Marine Accident Investigation Branch (MAIB) - Safety Digest 03/1999

Contents

Marine Accident Investigation Branch

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

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

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

The publications home page contains information on how and where you can obtain publications produced by the Department for Transport.

Glossary of Terms and Abbreviations

AB - Able Seaman
ARPA - Automatic Radar Plotting Aid
CPA - Closest Point of Approach
EPIRB - Emergency Position Indicating Radio Beacon
GPS - Global Positioning System
GRP - Glass Reinforced Plastic
IMO - International Maritime Organization
MAIB - Marine Accident Investigation Branch
MCA - Maritime & Coastguard Agency
RNLI - Royal National Lifeboat Institution
RYA - Royal Yachting Association
SCBA - Self-contained Breathing Apparatus
STCW - Standards of Training, Certification and Watchkeeping
SOLAS - Safety of Life at Sea
UTC - Universal Time Co-ordinated
VHF - Very High Frequency

Introduction

No matter how much effort is put into preventing transport disasters, they still occur around the world with alarming frequency. In recent weeks we have witnessed the Paddington rail collision, a tourist bus crash in South Africa and the loss of an Egypt Air aircraft off Nantucket Island. On the marine side, the fire onboard the ferry *Dashun*, and her subsequent foundering in rough weather off the Chinese coast was the worst marine tragedy in China for many years; about 280 people lost their lives. A further 17 people also died when the fast ferry *Sleipner* went aground at high speed off the Norwegian coast at the end of November.

One of the significant differences between marine disasters and those involving other transport modesis that few, very few, vessels are ever fitted with data recorders or 'black boxes'. Many argue activelyagainst their fitting on grounds of cost. Finding out the main and underlying causes of an accidentpresents the marine accident investigator with a formidable challenge. Notwithstanding thishandicap, the MAIB inspector endeavours to look beyond the obvious causes and identifies thelessons to be learned. These are published in the *Safety Digest* which is published three times eachyear.

We have been delighted with the response to these *Digests* but discover that all too often our targetaudience, the seafarer and especially the fisherman, continues to be unaware that we provide this freeservice. It is my hope that everyone at sea has access to these *Digests* so that they too can learn fromthe experiences of others. A telephone call, e-mail, fax or letter to our Southampton offices willensure your name is added to our distribution list. The *Digests* can also be accessed by visiting ourwebsite.

As in previous *Digests*, this edition provides ample food for thought. We are particularly gratifiedwhen people write to say that a particular article was the focus of discussion onboard ship. Discussingaccidents, and identifying oneself with what has gone wrong elsewhere, will very often make a majorcontribution to the development of a safety culture and lead to an overall improvement in safety. I amvery aware that some of the features we draw attention to are beyond the scope of the man at sea.Nonetheless by identifying the problems, much can be done to reduce the risks - by applying some ofthe lessons to be learned.

One unexpected consequence to publishing these *Digests* has been the growing number of seafarerswho have taken to writing to the Branch to draw our attention to safety matters. We ensure that anysuch reports are treated in the strictest confidence as some of the points raised have been veryrevealing and highlight practices at sea that are condoned by people who should know better. Someof these observations form part of our thinking when drafting the lessons to be learned. I encouragepeople to be open with us. You may unwittingly be saving a life, or a major marine disaster. Pleasecontinue to write to us.

John Lang Chief Inspector of Marine Accidents December 1999

Part 1 - Merchant Vessels

Seafaring is not without risks. As a vessel approaches her port of discharge at the end of an otherwiseuneventful voyage, she might be coping with bad weather, heavy traffic and a concentration of fishingvessels. The master is becoming anxious about the need to catch a tide, and the engineers are tacklingsome unexpected defect that has necessitated a reduction in speed. The vessel eventually reaches portand cargo work starts. An army of visitors jockey for position at the bottom of the gangway, and aweary master and equally tired mates, have to cope with the many demands placed on them. A tidelater, the ship sails. Fog descends and the radar reveals yet more fishermen. The master, his officersand crew are resigned to being tired and know they are at their most vulnerable, but it is the reality ofshipping today. The commercial pressures dictate little or no let-up in the pace.

The man at sea will do his very best to avoid a mistake, but human failure in the guise of fatigue,interrupted sleep, lack of training, poor communication, failure to delegate, inadequate teamwork,social conditions onboard or poor ergonomics in the workplace, all feature as contributory causeswhen determining why so many accidents happen.

The conscientious ship owner will have done his best to identify the risks, and taken measures toovercome them. And yet, when MAIB inspectors identify the primary and underlying causes ofaccidents, they often identify practices and procedures that have survived unchallenged for years yetcontribute directly or indirectly to whatever happened.

Too often we see the lookout at night being stood down to rest or, worse still, never being used at all.We see junior officers sitting back and watching errors being made by their seniors, but, because theold man or the pilot is assumed to know what he is doing, they do nothing to query the action, orintervene. At times of high activity we have seen the master, as the senior officer and mostexperienced man present, taking charge of the detail of whatever needs to be done. He is usually theonly person not involved elsewhere and few people would question that this is his proper role. Wesee, nonetheless, masters in this position making avoidable mistakes or being responsible for errors ofjudgment. As many other mariners have discovered over the years, there is a very strong argument forthe master to delegate charge to a subordinate, and then stand back and absorb the wider picture.When things go wrong, as they surely will, he is very well placed to spot them immediately and ensurethe right action is taken. When he becomes too involved himself, his focus of concentration narrowsdangerously.

This *Safety Digest* describes a variety of things that have gone wrong recently. The thinking mariner will reflect on what he or she would have done had he been present at the time.

CASE 1
Fire in Rechargeable Torch

Narrative

The 32,500gt container vessel *Cap Blanco* was in mid-Atlantic on passage from Europe when, at 1855, the automatic fire alarm system activated showing a fire in the accommodation on "C" deck. Immediate investigation found a fire in the cook's cabin. The ventilation to that area was stopped, with "C" deck, "D" deck above and "B" deck below electrically isolated. At 1903, a fire party comprising the chief officer, cadet, and AB, all wearing self-contained breathing apparatus (SCBA) because of the thick smoke, tackled the fire. It was extinguished within a minute using two portable extinguishers; one water and the other CO_2 . Ventilation was then restarted to clear the area of smoke to allow the cause to be investigated.

Decks "D" and "B" were checked for hot spots and a head count taken of the crew; they were all found safe. A fire check in the area continued by taking down deckhead panels and checking the electrical circuits for damage. The area was declared clear at 2052. A new fire detector head was fitted in the cabin and electrical power restored. Fire extinguishers and SCBA air bottles were refilled.

The investigation found a rechargeable torch lying in a molten heap on the cook's cabin desk top with the remains of a stereo speaker fused to it. The wooden desk top was burnt under and around the torch and the bulkhead behind it was also damaged. The bulkhead electrical socket, into which a two pin charging lead for the torch was still inserted, was flame damaged as were adjacent book shelves and deckhead panelling. The supply cables to the socket had been burnt away. Despite heavy smoke damage to the cabin and bathroom, the fire had not penetrated into the void spaces above.

The rechargeable torch had been bought in the UK from a reputable store just before departure. It was supplied with a charging transformer and a UK standard three-pin plug. (The ship's sockets were three-pin round. By using a multi voltage mains transformer adapter with a two-pin round on one end and four sockets on the other, the charging transformer had been connected to the ship's system.) Although the wiring was damaged, there was no evidence to indicate that the transformer adapter had caused the fire. Examination of the torch suggested that a short circuit in the torch's internal wiring was responsible.

The torch was described as a "6 Function Rechargeable Lamp" and was fitted with a large 6V 4AH lead acid battery, rechargeable from either the mains or a 12V car lighter socket.

The Lessons

1. Any item of electrical equipment that is non standard to a vessel has the potential to cause damage however reputable its manufacturer or where it was purchased. No such equipment should ever be connected to the vessel's electrical supply until it has been checked by an electrical officer. Instructions to this effect should be stated in ship's standing orders and drawn to the attention of the newly joined crew.

2. This incident demonstrates the effectiveness of a swift response to a fire alarm in the accommodation spaces. The ventilation was stopped, electrical supplies isolated, it was tackled promptly by the crew who knew what to do, were properly dressed and carried the correct equipment. Regular training minimises the risk to personnel as well as limiting damage to the vessel.

3. The crew fully appreciated the potential danger from smouldering fires in void spaces above deckhead panels and from water cascading onto electrical installations on the deck below. Their actions showed the value of thinking through the situation once the fire was out, and what might have been affected by heat transfer and/or the firefighting efforts.

CASE 2
Mix up Leads to Dover Strait Collision

Narrative

With one possible exception, activity in the Dover Strait during the closing hours of 5 May 1998 was normal. It was a dark clear night, the wind was west-south-west force 5 to 6 and traffic was moving easily both ways in the traffic separation scheme. As so often happens a "rogue" ship was heading north-east on the northern edge of the south-west bound lane. It was not identified.

The only additional, but by no means unusual, activity that night was a cross channel survey by the 1,774gt survey vessel STM Atria. She was traversing the channel between a position off St Margaret's Bay and the Belgian coast. She was showing the lights of a vessel restricted in her ability to manoeuvre, red white and red all round lights, and also displaying an orange flashing light. Regular traffic information about her activities was broadcast by the CNIS every hour. She was making good between 4 and 5 knots.

Several miles to the north-east the 347gt St Vincent and the Grenadines registered tug *Towing Wizard* was approaching the Strait in the south-west bound lane having sailed earlier from Tilbury. Without a tow she was on the first night of a passage to the Black Sea but was expecting to divert to a south coast port en route to repair a defect to her autopilot. She was making good about 6 to 7 knots. One officer was on watch and a rating was on the wheel. With a crew of six, there was no lookout. The radar was not ARPA fitted.

A few miles astern of her, the 13,633gt Greek registered cargo vessel *Anangel Honour* was also heading towards the Dover Strait. She too had come from the Thames Estuary and was bound for the Le Havre pilot. Making between 9 and 10 knots she had four people on her bridge, the master (who had the con), the second officer, a helmsman and a lookout. She was overtaking *Towing Wizard* and those on the bridge could see her overtaking light. She was also held on the radar.

On board *Towing Wizard* the master had handed over the watch to the mate at midnight (2300 UTC). He initially forgot to inform him about the survey ship activity but returned to the bridge to do so. The mate had, in the meantime, heard STM Atria over the VHF radio. He identified the survey vessel when she was still some miles ahead and he also saw the lights of the rogue vessel approaching from beyond *STM Atria*. He had not detected the overtaking *Anangel Honour* and was unaware of her presence. He monitored the unidentified rogue vessel as she altered course to starboard to pass ahead of the survey vessel. *STM Atria* had, by now, started to head south-east away from the Kent coast. The rogue's course alteration placed her in the separation lane going "the wrong way". Nevertheless she passed clear of both the survey vessel and the tug. Meanwhile the mate on board *Towing Wizard* had become concerned he was on a collision course with STM Atria and prepared to alter course to starboard to pass clear astern of her.

On *Towing Wizard's* starboard quarter *Anangel Honour* continued to overtake. She had misidentified the survey vessel as a fishing vessel and had also seen the rogue ship approaching. She altered course 20° to port to bring her further inside the traffic lane which effectively allowed the rogue to pass clear to starboard. This course alteration to port brought her closer to the tug, whose stern light was clearly visible on the port bow. The master was unaware of any survey activity despite radio broadcasts to that effect. His second officer who was conducting the navigation could only speak a little English and would probably not have understood the broadcast had he heard it. The master became concerned at the developing close quarters situation between himself and the "fishing vessel".

Meanwhile the officer of the watch on board STM Atria (the chief officer), was becoming equally concerned by the two vessels approaching on his port bow. Of the two he was more anxious about the most easterly one (*Anangel Honour*) and called on his VHF *"Ship on my port side ... eh ... Ship on my port side, approximate distance 1 m north-east of me, your approximate position is 51° 06.2'N 001° 30.7'E. This is the STM Atria". Towing Wizard,* still unaware of the presence of *Anangel Honour* overtaking on his starboard quarter assumed the call was for him, and acknowledged it by saying he would keep clear by passing under the survey vessel's stern.

The master of *Anangel Honour* also heard Atria's radio call but failed to correlate the broadcast position with his own and assumed the exchange had nothing to do with him. But he continued to be very concerned by the developing close quarters situation and started to flash his aldis at the "fishing vessel".

At the same time the mate in *Towing Wizard* briefly went out on to his starboard bridge wing to check all was clear before altering course to starboard. For some reason he never saw the overtaking vessel and ordered a course alteration of 50°. A few moments later she struck *Anangel Honour* on the port bow. At no stage in the entire manoeuvre did the tug's mate, or his helmsman, see the other vessel. They were suddenly thrown to the deck by the impact. The master below in his cabin was also hurled from his bunk. He dashed to the bridge to see the grey hull of another vessel passing close down the starboard side.

