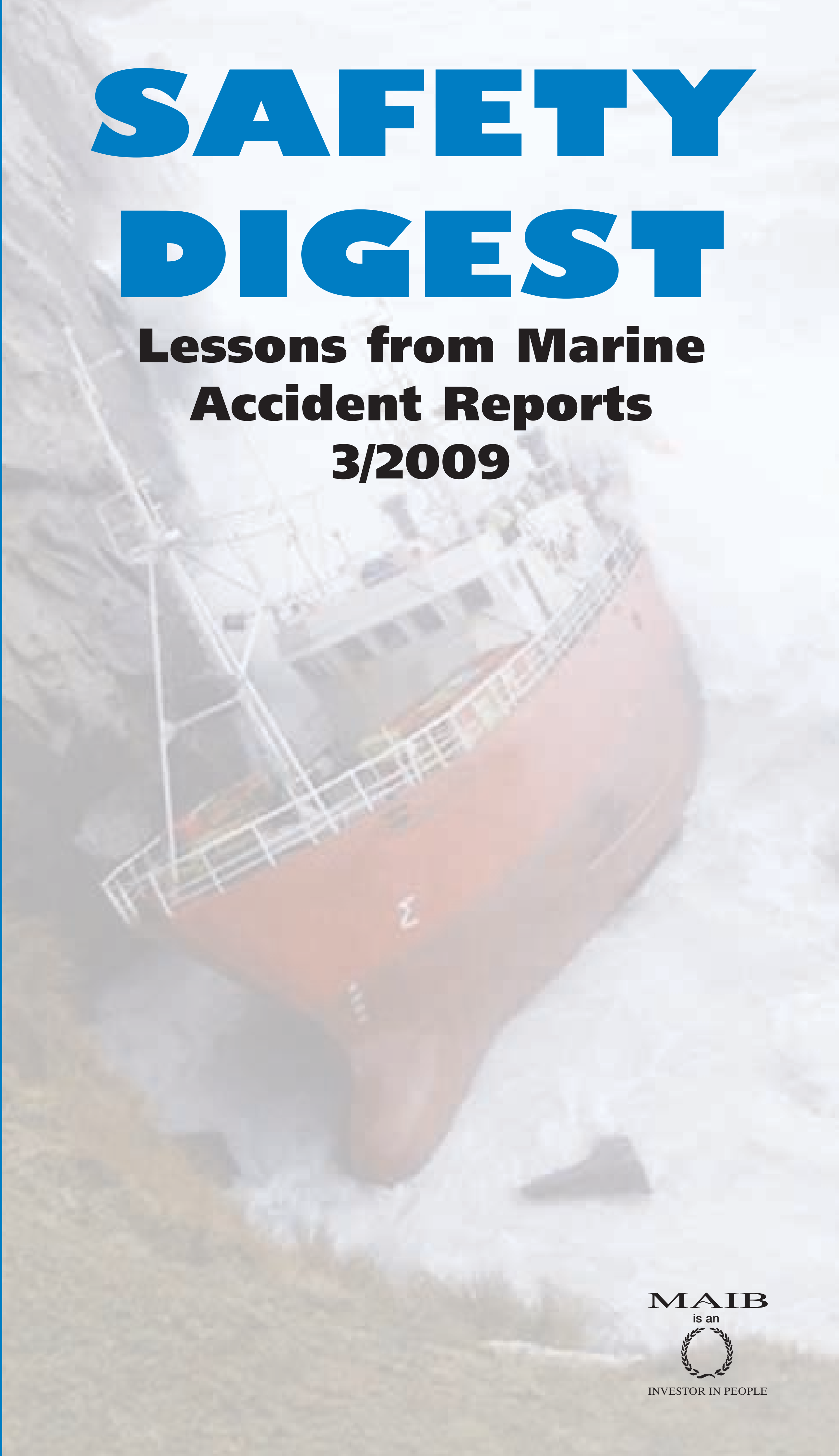
MAIB

MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY DIGEST

Lessons from Marine Accident Reports 3/2009



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No 3/2009

MAIB is an INVESTOR IN PEOPLE

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MARINE ACCIDENT INVESTIGATION BRANCH

The Marine Accident Investigation Branch (MAIB) is an independent part of the Department for Transport, the Chief Inspector of Marine Accidents being responsible directly to the Secretary of State for Transport. The offices of the Branch are located at Mountbatten House, Grosvenor Square, Southampton, SO15 2JU.

This Safety Digest draws the attention of the marine community to some of the lessons arising from investigations into recent accidents and incidents. It contains information which has 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.

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The Editor, Jan Hawes, welcomes any comments or suggestions regarding this issue.

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MARINE ACCIDENT INVESTIGATION BRANCH

The role of the MAIB is to contribute to safety at sea by determining the causes and circumstances of marine accidents, and working with others to reduce the likelihood of such causes and circumstances recurring in the future.

Extract from
The Merchant Shipping
(Accident Reporting and Investigation)
Regulations 2005 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

INDEX

Glossary of Terms and Abbreviations

AB – Able seaman
ARPA – Automatic Radar Plotting Aid
C – Celsius
CCTV – closed circuit television
CO_2 – carbon dioxide
CPP – Controllable Pitch Propellers
ECR – Engine Control Room
EPIRB – Emergency Position Indicating Radio Beacon
GPS – Global Positioning System
HRU – Hydrostatic Release Unit
IMO – International Maritime Organization
kg – kilogram
LPG – Liquefied Petroleum Gas
m – metre
“Mayday” – The international distress signal (spoken)
MCA – Maritime and Coastguard Agency
OOW – Officer of the Watch
PTW – Permit to Work
RIB – Rigid Inflatable Boat
RNLI – Royal National Lifeboat Institution
Ro-Ro – Roll on, Roll off
SMS – Safety Management System
SWL – Safe Working Load
TSS – Traffic Separation Scheme
UV – ultraviolet
VHF – Very High Frequency
VTS – Vessel Traffic Services

Introduction

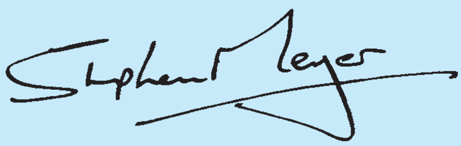
It is only a year since I last wrote about the importance of risk assessments. However, in the past 12 months, so many deaths have been reported that could have been avoided by a simple consideration of the risks, that I feel compelled to return to the subject.

Just the phrase “risk assessment” is enough to cause most mariners’ eyes to glaze over. “More paperwork and bureaucracy” I hear you cry. But what I am after is the thought process, not the paperwork. Let me give you a couple of examples.

This morning I was briefed on the death of a fisherman. The owner and the skipper of the vessel had so nearly got it right, but for want of following things through, a man died last week. The fishing boat had one of the best risk assessments I have seen, and the fish deck had been specifically designed to eliminate major hazards. Unfortunately, in the months since the vessel had been built, the method of working had been modified, and the hazards associated with the new system had not been risk assessed. Additionally, neither the skipper nor the owner were monitoring how the crew were operating, and one of the crew had developed his own system of repairing fishing gear. These two minor changes to a well risk assessed system cost one man his life – what a price for 20 minutes or so, to risk assess those changes.

My second example is given in Case 25. Two leisure craft were involved in this case, with two separate risks that had not been considered. In the first, a man fell overboard when doing the simplest of routine daily tasks. Had the risk been thought about, there were several simple ways of reducing it. He was not wearing a lifejacket, and owed his life to the alertness of two men in another yacht, who heard his cries and went to rescue him. Unfortunately, despite there being two men on board, they were unable to get him out of the water. Recovering a person from the water to a yacht or even a small power boat is much more difficult than people imagine. Have you worked out how you would do it – and have you briefed your crew in case it is you in the water? A simple mental run through the risks involved in sailing, and a crew talk at the start of a day’s sailing, would dramatically reduce the likelihood of an accident.

In the aftermath of an accident, we are almost always told what steps people intend to take to stop such an accident happening again. Please read through the accounts of incidents in this Safety Digest, and take appropriate steps now, rather than waiting until you learn the hard way.



Stephen Meyer
Chief Inspector of Marine Accidents
December 2009

Part 1 – Merchant Vessels

As another year draws to a close we should be grateful that the MAIB has published the third of this year's Safety Digests. Each issue and the reports they contain are a valuable contribution to improving safety at sea and in port, so protecting lives, property and the marine environment. They provide the means to learn from others' misfortune even if when reading about an incident you may think the participants brought that misfortune upon themselves. Such is the benefit of hindsight. It is a crucial foundation of the MAIB's role not to be part of the increasingly prevalent Blame Culture which has inevitably led to the criminalisation of seafarers for genuine accidents rather than intentional acts. No excuses should be made for those deliberately breaking the law but we must all work together to ensure that the IMO's Guidelines on the Fair Treatment of Seafarers involved in marine accidents are universally applied. Accidents should not be criminalised and international maritime law should be respected.

Yet we should soberly reflect on the recurring themes in these incidents that the MAIB has so carefully investigated, and, if I may be permitted to mention them, the reports in the Nautical Institute's confidential Mariners' Alerting & Reporting Scheme (MARS). In this issue of the Safety Digest, we have depressingly familiar reports on:

- Poor watchkeeping, usually combined with distraction by other work
- Poor seamanship, in which I would include lack of knowledge of the ship's systems and operating capabilities
- Lack of or insufficient risk assessment, including not looking for hidden dangers or respecting the power and capacity for change of the elements
- Poor inter-personal skills and communications
- Insufficient manning for the ship's operating environment.

Whether we are working at sea or ashore, there is much to learn from these reports and, if we are honest, it is likely that we can all recall similar incidents in which we have been involved but were fortunate that something or someone intervened at a crucial moment to avert an accident. Perhaps too, we can remember practices before the ISM Code when reporting of near misses (or near hits as some now prefer to call them) was not required by international regulations. I can certainly remember some of my unsafe practices and as I read MAIB and MARS reports others come back to me, and they still have the power to make me shudder and thank my lucky stars that they did not lead to a casualty.

In this Safety Digest, it is encouraging to read in some cases that despite the initial problems that resulted in the incident being investigated, the ship's crew reacted professionally in containing the situation and averting disaster. There are, for example, four cases involving fire – probably the seaman's greatest fear. In each case, the crew's training resulted in a rapid and successful fire-fighting response in challenging circumstances. This underlines the value of professional training courses and frequent drills on board. It should go without saying that these drills need to be varied and effective rather than just going through the motions to tick the right boxes in the Safety Management System documentation. Each drill should also be preceded by a risk assessment, in itself a useful training exercise, and planning involving the key personnel. The aim of all these activities is that, when a real emergency occurs, the crew will know exactly what to do and how to do it in a calm and efficient manner despite the pressure that an emergency is bound to cause.

This is simply good seamanship (fortunately Political Correctness has not forced us to change to seapersonship just yet). So what makes a good professional seaman? A key attribute, I think, is attention to detail and a willingness to check, check, check. Does this support the proliferation of check lists in the industry today? Yes, but only if they are relevant to the ship and specific operation as well as being used to really assess the equipment, readiness, or conditions rather than mindlessly ticking the box. They should be an aide mémoir to correct operations, not merely a documentary defence after the event. This eye for detail must be combined with professional knowledge through effective training and will, with sufficient sea time, lead to experience. Seamanship is also about making competent use of the technology at your disposal whilst developing and maintaining your core skills as a seafarer. This is essential for those times when the technology lets you down at crucial moments, and being able to carry out navigation and other operations without it may well be the difference between a successful voyage and disaster. However, it is also about not developing an over-reliance on technology so, if you are a navigator, enjoy looking out of the bridge window and using all your senses to assess the shipping and elements around you. Similarly, in cargo operations read everything you can about the cargoes' characteristics, use all your senses to assess danger and stop operations whenever necessary.

Above all, share your knowledge and experience with others, on board, within your fleet and through industry publications so that lessons are learned and best practice encouraged. By doing so, you will be contributing to safer and more efficient shipping operations which will not only protect the marine environment, and so gain the approval of the public, but will be an important part of reversing the criminalisation trend.

Safe sailing and enjoy being a professional seafarer.

Mr Philip Wake, MSc RD* FNI

In May 2003, Philip Wake became the Chief Executive of The Nautical Institute – the international professional body for qualified seafarers – having served in the Secretariat since November 1999. Prior to that, he was Chairman of the voluntary London Branch in 1998/99 and was elected a Fellow in 1996.

Previously, he served at sea from Cadet to Chief Officer with Ellerman City Liners before coming ashore to a container consortium where he established a new commercial department focusing on operational cost control. He became a Senior Consultant in shipping economics at Lloyd's Maritime Information Services, and latterly was a Director of Clarkson Research Studies – a division of major shipbroker, Clarksons.

He gained his Master's Certificate of Competency (Foreign Going) in 1978 and was awarded an MSc in Shipping, Trade, and Finance from the City University Business School, London in 1988. He also served in the Royal Naval Reserve specialising in Mine Counter Measures and Naval Control of Shipping.

He is a member of the Council of the RNLI (Royal National Lifeboat Institution); a Younger Brother of Trinity House, London; an active member of the Honourable Company of Master Mariners; and a Trustee of the CHIRP Charitable Trust (which runs a confidential hazardous incident reporting scheme for aviation and maritime.

A Flood and Fire – a Testing Time

Narrative

The master of a Panamax container ship obtained a weather forecast before sailing just after midnight. The forecasted winds of force 5 to 6 were set to worsen, but this did not concern him. After dropping off the pilot the master instructed the bosun to fully secure the anchors. The chain lashing was fitted and the Senhouse slip tapered pin pushed in by hand, the guillotine blocks were lowered and it was said that the brake was fully tightened (Figure 1). After the bosun reported the anchors secured, the master increased speed. No heavy weather checks were carried out.

Overnight the weather deteriorated and the ship's speed was reduced. At about 0800 the chief officer was sufficiently concerned about the conditions that he put the upper deck out of bounds so that heavy weather checks could not be undertaken. However, he did warn the engineers and catering staff to check that their departments were properly secured for rough weather. A rapid sequence of events was about to take place.

By 1200 the wind had further increased to force 8 to 9, with rough seas. At about 1215 alarms sounded in the Engine Control Room. There was a smell of burning around the electrical supply breaker panels, and a number of earths were detected, as well as a high temperature bow thruster motor alarm – although the motor was not running. The symptoms were somewhat confusing. A short time later the bow thruster fire alarm sounded.

The master altered course to provide safe access across the deck. On entering the bow thruster room the cause of the confusion quickly became apparent. A number of holes were found in the port side of the bow thruster room shell plating, through which water was pouring. The crew blocked the holes with wedges and neoprene rubber, and this stemmed the water ingress. It was found that the port anchor chain lashing had released and the anchor had fallen against the windlass brake tension, into the water. As the ship had pitched, the anchor had impacted against the hull, causing numerous indentations and holes (Figure 2), and flooding to five adjacent compartments.

After securing the anchor once again, the passage was resumed to the next port, where repairs had been arranged by the shore management. Despite the crew's damage control efforts, and continuous bilge pump operation, the water level in the bow thruster room eventually reached the outside sea level because of undetected holes in the bilge area. As the ship continued her passage, the weather moderated, and she arrived in port for repairs and cargo operations 3 days later.

On arrival at the lay-by berth, a survey identified the need for 23 insert plates. The port authority approved the hot work, which was conditional upon the contractor complying with the ship's Safety Management System (SMS). However, the instruction was in a foreign language which the crew did not understand, and they did not query it.

The ship duly moved to the container berth to discharge her cargo. As far as the crew were concerned the contractors were moving their repair equipment on board, which included 15 acetylene and 16 oxygen bottles stowed on the forecastle, in preparation for hot work to be carried out on return to the lay-by berth. However, this plan was not the one to which the technical superintendent, who was overseeing the repair, or the repair contactor, was working.

