as practicable. The implications of any deficiency that cannot be properly rectified immediately should be carefully assessed before deciding whether or not it is safe to proceed to sea.

Case 3
Man Overboard while Preparing Pilot Ladder

Narrative

Mineral Century, an 81,589gt bulk carrier, was departing in ballast from Port Talbot. It was a dark night with good visibility and the sea temperature was14°c. A number of crew members were instructed to prepare the starboard combination ladder for disembarking the pilot. The relative wind on the starboard side was force 5 to 6, but the prevailing conditions did not cause any significant movement to the vessel.

The operation initially required the rigging of an accommodation ladder, the upper end of which was permanently attached to the main deck. The ladder was 22m long, and its lower end was suspended by wires connected to a winch. A railing with collapsible stanchions was located on each side of the ladder and ran the full length. Each railing consisted of two sections. The standard procedure was for the upper section to be rigged first, and then for the lower section to be rigged and connected to the upper section with a pin. However, it had become customary for both sections to be permanently connected, and for the full length of the railing to be rigged in one go. Three crew members were required to stand equally spaced on the ladder and simultaneously pull up the stanchions with the attached railing. Each crew member wore a lifejacket, but no safety line.

As the three crew members attempted to pull up the outboard stanchions and attached railing, the one at the lower end of the ladder fell overboard from a height of about12m. An urgency message was broadcast from the vessel and lifebuoys were thrown overboard into the sea. A pilot boat located the crew member after about 20 minutes, and he was eventually airlifted to hospital. He later died.

The Lessons

1. Standard operating procedures should be formulated on the basis of careful risk assessments. As such, they should be followed at all times, regardless of how unnecessary or inconvenient they might appear. If a crew member has good reason to want to deviate from the standard procedure, he should first ensure the risks are reassessed and any revised procedure is authorised.

2. In this case, the standard operating procedure required each section of the railing to be rigged separately. The additional effort required to rig both sections in one go was probably a contributory factor to the accident.

3. Wearing lifejackets was a sensible precautionary measure. But the lifejacket alone was unable to save the crew member's life when he fell overboard. A safety line, suitably attached to a strong point on the vessel, would have prevented him falling overboard in the first place.

4. Although the sea temperature was 14°c, the victim died after being in the water for only 20 minutes or so.

Case 4
Steering Difficulties Lead to Collision With Yachts

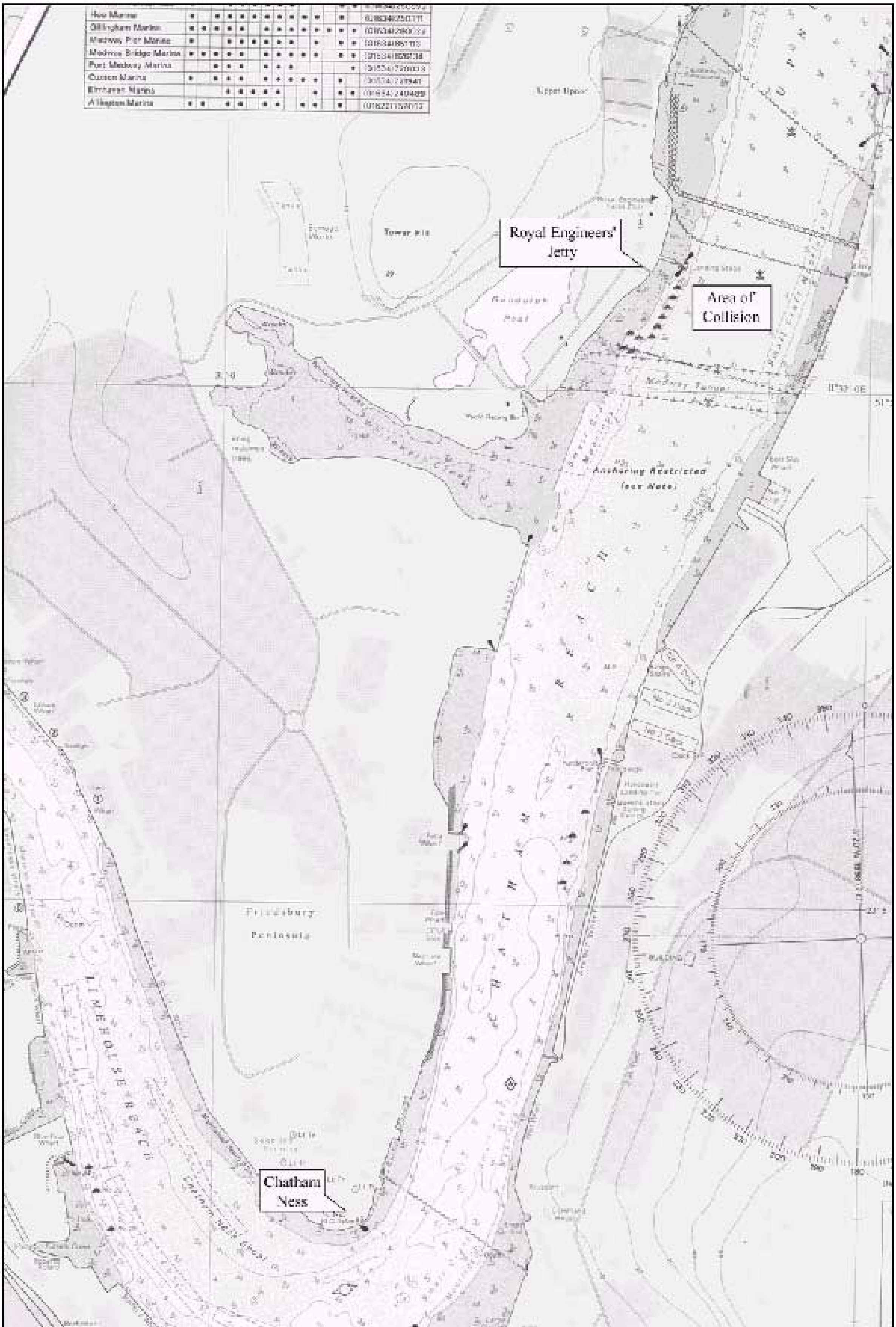
Narrative

The 2,580gt general cargo vessel *Mangen* was proceeding under pilotage along the River Medway. It was dark, and the weather was calm with dense fog patches. Visibility was less than 0.5 mile, and the tide was flooding at springs.

The pilot, the master, and the second mate manned the bridge. A lookout was posted forward. The pilot was using the main radar, while the second mate acted as helmsman and used the second radar. The master acted as lookout on the port side of the bridge.

During the passage, *Mangen* was manoeuvred to the starboard side of the channel to provide a safe clearing distance for a passing vessel. She was now in the vicinity of the Royal Engineers' Jetty (see chart extract), and her course was 210°. After the vessels had passed, the pilot considered he needed to bring *Mangen* back towards the middle of the channel in preparation for taking the deeper water on the port side of the channel rounding Chatham Ness. He ordered 20°port helm, with an instruction to steer a course of180°. The engine was dead slow ahead, and the vessel was making good about 3 knots.

The pilot continued to monitor the radar and saw the heading was165°. He repeated his order for180°and then, intending to control the anticipated swing to starboard, removed the full starboard helm which had been applied by the second mate. There is conflicting evidence as to whether the pilot returned the rudder to amidships or, in fact, applied port helm. In any case, the vessel continued to swing to port and, in an attempt to stabilise the situation, the pilot ordered hard to starboard and slow ahead. The vessel reached a heading of about140°before she started swinging to starboard. By now she had closed a line of moorings on the east side of the river, and collided with nine yachts secured to them. The engine was stopped and the vessel finally drifted clear of the moorings, having also caused considerable damage to buoys and ground tackle.



Reproduced from Admiralty Chart 1835 by permission of the Controller of HMSO and the UK Hydrographic Office

The Lessons

1. An initiating cause of the accident was the fact that the vessel overshot the desired heading of 180° while making a 30° alteration of course. An initial rudder angle of 20° to start the swing was reasonable, but helmsmen need to be sufficiently aware of the manoeuvring characteristics of their particular vessel in the prevailing circumstances. They will then know when to remove the helm, when to apply counter helm, and the amount of counter helm to apply to prevent the vessel overshooting the desired heading.

2. Although the second mate applied full starboard helm to counter the swing to port, it was done too late to prevent the vessel overshooting. This may have been due, in part, to the lack of a visual reference with which to estimate the rate of swing.