Towing Wizard immediately transmitted a "Mayday", reporting she had been in collision and had suffered serious damage to her bow. *Anangel Honour* made no such report and maintained course and speed. It wasn't until half an hour later that her master reported that she too had been in collision. She had been holed above the water line in her empty No 1 cargo hold.

Both vessels were able to berth at Dover. Four crew members on *Towing Wizard* had suffered minor injuries. There was no pollution.

The Lessons

1. The Dover Strait is one of the busiest waterways in the world. The traffic separation scheme has been immensely successful in reducing the number of collisions but transiting it still requires concentration and a keen awareness of what is going on.

2. Cross channel survey activity is commonplace and must be expected. Warnings are given at hourly intervals but it is possible that some ships could miss the transmission if they do not tune to the correct channel, or if the English broadcast is not understood. Ships transiting the Strait must listen to all traffic information broadcasts and have someone on hand to understand what is being said.

3. Once aware of survey activity, or indeed any other navigation information, the information should be plotted on the chart so it is both expected and can correlate with what is subsequently seen or detected on the radar.

4. Vessels on passage at night must carry a dedicated lookout to fulfil their obligations under the STCW convention.

5. The temptation for through traffic to use the inshore traffic zone as a short cut when "coasting" must be resisted at all costs. It is inconceivable that mariners are unaware of the requirements of navigation in the Dover Strait and their obligations under the Collision Regulations to proceed in the appropriate traffic lane, yet too many ships flagrantly disregard the regulations in the expectation they will not be identified. Such actions are dangerous, unwise and increase the risk of

collision. They are also a major distraction to all those using the traffic separation scheme legitimately.

6. Mariners must remember that when risk of collision exists, in a traffic separation scheme, vessels must comply with the Collision Rules. This applies even when one is required by the 'Rules' to avoid impeding the safe passage of the other. If necessary ships can cross the boundaries of the separation scheme to avoid immediate danger.

7. Correctly identifying navigation lights is a fundamental task of a navigation officer. The tendency to make an assumption about the lights seen is potentially dangerous. In this instance the red white red all round lights of a vessel restricted in her ability to manoeuvre were misinterpreted as the red over white of a vessel engaged in fishing other than trawling.

8. Neither *Towing Wizard* nor *Anangel Honour*saw the flashing orange light shown in STM Atria. There is no obvious explanation for this but mariners should be aware that flashing lights, navigation and warning lights are becoming increasingly common. Purse seiners, submarines, hovercraft and, sometimes, survey and other vessels use them.

9. The practice of calling unknown ships on VHF to resolve a rule of road predicament is fraught with danger and is discouraged. In this instance STM Atria transmitted the accurate position of the ship she was addressing. Even in this focused exchange the wrong ship answered and the ship whose position was correctly given did not. It should be remembered, the need to check a position may be the last thing navigators will want to do if a close quarters situation is developing.

10. Watchkeepers have a responsibility to keep an all round look out. Human nature dictates that a watchkeeper will focus nearly all his attention on what is going on ahead of him, especially when using radar. A conscious decision to check astern must be instinctive. All watchkeepers, and especially those on slower vessels, must make frequent visual checks astern.

11. Whenever altering course ALWAYS check your quarter before turning. This is doubly important if you are in a vessel proceeding at slow speed.

12. The most intriguing issue to arise in this incident is why the mate in *Towing Wizard* did not see, or detect, the overtaking ship. There are several possible explanations:

- The radar target of the overtaking vessel was difficult to distinguish in the sea clutter.
- Having failed to detect it at any stage as it approached from astern he wasn't expecting to "see" anything as he prepared to alter course to starboard to avoid STM Atria.
- He may well have seen a ship when he checked his quarter but mentally assumed it was the departing rogue ship that had passed by a few minutes earlier.
- He confined his check to a scan of the horizon not appreciating that the lights of a very close ship would have been much higher.
- Contrary to his recollections he didn't check the starboard quarter before making the turn. The fact remains the mate did not see *Anangel Honour*at any time. Had a designated lookout been closed up, there is every prospect he would have been aware of the overtaking vessel.

13. The failure of *Anangel Honour*'s master to report the collision immediately, or check the other ship was all right before proceeding was a flagrant disregard of his obligations.

14. When a master personally takes the con he denies himself the freedom to stand back and monitor everything going on around him including intercepting radio transmissions, watching other

traffic, seeing the things his officer of the watch will undoubtedly miss and weighing up the options. *Anangel Honour*'s master generally kept the con while the ship was in the busier parts of the Dover Strait.

Footnote

The MAIB is well aware how difficult it is for vessels with minimal manning to comply with STCW watchkeeping regulations when an abnormal situation arises. A vessel with a crew of six is manned on the assumption that auto steering is available. This releases one rating to act as lookout. If the autopilot is defective, the rating on watch is placed on the wheel leaving nobody to keep a dedicated lookout. The master is faced with a dilemma. He either ignores the STCW requirements, closes up yet another rating so that everyone is exhausted, remains on the bridge himself so he becomes tired, or he anchors until daybreak. It is a catch 22 situation. In practical terms, masters will have to make a judgment on how best to cope with a difficult situation.

Alternatively the minimum safe manning standards will have to consider this eventuality. The MAIB has increasing evidence to indicate that some ships have too few people on board for safe operation.

On 1 July 1999 a mandatory reporting scheme has been introduced for all vessels over 300gt passing through the Dover Strait. The number of rogue ships has reduced substantially.

CASE 3
Involuntary Movement of Ro-Ro at Berth

Narrative

The Irish registered ro-ro ferry Normandy completed loading on 22 February 1999 and was preparing to sail from Pembroke Dock for Rosslare. The bridge gear was tested as normal.

The main engines were started and the engineers contacted the bridge to say they were changing to bridge control. This was accepted, but very soon afterwards Normandy began to move slowly ahead. She made contact with the upper loading ramp but further movement was prevented by the mooring lines.

An investigation into what had happened revealed that after the gear had been tested, the port wing main engine control had not been left in neutral. When control was passed from the engine room to the bridge the port propeller responded to the ahead pitch setting and started to propel the ferry ahead.

The Lessons

1. Whoever is testing the bridge controls for main engines must ensure they are left in neutral on completion.

2. Newly constructed passenger and cargo vessels fitted with main engine bridge controls are required by Chapter II - I of SOLAS to have a system that prevents the propeller thrust from altering significantly when transferring control between engine room and bridge. Although this is not a requirement for older vessels, this incident demonstrates the value of such a system.

3. It may be possible to modify control systems fitted to older vessels to incorporate this safety feature.

4. In the absence of a suitable modification, operating and checking procedures need to be strictly followed to prevent incidents of this type.

5. Any involuntary movement of a ro-ro vessel when loading or unloading has the potential to dislodge or damage the ramps. The consequences for any vehicles or personnel passing across them at the time are obvious.

CASE 4
Engine Room Fitter Scalded

Narrative

The 20,186gt cruise ship *Pacific Princess* berthed at Cotonou, West Africa at 0700 on 21 March 1999. Among the maintenance tasks planned during the stay was the replacement of the cover joint on an isolating valve serving the starboard exhaust gas economiser and boiler. This steam system normally operated at 7.5 bar and the pipework was 100mm diameter.

After "finished with engines" at 0815 the starboard economiser was shut down and vented to atmosphere. All valves on the economiser and its associated piping were closed to isolate the valve to be repaired. The starboard boiler was still under steam.

The system was allowed to cool until 1145, then the valve was fully opened and the nuts on its cover were slackened to allow the system to vent to atmosphere. It was again allowed to vent and cool until 1330 when an engine room fitter and a crewman removed the valve cover assembly. The valve body seemed to be isolated; there were no signs of steam or water coming from it.

Five minutes later when the engine room fitter was measuring the valve body to obtain the dimensions for cutting a new joint, a slug of hot water shot out of the valve. Although this involved only about 20-25 litre it hit the fitter and scalded him. He had to be evacuated ashore for medical treatment.

The Lessons

1. This system had been shut down for five hours and open to atmosphere for nearly two hours before the valve's cover was removed. Intervals of this duration would normally be considered adequate for a low pressure steam system to cool and vent sufficiently for work of this type to proceed. In spite of these precautions a man was injured.

2. The post incident investigation found that the valve was connected to a length of horizontal piping. It was concluded that hot water had been retained in this pipe by a partial vacuum and had released just as the fitter was measuring the valve body. This was probably a coincidence. Anything could have broken the vacuum, including a slight movement of the ship. The significant factor was the existence of the water in the pipe in the first place.

3. The precautions taken were neither unusual nor unreasonable, but if the economiser and pipework had been completely drained, there would have been no water in it to discharge unexpectedly.

CASE 5
Another Nocturnal Grounding

Narrative

On the night of 6/7 December the 909gt bulk carrier *Pentland* was on passage across the North Sea from Amsterdam to Inverness. Her master planned to make landfall south of Flamborough Head before turning northwards to parallel the coast and remain in sight of land until he reached his destination.

Pentland was like many other vessels of her size and trade. She had a six man crew and the six hour bridge watches were shared between the master and mate. Both officers tended to be up and about whenever the ship was in harbour. They rested when they could but time in port was always busy. The master dealt with ship's business, the mate supervised the loading and discharge of the cargo. As every ship's officer will know, a vessel in harbour is a target for visitors. Surveyors, agents and port authorities are forever tramping up the gangway and the telephone never stops ringing. Resting in harbour can be difficult.

On passage the officers slept when they could.

A lookout at night was rarely posted which meant that only one person was on watch during the dark hours.

The passage was proceeding normally but, for various reasons, the master decided not to call the mate when his watch ended at midnight. He opted to remain on the bridge while *Pentland* passed the next significant navigation mark, the Bell Rock lighthouse.

The master decided to spend part of this watch sitting on a seat or locker in the wheelhouse. He had been on duty for several hours. It was quiet. He fell asleep.

The next thing he knew was waking up to find the coastline dead ahead. He put the engines to full astern but it was too late. His vessel ran aground at Carlingheugh at 0342.

Damage was confined to a flooded forepeak. There was no pollution and nobody was injured.

The Lessons

1. This is not the first accident to have occurred recently involving a short sea trader going aground while the officer on watch slept.

2. Previous MAIB accounts of similar situations have tended to concentrate on the working hours of the watchkeepers, the resultant sleep deprivation and the near inevitability of somebody falling asleep if he sits down. The only new dimension on this occasion was the decision of the master to delay calling the mate so that he too could catch up on sleep. It was a laudable aim but seriously flawed.

3. A six hour watchkeeping cycle is quite punishing enough but to extend the time on duty deliberately, and deny yourself the rest so badly needed is inviting trouble. Don't do it. Obtaining adequate sleep is already difficult enough in the short sea trade and the likelihood of making a mistake, or falling asleep inadvertently, escalates rapidly if the duty hours are extended in the middle of the night.

4. Once again the spotlight comes on both manning and the regulations. Not for the first time the MAIB focuses on the ambiguity of the STCW regulations.

5. The STCW regulations state "The officer in charge of the navigational watch may be the sole lookout in daylight provided that on each occasion ..." (this is followed by conditions which should be taken into account such as weather, visibility and traffic density). There are no specific directives for keeping watch at night but the implications are that these regulations only apply to daytime watch keeping. There is an urgent need for this rule to be totally explicit about what is required. Until it is, people will try and get round it, ships will not be properly manned, further groundings or collisions will occur, damage and injury will result and pollution will follow.

6. All ships should have a lookout posted at night and this should be his only duty.

Footnotes

In April 1998 and some 7 months before this incident, the UK government submitted a paper to the IMO Sub-Committee on Safety of Navigation, highlighting a number of accidents resulting from officers falling asleep on watch. The MAIB has also, through the MCA, recommended clarification of paragraph 15 of Section A-VIII/2 of STCW 95. (The Cita report dated 11 June 1998.)

Evidence that no lookouts are posted at night only becomes known to the MAIB after an accident. It would be useful to learn of other incidents where the practice is commonplace before the next serious accident occurs. As part of a research project the MAIB is interested in hearing from mariners of any instance where watchkeepers are not closed up at night. Any information received will be treated in the strictest confidence.

CASE 6
Rag Trouble!

Narrative

The Viking Vixen, a 475gt standby safety vessel, operates in the North Sea. She is fitted with two main generators, a harbour or emergency generator and emergency battery lighting. The ready use fuel system consists of a daily use header tank with a run down line feeding a fuel manifold from which both generators and the main engine are supplied.

The vessel was on station in poor weather with rough seas. The wind was blowing at about 35 knots so that the vessel was forced to "dodge" to maintain her position. At 2325, the port generator suddenly stopped and all attempts to restart it failed. The starboard generator was then started, but this too lost power after a few minutes and stopped. On removing the fuel filter vent plugs on the starboard generator, no fuel was found. Attention then returned to the port generator. The fuel filters were bled, the fuel pumps primed, and the generator successfully restarted and placed on load. The fuel oil daily service tank was also checked to ensure it contained sufficient fuel. A few minutes later, the port generator stopped once again.

