Marine Accident Investigation Branch (MAIB) - Safety Digest 1/2001

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About The Marine Accident Investigation Branch

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

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

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

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

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Summaries (pre 1997), and Safety Digests are available on the Internet:
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Extract from
The Merchant Shipping
(Accident Reporting and Investigation)
Regulations 1999

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

Glossary of Terms and Abbreviations

ARPA	- Automatic Radar Plotting Aid
CAST	- Coastguard Agreement for Salvage and Towage
CPA	- Closest Point of Approach
DGPS	- Differential Global Positioning System
DR	- Dead Reckoning
ETA	- Estimated Time of Arrival
ETV	- Emergency Towing Vessel
GPS	- Global Positioning System
GRP	- Glass Reinforced Plastic
GT	- Gross Tonnes
IMDG	- International Maritime Dangerous Goods Code
m	- metre
"Mayday"	- Spoken distress signal
MCA	- Maritime and Coastguard Agency
MES	- Marine Evacuation System
MGN	- Marine Guidance Notice
OOW	- Officer of the Watch
PLB	- Personal locator beacon
RNLI	- Royal National Lifeboat Institution
Ro-Ro	- Roll-on, roll-off
RYA	- Royal Yachting Association
SCBA	- Self contained breathing apparatus
TSS	- Traffic Separation Scheme
VHF	- Very High Frequency
VLCC	- Very Large Crude Carrier
VTS	- Vessel Traffic Services/System

Introduction

We are grateful to the number of our readers from around the world who have contacted us to express appreciation for the way we publish the lessons to be learned from marine accidents.

The comments have tended to focus on two themes: approval of the no blame culture coupled with what some kindly refer to as the common sense approach, and the value that many readers appear to attach to learning how other types of vessel might be operated.

Merchant ship watchkeepers have found it useful to be reminded about how engrossed their opposite numbers in fishing vessels can become in the fishing and are not as alert to other shipping as they might be. There is a contact on the radar and the ARPA predicts a CPA that involves no risk of collision. The OOW turns his attention elsewhere and fails to spot the subsequent change in CPA when the contact, almost certainly a fishing vessel, has turned through180°and is now on a collision course. This is not as uncommon a problem as some might think.

In the same vein the fisherman might also be reminded that to suddenly alter course to avoid a bottom obstruction, or for any other reason, and steer into the path of approaching traffic might not be spotted by the other ship until it is too late. Some merchant ship officers of the watch will assume the fishing vessel is going to maintain the original course and speed and stop paying attention. It shouldn't happen, but it does.

Some leisure craft users, meanwhile, have told us how much they welcome the chance to learn something about how merchant vessels are run and discover something about their limitations. If this is translated into an action whereby a yacht skipper goes out of his way to avoid embarrassing a merchant ship in confined waters then the *Safety Digest* has served its purpose.

We are very conscious that nearly all the lessons we publish are directed at seamen, engineers or fishermen. We have not forgotten that there are others employed at sea, the hotel and entertainment staffs in passenger vessels. With them in mind we have compiled a special Section 4 in this edition to remind them of the sort of problems they may confront in the immediate aftermath of a major accident. None of the points raised are new, but an analysis of past accidents reveals they are often forgotten. We would like to think this section will act as a catalyst for discussion about the difficulties likely to be encountered when the unexpected occurs in any vessel carrying passengers.

Readers will wish to know that most Safety Digests are now available on our web site;
www.maib.dft.gov.uk

John Lang
Chief Inspector of Marine Accidents

Part 1- Merchant Vessels

Few mariners can be unaware of that well-known litany, "About 80% of all accidents at sea are caused by some form of human error." We probably acknowledge there is some truth in it but feel it doesn't apply to us. Even if it did, there is virtually nothing we can do about it. We have, for example, heard about such things as 'fatigue', but what can you expect in a ship where we know there are too few people to fulfil every expectation without getting tired or, to put it more delicately, 'knackered?' We have no say in the manning levels, and if we complain we are likely to get the sack.

Although fatigue is one of the most obvious examples of the human factor, there are many others. Taken at random they include ergonomics, welfare, diet, training, communications, morale, stress, cognition, human information processing and health. Ignore any of these and human error follows. Some ship owners and managers go to great lengths to ensure safety and prevent human error by trying to recruit and train high calibre people. But many, too many, don't and overall the MAIB detects a widespread lack of understanding of what is meant by the human factor.

It is so easy to blame someone for making a mistake, or failing to act correctly in a specific situation, but so often this 'blame' culture totally fails to understand why the mistake was made in the first place. The temptation to recommend some new regulation, or a technological solution, to prevent a repetition is irresistible to those who must be seen 'to do something.' It also means that whatever the underlying cause, it remains in place, and is likely to feature as a significant underlying cause in some future accident. While many of the solutions lie in the hands of the owners and managers, the seafarer can do much to improve safety if he or she, too, develops a greater understanding and awareness of how humans behave and perform in a marine environment.

There is very little literature on the subject in a form digestible to the average mariner, and the MAIB attempts to meet the need by publishing lessons learned in the Safety Digests. We attempt to highlight some examples of how the human factor has played a part in the causes of past accidents. Once you understand why mistakes are made, you are much less likely to make them yourself.

As we have said on many previous occasions, an accident only occurs when a number of totally unrelated events come together to create the circumstances that lead to something going badly wrong. If one begins to understand the effects of fatigue, how humans relate to each other, the effects of over-the-counter medication, or the limits of absorbing information, then measures can be put in place to live with them. Man has great ability to sense information by sight, hearing, smell and touch. But he has only one single decision-making channel. Over and over again we see that same person being swamped with information only to be severely criticised, or even arrested, for getting it wrong. Human factors matter. Learn from the experiences of others before it is too late.

Case 1
Collision in Restricted Visibility

Narrative

Wintertide and *MSC Sabrina* were transiting the south-south-west traffic lane of the Off Vlieland TSS in poor visibility, which was assessed at about five cables. *MSC Sabrina* was making good 17.5 knots and overtaking *Wintertide* on her starboard quarter. She was predicting a CPA of eight cables. Although *Wintertide* was making sound fog signals, neither OOW had taken any specific precautions on encountering restricted visibility; the masters had not been informed, nor bridge manning increased, in accordance with company orders.

With the vessels about 1.5 miles apart, the Netherlands-registered fishing vessel *Concordia*, was crossing the traffic lane from the south-east and passed close astern of the lead vessel *Wintertide*. Soon afterwards the fishing vessel collided with *MSC Sabrina*. Although the visibility had reduced further to less than two cables, the merchant ship kept going and maintained her original speed.

Wintertide's OOW was aware that *MSC Sabrina* was overtaking, but did not estimate when or where the CPA would be. Neither was he aware that she had been involved in a collision. As *MSC Sabrina* closed to one mile on his starboard quarter the OOW, prompted by a GPS waypoint alarm, altered course 25° to starboard to follow the ship's planned track. In doing so he put the two vessels on converging courses. After the alteration, *Wintertide's* OOW estimated from his radar that the overtaking vessel would pass astern on the port quarter, and it wasn't until *MSC Sabrina* was sighted very close on the starboard side that he realised what was happening. At this point he applied 20° of port helm and put the propeller pitch to Dead Slow Ahead.

Meanwhile, *MSC Sabrina's* OOW, who had been distracted by the collision with *Concordia*, did not notice *Wintertide's* alteration of course. This was only evident after the master arrived on the bridge following the incident with the fishing vessel and saw a radar contact 3-4 cables forward of the port beam on a converging course. The master immediately ordered the OOW to put the helm to starboard.

Despite the actions taken by both vessels to avoid a collision, *MSC Sabrina's* port quarter struck *Wintertide's* starboard bow.

The Lessons

1. Any OOW, who happens to be on watch when visibility reduces, has an awesome responsibility. The owners expect him to do the right thing, the master trusts him to comply with the regulations and his standing orders, and other vessels expect him to be keeping a proper lookout and taking whatever actions are necessary to comply with the COLREGs.

2. The master's recurring nightmare is to be called too late when things begin to get out of hand. A responsible master will stress over and over again that he would rather be called unnecessarily if the OOW is in any doubt, than be called too late or not at all. Yet officers of the watch are seemingly reluctant to call the master on the assumption (often erroneous) that they think they can handle the situation themselves. By not informing the masters of the reduced visibility on this occasion, both OOWs denied themselves the benefit of added knowledge, watchkeeping experience, and judgment. The really good OOW is the one the master can rely on to call him.

3. A key feature of navigating a vessel through a TSS is to anticipate two separate events: the likely consequence of one's own movements on other vessels after any planned course alteration, and to think through what the other vessel may do when it too reaches a probable wheel over position. The one thing to be avoided at all costs is to ignore the inevitability that things will change once you, or the other vessel, alters course. And pay particular attention to the vessel coming up astern. Human nature, and bitter experience, shows over and over again that OOWs often overlook what is happening behind them. A bump up the backside is unlikely to endear an OOW to either the master or his employer, no matter what the Rules might say.

4. Before altering course, an OOW must check that both the new course and the appropriate quarter is clear before putting the wheel over. The practice applies in good visibility as well as in poor. An alteration of course into the path of an overtaking vessel so close astern in poor visibility is a guaranteed recipe for cardiac arrest. In the interests of healthy seamen, don't do it.

5. Tracks on a chart and planned passage speeds are not set in stone; ships may well have to deviate from them when the circumstances dictate. While a GPS waypoint alarm provides an invaluable reminder that a course alteration is due, the actual decision to do so depends on the OOW first checking it is safe. If there is something that prevents a safe alteration, such as an overtaking vessel close on the engaged quarter, a delay may be appropriate providing there is sufficient sea room. When checking to see that navigable water is available, OOWs should not rely exclusively on GPS and waypoint navigation. Those old friends the DR and the EP, still give a very good indication of where your vessel is likely to be in the minutes ahead.

6. To be an accurate aid to collision avoidance, radar must be closely monitored at all times on a range scale appropriate to the conditions and circumstances. Operators must also be aware of the capabilities and limitations of the radar in use. In a close quarters situation it is entirely appropriate to reduce the range scale of the radar in use. And the echo of a ship coming up astern may, for instance, lie within a blind arc created by a funnel. Or you are so focussed on looking at one echo that you ignore the new one that has just appeared at short range. In short, remember radar is a wonderful aid, but it doesn't produce all the answers-especially at close range when you don't hold the other vessels visual. A second, or even a third pair of hands on the bridge to help out is often a very sensible, even essential, ingredient to safe navigation in such circumstances.

7. Despite modern aids to prevent collision, the most common ingredient to accidents occurring in reduced visibility is excessive speed. It is so much better to slow down and be late, than to maintain full speed and perhaps arrive with a hole in the side; or even not make it at all. Engineers will often remind their bridge watchkeeping colleagues about how difficult it is to slow down at short notice. But given plenty of warning, and an early decision to put the engines on stand by if poor visibility is forecast when approaching congested waters, even the most hard-bitten among them will agree with the decision.

8. Sound signals in restricted visibility are made for a single purpose; for others to hear them. Masters should take whatever steps are necessary to ensure they comply with the requirement to (a) make them and (b) hear them. It is very difficult to hear another sound signal from the comfort of a totally enclosed bridge.

9. Very few vessels nowadays have helmsmen closed up on the helm. In reduced visibility when in congested waters, and assuming the engines are on stand by, and an extra officer is

on the bridge, a course alteration may have to be implemented without delay. A ship in hand steering is far better placed to comply. A dedicated helmsman is strongly recommended.

10. If you are ever involved in a collision, the only thing you must not do is to press on regardless. In very simple terms there are three actions you must take: check your own vessel is safe, ensure the other needs no immediate assistance from you, and alert the authorities. The order in which these actions are done will depend on the circumstances, but within a very few minutes, all three should be initiated. Failure to do so could lead to an already serious situation becoming even worse.

11. There is one final lesson. For all mariners. If crossing a TSS in poor visibility, do be sensible. Don't try and nip in front of a fast moving contact on a steady bearing. Ever.

Case 2
Light Reading!

Narrative

P&OSL Canterbury, a ro-ro passenger vessel, was in Calais and preparing to depart. The routine included closing the bow door, and the second officer positioned forward by the control station, started to do so. The visor did not, however, move and realising that there was a technical problem, he called for engineering assistance. The chief and third engineers, and an electrical officer arrived, and tried to close the visor using the manual procedure. The instructions for this were displayed next to the control station.

After operating the "cleats/bolts off" directional valve, the local control system was checked to ensure that the controls were in the right position for manual lowering. On confirming this, the manual control for lowering the visor was operated. Shortly after this was started, a call was received saying that the starboard visor ram and support arm were buckling. The operation was stopped immediately.

An investigation revealed that the starboard support arm locking bolt was still in the engaged position. On examining the control panel, it was found that a "secured" indicating light was positioned next to the "visor open" label which gave the impression that the visor was free to be lowered. The light actually referred to a top deck forecastle flap. The operators at the control station had been unaware of this, and had assumed it meant the visor was free to be lowered.

Following the incident, temporary repairs were carried out to enable the vessel to continue in service using the stern doors only, until replacement parts could be manufactured and fitted. Two additional control system indicating lights were fitted to show the position of the locking bolts, plus modifications to the operational instructions. The hydraulic system was also to be modified to enable interlocks to be fitted preventing operation of the visor with locking bolts engaged.

The revised manual operation instructions were also modified to include a visual inspection of the position of the locking pins prior to operating the system by hand. The locking pins are also to be manually checked on completion of the operation.

The Lessons

1. The layout of any control panel must be clear and unambiguous. It should be as close to idiot proof as possible if it is capable of being read wrongly, you can be sure it will! Crews come and go, and unless instructions are up to date, clear and easily understood, experience and word of mouth explanations get lost.

2. Labelling needs to be clear, with an accurate description of what is being identified and what it means. It also needs to be in a language understood by the crew.

3. Always carry out a visual check of a system before attempting a change of procedure. It may sound obvious, but it could save considerable time and effort at a later stage. In this case visual checks were difficult, the vessel was in the process of leaving port and checks could only be arranged using two men equipped with VHF sets. The company acknowledged the degree of difficulty, and subsequently fitted hydraulic interlocks.

Case 3
You Cannot Breathe without Oxygen!

Narrative

MT Flamenco, a 28,256gt tanker, was on passage from Rotterdam to Wilhelmshaven in ballast. The crew started tank cleaning during the day, and continued the process throughout the night. At about 0215, one of the crew realised he had left a pair of gloves in No 4 cargo tank, and decided to retrieve them. Leaving one of his colleagues at the top of the tank opening, he entered the tank and started down the access ladder. Before he reached the bottom he had, however, lost consciousness and collapsed on to the tank top.

His colleague saw what happened, and immediately called the second officer who was on watch on the bridge. Realising the potentially fatal consequences, he sounded the general alarm. Two crew members wearing self contained breathing apparatus (SCBA sets) entered the tank with a stretcher. They administered first-aid, and lifted the victim from the tank and out on to the open deck.

It took between 6-7 minutes to rescue the man. The crew's quick response, and their first-aid treatment, were successful. The casualty recovered without any sign of injury or illness.

At the time the casualty entered the tank, it had been inerted with nitrogen, the oxygen content being at about14%. The crew had been advised that the tanks were inerted and were familiar with tanker operating practices.

The Lessons

1. NEVER, EVER enter a cargo tank without first testing the atmosphere. If immediate entry is unavoidable SCBA sets should be worn, together with a suitable harness and safety line. A back-up team capable of, and provided with, suitable equipment to rescue or haul out an unconscious person must be standing by the tank entrance while a person is in the tank.

2. The standard rules that are laid out in *The Code of Safe Working Practices for Merchant Seamen*, Chapter 17 MUST be followed whenever entering an enclosed or confined space. The atmosphere of any enclosed or confined space is potentially dangerous for a number of reasons: from lack of oxygen, through to poisonous or flammable gases.

3. NEVER EVER think that you can take a quick breath of fresh air, and then rush in and out of a tank without taking another breath! Climbing a ladder, or any exertion, uses oxygen. The faster you move, the quicker you use it up. One breath of air with a low oxygen content, or a noxious gas, will immediately create an automatic reaction in your body. This could in turn kill you and those who take risks to rescue you.

4. Leaving tools, or other articles in tanks just cleaned, can cause a lot of shouting and ill temper, BUT they can be retrieved or replaced. Your LIFE cannot.

Case 4
Alive or Dead

Narrative

RFA Orangeleaf, an18,854gt Royal Fleet Auxiliary oil tanker was operating off Dubai on 23 August 2000 when, on trying to bring the starboard diesel generator on load, the breaker failed to engage.

A second attempt was made, and it too failed. The breaker assemble was then racked out to the test position so the breaker contacts could be inspected. The closing coil mechanism was confirmed as working, but the main breaker contacts would not engage. While the circuit breaker mechanism was being inspected, and various loose connections tightened, the closing coil operated on a signal from the switchboard, causing the breaker to engage and close the breaker contacts.

The breaker was again tripped, and the breaker mechanism successfully re-engaged on demand. Test closings were repeated, but the failure could not be reproduced. The breaker assemble was then racked back into service and the generator successfully brought on to load.

On arrival back in Dubai, the breaker was removed and sent ashore for servicing and testing by the manufacturer's service engineer. On satisfactory testing, the unit was returned to the vessel, installed, and placed back in service.

The Lessons

1. Breakers have TWO racked out positions: TEST and DISCONNECT. When a breaker assemble is racked out into the test position, the main circuit contacts are separated BUT the control circuit isolating contacts remain connected. If work is to be carried out on the breaker assemble, move the breaker into the DISCONNECTED position. That way both main and control circuits are isolated.

2. Apart from interfering with the mechanical operating mechanism, loose connections can cause high resistance points, leading to the generation of high local temperature points. Regular checks of the mechanical mechanism should be carried out, BUT with the breaker fully racked out to the DISCONNECTED position.

3. The use of a thermograph camera to identify hot spots brought about by loose connections in a breaker or switchboard, is a useful maintenance tool. It enables potential problem areas to be seen in the context of a live switchboard or breaker, and for action to be taken before they become an issue.

Case 5
A Let Down!