3. It is essential the consequences of human error be carefully assessed against the manoeuvring characteristics of the vessel and the restrictive nature of the channel. Any risk that an error by one person could have disastrous and irreversible consequences needs to be adequately minimised. In this case, the actions of the second mate were not monitored closely enough to enable his error to be detected and corrected in sufficient time to prevent the accident.

Case 5
High-Speed Ferry has Difficulties Entering Harbour in Strong Winds

Narrative

On returning to Newhaven from France in northeasterly winds of 25 to 30 knots, the high-speed ferry *Superseacat Two* requested the tug *Meeching* (twin screw with a15 tonne bollard pull) to assist her with berthing. Previous experience in similar conditions had shown that the bow of the ferry could be blown off the centreline of the narrow channel between East and West Piers.

The ferry entered the approach channel to the harbour between the piers and stopped to lie head to wind. The intention was to make the tug fast forward, turn to starboard, and then make a sternboard between the four piers. Such a manoeuvre would enable her to optimise the advantage of her two waterjets. A mooring line was passed through the centre fairlead and made fast on the tug. She then turned to starboard, but part way through the turn the tow line parted. A second line was passed, but this too parted. By now both vessels were being set down on the western breakwater lighthouse.

At the third attempt to secure a tow, the tug's line was made fast through the port bow fairlead rather than the centre, because the rope used was too large. The bitts to which the tow line was secured were made of aluminium and, when the weight came on, they began to give way. The towline was then quickly doubled to a second set.

The ferry made her sternboard between the piers with the intention of using the tug as a drogue.

In the circumstances however, the tug came broadside on to the ferry so that weight began to act on her gob rope. As the two vessels entered the narrowest part of the channel, the ferry's port bow closed the east, or windward Pier, and the master ordered the tug not to put weight on the towline. The tug meanwhile faced a similar predicament. She too needed to propel ahead to clear the pier, but did not do so. As a result she made repeated contact with the pier. As the two vessels moved towards the berth, the contacts continued and eventually damaged the tug. She then slipped the line by using the quick-release mechanism. The ferry berthed safely without the tug.

The Lessons

1. Handling any vessel in high winds in constricted waters is potentially difficult, and the use of a tug to assist with berthing is commonplace. Among the many factors to be considered when planning such a manoeuvre is the compatibility of the vessels concerned. In this instance there were major differences between engine power (27,500kW for the ferry and 984kW for the tug), response time and handling characteristics. This made it difficult for the tug to keep pace with the ferry and to manoeuvre into the right position for making fast and towing. Had the ferry master realised how difficult his intended plan would be for the tug, would he have selected an alternative?

2. Any harbour movement involving a tug needs forethought, particularly when a relatively high speed is being contemplated. What might appear to be the optimum speed for the ship in strong winds could be potentially dangerous for the tug.

3. Masters using tugs should always bear in mind their handling characteristics. This tug had to rely heavily on the gob rope being kept tight to prevent her being girded. This requirement would have further restricted the tug's manoeuvrability.

4. Masters holding a PEC for a particular port can do no wrong by seeking approval to embark in a tug to gain first-hand experience of its handling characteristics. Harbour authorities and tug companies should be sympathetic to such requests.

5. Experiences such as this emphasize the need for port authorities to consider every possible contingency, and for them to liaise with the users to consider solutions and harmonised operational procedures.

6. No doubt the ship designer responsible for selecting materials with which to build a lightweight fast ferry will reflect on the apparent ease with which the bitts gave way.

Case 6
Motorman Killed in Berthing Accident

Narrative

Shortly before1500 on18 May1999, the 21,104gt ro-ro cargo ship *Sea Centurion* was preparing to sail from Portsmouth for the short passage to Marchwood near Southampton. In what should have been a perfectly normal procedure one of the stern lines was let go. Having done so however, it suddenly tightened, and struck one of the mooring party. He died from multiple injuries received.

There was nothing unusual about the unberthing arrangements. *Powerful*, a harbour tug fitted with a Voith Schneider propulsion unit,was one of two tugs in attendance and was standing-by the port quarter waiting to be made fast. *Sea Centurion*'s after mooring party consisted of the third officer, two able seamen, a cadet and a motorman. This was the first time the motorman had been tasked to assist in the unmooring operations.

The first mooring line to be let go was from the offshore port quarter. There was a delay to heaving it in as the winch gearing system was changed to the drum barrel. Before it could be recovered it was sucked into *Powerful*'s port propulsion unit.

The rope surged and then ran outboard at great speed. The third officer and one of the able seamen saw what was happening and shouted to let the rope go, and for people to get out of the way. Reacting instinctively, everyone in the mooring party, except the motorman, took cover. The motorman attempted to stop the rope with his foot and lost his balance. As he was picking himself up, the rope came off its storage reel and struck him. It threw him against a short flight of steps and, despite medical assistance he died at the scene of the accident.

The Lessons

1. As with nearly every tragic accident, this one was caused by a series of unconnected events that came together in a certain sequence to generate the circumstances that occurred. The art of accident prevention is to recognise a potentially dangerous situation developing and to take the appropriate measures in time to stop it.

2. It was a perfectly normal departure. The bridge controls were set at zero, but the turning variable pitch propellers were creating turbulence astern and a degree of stern wash. This would have been normal, but because there was a delay to heaving in the stern rope, the wash caused the bight to sweep away from the quay and into a large arc towards the tug.

3. Had it been known there was likely to be a delay to heaving in the stern rope, the shore riggers could have been told to keep the eye in hand before releasing it.

4. If the delays at the winch were predictable, the officer in charge could have delayed letting go.

5. Officers in charge of the aft mooring station should always be aware of the effects of sternwash. If in their opinion it is excessive, or likely to cause problems, they should have no hesitation informing the bridge.

6. Once a line has been let go, immediately heave it in.

7. Know your tugs. Those fitted with Voith Schneider propulsion units will have them turning at all times while standing-by.

8. Any length of rope passing near a tug runs the risk of being sucked into whatever the propulsion unit is.

9. Whenever tugs are in attendance, officers in charge of mooring stations should keep a careful watch on mooring lines while they are being let go.

10. Masters like to be, and should be, kept informed of anything unusual or potentially hazardous during unberthing operations, particularly down aft where they are unlikely to see things themselves.

11. Every one of us who has ever stood on the forecastle as part of a mooring party at stations, or has been in the more isolated position down aft will have acquired basic skills and instincts about what to do and what not to do when handling wires and ropes. But we have all got to start somewhere, and the newcomer must be told about the hazards before he closes up for the first time. Above all, the novice must be told to keep well clear of any rope or wire running out of control. Other basic advice should include the dangers of standing in a bight, and knowing what to do when someone shouts a warning. There is unlikely to be any time to explain what is happening.

12. Everybody involved in mooring or unmooring operations should take adequate precautions and monitor the developing circumstances, particularly where the design of vessels or tugs restricts visibility from the wheelhouse.

13. When practicable, tugs should remain clear of ships until they are required.

Footnote

As part of the investigation the MAIB tried to establish whether there was any other instance of mooring ropes being sucked into the propulsion unit of a Voith Schneider tug. There is no evidence that it has happened before, but clearly such an accident can occur. The lessons listed here are as relevant to ships crews, tug crews, riggers and port authorities.

Case 7
Don't Forget the Effects of Wind and Tide!

Narrative

Elke, a 1,473gt general cargo vessel, was on passage from the River Humber towards Flushing at night in good visibility. The wind was westerly force 7, and a northerly tide was setting at about1 knot.

While approaching the *Inner Dowsing* light float on a south-southeasterly heading, the chief officer altered course to starboard to pass port-to-port with a vessel on a reciprocal heading. Due to the close proximity of the light float on his port side after the other vessel had passed, he decided to maintain his heading rather than return *Elke* to the planned track.

The prevailing wind and tide pushed *Elke* towards the light float, and she eventually collided with it, sustaining damage to her port quarter.

The Lessons

1. Inevitably, there will always be occasions when, for reasons of good seamanship, a vessel has to deviate from her planned track. The consequences of doing so should always be considered, not only at the passage planning stage, but also during the passage itself. In this case, the chief officer failed to take full account of the likely effects of wind and tide when he decided to modify the passage plan by passing the light float on his port side.