At this point, all non-essential electrical loads were isolated at the switchboard and the harbour generator started to maintain lighting and steering. The bridge was told that the engine room was having difficulty maintaining fuel supply to the machinery and that there was the possibility that the main engines would stop. Efforts to clear an apparent blockage in the fuel line from the fuel manifold to the starboard generator using compressed air failed. At 0045, the main engine lost power and stopped. The fuel line was vented, the fuel pumps primed and the main engine restarted. A few minutes later it stopped yet again. This left the vessel with no main propulsion, electrical power or steering other than what the harbour generator could supply in poor sea conditions and wind force 6 to 7. The aquamaster thruster could not be used as it was electrically driven via the starboard main generator.

It was obvious to the engineers that they were being confronted with a fuel starvation problem as they made every effort to trace the cause.

The outlet flange on the quick closing fuel valve was opened to reveal only a trickle of fuel running down from the daily service tank. As the tank contained 3.5 tonne of fuel, this confirmed that the blockage was in the run down pipe from the fuel tank to the fuel manifold. This was not an easy part to check. The pipe was of all-welded construction, had no bolted flanges and contained three 90° bends. Examining it was neither going to be quick nor easy.

To try and maintain some of the shipboard systems, the harbour generator was stopped, the supply line broken and coupled to the fuel manifold. At 0430, the main engine and port generator were restarted but after a few minutes, the generator once again stopped due to fuel starvation - the harbour generator supply line was not large enough to supply both the generator and the main engine. The main engine continued to run until 0500 when that too stopped. With a restricted fuel supply, it was decided to abandon attempts to run the main engine and concentrate on the port generator to provide electrical power in the vessel. A sister vessel subsequently made contact and Viking Vixen was towed to Montrose.

On arrival in port, the remaining oil in the daily service tank was pumped ashore and the tank opened to establish the cause of the blockage. Three pieces of rag were found in the bottom of the tank. They had been left there when the tank was cleaned and had been sucked into the supply pipe, blocking it.

As a result of this incident, the daily service tank run down line was fitted with flange connections at suitable points and modifications carried out to the piping system to allow the settling tank to be used as a direct supply in an emergency.

The Lesson

1. When fuel tanks are opened up and cleaned, ALWAYS, inspect the tank internals thoroughly before the tank manhole doors are refitted.

CASE 7
Vessel Loses Electrical and Main Engine Power when Quick Closing Valve Trips

Narrative

The 5,669gt ro-ro cargo vessel *Picasso* was being operated on the Boulogne to Folkestone cross-channel route. Shortly after sailing from Boulogne on the morning of 22 February 1999, and having just dropped the pilot she lost all electrical and main engine power. The tug had been dismissed. The wind was north west 30 knots becoming 45 knots.

The port anchor was let go, but within five minutes it began to drag. The starboard anchor was also let go and she was brought up within two cables of a submerged breakwater. She didn't ground or touch the breakwater but it was close, very close.

The electrical failure was caused by a flexible hose hanging close to the generator's daily service tank, which caught the quick closing valve and tripped it. It was presumed the hose had swung when the ship started to roll on putting to sea.

Efforts to restore the fuel supply and remove air from the system used up the entire starting air supply. Attempts were made to fill one starting air bottle using the emergency, manually powered, air compressor. Because leaking bottle head valves allowed air to fill all three bottles this proved difficult and slow. Recognising that this method was unlikely to be successful, engineers coupled the emergency switchboard to a main air compressor using extension power leads. This allowed all the air bottles to be filled.

A request was made, meanwhile, for helicopter and tug assistance. Of the 34 people on board, 17 passengers and non-essential crew were evacuated by helicopter.

About five hours after the initial power failure, a main generator was successfully started, followed twenty minutes later by the main engines. The vessel weighed anchor and was able to complete its passage to Folkestone without further incident.

The Lessons

1. Like many accidents, this was caused by something insignificant not being properly secured for sea. A loose length of hose resulted in the vessel losing power in a very difficult position close to a lee shore. The importance of securing all gear before proceeding to sea is clearly demonstrated. Even things that swing in a seaway are just as likely to cause damage including items in the engine room.

2. A manually powered emergency air compressor is only of value if there are sufficient crew on board to operate it for long enough to fill an air bottle capable of starting a main generator.

3. The vessel had an emergency generator of sufficient output to start and run a main air compressor. This suggests that little modification would be required to install a power driven emergency air compressor supplied from the emergency switchboard.

4. A commendable level of ingenuity was demonstrated in setting up the emergency power supply to a main air compressor. The adopted solution suggests that power driven 'dead ship first start arrangements' are preferable to manually powered systems. This view is probably shared by most engineers who have used these arrangements in 'anger'.

5. With very few options available to him the master anchored. As soon as one anchor started to drag, he let go the second. The MAIB has investigated several accidents involving ships dragging onto a lee shore. Either insufficient cable was let go in the first instance, or the second anchor was let go too late, or not at all.

6. The decision to evacuate passengers and non-essential crew was sensible and nothing was lost by doing so. Had the ship gone ashore, evacuation would have been infinitely more difficult and, perhaps, more dangerous.

CASE 8
Serious Injury occurred during Loading of Gas Bottle

Narrative

The accident occurred while the deck crew of *Aintree*, a Panamanian registered liquid gas carrier, were loading the first of three 50 litre nitrogen cylinders at Fawley Oil Terminal. Although the cylinder was safely embarked, it toppled over once on deck. The valve hit the side railings and fractured. Gas at 3000 psi was suddenly released, hit one of the seamen in the chest and seriously injured him. He was rushed to Southampton General Hospital and admitted into intensive care where, fortunately, he made a full recovery.

The cylinders belonged to the vessel's fixed dry powder fire extinguishing system and had been sent ashore for refilling. Each was fitted with a valve safety cover. In addition, a valve cover fitted with a lifting eye was available on board to facilitate loading.

The loading method involved using a small swinging davit arm and a hand operated block and tackle. The crew had decided not to use the special lifting valve cover and, to make life easier for themselves, had removed the standard valve covers. They lifted each cylinder vertically with the valve uppermost and a rope secured to the base with a timber hitch and a half hitch around the body at about two thirds height. Another half hitch around the valve spindle was seen as an easy way to ensure the cylinder would not slip.

The system worked insofar as they managed to lift the cylinder up and over the side rail and onto the deck. But one cylinder did not land smoothly. It possibly landed on discarded rope from the block and tackle and, with nothing to keep it upright, it toppled over as it was untied.

The Lessons

1. Special lifting equipment to ensure cylinders can be loaded safely are there for a purpose. Use them. If for any reason they are found to be unsuitable, make sure the deficiency is drawn to someone's attention so it can be attended to.

2. Never transport a gas cylinder without first ensuring its valve safety cover is screwed in position.

3. Before every operation consider the potential for an accident and take appropriate precautions.

CASE 9
Collision in Harbour between Dredger and Yacht

Narrative

The 1,204gt dredger *Sand Swan* had completed discharging a cargo of sea-dredged aggregate in a drying out berth at Langstone Harbour and was waiting for the tide to rise sufficiently to give him enough water to sail. The master planned to leave the berth shortly before high water, having ballasted down once he had refloated.

Two hours before high water and just as *Sand Swan* was beginning to float, the terminal operator informed the master that he was to sail immediately to allow another vessel to berth in her place on the same tide.

The master had insufficient time to ballast down completely before departure and brought *Sand Swan* off the berth with a higher than normal freeboard and trimmed by the stern. She swung off the berth and entered the buoyed channel without incident but the wind caught her and set her over to the lee side of the channel where a yacht was moored. A lifebuoy bracket on the starboard quarter of *Sand Swan* snagged one of the yacht's stays and damaged its mast. *Sand Swan* also lightly grounded on the adjacent mud bank but with the rising tide she refloated a few minutes later and was able to proceed to sea without further incident.

The Lessons

1. Unless there are extenuating circumstances, the decision on whether to sail must lie with the master. There might be a valid reason why it is necessary to vacate a berth 'immediately' but the master is still responsible for ensuring this can be done safely. An assessment of the prevailing conditions: wind, tide, depth of water, own vessel characteristics, other traffic and potential hazards (including nearby yacht moorings), needs to be made. He also needs to plan his actions should something go wrong. By sailing before he had ballasted down on this occasion he was particularly vulnerable to the effects of the wind.

2. There is nothing fundamentally wrong in planning more than one movement on a water restricted berth on a single tide, but the implications should be carefully thought through and allowances made. If it cannot be done safely on one high tide, wait for the next one.

3. The master should be satisfied that all necessary on-board preparations for berthing or unberthing have been done beforehand.

Footnote

As a result of this incident, Langstone Harbour Board has drawn its wharf operators' attention to the potential dangers of scheduling more than one vessel movement per tide without taking into account all external factors such as weather and the characteristics of the vessels involved.

CASE 10
Hazardous Incident in Traffic Separation Scheme

Narrative

A 1,300gt general cargo vessel was on passage from the Medway to Antwerp and was starting to cross the Dover Strait traffic separation scheme at 8 knots and very nearly right angles on a course of 120°.

At approximately the same time a 40,000gt container ship had joined the south-west traffic lane some 4 miles to the north and steadied on a course of 215° at a speed of 14 knots. She was seen by the master of the smaller vessel who quickly assessed that a risk of collision existed. The smaller vessel was, by the 'Rules', the stand on vessel.

When the distance between both vessels had reduced to 2.75 miles and there was no sign of any avoiding action by the larger ship, the smaller ship's master reduced speed to half ahead and sounded five short and rapid blasts to attract attention.

When the distance between both vessels had reduced further to 1.5 miles the smaller ship's master stopped his engines. He was unable to alter course to starboard because of other traffic and was unwilling to alter to port in case the container vessel altered course to starboard at the last minute.

She did not, and passed ahead at a range of 5 cables.

The master of the smaller vessel called Dover Coastguard on VHF to report the encounter as a hazardous incident. The watchkeeper on board the container ship denied that any risk of collision had existed. Both ships continued on their respective passages.

The Lessons

1. This incident is described, not so much to highlight a possible breach of the regulations, but to demonstrate how those on the bridges of two separate vessels in a crossing situation can come to such very different assessments about whether a risk of collision existed. The common factor in this instance was that both vessels had altered course in the 20 minutes before the closest point of approach (CPA). One came to starboard to cross the traffic separation scheme at right angles while the other altered course to join it. Both ships were therefore having to contend with the other altering course before any risk of collision existed.

2. Very shortly after the container vessel had settled on course, the smaller one was quick to assess that risk of collision existed. Once the range had reduced to 2.75 miles (or about 10 minutes to point of potential impact) her master took such action as he judged was necessary to avert collision. He slowed down in good time.

3. The larger vessel meanwhile had seen the smaller cargo vessel. It is not known at what stage her officer of the watch began to assess whether risk of collision existed or not but by the time the range had closed to the same 2.75 miles, and about five minutes after he had steadied on his new course, we assume he had begun to think what action, if any, he should take. He would have known from both visual observation and his ARPA that the vessel on his starboard bow had a CPA to starboard and that he was passing ahead of her. He therefore judged that risk of collision did not exist and felt justified in maintaining his course and speed. Who, therefore, was right?

4. The essential lesson to be learned from this incident is not so much another homily about keeping a good lookout, assessing whether collision exists or interpreting the Rules, but a salutary

reminder to bridge watchkeepers entering, leaving or crossing a separation scheme or, indeed, approaching a planned course alteration position. Officers of the watch must take account of any other shipping that might become an embarrassment once the alteration has been made. The ship that might seem perfectly safe before the alteration could be on a collision course immediately afterwards. The sooner any such assessments can be made the better.

5. By the time the range between two vessels closes and there is any doubt at all about whether risk of collision exists, each should be watching the other very carefully indeed. If risk of collision then develops it must be identified as soon as possible and the appropriate action taken.

6. There is a second lesson. The master of the smaller vessel clearly felt that the only way he could avert a collision was to slow down when the range had closed to 2.75 miles. This is a useful point to discuss and he cannot be criticised for taking this action, but there are some who would feel this measure was premature. Once he had slowed down, the larger vessel would be watching a very different situation to that which had existed earlier and would have reacted accordingly. But the important thing here is that the stand on vessel had made an assessment, had concluded that a risk of collision existed and had done something about it.

7. It is unlikely that five short and rapid blasts on the whistle at a range in excess of 2.5 miles will be heard if the watchkeepers in the other vessel are maintaining a lookout from an enclosed bridge.

Footnote

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

CASE 11
Crew Members Injured whilst Backing Up to Rig

Narrative

The standby vessel *Grampian Highlander* was transferring cargo between oil platforms in the Forties Field.