Narrative

The Fishery Protection vessel *Vigilant*, one of four in the SFPA's fleet of offshore patrol vessels, was about 6.5 miles west-south-west of Cape Wrath, when it was decided to carry out a routine inspection of a fishing vessel. The transfer craft, a 6.7m rigid inflatable, was prepared and the usual pre-launch test carried out. This test involved swinging the boat out, lowering, recovering, and swinging it in again with no one embarked.

The boat/davit was swung out and the winch control set to lower. At this point the winch "free-wheeled" and the boat dropped about 3m into the sea. Although all hydraulic and electrical power was available, the winch could not be used for boat recovery. This was done by using the deck-mounted hydraulic crane, and placing the craft into a temporary stowage position.

The main winch, a two-speed hydraulic system, is mounted independently of the winch drum, brake and light tension motor, but is connected to them by a "Centraflex" flexible coupling. The coupling hub is mounted on the main motor shaft with the driven plate secured by eight 12mm x 25mm countersunk slotted mild steel screws on to a disc welded on to the inside of the drum. On being stripped down, it was found that the remains of all eight screws were in the bottom of the drum. One was intact but with its threads slightly damaged. The remaining seven had sheared. The brake worked, but such was the speed of descent that the boat was in the water before any action could be taken.

Further detailed examination by a hydraulic service company found that although the main hydraulic motor was in good condition, the motor with brake assembly had suffered internal damage. This had been caused by poor overhaul and assembly techniques by a contractor when last serviced. The internal spring discs had moved and shattered while in operation, and various pieces had caused further damage. The motor crankcase had also been re-fitted 180° out of position so that the internal workings had also been damaged through misalignment. Several components were found to be missing, and the condition of the flexible coupling was poor.

On re-assembly, high tensile Allen socket screws were substituted for the slotted head variety so that they could be torqued to an acceptable and reliable level. For added security, the frequency of overhaul inspections was increased.

The Lessons

1. The value of good routine test procedures prior to undertaking potentially dangerous activities was graphically illustrated in this incident. The failure of the davit system when in the unloaded condition prevented what could have been a major accident with injuries and possibly loss of life.

2. This investigation highlights the importance of ensuring that securing devices are suitable for the intended service. Any driving assembly hidden from view, particularly one exposed to the elements, requires secure locking devices and a reasonably frequent inspection regime. If the assembly is new, or the operational experience is limited, then frequent inspections should be carried out until a sensible period between overhauls can be established. Consult with the manufacturer and/or the supplier but REMEMBER, you are on the receiving end so FOLLOW IT THROUGH.

3. Maintenance, whether on essential equipment or not, must be carried out by experienced and competent persons. Short cuts on maintenance to save a few pounds can result in death or injury. DO NOT LET IT BE YOURS!

Case 6
Grounding of Coastal Tanker

Narrative

At the end of December 1999 *Blackfriars*, a 992gt tanker in ballast, was on passage between Dundalk and one of the oil terminals in Milford Haven.

At 0330, when *Blackfriars* was still underway in St George's Channel to the west of Wales and still some three hours steaming from her destination, Milford Haven port control told the master that due to adverse weather, entry might be refused. The wind at the time was south-west force 8. The master was told 50 minutes later that all anchorages were occupied, and that ships were no longer entering the haven. The master decided to anchor elsewhere while waiting for a berth and, at 0655, *Blackfriars* anchored in Fishguard Bay.

At 1000, the master was informed that *Blackfriars* berth would become free at 1400. He therefore weighed anchor and resumed his passage to Milford Haven. On clearing the shelter provided by the bay he encountered a force 6 from the south-west. By 1500 the wind had increased to force 9 and the ship was unable to make headway, so the master decided to anchor in near-by Saint Brides Bay. He did so some 3.5 cables from the shoreline of a small cove at the southern end of Saint Brides Bay where the depth was about 10m and the holding ground was sand. He lay to a single anchor with three shackles in the water. The engine was placed on immediate stand-by.

Just after midnight the anchor cable parted. The officer of the watch ordered the main engine to be started and called the master. The wind by now had veered and was west-south-west force 8 and was blowing straight into the bay. By the time the master reached the bridge the engine had been started but the ship had also grounded on a sandy beach in St Bride's Bay. A "Mayday" message was broadcast, and Milford Haven Coastguard responded. The Angle and Saint David's lifeboats were launched, and a rescue helicopter was scrambled. The master tried to refloat the ship, but sand blocked the engine's intakes and it had to be shut down. It was low water, with high water springs predicted at 0703. Three of the non-essential crew members were evacuated by helicopter.

Soon after the grounding, tug brokers were approached to identify a suitable commercial tug to provide assistance. The quest was unsuccessful.

The ship's owner and the coastguard made urgent requests to a tug company in Milford Haven to make its harbour tugs available for the emergency, but were told they were engaged contractually to the berthing of a VLCC at one of the terminal's berths. The company went on to say that on completion of that operation, their tugs were required to provide safety coverage for berthed tankers during the period of strong winds. However after further negotiations, a harbour tug was mobilised at 0630 with the expectation it would arrive off the grounded *Blackfriars* at about 0700.

The south-western Channel approaches coastguard ETV was mobilised, but her ETA was 1300, which coincided with the low water period. It was thought unlikely that she would have succeeded in refloating the ship until about 1900 that night.

Meanwhile *Blackfriars* was moving north along the coast towards rocks on the rising tide. With the assistance of one of the lifeboats and the ship's engine, she was able to move into deeper water. There she stemmed the tide to await the arrival of the harbour tug.

At 0432, Milford Haven Coastguard declared "Silence Fini", thereby terminating the distress status.

When the tug arrived, Lloyds Open Form salvage agreement was agreed, the tow successfully connected and *Blackfriars* was towed to Pembroke Dock without further incident. She berthed at 1250.

The lessons

1. From time to time, operational factors may dictate it is impossible to enter harbour. If the conditions are bad, or the forecast is for deteriorating weather, masters have to decide whether to seek shelter and anchor, heave to or head to sea and ride it out. The circumstances will dictate the most appropriate course, but the one thing they should avoid doing is to anchor close in to what could become a lee shore. It might seem to be relatively calm in the shelter of a nearby headland, but it only needs a wind shift of a few degrees to make such an anchorage very exposed.

2. If there is no alternative to anchoring then additional precautions must be taken. If the nearest land is downwind at a range of 3.5 cables and something goes wrong the crew have, at best, only two or three minutes available to take emergency action. The additional precautions should allow for this.

3. When anchoring, make sure sufficient cable is used. This will depend on the depth of water, the weather conditions and the holding ground. The old adage of five times the depth of water still holds good in most conditions. A second anchor might be considered. (In this age of metric measurements a shackle of cable is 27.5m).

4. In determining the degree of shelter being afforded by adjacent land, don't ignore the likelihood of a wind shift, or the effect of wind accelerating around a headland.

5. Whoever is on watch must make very regular checks on the ship's position. In the event of dragging it is imperative that this is spotted immediately.

6. If the weather continues to deteriorate, the safest option might well be to weigh anchor and head for sea before undue strain comes on the cable.

7. If for any reason this is impossible but the engines are still available, they should be used to ease the strain on the cable.

8. If something does go wrong, the drift ashore is likely to be so fast that there is insufficient time to call the hands. Have them instantly available if there is no alternative to remaining at anchor.

9. The much better solution is not to anchor in a potentially exposed bay in the first place.

Footnote

This accident was not subject to a full investigation and no recommendations have been made. One of the prime functions of the MAIB is to identify any lessons to be learned, and this article fulfils that obligation.

Blackfriars was extraordinarily fortunate. She managed to ground on one of the few parts of the coastline where there were no rocks. Had she gone aground a few yards either side, or the RNLI lifeboat had been unsuccessful in keeping her off the rocks, *Blackfriars* would almost certainly have been holed with every prospect of bunker fuel leaking out. Bunker fuel damages the

environment. This part of Pembrokeshire is an environmentally sensitive area, and therefore particularly susceptible to the damaging effects of pollution.

This incident has caused anger and grave concern to both the residents and authorities of Pembrokeshire. The position at the end of December 1999 was that the tug company in Milford Haven had signed a Coastguard Agreement for Salvage and Towage (CAST) with the MCA. Under the agreement the company would, from time to time, make available on request, all or any of the tugs for salvage and towage work as were available at the time.

In this particular event the tug company had contractual arrangements and commitments with the oil companies in meeting harbour movements and having tugs available to assist vessels already in the Haven in adverse weather. When *Blackfriars* grounded the contractual arrangement restricted the tug company's ability to respond to this particular emergency. Had a tug responded it would have been necessary to increase its manning level for sea operations by taking crew off another. This would have left only one tug to cover any major emergencies at any of the oil terminals. The tug company's contract was with the oil companies, not the port authority.

Several meetings have been convened between representatives of the tug company, the port authority, the oil companies and the MCA to develop protocols in the CAST agreement. These are still under review.

Case 7
Collision with the Nab Towe

Narrative

At 0402 (UTC) on 7 November 1999, *Dole America*, a Liberian-registered refrigerated cargo vessel, collided with the Nab Tower in the eastern approaches to The Solent. She was outbound for Antwerp and behind schedule.

After a rough transatlantic crossing, Portsmouth was her first port of call. She had arrived at about 1800 and was expecting to sail again at midnight but, because of delays, her departure was delayed until 0250. During the time in harbour the Norwegian master managed to get about 1½ hours sleep. The departure plan was not discussed between master and navigating officers.

Dole America proceeded under pilotage to the vicinity of the New Grounds buoy about 2 miles to the north of the Nab Tower. The pilot disembarked somewhat further north than the designated disembarkation point, but in safe water and with the full agreement of the master.

The original plan had then been for her to continue heading south and to pass to the west of the Nab, but this was amended by the master shortly before the pilot disembarked. He stated his intention to pass to the east of the Nab. It was a dark clear night and the Fl (2) 10s Nab light was clearly visible. The tide was setting to the south-east. Two ARPA radar sets and an electronic chart system with GPS overlay were operational.

Having dropped the pilot, the master began to increase speed, and altered course to port to pass about 2 cables to the east of the Nab. As he approached the tower, he saw what he thought was a red light at close range on the starboard bow. Assuming it was another vessel and therefore presenting a risk of collision, he ordered starboard helm before going to the front of the bridge to take a better look. The Filipino second officer, who had just returned to the bridge after watching the pilot disembark, was told to come to the front of the bridge to confirm the sighting. Apart from the helmsman he was the only other person on the bridge. He agreed with the master and said he saw a second light to starboard of the first. The master then ordered hard to starboard helm.

When no further lights were seen ahead, he ordered hard to port helm with the intention of resuming the original track to the east of the Nab. From his position at the front of the bridge the master did not know the vessel's heading or his exact position in relation to the tower. Shortly afterwards, *Dole America* collided with the tower's foundation, bounced off, and made contact a second time.

She started to take water and developed a 12° starboard list. The pilot subsequently re-boarded and, with the agreement of the master, ran the vessel aground. She was later salvaged successfully.

The Lessons

This was, by any criteria, an unusual accident. The Nab Tower is a very conspicuous navigational mark and there is clear water all round it. The master was experienced and *Dole America* was well equipped. In identifying the lessons to be learned, the MAIB has deliberately touched on factors that go beyond the actual event to embrace some wider issues.

1. Everyone is subject to circadian (around a day) rhythms, and needs regular sleep. Mariners traditionally work irregular hours, and shortage of sleep is a feature of their profession. But it makes them vulnerable to making errors of judgment they would normally

think inconceivable. Adequate, and quality, sleep is among the most vital factors in a mariner's working life. Too often it is ignored. In this particular instance the master had been unnecessarily disturbed during the time in harbour. It was for something that could have been delegated to a subordinate and explains why he achieved so little sleep during the few hours in harbour.

2. The time when mariners are most vulnerable is in the middle of the night. Even if they feel wide-awake and fully alert, their decision-making capability might be affected. Any master who decides to delay departure for this reason should be confident his decision will be fully supported by the owners.

3. Plans should be drawn up well in advance, discussed with those involved and only changed after careful consideration. In this case, the last minute decision (taken at about 0350) to pass to the east of the Nab rather than the west, was made to save time; it did, by about three minutes. In the event, it delayed things by several weeks.

4. Having dropped the pilot, the master ordered a course that would pass clear of the only obstruction in sight, the Nab Tower. The fact that the planned clearance was only 2 cables might raise the odd eyebrow. If sea room exists, use it.

5. Apart from the helmsman, the master was, for a few moments, the only person on the bridge; the second officer had temporarily gone below to watch the pilot disembark. There was nobody else to monitor what was going on; most bridge teams will recognise the scenario. It is at such times that even greater care is necessary.

6. There is no satisfactory explanation for the red light(s) seen by the master, and, subsequently, by the second officer. Several things could have explained it but, no matter, the master thought it was close and took what he thought was the appropriate action. There was nothing on the radar to correlate with the sighting.

7. The second officer's opinion was sought. He had returned to the bridge a few minutes beforehand and it is possible that he had not fully recovered his night vision. It can take up to 25 minutes for eyes to be totally night adapted but they should be capable of seeing most things within about four or five minutes. Had this limitation been fully recognised, less reliance on his view might have been taken. His eyes would have been better adapted to monitoring the radar where he would have seen any close range contact including the Nab Tower.

8. By moving to the front of the bridge and in front of the console, the master was not in a position to monitor the instruments personally. He then has to rely on aural responses to such questions as "Ship's head now?" or "Range of the Nab?" His team must be in a position to anticipate such requests and respond immediately. The good deck officer in a worked up team will provide the information without being asked for it.

9. After the master had altered course to starboard for what he believed to be another vessel at close range, he would have been perfectly safe to continue his swing and pass to the west of the Nab. He did not do so, and reverted to his original plan by ordering port wheel. This was clearly an error of judgment. He thought he could do it, and realised too late he had insufficient room to complete the turn safely.

10. On the flight deck of an aircraft, the operating philosophy is that the non-handling pilot monitors the actions of his colleague. In this way any procedural error is quickly identified

and mistakes corrected. Aircraft pilots generally accept and welcome this approach. A similar understanding between master and mate exists in some ships; but not all. It should.

11. Even the most experienced master can make an error. A likely time could be in the small hours of the morning and unless it is corrected, a disaster can follow. Junior officers should recognise the importance of their role, and not only monitor what is happening, but have the confidence to speak up when something isn't going right. This can be difficult when those involved are from different nationalities and cultures, but masters should do all they can to encourage it.

 Select the thumbnail to view the accompanying chart (117KB)

Footnote

This accident highlights two factors of shipboard activity that demand the attention of everyone concerned with safety at sea.

The first is the importance of bridge resource training, with specific emphasis on the relationship between senior and junior officers. It should also embrace a thorough examination of who does what on the bridge. It is impossible to say what might have happened had things been handled differently that morning, but other bridge teams might care to reflect on the likely outcome had the second officer been handling the ship, with the master doing the monitoring.

The man who stands back, sees everything. The man in the hot seat tends to focus his attention on the immediate problem.

The second is the recognition that watchkeeper fatigue is one of the most serious problems at sea. An individual is not always able to identify when fatigue is likely to affect his judgment. Routes, orders and guidance should be adapted to cater for this failure of human nature.

Case 8
Alter Course to Port or Stand-On? That is the Question

Narrative

Hoo Venture, a 671gt cargo vessel, was converging on the south-west lane of the Dover Strait traffic separation scheme (TSS) on a course of 187° prior to crossing it. On reaching the northern edge of the lane she intended altering course to port to cross the TSS at 'right angles to the general direction of traffic flow'.
Zgorzelec, a 3,127gt bulk carrier, was proceeding in the south-west lane on a course of 200°. It was daylight, the weather was calm and the visibility was good.

The vessels were on converging courses, and each was monitoring the other visually and by radar from a range of about 5 miles. Had each vessel maintained her respective course and speed, *Hoo Venture* would have passed about 1 mile ahead of *Zgorzelec*.

At approximately 1548 (UTC), *Zgorzelec* altered course some 30° to starboard to a new course of 229° in accordance with the general direction of traffic flow. At 1610 *Hoo Venture*, having reached the northern edge of the lane, altered course to 133° in accordance with her original plan. The vessels were now on a collision course at a range of about 1.5 miles.

Minutes later, *Hoo Venture's* OOW increased speed, which alerted the master, who proceeded immediately to the bridge. The range had closed to about 500 metres. The master turned his vessel hard to starboard and applied reverse propulsion. At about the same time *Zgorzelec* altered course to starboard. She passed about 300 metres astern of *Hoo Venture*.

The Lessons

1. The origins of this situation will be familiar to anyone using a TSS. Rule 10 of the Collision Regulations requires vessels *joining* a lane from the side to do so at as small an angle as practicable, and those *crossing* a lane to do so as nearly as practicable at right angles to the general direction of traffic flow.