2. It is essential that the vessel's track is effectively monitored so as to be able to determine and correctly allow for the effects of wind and tide. Only when the true effects of the prevailing wind and tide are known can a vessel be assured of passing stationary objects at a predetermined safe distance.

3. Risk of collision with a light float (or anything else) can be assessed by watching its compass bearing. If it does not appreciably change, collision is almost inevitable. Watch it and do something about it.

Case 8
Collision Between Two Cranes!

Narrative

Nandu Arrow, a 25,063gt general cargo vessel, was secured starboard side alongside, discharging steel from No3 hatch using a shipboard gantry crane. Shore cranes were not required for the operation and were in a "parked" position on the quay. During a shift change, members of the ship's crew took the opportunity of investigating an unusual noise emanating from the gantry crane.

The third officer and the electrician were positioned on top of the gantry, which was being driven by a cadet. A seaman was positioned on the port side. All were equipped with hand-held radios and were in communication with each other.

The gantry was driven aft to No5 hatch, and then forward to land some equipment on top of No2 hatch. As it moved forward, the outrigger arms struck a shore crane, which toppled sideways onto an adjacent hopper and caused extensive damage to both crane and hopper.

The Lessons

1. It is essential that adequate checks are made before and during the movement of a gantry crane to ensure there is no obstruction or danger to personnel.

2. *Nandu Arrow*'sstandard operating procedures required three people to be in position to carry out a risk assessment of their particular sector. However, the seaman on the port side was at deck level and unable to see the starboard side due to the 2m high hatch coaming, while the third officer, who would normally have been at deck level on the starboard side, was preoccupied with investigating the unusual noise.

3. The gantry crane should not have been moved ahead until it had been confirmed that it was safe to do so. The third officer had looked ahead, but he and the cadet had not seen the shore cranes on the quay due to the setting sun. Both of them had assumed it was safe to move the gantry; both were wrong.

4. Not for the first time an underlying cause of an accident was due to a wrong 'assumption' being made.

Case 9
Safety First

Narrative

The Southampton passenger ferry, *Red Jet 2* was on passage to Southampton at full speed, 36 knots, with a lunch-time passenger load of 28 people. At1344, a fire alarm sounded, indicating a fire in the port main engine room. A check of the area using the CCTV monitor showed the space to be full of "smoke." The engine room fan was stopped while the mate, who had gone aft to shut the fire flaps, reported smoke billowing from the aft vent. All machinery in the space was shut down and fuel valve trips operated. Although smoke was present, together with the smell of burning, the crew were unable to find out the extent of the fire. It was decided therefore to release CO_2 into the space. Boundary cooling was also applied. The passengers, who had been told of the incident, were moved forward away from the area. Both the company and Southampton VTS were informed of the incident and updated on the actions taken.

At1350, six minutes after the fire alarm sounded; the vessel continued her passage to Southampton using the starboard main engine. She arrived at Terminal 2, Town Quay at1400 when all passengers and the cabin attendant left the vessel. The vessel then moved to the maintenance berth at Terminal1to await the Southampton fire brigade. The port engine room was left sealed for a further 30 minutes before fire-fighters entered the space wearing SCBA sets. No fire was found.

The subsequent investigation established that a high-pressure flexible coupling on the propulsion system leaked a very fine hydraulic oil spray. The oil vapourised when it came into contact with hot surfaces in the engine room. The 'smoke' that triggered the fire alarm was believed to be a combination of the fine oil spray and vapour.

Although in the end the incident did not turn out to be a fire, the crew's actions in shutting down the engine room and treating it as a fire were correct.

The Lessons

1. If a fire detector activates and signals a fire, treat it as one until or unless, further signs or signals show that the situation is not what was originally thought.

2. Fine sprays of hydraulic or lubricating oil can and do, ignite when coming into contact with a flame or a hot surface. The result of this ignition will depend upon a number of factors such as droplet size, characteristics of the fluid, concentration, and turbulence. It is important therefore that the system producing the spray is shut down as soon as possible, and that the ventilation system is stopped.

3. If you are unsure of the extent of the fire, leave the area sealed, apply boundary cooling, and call for advice and/or assistance.

Case 10
Fuel Bacteria Results in Grounding

Narrative

When due for her annual overhaul, one of the Skye based inter-island ferries *Loch Striven* was to be replaced by another vessel from the Clyde. The two vessels met at Kyle of Lochalsh, where the crews changed over. Apart from the motorman who remained onboard, the delivery crew was now manning the southbound ferry. The voyage south was to be made in stages, dependent on weather conditions, with overnight stops as required. The chargehand in command was experienced and qualified, and had regularly undertaken delivery voyages in this area.

The first leg of the voyage passed without any problem and she spent the night in Oban. The forecast on the following day was for wind strength 4 to 6 increasing to force 7 in the evening. It was decided she could reach Campbeltown by nightfall and before the weather deteriorated.

Loch Striven sailed from Oban at 0730 for the Clyde. By the time she cleared the shelter of the Kintyre peninsula the wind had increased to force 6. At1755, the forward main engine stopped due to choked fuel filters. These were cleaned, the engine restarted, and the vessel resumed her voyage. As she rounded the Mull of Kintyre and turned north, the wind increased further. While lining up the leading lights for entry into Campbeltown Loch at 2110, the aft main engine stopped. Soon afterwards she grounded on Macringan's Point under the influence of beam seas and the wind.

Again the cause of the engine stoppage was found to be choked fuel filters. These were cleaned and the engine restarted. With both main engines now operating and the hull only slightly damaged, the vessel came off the ground and made her way safely into harbour under her own power where she tied up at 2140.

The subsequent investigation found that the fuel tank was contaminated with bacteria, which had formed black deposits on the internal tank structure. The deposits had broken away during the rough weather and had entered the fuel systems. These built up in the fuel filters and eventually led to fuel starvation. The frequency of choked filters had been recorded while in service and the question of fuel tank cleaning was to be investigated during the overhaul.

The owners later established that the "blocked fuel filter" problem, although known to the motorman, had not been identified on the handover notes. This potential problem was not therefore known to the chargehand in command. The choking of the fuel filters, although of the duplex type allowing for quick changeover, only became known when the main engine revolutions started to drop. On the approach to Campbeltown, both motormen were in the accommodation, and by the time they became aware that there was a problem, the engine had stopped.

The Lessons

1. If fuel filters become blocked, find out why!

2. Make sure that whoever is in command is made aware of the problem, the estimated time it should take to fix, and whether it was an intermittent or regular feature.

3. If fuel starvation is a possibility, someone should be closed up in the engine room while negotiating narrow or dangerous waters.

4. When changing crews or personnel, the handover procedure MUST include any known defects, details of all known machinery problems, and an indication of difficulties likely to be experienced.

Footnote

If bacterial contamination of fuel and fuel tanks is suspected, take samples and have them tested as soon as possible. Cleaning fuel storage tanks and using biocides will overcome the problem and prevent a recurrence. It is a good idea to eliminate all water from fuel tanks by regularly draining them to remove condensation and any water delivered with bunkers.

Case 11
Oil Versus Water!

Narrative

The 6767gt cargo/passenger vessel, *St Helena* is powered by two Mirrlees Blackstone Major-6Mk3 diesel engines, each coupled via clutches and flexible couplings through a gearbox to the line shafting. Each crankcase is fitted with a Graviner Oil Mist detector, together with an auto record alarm system. In addition to the in-line Vokes lub oil filter units, both engines are fitted with Boll & Kirsch automatic back-flush, by-pass filter units.

On departure from Cardiff for *St Helena* at1700 on 4 November1999, a number of Graviner Oil Mist detector alarms sounded, the majority concerning the starboard main engine. When the watchkeepers investigated, they found water vapour coming from the Graviner return line. They considered this normal, and re-set the alarms. Also on departure, the starboard main engine Vokes lub oil filter sounded a high differential pressure alarm. This was eventually cleared at 0451on 5 November when the alternative filter was brought into use.

During the early part of the passage, the starboard main engine low lub oil pressure alarm sounded a number of times. On investigation, the watchkeepers found that these pressure fluctuations were of short duration, and did not last long enough to cause the engine auto-shut down device to operate.

The vessel continued her passage in worsening weather until at1439 on 5 November, the junior watchkeeper saw white smoke coming from the after end of the starboard main engine. He immediately operated the emergency shutdown causing the engine to stop. Following shutdown, the turning gear was engaged and operated, but the engine could not be turned. After a cooling down period, the crankcase was opened. The examination found white metal showing between the sides of No 5 lower end bearing. The vessel then proceeded on the port main engine to Brest where a full examination was to be carried out.