The ship moved to the container berth at 1930 and, at 2045, unbeknown to the crew, the contractor started to burn out the damaged sections of the hull plating in the forepeak and in the bow thruster room. After a short meal break the contractor resumed work at 2345. At 0055 the safety watchman on the forecastle left the area and went to the accommodation area without telling the foreman. Very soon

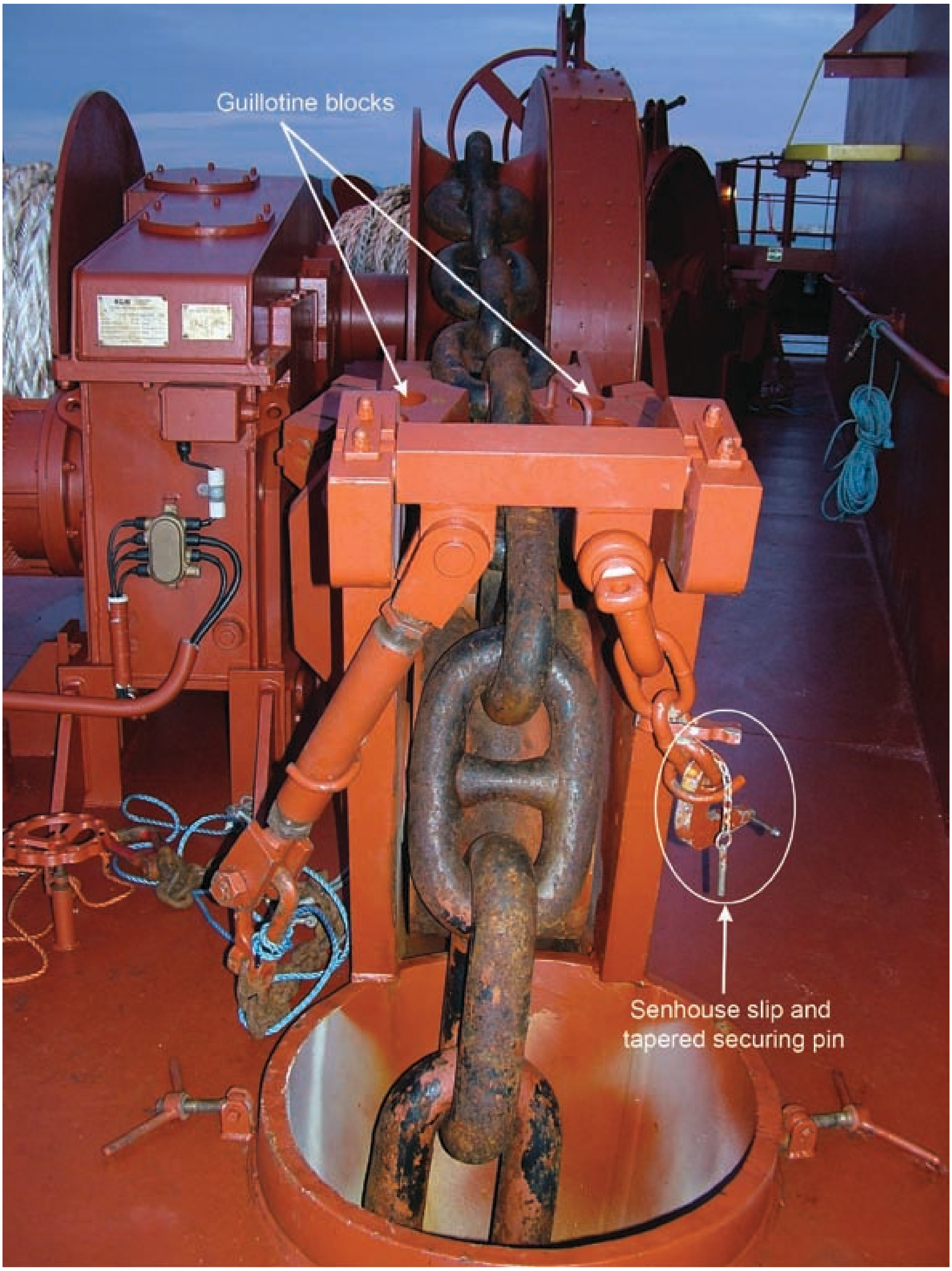


Figure 1: Mooring arrangement

afterwards, oxyacetylene burning stopped so that the rough edges of the holes could be ground off. At 0110 the foreman decided to leave the forepeak to check progress in the bow thruster room. As he was about to go onto the forecastle, he was met by a mass of sparks, which prevented his exit. Because the contractors were not equipped with VHF radios, the foreman used his mobile telephone to ask the safety watchman about the cause of the fire. The safety watchman, believing this was a joke, did not return to the forecastle.

Figure 2: Hull holes and indentations

Figure 3: Fighting the fire on all acetylene bottles

Figure 4: Acetylene bottle damage

Figure 5: Winch motor damage

In the meantime, the burner in the bow thruster room tried to re-light his blowtorch and found the acetylene pressure was too low. He and his assistant went to the acetylene storage area, but were confronted by a ferocious fire on the port polypropylene mooring rope and from the acetylene bottles. They attempted to close off the bottle valves, but the fire was too fierce. To their credit they then rigged a fire hose, but because the ship operated a dry fire main their efforts were thwarted. They then raised the alarm as the safety watchman returned to the scene.

The ship went immediately to muster stations, and soon afterwards two acetylene and one oxygen bottle exploded. Two fire parties made an attack on the fires from behind the breakwater bulkhead (Figure 3). They successfully extinguished the fire on the mooring rope, and then set about cooling down the gas bottles as the local fire brigade arrived.

One of the workers in the forepeak managed to escape onto the forecastle, and four others escaped onto a harbour tug through the holes they had cut in the forepeak shell plating.

The Lessons – Heavy Weather

The heavy weather damage was caused because the chain lashing Senhouse slip tapered securing pin was not fully secured. As the ship pitched in the heavy seas, vibration would have been set up, and this would have been exacerbated by water rushing up the hawse pipes because the covers had not been fitted. As the pin became displaced, the slip released, allowing the chain lashing to fall into the hawse pipe. The anchor cable progressively dropped as the acceleration forces overcame the winch brake, which was not fully applied. As the ship pitched, the anchor made contact with the hull, causing the indentations and penetrations.

1. Do take due account of the weather forecasts when deciding to carry out heavy weather checks – do it early, because when the weather turns it may be too late.

2. Ensure the heavy weather checklist is sufficiently detailed and adapted to be ship-specific. Many are not, and this can lead to important checks being missed.

3. Make sure that the relevant crew are familiar with the anchor chain securing arrangements. Bottle screws should be tightened after the Senhouse slip is connected to ensure the system is fully secured. All too often the bottle screw is considered to be in the right position as long as the slip can be connected. The acceleration forces are high, and will find any slackness in the system.

4. In this case, the Senhouse slip was a tapered pin, and it could be argued that it was not best suited to the application. Mousing the pin or changing it for a “drop nosed” pin would have made it more secure.

5. Winch brakes need to be applied tightly. Take due account of the stature of the individual crew responsible for tightening the brake. Using a wheel spanner or extension bar to get added purchase may be necessary.

By 0400 the fire had reduced and, at 0546, it was confirmed extinguished.

Fortunately there were no casualties and the damage was limited to the forecastle area, where burnt clothing was found. Had the ship's fire-fighting teams not taken the action to cool the acetylene bottles, more of the bottles could easily have exploded, causing structural damage and personal injuries. All the acetylene and oxygen bottles were badly damaged (Figure 4), the deck plating was distorted and the mooring winch electrical supplies were burnt, as was the winch (Figure 5).

The Lessons – Fire

The fire was likely to have been caused by a discarded cigarette, which had ignited clothing found in the vicinity of the mooring rope and acetylene hoses. The acetylene ignited because the gas bottle valves were open. Because the "in use" bottles were co-located with the storage bottles, the fire spread to the other bottles and so escalated.

Unfortunately none of the hot work Permit To Work (PTW) control measures were in place, and the contractors were not briefed on safety procedures because the crew were unaware of the intention to carry out hot work. Effective communications were an early casualty in this accident.

1. **Ship's staff must become fully engaged with contractors and understand their scope of work.**
2. **If shore management undertakes the oversight responsibility, the safety of the ship and her crew remains with the master.**
3. **Where there is high risk work being undertaken it may be appropriate to pressure dry firemain systems – a risk assessment will help in making the decision.**
4. **Where a port authority gives work approval in a foreign language, arrange for it to be translated so that the ship's responsibilities are fully understood.**
5. **Where the contractors provide the safety watchman, insist on him/her always being on station.**
6. **Conduct regular rounds of the work site, and do not hesitate to order work to stop if you believe safety is being compromised.**

Remember: it is good practice to segregate the "in use" gas bottles from the storage bottles to reduce the risk of a fire spreading.

Of Course They Can See Us, Can't They?

Narrative

A merchant vessel collided with a fishing vessel in clear visibility and broad daylight while on passage at full sea speed on autopilot steering.

On board the merchant vessel, the second mate was on watch alone. He had seen the fishing vessel on his radar while some 5 miles away and estimated, without plotting, that she would pass clear 1 mile to starboard. Soon after this he became engrossed in chart corrections, contrary to master's standing orders, and paid no further attention to the fishing vessel.

Meanwhile, the beam trawler's skipper started to shoot his gear and proceeded to tow in a reciprocal direction towards the merchant vessel, assuming that she would alter course. Once the gear had been shot and the vessel was towing, the trawler's deckhands left the deck and joined their skipper in the wheelhouse. There, they all observed the closing ship, now 2 miles away. The youngest deckhand queried the ship's proximity and bearing with his skipper. The skipper, however, was not unduly worried because many times in the past he had seen similar vessels come close before altering, so assumed this time would be no different.

When 1 mile (4 minutes in time) apart, the skipper of the beam trawler attempted to contact the cargo vessel coming east, by VHF radio. The radio call, however, was unable to clearly identify the merchant ship, and was broken up due to a radio malfunction.

Figure 1: Damage to merchant vessel caused by contact with the derrick on the fishing vessel

Figure 2: The derrick involved in the collision

As the vessels closed, the trawler's skipper made urgent pleas for the cargo vessel to keep clear of his hampered craft, latterly calling her by name (the vessels were now so close he was able to read it). No action was taken to attract attention using the mast-mounted sound signalling apparatus, or to free the vessel from her fishing gear by releasing the wires from the wheelhouse controlled winches.

At about this time, the merchant vessel's first mate arrived on the bridge for the change of watch and, following a cursory look out of the windows and at the radar, proceeded to file some paperwork. The second mate, meanwhile, who was still at the chart table, entered their change of watch position. The first mate's attention was suddenly attracted, simultaneously, by a radio call to the ship and by the second mate's exclamation when he looked up from the table and spotted the trawler close on their starboard bow. The first mate took evasive action by going hard to port, away from the trawler; the trawler came full astern.

Unfortunately these actions were insufficient to clear the vessels, and resulted in the merchant vessel striking the fishing vessel's starboard derrick. Fortunately the derrick's preventer stay snapped under the impact, thus preventing the trawler from serious damage.

The Lessons

1. Regulation and common sense require that a good lookout be maintained on all vessels, at all times. This necessitates discipline on the part of watchkeepers to prevent them from becoming distracted.

2. Chart corrections are a fact of life on board ships, so time should be set aside for completing these; that time is not while keeping a watch.

3. The merchant ship had a watch alarm, ARPA and radar guard zones, but none were activated. The purpose of these alarms is to assist watchkeepers should they become distracted for any reason. These systems help only if they are activated, and in the case of watch alarms, are even more effective when interfaced with the autopilot.

4. The fishing vessel's skipper assumed that the merchant vessel was keeping a good lookout and would keep clear, as indicated by previous situations. Allowing the ship to come so close, before attempting to attract her attention, was complacent and left little time for evasive action. Never take it for granted that the other vessel is keeping a good lookout – always act in good time.

5. The beam trawler had wheelhouse controlled winches; ideal for running off wire or jettisoning the gear if need be. Better to spend a day grappling back a set of gear than being run down; no-one is in the right during a collision.

Complacency Leads to Blackout and Grounding

Narrative

A ro-ro cargo ship had spent a quiet weekend at the lay-by berth. During the lay-over the two electrical generators had been swapped over to facilitate minor routine maintenance. The generators were considered to be very reliable. The fresh water cooling temperatures had been steady at 82°C and the other parameters equally constant. It was the ship's routine that, when in harbour, the generator fresh water system was cooled by sea water supplied from the harbour service pump, and when the main engines were running the sea water was provided from one of two main service pumps through an awkwardly positioned isolating valve (Figures 1 and 2).

The systems were reconfigured once the main engines were warmed up to 60°C. At this point one of the main service pumps was started and the harbour service pump stopped. A schematic of the main service and harbour service sea water cooling systems is at Figure 3.

While the generators were healthy, unfortunately the same could not be said for the chief engineer's interaction with the rest of his engineering team, who were all of a different nationality. The somewhat strained relationship resulted in him not always being informed of defects, and he was unaware of starting problems associated with the emergency generator when it was set to the "auto" start position.

At about 1730 on Sunday evening the third engineer started preparing the main engines for the planned shift from the lay-by berth to the ferry linkspan at 1800. At 1745 he advised the chief engineer that "standby" engines was expected at about 1800. The chief engineer considered this to be a low level, routine move, and advised that he would remain in his cabin, but that he was to be alerted to any problems that may be encountered. Soon afterwards, at about 1750, the second engineer took over the watch in the middle of the critical time of preparing for the move. Having completed his steering, Controllable Pitch Propeller (CPP) and communications checks, the master positioned himself at the port bridge wing control position as the vessel left the berth at about 1809. He had undertaken this move on many occasions, and he also considered it to be very much routine, requiring only himself to be on the bridge.

In the meantime, the second engineer had completed his preparations. He reconfigured the sea water cooling system so that a main service pump supplied the sea water cooling requirement. He was alone in the engine room during this busy time, and completed

Figure 1

Figure 2

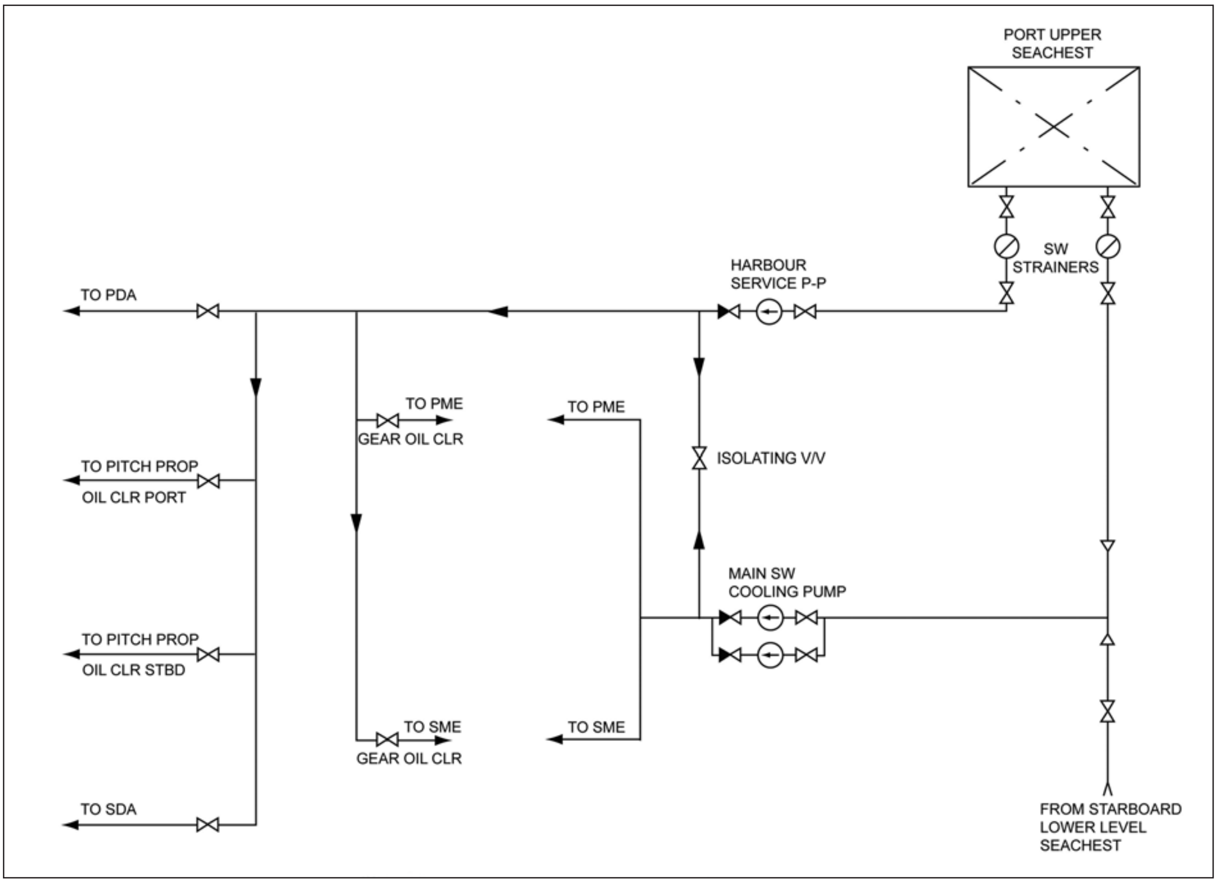


Figure 3: Schematic of the sea water cooling system

preparations without regular reference to the departure checklist. A short time later, at about 1808, the port generator high fresh water temperature alarm sounded. As the second engineer went to investigate, other alarms also started to sound. The second engineer did not report the high temperature problems to either the chief engineer or the master. Meanwhile, the vessel slipped from the berth and proceeded astern. At 1811 the port generator tripped out on high fresh water temperature, closely followed by the starboard generator tripping out, also on high fresh water temperature.

With all electrical power now lost the CPP defaulted to its designed full astern position on the loss of its hydraulic oil supply, and the vessel continued astern and grounded at about 1813, badly damaging both rudder stocks. It is notable that no-one on board was aware of the CPP default position.

Immediately on arrival at the Engine Control Room (ECR), both the chief and third engineers stopped the main engines without approval from the bridge and without knowledge of the navigational position. The situation in the engine room was chaotic; the chief engineer tried to impose his authority, but the engineers spoke in their own language and failed to communicate with him. The situation was exacerbated by the lack of lighting as the emergency generator had not started. It was about 15 minutes later before the emergency generator was finally started in “manual” mode, and a further 10 minutes before the main generator fresh water systems had cooled sufficiently to enable the generators to be started and electrical supplies to be restored.

Throughout this time the master communicated with the ECR via the chief officer. He opted to do this because, during the early stages, he had only the soundpowered telephone available, which went unanswered, and was located in the bridge and remote from his bridge wing control position. The extended communications chain led to confusion and the later restarting of engines without the master's approval.

At 1945 the master ordered the starboard main engine to be started. Just before 2000, tugs arrived to assist in bringing the vessel back to the lay-by berth.

The Lessons

The investigation concluded that the generator's high fresh water temperature was due to the sea water system isolating valve supplying the generators not being properly opened during the system reconfiguration in readiness for departure. The poor use of the departure checklist is most likely to have contributed to this failure.

The move from the lay-by berth to the linkspan was seen as a low level operation by both the bridge and engine room teams. However, in many ways this was the time when the vessel was subjected to most danger. The machinery state had changed, systems had been reconfigured, the power requirements were variable and the vessel was in severely restricted waters. Despite these factors, the risks were not appreciated and complacency had led to unacceptable manning levels on the bridge and in the engine room. This resulted in the lack of support to deal with the accident as it developed.

The following lessons can be drawn from this accident:

1. It is advisable that minimum manning levels, identified by risk assessments, are reflected in the Safety Management System and in the master's and chief engineer's Standing Orders. These should include shifts of berth.

2. Do encourage the systematic use of checklists. It is all too easy to think that experienced personnel can prepare systems from memory. During periods of high activity and distractions, important steps can be missed, and this can lead to failures.