The vessel had been working at the Forties Alpha platform the previous night but due to the weather conditions, had been forced to suspend the discharge of cargo leaving five lifts (containers) still on board. It was the intention to finish the discharge when the weather improved.

The following morning brought that improvement. The wind was a south-easterly force 4 to 5 and a moderate swell was running. At the request of the Forties Alpha platform the *Grampian Highlander* proceeded astern (backing up) towards the rig to prepare for the discharge of the remaining cargo.

Two crewmen were on deck unlashing the cargo when a large sea broke over the starboard aft quarter to wash them both, and a loose container, forward.

One crewman suffered a knock to the head and the arm of the other became momentarily trapped between a loose container and the safety barrier. As soon as he became aware of what had happened the master sounded the general alarm to summon assistance on deck. Both men were taken into the accommodation while the vessel pulled away from the platform. The man whose arm had been trapped was in severe pain and was semi-conscious. He was suffering from a severe fracture with lacerations to the arm and elbow. The other crewman was suffering from shock.

After being treated onboard by the first aider, both men were transferred ashore to Aberdeen Royal Infirmary by coastguard helicopter.

The Lessons

Backing up to a rig to load or discharge cargo is, in all but the finest weather, a dangerous business.

1. Never go out on deck and start preparing to load or discharge the cargo until the vessel is under the rig and settled in position

2. Do not venture onto the deck without instructions from the bridge to do so.

3. When on deck always wear the correct safety gear.

4. Injury can happen at any time and at the most inconvenient moment. Knowing what to do when someone is injured can save life. Although first aid training is now commonplace, anybody can find themselves in the position of being first on the scene after an incident. Do you know what to do if you are first on the scene? Or putting it another way, do you know what not to do?

CASE 12
Atmospheric Problems and a One Way Door!

Narrative

The ro-ro vessel, *European Pioneer*, was undergoing refurbishment work in Birkenhead. One of the tasks was to de-scale and recoat the vessel's two forepeak tanks.

A shore-based contractor was employed to de-scale the tanks using impressed current. Each tank had been fitted with a number of electrodes and filled with salt water. The current was then switched on and the process left for several days.

Four days later, the vessel's electrician entered the bow thruster room to carry out routine maintenance. He soon began to cough violently and attempted to leave but couldn't because the handle on the nearest door came off and he was unable to open it. Using his portable radio he called for help.

The second officer responded quickly and joined him in the bow thrust space. The door with the broken handle closed behind him. Although two other exits were available, and could have been used, they used their radios to call for further assistance. Help arrived promptly; the door was opened and both officers were able to walk from the space with no apparent long term ill-effects.

The area was immediately declared unsafe, doors were locked, notices posted and power to the impressed current system was switched off. Further work was halted while the tanks were pumped out, ventilated and the atmosphere tested.

The Lessons

1. Tank de-scaling was being carried out by contractors without the ship's staff being aware of possible side effects, or having sufficient information on which to base a reliable risk assessment. Contractors performing tasks which may be unfamiliar to ship's staff, should not be allowed to begin work until they have supplied all relevant information.

2. A defective door handle may not seem particularly important - until you are the poor unfortunate who is trapped on the wrong side and trying to get out. Any defect on board a ship should be reported, recorded and dealt with as soon as practicable.

CASE 13
Fire On Board Catamaran

Narrative

Condor 9 is a 48.7m passenger carrying catamaran operating between the Channel Islands and France. The vessel is constructed of aluminium and has two main engines in each hull. All propulsion units are duplicated, with each set independent from the other.

Shortly after leaving St Helier, Jersey, with 31 passengers and 18 crew, the fire alarm sounded indicating a fire in the starboard engine room. This was confirmed by the closed circuit television surveillance system which showed flames in the vicinity of the starboard outer main engine. The vessel was immediately stopped, all machinery in the starboard engine room was stopped and the fuel supplies shut down. Jersey Radio was informed of the situation two minutes after the alarm sounded.

After closing all ventilation openings and accounting for all personnel, halon fire smothering gas was released into the starboard engine room. This was done five minutes after the fire alarm first sounded.

The crew maintained boundary cooling and intermittently operated the sprinkler system to the affected space.

Twenty minutes after the alarm sounded the situation was considered to be under control. Using the port main engines the vessel returned to St Helier where assistance was available from shore based emergency services.

The Lessons

1. The use of closed circuit television allowed the presence of a fire to be confirmed without the need for personnel to enter the engine room. This saved time, reduced risk to crew and greatly assisted the speed of response.

2. Early release of the halon fire smothering gas into the space prevented a serious accumulation of heat, which might have resulted in serious damage to the vessel and its equipment. The closed circuit television system remained largely undamaged due to this prompt action and was available to monitor the space and the effectiveness of any actions.

3. The use of sprinkler systems was valuable not just in controlling the fire and cooling the space, but also for improving visibility by reducing smoke concentrations.

4. Boundary cooling was applied to the outer surface of starboard hull from a very early stage. The importance of this cooling on an aluminium hull must not be overlooked.

CASE 14
Lifeboat Falls 25m into Sea - Two Killed

Narrative

As part of a safety equipment survey on board the tanker *Jahre Viking* while she was lying alongside in Dubai, a totally enclosed lifeboat was being lowered when a suspension chain parted resulting in it falling 25m into the water. Two of its occupants were killed.

The lifeboat was manned by the chief officer and five others. They had embarked when the lifeboat was in its stowed position and had strapped themselves in their seats. The bosun controlled the winch locally.

The lowering operation progressed normally until the swinging arms of the davits made contact with their resting pads. At this stage one link of the suspension chain on the forward lower block failed and caused that end of the lifeboat to drop. As it swung down, the aft hook involuntarily released allowing the lifeboat to fall 25m into the water where it remained afloat, but upside down.

Four people inside the lifeboat managed to scramble clear, but two did not. They both lost their lives. Laboratory testing of the fractured chain link established that failure had occurred due to excessive brittleness leading to the creation of fine cracks in the link. These allowed the salt laden atmosphere to penetrate causing corrosion. Repeated mechanical load, together with the corrosion, caused the cracks to spread until the link was seriously weakened.

The Lessons

1. The steel from which these chains and other load bearing components within davit/lifeboat systems may be made are sometimes a high alloy type. Without proper heat treatment during manufacture this material can have brittle properties which might make them prone to cracking. These cracks are virtually impossible to detect without specialised equipment and knowledge and do not, until failure occurs, come to light. Failure can be catastrophic. Periodical load testing of these chains, independently of the davits and by a qualified person, is probably the most practical way of identifying any problem.

2. It is important that load bearing chains and links which are made from these steels are clearly identified, if for no other reason than to prevent them being subject to a routine annealing process which could adversely affect their properties. For a similar reason, excessive heating from adjacent welding or gas cutting should be strictly avoided. We acknowledge the Norwegian Maritime Directorate as the source of this article.

CASE 15
Loss of Power and Hand Steering v Narrative

Britannia Conquest, an oil rig standby vessel, was on passage from Lowestoft to Liverpool Bay via the English Channel. At 1340 when off Poole Bay, the hydraulic steering system failed. While it was being investigated, the vessel continued on passage using her aquamaster azimuth thruster as the propulsion and steering unit. At 1650, the defect on the hydraulic steering system was cleared. The aquamaster thruster stopped and the vessel reverted to normal main propulsion and steering.

At 1800, the hydraulic steering system failed once again. The master realised he would require shore assistance to rectify the problem, and diverted towards Portland using the thruster to steer by. The weather at this time was south-south-west force 5. About three hours later, the aquamaster drive unit failed due to a leaking fuel injector pipe on the power unit. This was replaced using the spare carried on board. Immediately following the engine restart, an adjacent fuel line failed causing shut down of the unit. With no fuel line spares available, the aquamaster power unit could not be used. The failure of this unit, and that of the main hydraulic steering system, left the vessel without any steering capability.

At 2155, with the weather deteriorating and no steering, the master contacted the Portland Coastguard and a "Pan Pan" message was broadcast. A tow to Portland Harbour was arranged and she arrived alongside at 0240 the following morning. The subsequent investigation found that the main hydraulic steering system failure was due to a seized shuttle valve in the main hydraulic solenoid valve block. The solenoid valve had been recently overhauled. It was thought that the "O" rings fitted to the shuttle valve were of either the wrong type or were defective. The valve had seized in such a position that hydraulic pressure by-passed the system preventing use of the hand steering.

The failure of the fuel injector pipes on the aquamaster power unit was due to vibration between two adjacent fuel pipes. This movement caused localised wear and thinning of the pipe wall. Normal fuel pressure pulsation when the power unit was operating eventually caused the pipe wall to rupture.

The Lessons

1. If, as in this case, the seizure of a shuttle valve can cause loss of the hand steering system, make sure that that this is known to those on board. Better still they should investigate the possibility of modifying the system so the unit can be by-passed leaving the hand steering operational.

2. When overhauling hydraulic systems involving moving parts with small tolerances, always ensure that the replacement parts are of the correct size, type and material. Cleanliness is essential during the overhaul and reassemble.

3. Always be aware of the possible affects of vibration on pipes, cables etc. Regular inspections of pipe and cable supports, together with their securing arrangements should be carried out.

Part 2 - Fishing Vessels

One of the most frequently reported types of accident in recent years has been the flooding and foundering of fishing vessels. One or two have involved the tragic loss of life. More often, the combined effects of good communication and the dedication of the search and rescue organisations (including fellow fishermen), have meant that most crews have been saved. The MAIB pays tribute to all those involved in such rescues.

By looking at a number of such incidents and identifying common features, it is possible to build up a picture of the most likely causes, and identify some important Lessons. Once this has been done, we do our utmost to ensure that others are aware of the circumstances, so that they can prevent the same thing happening again.

The two spaces most vulnerable to flooding are the engine room and the fish hold. Of the known causes, sea water pipe failures account for about half, with hull failures coming a close second.

The MAIB tries to analyse the significance of age to flooding and foundering. Vessels less than about 20 years old require less maintenance to ensure the integrity of hulls, pipes and valves. The older vessels are more susceptible to flooding, because the same level of maintenance is no longer adequate to prevent the type of defects that can cause flooding. By about 40 years of age, vessels are either scrapped, or extensively refurbished to bring them more in line with boats less than 20 years old. Owners and skippers of the older fishing vessels need to pay greater attention to sound maintenance

to ensure that age, and wear and tear do not become the reasons why so many fishing vessels founder. The ultimate consequence of flooding is a vessel that sinks. Of the 25 vessels lost in 1999 about 70% were the result of uncontrollable flooding. There is no reason why a well maintained vessel should sink if the flooding can be contained to a single compartment. Too often we find that the bulkheads between compartments are not watertight. Water flooding into one compartment seeps into the next. Bulkheads in wooden vessels are not required to be watertight but in steel built boats they are. Watertight integrity will be far more effective if all bulkheads are properly maintained.

But no matter what the cause of flooding, a major shortcoming in too many vessels is the state of, or lack of, bilge alarms in the engine room. We hear, over and over again, that the crew are seemingly unaware that the engine room is flooding until it is too late. Had the alarm sounded as designed when the flooding was first detectable, adequate action could have been taken to save lives and the vessel. We often find the alarm has been landed for repair and not replaced, or was known to be defective and due to be looked at 'next time in harbour', or even assumed to be correct but was never tested. We even hear of some that have been muted because the noise was 'irritating'. In each case the epitaph is the same. If only ...

Bilge alarms matter. Test them daily; and make sure they work.

CASE 16
Purchaser Beware!

Narrative

Fv Cracker, an under 12m fishing vessel, was working about 80 miles off the west coast of Scotland when a rope fouled the propeller. While attempting to clear the obstruction, the main engine gear box drive failed. With all propulsion lost, the fishing gear was retrieved, a line passed to another nearby fishing boat, and the vessel towed to port for repairs.

On examination, all three bolts securing the gearbox flange to the main engine drive shaft were found to have sheared. The condition of the two broken bolts showed that they had sheared some time before the incident and that the main engine drive shaft had been transmitting engine power on the one remaining bolt. This bolt had in turn sheared while manoeuvring the vessel astern to free the rope from the propeller. It was found that the vessel had been involved in a previous accident involving a fouled propeller and it is probable that during that incident, the three drive plate bolts had been stressed. Subsequently, after the boat had been sold to the new owners, the stressed drive bolts broke.

Following the incident, the main engine drive plate bolts were renewed and all main engine, gear box, and line shaft mountings checked. Shaft alignment was checked and a rope cutter fitted to the propeller.

Over the next few months, various flexible engine mounts required replacement ending with another complete loss of drive in December 1998. Inspection showed that again three mounting bolts had sheared. Further investigation found that when running, engaging the forward or aft gears caused considerable fore and aft engine movement.