***Zgorzelec*, already in the south-west lane would have had no knowledge as to whether the other vessel was going to join the lane or cross it. Either was possible, but she should have been prepared for both. The situation required very careful watching. She should have mentally prepared for the very real possibility that *Hoo Venture* would alter course to port to cross the lane at right angles, and create a risk of collision. Such a move would require her to take prompt avoiding action in accordance with her obligations as a give-way vessel under Rules 15 and 16.**

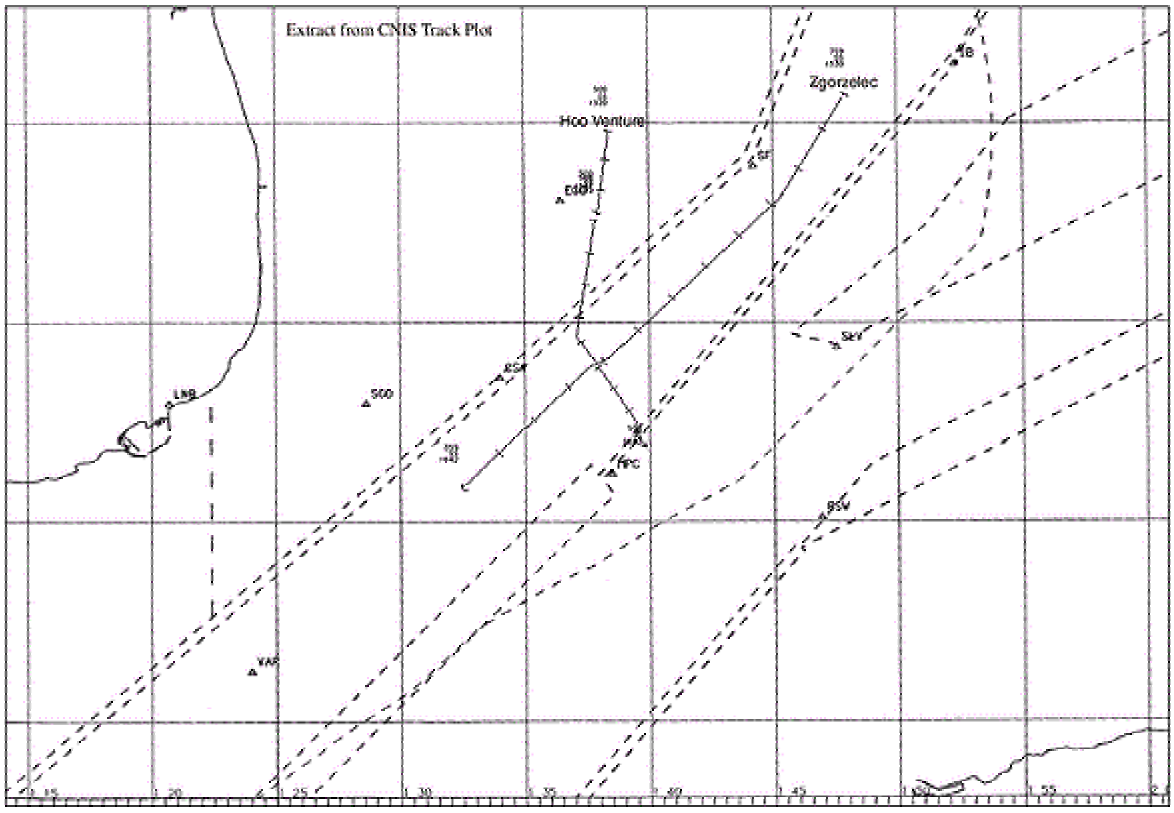
Rule 2(a) of the Collision Regulations states

Nothing in these rules shall exonerate any vessel, or the owner, master or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

2. Rule 2(a) is, however, equally applicable to *Hoo Venture*. She would have known that by altering course to port at the edge of the separation lane she would have introduced a risk of collision with another vessel. She should, furthermore, have realised that the time available for the other vessel to take avoiding action would be limited. Given the circumstances, good

seamanship and forethought should dictate the actions that might be taken. Although no book will ever refer to it, there is also the matter of good manners; it applies at sea as well as elsewhere.

3. The vessel contemplating a substantial alteration of course to comply with her obligations under Rule 10, but realises that by so doing will embarrass another already in the lane, has several options. No two situations will ever be the same, and it is impossible to come up with a text book solution. Had *Hoo Venture* delayed her alteration of course, this article would not have been written, and others would not have had the fun of discussing what they would have done in similar circumstances.



Case 9
Singing from Different Song Sheets?

Narrative

The Danish general cargo vessel *Opnor* was steaming towards Grangemouth in the Firth of Forth. It was daylight, the visibility was good and the sea was slight.

She was heading 240°. Her master, who was on watch, saw a trawler on his port bow engaged in fishing. He was very nearly on its starboard beam, so he altered course to 270° to overtake on her starboard side.

The UK trawler *Stronsay Lad* was towing on a NNW'ly heading in an area of several seabed obstructions. The skipper, who was on watch, watched the approaching cargo vessel and realised a risk of collision was developing. He was reluctant to alter course to port for fear of fouling his gear, but did so at the last minute. His gear came fast and *Opnor* passed very close down his starboard side.

It was a near miss.

The Lessons

1. When closing another vessel and risk of collision is thought to exist, take a compass bearing either visually or by radar. If the bearing is steady, or near steady, and you are the give-way vessel, take the appropriate action and make your intentions clear.

2. Any give-way action should be substantial, and taken early to keep clear. Passing ahead of another vessel, even one fishing, is not normally terribly sensible.

3. If the bearing changes appreciably, it is unlikely that risk of collision exists. In this case, it is apparent that had *Opnor's* officer of the watch taken bearings of the fishing vessel, he would have realised that the risk of collision did not exist. Had she maintained her course and speed she would probably have crossed safely astern of *Stronsay Lad* and her tow.

4. Having altered course to starboard, it is apparent that insufficient monitoring was carried out on board *Opnor* to ensure the alteration of course was having the desired effect.

5. It should never be assumed that a trawler will be able to take effective avoiding action if a give-way vessel fails to do so. A standard navigational chart will not normally indicate all seabed obstructions deemed hazardous to trawling operations.

6. With the above in mind, the obligation on a give-way vessel to take early and substantial action to keep out of the way becomes all the more important.

Case 10
Undeclared Dangerous Goods; Problems

Narrative

The ro-ro ferry, *P&OSL Aquitaine*, fully loaded her main vehicle decks in Calais for her passage to Dover on 24 March 2000. Four cargo units were declared as carrying dangerous goods.

Shortly after departure from Calais the fire alarm sounded, indicating a problem on the lower vehicle deck. During a preliminary inspection the first officer found no smoke, but reported an ammonia type smell. Reference to the declared dangerous goods on board, and the IMDG Code, failed to account for it. The drivers of the vehicles carrying dangerous goods were able to offer no explanation. One of these drivers had been found sleeping in his cab. Precautions were taken to prevent passenger access to the vehicle deck.

Meanwhile, in order to reduce the chances of the odour migrating to the passenger areas, the vehicle deck ventilation was changed from balanced draught to extraction only. BA parties were also prepared; one of which located the source of the ammonia smell to a trailer in the aft port area of the vehicle deck. This trailer had declared contents of 'metal products'; no dangerous goods were declared.

As the vessel approached its berth in Dover, two crew, wearing BA sets, controlled the opening of the stern doors. This assisted in ventilation, and allowed the first few vehicles to be driven off. A tractor unit then towed the offending trailer ashore to a safe area.

The trailer's sides were found to be hot, and water spilled from its bottom. Its contents were thought to be aluminium waste/turnings; a material likely to heat when in contact with water. It can produce flammable and toxic gases such as hydrogen and ammonia.

The Lessons

1. Although the trailer's contents were not positively identified as aluminium waste, the symptom of ammonia production when wet strongly supports this analysis. As such its packing, labelling and documentation should have been in accordance with the IMDG Code as a Class 4.3 substance- 'dangerous when wet'. The criteria for Class 4.3 is that contact with water will produce a flammable gas and sufficient energy to ignite that gas. An explosive ignition is likely to happen within an enclosed, unventilated space, such as a tween deck space with hatches battened down. However, ignition is unlikely to happen on a well-ventilated vehicle deck, other than within the vehicle itself. In any case, the crew took no unnecessary action until they were certain of the problem.

2. The driver who was asleep in his cab clearly had no idea of the risks he was taking. Had the incident deteriorated, or not been properly handled, his safety could have been seriously jeopardised. The lives of others might also have been put at risk in order to remove him from danger.

3. All drivers must be made aware of how important it is *not* to remain on the vehicle deck when the vessel is at sea. The temptation to get one's head down for a while must be resisted. Responsibility for complying with instructions not to remain on the vehicle deck lies squarely with the drivers. The crew have more than enough to do during a vessel's normal turnaround, and are unlikely to have sufficient time to go round each cab to check it is empty.

Case 11
One Thing Leads to Another

Narrative

In preparation for manoeuvring to berth alongside in the Port of Montreal, Canada, an engine room greaser on the 15,647gt containership *Canmar Spirit* started two air compressors. Shortly after starting the second machine, one of its intercoolers burst due to overpressure. This, in turn, ruptured the water jacket.

Fragments of the machine were thrown about violently. Some of these fatally injured the greaser.

Later inspection found that the main discharge valve from this compressor was closed, and the safety valves on both stages were rendered ineffective by carbon type deposits. The performance of the non-return discharge valves had also been affected by carbon deposits; to such an extent that it had become the practice to close the main discharge valve after stopping a machine. Although he had opened this valve on the first compressor, the greaser had overlooked the need to open the discharge valve on the second machine.

Inspection of the other air compressors found that some of their safety valves were also badly affected by deposits.

The Lessons

1. Whereas the compressors had previously been arranged for automatic or remote starting, starting procedures had been modified to compensate for the leaking non-return discharge valves. This introduced the need to open the main discharge valve on a machine before starting. However, the possibility that a machine would be started with its discharge valve closed was also introduced.

2. The safety of the compressors then relied totally on their safety valves functioning correctly in the event of an error being made during starting. No checks were made to ensure that these vital items were capable of performing this, their intended task.

Case 12
No Breathing, Engine Dies

Narrative

The 1,709gt liquid gas carrier, *Quentin*, was approaching her berth in Belfast on 20 August 2000. It was intended to pass the berth, and swing to berth starboard side to. The master, chief engineer and pilot were on the bridge.

Speed had earlier been reduced to 'dead slow ahead'. This was judged insufficient, and propeller pitch was increased slightly to give about 2 to 3 knots.

When about five ship lengths away from the berth, the main engine overload light came on. The main engine stopped shortly after.

As the bow then slowly started swinging to port the starboard anchor was let go. This did not sufficiently affect the vessel's motion, and the port anchor was let go a minute later.

The vessel continued to swing slowly to port, making contact with the berth about three minutes after the engine failed. After sliding along the berth the vessel stopped, and lines were passed ashore and the vessel secured.

The main engine was changed from heavy oil to diesel supply, and restarted five minutes after failure.

Subsequent investigation found the vent from the fuel oil heater to the fuel tank was partially blocked with carbon and deposits. It was concluded that this allowed the heater to gas up and starve the main engine of fuel.

The Lessons

1. The primary lesson is well known to all mariners. When the obscure causes things to go wrong, it does so in the most awkward circumstances!

2. This was not a common problem. Without a history of similar incidents, it is difficult to justify the time to dismantle and regularly check these vents. Now that the problem has been experienced however, an inspection programme is demonstrably worthwhile on this vessel. Three monthly interval inspections have now been introduced.

Case 13
Vessel Grounds in Thames

Narrative

British Shield, a 2084gt oil tanker carrying molasses was on passage up the Thames to Dagenham when shortly after changing pilots at Gravesend, she went aground off Broadness.

The passage from Sunk Spit pilot station to Gravesend had been uneventful. The ship was in autopilot, and the bridge manned by the pilot, the master, a Polish OOW and a lookout. The OOW was sailing with the vessel for the first time. After exchanging pilots at Gravesend the lookout did not return to the bridge, and the vessel continued her passage in autopilot with the pilot adjusting course as required.

As the vessel began a long turn to pass around Broadness, the master left the bridge to complete an administrative task, leaving the OOW as the only member of the ship's crew on the bridge. The pilot then moved to the port bridge wing to monitor adjacent shipping before giving three consecutive orders to the OOW: Half Ahead; Hand Steering; and Port 20.

The OOW adjusted the engine speed and changed to hand steering, but put the helm to Starboard 20. Broadness is a sweeping left-hand bend in the river, and this error put the vessel into immediate danger. Once the pilot had realised what had happened, he ordered the OOW to put the engine pitch to full astern and to execute the correct helm order.

The vessel was, by now, swinging to starboard and heading towards shoal ground to the north, Black Shelf. Although applying full astern pitch slowed the vessel from 10 knots to 3 knots it could not prevent the vessel from running aground.

Assisted by tugs, the vessel was safely refloated, and allowed to resume passage to Dagenham.

The Lessons

1. In pilotage waters, bridge manning must be sufficient to reflect the proximity of dangers, and deal with the manoeuvres and potential emergencies likely to be encountered.

2. Additional personnel are required to deal with the increased demands and pressure caused by an increased number of helm and engine orders, the density of shipping, additional navigational marks, and the volume of VHF traffic. In this case, the pilot on the bridge wing gave an order that was incorrectly executed by an OOW. He was unfamiliar with the ship and nobody noticed the wrongly executed order until it was too late.

3. Effective bridge resource management is a key element in ship safety. A pilot will probably not have the same knowledge of a vessel's manoeuvring characteristics as her master, and cannot substitute for him. Any conning orders by the pilot must be monitored by someone other than the person designated to carried them out. This ensures that mistakes can be identified immediately so that swift remedial action can be taken to prevent unwelcome consequences.

4. An autopilot should only be used in pilotage waters after careful consideration of the circumstances. When navigating in confined waters, and in close proximity to dangers and shipping, hand steering should normally be adopted, thus reducing reaction times in the event

of mechanical failure. The master/pilot interchange on embarkation should include the agreement on which steering mode is to be adopted and where.

5. The Polish OOW understood the helm and engine orders, but inadvertently applied the helm order incorrectly. The importance of giving orders in a clear well-enunciated form is highlighted. In particular the ordering of steering mode and a substantial helm order at the same time should be avoided.

6. The precautionary measure of having an anchor ready for immediate use to act as a brake might have prevented the vessel from grounding.

Case 14
Container Ship Slices Tanker in Two. Five Killed

Narrative

During the forenoon of 28 March 2000 and in falling snow, two ships were approaching each other on near opposite courses in Öresund off the Swedish Coast.

The northbound vessel was the 6,378gt Maltese-registered container vessel *Werder Bremen*, doing about 15 knots. She was on a regular route between continental ports and Russia, and manned by a 13 strong crew. Her bridge team maintained four hour watches, and at the time of this incident her well-rested master was on watch and seated in front of one of the two functioning ARPA radars, the 10cm set to a 3m range scale in the true motion mode. The range scale on the other (3cm) radar was set to 6 miles. Steering was by autopilot. A lookout was also on watch.

The southbound vessel was the 393gt Liberian-registered chemical tanker *Martina*, doing about 11 knots. She was on her way from Sarpsborg in Norway to Copenhagen, with approximately 600 tons of hydrochloric acid embarked. She had a crew of six and one passenger. Bridge watchkeeping was shared between the master and mate on a six hours on, six hours off basis.

At the time of the accident *Martina's* chief officer was on the bridge, and when his body was subsequently found it was only lightly clad. The master's body was found below, and there is evidence to suggest he had been temporarily relieved by the chief officer. As with *Werder Bremen*, there were no known deficiencies on board. The investigation was able to determine that the chief officer was alone on the bridge at the time of the accident, with one of the two radars in the stand-by mode. The second radar was probably set to the 2-mile range scale.

In the minutes before the accident *Werder Bremen's* master saw an echo on his radar at a range of 2.5 miles and about 10° on his starboard bow. He established from ARPA that it was a contact on a course of 162°, had a speed of 11 knots and a CPA of 0.5m to starboard. *Werder Bremen* was steering 332° at the time, and having established that the two vessels were to pass safely starboard to starboard, her master ceased to pay specific attention to the movements of the closing contact.

It has not been possible to determine accurately what happened on board *Martina*, but it would appear that her officer of the watch altered course to starboard when very close to the contact he held on radar ahead of him.

Meanwhile, the master and lookout of *Werder Bremen* suddenly caught sight of the other vessel through the snow at a range of between 1 to 1.5 cables and turning to starboard. On realising that this other vessel would cross ahead of him *Werder Bremen's* master set a speed of zero and put the wheel hard to starboard. But it was too late and the two vessels collided without reducing speed. *Werder Bremen* sliced through *Martina* with the result that she sank within seconds. Five people lost their lives; two were rescued.

The weather at the time of the accident was not good. The wind was north-easterly force 5 to 6 with falling snow and visibility in the order of 1 to 3 cables.

The Lessons

1. Despite modern radars with ARPA, navigating vessels in conditions of poor visibility remains one of the most challenging tasks that an officer of the watch has to face.

2. Falling snow is among the most deceptive of all forms of precipitation. Most people overestimate the visibility range when making way in it, so allow for this and temper your actions accordingly. And remember it has an adverse effect on radar performance.

3. In poor visibility, make conscious decisions about how you deploy your assets. The key requirement is to ensure that you have early warning of any form of obstruction or potential collision hazard. Set your radars to their optimum settings for the prevailing conditions, and have one of them (assuming you have more than one) set to a range scale where you can see well ahead.

4. If radar is your primary aid to preventing collision in poor visibility, your back up is an alert lookout by both officers and ratings. Despite all modern aids, eyes and ears remain extraordinarily effective in providing crucial information on which to make decisions to prevent a collision. Where possible this means going outside the warm wheelhouse to listen and look. Watchkeepers in such conditions should be suitably attired to achieve this.

5. Do not be seduced into thinking that a digital readout of a 0.5m CPA from ARPA means just that. Quite apart from any action that the other vessel may take to change the CPA, the ARPA's predictions are based on information that contains a margin of error that could be greater than the predicted CPA.

6. The golden rule about using radar in fog when you detect another ship is never, ever, ASSUME you know what the other man is going to do. Remember that Section I of the Steering and Sailing Rules apply to vessels in any condition of visibility, Section II applies to vessels in sight of one another. Many officers of the watch assume that Section II Rules will be applied when vessels cannot see each other. The key factors are to '*proceed at a safe speed*' and '*Any action taken to avoid collision shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship'.*

7. If, in poor visibility, you calculate the CPA of an approaching vessel is likely to be very small and safe, never ASSUME the other man has come to the same conclusion. He may decide to do something about it and take action that aggravates the position before you realise it. At the risk of being boring it is worth reminding yourself what Rules 8(b), (c) and (d) say.

8. Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel ___.

9. If there is sufficient sea-room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.

10. Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance___.

11. And one final thought. Don't forget Rule 19 and its title. There are no stand-on vessels in restricted visibility. It also reminds mariners to make sound signals and to turn away from each other to avoid close quarters situations.

Footnote

The investigation was carried out by both Swedish and Danish authorities, and the original report was produced jointly by the Investigation Division of the Danish Maritime Administration and the

Marine Casualty Investigation Staff of the Swedish Maritime Administration. The MAIB gratefully acknowledges the co-operation of both administrations in the drafting of this article.

The official report into the accident commented that "Whatever took place on *Martina*'s bridge is shrouded in obscurity, since her officer of the watch did not survive the accident."

Neither *Martina* nor *Werder Bremen* was fitted with Voyage Data Recorders, but the investigating authorities were able to recover the radars from Martina and draw conclusions from the evidence they revealed.

Part 2 Fishing Vessels

Fishermen are required to undertake a range of tasks at sea. Few demand such a high level of responsibility as watchkeeping.