This examination found:

> No 5 lower end bearing shell destroyed.
>
> No's 5 & 6 main bearing lower shells deeply marked circumferentially with worn areas.
>
> Deep hardening on No 5 crankpin resulted in the crankshaft being condemned.
>
> Various levels of bearing shell scoring on No 3 main bearing, No 4 & No 6 lower end bearings, and No 2 lower end bearing shell.

Further investigation found hard particles in the Vokes filters and a lub oil water content of 4%.

The sequence of events, which led to this failure, started when maintenance work was carried out to the starboard main engine before the vessel left Cardiff.

During the overhaul of No 2 unit on 31October, the cylinder liner was removed before the block had been drained down or isolated. This resulted in between 200 and 300 litres of water entering the crankcase and draining down into the lub oil sump tank. On completion of the overhaul, and before the vessel sailed, the contents of the sump were circulated through a lub oil purifier to remove excess water. However, during the period between the water entering the crankcase and

completion of the overhaul, it is probable that a large amount of the water had settled out and was in the lower part of the sump tank. With the purifier high suction being 0.4m above the tank bottom and in use, and the full charge of 6000 litres giving an oil depth of 0.7m, the 200 to 300 litres of water would be well below the suction line.

The engine manufacturers recommended maximum water content in lub oil given as 0.2% but the actual water content found in the oil after the bearing failure was 4%. This amount of water would have the effect of reducing the supply of oil to the bearings by partially blocking the filters; reduce the viscosity of the oil and thereby raising the film operating temperature causing a reduction in the oil film thickness; and result in oil film breakdown as water flashes off.

The Lessons

Poor engineering practice and supervision brought about this very expensive breakdown. Water and oil do not mix, and engineers should know that water- contaminated lub oil results in bearing failure.

1. Before starting any machinery overhaul, check both the manufacturer's and company's guidance notes on the procedures to be followed.

2. When removing a cylinder liner, always drain down the cooling water before starting. The cooling water to the unit may be capable of being isolated or it may not, BUT the water must be removed before you start.

3. When operating a lub oil purifier system on a sump tank, always use the low suction. REMEMBER lub oil floats on water if left standing!

4. Regularly test lub oil for water; easily used test kits are available

5. Alarms are important and should be investigated thoroughly. NEVER accept the alarm condition and then forget to reset the alarm. It is Murphy's Law that when that happens, that alarm was for real!

6. If an alarm goes off several times for no apparent reason, never ever disregard it. There will be a reason, and it could be very serious.

Case 12
Undetected LPG Leak, then Explosion!

Narrative

Lord Trenchard was a 16.5m sail-training vessel, constructed of GRP, operated out of Gosport, Hampshire. She sailed from Gosport on 29 June 1999 with a trainee crew, plus a very experienced skipper and mate.

Following an overnight stay in Cowes, Isle of Wight, the vessel arrived in Poole on the south coast of England the next evening. While the dinner was cooking, the in-use gas bottle ran out. The gas installation had a pair of gas bottles in the ready-use locker, so the valve on the empty bottle was closed and the valve on the second bottle opened. This restored the gas supply and cooking of the meal was completed.

After a couple of hours ashore later that evening, five of the crew, including the skipper and the mate, returned to the vessel to sleep on board.

The following morning two of the crew awoke and made their way ashore to shower at the shore facility. Meanwhile the skipper put the kettle on the cooker and lit its burner. Noticing that the main battery voltage was slightly low, the skipper made preparations to start the small diesel generator situated in the aft watertight storage space.

He pressed the generator's electric starter button once, but the generator failed to start. He tried again, but almost immediately a violent explosion destroyed the aft end of the vessel. The skipper lost his left leg, and the three others on board suffered shock and other injuries.

Investigations found that the threaded connection on the gas bottle brought into use the previous evening had not been correctly tightened when both bottles were changed several weeks before. Once this bottle's valve was opened, gas was able to escape into the ready-use gas locker. Unfortunately it was also discovered that there were several penetrations of the ready-use locker's boundaries which allowed some of the gas, being heavier than air, to migrate into the aft space of the vessel. This was the space in which the diesel generator was housed.

Sparks from the starter motor of the diesel generator were sufficient to ignite the gas, which had collected in the aft space.

The Lessons

1. The ready use gas bottle locker was fitted with a suitable drainage arrangement to allow gas to safely drain overboard. This arrangement is a requirement of BS5482, which contains excellent advice and should be essential reading for all users of LPG at sea.

2. Poor sealing arrangements on locker fittings, such as gas pipe penetrations, lock fittings and bottle securing arrangements can allow gas to enter the below deck spaces. From here it is often difficult to ventilate.

3. This space may be separated from the main cabin by a watertight bulkhead. The crew may therefore be unable to smell the leakage.

4. *Lord Trenchard*'s crew were not warned of the leakage by the gas alarm, which for unknown reasons did not function. Proper and regular testing of alarms is vital.

5. Use of LPG at sea is perfectly safe, IF the basic barriers to an accident are in place: properly tightened gas fittings; gas tight bottle locker; bottle locker able to drain overboard; gas detector and alarm serving hull compartments.

Case 13
Inertia - a Property of Flywheels and Purifier Bowls

Narrative

An engineer on board *European Seaway* was about to undertake a maintenance job on a centrifugal purifier used for treating lubricating oil in the auxiliary engine room. The purifier's motor had been shut off, but the bowl was still rotating at considerable speed.

With the purifier's bowl exposed, the engineer began to remove parts from the oil inlet pipe. Unfortunately, the pipe became fouled with the rotating bowl, buckling the pipe and causing it to rotate at speed. The pipe caught the engineer's hand, causing several nasty lacerations.

The Lessons

1. The bowls of centrifugal purifiers run at considerable speed which, combined with their substantial mass, ensures they have considerable inertia. Stopping times are therefore long; often many minutes. Any plans to work on a purifier should take account of this delay before the cover is lifted to expose the bowl.

2. These characteristics of centrifugal purifiers are well known to engineers. However, familiarity can breed contempt, resulting in associated dangers being forgotten.

Case 14
A Simple Job, a Serious Scald

Narrative

While the RRS *Charles Darwin* was alongside in Leith Docks, the second and third engineers were in the process of testing the main engine's safety devices. This was part of the engine's routine maintenance programme.

Part of these procedures involved withdrawing two main engine fresh water temperature measuring probes from their pockets, and immersing them in a testing bath. The two probes were fitted into dry pockets, so allowing for their removal for testing without breaking into, or draining, the fresh water system. Each probe had electrical cable connections. Very close by was another connection for venting the fresh water system to the header tank through a flexible pipe. Instead of removing one of the probes, the second engineer mistakenly removed the flexible vent line, allowing water at 2.3 bar and 78°c to spray over his left hand and arm, causing significant scalding.

The Lesson

This was the type of operation that most engineers perform routinely. A very simple operation that would normally be considered as requiring very little thought. Unfortunately insufficient attention applied to any operation, even the most simple, has the potential to cause problems. As this incident demonstrates, eternal vigilance and care is essential even for those tasks which are apparently dull, routine and can be performed on 'auto-pilot'.

Part 2 - Fishing Vessels

One of the most worrying concerns to fishing vessel owners, marine insurers, fishing industry families and ourselves, is the number of times vessels founder without any identifiable cause. In recent years when vessels have begun to sink most, but not all, crews have been successfully rescued in time. But a lost vessel is a lost vessel and there can be no guarantee that the next time a fishing vessel sinks, those on board will be picked up.

This is not a new subject and in previous Safety Digests the MAIB has, from studying a range of accident reports, drawn attention to some of the fundamental lessons to be learned. We make no apology for returning to the same subject again.

Ideally the bilges of any vessel should be dry from the day she is launched until she is finally disposed of. In reality there are a number of reasons why water accumulates in the bilges, including melting ice, condensation, unavoidable leaks, deck wash water that finds itself below and, possibly in heavy weather, from rough seas. But too often water that shouldn't be there finds its way into the bilges. It either accumulates unnoticed, or is allowed to remain 'because we always have some there', or stays there because those on board do not realise the potential seriousness of having excess water on board.