To counter this movement, the engine mountings were replaced with mountings designed to a substantially higher specification. Since this change, there have been no further problems with sheared mountings. A side product of this solution, was that a succession of unexplained coolant pipe and oil pipe leaks had stopped, suggesting that the engine movement was the cause.

The Lessons

1. When you purchase a second-hand boat or any machinery item ALWAYS ask if it has been involved in an accident, what the accident was, and what repairs etc were carried out. The records of the vessel and machinery should be examined for evidence of regular maintenance, repairs and renewals.

2. A pre-purchase inspection of the vessel and its machinery by a competent fishing vessel surveyor can save both time and money in the long run as well as ensuring that the vessel is safe to operate. Do see it afloat, and test both engine and gearbox.

3. It is well to remember that buying a second-hand boat is like buying a second-hand car - do not believe everything you are told and CHECK everything. Your life, and that of your crew, may depend on it.

CASE 17
Loss of Another Fishing Vessel

Narrative

The 24.2m seine trawler Rosemount II built in 1975, was pair fishing with another seine net trawler Morning Star. Visibility was poor with fog descending. She had a crew of seven and was just about to haul when flooding was discovered in her engine room. A member of the crew had gone below to start an engine to provide power when he discovered the flooding with the water level already above the floor plates. The bilge alarm had not operated. The coastguard were alerted via a North Sea Platform. Because of the poor visibility, a rescue helicopter was unable to deliver a salvage pump.

As the flooding continued and spread to the aft cabin, the crew transferred to Morning Star. It was only then that the skipper realised he did not know who among his crew had ever attended a survival course.

The vessel sank about five and a half hours after the flooding had first been discovered. Before this trip the vessel had been slipped to have the stern tube seals replaced and a cooling water sea cock fitted.

The Lessons

This type of accident is all too common. An apparently well found vessel sinks for no clearly defined reason. It is easy to speculate about the causes, and many will have their own theory about what happened. The following is known: the source of the flooding was in the engine room, it was uncontrolled, it was discovered too late for it to be contained and the bilge alarm did not function. Bad weather prevented a helicopter flying in a salvage pump and the crew were forced to abandon ship. They were lucky; there was time to do it in an orderly fashion and there was another trawler close by to embark them. The Lessons must therefore focus on what is known.

1. Although flooding in an engine room can occur as a result of a leak in the hull or the failure of a stern gland, the more usual source is the failure of pipework carrying seawater and the inability to isolate it. In this instance there is no evidence to suggest that the work carried out on any underwater fitting before this particular trip had anything to do with the cause, but skippers are advised to pay particular attention to all pipes carrying seawater and have them, and the seacocks, very regularly checked and surveyed.

2 On the first trip to sea after slipping for underwater work, be meticulous in carrying out checks on whatever work has been done. It is far better that any defect is identified as soon as possible rather than discover the hard way once far from ready help.

3. A working bilge alarm is among the most important items of equipment carried on board a fishing vessel. It is your silent watchkeeper in unmanned spaces. If it is landed for repair, is defective or switched off, it is totally useless. It should be routinely checked for correct operation on a regular basis. Early detection of flooding greatly increases the chances of containing the problem and saving the vessel. There is a useful MGN worth reading No 49 (F). For those who may not be familiar with these notices issued by the Maritime and Coastguard Agency, this is probably a good starting point.

4. As a mental exercise, any crew member of a fishing vessel might care to think how he would isolate a seawater service pipe if it failed. The correct answer might save his vessel, and more important, the lives of all onboard.

5. Rescue helicopters play an enormous part in saving life around our coasts, but they have their limitations. Carrying salvage pumps in fog is one of them. Never assume the helicopter will solve all your problems. They have been phenomenally successful and will contrive to provide assistance wherever they can, but for planning purposes assume you are on your own.

6. The only certainty about abandoning ship is the lack of notice. Many, many mariners, and especially fishermen, have had cause to be grateful for attending a survival course. Once again, knowledge about what to do in such circumstances can be the difference between life and death. It is far too late to be thinking about it as your vessel sinks beneath you. Owners and skippers should encourage everyone to attend such courses. It could be the difference between surviving and a grieving next-of-kin.

CASE 18
Collision between Coaster and Fishing Vessel

Narrative

Gert Jan de Ridder, a 33m fishing vessel was beam trawling in the North Sea and towing in a north-westerly direction with the correct lights displayed. The wind was southerly force 4 to 5 and the visibility was good.

The 465gt Danish coaster *Othonia* was on a westerly heading on passage from Frederickshavn to Aberdeen. The mate was on watch and saw a cluster of lights about 5 miles ahead and some 10° on his port bow. He thought they might have belonged to a fishing vessel but because he was unable to make out any specific lights to verify this, he was unsure.

The fishing vessel's watchkeeper detected a ship approaching from the east when its range was 3 miles. It was *Othonia*. Realising he was the stand-on vessel, he maintained his course and speed. When the range had closed to 1 mile he called on the VHF to establish the approaching vessel's intentions. There was no reply, and because he was unsure whether she was going to pass ahead or astern, decided to maintain his course and speed.

Meanwhile, *Othonia*'s mate took avoiding action and altered course 15° to starboard. When he estimated the range had closed to about half a mile he went to the bridge wing to get a better view, assumed he would pass ahead of her and returned to the wheelhouse to check the course.

On board the fishing vessel the watchkeeper had realised that a collision was imminent and put the helm hard over to port to avert it. It was too late and shortly afterwards *Othonia* hit the fishing vessel's starboard quarter, raked down her starboard side and snagged a fishing boom. The two vessels became entangled. One of the beam's supporting stays eventually parted allowing *Othonia* to break free.

After the collision, radio contact was established. Damage to both vessels was limited and there was no pollution. After standing by for a short period *Othonia* continued on passage while *Gert Jan de Ridder* hauled her fishing gear and then made for Harlingen to carry out repairs.

The Lessons

1. This was another typical incident involving two ships where too many assumptions were made. Under the Collision Regulations *Othonia* was the give-way vessel; *Gert Jan de Ridder* was engaged in fishing. How the coaster's mate failed to recognise the lights of a fishing vessel is not clear, but many of us who have kept bridge watches can recall instances when trying to pick out the navigation lights of a vessel engaged in fishing and find it is not as straight forward as the text books would have us believe. If the coaster's mate was unsure whether the other vessel was a fishing vessel, he should have assumed she was and taken effective avoiding action. In any event he should have taken early measures to establish whether risk of collision existed. Leaving such action to when the range had closed to within a mile was far too late.

2. Identifying navigation lights at night is one occasion when a good set of binoculars can be crucial. Early recognition of what is being displayed is important enough, but even if the uncertainty remains, it is essential that an assessment of the risk of collision be made. A steady, or nearly steady, compass bearing should alert even the least experienced watchkeeper to the possibility that a collision, or a very near miss, will follow if nothing is done about it.

3. When trying to avert a collision with a vessel less than a mile away, a course alteration of 15° is totally inadequate. Positive avoiding action should have been taken much earlier and watchkeepers should need little reminding that any alteration of course (or speed) must be sufficiently bold to be readily apparent to the officer of the watch in the other vessel.

4. Fishermen should be aware that working lights can be confusing. They can also interfere with the keeping of a good lookout. If they are not required to be on between hauls, they should be switched off and it will pay dividends to check that they do not interfere with the effectiveness of the navigation lights. And just in case anybody has forgotten there is a reference to all this in the 'Rules'. *"The Rules concerning lights shall be complied with from sunset to sunrise and during such times no other lights shall be exhibited, except such lights as cannot be mistaken for the lights specified in these Rules or do not impair their visibility or distinctive character, or interfere with the keeping of a proper lookout."*

CASE 19
Hooked-back Engine Room Door causes Loss of Vessel

Narrative

The 31m long beam trawler *De Kaper* was fishing 30 miles off the Danish port of Hanstholm when at 0222, a fire alarm on the bridge indicated a fire in the engine room. The watchkeeper went below immediately to investigate but was unable to get close to the engine room entrance because of smoke in the accommodation. It had been the habit on board to keep the engine room door hooked back open as it was heavy and awkward to handle in the confines of the accommodation alleyway.

The remaining four crew were roused quickly and, using a hose and extinguishers, they tried to close the door which, by this time, was engulfed in flames. They were unable to do so.

The fire, which was fed by fuel oil from the nearby daily service tank, and fanned by air from open external doors, spread rapidly to the accommodation and the wheelhouse. Much of these spaces were destroyed.

The vessel had been fitted with emergency fuel trips and halon gas fire smothering equipment, but neither could be reached. They were located in the accommodation immediately outside the engine room entrance and close to the seat of the fire.

With the fire completely out of control, the crew launched a liferaft and retreated to the foredeck. The EPIRB was activated and distress rockets were fired. When a nearby fishing vessel was seen approaching they abandoned the blazing *De Kaper* and drifted in the liferaft towards her. Their rescuers took them to Hanstholm where they were all landed safely.

Crews from other vessels later extinguished the fire and *De Kaper* was towed into port where she was declared a constructive total loss.

Examination of the vessel by the MAIB indicated the probable cause of the fire was a faulty battery charger. A small initial fire spread to the vicinity of the daily service tank where a faulty closing valve on the tank's contents gauge allowed fuel to feed the flames.

De Kaper had transferred on to the British register in 1993 having been built and first registered in Belgium in 1985. At the time of the transfer she was granted exemption from compliance with several sections of the Fishing Vessel (Safety Provision) Rules 1975. Of particular relevance to this accident, the MAIB found she was exempted from full compliance with several structural fire protection requirements which are designed to contain and limit the speed and spread of a fire.

The Lessons

1. Given a ready supply of fuel and air and no boundary, a fire will spread very rapidly. There is every prospect it will get out of control before a fire fighting party can be mustered.

2. Good operational management against the ever present risk of fire entails maintaining the integrity of the structural fire boundaries at all times and, in the event of a fire, rapidly starving it of fuel and air.

3. It is particularly important, given the high risk of fire in the engine room, to keep the engine room door(s) closed at all times.

4. Good maintenance and cleanliness in the engine room will help to minimise the risk of fire.

CASE 20
Corroded Pipework causes Flooding of a Fishing Vessel

Narrative

The 23m steel trawler *Ocean Hunter* was heading for fishing grounds in good weather.

When she was about 25 miles east-south-east of Peterhead the driver (engineer) found water spraying from a bad leak in the elbow of a section of pipe to the starboard bilge pump. He shut the valves to that section of piping to stop the leak and told the skipper. The skipper decided to return to port to have the pipe repaired.

Soon afterwards the engine room bilge alarm went off. Are turn visit to the engine room revealed that the main sea water inlet pipe had fractured at a flange. The flooding was isolated by closing the appropriate valves but because this led to the loss of sea water cooling, the main engine had to be shut down.

Apart from water spraying onto the nearby starboard generator and putting it out of action, there was no other damage. The engine room was quickly pumped dry using the port, auxiliary engine driven, bilge pump. With no main engine, *Ocean Hunter* was towed back to port by another fishing vessel without further incident.

The Lessons

1. The well located and effective bilge alarm gave early warning of the flooding and prevented serious damage to the main engine and gearbox.

2. The driver had many years of experience, including 3 years on *Ocean Hunter*, so was able to identify the problem and take the appropriate corrective action very quickly. Good ship knowledge paid dividends.

3. The pipes failed because they had been severely weakened by corrosion. On one length of pipe there was already a temporary repair which indicated that corrosion was becoming a problem and that a closer and more extensive inspection was required (see photograph).

Footnote

Flooding of engine rooms in fishing vessels is not new. There is increasing evidence to indicate that corroded pipework is very often the cause. If there is any doubt at all about the integrity of such pipework, or the isolating valves, have them properly surveyed. If corroded, damaged or defective, get them professionally repaired or, better still, replaced.

CASE 21
Entrapped Water causes a Small Fishing Vessel to Capsize

Narrative

The 7m open dory type boat *Fleetwing* was hauling pots about 2 miles off the Butt of Lewis when water started to pour in over the stern. She capsized very shortly afterwards.

The eleven year old boat had a small wheelhouse forward and a working deck aft for stowing pots. She was operating about 1.5 miles offshore in fine weather. Winds were southerly force 2 to 3, gusting 4 to 5. There were eleven boxes of crabs on board.

The crew of two had completed lifting, re-baiting and setting four fleets of 20 pots. The 5th fleet of pots became tangled as it was being lifted and took the crew about 20 minutes to clear. Soon afterwards they noticed water beginning to pour in over the stern. When the skipper went aft to investigate, the dory began to sink and then capsize. The crew climbed onto the upturned hull where they were spotted from the shore by a member of the public who informed the coastguard. They were rescued by a helicopter about 1and a 1/2 hours later.

The boat capsized so quickly that there was insufficient time to collect the lifejackets, radio, or flares from the wheelhouse.