No two fishing vessels are quite the same and no two crews will ever operate exactly alike. Some vessels are required to carry qualified watchkeepers, others do not. Scrutiny of a number of accidents show that watchkeeping errors, or worse, are just as likely to occur among the qualified as those who are new to the sea. All too often we see bad practice being perpetuated. Most fishermen know the rudiments of good watchkeeping and keep themselves and their colleagues out of trouble. It isn't always so, and we see too many instances of fishing vessels that ground, collide or founder. In nearly every case the person on watch could, and should, have done something to prevent whatever it was from happening. If mistakes are made then others must learn from them and avoid doing the same thing all over again.

Before allowing anyone to take responsibility for the safety of a vessel and everyone on board, skippers must satisfy themselves that those keeping a watch know how to navigate, use a radar and interpret the Collision Regulations. They must know how to operate equipment in the wheelhouse and react to certain situations such as an alarm sounding. And they must develop an instinctive feel for the weather, changing visibility, the effects of the tide and how their vessel is responding to a given sea state. In short the skipper must ensure that whoever is on watch has sufficient basic skills and knowledge to keep him, and his mates, safe at all times.

The MAIB has come across at least one example where the watchkeeper's only understanding of his role was to steer the vessel so that he followed an electronic line on the video plotter. He did this very well notwithstanding the appearance of a large island on the radar's heading marker. Hardly surprisingly, his vessel went aground.

We have come across watchkeepers who had no concept of how to plot a position on a chart or any idea of distance and scale. Some have been known to leave the wheelhouse for extended periods to visit the galley or help stow fish down below. Others have been found with the lights on at night; reading magazines or watching TV. It is tempting to ignore such practices as being unrepresentative of what goes on at sea, but the sad reality is that they have all happened and we have evidence to show that in each of the examples given, the vessel concerned had an accident.

Many fishermen do not understand the Collision Regulations and at least one person we have come across did not even know of their existence. One of the least understood Colregs of all is Rule 19, concerning the conduct of vessels in restricted visibility. Many fishing vessel watchkeepers appear to believe that because they are fishing, even in thick fog, other ships have a duty to keep clear. They are wrong.

Watchkeeping can be a tedious process. It should be rewarding. It is always challenging. But those who keep watch must do it properly, day in day out, night and day, fair weather and foul. If those entrusted with this important duty do not know enough to do it properly, or do know but then fail to live up to their responsibilities, the consequences can be devastating.

Case 15
Fires Love Open Doors!

Narrative

Be Ready, a 24m fishing vessel operating out of Scalloway, Shetland, left port on Monday 17 January 2000 with a crew of four for the fishing grounds 60 miles west of the Shetland Islands. She returned briefly on Thursday, to embark a new set of trawl boards and an additional deckhand before returning to the same area and re-start trawling.

At about 0215 on Saturday morning, the vessel was slowly trawling in a southerly direction, when the mate, who was on watch, discovered a fire in the galley. The skipper and crew were called and gathered in the wheelhouse, passing the galley on their way. With the galley door secured in the open position, all saw the fire but nobody attempted to shut the door. A short abortive attempt was made to fight the fire but, by this time, the accommodation itself was starting to burn. The skipper called the coastguard on the VHF to tell them of the fire, but lost direct contact. He attempted to stop the main engine, but the controls failed to respond. Kirkwall lifeboat was launched and a rescue helicopter was airborne at 0219. Using a "Mayday" relay, local contact was made with fishing vessels in the area, and contact re-established with the casualty.

Be Ready's crew, having realised that the fire was beyond their control, launched both liferafts. With the vessel still going ahead slowly, both liferafts became entangled with the trawl wires aft and were lost. Lifejackets had to be retrieved from the accommodation using the emergency escape hatch. The crew of five then moved forward and waited for the rescue vessels, maintaining contact via a hand-held VHF set. Weather conditions were force 8, rough seas with wintry showers.

The fishing vessel *Mizpah* was first on scene, followed by the helicopter. The helicopter tried twice to get a Hi-line aboard, but conditions were too bad. *Mizpah* then made two close passes, bow to bow, managing on the second attempt to pass a line connected to a liferaft to the casualty. Once the liferaft was alongside the bow, the crew entered it using a rope ladder over the starboard side. With all five aboard, they moved away from the burning vessel and were then lifted into the helicopter and taken to Lerwick hospital for a check up. Apart from minor burns and bruises, there were no injuries.

The galley fire is thought to have started due to a combination of a hot heating element on the cooker and items of clothing/drying cloths above, or close to, the hot plate. Once alight, and fanned by a strong draught from an open window on the starboard side shelter deck and an open door on the port side, the fire rapidly gained strength and entered the accommodation.

After the fire had burnt itself out, *Be Ready* was towed to Lerwick for repair and/or re-sale.

The Lessons

1. When nobody is in the galley, ALWAYS close and KEEP CLOSED the galley door. If a fire breaks out, this not only contains the fire within a protected space, but it also gives the crew valuable time to organise what course of action should be taken. Never tie or secure a fire door in the permanently open position. By doing so, you encourage the fire to spread and then it can become too dangerous to risk closing the door.

2. Always turn off all hotplate elements and cookers after use. Never leave them on in an unattended galley. Leaving them on may save a few minutes in getting up to working

temperature, but it can also be the cause of a fire, or a bad burn as a result of a moment's inattention by a fellow crew member.

3. Never leave drying cloths or clothes over, or close to, hotplate elements which are switched on.

4. In all cases of fire, close all sources of ventilation to slow its progress- SHUT all doors and windows to the space.

5. Once a fire such as this is found, the main engine throttles should be pulled back immediately to reduce the wind effect from forward ship movement on the fire.

6. The installation of a smoke or heat detector in the galley area would have detected this fire before it became well established, and allowed it to be tackled using the vessel's fire extinguishers.

Case 16
Overloading, Disregard of Stability and Flooding, Results in Loss of Vessel and Skipper

Narrative

The 23m long fishing vessel, *Amber Rose*, was trawling for herring with a partner vessel in the Irish Sea to the east of the Isle of Man.

It had been a successful trip, and her crew decided to load the last catch in *Amber Rose* and then head for Ardglass to land it. After filling all three RSW tanks to capacity, some of the catch had to be dumped into the sea.

The vessel's stability book, carried on board, stipulated that the volume within the hatch coamings had to be left empty, and that there should be an ullage of 500mm in the centre tank to ensure adequate stability. The crew, keen to get as many fish on board as possible, ignored this restriction.

With the catch on board, *Amber Rose* set course for Ardglass. The mate took the watch and the rest of the crew turned in. During the passage everything appeared normal until the mate altered course just south of the Chicken Rocks to put the prevailing weather on her port side. Moments later, and without any warning, *Amber Rose* capsized. There was no time to send a distress message.

Five crew members managed to escape, but sadly the skipper became trapped in the accommodation. As the vessel sank, the liferafts released automatically and inflated. The five survivors were able to reach and board them. They were eventually recovered by the search and rescue team.

The MAIB investigation found that the skipper had increased the capacity of the RSW tanks without informing the MCA. It was further revealed that *Amber Rose* had recently undergone a refit, which affected her stability to such an extent that she did not meet the minimum stability standard for fishing vessels. The skipper had ignored requests by the MCA to have the vessel's stability remeasured.

Model tests to identify the cause of the capsize showed that internal flooding further reduced the vessel's stability. It was concluded that the direct cause of the loss was undetected flooding to the forward spaces. One contributory cause was the poor initial stability of the vessel following successive alterations and overloading. The bilge alarm, fitted in the forward spaces, failed to operate.

The Lessons

1. Whenever any alteration is made to a vessel's permanent structure that affects her displacement, the MCA should be informed so, if necessary, new stability data can be produced. Failure to do so can lead to vessels sailing in a potentially dangerous condition. Because *Amber Rose's* stability had fallen below the required standard, she became vulnerable to capsize and did so.

2. When there is a good catch the temptation to overload should be resisted. To overload will adversely affect stability, and could lead to the vessel capsizing and loss of life.

3. Always consult the stability booklet; it is there for your safety. If you do not understand it, consult someone who does.

4. The failure of high-level bilge alarms is all too common in the fishing industry. Had the bilge alarm been fully operational, the crew would have had early warning of flooding, and the outcome might have been very different.

Apply the family test for bilge alarms. If you know it isn't working in your vessel, tell a lady friend or relative. It is very likely she will tell you to make sure it is before you sail. It's good advice; take it.

Case 17
Lone Skipper Trapped in Winch for Several Hours

Narrative

The 9.98m wooden fishing vessel *Wakil II* was fishing off the Cumbrian coast, when her skipper, operating on his own, became caught in a winch.

Wakil II was trawling for prawns. The skipper was hauling for the second time that day and, for ease in handling and grading, had laid out six empty fish boxes on the small working deck aft. Because the size of prawns varied so much, this was three more than he normally had. These additional boxes cluttered the deck and made movement difficult.

The skipper normally squared up the deck before hauling but, because he hadn't finished grading the previous catch, the six boxes were left in place. He continued to haul at the same time as grading the prawns.

He was standing near the port winch barrel when he lost his footing and fell onto the port trawl warp as it was being heaved up. He fell awkwardly and the sleeve of his oilskin jacket caught on a shackle. He found himself being dragged onto the barrel of the winch. Unable to free himself he became pinned to the deck beneath the winch barrel by the sleeve of his jacket becoming trapped from the cuff to the neck. The winch was not fitted with a dead-man's handle.

The winch did, however, stop. The resistance of the skipper being trapped proved too much for the small diesel engine providing power to the winch, and it cut out.

Injured and in a lot of pain, he lay trapped beneath the winch for about 9 hours. It began to get dark and the navigation lights were not switched on. He became very worried that he might not be found and realised his vessel was in danger of drifting onto the rocks at St Bees Head and breaking up.

Concerned that by remaining trapped he might drown, he put as much effort as he could into freeing himself. He eventually managed to rip his oilskin jacket from the arm up to the neck, freeing first his head and then the rest of his body. He managed to make his way to the wheelhouse and raise the alarm. He was also suffering from mild hypothermia and switched on the heaters.

St Bees inshore lifeboat, and the Workington lifeboat with a doctor onboard, were launched and tasked to the scene. The skipper was transferred to hospital suffering from shoulder, facial and rib injuries. He made a full recovery.

The Lessons

1. Single-handed operations carry additional risks. If anything goes wrong, you are on your own and there is nobody to help or raise the alarm. There are obvious safety advantages to having two people on board, but if circumstances dictate that you have to operate on your own then additional care has to be taken. The temptation to take a short cut or do something that is inherently unsafe must be resisted.

2. Always clear the working deck of any tripping hazards before hauling or shooting. The MCA has produced a very useful leaflet called *Fishermen* and *Safety* which is worth reading. It is free!

3. There is no evidence to indicate this skipper suffered from shock in this particular accident, but anyone in such a situation may well be affected. Never underestimate its effects. Until you have experienced it, you cannot imagine how it constrains your ability to do things you might normally find straightforward. Double your efforts not to take an unnecessary risk. Prevention is so much better than cure.

4. Dead-man's handles fitted to winches make sense. It means the winch can not be operated without applying pressure to the control lever. Had such a device been fitted in this instance, the accident is unlikely to have happened.

5. Even if you do operate your vessel single-handedly, it is still advisable to carry out a risk assessment, if only in a simplified form. The risks taken by the skipper in this case could have been identified and addressed, thus preventing the accident from happening.

Case 18
Low Freeboard Causes Two Fatalities

Narrative

Donna M, an 8.8m decked vessel, was fishing for lobsters and crabs about a mile south of the Island of Sanday in the Orkney Islands. The vessel was shooting and recovering pots in fine weather one afternoon at the end of August. The skipper had only just purchased her, and this was his first trip carrying 50 lobster/crab pots.

The previous owner had used the boat mainly for prawn potting, but had occasionally fished for lobsters and crabs with just 30 pots. Prawn pots weigh much less than lobster/crab pots.

Donna M's freeboard was very low at the aft end. Her skipper assumed the previous owner had carried a similar load of 50 pots, and that the low freeboard was normal. He was unaware that by carrying this many pots he had reduced the freeboard to an unsafe level.

When underway on the day of the accident, water flowed on to the aft deck through the freeing ports. The crew might not have been aware of this development because the pots were stowed aft, and prevented anyone from seeing what was happening. There was a non-watertight hatch in the aft bulkhead with a low lip at the bottom edge. The water lying on the aft deck would have lapped over this lip as the vessel pitched and rolled. This water would have settled in the bilges.

This floodwater then built up to such an extent that it penetrated the wiring to the electric bilge pump. The wiring was in poor condition, and the effect was that it disabled the bilge pump.

It is possible the crew were unaware that the pump was disabled to start with and, when they switched it on, might have assumed there was no water in the bilges. They must have realised something was wrong eventually because they tried to rig the deck wash pump to pump out the bilges. Before this could be achieved, however, sufficient water had flooded into the vessel and *Donna M* capsized.

The two-man father and son crew were both lost; neither was wearing a lifejacket.

The Lessons

1. Skippers should ensure that their vessels have adequate freeboard when loaded. There are no statutory requirements regarding freeboard for fishing vessels under 12m, but the formula in the Workboat Code published by the MCA is a good guide.

2. A relatively high percentage of accidents occur in vessels that have just changed owners. New owners or skippers should, so far as possible, do their best to establish how the previous users operated the vessel, paying particular regard to stability considerations and weights embarked.

3. Lifejackets should be worn. Comfortable self-inflating lifejackets, suitable for constant use, are readily available. Further guidance is shown in MGN 155(F), provided free by the MCA.

4. Bilge pumping systems should be regularly inspected to ensure they are reliable. Further guidance is shown in MGN 49(F), provided free by the MCA.

Case 19
Saturated Buoyancy Causes Dory to Capsize

Narrative

At midday in late August, the 8m long GRP dory *Fisher Lad* was fishing in Scapa Flow in the Orkney Islands. The wind was force 4 to 5 and the sea was choppy.

While deploying a string of pots, the back rope snagged the threads of a bolt protruding below the rack in the port aft corner. When the next large wave came along, the stern failed to rise because it was now firmly anchored by the back rope tethered to the pots. The wave swamped the open deck, and because the hatch to the engine room was not watertight and there was no protective coaming around it, water flooded into the engine space below. The weight of the floodwater, together with an estimated 300kg catch onboard, caused the freeing ports to dip below the waterline. This, in turn, lead to progressive flooding. The bilge pump in the engine room was unable to cope and *Fisher Lad* capsized.

The crew had insufficient time to either don lifejackets, or send a distress message on the VHF radio. They were, however, rescued by the crew of a nearby fishing vessel, and *Fisher Lad* was recovered back to Stromness where she was later salvaged intact.

Fisher Lad was constructed of an outer GRP hull moulding, into which was laid an inner deck moulding. The space between the two was partially filled with foam, which, over a period of time had absorbed a quantity of water. This progressively reduced the vessel's freeboard, making her less stable and more vulnerable to capsize.

The Lessons

1. Owners of GRP dories should investigate any change in freeboard, as this might be the result of water entering the void.

2. If there is reason to believe that water is present in the void space, seek expert advice before attempting to use the craft.

3. Water in the void should be cleared, and any damage to the hull and decks carefully checked and repaired. Particular attention should be paid where it is known that a dory has capsized before.

4. Flush hatches in open decks should be watertight. If it is necessary to have non-watertight hatches, the opening should be protected with an adequate coaming.

5. Always wear a lifejacket. Although it is obviously impractical to wear survival suits when fishing, consider having them readily to hand. In other parts of the world many fishermen have cause to be grateful for having them on board. Assuming there is time to put them on, they have been found to be a very effective protection against the cold of seawater immersion, and ensured the survival of people who would otherwise have lost their lives.

Footnote

The MAIB has investigated several accidents involving dories similar to the one described here, where water has penetrated one or both mouldings, and the foam-filled void has, over time, absorbed a great deal of water.

Boat builders have ceased production of this particular design partly because of the problems associated with water ingress into the void.

The MAIB regularly recommends that fishermen wear lifejackets. At the same time the Branch is well aware that many who have tried to do so find that they soon become damaged, become covered in fish oil, or have a tendency to catch on things. Despite the best intentions, even the most determined fishermen will become disillusioned in such circumstances, and be tempted to abandon the endeavour as a waste of money and effort. There is another approach. Talk to the manufacturers, or get your association to represent you. The people who design and make lifejackets will listen to your concerns, and will do their best to overcome the problems. Unless they have practical feedback from sea, they are unlikely to get it right first time. The manufacturer would like nothing better than to hear that fishermen approved their product.

Case 20
Loss of Fisherman Results in Lifejacket Campaign

Narrative

Harbour Lights, a 7.2m long vessel, was gill netting off the south coast of Cornwall late one afternoon in January. The wind was force 4. The sea was moderate with a slight swell, and visibility was good.

The experienced young skipper was operating the vessel on his own and, while deploying the last net, he appears to have fallen overboard. The vessel, steered by auto-pilot, continued on its way until it hit rocks and broke up just east of Polperro.

An extensive search operation began shortly after *Harbour Lights* became overdue. While flotsam and wreckage from the vessel was recovered, the skipper's body has never been found.

Like many single-handed operators, the skipper did not normally wear a lifejacket. Had he done so his chances of survival would have increased substantially through being so close to the shore. The non-wearing of lifejackets is a persistent feature when analysing the reasons why so many fishermen are lost at sea. This tragic accident spurred the harbourmaster of Polperro, and the skipper's father, to organise a lifejacket campaign in the area. It was so successful that the local chandler sold out of lifejackets.

The Lesson

The attitude to lifejackets adopted by the fishermen of Polperro and the surrounding area should be followed throughout the country. Comfortable and compact lifejackets, suitable for constant wearing are readily available, and cost only £50-£100. This is a cheap price to pay to save your life, and prevent the heartbreak of your family. Fishing communities should accept that wearing lifejackets is necessary, without being reminded of it by a tragic accident.

If you still have complaints about a lifejacket's suitability for use in a fishing vessel, draw the problems to the attention of the manufacturers. They will be only too pleased to listen to you.