3. Consider staggering watch changes to avoid handovers mid-way through critical events, e.g. engine preparations or shutdowns.

4. Ensure that key personnel are aware of the default positions of machinery in the event of electrical/hydraulic power failures. CPPs default variously to full astern, full ahead or to the "set" position. It is wise to ensure that appropriate signage is posted at all control positions.

5. Shore managers should be aware of the potential personality and cultural issues and be prepared to advise and mentor officers, where necessary, during ship visits.

6. The position of sea water to the generator isolating valve made its operation difficult. Had it been in a more visible and accessible position, the second engineer might have noticed that it had not been properly opened.

7. Attend to defects as soon as possible. In this case the lack of lighting, caused by the emergency generator failing to start, created confusion, anxiety and delays to fault-finding and rectification.

8. During breakdowns it is essential that there are effective direct communications between the bridge and the engine room. This avoids the risk of misinformation resulting in confusion, which is often the case when extra steps are introduced into the communications chain.

CASE 4

New Berth, Old Routine

Narrative

A port was undergoing extensive building work, requiring the construction of a new temporary pontoon for tugs and pilot boats to operate from. Previously, they had operated from a sheltered enclosed dock, but the new pontoon was located in a more exposed position within the harbour. It had become the practice within the port for the pilot boat coxswains to ferry the tugs' crews across the harbour at the end of their shift, saving them a taxi ride of over an hour to reach their homes on the opposite side of the harbour.

The new pontoon entered service following a risk assessment, and a number of safety issues had since been addressed; these were related to the pontoon itself rather than to the pilot boat boarding and landing procedure. The normal practice was for the coxswain to approach the pontoon at an angle, to lean the bow onto the pontoon tyre fendering and to maintain this position during the personnel transfer. This was a similar procedure to that used previously in the sheltered enclosed dock.

On the day of the accident, three tug crew members had arranged to be picked up from the pontoon at the end of their shift. As the pilot boat approached, the deckhand went forward in preparation to assist them in boarding. The coxswain leaned the port shoulder against the tyre fenders, as normal, and the first two men quickly boarded and made their way aft to the cabin.

The third man, who was carrying two small bags in one hand, stepped onto a tyre fender with his right foot and was about to step onto the boat's deck with his left foot. The boat's bow pitched down and the man, realising that he was in danger of falling onto the boat, decided to fall backwards onto the pontoon

Figure 1: Pilot boat with port shoulder leaning against tyre fender of pontoon

Figure 2: Pontoon and tyre fendering

instead. As he did so, the bow pitched up, rode over the fender, and then pitched down again, trapping the man's lower leg between the pontoon and the boat's hull.

The emergency services were called and the man was transferred to hospital, where his lower leg was later amputated.

The Lessons

1. The risk assessment for the use of the pontoon did not identify the dangers posed by personnel stepping onto a tyre fender and the bow of a pilot boat riding over the fender during boarding and landing operations. While the normal practice had previously posed little risk to personnel in the sheltered enclosed dock, the exposed nature of the pontoon subjected vessels using it to the effects of wind, swell, self-generated wash and wash from passing vessels.

   These factors had not been considered during the risk assessment. This was largely because those involved either lacked sufficient marine expertise or were routinely involved in what had previously been the normal practice. Consequently, they lacked sufficient objectivity in reviewing the changed circumstances under which the boarding and landing operations were to be undertaken. It is essential that risk assessments are developed in consultation with personnel who are sufficiently remote from similar routine operations but who have the necessary marine expertise to provide an objective overview.

2. Had the pilot boat been lying parallel and secured alongside, the bow would still have pitched, due to the environmental effects. However, the likelihood of it riding over the tyre fenders would have been greatly reduced. Before transferring personnel, ensure a vessel is lying parallel to the quay or pontoon, and secured with at least one line.

3. It is dangerous to stand on a tyre fender while boarding a vessel. Unforeseen movement of the vessel can compress or move the fender. Furthermore, its rounded nature offers little surface area on which to step safely and, when wet, it presents an unacceptable slip hazard. Personnel should step directly from the quay or pontoon onto the deck of the vessel or, where this is not practicable, a gangway or other appropriate additional means of access should be provided.

4. Access to a vessel is potentially hazardous at the best of times, and usually requires both hands for it to be effected safely. Any bags should be either secured to the body or, ideally, passed separately to or from the vessel.

5. The pilot boat approached the pontoon at high speed, something the coxswain would not have done in the past given the enclosed nature of the dock used previously. The wash generated by this is likely to have contributed to the vessel's movement as she was manoeuvred alongside. To reduce this effect, vessels should reduce speed well in advance of approaching a boarding or landing position.

It Takes Two to Tango

Narrative

A medium sized container feeder vessel was heading east on passage at around 16 knots when she collided with a small fishing vessel that was slowly proceeding to the south-south-west. The conditions were near perfect – it was a beautiful clear day with bright sunshine, excellent visibility and only light winds.

The container ship's master was sitting in the bridge keeping watch alone when he observed a small target on the radar about 5 miles away. He recalls looking out of the window to visually identify the target and, despite having the bridge window blinds down, being dazzled by the sun glinting off the sea. He became aware of coming round some time in the aftermath of the collision.

The fishing vessel, meanwhile, had come fast earlier in the day, and her two crew were on deck mending a trawl net. The other two nets were trailing in the water, and she was showing her fishing signal, albeit incorrectly. Just over 10 minutes before the collision, the skipper went into the wheelhouse and observed a merchant vessel on the radar around 3 to 4 miles away. He assessed the situation and, believing there to be no risk of collision, returned to the aft deck to resume mending. He did not continue to monitor the approaching vessel.

Seconds before the collision, the fishing vessel crewman looked up, and saw an approaching wall of water. By now too late to take avoiding action, the vessels collided. The fishing vessel sustained significant damage, with her deck

Figure 1: Small fishing vessel involved in the collision

Figure 2: The container vessel involved in the collision

momentarily swamped. One of the crewmen suffered a minor head injury; the two fishermen were lucky not to be swept overboard as the vessel listed to port.

Fortunately the water shed quickly and the vessel settled well, with no significant water ingress. She was, however, now disabled, and the skipper had to rip the wheelhouse door off its hinges to gain access to issue a "Mayday". Several vessels in the area responded, and she was later safely towed into port. The container ship sustained minor damage.

The Lessons

1. Not surprisingly, this case proves that the inevitable outcome of two vessels approaching on a collision course, with neither keeping a lookout, will indeed be a collision. The practice of lone watchkeeping on the merchant vessel, combined with a period of no watchkeeping on the fishing vessel, meant that neither vessel was keeping a good lookout, nor monitoring the approach of the other, and is the perfect example of why these are both so essential.

2. The posting of an additional lookout will help counter situations when a lone watchkeeper becomes incapacitated, and is clearly beneficial at all times, not just at night or in restricted visibility. Although the fishing skipper was aware of the approaching vessel, it is possible: he had become distracted by the task of mending; he was tired after a fairly intensive period of fishing; the glorious weather conditions had lulled him into a false sense of security; or he simply assumed that as his was the stand on vessel, the merchant ship would alter course. One thing is clear from this case; fishing signals do not create a magical force field which will automatically prevent other vessels from hitting you! Don't assume that an approaching vessel is keeping a good lookout, or has even seen you and will definitely keep clear.

3. The container ship had modern navigational aids fitted, including a watch alarm and two ARPA radars with guard zones. The fishing vessel's radar, although not ARPA-capable, also had a guard zone function, and again there was a watch alarm available. However, none of these items were being used on the day of the collision, perhaps because there was little traffic around and visibility was good. Such tools can help prevent accidents, particularly if a watchkeeper happens to become distracted or incapacitated, but they are only of use if they are being used … so do so!

CASE 6

Timber Cargo Reminder

Narrative

A 7000 tonne deadweight cargo ship loaded her cargo of packaged timber, just under half of which was stowed on deck. The weather forecast for the initial section of the passage was not good, but the master proceeded with caution, altering his course when required to ensure the sea was on his bow and ship motions were not excessive.

Four days into the voyage, while transiting a TSS, a gale warning was received warning of southerly veering westerly force 8 to 10 winds imminent. The master decided to alter course to seek shelter to the south once clear of the TSS.

The wind at this time was on the ship's port bow, causing her to list to starboard. The master transferred some ballast from the starboard to the port wing tanks to correct the list. A little time later, the wind suddenly increased and swung round to the ship's starboard bow. Just as the master was considering transferring the ballast back, he noticed the timber deck cargo start to shift to starboard as the ship rolled to starboard. As she rolled back to port the timber deck cargo shifted to port, and continued to shift until the ship was heeled nearly 40 degrees to port. At this point, some of the wire lashings and uprights failed and half of the deck cargo was lost overboard. The ship recovered to a 15 degree list to port after shedding the cargo.

As a result of the crew being in the engine room, the main engines and generators were kept running, although the controllable pitch propeller hydraulic pump had to be restarted to maintain propulsion. By transferring ballast, the ship's list was reduced to less than 5 degrees.

The coastguard was called and the ship was directed to port, where the cargo was unloaded and re-stowed for the onward voyage. The only damage sustained was to the uprights, lashings and the port bulwark upon which the uprights were mounted.

Figure 1: Port side – showing collapsed stow. Note the smooth surface on the hatch covers

Figure 2: View forward, showing damaged uprights

The Lessons

1. The cargo stowage arrangement did not include many essential safety precautions. For example:

   - The stow was not tight because the slings used for loading had been removed once the packages were in place.

   - There was insufficient friction in that the hatch covers were smooth, the steel banding of the packages rested directly on the deck, and the plastic wrapping of the packages was also smooth.

   - The windage was too great for the lashings provided, as the cargo was stacked in excess of the limit laid down in the IMO timber deck cargo code.

   Collectively, these poor practices increased the likelihood that the cargo would shift in transit.

2. Although, ultimately, a brief worsening of the weather led to the cargo shift, strong winds had been forecast for some time leading up to the accident. There was a plan to seek shelter, but this was too far away considering the forecasts. Ensure your plans for shelter are feasible. Seek refuge early and avoid becoming trapped with nowhere to run.

3. There were no safety lines or guardrails rigged over the deck cargo. This was significant for two reasons. Firstly, the lashings were unable to be checked and tightened for the 2 days leading up to the accident as the weather meant it was not safe for the crew to venture on top of the cargo. Secondly, the only access forward to the foc's'le was over the cargo. Without safe access, reaching it in an emergency would have been potentially hazardous.

4. The timber deck cargo stowage arrangement meant that certain tanks, including double bottom ballast tanks, could not be sounded. The IMO timber deck cargo code requires that safety equipment, including sounding pipes, remains accessible once the cargo has been stowed on board. Blocking off areas of the ship hampers the crew's ability to deal with an emergency effectively.

Hot Work – Some Risks Are Not Always Obvious

Narrative

A standby vessel was in port waiting for her next tasking, so the opportunity was taken to carry out an electric arc welding repair to the bedplate of an alternator located in the engine room.

The ship's staff carried out the pre-welding checks as laid out in the Safety Management System (SMS) and associated risk assessment. The bilges were confirmed to be clean and free of oil, and a thorough check was made to ensure there were no flammable materials in the area of work. The welding contractor was well known to the ship's staff and had a reputation for being particularly safety conscious, so there was of course nothing to worry about. The welder was accompanied by his fire watcher, who was wearing correct personal protective equipment and was equipped with fire extinguishers. The extent of the work was agreed, and with all recognised safety precautions in place the Permit to Work was signed and the weld repair started.

A short time later, copious amounts of smoke billowed up from under the floor plates (Figure 1). The second engineer, who was in the engine room at the time, raised the alarm, and the chief officer contacted the shore Fire and Rescue Service. In the meantime the engine room was evacuated and personnel were accounted for.

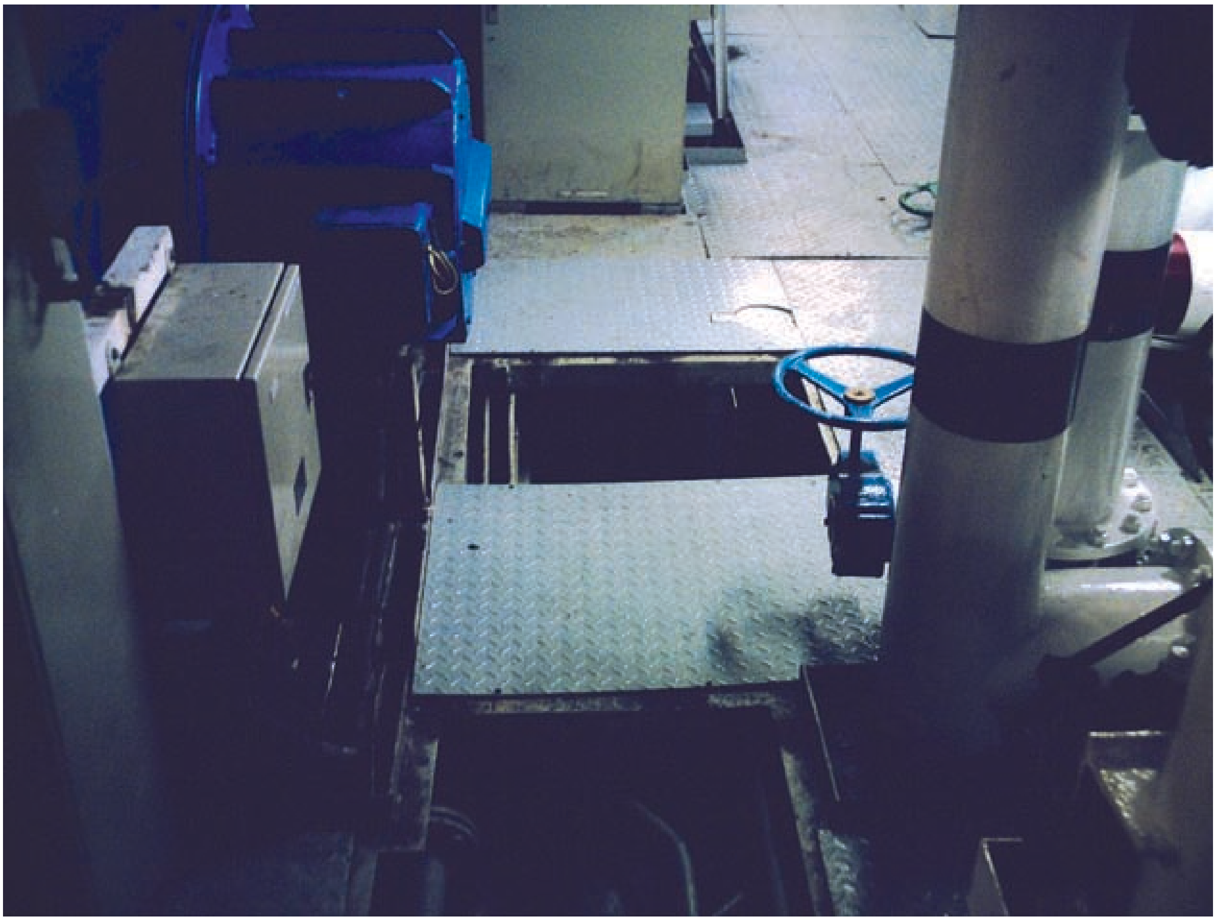


Figure 1: Welding area

Figure 2: Charred rubberised sheathing of cable

Following a debrief on the incident, given by the second engineer, and since no fire was seen, the chief engineer judged it safe to make a re-entry of the engine room, with his team, wearing breathing apparatus. They found no evidence of fire, but noted that the insulation of a fire retardant electrical cable close to the area of welding, under the floor plates, had suffered from smouldering (Figure 2). The area was doused with water and the smouldering was extinguished.

After smoke clearance was completed, the cable insulation was repaired and a check was made on the integrity of the electric cable, which was found to be satisfactory.

The Lessons

The ship's staff carried out all the necessary pre-welding checks as specified in the onboard documentation, so they were content to issue the Permit to Work. However, while the bilges were thoroughly checked, they had not considered the risk of hot welding slag bouncing into the bilge area and lodging against the electrical cable in the cable tray.

The ship's staff knew the welding contractor well, and there was a degree of over-reliance on his well known safety attitude. However, the simple precaution of using a suitable fire blanket, which would have prevented this accident, was missed.

A firewatcher's job can be boring, so it is vital that those involved in hot work procedures ensure that he/she remains vigilant. His/her prompt initial actions are crucial in preventing the spread of fire.

While hot work procedures are generally well known, it is timely to highlight the following:

1. Look for the less obvious fire risks e.g. cable insulation, heat transfer to the other side of bulkheads/decks, and the possible release of gas from nearby gas bottles.

2. Use fire blankets to prevent slag or sparks falling under floor plates or into catchments which can cause "out of sight" smouldering and can lead to the development of a fire.

3. Ensure that the firewatcher is correctly equipped and that he/she remains vigilant and fully understands the correct first-aid action in the case of fire.

4. Be critical when reviewing hot work risk assessments and guidance in the SMS.

5. After hot work is completed, visit the work site and adjacent areas during the following 2 hours to ensure that residual heat has not caused smouldering or fire.

Further guidance on hot work procedures and precautions can be found in Chapter 23 of the Code of Safe Working Practices for Merchant Seamen, which is available on the MCA's website at www.mcga.gov.uk.

CASE 8

Thanks For The Advice!

Narrative

A cruise liner with several hundred passengers on board narrowly avoided disaster due to the vigilance and intervention of a shore-based Vessel Traffic Services (VTS) station.

The cruise liner's officer of the watch (OOW) was navigating towards the extremity of his chart, without the adjoining chart to hand, and no indication of which chart was required next entered in the vessel's passage plan. On leaving the charted area the ship was navigated blind, at full sea speed as it approached shallow water and an area of course alterations. A vigilant VTS operator observed the cruise liner standing into danger and advised the ship, by name, of this. However, the ship continued without course or speed alteration.