The bilge pump and the automatic bilge alarm are essential items of equipment, but it gives us no pleasure to learn of far too many instances when either the bilge suction arrangements are blocked because of accumulated debris, or the alarm system is not working for a number of reasons. One of the most basic checks to be made before going to sea is to ensure the alarm is working correctly. We have even come across vessels putting to sea without any alarm at all, usually because it has been landed for repair.

Even if the alarm is known to be working correctly, insist on regular checks of both the engine room and the fish hold to see if water is present. If so pump it out. And ask why any water is there in the first place.

Among the most dangerous situations the crew of a fishing vessel can encounter is when they accept, without question, the occurrence of a steady ingress of water for which there is no obvious explanation. For all they know a length of pipework is seeping water as a prelude to bursting. Or there might be a slow leak in the planking of a wood construction vessel after that heavy berthing incident a while ago. Or a valve might be on the point of failure. They should check the pipework very carefully to see if all is well, ask how long it has been there, and consider getting it surveyed by an expert.

Although a quantity of water lying at the bottom of a fish hold may not seem particularly alarming at first, too much of it can, if subjected to free surface effect in a seaway, have a devastating effect. It can cause the vessel to capsize. Get rid of it immediately and identify the source as a matter of urgency. Lives may depend on it.

Case 15
Expect the Unexpected

Narrative

Two fishing vessels, *Marabelle* and *Ripple* were returning to their home port of Stornoway. It was dark, and the weather was calm with good visibility.

On the approach to Stornoway Harbour, Ripple overtook *Marabelle* and, after entering the harbour about 30 minutes later, stopped to dump a large boulder she had picked up in the trawl earlier in the day. She was displaying her steaming lights, and her deck lights were also on. The skipper and his crewman saw *Marabelle* entering the harbour behind them. The skipper interpreted from the course of *Marabelle* that a collision would not occur, and he assumed she would keep out of the way. During the dumping operation the skipper and his crewman stood under the shelter deck to protect themselves. When they looked back at *Marabelle*, she was almost on top of them. There was no time to take avoiding action, and a collision followed.

On entering the harbour, *Marabelle*'s skipper checked his radar display, which showed some clutter. He noticed a green light ahead, and opened the starboard wheelhouse window to get a better view. Realising the green light was a starboard sidelight, he turned the wheel hard to starboard and reduced speed in an attempt to avoid a collision. He was too late.

The Lessons

1. All vessels must maintain a proper lookout at all times. Neither vessel was keeping a proper lookout immediately before the accident.

Contributory factors were:

- **the perceived need to dump the boulder in the harbour;**
- **the unexpected presence of *Ripple* immediately ahead of *Marabelle*, having been overtaken by her on the approach to Stornoway; and**
- **the possible presence of background light on the shore which may have impaired the detection of *Ripple*'s lights until the last moment.**

2. It should never be assumed that an approaching vessel is keeping a proper lookout and will keep out of the way. To increase the chance of detection, it would have been wise for *Ripple*'s skipper to have given a visual or audible warning.

3. Too many accidents are caused by someone 'assuming' another vessel is going to do something. Never 'assume' anything. Watch the other man like a hawk.

Case 16
Fisherman Swept Overboard by the Wash From a High-Speed Ferry

Narrative

Purdy, a10m long, Aquabelle angling boat with the skipper and one guest on board, was preparing to anchor and begin fishing on a shallow sandbank off the east Anglian coast when *HSS Stena Discovery* passed inbound for the port of Harwich. *Purdy*'s skipper turned his boat towards the wash from the high-speed ferry. The conditions were fine, with a southerly wind of force 3, good visibility and a slight sea. As the first wash waves approached *Purdy*, they appeared to grow in height to 4 metres and begin to break. The first wave crashed over *Purdy*'s bow, swamping the vessel and washing the guest, who had been sitting on the engine casing aft, overboard.

The skipper threw a life buoy towards the man in the water and tried to manoeuvre the boat towards him. The man disappeared from view. Despite extensive searches carried out by the skipper and the rescue services his body was not recovered until12 days after the accident. He had been wearing heavy leather boots and, crucially, no lifejacket.

The Lessons

1. Even when the weather conditions appear benign it is always sensible to wear a lifejacket on the open deck of a small boat.

2. Large high-speed, high-powered vessels are capable of producing high-energy wash waves under certain critical conditions of speed and water depth.

3. Wash waves, which may have little or no effect on other vessels in deep water, can, when entering shallow water, grow dangerously high.

4. The wash producing capabilities of high-speed craft are not fully understood and, despite the operator's best attempts to minimise wash production, large waves can be produced inadvertently.

5. Small craft should stay clear of very shallow water when, and just after, a high-speed ferry passes.

Case 17
Call the Coastguard when in Difficulties

Narrative

Annie Gabrielle, a 7.9m long fishing vessel, was dredging for oysters just to the west of the entrance to Portsmouth harbour at the end of February. It was early afternoon and the weather was moderate. A dredge was towed from each side of the transom.

The seabed was rocky, causing the dredge on the port side to snag on the bottom. *Annie Gabrielle* was turning to port at the time, and the line to the snagged dredge heeled the vessel over. The catch and the loose gear on deck slid to the port side, which resulted in a substantial list.

Once the way on *Annie Gabrielle* had been taken off the situation stabilised, albeit with a large list.

The skipper had been fishing with *Annie Gabrielle* for about 25 years; he had had the vessel on her beam-ends before, but had recovered her. He thought he would be able to retrieve the situation this time too.

Although the skipper and his one crew had time to alert the coastguard and don their lifejackets, they did not do so. The skipper considered throwing all the catch and loose gear over the side to right the vessel, but decided against it. He chose instead to come ahead and alter course to starboard in the expectation, or hope, that the dredge could be placed directly astern and remove the source of heeling. On coming ahead, the line to the dredge came tight, pulling *Annie Gabrielle* further over to port. Water then started to pour through an opening on the aft side of the wheelhouse. Soon afterwards, with sufficient water on board, she capsized. The crew were thrown in to the sea and *Annie Gabrielle* sank shortly after.

An angler on the shore witnessed the incident and called the coastguard using his mobile phone. The coastguard made a distress relay on VHF channel16. An Isle of Wight ferry went to the scene, and used her fast rescue craft to pick up the men. The skipper of *Annie Gabrielle* initially clung to a lifebuoy, which had floated free, but later he used a fender for buoyancy. The other crewman kept himself afloat by treading water. The crew were in the water for about ten minutes and suffered no ill effects.

Annie Gabrielle has been salvaged and put back into service.

The Lessons

1. At first this incident appears to be unremarkable, but if someone had not seen the accident from the shore the outcome might have been very different.

Debilitating hypothermia would probably have set in after about 20 minutes and, had the crew not been spotted, they could well have perished.

2. The coastguard should have been called once the nature of the problem had been diagnosed and before any remedial action was attempted. The coastguard likes to be informed even if the risk seems small. If the situation appears to be particularly hazardous a "Pan Pan" message will help to keep the distress frequency clear. Lifejackets should have been donned after the snagging, or preferably worn all the time. The skipper had just purchased two compact self-inflating lifejackets, suitable for constant wearing.

3. It would also be advisable to carry a liferaft. The MCA strongly recommends that this piece of safety equipment be carried on such vessels.

4. The skipper intends to fit pound boards on deck to the stop loose gear and catch from sliding around. In the future, he will also keep the amount of loose gear to a minimum.

5. When fishing for oysters the dredges are hauled along the bottom for about a minute, during which time a straight course should be steered. The dredges should be hauled before turning when fishing over rocky grounds.

Case 18
Liferaft - a Godsend, After Small Fishing Vessel Sinks

Narrative

Sea Plough, an 8m single-handed fishing vessel left Southwold Harbour early in the morning. She arrived on the fishing grounds 25 miles east of Felixstowe about 2 1/2hours later, and began hauling her long lines, having shot them earlier that day.

The skipper continued hauling throughout the day until late afternoon, when he had to suspend the operation due to the strength of the tidal stream. Everything had gone as normal and the skipper had no reason for concern.

When the tide began to ease, the skipper started to haul his lines again. Half an hour later and while still hauling, he noticed the bow was unusually low in the water.

He stopped hauling immediately. On seeing water on the fore deck around the hold hatch he inspected the engine space, where he found water flooding aft through the non-watertight bulkhead. This water was level with the engine sump. Although the electrical bilge pump was running, it could not cope with the quantity of flood water.