Case 21
Grounding and Loss of Fishing Vessel

Narrative

Betty James landed her catch in Mallaig one July evening. Before sailing to return to the fishing grounds that night, the crew went to an hotel bar close to the harbour for a drink. She sailed shortly after midnight, and about an hour later the skipper handed over the watch to a deckhand. *Betty James* was, at the time, south of Sleat, steering about 250° in autopilot and making good 7 knots. Safe navigation was reliant upon a video plotter and radar.

After taking the watch, the deckhand left the wheelhouse to make a sandwich. When he returned at about 0125, he turned on the wheeelhouse lighting, reduced the volume of the radio and sat down in the heelhouse chair to read the Sunday newspapers. Between 0135 and 0145 he fell asleep. *Betty James* was due to make a course alteration at 0205, but this was missed. At 0230, she grounded on rocks on the south-east coast of the Isle of Rhum.

Awoken by the impact, the skipper went straight to the wheelhouse where he found the deckhand looking shocked, the vessel listing about 20° to starboard, the watch alarm sounding continuously, and the propeller still driving ahead. The skipper took the propeller out of gear immediately and alerted *Arnisdale*, a fishing vessel nearby, and the coastguard.

Attempts to refloat the vessel using engines and rudder failed and, as the vessel's list and motion became increasingly unsafe, the skipper decided to abandon ship. The four crew disembarked into a liferaft and, rather than head for the nearby shore, paddled towards *Arnisdale* lying some 500 metres away. When abandoning ship, two deckhands donned personal survival suits but no lifejackets, while the skipper donned a lifejacket but not his survival suit. The remaining deckhand, who had not completed a sea survival course, did neither. The crew were safely recovered and, other than suffering from shock, were unscathed. There were no injuries.

Further attempts to re-float *Betty James* were unsuccessful and she eventually became a total loss.

The Lessons

1. Disrupted sleep, which leads to fatigue, is an unavoidable aspect of a fisherman's life at sea, and every opportunity to catch up on lost sleep should be taken; especially when the interval between landing and sailing is as short as an hour or two.

2. Even a modest amount of alcohol can have a detrimental effect when trying to keep alert late at night. The situation is aggravated when you are already tired.

3. After having consumed several beers and a sandwich, the deckhand spent his watch, in the middle of the night, reading a newspaper in a comfortable chair with the lights turned up and the radio on. A fishing vessel was lost and four fishermen got wet. Next time, it could be worse, far worse, and lives may be lost. Somebody will then have to tell the families what happened and will find it impossible to explain why a loved one died simply because bad watchkeeping habits had been allowed to become an accepted way of life.

4. To many, the existence of a watchkeeping alarm is the solution to the problem. The alarm will sound, the argument goes, the watchkeeper will wake up and the problem will go away. But even when he wakes up to cancel the alarm, the watchkeeper is just as likely to be very tired and incapable of performing to the best of his ability and, secondly, some are so tired

that they sleep through even the loudest alarm. If you have an alarm, make sure it sounds in the accommodation area as well as the wheelhouse. It may waken somebody who will do something about it.

5. Crews in vessels that founder or go aground often have only moments to prepare for the worst, but donning lifejackets and, if carried, survival suits should be an instinctive priority. Having them readily available will do much to ensure this can be done.

6. In an emergency even the most experienced people will react out of character. It is even more evident when people are suddenly plunged into cold water. Research has repeatedly shown that in such conditions an individual will instinctively revert to whatever training he has received in the past; which is why survival training is so important. Training in basic sea survival is mandatory for all fishermen born on or after 1 March 1954. It is significant that the one deckhand who had not completed a sea survival course was the only one not to don a lifejacket or put on a survival suit.

7. The skipper's decision not to head for the shore but to paddle for *Arnisdale*, which was considerably further away, was prudent. It would have been difficult to control the liferaft in the surf on a rocky shore, and serious injuries might well have resulted.

Part 3 Leisure Craft

Nearly everyone who goes to sea for pleasure, or is involved in this sector, will sooner or later experience the odd misfortune. Most will be relatively minor. There will be the odd bump, the occasional grounding, a scald or two, a sore head (from a swinging boom, not the after-effects of some modest indulgence), an embarrassingly close encounter with a merchant ship in confined waters, or any number of untidy berthing incidents. (For some unfathomable reason people are always watching when you make a meal of coming alongside.)

Occasionally however the situation is more serious and someone either gets badly hurt, a boat sinks, or there is loss of life. In such circumstances the MAIB may well take an interest.

An analysis of a number of leisure craft accidents over the past few years makes interesting reading. It is apparent that very few serious accidents occur because of the total inexperience of a skipper. A common feature in many of the more serious accidents is that the person in charge is either very experienced and/or is more than adequately qualified.

The only time a lack of experience, or familiarity with the sea features is when a skipper is sailing with an inexperienced crew, and rough weather is encountered. When analysing any such accident it is interesting to note the number of times a crew has commented on the inadequacies of the pre sailing brief. Very few of the skippers involved have, apparently, ever insisted on their visitors actually putting on a lifejacket and harnesses before setting off so they know where to find them and how to put them on. Come the emergency, this one omission can have tragic consequences.

It also seems that many 'experienced' skippers forget what a challenge it is to be at sea for the first time and the conditions deteriorate. If the weather is rough, and the crew are tired, wet, hungry or suffering from seasickness, the skipper begins to realise he is no longer facing one problem, but several. The inexperienced are not in a position to act instinctively to help, or indeed to respond to directives to do things. They do not know how to. The skipper then has his hands full, tends to do everything himself and very rapidly tires. He knows the burden of responsibility falls to him, but a tired skipper starts to make mistakes. It happens over and over again.

There is nothing whatsoever wrong with an experienced skipper taking out non-sailors, or sailing with an inexperienced crew. But if the lessons of the past are to be heeded, we strongly urge more attention being given to safety briefings before leaving the berth, and having a second experienced hand on board if bad weather or rough conditions are anticipated.

Case 22
So Close to Home and Yet So Far

Narrative

At the end of October 1999 five schoolteachers sailed across the English Channel in the 28ft bilge keel Westerly Konsort *Kishmul* of Ayr. Setting off from Plymouth on a Wednesday evening they crossed the Channel to spend a night at St Peter Port, Guernsey, before moving on to Cherbourg. After an evening spent ashore, and with bad weather forecast, they decided to curtail their visit and head for home. Conditions deteriorated during the return passage and by the time they sighted the breakwater at Plymouth on the Saturday evening and in the dark, the wind was blowing force SSW 7 to 8 with a high sea running. As the yacht headed towards the eastern entrance of Plymouth Sound, she grounded on rocks, subsequently broke up and sank. Four of the crew survived but the owner/skipper did not. His body was recovered from the sea the following morning.

The skipper was an experienced yachtsman and had owned his boat for 9 years. He held a yachtmaster's certificate and had crossed the Channel several times before. He knew the approaches to Plymouth well, and had a reputation for putting the safety of his crew first. His crew were less experienced. Two had sailed a number of times before, but the other two were novices. One had no experience at all. All four had total confidence in the skipper.

Kishmul of Ayr was well equipped for the intended passage. She carried adequate navigation equipment including a Garmin GPS navigator. A full range of lifesaving equipment was also held on board.

The prime purposes of the voyage were to have an enjoyable time and to provide sailing experience for the crew. One of them was studying for a Yachtmaster's qualification.

The passage had been uneventful until a weather forecast was received on the Friday evening to indicate the conditions were going to deteriorate more than expected. The collective decision was taken to return across the Channel some 12 hours earlier than planned and sail from Cherbourg at midnight. Mindful of the tides prevailing over the weekend the selected destination was to be Salcombe. On departing Cherbourg, a freshening southerly breeze was forecast with an Atlantic depression expected on the Sunday.

During the passage the four crew members shared the watchkeeping, with the skipper coming on deck when required. Lifejackets were not worn. The course selected was towards Start Point so that one of several options for the final destination could be considered once the landfall had been made. Navigation was conducted using the GPS and by plotting the positions on the chart. With the generally unpleasant conditions, there is evidence that towards the end of the passage the crew had become wet and tired, and at least one of them was suffering from sea sickness.

Once Start Point had been raised, and with a fair tide under them, the skipper decided to head for Plymouth. The track selected involved keeping about 10 miles off the coast initially but coming close inshore for the final approach.

The skipper took the helm himself for the last four hours of the passage, and was navigating by eye. He knew the waters well and visibility was good as he approached Plymouth Sound from the east.

It isn't possible to know exactly what plan the skipper had in mind as he headed for the shelter of the Sound, but it involved keeping to seaward of a number of yellow firing range buoys lying off

the Great Mew Stone. There are seven such buoys in almost a straight line; three of which were lit with flashing yellow lights. The two end buoys flash every 5 seconds and the centre one every 10. He clearly anticipated following them until he thought it was safe to alter course to starboard. As they passed close down the line, the skipper and the one member of the crew who was with him in the cockpit realised they had not been counting them.

As they passed what they thought was either the third or fourth buoy, course was altered to starboard to round up for the Eastern Channel. It is possible the skipper thought he had reached the most westerly buoy in the line and had clear water to run up to the Eastern Channel.

For the approach he used the Eastern Breakwater sectored light as the head mark. It was identified as 'a red light'. He did not take a bearing of it or check his position by any means. He continued to navigate by eye.

Throughout this period the GPS was functioning correctly but was not being used. The other three members of the crew were below in the cabin, and the echo sounder was switched off. No positions were being plotted on the chart.

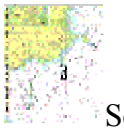
Soon afterwards there was what one of the crew described as an 'almighty bang'. A few moments earlier the skipper had seen something in the dark ahead and thought it might have been a buoy. Almost immediately the 'something' was identified as a rock. Kishmul of Ayr grounded on the Renny Rocks ledge off Renny Point and just to the east of the unlit Shag Stone. It was shortly before 1950. The wind was SSW to SW near gale and the sea assessed as moderate to rough. It was very confused in the immediate vicinity of the rocks.

The yacht did not appear to have been badly damaged on first impact, but subsequent waves swept her back on to the ledge and holed her. She started to fill with water and the skipper went below and transmitted a "Mayday" which was acknowledged immediately. The skipper was already wearing a jacket with built-in buoyancy, but told the others to don lifejackets and come on deck. With the boat moving about so much, at least one of the crew found putting on the lifejacket very difficult. He needed two hands to don it but also needed to steady himself.

With waves continually sweeping over her, the yacht showed signs of breaking up as she was buffeted against the rocks. The liferaft was prepared for launching but was swept away and not used. The survivors subsequently felt that it would have been of limited value given the proximity of the breaking waves on the nearby rocks. The skipper returned below to locate the flares but couldn't find them. With all the gear floating around in the half-filled cabin it was chaos.

Soon afterwards, the Plymouth lifeboat was seen approaching but, because of the yacht's proximity to the rocks, it couldn't get sufficiently close to rescue anyone. The time was 2017. About 20-30 minutes after the first impact it was clear the yacht was about to capsize and the skipper ordered his crew "to get off the boat". They found themselves in the water and trying to survive. One man found that one of his training shoes had caught in one of the halyards. They found that by swimming away from the rocks they were in slightly better conditions.

Three men were winched from the sea by a helicopter between 2040 and 2052, while a fourth managed to swim ashore after spending about an hour in the water. The fifth, the skipper, was last seen near the wreckage of the yacht. An exhaustive search was made for him but without success. When his body was recovered the next day, the jacket and buoyancy aid he had been wearing the previous evening was no longer on him.


Select the thumbnail to view the accompanying chart (118KB)

The Lessons

1. It is very easy to attribute this tragic accident to navigation error. As in all accidents, it happened because a number of events, none in themselves particularly serious, occurred one after another. In this case they eventually led to the loss of a yacht and the life of her skipper.

2. Although it was late in the year, the yacht, her skipper and crew were fully capable of undertaking the planned passage. Bad weather was both forecast and experienced, but there were no overwhelming reasons why *Kishmul of Ayr* could not have made a successful crossing in the conditions encountered. The decision to curtail the weekend cruise while in Cherbourg was reasonable, but it was probably there that the first link in the causal chain occurred.

3. With bad weather forecast a skipper is faced with four basic choices. He can abandon the passage altogether, delay sailing until conditions improve, advance the time of sailing to try and beat it, or batten down completely and go when planned. If the third choice is selected, a skipper must think through what needs to be done before setting out. By the time the yacht is approaching her destination it is highly likely the conditions on board will be uncomfortable, and there is every prospect the crew will be very tired. The more that can be done before departure the better. Preparations not only involve securing everything for sea and planning the port entries, but thinking through the effects of fatigue. A skipper should also bear in mind the implications of having a crew with relatively little experience. Such considerations might have a bearing on the planned conduct of the passage.

4. If the final approach is likely to be made at night and in foul weather, it pays to think through the height and effects of the tide, unmarked dangers, the availability of navigation marks and the chances of seeing them. Above all, the skipper must plan on giving himself the maximum amount of sea room. A few minutes spent thinking through the options before sailing, and sharing your thoughts with your crew before setting off, will be time well spent. A key component of such planning is to think through the consequences of not having GPS available when at your most vulnerable.

5. The all weather yachtsmen will know only too well that those who make up the crew will perform best if they are warm and dry. Anyone who is cold, wet and almost certainly tired, is unlikely to be fully effective. If they are seasick as well, the situation is aggravated further. Any planned passage must take account of the experience and knowledge of the crew, with an allowance being made for the toll that might be taken if bad weather is encountered.

6. A check frequently overlooked is to ensure that everyone on board, particularly anyone without previous experience, is properly equipped with effective foul weather gear. Time should be taken to ensure lifejackets and harnesses fit properly.

7. The greatest enemy to the small boat sailor in rough weather is fatigue. Lack of sleep, or prolonged periods without it, can have a devastating effect on the ability to think straight or exercise cool judgment. Anyone who is very tired will start to do things that would be very unlikely in normal circumstances, or make mistakes. Recognising the state, and making allowances for it, will do much to offset the effects. Ensure that everyone, and especially the skipper, gets as much sleep as possible before closing the coast at the end of a tiring passage. Even a short catnap can pay handsome dividends.

8. The Sailing Directions contain sound advice; if they advise against using a particular channel in certain wind conditions, heed it. The Channel Pilot embracing Plymouth Sound specifically warns against use of the eastern channel in strong westerly winds.

9. All skippers, even the most experienced, will benefit from help in a potentially difficult situation. In the closing stages of this particular voyage the skipper was, in essence, handling everything himself. At the very least there should, if at all possible, be two people involved. One should be concerned with navigating. A skipper might well choose to delegate steering to one of the others and handle the conning himself. And the fourth could be standing by to handle the sails. A team approach works.

10. Although the GPS was functioning correctly, no fixes were being plotted and no planned track for the approach had been prepared. The actual approach to Plymouth was the shortest available and involved skirting the eastern, and lee, shore as the yacht shaped up towards the sheltered waters of the Sound. When entering a harbour at night give yourself plenty of sea room and have a plan prepared. Deviate from it if necessary, but know by how much. Pre-planned clearing lines on known dangers will do much to ensure you remain in safe water. And you won't go far wrong if you remember the old adage of good seamanship: log, lead and lookout. Had someone been looking at Kishmul of Ayr's echo sounder, and ensured she kept outside the 20m contour line on her approach to harbour, she would have been safe.

11. If your safe navigation depends on counting buoys, do so but make sure you identify them correctly. A miscount or a misidentification (so very easily done when you are very tired) can lead to a course alteration being made in the wrong place. Such a technique must be verified by other means such as GPS, and by calculating the DR.

12. Not all buoys are laid for navigation. While gunnery range buoys should be where charted and lit as stated, they serve a different purpose. The sensible navigator should be aware of this and go to even greater lengths to ensure he or she has an effective alternative method of establishing his or her position.

13. Use the available navigation aids to advantage. Leading lights or natural transits are the easiest to use, but a sectored light can be relied upon to indicate safe water. Kishmul of Ayr could have made a safe approach to the Eastern Channel had she identified, and remained within, the white sector of the eastern breakwater light. This would have ensured she kept to seaward of the unlit Renny Ledge rocks and the Shag Stone Rock, and would have alerted the skipper to any leeward set.

14. Making out lights of buoys, and other navigation aids against a well-lit background of street lights and buildings can be difficult. Don't rely on them alone.

15. When approaching a harbour entrance in bad weather, and most especially at night, the crew may have to work on deck to go about, hand sails, or act as lookouts. There is always the prospect of something going wrong. Lifejackets should be worn and donned well in advance. Trying to put them on after going aground is likely to be extremely difficult.

16. Fitting strobe lights to a lifejacket as well as having a fixed light makes the task of locating you infinitely easier.

17. Don't forget it is not drowning that becomes the most likely cause of death once you are in the water, it's the cold. Survival suits are not such a silly idea. Nor are personal locator beacons (PLBs).

Footnote

After the accident the GPS was recovered from the wreckage. Using the data contained, it was possible to reconstruct the yachts track during the final few minutes of its passage. The track on the attached chart has been reproduced using this information but makes no attempt to speculate on exactly where the skipper altered course to starboard, or what the set to leeward would have been. Using this data alone it shows that Kishmul of Ayr altered course to starboard after passing one of the middle buoys in the line.

Case 23
Tynemouth Tragedy Two Killed

Narrative

During the night of 2- 3 April 1998 an easterly gale had been blowing in sea area Tyne to create a heavy onshore swell along the Northumberland coast. A frontal system passed through during the morning and the wind veered so that, by 0900, it was a force 4 from the south. A gale warning remained, nonetheless, in force. The conditions some 11 miles up the River Tyne at St Peter's Marina had, meanwhile, improved significantly with bright sunshine, blue skies and a force 3 to 4 wind. The Bavaria 46 yacht *Signature* was secured to one of the pontoons, and her skipper was preparing to take nine guests to sea for the day.