The cruise liner was 2 minutes from grounding when, fortunately, the master arrived on the bridge just as the VTS station was again issuing an urgent warning. The master immediately put the ship on a reciprocal heading by turning her through starboard, 180°. This starboard alteration, however, was towards the danger area, bringing the ship even closer to grounding until the reciprocal course was picked up. The ship was then navigated clear of the danger area, allowing her to berth safely soon afterwards.

The Lessons

1. An appropriate passage plan should indicate the charts to be used and they, in turn, should be laid out or made readily available. When operating close to the margin of a chart, the adjoining chart is essential to enable a "look ahead" and to appropriately monitor a vessel's position. In this case this was not done, which brings into question the OOW's competence and experience.

2. The OOW did not call the master when it became apparent that he was operating outside his capabilities and without suitable navigational information or guidance. The master has the ultimate responsibility for the safety of passengers and crew, and no watch officer, at any time, should hesitate to call him when his advice and guidance is needed. Similarly, masters should make this requirement clear in their standing orders: *"If in doubt, call me out!"*

3. When approaching port, or restricted waters, additional support should be available on the bridge in ample time to assist in, what is usually a stressful time. During such a time, course alterations, shallow water and increased traffic must be anticipated. In this case, the master had only minimal time in which to acclimatise himself with the vessel's circumstances, and he turned his ship even closer towards the danger while reacting to the VTS warning.

4. The VTS station played a fundamental role in diverting the cruise liner from danger. Mariners should remember that VTS stations can not instruct them as to how to avoid danger; they can only advise. However, their advice is based on clear local knowledge and experience, and should not be ignored lightly.

An Unconventional Manoeuvre with a Surprise Ending

Narrative

A 100m long, LPG tanker was fully loaded with butane and was ready to sail from a river jetty, to which she was secured port side alongside and head upriver. A tug had been ordered to assist the unberthing because there was a strong flood tide and the ship did not have a bow thruster.

Before boarding the ship, the pilot met the berthing master on the jetty. The berthing master was concerned that the ship did not have a bow thruster and drew the pilot's attention to the protruding anchor crown, which he considered could cause damage to the jetty fendering if the ship was manoeuvred off the berth as normal using the forward spring.

The tug was made fast to bitts at the aft end of the main deck, by the break of the accommodation superstructure. Once the ship was singled up, VTS gave permission for her to sail. All mooring lines were let go and, using astern engine movements, with the tug pushing, the bow moved off the jetty. The pilot instructed the tug to pull at 20%, which caused the ship's bow to fall back towards the berth. He then decided to move the ship astern and to use the rounded downriver end of the jetty to swing the bow into the river, without assistance from the tug. This was achieved but, just as the pilot ordered an ahead engine movement to lift the ship off the jetty, he was surprised to see another outbound vessel ahead of him, approaching the area in which he intended to turn the ship to head out to sea. Instead of moving into the river, the pilot manoeuvred the ship close and parallel to the jetty, and as she approached the upriver mooring dolphin, he placed the engine full astern. However, the ship's bow made contact with the dolphin, causing significant damage to both.

The pilot was unaware of the other vessel's scheduled movement because:

- He had not previously obtained from VTS a full list of scheduled ship movements; and
- While he was on the bridge wing, his hand-held VHF radio was set to a working frequency for communications with the berthing master and the tug. He was therefore unable to hear the VHF radio ship movement broadcasts made by VTS on the main port working frequency, which were received inside the bridge.

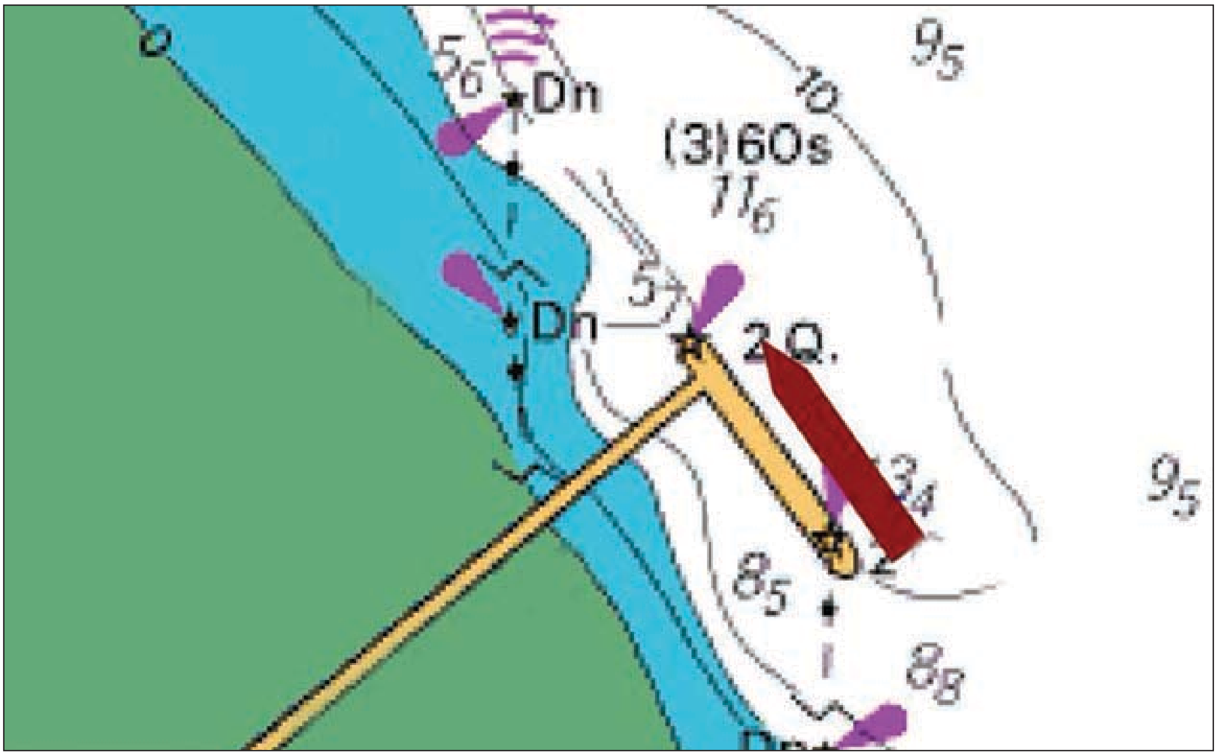


Figure 1: Vessel at beginning of manoeuvre

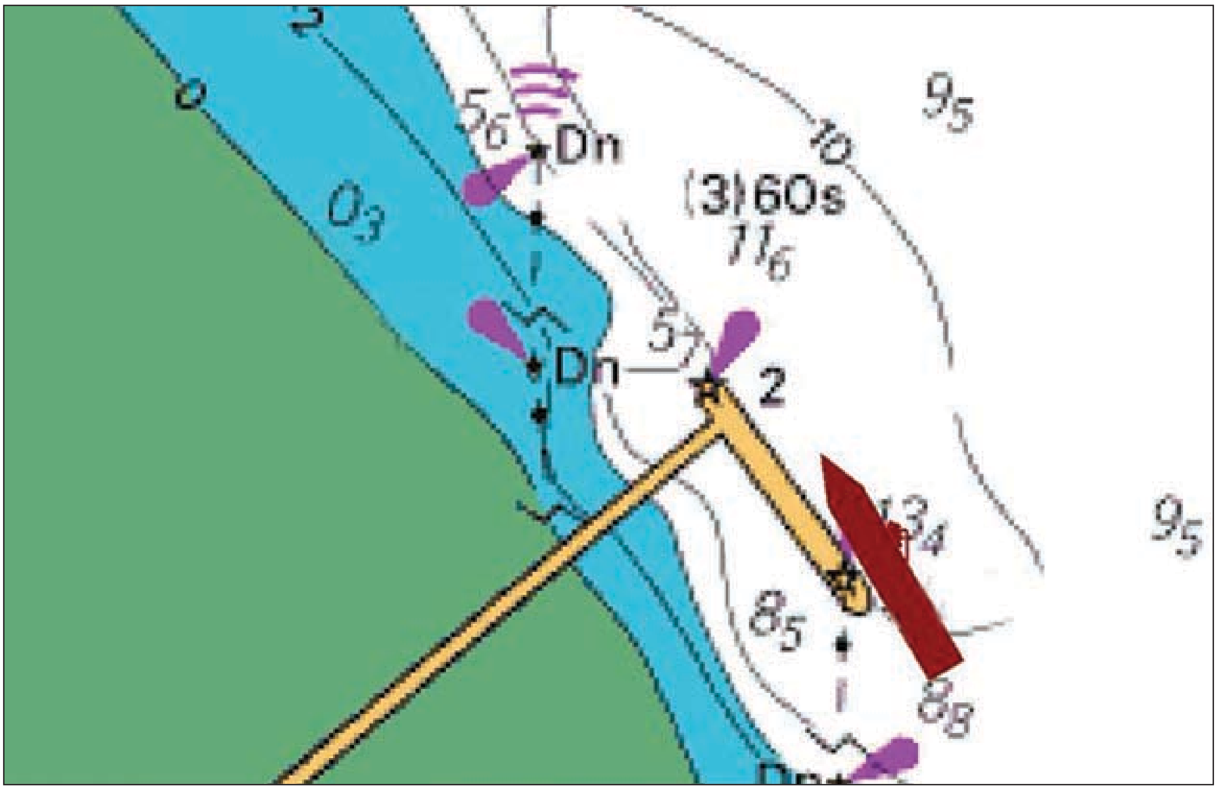


Figure 2: Vessel moving astern

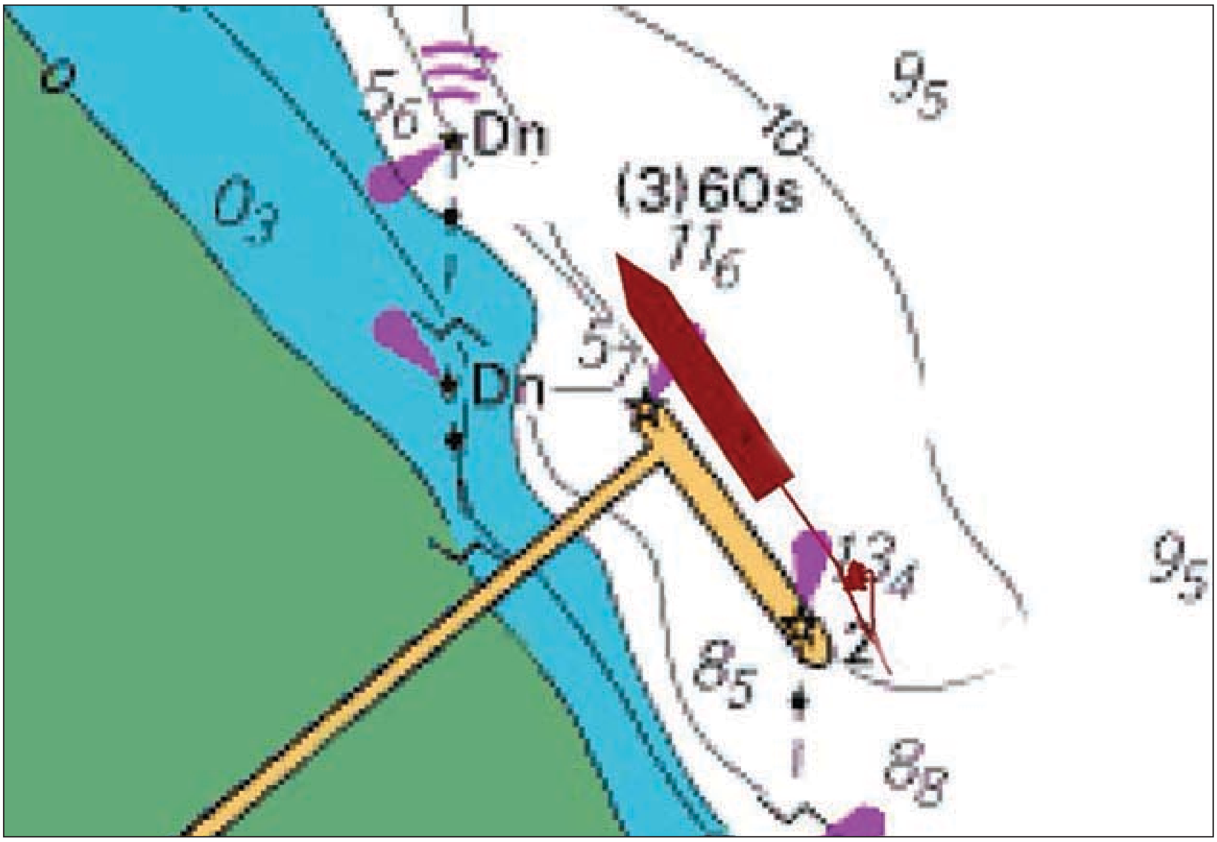


Figure 3: Vessel moving off the jetty

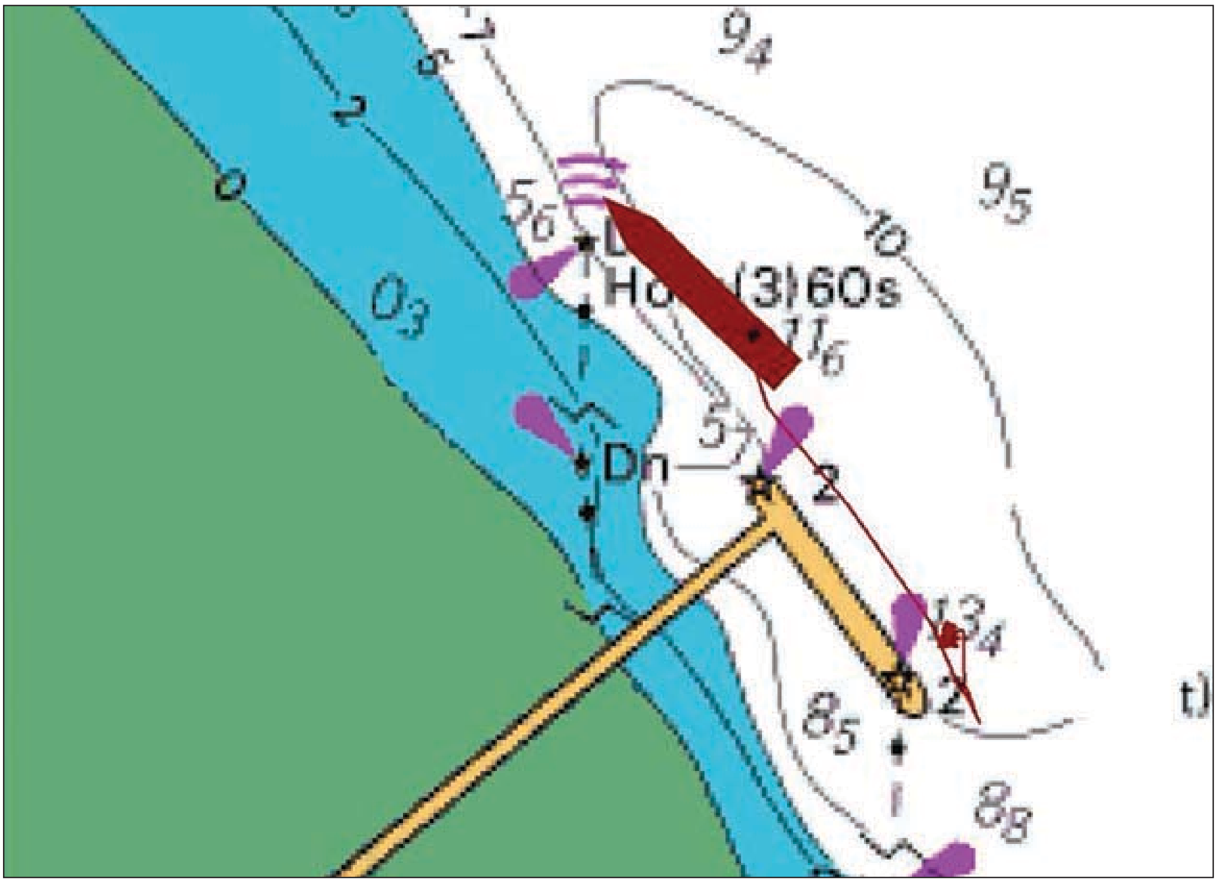


Figure 4: Vessel in contact with dolphin

The Lessons

1. Any intended manoeuvre should be carefully planned, taking full account of the potential effect of the tidal stream. It is essential that the pilot discusses his/her intended actions in detail during the master/pilot exchange. The master can then challenge those intentions at an early stage, and effective corrective action can be taken when required. This is particularly necessary if an unconventional manoeuvre is intended, in which case VTS may also need to be informed.
2. In preparing to berth or unberth a ship, it is essential to maintain full situational awareness by gaining information on all scheduled ship movements. If, for whatever reason, a pilot is unable to monitor the main port working frequency himself, he should not hesitate to utilise the bridge team to relay relevant communications and traffic information as necessary.

Failure of Provisions Crane

Narrative

A product tanker was alongside a refinery jetty, loading a cargo of gas oil. Routine ships' stores were expected, and in accordance with the refinery's regulations a stores barge was secured at the starboard (outboard) quarter of the vessel.

The vessel was fitted with a provisions crane on the starboard side, with a Safe Working Load (SWL) of 0.8 tonne. The crane was mounted on a pedestal above the deck and the bosun climbed up to the platform mounted on the side of the jib to operate the controls. He had a good view of the stores barge below.

The crew attached the first load, consisting of three drums of oil secured to a pallet, safely lifted it on board and then stowed it on the poop deck. A second load of oil, weighing 788kg (within the crane's SWL) was attached to the crane. The bosun began to lift the load, with the skipper of the stores barge steadying it as it cleared the deck. As the load reached the skipper's shoulder height, it suddenly lowered, landing heavily on the deck of the stores barge. The crewman looked up and saw both the crane and the bosun falling. He shouted a warning to the skipper, and both men ran clear. The crane struck the side of the ship and hit the deck of the barge, crushing a rubbish skip. It then fell into the sea.