The skipper called for assistance, then used a bucket to bail out water. It soon became apparent that his efforts were having no effect, and that his vessel was sinking. He then shut down the engine, closed both sea-cocks, and went to the wheelhouse. Using the VHF radio he notified other vessels in the area that he was abandoning the vessel.

Back on deck, he just had sufficient time to throw the liferaft overboard, heave on the secured painter and board it before *Sea Plough* sank.

A relatively short time afterwards he was rescued by one of several other vessels in the area. He eventually transferred to another Southwold fishing vessel and was taken ashore.

The Lessons

1. By spotting something was seriously amiss, (the vessel was well down by the bow) the skipper had just enough time to take appropriate action before it was too late.

2. The cause of the flooding is unknown, but it happened very rapidly. The lack of a bilge alarm, insufficient bilge pumping capacity, and the absence of a watertight bulkhead between the forward hold and the engine room were contributory factors to the rapid flooding and the loss of the vessel. Had these safety measures been in place *Sea Plough* may well still be afloat.

3. Statistics clearly show that liferafts save lives. As an under 12m registered fishing vessel, *Sea Plough*, was not required by law to carry a liferaft. Despite this, the MCA strongly recommends that they do. In this instance the skipper may well owe his life to the fact that one was embarked and rigged correctly.

4. Liferafts of the type *Sea Plough* was carrying, a four-man raft contained in a portable valise or container, can be hired from several manufactures and agents throughout the country for a small annual charge. It is a small price to pay for saving a life. Your life.

Case 19
Flooding and Foundering of a Small Fishing Vessel

Narrative

Weather conditions were reasonable, winds were force 4 from the south-west, and a moderate sea was running. The skipper and deckhand of the11.98m steel fishing vessel *Bountiful*, were on deck hauling crab pots off the north coast of Scotland.

As the skipper passed the open door to the wheelhouse he noticed that the light to the bilge alarm was on, but the buzzer had failed to sound. Alerted to a problem, he found the engine room to be flooding rapidly.

He started the bilge pump and switched the pump on the vivier tank to pump bilge water. All non-essential sea suction valves were closed, but the water level continued to rise. The flooding spread into the spaces aft of the forward-situated engine room. The shaft tunnel ran under the vivier tank space immediately aft of it.

The skipper transmitted a "Mayday", and Thurso RNLI lifeboat and rescue helicopter R137 were tasked to render immediate assistance. Fearing that the vessel was going to capsize, the two crew donned survival suits and lifejackets. The liferaft was launched and they took to it. Within15 minutes they were were rescued unharmed by the fv Karen Jane. *Bountiful* rolled over and sank less than one hour after the "Mayday" broadcast.

The Lessons

1. The cause of the flooding was never established, but the bilge alarm alerted the crew in time for them to make an orderly evacuation of the vessel. Had the buzzer been working, it is possible the flooding would have been noticed soon enough to enable the source of the flooding to be found, and measures taken to stop it. Bilge alarms must be kept in full working order - those precious minutes gained by an early warning can make all the difference.

2. The vessel was equipped with both liferaft and survival suits. Neither was required by regulation on a vessel of this size, but both skipper and crew had cause to be grateful for the skipper's foresight. When discussing the incident with the MAIB inspector afterwards, the skipper said, "The liferaft is the most important item of equipment on my vessel." It proved its worth that day.

Case 20
Flooding and Foundering of a Steel Fishing Vessel

Narrative

Jasper III,a 24m long steel fishing vessel, left Peterhead with her partner vessel *Crystal River* on a pair trawling trip at 0930 on10 September 1999. The weather was southerly winds force 5 to 6, with a moderate sea running.

Part way through their first tow at about 2000, the bilge alarm on *Jasper III* sounded. On investigation the engine room was found flooded up to the propeller shaft. The bilge pumps were started and the driver searched for the source of the leak. The vessels began to haul the fishing gear.

The source of the leak could not be found, and the rate of flooding outstripped the bilge pump's capacity. Flooding spread aft into the accommodation and forward into the fish hold. *Jasper III* cut her end of the fishing gear away and pulled clear of her partner vessel while she still had engine power. Shortly afterwards the main engine and auxiliaries stopped. A "Mayday" was sent at 2041, and the crew prepared to abandon ship.

At about 2100 the crew abandoned to the liferafts from where they were rescued by *Crystal River* within 30 minutes. At 2232 *Jasper III* sank. Her EPIRB did not surface and transmit.

The Lessons

1. Despite the early warning from the bilge alarm, the cause of the flooding was not found because the ingress of water was so rapid. It was probably due to the sudden failure of a large diameter pipe or small area of hull plating, weakened by advanced corrosion. Pipe failures cause 35% of all floodings to fishing vessels, and hull plating corrosion accounts for a further 4%. It is likely that better inspection and maintenance could have prevented the initial flooding.

2. A vessel might survive flooding where the ingress of water is greater than the capacity of her pumps, but only if the flooding is prevented from spreading throughout the vessel by watertight bulkheads. The Fishing Vessel (Safety Provisions) Rules 1975 require engine rooms (the space most commonly flooded) on steel fishing vessels to be contained between watertight bulkheads to prevent flooding spreading from there to other compartments. On *Jasper III* the flooding spread aft of the engine room because the aft bulkhead was penetrated by two open drain pipes from the accommodation; it is not known how the flooding spread forward. It is important to inspect watertight bulkheads regularly and to strive to maintain their integrity - it could make the difference between a flooded engine room and a lost vessel.

Case 21
The Importance of Safety

Narrative

Weather conditions were good with force 3 to 4 winds from the south-west and a slight sea. The four crew of the15m wooden fishing vessel, *Minniewood II*, were about to shoot their trawl net when they discovered flooding in the engine room. The main engine-driven bilge pumps and hand bilge pumps were started, and the skipper called the coastguard for assistance.

At that time she was about 4.5 miles south-east of the Isle of May. The fishing vessels *Finella* and *Venture II* came to her aid and stood by her until the Anstruther and Dunbar RNLI lifeboat arrived on the scene. She escorted the vessel safely into port.

The cause of the flooding was found to be the failure of a valve in the bilge system.

The Lessons

1. The flooding was restricted to the engine room and aft cabin by the watertight bulkhead between the engine room and the fish hold. This probably prevented the situation from getting out of hand. Very often it is unrestricted flooding past non-watertight bulkheads which leads to the loss of a vessel.

2. A bilge alarm, in working order was fitted in the engine room, but the circuit to which it was connected had tripped. All too often the failure or lack of a bilge alarm does not give a crew sufficient time to tackle the flooding and save the vessel. In this case they were lucky enough to notice the flooding before it was too late. The skipper has had the bilge alarm system completely overhauled and a new alarm has been fitted.

3. It is worth reflecting on the skipper's comments: "In 25 years at sea I have never been complacent about safety, but this has made me even more aware".

Part 3 - Leisure Craft

We have noted with pleasure that our Safety Digests are being used by several sea schools, are to be found in the bars of yacht clubs and, occasionally, find their way on board yachts and motor cruisers. Our aim of drawing lessons to be learned to the person who actually goes to sea seems to be working, and one skipper contacted us recently to say that he had found them particularly useful for briefing his crew about safety.

Each member of the crew of a small craft can make a major contribution to safety no matter whether he or she is extremely experienced, or going afloat for the first time. On the other hand a crew member can inadvertently be the cause of an accident through ignorance or inexperience.

Overall responsibility for safety must, of course, ultimately lie with the skipper. One of his or her basic tasks will be to ensure that there is sufficient expertise available to ensure the boat can be handled safely should anything untoward happen to him or he is preoccupied with something else. The skipper who attempts to do everything himself and becomes overtired is in danger of making mistakes.

The newcomer to small boats will find everything very strange, including the terminology being used. But the language of the sea is a common one that all seafarers understand. A skipper will naturally use it to refer to parts of the boat, to the way it is being handled and for directing activity. Newcomers can greatly help by trying to learn basic terms and expressions and more experienced crew members can do much to teach them with patience and understanding. The skipper who yells at the newcomer in language that means nothing whatsoever is in danger of aggravating rather than alleviating matters.