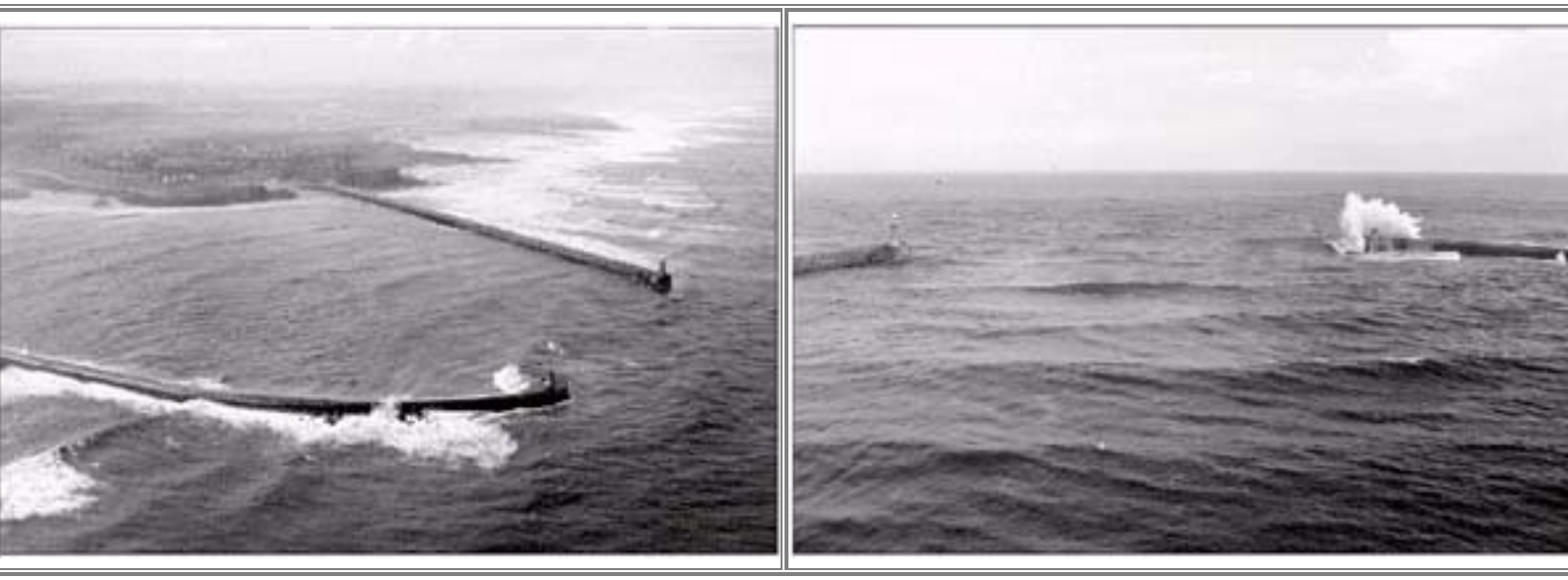
Within three hours of sailing, however, the yacht had virtually pitchpoled and three of the guests had been swept overboard. One was recovered alive, the other two drowned.

The day before the accident *Signature* had put to sea on the first of two days planned hospitality charters aimed at raising funds to enable the skipper to participate in the 1998/99 'Around Alone' circumnavigation race. During the day the wind had been blowing force 6 to 7 with an 8-10 ft swell, the boat behaved impeccably and the nine guests had enjoyed their sail. No problems were encountered and Signature returned to the marina in the late afternoon to disembark her guests and spend a wet and windy night alongside.

In the shipping forecasts issued at 2358 the night before and at 0505 that morning, gale warnings for sea area Tyne on 3 April had been issued. Easterly 7 or gale 8 had been forecast and this was reflected in the Tyne Tees Coastguard broadcast transmitted at 0750. The skipper wasn't able to receive any of these, but had watched the weather forecast on TV the evening before. He was expecting a force 2 to 3 with conditions set to improve further.

Shortly before 0930 on 3 April, the day's guests arrived onboard and were given a 20- 30 minute safety talk by the skipper. In addition to telling his visitors about his plans for the day, he briefed them on what to do in certain emergencies including man overboard. He also showed them where the liferaft was stowed and how to use it, and where to find the lifejackets and harnesses. Because *Signature* was not going offshore, it was the skipper's practice to provide his guests with waistcoat type 100N (Newton) lifejackets as they were easier to put on with a zip and were warmer. He did not show anyone how to put them on. The policy he adopted for wearing foul weather clothing, lifejackets and harnesses was that unless he directed they should be worn, the decision to do so was left to individuals.

On slipping from the marina, *Signature* made her way down river on the strong ebb tide of about 11¼2 knots. The wind was light, and using her engine she made good progress. It was sunny and everyone on board was relaxed and enjoying themselves.
The only experienced yachtsman onboard was the skipper. Although he held no formal qualifications he had extensive sailing experience, knew his boat well and had visited the Tyne before. He was familiar with single-handed sailing and often took newcomers to sea without another experienced sailor on board to assist him. He wore glasses.



Entrance to the River Tyne after the Signature accident. The height of the waves had substantially reduced by the time these photographs had been taken [courtesy of the Northumbria police]

The sailing experience of his guests varied from the very limited to the complete novice. At least one was a non-swimmer.

When some three miles from the harbour entrance and still unable to see it himself, the skipper called Tyne Harbour Radio, reported his position and asked, "Is it all right to go seabound through the port?" It was just before 1100. The officer on watch at the Harbour Master's office (Tyne Harbour Radio) could see the harbour entrance and replied, "Yes, but you've got an awfully big swell and sea running." This was acknowledged by *Signature's* skipper who added, "We'll see what it's like out there and may well come back in earlier."

Having been warned about the conditions, the skipper instructed his guests to don foul weather gear. He continued under power heading seawards with two reefs in the main. Two guests chose to wear lifejackets, but removed them later when they began to get too hot. Nobody else wore them at any stage and the skipper did not think it necessary for anyone to put on harnesses or clip on.

Seen from *Signature's* cockpit, the sea conditions ahead were dominated by a heavy swell, but the wind was light and the surface water was calm. None of the waves were breaking and the skipper was totally confident of his, and the boat's, ability to handle the situation. *Signature* was prepared to withstand heavy weather in the Southern Oceans and the skipper had experienced far worse conditions without any untoward effects. Nevertheless he drew his guests' attention to what lay ahead and asked if they were happy to keep going. There was unanimous agreement that they wanted to press on; they had every confidence in the skipper's judgment and ability.

Seen from ashore however, *Signature* looked extremely vulnerable as she set out in what appeared to be very rough seas. Preceding her out of harbour by about a mile was a small car carrier, also outward bound and seen to be pitching very heavily.

A feature of the Tyne is the strong ebb, especially at springs and after heavy rains. This discharge of fresh water on top of the outgoing tide is magnified when water is released from Kielder water some miles inland. The outgoing stream is stated to run to a maximum of 2½ knots at springs, but in practice can reach 4 knots. It is channelled as it reaches the bar, or the area between the pier arms. Although there is no longer any shallowing at the river entrance the term bar is still used

locally. It is a hangover from the days when a bar did exist at the entrance of the river and before the piers were built.

Heavy seas form at the entrance during the ebb and are particularly pronounced in north-easterly gales. They persist so long as the residual swell continues to feature and do not occur during the flood. The phenomenon of very steep seas is well known locally and is avoided by the locals. On 3 April, high water was at 0857 and low water at 1519. It was two days before neaps.

The skipper was aware of the effects of an ebb tide meeting an incoming swell, and knew there had been an easterly gale the night before. He could see the seas ahead were not breaking so, not wishing to disappoint his guests, and with total confidence that all was well, he decided to head on out. *Signature* began to pitch heavily as she made her way seawards and began to slam but, with the ebb under her, she made good progress and came abeam the pier end lighthouses at 1145. She was soon in open water and found the conditions easier. The skipper believed he had left the shelter of the Tyne at the most difficult time but there had been nothing to unduly trouble him and he had come through the heavy swell without difficulty.

Once about a mile clear of the harbour entrance he set about preparing to sail. The wind had reduced substantially so the main, with the reefs shaken out, was fully hoisted. A working jib was set.

It soon became clear, however, that with almost no headway in the dying wind and heavy swell, the wallowing motion was distinctly uncomfortable and some of the guests began to be seasick. As the day was supposed to be a fun occasion the skipper asked whether they had actually had enough and prefer to return to harbour. They did. Course was shaped for the harbour entrance, the jib handed and the main was reefed again. *Signature* began her homeward passage under power. The skipper knew that low water was predicted shortly after 1500, and with only two hours left of the outgoing stream still to run, believed the worst of the sea conditions would be over by the time he reached the entrance. He had no doubts that returning would be straightforward, and did not anticipate rough conditions. Nobody was told to wear lifejackets or harnesses and clip on.

The skipper furled the main as *Signature* headed back towards the harbour entrance and clipped himself on while doing so. On his return to the cockpit he once again clipped himself on.

Back in the cockpit, and when about a mile from the harbour entrance, he called Tyne Harbour Radio and reported his position. He then asked, "Is it all right to come on in, and up to the marina?" The reply was, "Yes, you are all clear." He headed for the harbour entrance.

As he approached it was obvious waves were breaking over the piers and the two lighthouses marking the seaward ends but, apart from this, the actual conditions could not be seen from the low height of eye in the cockpit until they were much closer. Once again the sea surface was calm.

The skipper had little inkling, or foreboding of trouble, but was aware his full attention would be necessary to bring the yacht into harbour. The crew was briefed and one of them, known to have dinghy sailing experience, was given instructions for handling the main sheet. *Signature* was under full control with minimal sail set, and those onboard were happy that all was well.

Apart from the skipper who was steering and standing abaft the wheel, nearly everyone else was sitting in the cockpit. At least one other was also standing and another was filming events with a video camera. Everyone had begun to enjoy the experience.

As the yacht entered the river and passed between the pier ends it became obvious the seas were much heavier than expected. Once inside, the skipper, given the following seas, was giving his full attention to steering. The time was shortly before 1300.

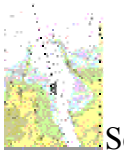
When about 2-3 cables inside the entrance, those on board looked astern and saw large waves beginning to build. They began to break, and one of these lifted the stern so much that the yacht adopted a steep bow down angle as she slid down its face. With the bow now digging in, her forward movement was arrested and she virtually pitchpoled. Almost immediately she twisted to port and was knocked down to starboard.

Signature went over to about 120°, remained there for an indeterminate number of seconds and then came upright. The engine was still running. It was a difficult moment; the skipper had been pressed so hard against the wheel by the force of the water that he had bent the spokes of the wheel and he found he couldn't steer. He had also lost his glasses and couldn't see properly for a few moments. At the same time it became very obvious that three people had been swept overboard. The yacht had, in the meantime, been turned through 180° and was heading seawards once again.

Rescuing those in the water became the first priority, and various measures were taken including deploying the horseshoe buoy. At the same time and using his hand-held VHF radio, the skipper transmitted a call for assistance. The event was also seen by watchers ashore and some of these took immediate steps to alert the rescue services including the local RNLI lifeboats and the RAF search and rescue helicopter. Other local craft also went to assist.

One of the victims was seen floating face down very shortly afterwards. While attempting to carry out the rescue, and with one of the victims holding on to a deployed lifesling, the yacht was hit by another wave that pushed her well over to starboard. *Signature* recovered a second time and the engine was still running, but the victim at the end of the lifesling had not been able to put it on and had let go. Together with the other two, he was now being swept out to sea.

Assistance, however, soon came with the prompt arrival of the Tynemouth lifeboat. Although all three victims were recovered only one survived; the other two died from drowning. None of those washed overboard were wearing lifejackets.
Some time later the skipper was arrested on a manslaughter charge and for failing to register a vessel under the Merchant Shipping Act.

 Select the thumbnail to view the accompanying chart (124KB)

The Lessons

1. Although the Safety of Small Sailing Vessel Code of Practice (The Blue Code Book) lays down certain requirements for the carriage of lifejackets, skippers cannot go far wrong if they plan on always having 150 N lifejackets onboard regardless of how far offshore they intend going. As the correct fitting of lifejackets and harnesses is so crucial, the conscientious skipper will ensure his guests know how to put them on before going to sea. It is far better to sort out problems at this stage than when the emergency dictates. One of the key features of the lifejacket is its ability to turn and support the wearer's head so the face is uppermost when the victim is exhausted, injured or unconscious. Experience shows that any of these three conditions can apply within seconds of falling overboard.

2. When taking guests or indeed anyone you don't know to sea, ask if anyone is a non-swimmer, and whether they have been afloat before. If they can't swim, and are new to sailing, think through the implications. If such a person falls overboard through unfamiliarity with either the motion or the environment, they are unlikely to stay afloat sufficiently long for you to pick them up. But if they were wearing a lifejacket ...!

3. The Blue Code does not insist on having a second experienced member of the crew in certain circumstances when close to a safe haven. A skipper working on his own and without having anyone adequately experienced to help him, cannot do everything himself when anything goes wrong. Conditions can be just as bad 100m offshore as 1000 miles, and sometimes worse. The nature of an unexpected problem cannot be foreseen but when it happens, having someone else on board who knows what to do may make all the difference between an adventure and a disaster.

4. Few mariners would dispute that having the best possible weather forecast before setting out is good seamanship. If for any reason you cannot receive the conventional shipping forecasts broadcast on BBC Radio 4 or VHF, look to the alternatives now available. For those with a computer and onboard Internet access, there are several useful websites giving up to date weather information, while Navtex and the faithful telephone still enable skippers to receive an accurate shipping forecast. Once received, there are two further actions. Read the weather signs yourself, and think through the implications of what both the forecast and your own interpretation may have on your intentions. An overnight onshore gale on the Northumberland coast, for instance, will leave a swell that will create a heavy sea when it meets a strong outgoing stream from the Tyne.

5. When using a commercial port a yacht skipper calling the local authority on VHF may find he or she is treated in the same way as if calling from a merchant vessel. The shoreside operator may not be a yachtsman with an instinctive feel for the type of information a skipper would find useful. Harbour authorities and the coastguard will have no objection to being asked for factual information.

6. Rough seas and heavy weather are unlikely to trouble the well-handled, well-found, yacht. Breaking seas are the danger. Waves break in well-formed storms or when the bottom of the wave trips in shallow water- such as on a shoaling beach or at a bar. Or when the tide goes down sufficiently far to create the same conditions in a harbour entrance and the outgoing stream is running.

7. Notwithstanding any imperatives that might require you to enter harbour at short notice, you are advised to heed local advice. If the directions say it is better to enter on the in-going stream, there are likely to be very good reasons for saying so. The experienced sailor will understand this and amend his entry time accordingly.

8. The policy to clip, or hank, on is usually established by the skipper. Few insist on clipping on at all times but whatever system is adopted, a skipper should be prepared to change it at short notice if the circumstances dictate. Signature's skipper didn't see a need to tell his guests to clip on during this particular trip. With the benefit of hindsight he wished he had. Other skippers have Signature's experiences to reflect on.

9. One of the hardest decisions a charter skipper must take sometimes is to call off or amend a planned trip on safety grounds. Signature's skipper had done this before but such a prospect must be clearly drawn to charterers' attention at the outset. It is far better to leave guests disappointed than have an avoidable accident. The decision to change a plan on safety

grounds must be the skipper's and not the guests. It is reasonable to seek their views, but a skipper must appreciate that many will be reluctant to reveal their true feelings in the company of others. Never underestimate the effects of seasickness on those embarked, or how little a novice crew will be able to do if things go wrong.

10. If an accident at sea results in fatalities, there is an increasing possibility the police may start a criminal investigation with a view to bringing manslaughter charges. Should this happen skippers can expect the inquiry to probe every aspect of their operation with great thoroughness.

Footnote

The skipper was tried, twice, on manslaughter charges. The jury failed to reach a verdict at the first trial so a retrial was ordered. At the second one, the judge directed the jury to return a verdict of not guilty on the grounds that the prosecution was unable to call expert opinion evidence to support a gross negligence charge. The skipper was also charged for failing to register a vessel under the Merchant Shipping Act. He was found not guilty.

One of the issues to arise after this incident was a dispute about the insurance cover at the time of the incident. The MAIB does not become involved in such matters but very strongly advises skippers to ensure they have documentary evidence of the cover provided before putting to sea.

Case 24
Overtaking in Harbour Entrance

Narrative

A yacht engaged in RYA training of four student skippers was entering harbour, and had lined up to pass a particularly narrow part of the channel. An experienced yachtmaster instructor was in overall charge, and all five crew were on deck. The sails had been furled and the engine was running. Everything was normal.

As the yacht was making its approach, the skipper noticed that a fishing boat was overtaking them from astern, and instructed the helmsman to maintain course and speed. He fully expected the fisherman to slow down because he thought it was obvious there was insufficient room for both vessels to pass through the very narrow gap ahead at the same time.

He was wrong. The fishing boat increased speed to overtake to port. When it was abeam and only two metres off, it became clear that a dangerous situation was developing, with insufficient room for both vessels to fit through the gap. The yacht now found itself severely hampered because any turn to starboard would have resulted in her port quarter hitting the overtaking fishing vessel. The only option available was to take all way off by applying full astern power. She did so.

The fishing vessel completed her overtaking manoeuvre, but not before her starboard quarter had given the yacht's port bow a glancing blow with, fortunately, only minor damage.

In the verbal exchange that followed, the fishing vessel skipper said that because he was working, yachts should keep out of his way, and that the yacht should have used another channel.

No damage was done, but the incident left five yachtsmen very shaken.

The Lessons

1. From whatever the perspective, this relatively minor accident should not have happened, but the lessons must be learned before something much more serious occurs.

2. If you are the skipper of a small vessel entering a harbour, you may well encounter another small craft ahead of you doing likewise. Unless Rule of the Road No. 9 applies (*"A vessel of less than 20 metres in length or a sailing vessel shall not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway"*), or there is some bylaw which states otherwise, the overtaking vessel is bound to "keep out of the way of the vessel being overtaken". Most often this means the overtaking vessel should slow down.

3. A fishing vessel is indeed a 'working' vessel, but when not engaged in fishing she is just like any other, and must follow the 'Rules' as such.

4. If approaching a very narrow channel or gap, and going faster than the vessel ahead, give thought to the consequences of trying to overtake. It is good seamanship to anticipate the room required for manoeuvring, any shallow water effect, and the possibility of an outbound vessel affecting your ability to alter course or even the likelihood of interaction between the two craft. The obvious solution in practically every case is to slow down and wait for a more opportune moment to overtake. Patience is everything.

5. Remember that if the craft being overtaken is a yacht and you are likely to pass very close, it may well pivot around its keel if she is required to alter course. If she does so, her stern will swing out in the opposite direction to the turn.