The boat and engine were later recovered and, when righted, she floated with a list caused by water trapped between the outer hull and the inner moulding. (The boat is constructed with a GRP moulded hull, and a GRP inner moulding laid inside the hull to form the inner sides and deck. There is a space between the mouldings in which water can collect if the watertight integrity is breached). This additional water had increased the load in the boat and reduced the boat's freeboard.

An accident involving a very similar type of boat occurred recently on a Scottish loch. Unknown to the occupants, water had become trapped between the inner and outer mouldings. The occupants put out in marginal weather and, with its much reduced freeboard, the boat was soon swamped. Three people lost their lives. None of them were wearing lifejackets.

The Lessons

1. In this instance the dory was overloaded with an unknown quantity of water trapped between the hulls.

2. Large ships have draught marks and load lines. Very small craft do not need them but they do rely on the crew having an instinctive feel for when something is not right or looks wrong. If the freeboard somehow feels less than usual, or she is shipping more water in moderate conditions, the crew should be asking why? There may be no obvious answer, but if the hull construction involves an inner and outer moulding, suspect the worst - and return to harbour without delay. Operators of these types of boats should keep a check for any unexplained change of freeboard or angles of heel. They should also check for damage to the GRP hull and any leaks from the boat and rock the boat listening for water sloshing when she is beached, slipped or put on a trailer.

3. The crew of *Fleetwing* survived. Many do not. As in so many instances the sinking was so fast that there was no time to collect lifejackets, flares or portable GPS. The difference between life and death very often boils down to whether the crew were wearing lifejackets when on deck, wearing suitable clothing and had a means of attracting attention. The skipper of this craft recommends fishermen carry personal EPIRBs.

4. The chances of survival are greatly increased if the occupants of an upturned boat are able to remain with it. It is much easier to see and locate than a man swimming.

CASE 22
Loss of a Small Clam Dredger

Narrative

The small clam dredger *Equinox* was fishing about 2 miles west of the port of Ayr one evening. The weather was good with light airs and a slight sea. She was normally operated with a crew of two but, on this occasion, five were embarked. The fishing gear was shot and hauled twice without incident. On the third occasion the port gear snagged on the bottom.

The propeller was disengaged and power was supplied to the winch to pull in the warps. This moved the vessel over the dredges. The starboard dredge was hauled in but the port dredge remained tight on the bottom. Both sets of gear were towed from outriggers just above the bulwarks but were lifted inboard using a gantry. When the starboard gear reached the surface it was connected to the lifting tackle. When it was lifted, the tackle broke and the starboard gear ran away under its own weight. One of the crew then climbed up the gantry to try and repair it.

When the starboard gear reached the seabed its weight was released from the starboard outrigger. The warp to the port gear remained tight with the gear still snagged on the bottom. Given this force, the craft rolled to port, but because one of the crew had climbed the gantry the stability was much reduced. Furthermore, the additional weight of three extra people had reduced the freeboard to an estimated 3 inches. As she started to heel, water began to pour in through the deck scuppers and found its way to non-watertight openings on deck. With the low freeboard, flooding starting to take place and given the inherent poor stability, the heel continued. She capsized.

She sank shortly afterwards and all five crew ended up in the water without any lifesaving equipment. There had been no time to don the two lifejackets which were kept on board. One of the crew managed to swim ashore. The others lost their lives.

The Lessons

1. Many will draw their own conclusions about The Lessons to be learned from this tragic accident, but one of the underlying causes can be traced to a change of ownership and the decision to change the method of fishing. This vessel had fished successfully for many years under previous owners when she had been rigged for single beam dredging. She then changed hands and the new owner altered the method of fishing to twin beam dredging and made a number of modifications; additional weight was added. The modifications increased her fishing capacity but reduced her stability and reserve of buoyancy. The original freeboard was about 305mm (1 foot) but following the modifications, had come down to about 76mm (3 inches). She was no longer safe and several people who saw the modifications thought she was unseaworthy.

2. An increase in fishing capacity is not worth it if the result is an unsafe vessel. Modifying a fishing vessel, changing its type of fishing or adding top weight through additional equipment is potentially dangerous, especially if weights have to be lifted from high points or the freeboard is reduced. Fishing vessels under 12m in length are not required to meet any statutory criteria for stability which places an even greater responsibility on owners and skippers to ensure their vessels are safe. It is irresponsible to take a vessel to sea that is obviously unseaworthy. Owners of fishing vessels should seek professional guidance before undertaking modifications. Merchant Shipping Notice No 989 gives further advice.

3. Increasing the number of people on board in these circumstances does nothing to improve matters.

4. No vessel, regardless of size, should ever go to sea without sufficient life saving equipment for all on board.

5. Once again, four men lost their lives leaving families and friends to mourn. Had they been wearing lifejackets while working on deck, their chances of survival would have been greatly increased.

6. The astute reader will also be wondering about the tackle that broke. Gear does break from time to time, but skippers learn to recognise when it is time to change damaged, worn or rusty equipment on board. There is no evidence to suggest what, if anything, was wrong with the equipment in this vessel but the point will not be lost on those who rely on sound gear to pursue an already hazardous occupation.

Footnotes

The MAIB has noted the relatively high percentage of accidents that occur to fishing vessels that have just changed hands and where modifications have taken place. In practically every instance a desire to increase the fishing capacity with the consequent addition of topweight and the reduction of stability has been an underlying cause of the accident that soon followed.

Many fishermen still do not realise that there are many lifejackets available on the market that can be comfortably worn while working on deck. The MAIB is beginning to receive a number of reports from skippers and owners who insist that their crews now wear them. The common denominator in nearly all these reports is that the policy change has been made following the loss of a member of a colleague through drowning. The point the MAIB wishes to put across is that we are convinced that most families wish crews would adopt this policy before somebody else loses his life.

CASE 23
Collision between a Scalloper and an Angling Boat

Narrative

In this incident two vessels collided in good visibility about a mile north of the entrance to the port of Workington.

A lone angler was rod fishing from his anchored 5.8m long, fibre glass constructed boat *Dawn Run.* He saw a fishing boat approaching him and assumed it would keep clear. He then caught a fish and became preoccupied with landing it. The fishing boat was about 2 miles away.

Border Lassie a 12.13m trawler/scalloper was returning to Maryport from her fishing grounds. She was heading north-north-east and making good just over five knots. Her skipper saw a buoy and two boats ahead of him. He also held them on his radar which had a guard ring in operation. The guard ring alarmed and the skipper assumed it had been activated by the boats he had already detected. At this juncture one of his crew called for the deck wash to be put on. Satisfied that there was nothing ahead, the skipper engaged the automatic pilot and went below to the engine room. Before he could return, there was an ominous thump. He had hit something.

A moment or two earlier the angler had looked up and realised he was just about to be run down by an unknown fishing boat. He jumped overboard just before the impact. His boat did not survive and sank very quickly. He was picked up by the scalloper.

The Lessons

1. Safety at sea depends, very largely, on the keeping of a good lookout. It is all too easy to be distracted or to assume your radar has detected everything. Keeping a good lookout is not easy to do for long periods and radar helps but, ultimately, it involves seeing things by eye.

2. The text books will say the wheelhouse must be manned at all times. The 'Rules' are uncompromising; " *every vessel shall at all times, maintain a proper look-out ...*" No marine accident inspector would ever advocate anything else. Examiners would get out their red pens if you were to even suggest otherwise but, to be realistic, there are occasions in small craft when it is possible to safely interrupt the keeping of a constant lookout. The art is knowing how to do it and when.

3. You can never leave the lookout for long but, providing certain precautions are taken, it is possible to go below to shake your relief, find out why the bilge alarm has gone off, visit the heads, secure some loose gear on deck or even start the deck wash. The trick is knowing how long you can be away and then return *before* that time has expired. In the open sea it depends on several factors: your speed, visibility, ability to see things and the proximity of other vessels. If you are *absolutely* sure there is nothing within, say 5 miles, you can be confident that nobody will run you down, or you will hit anybody else within, say, three minutes. You can therefore interrupt the lookout for that time but, and it is a big but, you must ensure your absence is for no longer. You must, at all costs, resist the temptation to make it four minutes or more. Closer inshore any interruption to keeping a lookout must be very short indeed. Fishing net and pot markers, small craft and even swimmers can be hard to see until the last moment.

4. If, however, you are not sure you have seen everything, or the visibility has reduced, you should be very wary of leaving the wheelhouse unless there is an emergency. Remember that if your height of eye is low, or the boat's structure inhibits a good all-round look, or you are unsure how far

away other vessels are or what their relative movements are, you are not in a position to say there is nothing around. There may, for example, be a small angling boat with a single occupant catching a fish. If you must leave the wheelhouse in such circumstances, get someone to relieve you.

5. Radar is an aid, and a very good one. Its performance is dependent on knowing how to use it, being properly tuned, set to an appropriate range scale, the height of the aerial, the prevailing sea state and the echoing area of targets. Some small vessels do not show up well and if there is any suggestion that you are in an area where they operate, it is doubly important that you maintain a very thorough *visual* lookout as well. Small fibreglass built yachts and fishing boats can produce very poor radar returns. And never assume the guard alarm has sounded for the contact you can see. It might have been for a very much smaller echo at close range.

6. If you are the owner of a small craft such as a yacht or angling boat and you are operating offshore, you can help other vessels by fitting an effective radar reflector. They enhance echo returns and their use is strongly recommended.

Footnote

Guidance on fitting radar reflectors is provided in Merchant Shipping Notice No M.1638.

CASE 24
Cook Falls on Conveyor Belt - Fractures Ankle and Leg

Narrative

The crew of the 22.55m seine netter *Renown* were stowing fish in the hold. In the fish processing area on the deck above, the cook wanted to clear remaining fish from the holding bins. To achieve this he decided to stand on the stationary conveyor belt situated just below them. The boat rolled, he lost his footing and fell onto the conveyor belt's control handle which activated the hydraulic operating system. The belt started to move and he found himself being drawn forwards until his legs became trapped. Because his back was keeping the handle in the "on" position, and he was out of sight and hearing of the rest of the crew, the belt stopped only when it reached the power cut-off pressure of 175.8 kg cm 2. He was badly injured and fractured his right ankle and leg.

The fish handling system had been fitted the week before the accident occurred. The control handle was fitted to the side of the conveyor belt so it could be operated by the crew when gutting fish. Since the accident a number of safety measures have been introduced:

1. The control handle has been moved and a protective guard fitted.

2. To ensure the holding bins can be readily emptied, their inner shapes have been altered and a series of pipes have been fitted to supply running water.

3. A monitoring camera has been fitted in the wheelhouse so that the skipper can see what is happening and can, if necessary, shut off the power remotely.

The Lessons

1. It was dangerous and totally unnecessary to stand on the conveyor belt to clear fish from the holding bins. A deck wash hose would have been just as effective.

2. While the measures taken to prevent such an accident happening again are sound, they were only put in place after one of the crew was badly injured.

3. It is all too easy to remind fishermen that a full risk assessment of the fish processing area should have been carried out after installing new equipment. The MAIB know there are still many who are unconvinced by the need for such assessments, arguing they haven't the time to do it, or that they are unable to foresee a potential accident such as this. The whole purpose of risk assessment is to prevent accidents. Had the precautions listed above been implemented as the result of such an assessment, one man would not have been so unnecessarily injured.

CASE 25
Loss of a Small Crabber

Narrative

The single handed potter *Flying Fisher* was fishing off Trebarwith Strand in Cornwall at about midday. The wind was force 4 to 5 westerly and the visibility was good. She had sailed from Padstow about three hours before the incident.

The skipper was hauling his crab pots and stowing them on board. The number coming onboard gradually led to the draught increasing until such time that the transom drain holes submerged. More pots were hauled and water started to flow inboard. She was by now badly overloaded and the water level was rising. The battery powered bilge pump was used, unsuccessfully, to clear the flooding. Realising he had a problem, the skipper started to throw his pots overboard to increase the draught, but as he did so, the craft began to heel in the strong tide when the rope attached to the pots came tight. The list increased and shortly afterwards she capsized. The skipper found himself in the water without a lifejacket.

He managed to climb on top of the upturned boat and hang onto a rope. He was lucky. A German couple ashore saw what had happened and alerted the coastguard. This wasn't easy as their English wasn't very good. The local RNLI inshore lifeboat arrived about 15 minutes after the incident and successfully rescued the skipper. He was tiring rapidly.

There had been a lifejacket on board, but the skipper had not had time to don it.

The potter was recovered but there was extensive damage to the electrics and engine. It is unlikely she will be repaired.

The Lessons

1. This is what can happen when a small fishing boat is overloaded.

2. Transom drain holes are designed to let water out, not in. Potter skippers should know what the freeboard aft is and never load so that the drain holes submerge.