Inexperienced crew members can help the skipper in many ways, and these thoughts are directed at them. When underway, choose your moment for talking to the person at the helm (please note the use of two nautical expressions already). If the helmsman is obviously preoccupied with something, it might be tactful to keep quiet for a few moments until whatever it was has passed. You can usually tell. Try and avoid blocking the helmsman's view, especially when leaving or approaching a harbour or when manoeuvring in close proximity of other craft. Alternatively you may be looking aft and notice that the ship astern seems so close that you can read its name. A reflective 'You have seen that ship behind you haven't you,' might attract the response 'Of course,' followed by an energetic display of doing something about it.

The list for the novice to keep in mind is endless, but there are two final thoughts. It is quite possible you might break something while on board, are mortified about what you have done, and are extremely reluctant to tell anyone. But you must do so, no matter how embarrassing. The broken object could have safety implications later on. And finally, keep warm and dry from the outset. In home waters it is always colder at sea than in harbour, and if you get wet because of spray or rain you will become even colder. And the wet, cold, sailor is not as effective as the skipper might need. Apart from anything else it isn't much fun and can bring on seasickness.

Case 22
Two Fail to Survive Dinghy Foundering

Narrative

At about 1130 on 16 December 1999, two men chose to take the 4.26m (14ft) open, clinker built dinghy with a 10hp Yanmar diesel powered inboard engine, *Samphire of Wells*, on a short passage from Burnham Overy Staithe on the north Norfolk coast to the adjacent harbour of Wells-next-the-Sea.

It was a fine day, the sun was shining, it was high water and there was a light to moderate breeze. The total distance was about 6 1/2 miles and both men had a working familiarity with small craft. The purpose of the passage was to take the dinghy to Wells for some touch-up work and a winter lay up. They had decided not to use the alternative available to them, road transport. Both men wore warm clothing and lifejackets but had no means of keeping water out in the event of immersion in the sea.

On the day before the passage was made a strong breeze to gale force onshore wind had been blowing.

When the men failed to arrive at the expected time, initial concern developed into the realisation that something was wrong, and a full-scale search and rescue operation was launched. Shortly before 1900 that evening the body of one of the two occupants was found just outside Wells harbour wearing a fully inflated life jacket. The body of the second man was discovered 6 days later, some 7 miles north of Cromer, and about 20 miles from where the accident is thought to have occurred.

Although someone probably saw the dinghy while it was on passage, there were no witnesses to whatever happened and, apart from one or two items that have been recovered that probably came from the dinghy, there was no sign of the missing craft or its wreckage. It has not, therefore, been possible to determine the causes of the loss with any certainty. It is thought probable the dinghy managed to cross the bar at the entrance to Overy Burnham Harbour, but may have shipped some water while doing so. The investigation has concluded that the most likely reason for the tragedy was that *Samphire of Wells* foundered at some stage while she was on passage between Burnham Overy Harbour and the entrance to Wells harbour. It did not require the addition of much water to capsize her, and it is thought this probably happened.

Local sailing directions and knowledge warn users to be particularly careful when crossing specific harbour bars to one or two north Norfolk coast harbours and most especially when there is any northing in the wind. Evidence suggests that at least one of the victims would never knowingly take a risk if he perceived it to exist. It is also thought that the benign conditions that prevailed in the shelter of the harbour gave a false sense of security, compared with the reality of disturbed water at the bar which may not have become apparent until the boat was committed.

The dinghy was entirely suitable for sheltered waters but vulnerable to swamping in rough seas.

Both men were wearing lifejackets but these failed to save them. It is probable that a combination of the cold, and breaking seas over them, led to them swallowing sea water to such an extent that they drowned. Neither man had any means of attracting attention once they were in the water.

The Lessons

1. Any passage, no matter how short or close inshore, is potentially dangerous if not properly prepared.

2. Preparations should include ensuring the craft is suitable for the planned passage and that the engine is sufficiently reliable. An infrequently used engine, or one that is not regularly maintained, is more likely to fail. Likewise if its fuel has been left lying untouched in the storage tank for some time, the chances of moisture or other imperfections being present are much higher. This can affect engine performance. Other preparations should ensure that sufficient equipment is being carried for use in an emergency and should focus on improving the chances of survival and attracting attention.

3. Anybody planning a sea passage should check the weather forecast and, so far as possible, make an appraisal of recent conditions. Yesterday's weather can be a significant factor when determining today's sea state. It will also pay dividends to 'look over the sea wall' to observe the actual conditions. Very often the calm conditions of a sheltered harbour give way to something much stiffer once outside.

4. If unfamiliar with the waters to be sailed in do not be shy about seeking the advice of someone with local knowledge. This is particularly pertinent if the intended passage involves crossing a bar.

5. A small dinghy is vulnerable to capsize if large quantities of water are shipped. Always carry a bailer and ensure it is attached to the craft in some way. If water comes onboard get rid of it as soon as possible.

6. Remember there are four factors involved in ensuring survival: keeping afloat, keeping warm, preventing the ingestion of seawater and attracting attention.

7. Lifejackets come in various forms. Make sure you are wearing the right type for the activity you are involved in; if in doubt seek professional help. Ensure it fits properly, is in date for service and is properly secured. Splash proof hoods and crotch straps will do much to improve the chances of survival in rough seas.

8. Clothing should be suitable for the passage in question. Although nobody ever thinks they will be in a craft that founders, the risks escalate if you are in an open boat and making an open sea passage in winter. Cold water is often a primary cause of death or a major contributor to drowning. Consider wearing a dry suit with plenty of insulating clothing beneath it. Chest waders are unsuitable for wearing in small craft.

9. Give thought to how you might attract attention if you are left without any form of propulsion; or you find yourself alone in the sea.

10. Always inform a responsible and knowledgeable person or coastguard of your intentions, including your ETA prior to departure and report your safe arrival on completion.

Footnote

This accident occurred in the middle of winter on a relatively isolated part of the coast with few people around. Had it been the summer or in an area where there was a greater chance of anything untoward being seen, this tragic accident may not have occurred. The lessons are nonetheless just as relevant.

Case 23
Too Little, Too Late

Narrative

The yacht *Bluebell of Warsash* was sailing from Guernsey towards Gosport at night. Two of her four crew were keeping watch. The weather was fine and the sea state was slight. The wind was easterly 10 to 15 knots and the tide was setting west.

As the yacht neared the northern edge of the westbound traffic separation lane her watchkeepers saw the approach of a brightly-lit ferry from ahead and slightly to starboard showing her green sidelight. They also held a second ship to the right of the ferry showing two white masthead lights and a red sidelight. They deduced the ferry would pass clear down the yacht's starboard side, while the other ship would cross ahead.

The yacht was steering 038°by her magnetic compass, but was making good about 336°due to the prevailing wind and tide. She was not equipped with a radar and the watchkeepers were unable to gauge, with any accuracy, the range of the approaching ships. They saw the second ship cross ahead of the ferry, and then suddenly realised she was much closer than they had first assumed. Furthermore, she was closing quickly and on a steady bearing. She was so close that it was too late for those on board the yacht to take effective avoiding action. To lessen the impact, course was altered to port. The ship struck the yacht's starboard side.

One of the watchkeepers purposely threw himself overboard just before the collision. He was later recovered. The remaining crew all suffered injuries, and two of them were airlifted to hospital by rescue helicopter.

Although the yacht was damaged and taking water, the manual pumps on board were able to cope with the flooding, and the yacht was towed to Yarmouth, Isle of Wight, by the Yarmouth RNLI lifeboat.

The colliding ship has not been identified.

The Lessons

This must be every yachtsman's nightmare. A dark night, crossing the channel, two ships in sight and suddenly one of them is much closer than at first thought. And a collision occurs. What can be learnt from this incident?

1. The 'other' ship failed to take avoiding action as the give-way vessel. But stand-on vessels need to be alert to the possibility that give-way vessels may not act in accordance with the regulations. Although a yacht might be fitted with a radar reflector, there can be no guarantee that she will be detected and held on the radar of the give way vessel. And although we would also expect a proper lookout to be kept in the 'other ship' there are too many instances where the standards fall far short of even the minimum obligations. In short, trust nobody and be prepared to take effective avoiding action early enough to prevent a collision. In this case it is possible that the ship was, in fact, crossing ahead, and altered course towards the yacht at the last minute, possibly in an attempt to avoid the collision.

2. At face value keeping watch at sea is relatively simple providing you have adequate eyesight, are not colour blind, know how to steer and have a good working knowledge of the Collision Regulations. In practice it is more difficult. Establishing whether risk of collision

exists requires two further skills, the ability to take a compass bearing, and more difficult, to assess range. The first is the more important.