6. Overtaking another craft to leave no more than 2 metres between you in circumstances such as those described, is neither clever nor sensible. Put more bluntly, it is dangerous.

7. Skippers should always be prepared for the person overtaking to do something unseamanlike- or stupid. Or put the other way round, the man being overtaken may equally do something pretty silly in front of you. Expect the unexpected.

Footnote

This incident was reported as a hazardous incident. In accordance with established practice the names of the vessels involved have been deleted, but the lessons should be obvious to all of us who share the common heritage of the sea.

Part 4 Looking after the Passengers

From time to time the MAIB investigates accidents involving passenger-carrying vessels. We also receive a number of reports of similar incidents from other flag states. Many investigations tend to concentrate on why the vessel went aground, hit the jetty, caught fire, or collided. They concentrate less on how the accident was handled by those on board which means that those serving in other ships, especially the hotel and entertainment staffs, rarely learn as much from them as they might.

We have therefore examined a number of reports, including some old ones, to see if there are still lessons to be learned, or perhaps more accurately, relearned. We think there are, and this section has been drafted to list some of the more obvious ones. None are new. We are not attempting to produce a textbook on passenger handling, nor do we seek to replace the emergency procedures that already exist. We do, however, hope to stimulate discussion among those serving in passenger ships, and get them thinking about what needs to be done in the event of a major incident.

In writing this section we are well aware that many of those serving in such ships are made up of people with very different backgrounds, skills and qualifications. They may be from many different nationalities with no common first language. Some will have been at sea for many years and be very experienced. Others will be relatively new and still finding their feet. It is unlikely that anyone will have any previous experience of a major accident and some may never have read an accident report.

Travelling by sea is among the safest of all modes of transport, and the chance of something going badly wrong is extremely small. But when it does, it tends to happen very fast and there is no time to start wondering what to do next.

In an emergency passengers will seek, above all, an assurance that events are being handled competently and efficiently. They will wish to receive regular, accurate and timely information. They will react to the attitudes and composure of the crew and many will be reluctant to follow directions unless there is visual evidence of a problem. Nothing inspires confidence more than calm authority. Nothing causes alarm faster than panic, uncertainty or what is seen to be confusion among the crew. People react badly to needless officialdom or a lack of information. Complacent assurances that all is well will soon be undermined if it becomes abundantly clear that it is not.

Handling the fears and concerns of passengers requires skill, patience, sympathy and expertise. These characteristics cannot be learned overnight and the chances are that nearly everyone who ever goes to sea will complete their careers without ever being involved in a major emergency. But the most dangerous attitude of all is to assume it will never happen and do nothing to prepare for it.

Nearly everything referred to in section 4 has actually happened. It has been compiled to make people think. While regular and realistic training does much to prepare crews to be effective when it all goes horribly wrong, thinking through what to do when it actually happens is every bit as valuable. Never think it can't happen. Some people thought the *Titanic* swas unsinkable!

Case 25
Liner Hits Iceberg Over 1500 Perish

Narrative

On 14 April 1912 the 46,328grt, triple screw, White Star liner *Titanic* was nearing the end of her westbound maiden voyage from Southampton to New York. She was carrying 1320 passengers and a crew of 915. At 2340 she collided with an iceberg. As a consequence of the damage sustained, and the progressive flooding of the hull that followed, she sank two hours forty minutes later. 711 people survived; the rest perished.

Titanic complied with the regulations of the day and carried more than the requisite number of lifeboats. Her master and officers were well-qualified, and she was equipped with wireless.

During 14 April a number of wireless messages advising her of the presence of ice ahead of her had been received. The master became aware of these warnings but either chose to ignore them or, more likely, considered the lookout measures he had in place were adequate to give him timely warning. *Titanic* maintained her passage speed of 22½ knots towards the ice.

As night fell the conditions were unusual for the North Atlantic. The sea was flat calm, the visibility was excellent and it was, apart from a brilliant star lit sky, extremely dark. After 2200 the bridge was manned by three well-qualified officers of the watch. Two lookouts were closed up in the crow's nest on the foremast. It was very cold.

Shortly before 2240 one of the lookouts saw an iceberg dead ahead. He alerted the officer of the watch who took evasive action. Despite ordering starboard helm and ringing down full astern, *Titanic* grazed the iceberg. Although the initial impact was hardly felt and described as little more than a shudder, it soon became evident that the extent of the damage below the waterline forward was very serious and that progressive flooding would eventually lead to the ship foundering.

The decision to seek assistance was taken and a number of wireless messages were transmitted. They were received ashore at Cape Race, Newfoundland, and by a number of ships within several hours steaming.

Preparations to launch the lifeboats were made, but it was very evident from the outset there were insufficient to evacuate all on board. One by one the lifeboats were launched as *Titanic* began to sink slowly by the head and on a near even keel.

Despite a very slowly tilting deck, many passengers found it difficult to accept that being in an open boat on a very cold night was safer than remaining on board a warm, well lit liner. As a result many of the boats launched early in the process contained far fewer people than they were designed to carry, and it became evident that many of the crew were unfamiliar with either launching them or handling them once clear.

As the still fully illuminated vessel began to settle, there was increased urgency to get people away. Families became separated, and a sense of helplessness descended on those remaining on board when it became evident that there was no other means of getting away safely. There were no other vessels in the immediate vicinity as *Titanic* began to go down by the head. Her stern lifted out of the water, the lights went out and people were swept off her decks as she began her final plunge to the seabed. Some of those swimming were rescued by some of the boats but, given the extreme cold, few survived for long.

None of those left in the 0°C water survived and it is unlikely that any of them, including the crew, knew how to minimise the effects of cold water.

The survivors were in the lifeboats. They were rescued by the Cunard liner Carpathia, which arrived on the scene at about 0400 and within two hours of *Titanic* sinking.

The Lessons

The sinking of the *Titanic* must be the best known marine accident of all time. Most of the lessons arising from it have been learned and many safety improvements, such as having sufficient lifeboats (or liferafts) in ships, have been made since 1912. If, however, one puts the disaster into a modern context it is interesting to find there are still some lessons to be learned and relearned by everyone. This article looks at a handful.

1. Perhaps the most significant lesson to emerge from *Titanic* is that any ship, no matter how well designed, how well equipped or how well manned, can be involved in an accident. When it happens, all those things that had never been envisaged or had never been tested in training exercises will be exposed. What is evident is that a well-trained crew that understands how people react in difficult situations is far better placed to handle an emergency than those who merely go through the motions of carrying out statutory drills and exercises.

2. *Titanic* 's master received timely notification of ice ahead. Today's master can find himself in a position that is not dissimilar. It might not be ice, but fore warnings of bad weather still requires the master to make a decision. Does he assume that because he is in charge of a modern, well found ship, with ever increasing commercial pressures to consider, he can ignore it? Or should he do something about it?

3. Bad weather remains one of the most formidable dangers the modern shipmaster has to face. As a number of recent accidents have shown, heavy seas still have the ability to severely damage or even sink the largest of ships. And there are far too many instances of deck stowed containers being swept away in rough conditions. While routing advice has improved out of all recognition since 1912, and weather forecasts are usually reliable, the master still has to rely on the signs available to him at sea. A sudden drop in temperature on a cold, calm, night is still likely to foretell the presence of ice. And an ability to interpret the skies, the sea state and barometric pressures remain important skills. Even in the 21st century, the master ignores the signs of impending bad weather at his peril. Although he may be prosecuting his voyage 'with the utmost despatch', he should not hesitate to heave to or side-step bad weather if he judges it prudent to do so, rather than press on. It is far better to arrive late than not at all.

4. There was an assumption on 14 April 1912 that a good lookout alone would provide adequate warning of danger. Today's bridge watchkeeper with operational radars and ARPA, makes much the same assumption. Although radar has made a major contribution to improving safety at sea, it has its limitations and still relies on the watchkeeper to make the decisions. Remember it is only an aid to safe navigation and may not detect everything.

5. *Titanic* 's officer of the watch had about 40 seconds warning of the situation that initiated the tragic train of events which led to the ship sinking. Analysis of many passenger ship accidents reveals that although the events leading to the event might have been developing for some time, this timescale of the actual warning or realisation that a disaster was imminent is not untypical. This means that whoever is responsible for the safety of a vessel today with,

perhaps, as many as 5-6000 souls on board, could have less than a minute to absorb the warning, take the correct action and alert the right people to the problem.

6. In the 2½ hours or so between hitting the iceberg and sinking, the crew of *Titanic* had not only to contend with a situation they were ill prepared for, but also the attitudes of the Edwardian age passengers. The characteristics displayed then included class divisions, privilege, affluence, deference, ignorance, self-sacrifice, and individual acts of bravery. In an accident today the crew will confront the realities of the 21st century. Fare paying passengers are more likely to challenge authority, expect accurate and timely information, will have no hesitation about complaining and will be very quick to spot any shortcomings in the performance of the crew. They will probably video it as well!

7. Shortly after *Titanic* collided with the iceberg, it became necessary to blow off steam from one set of boilers via the vent pipes on the forward funnel. This was an extremely noisy process and made communication on the boat deck difficult. Noise is often one of the unexpected features of a marine accident and could come from either the effects of the weather, or if close to land, helicopters. If unprepared for it, noise can severely hamper rational thought and seriously interfere with any form of communications.

8. Analysis of many accidents reveals that the number of injuries and fatalities to both passengers and crew in the initial event tend to be low. Nearly all the casualties occur afterwards. Over 1500 people lost their lives when *Titanic* went down. Although most were wearing lifebelts, very few of those thrown into the water survived. The cause of death wasn't so much drowning as the cold. In the event of an accident today, having to abandon ship is very much the last resort but, from time to time, passenger-carrying vessels still sink, sometimes quickly. Despite modern marine evacuation systems (MES), lifeboats and liferafts, people still find themselves in the water.

9. Passengers should, under normal circumstances, wear lifejackets once an emergency has been declared, and should continue to do so until told otherwise. Provided the lifejackets are correctly fitted they should keep them afloat should anyone be unlucky enough to be in the sea. But hypothermia is normally the problem, not drowning. After all these years there are precious few measures to ensure that passengers who have the misfortune to find themselves in the sea after an accident will survive the cold.

10. If it becomes necessary to jump into the sea, it should be done from as low down as possible and no more than from a height of, say 5m above the water. Anything higher means the effect of cold water shock will be greater. On the assumption no survival suit has been provided, the more warm clothes the individual is wearing, and the less he or she needs to move about, the longer are the chances of survival. The overriding aim is to retain body heat. Swimming does not help. Staying still with your legs together, and with elbows in and arms folded, may just extend your life sufficiently long for someone to come to your rescue.

Case 26
Fire On Passenger Ship Five Crew Members Overcome by Smoke

Narrative

Early on 27 July 1996 while cruising in Alaskan coastal waters, fire broke out on board the Panamanian-registered passenger ship *Universe Explorer*. She was carrying 732 passengers and a multinational crew of 274.

The fire started in the main laundry shortly before 0300. The first sign of trouble was the sounding of an audible alarm on the bridge. This was thought initially to be false, but when multiple alarms began to sound, it became apparent that a real fire had started. Within 7 minutes of the first one going off 64 smoke alarms had sounded.

Shortly afterwards, the fire watch was alerted, the engines stopped, the remotely operated fire doors were closed, the powered ventilation was shut down and the coded phrase sending the crew to their emergency stations had been broadcast over the public address system. Analysis of the chain of events indicates that this coded message was broadcast about five minutes after smoke had first been detected. During this time smoke had started to spread into the crew accommodation where many were asleep.

Three factors soon became apparent. Smoke spreading rapidly from the source was thick and black, the telephone to the bridge was constantly engaged and the portable UHF radio did not provide the expected communications between the bridge and the fire watch.

The electromagnetic fire doors were not automatic, and could only be closed universally from the bridge. This meant they were not closed until the bridge personnel became aware of the emergency. By this time a lethal amount of smoke had almost certainly entered parts of the crew accommodation.

The ship's staff advanced through some very thick smoke and heat, and found the source of the fire in the main laundry some 40 minutes after it started. Flames were seen to be coming from the steam napkin press and one of the laundry bins. This information was passed to the bridge by the safety officer, who also asked for the electrical power to be shut off. Two fire teams had the fire under control by about 0410 and had it extinguished by 0615. A reflash watch was then set.

Analysis of the event revealed that the crew cabins had no telephones, or means by which the occupants could alert the bridge or report that they were trapped. The smoke alarms in the crew accommodation did not sound locally to alert sleeping crew.

Although the fire teams were mustered reasonably rapidly, the safety officer, who was in overall charge, decided to seek the source of the fire alone. Once he realised he was having no success, he was joined by a fire team leader.

Although public address announcements were made, several passengers later complained that neither the captain, nor any ship's officer, told them what was going on.

One handicapped passenger was unable to open a shut fire screen door by herself.

There was no organised or systematic search system for trapped personnel. Members of the crew searching the accommodation spaces alone were unable to help trapped colleagues.

To indicate a passenger cabin had been searched, a towel was placed on the knob of each cabin door.

During the post accident investigation it was found that several fire doors near the crew accommodation had been permanently tied back in the open position. It appears that this had been done deliberately, because the constant opening and shutting of doors was both an irritant and an obstacle to the crew, especially if they were carrying something. The open doors contributed to the rapid spread of smoke. Nobody, particularly the fire watch, had ever corrected this malpractice which appeared to have been condoned by senior staff.

Because the ship's hospital was situated immediately above the source of the fire and subjected to heat and smoke, the doctor and two nurses were unable to gain access to any of their emergency equipment other than a medical grab bag. Some passengers suffered from the effects of smoke inhalation. Because the ready use oxygen was also stowed in the hospital, it was inaccessible and could not be used. Oxygen was eventually provided by a Coast Guard cutter some four hours after the fire broke out.

The medical staff attended to several people with injuries in various parts of the ship. They were however handicapped by having only one portable radio between them, and were unable to establish where they were most needed. This prevented a rapid and flexible response to the treatment of casualties.

The investigation revealed that several heat detectors in the laundry area were not connected to the fire alarm system.

Five crew members, who had been trapped in their accommodation and been overcome by smoke, died in the fire.

The crew held weekly emergency drills, but some had always used the normal passages and stairs to reach their emergency or muster station. They had never practised using alternative escape routes.

An emergency drill for passengers had been conducted after they had embarked at Vancouver. Reflecting on the adequacy of the drill after the event, passengers' views varied but many commented on the lack of any instruction about what to do in the event of a fire or how to use a fire door. Some members of the crew had anticipated the timing of the emergency drill by placing passengers' lifejackets, normally stowed beneath each bed, on top of them. As a result, a number of passengers did not know where their lifejackets were.

Several people found the known route to their muster station blocked by closed fire doors, and did not know how to open them, even though instructions were posted close by.

The probable cause of the accident was the lack of supervision by the management, who allowed 'physical conditions and operating procedures to exist that compromised fire safety' on board.

The National Transportation Safety Board (NTSB) of the United States made 38 recommendations in its report.

The Lessons

Much has changed since this accident and today's passenger ships are required to meet existing SOLAS regulations for the prevention of fire. Many go further. There are still lessons to be relearned from the events onboard the *Universe Explorer*, and a number have been

highlighted here. While training does much to prepare the ship staff for a crisis, events always seem to catch people unawares. By reading about how one crew handled a particular situation, it will help others to gain an insight to all the things that can go wrong. It is important to learn from them. While everyone hopes they will never be put to the test in a real crisis, it pays to think through the types of problem that might occur in a genuine emergency, but rarely in an exercise.

1. The importance of having an effective fire detection system needs no emphasising. It must be reliable and have the full confidence of those on board. All alarms should be treated as genuine and reacted to every time.

2. Masters and ships' officers should be alert to 'false' alarms. If a detection system persists in giving an alarm, the source must be investigated. Something must have caused it in the first place. If it becomes necessary to check whether an alarm is false each time, delays in locating and then tackling the real fire will result. A few seconds can be the difference between a minor problem and a major disaster.

3. Materials used in ship construction are designed to contain a fierce burning fire for a finite time. Although safety officers should know how long they have got before such barriers are breached, they should never assume they have the luxury of time in hand.

4. First reactions to a fire at sea have two aims: establishing its seat, and evacuating everyone from its vicinity as rapidly as possible. Speed is everything, but the presence of thick acrid smoke can severely hamper this process unless it is contained as quickly as possible and people are alerted without delay. Passengers and crew must be mustered as quickly as possible.

5. Personnel working alone should never conduct the search for a fire's location. It should be methodical and involve two or more properly equipped teams who can cover more ground faster. The search is a race against time, and progress should be reported by radio to the command centre at frequent intervals.

6. Teams, rather than individuals, should conduct searches for people trapped or injured. People working alone may become casualties themselves, and could find they are unable to provide the necessary assistance without support. People who have not experienced the reality of being in a smoke-filled compartment with its attendant smells, toxic fumes and possible heat and lack of lighting, may succumb to a sense of claustrophobia and deep unease. Add to this the prospect of coming across severely injured or even dead bodies, the enormity of the task becomes clear. Training will prepare you for the worst; anticipating some of the difficulties by learning from past incidents will help. Other people's lives may well depend on how effective you are in carrying out a very difficult task.

7. Every member of the crew must know the layout of the ship sufficiently well to know all the escape routes which exist from wherever they live and work on board. This might seem a relatively straightforward task in normal circumstances, but could be extremely difficult if visibility is zero and you are guiding some very frightened or 'difficult' passengers. Constant and realistic training is essential to prepare for this.

8. Those in charge of a command post should stay there and not be tempted to have a go at fighting the fire themselves.

9. Among the most difficult and most frequently criticised features of any major fire on board a ship are internal communications. So often it appears to be effective in drills but breaks

down when the real event occurs. UHF radio 'dead' spots and jammed telephone lines to the bridge or command centre are the most cited shortcomings. Both applied in this instance. Most modern vessels are now equipped with some form of installed internal radio antenna network to overcome the UHF problems, but safety officers should check every part of their vessel to ensure adequate two way communications exist throughout.

10. When communicating by radio or telephone, keep the content of messages short and to the point. Somebody else will want to use the same channel or phone line.