The bosun had fallen onto a lifeboat deck some 5 – 6m below the crane operating platform, and had remained conscious. He suffered severe bruising to his head, and a broken leg. Although his injuries were serious, he was extremely fortunate not to have fallen onto the stores barge and been killed.

The crane had passed its 5-yearly load test less than 3 years previously, and the most recent annual inspection had been conducted by the classification society 6 months beforehand. The vessel's managers also had a detailed planned maintenance system in place for the cranes, with inspections completed at regular intervals. All of the records appeared to be in order, and the reason for such a catastrophic failure was not immediately clear.

The nuts and bolts holding the crane pedestal to the ship's structure were recovered and showed extensive, long term corrosion. The bolts were wasted to such an extent that the threaded parts were reduced to 50% of their original diameter. Very few of the nuts were complete, and none would have provided any significant holding down force. Thick layers of combined paint and corrosion were recovered from the scene, and it became clear from their shape that the nuts and bolts had been heavily painted, disguising their underlying condition. The other cranes on the vessel were inspected, and showed similar corrosion on the holding down bolts, poorly routed hydraulic hoses and a number of oil leaks.

It would have taken a considerable time for such severe corrosion to have developed; despite detailed procedures, neither the vessel's planned maintenance inspections, nor the classification society's surveys, had detected this problem.

Position of the crane at time of accident

The Lessons

1. It is extremely difficult to determine the condition of components such as nuts and bolts, without removing their paint coating. Further, coatings are easily damaged and corrosion may still be active beneath. Crane operators, senior crew and ship managers should look critically at crane structures and consider if the inconvenience of thoroughly inspecting the components is justified to avoid the risk of a serious accident.

2. Although ships' cranes are subjected to periodic examination and load testing, the test can only be an indication of the crane's condition *at that time*. Crane structures and major components should be the subject of ongoing inspection throughout their working lives, by someone competent to do so.

3. Classification societies should ensure that surveys are conducted in accordance with their published guidance, and that surveyors carry out a detailed examination of the entire crane structure and its securing arrangements at each inspection.

Select Your Experts Carefully

Narrative

The owners and crew of a small, 12 passenger steam reciprocating driven pleasure paddle steamer were very proud of their unique vessel and they had worked hard over the years at maintaining her appearance and mechanical condition.

As part of the company's regular maintenance regime, the fire tube boiler was removed for retubing and for a replacement superheater coil to be fitted in the back of the boiler. Although technical drawings were not supplied, the company used an experienced contractor to undertake the work, which was overseen by an independent consultant. The consultant hydraulically pressure tested the boiler and carried out an examination of the fireside of the boiler, which resulted in it being passed fit for service.

Following a successful summer season the steamer was being prepared to be lifted out of the water for "out of season" hull maintenance. As the boiler was fired up for the last time, the owner heard an unusual noise coming from the back of it. The boiler was shut down and cooled back before being removed from the vessel (Figure 1).

After removing the boiler lagging, the boiler rear casing was found to be severely discoloured. Further investigation identified that the superheater coil fitted behind the rear casing was too large for the boiler design. The continued expansion and contraction of the coil destroyed the insulation refractory lining

Figure 1: The boiler

Figure 2

(Figure 2), allowing the heat to be transferred to the boiler rear casing. The discovery prompted the owners to bring in their own consultant who discovered a number of other defects, including tubes blocked by refractory and washout and inspection plugs being ground off, and so preventing their use.

The Lessons

The owners and crew took prompt action to investigate the cause of the unusual noises heard during the last firing of the boiler. Had they not done so, the continual breakdown of the refectory would have increased the heat transfer to the after boiler casing and, with it, the likelihood of a fire developing. Had this happened at sea, with small children and elderly passengers on board, lives could potentially have been put at risk.

1. Promptly investigate unusual noises, vibration and out of tolerance parameters before they develop into more serious situations.

2. Be careful when selecting contractors for specialist work, and be precise about the extent of the work scope, including inspections and tests to be carried out. Where appropriate, consider discussing your needs with specialist trade/ commercial associations which may be able to recommend suitable contractors.

3. Wherever possible, supply contractors with the latest equipment and technical drawings. Modifications, which the contractor may be unaware of, might have been undertaken.

CASE 12

Lorry Cab Fire – Vigilance and Training Saves the Day

Narrative

It was a pleasant summer's day and the business of loading vehicles onto a cross-channel ro-ro ferry had just been completed. The vehicle securing arrangements had been checked and reported to the bridge, and pre-sailing preparations were well under way for another routine crossing.

Things were about to change!

It was about 1640 when the first officer started the bow door closing procedure. The inner bow doors were almost shut when an AB shouted to him that smoke was pouring from the lower door seal of one of the lorry cabs which was about 20 metres away from the first officer. Both men ran towards the cab and saw that flames and green smoke were rapidly filling it (Figure 1).

The first officer immediately contacted the master, who was on the bridge, and alerted him to the fire. Meanwhile, other ABs on the vehicle deck had assembled and hoses were rigged between the close confines of the lorries. While the seat of the fire had not been identified at this time, it was known that it was common practice for the vehicles to have full fuel tanks, so the potential for a significant fire situation to develop was abundantly clear to the first officer.

Two fire hoses were turned on and directed towards the cab. At 1642 the master sounded

Figure 1: Damage inside the cab

Figure 2: Camping stove

the main broadcast alarm and the fire party assembled. With the fire hoses providing protection, the cab side window was smashed and water directed into the cab. At 1648 the fire was declared to be extinguished. The contents of the cab, which included bedding, personal effects and a camping stove (Figure 2) were removed and doused with water.

The seat of the fire was found to be a locker at the rear of the cab in which the camping stove was found, together with some blankets.

After the area was confirmed safe the master instructed that the damaged lorry be removed to the jetty. The vessel was then able to continue on her planned passage.

The Lessons

The fire was caused after the lorry driver put the – still hot – camping stove in the locker and then placed bedding on top of it. The residual heat from the stove ignited the bedding and the wooden and plastic locker. Naively, the lorry driver did not realise how much heat was retained in the stove ring, despite it being turned off only just before he left the cab.

While this is a relatively minor incident, it is to the credit of the crew that they reacted in such an instinctive and competent manner. They had frequently trained in dealing with cargo fires and chemical spillages, and their prompt reactions prevented the spread of the fire, which had potentially severe consequences.

1. Ensure that onboard emergency drills include dealing with lorry/car fires where they are carried.

2. Bring to the notice of crews the difficulty in fighting fires in vehicle decks owing to the restricted access between vehicles.

3. Hauliers should advise drivers of the potential fire danger of using open flame appliances and of the precautions to be taken when stowing hot units.

Bow Door Cautionary Tale

Narrative

A ro-ro passenger ferry was 3 hours into a 9 hour crossing and was encountering high winds and rough seas. The ship's speed had been adjusted to limit slamming, however, after one significant slam the bow door alarm on the shell opening panel sounded.

The master was called to the bridge, and he observed on CCTV that there was more water than expected in the bow door space. Unable to immediately determine the cause of the water ingress, the master asked the chief officer to try and close the doors using the normal operating panel, situated on the car deck. For the doors to operate, the master had to switch the hull shell opening panel from 'sea' to 'harbour' mode in the bridge. On the car deck, the chief officer started the hydraulic pumps and then operated the switch to close the bow doors. On hearing the usual clunk, but not observing a green light indicating the doors were secured, he released the switch and reported to the bridge he had been unsuccessful.

The master switched back to sea mode and altered course and speed to bring the prevailing weather on to the ferry's stern. The chief engineer went to the car deck to investigate the problem. Once the water in the bow door space had drained out and the ship was on a comfortable course, the small watertight access hatch into the bow door space from the car deck was unbolted. The chief engineer had a look inside. He found most of the visible cleats and bolts disengaged.

The chief engineer proceeded to the solenoid room and followed the emergency instructions for closure of the door, which required manually activating the hydraulic solenoid

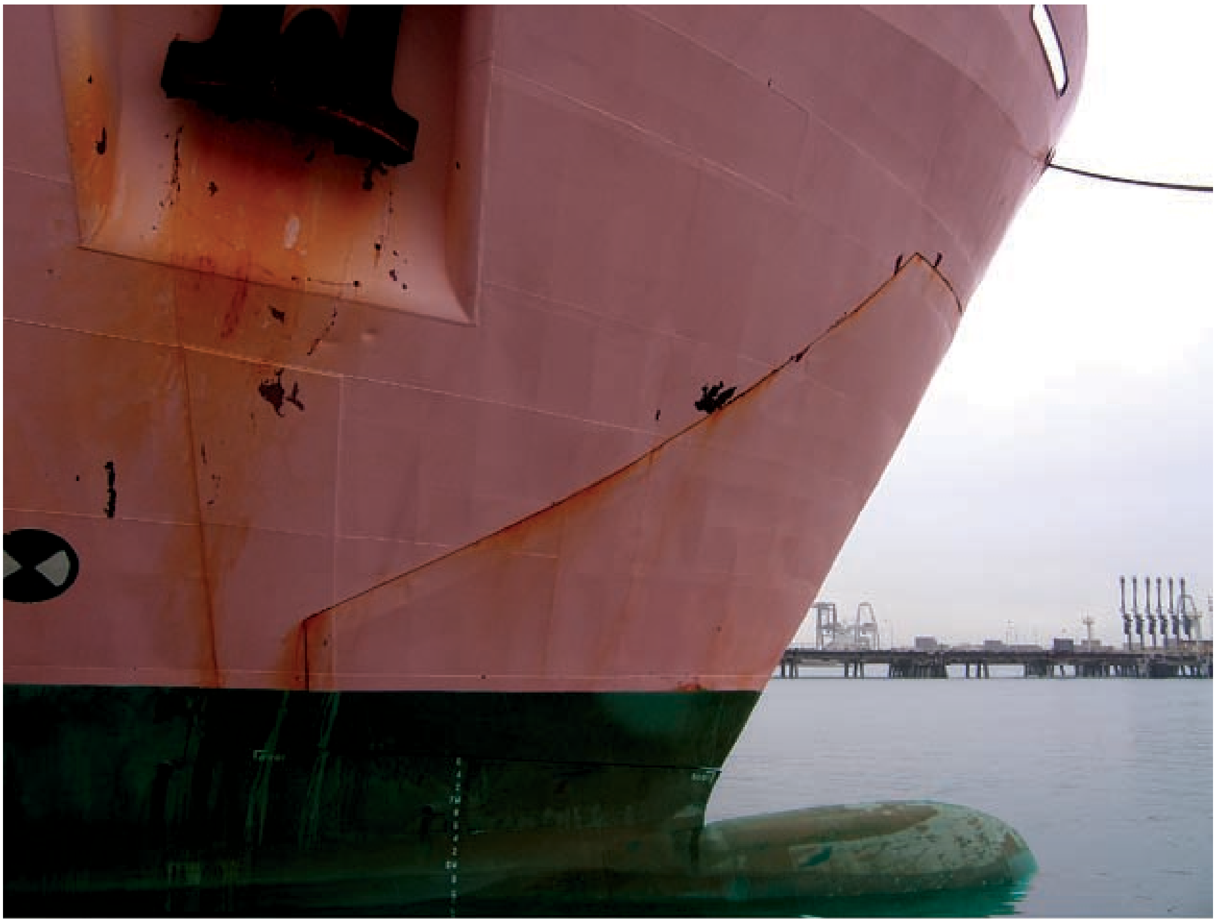


Figure 1: Bow door in closed position

Figure 2: Bow door operating panel on car deck

valves in the correct sequence. The door was re-secured, but no green light was visible to confirm it was secure. Further investigation in the bow door space found that a proximity switch had become dislodged during the incident. This was adjusted and a green light was achieved. The ship then resumed its original course.

Once in port, the bow door and hydraulic system were examined in detail. It was thought that the starboard lower vertical locking pin had become disengaged in the heavy seas, and this had caused the initial alarm. This was probably as a result of the hydraulics for this pin being worked on the day before the accident.

To recreate the accident, the pin was retracted by manually operating the appropriate solenoid valve until a red bow door light indicated in the bridge. The normal operating panel was then used to try and close the door. The first action of the hydraulic control system was to disengage the door cleating arrangement, but if the switch was held in the 'close' position, the cleats were subsequently reapplied. The bow door manufacturers confirmed that this sequence of disengaging all the cleats before re-engaging them was as intended. By holding the switch across until he heard the first clunk, and then releasing it, the chief officer had stopped the system halfway through its cycle, at a point when all the securing mechanisms were disengaged.

Figure 3: Starboard lower vertical locking pin

The Lessons

1. The requirement for the sea/harbour switch resulted from previous tragic ro-ro ferry accidents, to prevent inadvertent operation of shell openings. Do not operate in the 'harbour' mode while at sea, as the behaviour of the shell opening control system might not be as expected. Only emergency operation should be attempted, and then only by a competent operator in a careful and methodical manner.

2. Although the master and chief officer were very familiar with the bow door system, they had insufficiently detailed knowledge of the hydraulic system and the logic that operated the doors. Make sure ship's staff are adequately trained for the tasks involved, and also that they recognise the limits of their knowledge so that other expertise can be sought if necessary.

3. The guidance provided for operating the bow doors was not clear enough and led to the master taking inappropriate action. Although it is appreciated that bow doors are usually only weathertight, and some leakage is inevitable in heavy weather, the first action on finding more water than normal in the bow door space should be to alter course and/or speed to reduce the effect of the prevailing sea on the bow. This will provide valuable thinking time and remove the immediate danger of catastrophic failure of the bow doors.

4. Ensure critical systems, such as bow doors, are thoroughly tested after any repair or maintenance work. In particular, ensure any possible airlock in the hydraulic system has been removed. Also ensure the components used in any repair are serviceable and fit for purpose.

Passing Gas Causes Concern

Narrative

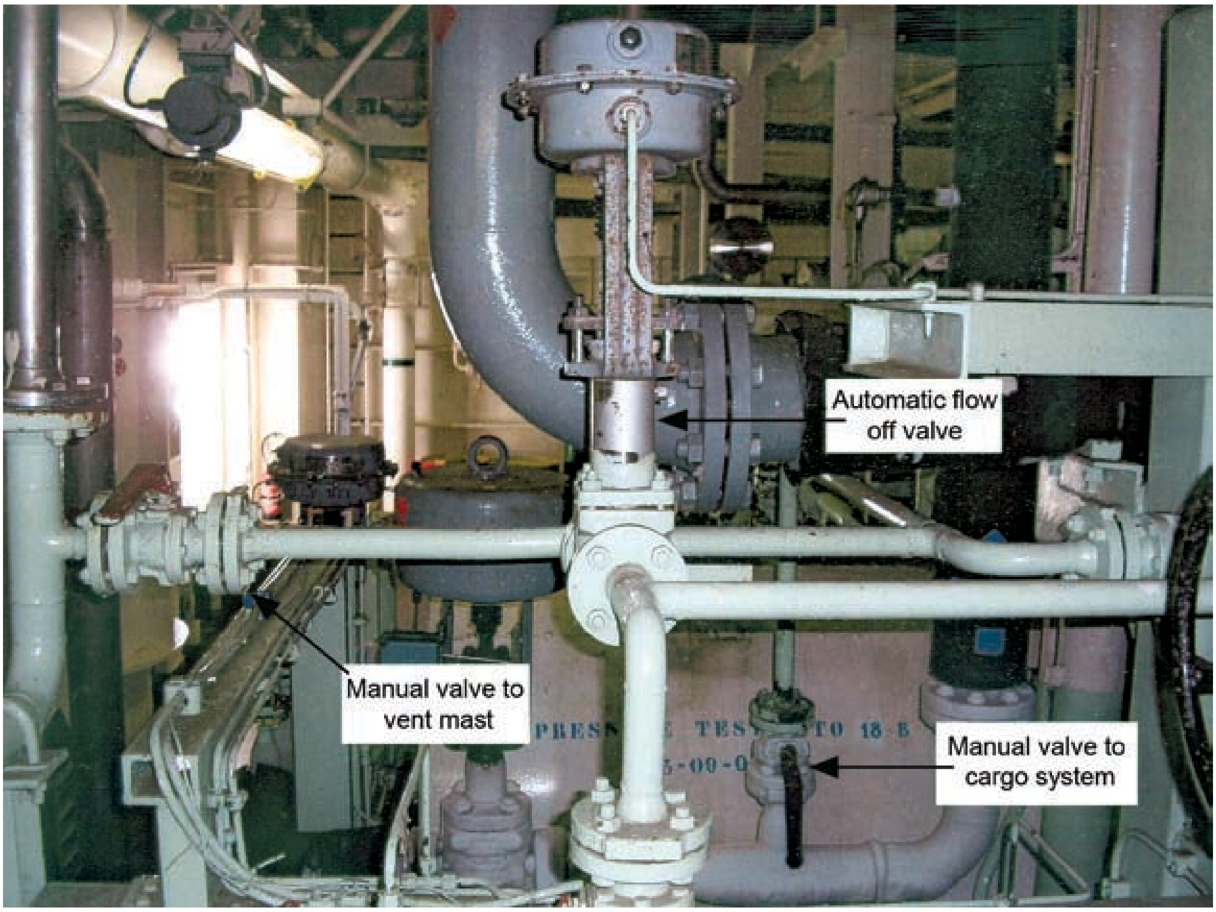
A 10,000 tonne LPG carrier was alongside loading a cargo of ammonia when personnel on an adjacent jetty reported a strong smell of ammonia. On investigation it was discovered that a valve to the mast riser had been left open.

The vessel was loading her first commercial cargo following dry dock. Before entering port she had gassed up and pre-cooled her cargo tanks with a liquid heel, a small parcel of ammonia, which had been loaded en route to the port specifically for this purpose.