3. At the risk of labouring the point yet again this incident has shown that it is not sufficient to merely carry a lifejacket somewhere on board. Often there is not enough time to collect it once the capsize has started. Fishermen, and most especially those working on their own, are very strongly advised to wear a lifejacket whenever they are on deck at sea. Working lifejackets do exist nowadays. Wear one.

4. This survivor was lucky, but he was very tired after just 15 minutes clinging to the hull of an upturned boat. Imagine what it would be like with nothing to hold on to.

CASE 26
Problems Opening the Engine Hatch on a Flooded Small Fishing Vessel

Narrative

The 6.5m long open boat *St Ebba II*I was used for catching lobsters. The skipper was working on his own and while transferring pots one day, he realised his craft was behaving sluggishly. It felt heavy. He instinctively knew he was taking water and needed to gain access to the engine space to find out what was happening. But he was unable to open the engine hatch because of the number of creels stacked on top of it.

He decided that the only way to gain access in a hurry was to throw the creels overboard. He did so and opened the hatch to discover that a hose had come off a sea-cock. He stopped the flooding by closing the valve and then pumped the vessel dry.

He made a temporary repair and returned to port safely. The problem had been caused by the failure of the clip connecting the hose to the sea-cock. It had corroded and broken. It was replaced with a stainless steel clip.

The Lessons

1. Engine spaces which do not have bilge alarms should be regularly checked for ingress of water. A visual check of the sea water system at the same time should be instinctive.

2. The installation of a bilge alarm would provide a much earlier warning of flooding. Where one is fitted it is important to test it daily by manually lifting the float.

3. Always use corrosion resistant clips to secure hoses and, on connections to seacocks, use two clips.

4. Skippers are the best judges of where to stow essential gear but, before loading creels onto engine hatches, they can usefully reflect on The Lessons of this incident.

Part 3 - Leisure Craft

This edition focuses on two events with very different outcomes. In one there was tragic loss of life. Inthe other, a potential disaster was averted by the organisers of a dinghy race having a plan to dealwith an emergency.

In both cases the actual events were unforeseen. Such is the way with accidents. We can rarelypredict the precise nature of a tragedy and most people take basic precautions to avoid one. But as sooften happens, it isn't until something goes badly wrong that all the shortcomings and the unforeseenhazards come to light. The role of the accident investigator is to find these, and ensure the lessons areidentified and promulgated. Lessons buried deep in an official report gathering dust in someone'scupboard are useless. We do our best to bring the lessons to as wide a readership as possible so thatothers can review their own procedures and modify them if appropriate.

A marine incident is, in many ways, unlike those elsewhere. It comes in two parts, the actual incidentand then what happens afterwards. The initial event could be a grounding, collision, fire or manoverboard, while the follow-up will embrace how it is handled. An accident ashore will usually seethe emergency services on hand, with relatively little delay to deal with the consequences. At sea,those involved in the original incident often have to cope with the aftermath without outsideassistance. It matters not if the vessel concerned is a large cargo carrier or a 10m yacht. Scrutiny ofthis second phase is often as crucial for improving safety at sea as identifying the causes of the first,and the MAIB is just as likely to focus on how a mishap is handled as identifying the causes.

The events that occurred in Weymouth Bay in early June 1999 were such an occasion. Severaldinghies were knocked down in a squall during a championship, but a major tragedy was averted.Much that happened that day went well. We believe the lessons to come out of a successful operationare every bit as valuable as when things go wrong.

We are sometimes asked what we can do to prevent collisions, or near collisions, between yachts and other vessels in the open sea. The questions invariably come from yachtsmen who are convinced that the standard of lookout on board many merchant ships is either appalling or non existent. The MAIB receives the occasional report of such occurrences, but we do not have any incident that can be used to bring out all the lessons. We believe the issue is sufficiently important to justify the publication of a different type of Safety Digest article and we include it for this edition. **The last item in this edition is not based on a single event**. It is published as a 'think piece' for yachtsmen to ponder. The article does not pretend to have all the answers, but it might do something to prevent a very frightening collision occurring in the future.

CASE 27
Young Woman Killed when Day-Boat Capsizes

Narrative

A group of 15 people were on a week long activity based team-building course organised by the Prince's Trust, Slough. As part of the course, the group of 12 volunteers and three team leaders/assistants, undertook a day of sailing in Milford Haven led by five instructors employed by the Trust.

The group left Neyland Marina at about 1230 on 3 February in four 6.1m Explorer II ketch rigged open day-boats. Each had five people on board, at least one of whom was an instructor. The boats were rigged and equipped with an outboard motor, crutches and oars. The weather was fine with a moderate westerly breeze. The outboard motors were used for the first part of the day to enable the volunteers to gain experience in boat handling. After a picnic lunch the crews in two of the boats motored across the Haven to Carr Flats where they prepared to sail back to the marina.

The mizzen sail was hoisted on one of the boats as she motored slowly into wind. While preparing to set the jib some water lopped over the port gunwale, prompting the crew to move quickly to starboard to avoid getting wet. The boat heeled to starboard and started to ship water. The situation was possibly aggravated by wind filling the mizzen sail. The boat capsized.

The instructor and volunteers were thrown into the water. The instructor attempted to right the boat but, after lying on its side for a few moments, it inverted. As it did so one of the crutches possibly snagged the buoyancy aid of one of the volunteers, a young woman, who had found herself between the two masts. She was pulled down and held under water beneath the upturned hull. As the boat inverted the centerboard slid into its housing, frustrating further attempts to right it.

Despite strenuous and prolonged attempts by two instructors (the other boat had come to their assistance) they were unable to free the victim.

The accident was witnessed from the beach by two fishermen who ran to their boat where they set off a distress rocket. A harbour authority launch came to assist and managed to attach a line to the rigging and right the boat. As it came upright the unconscious woman slipped out of her buoyancy aid and began to float away. One of the instructors began in-water mouth-to-mouth resuscitation. She was recovered to an inflatable boat which had also come to their assistance and resuscitation attempts continued as she was taken ashore to a waiting ambulance. Despite their efforts they were unable to save her; she was later pronounced dead.

The Lessons

1. The boats had been modified to enable them to be rowed. The crutches were mounted through the gunwale capping outboard of the hull and were secured with split pins. This made their shipping and removal slow and awkward and it had become the accepted practice to leave them permanently in place. By leaving them in situ they had become a snagging hazard for mooring lines, sheets and other rigging; were vulnerable when coming alongside pontoons or other craft and provided a means whereby people could fall or trip over them. They could also snag clothing or lifejackets in the event of a capsize. Crutches should always be unshipped when not in use.

2. Explorer II, like many open day-boats of similar size, is neither a very stable keel boat nor a light buoyant dinghy. Such boats can and will, on occasions, capsize. 3. Open day-boats are unlike

lighter dinghies, difficult to right by the crew if they capsize. Some have a tendency to invert which makes righting them even more awkward without assistance from another craft.

4. Distributing weight evenly for the conditions is part of sailing and novices must be briefed about what to expect and what to avoid. From time to time water will be shipped and people will get wet. They must expect this.

5. As part of the investigation an Explorer II was capsized intentionally. When inverted she sank slowly by the stern. This was because the after stowage lockers were not watertight. When she was righted the water level in the cockpit was above the top of the outboard engine well and made bailing impossible. Other open day-boats share this characteristic and appropriate measures should be taken to provide additional buoyancy. Such measures should also include providing a means of buoyancy on the mast to prevent inversion in the event of a capsize

6. Before purchasing a boat, look for the European Standards plate marked CE which will provide information on loading and power limitations.

CASE 28
Catamarans Capsize in Weymouth Bay - Everybody Saved

Narrative

While competing in the International Dart 18 Championships in Weymouth Bay on 2 June 1999, many catamarans were hit by a line squall and capsized within a short space of time. 77 boats had set out for the race but several had retired before the squall struck. A sizeable rescue operation had to be mounted but at least 25 boats were able to return to shore without assistance. By the end of the day all 156 competitors were safe and only one person, a volunteer in one of the rescue boats, was admitted to hospital suffering from sea sickness and possible hypothermia.

The forecast for the event was for freshening south west winds force 4 to 5 and strengthening to 30 knots later in the day but, although the weather pattern had been unstable over the preceding days, there were no signs of thunderstorms prior to the event.

As part of the championship safety preparations, each boat was issued with a clear identification (tally) number that was stuck prominently on both port and starboard hulls. Each boat had a set 'parking space' on the beach with this same number and had to use the tally system when checking in and out with the beachmaster for each race. All competitors were required to wear lifejackets. They were, as a matter of course, wearing suitable and sensible clothing.

The race organisers briefed the emergency services before the event. This included the coastguard, ambulance service and the Weymouth police, but the information was not relayed to Police Headquarters.

Although not a requirement to carry flares, many boats did so and this helped to raise the alarm. Flares were successfully used by one competitor when his crew became separated from the boat.

A major problem was that some of the catamarans could not tack back towards the shore in the prevailing conditions and became scattered over a very wide area before capsizing.

Five safety boats were in attendance, in addition to a committee boat and five keelboats. Although the race organisers were confident they had provided sufficient numbers of craft for normal circumstances (the RYA recommends one rescue boat for every 15 boats competing), they very rapidly assessed that the magnitude of the incident was beyond their immediate resources and did not hesitate to call for additional assistance.

The coastguard came to the same conclusion and not only dispatched the local lifeboats and the coastguard helicopter, but also broadcast a 'Mayday' to ensure as many rescue assets could be deployed in the minimum of time. The response to the situation and the rescue was successful.

There was no hesitation on the part of those responsible for organising the race that the overriding priority was the safety of personnel, with boat recovery taking second place. Although many of the capsized craft were towed to safety by their crews, local fishermen and other craft, some drifted down tide to be washed ashore. Several sustained extensive damage before they could be recovered. Survivors were prepared to leave their boats when asked to do so by the lifeboat crews and this greatly aided the success of the rescue operation.

The smallest of the rescue craft, a 4m RIB, was found to be unsuitable in the prevailing conditions.

The 'tally' system provided a simple and effective means of accounting for people even though many of them landed up far from the regatta headquarters on Weymouth Beach. All competitors

were returned to the same landing place so they could be processed and accounted for. The coastguard and police worked in conjunction with the race organisers to process and account for all the competitors. Ambulance teams were also present to check the conditions of those recovered.

The presence and requirements of the media presented difficulties to the organisers trying to cope with a very difficult situation.

The Lessons

1. Although this entire incident was unforeseen, the existing contingency plans that had been prepared to cope with an emergency, were in place and ensured a successful outcome to what might have been a tragedy.

2. Those planning to race in anything other than 'normal' weather conditions should be mindful of the limitations of the craft involved. This includes the effects of line squalls associated with thunderstorms. Race officers will be the best judges of local weather conditions, but thunderstorms can create very severe local winds as the down-rush of air ahead of the squall hits the sea surface and is deflected ahead of the advancing thunder clouds. There should be no qualms about postponing, or shortening a race if wind speeds are likely to exceed the capability of competing craft to handle.

3. The outstanding feature of this race was the tally system for keeping track of competing craft. It worked and is recommended. The essential requirement was to ensure that details of whoever was rescued were reported back to the race control. If anybody is taken to hospital it is essential that his or her name is reported to the race control at the earliest possible opportunity.

4. The race organisers insisted on the wearing of suitable clothing and lifejackets. The only person to suffer any ill effects was one of the crew of a rescue craft. Although she was wearing a wetsuit, she showed signs of possible hypothermia. Everyone afloat should be suitably dressed and equipped for the task demanded of them. Failure to wear suitable clothing can often lead to hypothermia, while an effective lifejacket will ensure an unconscious survivor's head is kept above water. It is often forgotten that death from cold shock can occur soon after immersion in the sea, and within a few feet of safety.

5. Rescue boats should be capable of being handled in the roughest sea conditions likely to be encountered.

6. Before a major event such as this takes place, it pays dividends to alert the coastguard, police and ambulance service that it is taking place. Discussion with these organisations before the event will identify potential problems and propose appropriate solutions.

7. Flares were used effectively to alert organisers to the scale of the problem.

8. The prompt and comprehensive reaction by the emergency services and others to the call for assistance ensured a successful outcome.

9. RNLI crews found the co-operation of crews to leave their upturned craft a great help.

10. Whenever a good 'story' is breaking, the media will be present. Their agenda will be entirely different to those coping with the incident. It is very easy to become frustrated or distracted by reporters' inevitable quest for something sensational to report, and their perception that someone must be 'to blame'. The appointment of a dedicated media liaison officer can do much to make the problem manageable and will ensure there is a reliable source on which reporters can draw. Good

press liaison pays handsome dividends; a lack of it will often result in an uncomfortable outcome that can be very distressing to families and friends of those involved in the event.

11. Planning for the unexpected pays.

Footnotes

It is common practice for safety boat crews to tie coloured ribbon (or marker) to an abandoned dinghy after its occupants have been rescued and taken ashore. This practice prevents other rescue boat crews or safety agencies becoming concerned when finding a capsized boat with no-one in or near it.