11. Communication channels in an emergency are predictable. Internally there will be reports from the scene of damage or fire, feedback from search parties, commands or directives from the command centre, requests for information about what is going on and shipwide broadcasts giving situation reports. Externally there will be two way communications with the search and rescue/emergency authorities, owners and salvors. There is every prospect the media will have worked out how to communicate with you, and will persist in their determination to establish contact. Contingency arrangements, including how best to link up with management ashore, should be thought through in advance. Once the emergency is underway it is too late to discover the shortcomings. Handling effective communications is always more manpower intensive than expected.

12. Whenever people are faced with an irritating or inconvenient barrier, such as constantly having to open and shut a fire door, they will seek ways to get round it. Never tie one back or wedge it open no matter how tempting; it is there for a purpose and will do much to stop the spread of smoke. Ship designers should note how an irritating routine procedure leads to the introduction of unsafe practices.

13. Analysis of fires or other emergencies in passenger ships very often feature complaints by passengers that they were not kept informed about what was going on. Perceived failures to keep passengers informed will always be picked up by the media anxious to identify everything that went wrong. Passengers who are well informed about what is going on will respond much more positively to events.

14. Although not a feature in this particular incident, an interesting aside in this age of the mobile phone involves a situation when the emergency occurs when passengers are able to communicate direct to the outside world. They could contact the media and find themselves giving a live commentary on what is happening. Ship's staff will have no means of checking on what is being said, but frequent and accurate broadcasts to passengers will ensure they are well informed, and could do much to limit any PR damage. Remember families and friends of both passengers and crew will be monitoring the media with intense concern. So will the owners. It is a trait of human nature that until an informed account materialises, people will always believe what they see or hear in the media.

Footnote

The full report (No.NTSB/MAR-98/02) can be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161, The United States of America. (703) 605-6000.

The source material for this article is taken from the original report and the MAIB acknowledges the co-operation of the National Transportation Safety Board in permitting this shortened version to be printed here. Some of the above lessons learned have been added by the MAIB.

A Pause for Thought

Despite huge investment in making passenger ships as safe as possible, there is always a risk that something might go tragically wrong. It could be a fire, a grounding, a collision, an explosion, a foundering, or some other unforeseen event but, no matter what the initial cause, it can be several hours and sometimes days before the incident draws to a close. Throughout that time the crew will have many things to attend to, including the care and wellbeing of the passengers.

This article draws together some of the features of a major marine incident but, drawing on the lessons of the past, confines itself to some of the problems involved when looking after passengers. It is especially directed at hotel and entertainment staff.

The successful outcome of an emergency at sea is dependent on four factors: the time available, the competence of the crew, the effectiveness of the search and rescue operation and, if all goes wrong, the survival factor.

A fifth dimension can be added: the environment. A daylight accident in calm waters and in temperate climes is likely to have a very different outcome to one which occurs on a bitterly cold night in bad weather.

The time available is likely to be the big unknown. *Herald of Free Enterprise* capsized in seconds; *Estonia* in about 1½ hours. *Titanic* took 2 hours 40 minutes to sink and, more recently, the Greek ferry *Express Samina* went down in about 40 minutes. In several accidents where fire has broken out, the vessels involved have remained afloat but people have been injured or lost their lives, often because of smoke.

Apart from those extremely rare occasions when things happen so fast that any form of organised response is extremely difficult, the outcome of a disaster and the saving of life will be in the hands of the crew. It will be their knowledge, ingenuity and leadership, which will be tested in potentially very trying circumstances.

In compiling this article an assumption has been made that everyone on board will have received some form of basic training, and will be familiar with the general layout of the ship. It is unlikely, however, that many will have practical experience of a real emergency, or know what it is like to be in a ship that is sinking or full of smoke.

The only certainty about an accident is that it happens without notice.

Accidents seem to occur at the most inconvenient moments and in conditions very different to those experienced during safety drills. It could be on a wild windy night with a high sea running, or under a blazing tropical sun. Unless some thought has been given to the problems likely to be encountered, it is probable that individual crew members will be facing situations they had never envisaged.

The sole aim of this piece is to provide food for thought and to encourage discussion about how best to handle a major incident.

Training

Take training. How confident are people that they can find their way to a muster station in pitch darkness? Or how to run out a fire hose without kinks in it, or maintain an aura of confidence and composure while trying to reassure a distressed passenger? The STCW Code lays down minimum

requirements for the training of personnel but as scrutiny of past accidents reveals, the actual need is for something much more comprehensive.

Effective training is the key to acquiring competence under pressure. Many will uphold that this is done routinely. The evidence suggests that in an emergency, training shortfalls are always exposed and that something always seems to go wrong with the best-laid plans. Training must not only prepare people for the fundamentals but also how to handle the situation when the basic services, such as reliable communications, start to break down. It is surprising how often the public address system, or part of it, fails.

Keeping people informed

In the immediate aftermath of an accident, it is unlikely that anyone will have a clear idea about what has happened or the extent of the damage. It will take even longer to determine the effect on normal services, but it must be assumed that some key ones will be lost somewhere.

The crew is usually, but not always, alerted to the nature of a problem before the passengers and the coded message procedure has stood the test of time well.

Passengers are normally alerted by means of the general alarm, and the dilemma so often faced by senior officers is how they amplify this without causing unnecessary concern. The worst- but sometimes followed- option is to say nothing at all for fear that any announcement will generate panic. There is no evidence to show that telling passengers what has happened has caused panic. On the contrary, there is overwhelming evidence to show that the lack of an announcement generates confusion, rumour and distress. Once passengers' confidence is lost, it is very hard to regain. A public broadcast that gives as much factual information as possible also enables the crew to speak with some authority when talking to passengers.

An analysis of a number of incidents shows that honesty and regular updates are by far the most effective means of keeping people informed. The aspect that takes many senior officers by surprise is how long the interval is between the actual event and the first broadcast. Most masters are convinced that the first information broadcast is usually made within two or three minutes of the accident. In practice the interval is often much longer. One of the first casualties in any emergency is an awareness of time.

The Crew

A feature of many disasters both ashore and afloat, is the reluctance of officials (crew) to adjust from the normal state to the emergency. Many will continue to apply the conventional or established rules to the new situations. Anyone who saw the James Cameron film "Titanic" may recall the scene where a steward found it necessary to chastise two passengers who broke down a wooden door while trying to escape. In the opinion of the steward such an action was outrageous: it "was damaging White Star Line property." Although amusing in a feature film, it actually depicts an attitude that prevails all too often in an emergency.

Once the emergency has been declared members of the crew must very rapidly adjust to the new situation. Lives may well depend on the ability of individuals to switch from their normal roles. While they, like passengers, may be seeking some information about the nature of the emergency, they have to accept that the general alarm is all they have to go on in the early stages.

The role of the crew is to provide leadership and reassurance when they themselves are probably frightened and uncertain about what is going on. It is quite common for even the most experienced

members of the crew to find they are incapable of thinking straight in the early stages of an emergency. The better trained they are, and the more they have thought through their various responses to unlikely situations, the more effective and confident they will be.

The Passenger

In an emergency, passengers will react in very different ways. Some will behave impeccably and will be an enormous help if given clear instructions. Many will be very anxious and, understandably, frightened. Their concerns will be amplified if they find themselves separated from immediate family and, especially, children. A surprisingly large percentage will be reluctant to follow any directions, or even be convinced that an emergency exists unless there is concrete evidence. While the crash of a collision might be all too obvious, a raging fire in a switchboard may have minimal impact on a sleeping passenger on D deck.

The one thing that passengers will seek from the crew is reassurance. Crew who can appear confident and in control in even the most trying circumstances when they, too, are likely to be very unsure about what is happening, can make a major contribution to a successful outcome.

Many of the more likely problems will have been anticipated. The elderly, for instance, may have difficulty moving from one place to another and are unlikely to move fast in ideal conditions, let alone having to climb to a higher deck when the lifts are no longer available. Those with dormant medical conditions such as heart problems may well require special attention, and their needs can rapidly overwhelm the available resources.

In cruise ships, passengers will expect to be allowed to return to their cabins to collect lifejackets and retrieve personal possessions. They are likely to become extremely distressed and even angry if they are prevented from doing so without adequate explanation. Their anxiety is likely to be aggravated further if their principal need is medication or a pair of spectacles. It might seem hard to convince a distressed passenger of the risks, but allowing anyone to go to their cabins in a vessel that is on fire is extremely hazardous. Some who have tried have lost their lives.

In many past accidents members of the crew have found it very difficult to explain to passengers that it will not be possible to bring any baggage with them. Hand-held baggage not only becomes a dangerous obstacle in any evacuation, but there will not be space for it in a lifeboat, liferaft or helicopter.

Cruise ship passengers will have received a comprehensive safety briefing shortly after embarkation at General Emergency Stations and should know where their muster stations are. They will also have had an opportunity to don lifejackets. No matter how General Emergency Stations is anticipated, every passenger should be in no doubt as to where, exactly, his or her lifejacket is stowed.

Should disaster strike, most passengers should know where to muster but might not know how to get there, especially if they are in a part of the ship with which they are unfamiliar. No member of the crew should be in the same situation. They should have an instinctive awareness about where the muster stations are, and be able to give unambiguous instructions about how to reach them; even if the most direct route is blocked for some reason. All members of the crew should, for instance, know how to open and shut a fire door. Such statements might be obvious when reading about them here, but there is compelling evidence to show that this knowledge tends to break down in an emergency.

Ferry passengers tend not to be so well prepared. Few appear to listen very carefully to the beginning of a voyage safety announcement, and even fewer will correlate what they have heard with their surroundings. The crew can do worse than pay attention to how the average passenger responds to that initial safety brief. If there is total disinterest, it should alert the crew to coping with passengers who have given no thought about what to do should an emergency occur.

Passengers gathered at a muster station will probably have only one thing to occupy their minds: worry. They will have an insatiable appetite for information, and in many instances the crew may not be in a position to satisfy this need. There will be requests to visit the toilets or return to cabins. Others will wish to send a radio message to loved ones. And every disaster seems to have at least one passenger who claims to be closely associated with the company chairman, and uses this as a pretext to see the captain. Anticipating the various demands, and having ready prepared responses, will do much to generate that all important air of confidence.

If it becomes necessary to evacuate passengers, a known difficulty is congestion at an exit to the evacuation system. Despite extensive research and trials, this persists as a problem area. An orderly exit can be very fast. A rush to the single door is almost certainly going to be very slow and guaranteed to create distress.

It is a sad fact that in an emergency some passengers will demonstrate selfish and aggressive tendencies. Knowing how to handle such people is not a skill acquired without training and practice.

The Hazards

Angle of list

Among the most frightening aspects of an accident at sea is when a deck begins to slope. Unlike the Titanic, which began to sink on an even keel after hitting an iceberg, most badly damaged ships start to list. People begin to notice the heel when it reaches about 2°- 3° and start to become alarmed by the time it becomes 5°. At 20° it will feel at least 40° and will be very difficult to negotiate. Doors become very difficult indeed to open; stairs and ladders are nightmares to negotiate and many people start to become disorientated. Loose gear starts to slide about, and a grand piano advancing across a public room concentrates the mind and is not to be argued with.

If a sloping deck is difficult to walk on, the list that is perceptibly increasing is very, very frightening indeed and will focus the mind on the need to expedite the evacuation from an enclosed space.

Smoke

Smoke is one of the most difficult of all hazards encountered in the wake of an accident at sea. At best it obscures visibility, at worst it kills. It can cause great distress and can lead to rapid disorientation. Those trapped by smoke should remember that clear air can often be found at deck level.

Lack of Lighting

Lack of lighting can be very distressing. Although the emergency or low level lighting should provide sufficient illumination to locate escape routes, there have been a number of accidents where even this basic facility has failed. Readily available torches with fully charged batteries are extremely useful.

Evacuation- Lifeboats, Liferafts and Helicopters

Thankfully, there have been few occasions when it has been necessary to evacuate a passenger ship for real. There have been a number of exercises, but there is relatively little live experience to draw on and any such evacuation in the future will involve an unknown element.

There is evidence to show that many passengers contemplating having to use a mass escape system view the prospect with dismay. The sea will seem a long way down and potentially hostile, especially at night. Lifeboats soon give the appearance of being overcrowded when everyone is wearing lifejackets. Liferafts can behave unpredictably in strong winds, and anyone unfamiliar with a hovering helicopter will be totally unprepared for the noise and the strength of the down draft from the rotor blades.

When a lifeboat is released from the falls, the fall block is likely to become a major hazard and there are many instances of people being knocked on the head by them. Passengers should be warned to keep their heads down.

The wearing of lifejackets in either a fully loaded liferaft or lifeboat reduces the amount of space for moving about. If unprepared this can cause needless distress. Some passengers will expect the lifeboat to make for land but modern emergency alert systems pinpoint the position of sinking, and this is where the search and rescue effort will be concentrated. Lifeboats are extremely uncomfortable and the main enemies are cold and wet or, conversely, heat and lack of shade. Heat can be just as much a cause of distress as cold, and people are likely to become very thirsty.

Seasickness is endemic in small craft and, most especially, liferafts.

Summary

The chance of a major accident happening at sea is extremely remote. If it does then there is no reason why everyone shouldn't survive. With forethought and practice, casualties can be kept to a minimum.

The successful outcome will be dependent on many factors, but the crew who can keep their heads and provide inspiring leadership in totally unfamiliar and extremely trying conditions, will do much to ensure it.

An Afterthought

The aim of this article is to generate active discussion among seafarers. It does not pretend to provide all the answers, and there may be major differences of opinion about some of the views expressed. This doesn't matter. If it makes people more aware of what they have to do to prepare for the unthinkable, then it will have served its purpose.

If you are sufficiently unlucky to ever be involved in a real maritime disaster, it is vital that others learn from your experiences. The marine accident investigators will want to hear of your experiences so they can make appropriate recommendations to improve things, and ensure the lessons are passed on to others. Other lives may depend on what you are able to tell inspectors from organisations such as the MAIB.

Appendix A

Investigations commenced in the period 01/11/2000- 28/02/2001					
Date of Accident	**Name of Vessel**	**Type of Vessel**	**Flag**	**Size**	**Type of Accident**
09/11/00	*Wightstone* *Rose Ryal*	cargo Pleasure craft	UK UK	439gt	Collision Collision
19/11/00	*Girl Alice*	Fishing vessel	UK	135gt	Accidents to Personnel
20/11/00	*Evangelos*	Bulk carrier	Cyprus	17,308	Accidents to Personnel
23/11/00	*Atlantic Princess*	Fishing vessel	UK	3,229gt	Accidents to Personnel
01/12/00	*European Pioneer* *European Highway*	ro-ro ro-ro	Bermuda UK	14,426gt 22,986gt	Grounding Machinery
12/12/00	*Xu Chang Hai* *Aberdeen*	Bulk carrier Tanker	China Bahamas	18,074gt 47,274gt	Collision Collision
13/12/00	*Lagik*	General cargo-multi deck	Antigua & Barbuda	1,721gt	Grounding
20/12/00	*Randgrid*	Tanker	Norway	75,273gt	Accident (2c)
21/12/00	*Brucestone*	Oil tanker	UK	357gt	Collision
21/12/00	*Loverval*	ro-ro cargo	Luxembourg	10,931	Collision
26/12/00	*Nordsee*	General cargo-single-deck	Antigua & Barbuda	2,579gt	Collision
26/12/00	*Poole Scene*	Passenger	UK	119gt	Collision
21/01/01	*Happy Lady*	Liquid gas carrier	Norway	6,107gt	Grounding
25/01/01	*Alma C*	Fishing vessel	UK	251gt	Accidents to Personnel
07/02/01	*Pride of Cherbourg*	ro-ro	UK	14.76gt	Hazardous Incident
07/02/01	*Briarthorn*	General cargo-single deck	UK	1,576gt	Hazardous Incident

18/02/01	*Commodore Clipper*	ro-ro passenger	Bahamas	14,000gt	Accidents to Personnel

Appendix B
Reports issued in 2000 (Priced)

MAIB Annual Report 1999
Published July 2000
ISBN185112186 2
£16

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Appendix C
Reports issued in 2000/2001 (Unpriced)

Alfa Britannia - parting of a mooring line while Bahamian-registered tanker was berthing at Tranmere oil terminal near Birkenhead on 18 November 1999

Amber Rose- foundering of fishing vessel with loss of one life off the Isle of Man on 15 October 1998

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

Arco Arun - grounding, off Broadness Point, River Thames on 13 October 1998

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

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

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

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

Celtic King/De Bounty - collision to the south of The Smalls traffic separation scheme off the south-west coast of Wales on 19 March 2000

Dea Fighter- two lifting wire failures on starboard fast rescue craft davit of safety stand-by vessel on 16 July 1999

Dole America - collision with the Nab Tower in the eastern approaches to The Solent on 7 November 1999

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

Dunan Star- fatal accident on board fv 1.5 miles south-west of the Isle of Arran on 10 August 2000

Fraoch Ban- Capsize of fishing vessel off coast of Shetland Islands 15 August 1999

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

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

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

Island Princess - rupture of the port economiser on board, resulting in two deaths on 7 December 1997

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

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

Luc and Toisa Puffin- collision between the two vessels 8.5 miles due east of the river Tyne on 13 June 1999

Multitank Ascania - fire on board vessel in the Pentland Firth on 19 March 1999

Opportune- man overboard fatality, 35 miles east of Wick on 23 February 2000

Pasadena Universal/Nordheim- collision between vessels in Dover Strait on 12 January 2000

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

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

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

Rachel Harvey - grounding and loss of fishing vessel off Peninnis Head on 1 October 1999

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

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

Ross Alcedo- fire on board vessel while underway about 32 miles north-west of the Isles of Scilly on 16 January 2000.

Samphire of Wells - foundering of dinghy off north Norfolk coast with loss of two lives on 16 December 1999

Sea Centurion- fatal accident to a motorman on board the ro-ro cargo ship at Portsmouth Naval Base on 18 May 1999

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

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

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

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

Toisa Gryphon- engine room fire 150 miles west-south-west of Isles of Scilly on 2 February 1999

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

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

Unio Arbo/Philomena- collision between Bahamian cargo ship *Union Arbo* and UK fv *Philomena* about 10 miles south of Newlyn, Cornwall on 2 September 1999

MAIB *Safety Digest* 1/2000
Published April 2000

MAIB *Safety Digest* 2/2000
Published August 2000

MAIB *Safety Digest* 3/2000
Published December 2000

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

Appendix D
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