To ensure the cargo tanks were at the correct temperature for loading ammonia the crew had circulated the heel, venting any incondensable vapour to atmosphere during the process. Once the tanks had reached the required temperature, the vessel declared that she was ready in all respects to load cargo, and had then entered port.

During the loading operation, personnel on an adjacent, downwind, jetty noticed a strong smell of ammonia, and some complained of feeling unwell. Shore personnel alerted the vessel to this and, on rechecking valve settings, it was discovered that the valve to the mast vent had not been fully closed before loading commenced.

The valve was immediately closed and loading continued. The vessel's owner subsequently amended its operating instructions to ensure that the mast riser was always closed in port and that any incondensable vapour would be sent to a cargo tank during the loading process.



The Lessons

1. On LPG vessels, and tankers in general, it is best practice to ensure that all the valves in the cargo system are closed before setting lines for the intended operation.
2. It is particularly important to ensure that the vent riser valve is confirmed to be closed in port to ensure that cargo vapour, which may pose a risk to personnel, cannot accidentally vent to atmosphere during the loading process.

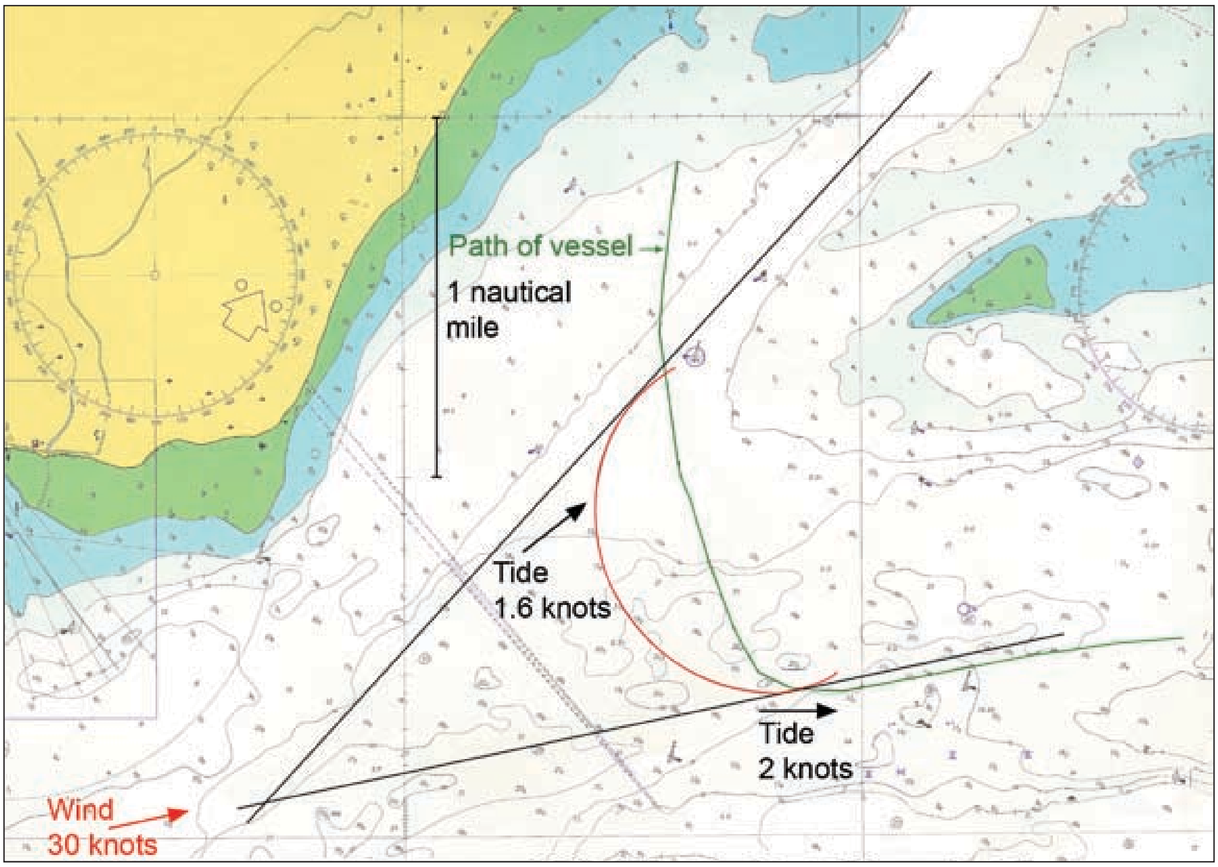
Turn For The Worse

Narrative

A cruise liner ran aground while attempting to navigate a tight turn during a routine approach to the port. The ship was refloated soon afterwards on the rising tide. There were no injuries, damage to the ship, or pollution as a result of the grounding.

The ship was conned by a preferred pilot and was under the supervision of her master, with a full bridge team in attendance. The position of "wheel over" for the start of the turn had been agreed between the bridge team and pilot, taking some account of weather and tidal conditions. However, full calculations for the manoeuvre had not been carried out by either the pilot or the bridge team with respect to the probable combined influence of forecasted wind and tide. The ship, which was heading into a strong wind and tidal stream as she approached her turn, was known to be problematic when turning across the wind, due to the large superstructure, and this was uppermost in the bridge team's minds as the order for "wheel over" was given to initiate the turn. Due to the opposing directions of the ship and the wind and stream, the ship's head payed off the wind very rapidly once "wheel over" was ordered and, driven on by her forward momentum she continued to swing, with an increasing rate of turn. This resulted in the ship being out of position to complete the turn into a narrow navigable channel, between two shallows.

The bridge team monitored the turn and recognised the impending situation. However, the remedial action taken was ineffective in bringing the ship back into position, compounded by a loss of manoeuvrability in shallow water and "stalling" from the speed reduction caused by the hard over manoeuvre and wind on the beam. When it became apparent that the ship would not be able to line up with the navigable channel, the ship's



Route taken by the vessel, showing "rate of turn" calculations master took the prudent decision to run her aground on the windward, gently shelving beach, rather than risk forcing her round outside the edge of the channel, or coming to a crash stop, whereupon she would have soon drifted onto a steeper, harder lee shore.

Tugs, which had been waiting to assist with berthing the cruise liner, were quickly dispatched to her aid and she was refloated within an hour of grounding, allowing her to complete her voyage without further incidence.

The Lessons

1. Calculations conducted after the incident, using the ship's manoeuvring and "rate of turn" data, revealed that the initial "wheel over" position was too far to leeward, given the prevailing wind strength and direction. The wind and tidal stream directly opposing the ship's head resulted in an increased rate of turn, when in reality a lesser rate was needed in these conditions. This was a routine passage and manoeuvre for this ship, giving ample opportunity for all involved to accurately plan the turning characteristics and positioning for all probable environmental conditions. Preferred pilots and bridge teams alike should take advantage of repetitive passages by pre-calculating, and thus pre-empting, any condition which may affect the ship's manoeuvring.

2. The "rate of turn" information for any particular turn radius was available on the ship's bridge, and showed prescribed rates in benign conditions. "Head to wind" would generally require a reduced rate to follow a predicted curve; on this occasion the combination of the wheel hard over and the wind, understandably, gave several degrees more turn than that indicated for benign conditions. Passage plans should take into account all available information so that corrective actions can be taken in good time should things go wrong.

3. The bridge team relied upon a regular preferred pilot and did not include "wheel over" positions in their passage planning. Only by including all relevant information in the passage planning can members of the team be in a position to challenge each other's, or the pilot's, opinions.

4. The master's decision to run the ship onto a previously identified soft, safe shore, after the difficulty in completing the turn was recognised, was a sensible choice: the tide was flooding; tugs were available; and the ship would come to little harm while waiting to refloat. The benefit of regularly plying this routine passage paid dividends in respect of the master recognising the difficulty of turning into this narrow channel, and contingencies had been planned for such an event. Good risk management should include such options, wherever possible.

Too Much to Do

Narrative

A 100m long, liquid petroleum gas tanker was conducting a routine berthing at a "T" jetty, which was connected to dolphins by walkways. The bridge team consisted of the pilot, master, chief officer and helmsman. The weather, tidal and sea conditions were benign, although a force 3 wind was blowing onshore. All seemed well, until a change was made to the bridge team, which altered the balance of workload and led to a loss of control.

As the tanker was approaching the berth, the helmsman was released to assist the aft mooring party. The chief officer took over from the helmsman while continuing to operate the push-button telegraph and record engine movements in the bell book. The master and pilot were on the port bridge wing.

Keeping the stern up into wind, the starboard anchor was dropped, and the pilot gave helm and engine movement orders to berth the vessel port side alongside. When the bow was about 4m off the berth and the stern was beginning to drop down onto it, the pilot asked for hard port helm and to stop the engine. The chief officer repeated the orders, applied full port helm and pushed the appropriate telegraph button. Shortly afterwards, the pilot asked for *dead slow ahead*. The chief officer repeated the order but incorrectly pushed the *dead slow astern* button. Noticing that the tanker was falling astern, the pilot asked for *slow ahead*. The chief officer repeated the order but pushed the *slow astern* button. The master then saw that the bridge wing rpm indicator was showing astern movement. He rushed to the telegraph and pushed the stop button. By that time, the tanker was rapidly approaching a dolphin walkway, so the pilot ordered *full ahead*. The chief officer repeated the order but pressed *full astern*. The master intervened again and pressed the stop button. The tanker made contact with the walkway, causing it to lift up and fall into the water.

The full ahead order was then correctly executed and, thereafter, the tanker berthed without incident.

The Lessons

1. **The chief officer had assisted the master and had operated the telegraph many times before without error. Despite being well rested and not under the influence of alcohol or drugs, on this occasion he slipped-up three times by pushing the astern buttons instead of the ahead buttons. The significant factors that contributed to this were:**

   - **It was a mistake to release the helmsman and to place extra workload on the chief officer, whose correct actions were vital at a critical stage of the manoeuvre. Manning levels should be such that sufficient manpower can be allocated to the relevant workstations throughout an evolution.**
   - **The pushbutton telegraph's ergonomics and signage were poor and gave rise to potential errors being made. After the accident, the company placed clearer signs on the telegraph to help distinguish between ahead and astern movements.**

2. **During critical manoeuvres, indicators and personnel need to be monitored effectively so that immediate corrective action can be taken when necessary. Effective resource and team management should eliminate the risk that an error on the part of one person could result in a dangerous situation.**

Part 2 – Fishing Vessels

It is generally accepted that in excess of 80% of industrial accidents are mainly due to human error. It is also a fair assumption that in any serious incident, more than one factor goes wrong to escalate a minor problem to a potentially lethal or catastrophic incident.

You will see from the following Cases that Human Error is the main cause of the incidents, however equipment failure after human error turns the issues into life threatening scenarios.

The MAIB dutifully publishes this Safety Digest regularly, and it is variously read and perused by many, but how many of us actually re-visit out daily lives and apply the lessons which are clearly demonstrated on a frequent basis and played out in this Digest? Sadly not enough.

At Scottish Boatowners Mutual we see incidents and accidents during our working day, as insurers, and all too often we are left scratching our heads, wondering why lessons are so often not acted upon from previous reported and well publicised accidents.

None of us are impervious to either our own human errors, or the impact of others' errors upon us, but we are able to minimise our own, by not cutting corners and not taking the risk.

I therefore would implore everyone involved in the Fishing Industry not just to read this from an academic standpoint, but to actually apply every case to your own daily life and make those changes – even if they might delay your progress by a few seconds or cost you a few pounds up front. It may just save your life, your friends' lives and your business.

Once you have done this, please pass on this Safety Digest to someone who you think may benefit from it. Even that action might save you from injury, or worse.

The Marine Accident Investigation Branch (MAIB) examines and investigates all types of marine accidents to or on board UK vessels worldwide, and other vessels in UK territorial waters.

As far as the MAIB is concerned:

> *"The sole objective of investigating an accident is to determine its circumstances and 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.*
>
> *We do not enforce laws or carry out prosecutions."*

Therefore I suspect that in these "enlightened" days of our blame culture, they are almost unique.

All industry practitioners from the most senior to most junior should sit up and take notice. The MAIB are only interested in improving our safety culture and not in creating further bureaucracy or red tape.

They are on your side!

Stuart Forsyth

Stuart Forsyth joined Scottish Boatowners Mutual Insurance Association as Chief Executive in 2000. Previous to this he worked at Lloyd's of London specialising in the insurances of ocean going vessels from Ship Owners and Companies based all over the world. He also had an involvement in broking the reinsurance protections of several Mutual Insurers who specialise in the Fishing Industry.

Stuart is married with three children and is fanatical about Rugby Union.

CASE 17

What Did We Hit?

Narrative

At approximately 0615 on a still autumn morning, a single-handed 5m dory left port and headed south towards her fishing grounds at a speed of between 18 and 26 knots. Soon afterwards, her skipper saw a cluster of lights ahead and adjusted course by several degrees to port to avoid them. Once steady on the new course, he sat down to rest in a position from where he could not see ahead (Figure 1). At about 0622, 1 hour before sunrise, the dory collided with a 9m open-decked gill-netter which was on an easterly course at 6 knots. The dory impacted almost head on with the port side of the gill netter (Figure 2).

The gill netter's skipper, who was on watch in the wheelhouse, and two deckhands, who were sleeping, were all thrown to the deck. The vessel was holed above and below the waterline and her wheelhouse was displaced to starboard (Figure 3). With the vessel taking on water, the skipper used a mobile phone to inform the coastguard while the deckhands launched a liferaft over the stern. However, the liferaft did not fully inflate due to there being insufficient gas in its cylinder; it had not been serviced in accordance with its manufacturer's instructions. Fortunately, a local pilot boat quickly arrived on the scene and recovered the skipper and his crew. Although the damaged fishing vessel was taken in tow, she sank at 0646.

When the vessels collided, the skipper of the dory, who was not wearing a lifejacket, hit his head on a chart plotter (Figure 1) and fell to the deck. He then possibly lost consciousness for a short period as the boat's engine continued to run. The skipper managed to drive the dory back to port, and from there was taken to hospital for treatment.

Although the visibility was good and both skippers had a good working knowledge of the local area, neither saw the other vessel immediately before or after the collision, and both concluded they had struck semi-submerged objects.

Figure 1: View from the seated position on the dory

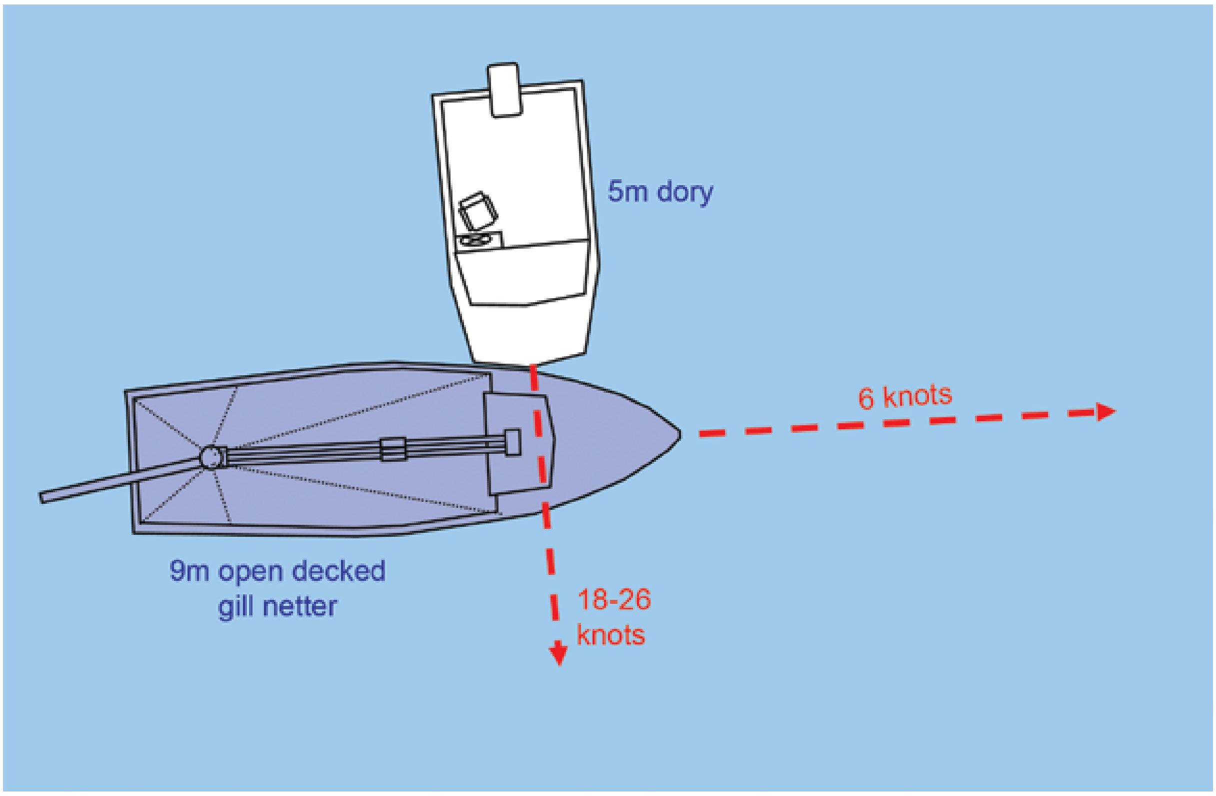


Figure 2: Relative positions on impact

Figure 3: Damage to bow of the dory

Figure 4: Gill netter diving survey

The Lessons

1. When in familiar waters, in good conditions, and when few other vessels are around, it can sometimes be easy to assign the keeping of a lookout a low priority. When this occurs, although more often than not no harm is done, there will always be a danger of being caught out. This is an unnecessary risk to lives and livelihoods; the effort required to keep an effective lookout is not onerous. It might take only a couple of minutes to make a cup of tea, but a boat moving at 25 knots will travel almost 1 mile in that time.