Those involved in yacht race rescue operations should be aware that most race organisers use M2 (channel 80) and channel 37 to conduct on-the-water operations. The monitoring of these channels by rescue craft should prevent the duplication of radio traffic during any incident.

This article has been prepared with the co-operation of the race organisers, the coastguard, the RNLI and the Royal Yachting Association (RYA).

The RYA has produced a useful list of lessons learned in its RYA Race Management Newsletter.

End of Century Think Piece

The Run Down Nightmare

One of the most difficult types of accident to investigate is a collision, or near collision, between a yacht and an unknown vessel. From time to time such incidents are drawn to the attention of the MAIB and we read about others in the yachting press. Although fishing vessels are just as likely to be run down as yachts, this article concentrates on the problems faced by the leisure sailor, and focuses on a variety of measures he can take to reduce the risk of collision.

Investigating such incidents is particularly complicated as it often proves very difficult to identify the 'other' vessel, usually a merchant ship. Most encounters occur at night or in poor visibility and noting identification features of the 'culprit' is unlikely to be the yachtsman's first priority. Daylight incidents often occur in bad weather. Forensic techniques can be, and are, used to match paint samples, but the success rate in making a positive identification is poor.

Study of a number of near misses and the handful of collisions that occur from time to time can, nonetheless, be used to draw out some important lessons. No two instances are ever quite the same, but some common themes emerge.

Nearly all reports of collisions come from the yachtsmen, rarely from the masters of ships. Although we cannot be absolutely certain, it is quite probable that the 'other' vessel would have been unaware that she had been involved in a collision with such a small craft. At least one MAIB inspector can recall steaming through the South China Sea in a cargo vessel at sunrise some years ago, and finding the mast and sails of a junk impaled on the starboard anchor. As he recalls, it was a particularly well run ship with very conscientious watchkeepers. And yet ...

A fundamental issue is, of course, the keeping of a good lookout. Needless to say it applies to both types of vessels. Failure to fulfil this most basic requirement is probably the primary cause of most collisions and near misses. The conscientious mariner will need little reminding of the need to so, but we do not live in a perfect world and some standards of lookout are poor. The yachtsman should be aware of this and take certain measures that will go some way to preventing a collision.

His starting point is to have some understanding of the problem facing the man on the bridge of a merchant ship. The officer of the watch does not, in practice, spend his entire time standing at the front of the bridge with his eyes glued to a pair of binoculars. Analysis of watchkeeping habits on a bridge several decks above the waterline, show that when keeping a visual look out, the eye naturally scans the horizon or that part of the sea just below it. It does not, unless there is something that specifically attracts it, or a conscious decision has been made to look much closer, instinctively see things near by or in the middle distance. It is in this region that a small craft is most likely to become visible initially.

The officer of the watch in a merchant vessel can be a busy man. He is responsible for safe navigation, monitoring the radar, keeping an eye on other shipping, ensuring the routine business of the ship is properly conducted, observing and recording the weather, checking an increasing number of displays and instruments on the bridge and dealing with incoming satellite and radio traffic. Every alarm, no matter what its source, is a potential distraction.

At night he should always have a lookout to assist him, but as the MAIB frequently observes, this requirement is often ignored, especially in ships with very small crews. Then there is the human factor. Today's watchkeeper might be tired (a high percentage of accidents occur in the middle

watch), or his level of arousal might be low if he hasn't seen another ship for days, or he is keeping his watch from the comfort of a comfortable chair and the auto pilot is doing all the work. Despite these slightly unpromising observations, he will nonetheless, usually see, or detect on radar, other vessels in sufficient time to take whatever measures are necessary to avoid a collision. Modern radars are now very reliable and have automatic plotting attachments. There are very few instances of collisions occurring between big ships when the watchkeepers are totally unaware of the presence of the other.

There are, however, too many instances when the officer of the watch of the big ship fails, apparently, to see, or detect a yacht. The yachtsman should understand why.

Even in the most perfect conditions, a yacht can be difficult to see, especially when under way on engine alone or lying with bare poles. Sails help, but when coloured white, can be difficult to see in a high sea state when viewed from a lofty bridge. The same colour is just as difficult to spot in the grey murk of a misty day. Yacht dodgers are invariably coloured blue with white letters. A merchant ship's watchkeeper attention would be greatly helped if they were coloured bright orange. Not nearly so pretty perhaps, but a great aid in preventing collisions.

Some watchkeepers have told the MAIB of their difficulties in seeing small craft navigation lights at night. It is sobering to reflect on what the 'Rules' stipulate about the minimum ranges of small craft navigation lights. The range of both side and stern lights is only 2 miles for vessels under 50m. For the under 12m vessel the minimum range of the side light is down to 1 mile. In practice, navigation lights can be seen at greater ranges, but it is still very difficult to pick out a lone sidelight in certain conditions and in sufficient time to do anything about it. Masthead lights are more easily seen than those fitted on the pulpit which can be obscured by the foresail or waves. And when a yacht heels, the minimum intensity is reduced further depending on the angle reached.

Masthead tri-coloured lights are excellent in the open sea but many masters and pilots have great difficulty picking them out closer inshore. They often tend to be on the direct sight-line between the bridge and shore lights. The use of lower lights in such waters is recommended.

If the yachtsman knows he can be difficult to see, he is better placed to take appropriate action to improve his visibility and reduce the risks of collision.

This may not always be easy. Apart from fitting brightly coloured dodgers, there is very little that can be done to a white coloured yacht with white sails and a furling genoa. But if at sea in heavy weather and the skipper has sensibly reduced sail to the minimum, the fitting of a yellow, or orange, coloured storm jib or trysail will do much to improve its visibility.

Merchant ships carrying a large number of containers forward of the bridge can have a substantial blind zone in the ahead arc. If, for any reason a yacht finds itself very close ahead of a big ship, especially one carrying containers, you should assume that whoever is on watch at the other end cannot see anything small, within perhaps four of five hundred yards immediately ahead.

Many glass reinforced plastic (GRP) yachts have much reduced radar echoing areas and are not only detected at relatively short ranges but are only held intermittently thereafter. Every effort should be made to increase the yacht's echoing characteristics. The choice of a radar reflector is crucial, and yacht owners are strongly advised to research the market carefully and fit a model with the most effective reflecting properties for the types of radars carried at sea today. Care should also be taken in fitting them on board. Merchant ship radars normally use a system known as ARPA (automated radar plotting aid) and rely on detecting an echo over several sweeps to generate an automatic plot that shows the course speed and closest point of approach of the other vessel. If the

radar fails to detect the yacht, or hold contact for at least 50% of the time, ARPA will not provide the necessary information. The yachtsman should also be aware that radar performance is degraded in poor weather and in rain.

Be prepared to enhance the yacht's visibility at night. Illuminating the mainsail with a torch is a favourite technique, but in your reviewer's opinion, never as effective as the yachtsman fondly imagines. Viewed from the bridge of a ship it can take several minutes of careful scrutiny to work out what on earth the strange pale glow is. A bright white light shone in the general direction of an oncoming vessel on a collision course will help to attract attention, but it can also detract from the officer of the watch's ability to make out the navigation lights. Having a white anti-collision flare ready to hand makes sense, but its use must not be left too late. If it becomes necessary to use a flare, it is not the best time to start wondering how to ignite it. One flare is probably not enough. The other ship's watchkeeper may have seen it out of the corner of his eye, but he will always want to have a better look. It is at that precise moment that the flare will choose to go out. A second, or even third flare should be immediately available and not stowed under an occupied bunk. No matter what attracts the attention of the officer of the watch, he needs a finite time to recognise what he is looking at, to assess the range and alter course on the auto pilot (having checked he isn't putting himself into any other danger). It is not an instant reaction. Some big vessels have very large turning circles and very, very few ships are able to stop quickly.

If the merchant ship's officer of the watch has problems, so does the yacht watchkeeper, especially if he is on his own. One of the revealing features of many yacht/ship collisions is the admission by the yacht watchkeepers that they were not necessarily keeping a perfect lookout. Those of us who have spent many hours in a cockpit keeping a watch will know only too well how easy it is not to perform to the high standards expected of the RYA examiner. Watchkeeping on a fine summer's day with the sun shining is one thing. The same thing on a foul night is quite another.

We might be tired, bored, cold, possibly wet, even seasick and looking forward to turning in again. Our mind is in neutral and we haven't moved for a while. To do so destroys what little warmth we have been able to retain. To be honest, we know very well we haven't looked underneath the genoa to see whether there is anybody approaching on the lee bow. After all we aren't in the shipping lane, and it is all too easy for the lone watchkeeper to forget to look astern for long periods. The temptation to go below for 'just a few minutes' to plot a fix, heat up some soup, listen to the weather forecast or write up the log is all too great. Such visits can indeed be 'just a few minutes'; but too often they are nearer twenty minutes than three. A merchant ship doing 20 knots can come from hull down on the horizon, to being on top of you in less time than that. And if there is a sea running, or visibility is reduced for whatever reason, the horizon can be very close indeed. In areas where there is a concentration of shipping and there is sufficient manpower available, two watchkeepers are recommended. One of them should have night watchkeeping experience.

There is no harm in the lone watchkeeper going below for a very short spell, but give a thought to the prevailing conditions. If the range of visibility is reduced, the watchkeeper's alertness must increase accordingly, and any time spent away from keeping a lookout is reduced. Switching navigation lights off to preserve battery power on a long passage is understandable, but the 'Rules' are uncompromising; they should be exhibited from sunset to sunrise. Some skippers may take a calculated risk and have them switched off but ensure they are readily available. Sometimes when sailing miles from the recognised shipping lanes we know that even this basic precaution is ignored. A percentage of the world's reported collisions between yacht and merchant ship have occurred in the emptiest parts of the ocean. If, for any number of reasons, the lights are not switched on at night, the risks of being unseen rise dramatically, and an even greater responsibility is placed on the watchkeeper. It is up to him to ensure they are burning in sufficient time for

another vessel to see them and take appropriate action. They should, for instance, be switched on when the other ship is at least 4 miles away. But how do you gauge distance at night?

Preventing a collision, or indeed a close quarters situation, is among the most demanding challenges the amateur sailor faces. He must have a good understanding of the 'Rules'. He must know how to 'look' at other ships and make assessments about what they are doing and likely to do next, especially when in confined waters. He must know how to work out if risk of collision exists. And what to do when it does.

When looking at another ship, whether by day or night, two thoughts should pass through the yachtsman's mind. What is his probable range, and what is his bearing movement? The latter is the more important. The first regulation that every aspiring sailor should learn by heart is 'that risk of collision *shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change*.' In practical terms it means just that. Using a stay, or a fixed part of your craft, to establish relative movement can give a false sense of security. Using compass to determine bearing movement is the seamanlike approach.

Determining range is important, as it gives an idea of how much time there is for decision making. It is also an important factor when working out the approximate closest point of approach. The results of such calculations will often determine what action should be taken. By insisting the yacht stands on because it is under sail and has right of way, can sometimes cause metaphorical heart attacks in a big vessel if it has to manoeuvre when constrained by its draft, or places him in difficulties with other shipping that the yachtsman might be totally unaware of. The answer is to use common sense. Going about in very good time and be seen to be opening from the track of an oncoming vessel is likely to be much appreciated.

Judging distance at sea accurately by eye is still one of the most difficult of all nautical skills to acquire. It takes a lot of practice to get it right, and even the most experienced sailor will find himself taxed when faced with the problem at night. Radar removes the anguish for many, but many yachts are not so fitted.

Estimating the aspect or inclination of an oncoming vessel is also an acquired skill. It is easy enough to work out what is likely to happen if you see two steaming lights in line above red and green sidelights. It is less easy to assess the heading of a large vessel when the steaming lights are well displaced. Inclinating by day is easier but estimating angle on the bow only comes with practice. The ancient mariner will assess the range and aspect and make a rapid mental calculation as to what the closest point of approach will be. To an extent this is academic, but the relevance of such mental agility is to know whether collision is likely.

Despite taking all these precautions the situation can arise when a collision, or near collision is inevitable. There are many harrowing tales of yachtsmen who were unaware of anything untoward until they suddenly saw some vast bow towering above them. What then?

There are no staff answers to this ghastly predicament. No two situations are ever the same, but if the yacht is badly damaged and in danger of sinking, there is one overriding priority; the saving of life. The skipper who has mentally prepared for this most awful of scenarios and has a crew who know where the life-saving equipment is stowed and how to use it, the chances of survival are greatly increased. It is too late then to realise there is no grab bag, that the liferaft is out of date for a service, that the EPIRB is registered in the name of another yacht and the spare flares were landed last weekend.

Avoiding collision in the first place is a far happier solution.

Welcome 21st century. A happy new year, safe sailing and don't, please don't, forget to look astern as well as ahead!