3. It doesn't matter what your heading is, or your course made good, or the relative bearing of the other vessel. What does matter is the compass bearing (true or magnetic, again it doesn't matter). A handheld compass is the easiest way to take the bearing, or it can be done using ships head and a relative bearing but the important thing is to take it. If that bearing does not appreciably change then risk of collision exists. And that involves responsibilities, even if you are the stand on vessel.

4. Judging range at sea by eye, especially at night, is not easy and even the most salt-stained mariner will admit to a certain vulnerability when trying to make an accurate assessment. In this radar age most professionals will prefer to check the range on radar. When you don't have it, you have to rely on the Mk 1 eyeball. And the chances are that your estimate will be wrong. There is a tendency for those keeping watch with a low height of eye such as from a yacht's cockpit, to assume a vessel is further away than she is. Use binoculars. If you can see details of the accommodation lighting then assume you are close. And use your ears. If you can hear the rumble of engines then you are probably very close indeed. And if the steaming lights seem to be pretty high in the sky, then no matter what your thoughts are about steam giving way to sail, you should be taking avoiding action.

5. But range is never as important as the compass bearing. Range only becomes critical if you are that close and it is only by taking avoiding action yourself that collision can be averted.

6. And finally. Ask yourself whether the other vessel can see you. On the assumption that your navigation lights are switched on and 'burning brightly' remember that the range of visibility of a yacht's lights are limited. Having another light to hand, or even a white flare available, to attract attention are viable alternatives but ultimately it may well be necessary to invoke Rule 17 (b). The examiner would be proud of you if you can quote it verbatim: "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".

7. The Collision Regulations permit a stand-on vessel to take avoiding action by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action. In this case, despite the close proximity of the ferry, the watchkeepers could have altered the yacht's heading to starboard into the wind and tide, which would have brought her into stays. Additionally, they could have illuminated the sails with a powerful light, or directed it at the approaching ship to bring the yacht to the notice of those on board.

Appendix A

Investigations commenced in the period 01/04/2000 30/06/2000

Date of Accident

Name of Vessel

Type of Vessel

Flag

Size

Type of Accident

29/02/00

Princess Anne

Hovercraft

UK

325 tonnes

Machinery

02/04/00

Astra II

Fishing vessel

UK

16.43m

Accident to personnel

05/04/00

Diamond Bulker

Bulk carrier

Philippines

16,721grt

Accident to personnel

10/04/00

Wakil II

Fishing vessel

UK

9.88m

Accident to personnel

16/04/00

Fleur de Lys

Fishing vessel

UK

16.15m

Fire and explosion

27/04/00

P&O SL Aquitaine

Ro-ro passenger

UK

28,833grt

Collision

13/05/00

Solstice II

Fishing vessel

UK

33.30m

Accident to personnel

10/06/00

Mariama K

Fishing vessel

UK

29.76m

Accident to personnel

13/06/00

Concordia

Fishing vessel

Netherlands

40.05m

Collision

MSC Sabrina

Container

Panama

35,598grt

Winter Tide

Reefer

UK

5,084grt

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
ISBN1851121072
£10

Gaul Report on the underwater survey of the stern trawler and supporting model experiments
Published 16 April 1999
ISBN1851121714
£20

Sand Kite Collision of dredger with theThames Flood Barrier on 27 October 1997
Published 24 April 1999
ISBN1851121080
£20

Margaretha Maria Sinking of fishing vessel between 11 and 17 November 1997 with loss of 4 lives
Published 22 July 1999
ISBN1851121099
£12

MAIB Annual Report 1998
Published 3 August 1999
ISBN1851121846
£16

Green Lily Grounding of cargo vessel on 19 November 1997 with loss of one life
Published 11 August 1999
ISBN1851121838
£12

Rema Sinking of cargo vessel on 25 April 1998 with loss of four lives
Published 17 February 2000
ISBN1851121854
£20

MAIB Annual Report 1999
Published July 2000
ISBN1851121862
£16

Copies of Reports are available in the UK from the Stationery Office, PO Box 276, London SW8 5DT and good booksellers. Copies are not available direct from MAIB and no payments by any means are accepted by this office.

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

Appendix C
Reports issued in 1999 and 2000 (Unpriced)

Adherence - loss of tug in the Bay of Biscay on 25 October1999

Aquitaine - failure of lifeboat bowsing gear on vessel in Falmouth dry-dock on 29 October1999

Arcadia - lifeboat winch failure on passenger cruise ship on 9 December1998

Arco Arun - grounding off Broadness Point, River Thames on13 October1998

Baltic Champ - grounding off Kirkwall on 4February1999

BeverleyAnn II, Cypress Pass - collision on 9March1999

Blue Hooker - loss of the fishing vessel with two lives off Blackchurch Rock, North Devon on 12November1998

Catrina - capsize of the UK registered fishing vessel south of Newhaven on13 October1998

De Kaper - fire on board trawler of Hanstholm, Denmark on12 February1999

Dinghy (Unnamed) which capsized in The Sound of Iona with the loss of four lives on 13December1998

Donna M - capsize of fishing vessel off the Orkney Islands with the loss of two lives on 31August1999

Dory (Unnamed) which sank on Loch Awe with the loss of three lives on 29 May1999

Drum Major - foundering of narrow boat with the loss of four lives at Steg Neck lock near Gargrave, North Yorkshire, on19 August1998

Edinburgh Castle - fire in main galley of vessel on 21August1998

Edinburgh Castle - death of one person on cruise ship while berthed in Southampton Docks on 3 May1999

Enak/Loveletter - failure of lifting arrangement in Sunderland Docks with loss of one life on 9May1997

mv ***Elm/Mfv Suzanne*** - near miss incident on 11February1999

Geeske - death of one person while fishing off Beachy Head on 9 December1998

Gradely - manoverboard fatality off the west coast of the Island of Mull on 28 October1999

Hoo Robin/Arklow Marsh - collision between cargo vessels on River Trent on 2 March1999

Jasper III - foundering of vessel 90 miles northeast of Fraserburgh on10 September1999

Loch Awe (see ***Dory***)

Lord Trenchard - explosion on board vessel in Poole Harbour on 30 June1999

LUC and Toisa Puffin - collision between the two vessels 8.5 miles due east of the river Tyne on13 June1999

Ocean Madam - capsize of yacht with the loss of one life in the Bay of Biscay on 8 October1997

Octogon 3 - grounding of the Romanian registered ro-ro cargo vessel two cables south-east of Spurn Head at the entrance to the River Humber on 22 October1998

Pentland - grounding of the dry bulk carrier on 7 December1998

Pescalanza - sinking of a the fishing vessel with the loss of six lives on 2 November1998

P&Osl Kent - death of a donkeyman on 10November1998

Pride Of Le Havre - engine room fire on 18March1999

Quiberon - grounding of passenger ferry in Plymouth Sound on17 March1999

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

Saga Rose - fire on the passenger cruise liner whilst undergoing a refit at the A&P Docks, Southampton on14 December1997

Sally Jane - capsize alongside in Shoreham Harbour on 27 July1998

Samphire of Wells - foundering of dinghy off north Norfolk coast with loss of two lives on 16December1999

Sea Centurion - fatal accident to a motorman on board the ro-ro cargo ship at Portsmouth Naval Base on18 May1999

Suzanne - see ***Elm***

Symphony - steering failure and subsequent collision with Lambeth Bridge on River Thames on 4 October1999

The Sound Of Iona - see ***Dinghy*** (unnamed)

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

Trijnie - capsize and foundering of the workboat/tug in the approach channel to Milford Docks, Milford Haven on 8 September1998

Union Arbo/Philomena - collision between Bahamian cargo ship Union Arbo and UK fv Philomena about10 miles south of Newlyn, Cornwall on 2 September1999

Wahoo - man overboard fatality from an Etchells 22 keelboat off Yarmouth, Isle of Wight on 14May1999

Willem B - crushing and subsequent death of a bargehand at Nab Tower Dumping Grounds on 6June1999

Copies of these reports are available free of charge on request from MAIB (023 8039 5500).

MAIB Safety Digest 1/99
Published May1999

MAIB Safety Digest 2/99
Published November1999

MAIB Safety Digest 1/2000
Published April 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)

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