2. Unfortunately, liferafts occasionally do not operate as intended or expected due to poor design or maintenance. This can be prevented by ensuring that all liferafts carried meet a recognised standard and are serviced by approved technicians at intervals recommended by their manufacturers. Liferafts can and do save lives, so don't leave it to chance that yours will work when you need it.

3. The skipper of the dory was injured and was not wearing a lifejacket. Had he been thrown from his boat, he would have found it difficult to keep afloat and might have drowned. Wearing a lifejacket is always a *worthwhile* precaution when working on deck; it is *invaluable* when operating single-handed on a fast craft with low gunwales, where the risk of falling overboard is increased.

A Costly Snack

Narrative

Having departed port in the early hours of the morning, the skipper of a wooden prawn trawler altered course to parallel the coast and head towards his intended fishing grounds. It was dark and he was following an old track on his plotter which took the vessel within 0.5nm of the shore. The vessel was fitted with radar, but this was not used.

Shortly afterwards, the skipper engaged the vessel's autopilot before leaving the wheelhouse to make a cup of coffee and a sandwich. Minutes later, the vessel struck charted rocks close inshore, and rapidly started to take on water. The skipper quickly alerted the vessel's two deckhands who were asleep below, and told them to don lifejackets. A "Mayday" was broadcast on VHF channel 16 before the skipper and deckhands abandoned into a liferaft.

The "Mayday" was received by the local coastguard station and a nearby fishing vessel, which recovered the men within 15 minutes. When the vessel sank shortly afterwards, her EPIRB released and activated.

The Lessons

1. No matter how familiar with the waters a crew might be, leaving a wheelhouse unattended is not advisable at any time, particularly when navigating close to the shore and in the dark. When dangers are close by, a 5 minute break from the wheelhouse is potentially 5 minutes too long.

2. There is no doubt that plotters and autopilots have eased the burden of wheelhouse watchkeepers in recent years. However, although their use might generally be problem free, equipment failure or operator error will always be a possibility. Therefore, the cross-checking of a vessel's position and movement by all of the navigation aids available, which might seem unnecessary, is a really good habit to adopt.

3. The broadcast of a "Mayday", the donning of lifejackets, the use of a liferaft, and the carriage of an EPIRB all contributed to ensuring the safety of this vessel's crew, despite the vessel being lost in a remote area in the dark. Are you as well prepared for the unthinkable?

A Basic Mistake Costs a Deckhand His Life

Narrative

A long-liner fishing vessel was in the process of paying out her baited hooks onto the sea bed to a depth of 200m through a stern shooting hatch. At the end of the line there were three heavy weights to which was attached a 300m riser line. The other end of the line was to be attached to two dhan buoys, which were, in turn, connected by a 15m rope to a 3.3m tall marker buoy weighing 27kg. The buoys were stored on the aft deck, which was above the shelter deck shooting area.

An accident occurred at night in force 5 wind and 2 to 3 metre seas.

Two deckhands, who were wearing inflatable lifejackets and oilskins, went up onto the aft deck to prepare to launch the buoys. The free end of the 300m riser line was passed through the shooting hatch and over the stern bulwark, and then attached to the dhan buoys. The marker buoy had been positioned outboard and was held in place with a slip rope. The vessel was stopped to lower the weights to the sea bed, after which the vessel began to move ahead. When the riser line was nearly all out, the first deckhand threw the dhan buoys over the side and, shortly afterwards, the second deckhand released the marker buoy. Suddenly, the second deckhand was lifted up and thrown over the metre-high bulwark. The first deckhand shouted to the shelter deck crew who saw the second deckhand land in the sea, face upwards, and threw two lifebuoys towards him. He made no attempt to swim to the lit marker buoy or to the lifebuoys, and he was quickly lost from sight.

The skipper manoeuvred the vessel to pick up the marker buoy to see if the deckhand had become entangled in the line, and he broadcast a "Pan Pan" message, which was relayed to the local coastguard by another fishing vessel nearby. An extensive search by 11 vessels, a helicopter and a fixed-wing aircraft was unsuccessful in finding the deckhand.

It is likely that the deckhand had stood in a bight of the connecting rope and was thrown overboard when weight came onto the rope between the dhan buoys and the marker buoy.

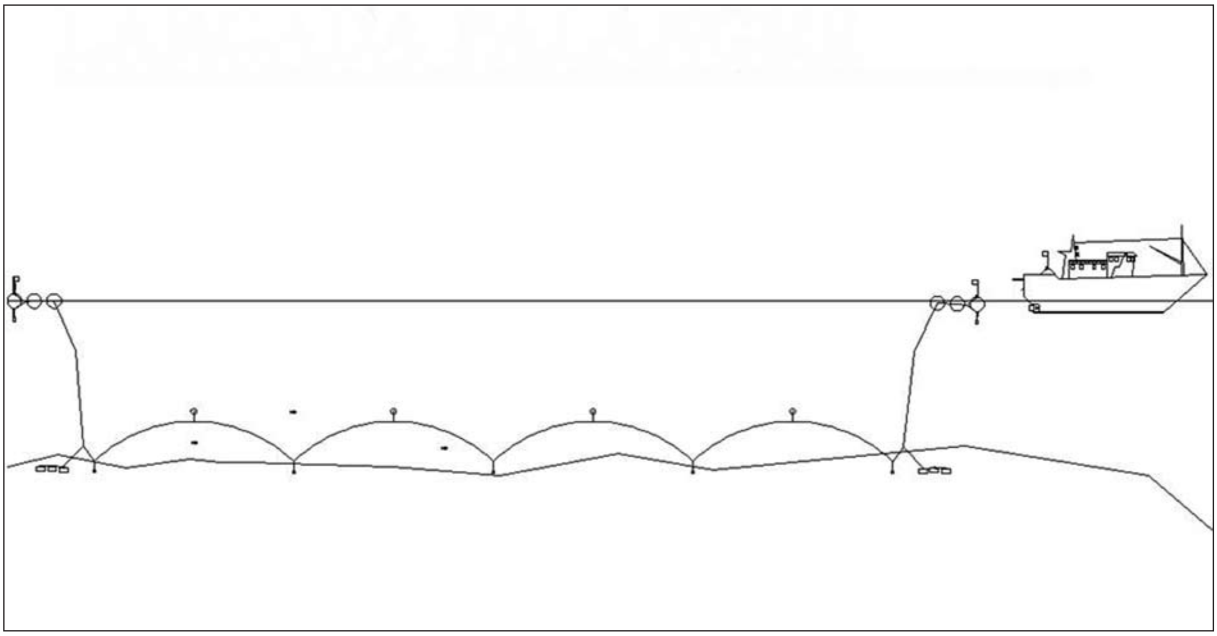


Figure 1: Diagram showing the long-line on the seabed

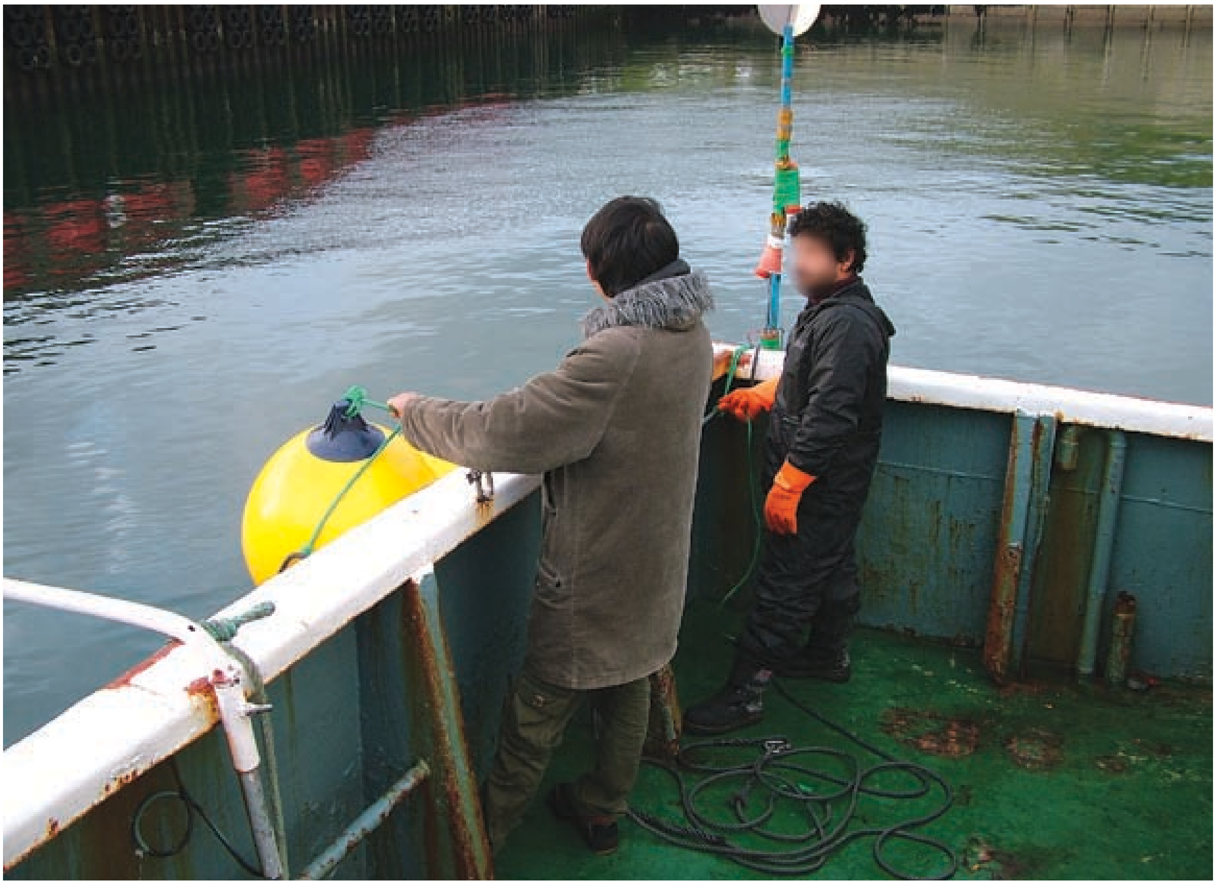


Figure 2: Two fishermen showing the point of letting go of the dhan buoy

The Lessons

1. The activity of letting go two dhan buoys and a heavy marker buoy, at night, and with weight on the connecting rope, rendered the two deckhands particularly vulnerable to accidents. The connecting rope was black and lying on the deck between the two deckhands. The deck lights were behind them and they would have cast a shadow over the line. Furthermore, the deckhands were visually concentrating on releasing the buoys rather than keeping their feet clear of the connecting rope. In this case, the connecting rope should not have been attached to the riser line until such a check had been made. The dangers of standing in a bight of rope are well publicised. It is, therefore, essential that a positive check is made to ensure that the rope is clear before allowing weight to be taken.

2. A documented risk assessment on board covered the activity of launching the buoys and listed a number of control measures, including the need to keep away from the lines. It is necessary for skippers to ensure that safety-critical control measures are emphasised to the crew, and that they are adhered to. It is also important that all the crew embrace the safety culture promoted by risk assessments and their resulting safe systems of work.

3. The deckhand's body was not found. It is possible that his lifejacket did not inflate automatically due to a malfunction, and that he was rendered unconscious and therefore unable to pull the manual inflation cord. Any inflatable lifejacket held on board should be regularly serviced according to manufacturer's instructions. Ideally, a light should also be fitted.

Over and Out

Narrative

Two fishermen were on the deck of their small fishing boat, attempting to recover an anchor, which they had laid earlier in the season on one of their regular fishing marks, several miles off the south coast.

The anchor, which was used to hold bait for rod and line fishing, was proving very difficult to heave in. The fishermen led the line around the pot hauler and pulled hard, causing the boat to list heavily. At this point the boat was suddenly and unexpectedly lifted on a larger than average wave, causing her to heel right over.

The fishermen were thrown off balance by this sudden heel and both fell overboard into the water. As they surfaced, they saw their boat on her side, capsizing. The anchor rope had remained tight around the pot hauler and appeared to be preventing the boat from righting; the boat then sank rapidly.

The fishermen were now in a very serious situation. They had not been wearing lifejackets and, due to the rapid sinking, had not had any time to alert the authorities to their predicament. Although it was daylight and the weather was fair, they were a long way from land and, being in an area of strong tidal flows, realised they would not have the strength to swim to the shore.

Although the boat had carried a liferaft fitted with a hydrostatic release, it was not in date and had not been serviced or checked for some considerable time. Predictably, it failed to inflate, and the two lifebuoys which the boat also carried failed to float free. They did not carry any float free device, such as an EPIRB, which would have alerted the authorities to their distress.

Fortunately for them, the helmsman of a yacht, which was on passage a few miles away, happened to be looking towards the boat when she suddenly disappeared from his view. He altered course to investigate and came across the two fishermen in the water, informed the coastguard, and stood by until the men were rescued.

The men recognised that they had been lucky to survive, and although they had been fishermen for many years they had never worn lifejackets. They both intend to return to sea, but will always wear a lifejacket on deck in the future.

The Lessons

1. **Although the men had been fishing for many years they did not wear lifejackets, and when they were suddenly thrown into the water they were at serious risk of drowning. They were very lucky to have been seen by the crew of a passing yacht and subsequently rescued. Always wear a lifejacket when on deck.**

2. **Although there was no statutory requirement for the boat to carry a liferaft, the fishermen had fitted one, which they had transferred from their previous boat. However, neither the liferaft nor its hydrostatic release unit (HRU) had been serviced for several years and the system failed to operate. While the fishermen had shown good judgment when fitting the liferaft and HRU, they should have kept them regularly serviced by an approved agent.**

3. **The MAIB has investigated many accidents in which small fishing boats have capsized and sunk very rapidly, giving the crew no time to make a distress call; in many cases with tragic consequences. Although not a statutory requirement, the MCA strongly recommends the carriage of an EPIRB, which will inform the authorities of your location in the event of an accident.**

Downflooding and Stability Reminder

Narrative

A 2 year old, 11.7m mussel dredger left port during the early hours for her fishing grounds, in company with another fishing vessel. The weather conditions were good, and dredging took place until 0930 when there was insufficient water over the mussel beds to continue. The fishing vessel was beached and waited for the next tide. Approximately 11 bags of mussels had been gathered in the hold by this time, equating to approximately 14 tonnes of catch.

At about 1415, the fishing vessel returned to the mussel beds and started dredging again. After a few tows, when the vessel was heading into shallower water and turning to starboard to haul the starboard dredge, the dredge became fast. The vessel quickly heeled to starboard, taking water onto the deck.

Despite the skipper's efforts, he was unable to free the dredge or correct the heel before downflooding occurred into the engine room via the vents sited under the bulwark. As the vessel capsized to starboard, the two crewmen on deck managed to scramble on to the port side of the wheelhouse. As a result, none of the crew entered the water. The skipper, who was in the wheelhouse, called the coastguard and the accompanying fishing vessel.

With the other fishing vessel's assistance, the capsized boat was pulled upright and the crew were rescued, before the boat slowly sank in the shallow water. The vessel was salvaged the following day and towed back to port.

Figure 1: Deck, showing engine room air intakes

Figure 2: View of stern showing limited freeboard

The Lessons

1. The fishing vessel had been built by the owners from a proven hull design. However, the four air intakes for the engine room had been positioned inside the bulwark only 0.3m off the deck. It has been estimated that these intakes would have been immersed at only 17 degrees of heel. Although your vessel may appear to have good initial stability, ensure that downflooding does not occur before 40 degrees of heel so as to maintain an adequate righting moment at greater angles of heel.

2. To improve a bow down trim when fully loaded, roughly 2 tonnes of concrete ballast was added in the engine room 6 months before the accident. Although this ballast would have improved initial stability, the effect of the decreased freeboard would have also reduced the vessel's righting lever. It would also have resulted in the air intakes being immersed earlier. Before modifying your vessel, make sure you get an expert to assess the possible effect on your vessel's stability.

3. The loading limit for this fishing vessel was based on approximate calculations, since vessels of 'under 12m' registered length require no formal stability assessment. The stability performance of your fishing vessel is fundamental to you and your crew staying safe. Act on Seafish's recommendation and ensure your 'under 12m' fishing vessel has a stability assessment. At least then you will be able to operate knowing your vessel's loading limits.

4. The crew of this fishing vessel were extremely fortunate not to have ended up in the water. Given the circumstances, it would have been prudent, if possible, to retrieve and don the lifejackets to prevent the incident escalating. However, the lifejackets were stowed down in the cabin and were not readily available.

What Price an Arm?

Narrative

A large scallop dredger was recovering its gear in the early hours of a summer's morning. The weather was fine and, as was standard practice, the 14 dredges on each side had been brought alongside and draped over the vessel's gunwales prior to "tipping" the contents of each dredge onto the deck.

Unlike some vessels, "tipping" was still quite a manual process. A whipping drum, fitted either side of a winch house was used to control a rope, attached to a hook, which was connected to each dredge in turn to "tip" the contents onto the deck.

Three crew were on deck to "tip": the skipper and a deckhand working together on the starboard side, while on the port side an experienced deckhand was working alone. The latter had successfully "tipped" a couple of dredges when a riding turn developed in the several turns of rope being used around the whipping drum.

The deckhand let go of the dredge and "tipping" rope, and quickly moved back aft towards the winch head. He was aware of the problems with riding turns and knew he needed to stop the winch using the recessed emergency stop button above the drum.

As he approached the winch, he slipped on the recovered dredging gear lying on the deck and, as he fell, his left hand became caught in the rope between the winch head and the lower framework. He was subsequently dragged twice round the whipping drum and framework, effectively performing two backwards somersaults, and on both occasions was unable to reach the stop button due to the framework. It was only once his arm had broken and shoulder dislocated that the deckhand was able to stop the winch and avoid being dragged round a third time, probably to his death.

As soon as the winch stopped, the skipper and other deckhand hurried over to the port side to investigate. There they found the deckhand wrapped around the whipping drum and framework. They freed their colleague and then helped him into the galley. He had lost several fingers, fractured and severed his upper left arm and fractured nine of his left ribs. He had also punctured his left lung. With his condition deteriorating, the deckhand was evacuated by lifeboat and ambulance to hospital, where he was stabilised, but his arm subsequently had to be amputated.

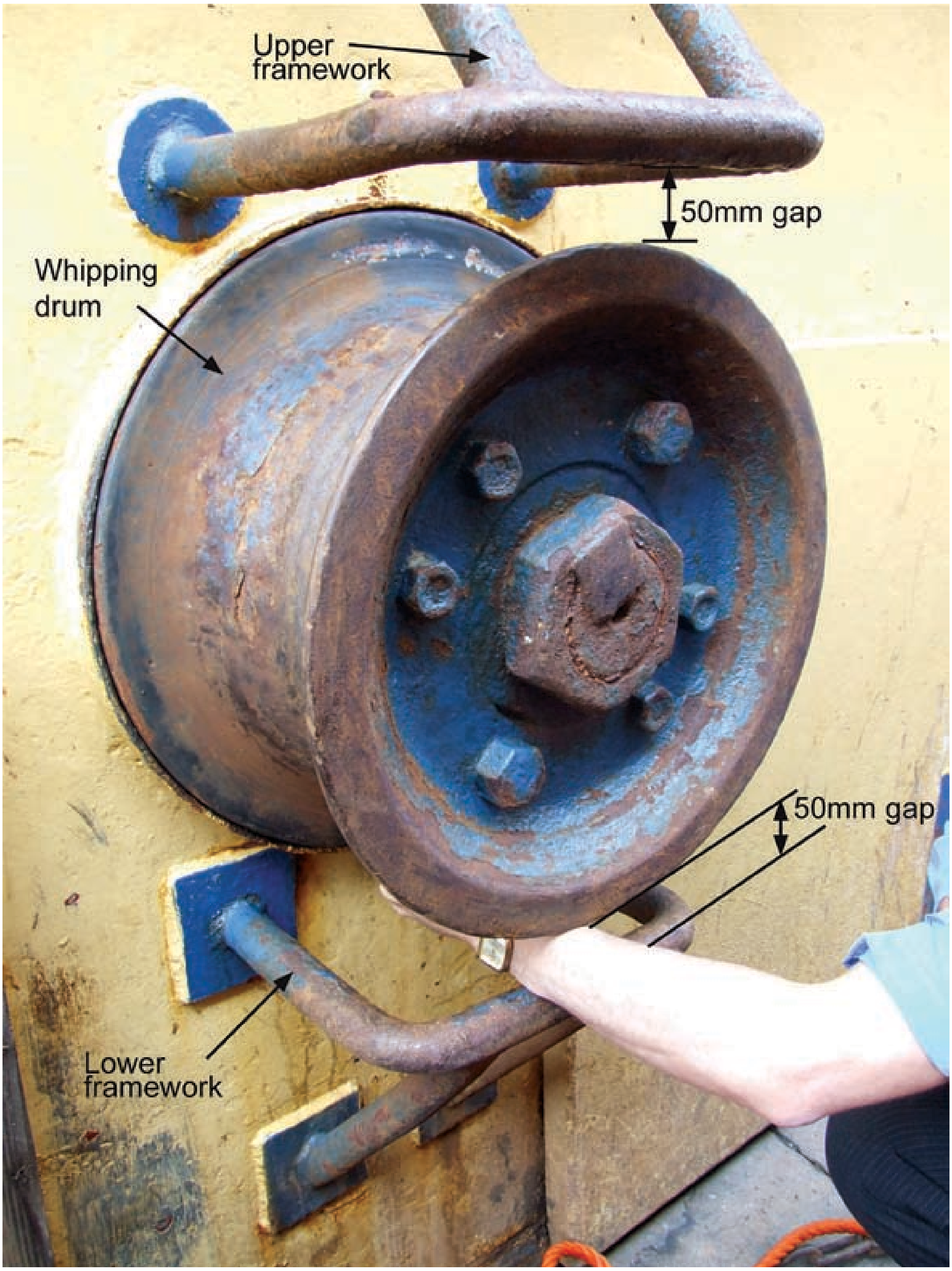


Figure 1: Port whipping drum with demonstration of an arm in the gap between winch head and lower framework

Figure 2: Demonstration of "as-found" position of deckhand, trapped in whipping drum

The Lessons

1. The nature of the injuries sustained by the deckhand during this accident was truly horrific, and he is indeed fortunate to have survived the ordeal. Yet given the working arrangement on board this vessel, it is a wonder that other serious accidents had not occurred before this one.

2. Had a risk assessment of the operation been conducted, it should have recognised the hazards posed and then measures to mitigate their effect could have been put in place, notably:

   - The frameworks above and below the whipping drum had been fitted when the vessel changed from a beam trawler to a scalloper. They created an additional entrapment hazard and undoubtedly contributed to the very serious injuries sustained by the deckhand.

   - The frameworks also meant the emergency stop button could no longer be easily reached, and clearly delayed the deckhand in stopping the winch once he was trapped around it.

   - The normal practice was for experienced deckhands to "tip" alone on the port side. However, the working arrangement was unsuitable for single-handed operation, and required two crewmen: one to control the winch, the other to "tip" the dredges.

   - The design of the vessel meant that the dredging gear had to sit on the side decks in way of the whipping drums, therefore creating a significant slip/trip hazard.

   - Problems were noted with the adequacy of the "tipping block" leading onto the whipping drum, which could have increased the frequency of riding turns.

3. A new "tipping" arrangement has now been fitted to this vessel, which should remove the dangers evident from the initial working arrangement. Various alternative "tipping" configurations are available, such as automatic systems, or the use of a dedicated "tipping" winch, with a remote control. Not only will such systems offer safety benefits, but they will also lead to more efficient operations, thus saving time and money.

Part 3 – Small Craft

After Jan Hawes, the editor of Safety Digest, asked me to write this introduction, my first reaction was surprise, the second was consternation. I wasn't entirely sure what had qualified me for the honour, and it was with some concern that I sat down to read the articles published in this edition of the Digest, wondering what I might contribute.

Fortunately, I found guidance from those who had gone before; many of the previous introductions were endorsements of this fine publication. I quickly realised that the sensible way to begin would be to add my own – anything you can do to prepare yourself for a moment of crisis is worth doing, and reading the Safety Digest definitely qualifies. And if there's one thing that I can say with some confidence on the topic of safety, it's that it's best to assume that at some point you will experience that moment of crisis.

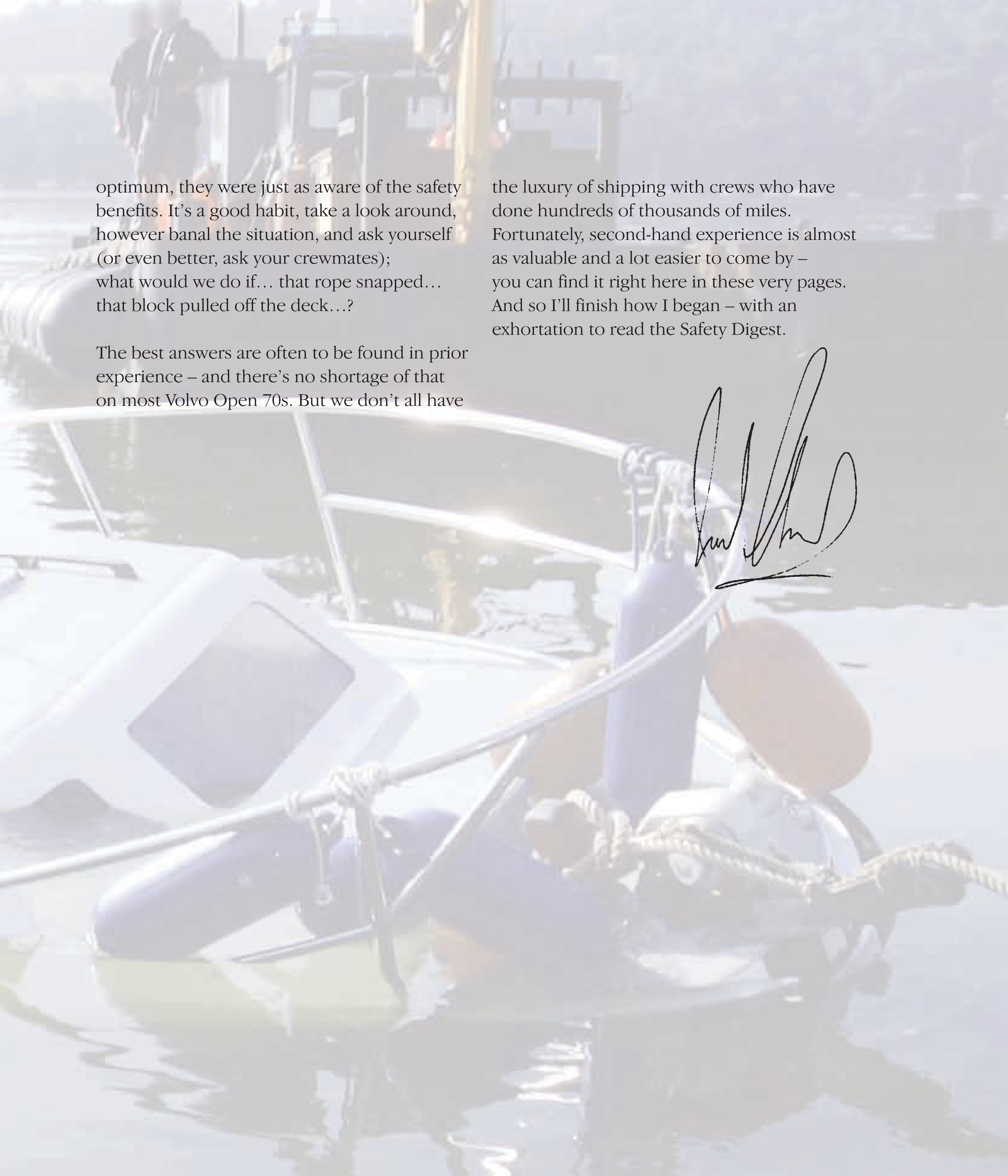
The latest articles in the Small Craft section endorse this; the random nature of accidents cannot be underestimated, whether it's a sudden bigger wave, or a little debris soaking up oil. It's all too easy for those close calls that we've all experienced to turn into a real and life-threatening emergency; a fire, a swamped boat or injured passengers.

There was another potent reminder of the dangers this past summer, with the 30th anniversary of the tragic 1979 Fastnet Race. A small and violent low pressure system turned unexpectedly in the North Atlantic and accelerated towards the Western Approaches of the British Isles, where it collided with the fleet of 303 competing yachts. In the space of 24 hours, 15 people died, and 24 of those crews abandoned boats battered by 60 knot winds and breaking waves in excess of 15 metres high.

The anniversary was well publicised across the mainstream media, and the evident and painful unreadiness of some of those boats and crews is something that I think many national sailing authorities, race organisers and individuals have all subsequently taken onboard. We can be hopeful that such a tragedy would not be repeated.

This hope was reinforced for me during nine months of following the 2008-09 Volvo Ocean Race. Quite apart from the plethora of improvements in the design, manufacture and use of safety equipment, often backed by stringent regulation, the sailors were very aware of safety issues. There's the basic stuff, a willingness to wear and use safety harnesses and lifejackets, but there was also a more subtle consciousness of the risks.

There were crewmen who regularly thought through how any given situation might potentially unravel. And while their motive was primarily to keep the boat racing at its



optimum, they were just as aware of the safety benefits. It's a good habit, take a look around, however banal the situation, and ask yourself (or even better, ask your crewmates); what would we do if… that rope snapped… that block pulled off the deck…?

The best answers are often to be found in prior experience – and there's no shortage of that on most Volvo Open 70s. But we don't all have the luxury of shipping with crews who have done hundreds of thousands of miles. Fortunately, second-hand experience is almost as valuable and a lot easier to come by – you can find it right here in these very pages. And so I'll finish how I began – with an exhortation to read the Safety Digest.

Mark Chisnell

Mark Chisnell has mixed writing and professional sailing for over 20 years; he has won three offshore sailing world championships, and sailed as navigator with six America's Cup teams. He has also published nine works of fiction and non-fiction, and written for some of the world's leading magazines and newspapers, including Esquire and the Guardian. Most recently, he contributed race commentary reports to the Volvo Ocean Race 2008-09 website, and has just completed a book about the crew's experiences, *Spanish Castle to White Night*, published in October 2009.

CASE 23

Teenage Tragedy

Narrative

A group of 7 adult instructors with 17 members of a UK youth organisation set off for a day's activities as part of their annual summer camp, in 3 open decked, cathedral-hulled powerboats. Two of the boats each carried six persons. The third, which was the largest, had four adults and eight teenagers on board, and its coxswain was in overall charge of the activity. The conditions alongside were calm, although the wind was predicted to be between force 3 and 4, increasing to 5 to 7 and perhaps gale force 8 later. The visibility was also forecast to decrease during the day.

After setting off, the boats soon encountered rougher sea conditions, and the instructor in charge decided to turn back. He managed to indicate his intentions to the boat behind using hand signals, but he was unable to attract the attention of the boat ahead, and decided to give chase.

The boat started taking on water over its bow and sides, which then accumulated on the deck and caused the boat to loll to port. To address the problem, the instructor in charge turned his boat into the sea and stopped. The *'elephant's trunk*[1]*'* on the port side of the aft transom was lowered. Speed was then increased and a turn to starboard was commenced. As the boat started to turn, the teenagers seated on the port side of the boat were instructed to transfer to the starboard side. As they moved, the boat heeled to starboard and capsized.

Capsize trial illustrating weight shift and boat swamping

[1] The craft was fitted with two elephant's trunks on the aft transom which are designed to act as self-bailers when the craft is underway

Four of the twelve persons on board surfaced in an air pocket under the upturned boat, but only three managed to swim clear. The fourth, a 14 year old girl, manually activated her gas inflation lifejacket, which was designed for military use. The lifejacket was extremely buoyant and pinned the girl under the boat. Within minutes the lead boat arrived on the scene and began to retrieve the teenagers and their instructors from the water; its coxswain also transmitted a 'Mayday' via VHF radio, but an inaccurate position was broadcast. None of the boats was equipped with GPS or nautical charts.

A head count was conducted, but this did not identify that one of the teenagers was missing. The survivors were taken to the shore and were driven back to their base camp for treatment and shelter. About 1 hour 30 minutes after the capsize, the organisers realised one of the group was missing. A search was started and the girl was found under the capsized boat on the rocky shores of a nearby island. She was air-lifted to the local hospital but, despite the efforts of the coastguard helicopter crew and hospital staff, she could not be revived.

The Lessons

1. When at a sheltered mooring, although the conditions might be calm in the immediate vicinity, they will inevitably be more severe in exposed waters. The checking of the local forecast is a simple cost-free precaution, which can prevent many smaller boats encountering unexpected seas and getting into difficulty.

2. The accumulation of water on the decks of any boat is dangerous, and can quickly lead to the loss of stability where it is able to move feely from one side of a vessel to the other. Prevention is easier than cure, and the use of 'elephant's trunks', self-bailers, freeing ports and bilge pumps is usually very effective, even in rough conditions. However, once water has accumulated and can move unchecked, great care must be taken not to counter any apparent list with the movement of people or weights. This is unlikely to have the desired effect and can result in capsize. Limiting the movement of people on the boat and getting rid of the water by all means available is the safest and simplest solution.

3. There are many types of lifejackets providing varying degrees of buoyancy in order to meet the differing requirements of the waterborne activities undertaken and the range of sizes and weights of their users. Unfortunately, one size does not fit all, and one type of lifejacket is not suitable for all activities. Consequently, where a lifejacket is ill-fitting, or provides an unsuitable degree of buoyancy, it is more likely to hinder than to assist survival. Too much buoyancy can be just as dangerous as too little.

4. When a boat is in difficulty and requests assistance, this cannot be provided promptly unless an accurate position is available. When navigating in an unfamiliar area, restricted visibility, or in darkness, this is usually best achieved by the use of latitude and longitude or reference to a local feature. Neither of these methods is possible without a GPS or chart.

5. Following capsize of any craft, it is vital that checks are made to ensure that *everyone* on board is accounted for. The responsibility for this important task rests not only with the persons in charge of individual boats, who should be aware of the numbers carried at all times, but it also rests with the organisers of events involving large numbers of persons engaged in waterborne activities, who must have a system in place to ensure an accurate record of persons on the water is maintained at all times. The failure to quickly determine when someone is missing can and does cost lives.

Waves Aren't Always Fun

Narrative

A small high speed vessel was employed to conduct pleasure trips for tourists. The vessel was skippered by an experienced helmsman and there was one crewman on board, who also acted as the tour guide for the passengers.

On the day of the accident 11 passengers, including 2 children, boarded the vessel and, supervised by the crewman, took their seats. The crewman then stood at the front of the vessel and provided a safety brief as the skipper manoeuvred the vessel slowly out of the bay. Weather and sea conditions were good, there were light winds, clear skies, and relatively calm water with up to a 1m swell.

Once the safety brief was completed, the skipper increased speed and conducted a few manoeuvres as they started the trip. All the passengers appeared to be comfortable and enjoying themselves. The vessel then proceeded to stop at the usual set points on the route and the crewman provided the relevant commentary.

Thirty minutes into the trip the vessel reached a 15-20m wide channel between two rocks where, as normal, the skipper stopped the boat to assess the current sea conditions. Having decided they were suitable, he told the crewman he intended to transit the channel, and the crewman then briefed the passengers. Once the brief was complete and the crewman had returned aft, the skipper increased thrust and headed through the channel.

While the boat was in the channel, a single steep wave, roughly 2m in height, rose up immediately ahead of it. Despite the skipper's best efforts, he was unable to stop the vessel slamming heavily as it dropped off the back of the wave. The passengers landed heavily on

Figure 1: Rear view of the high speed vessel

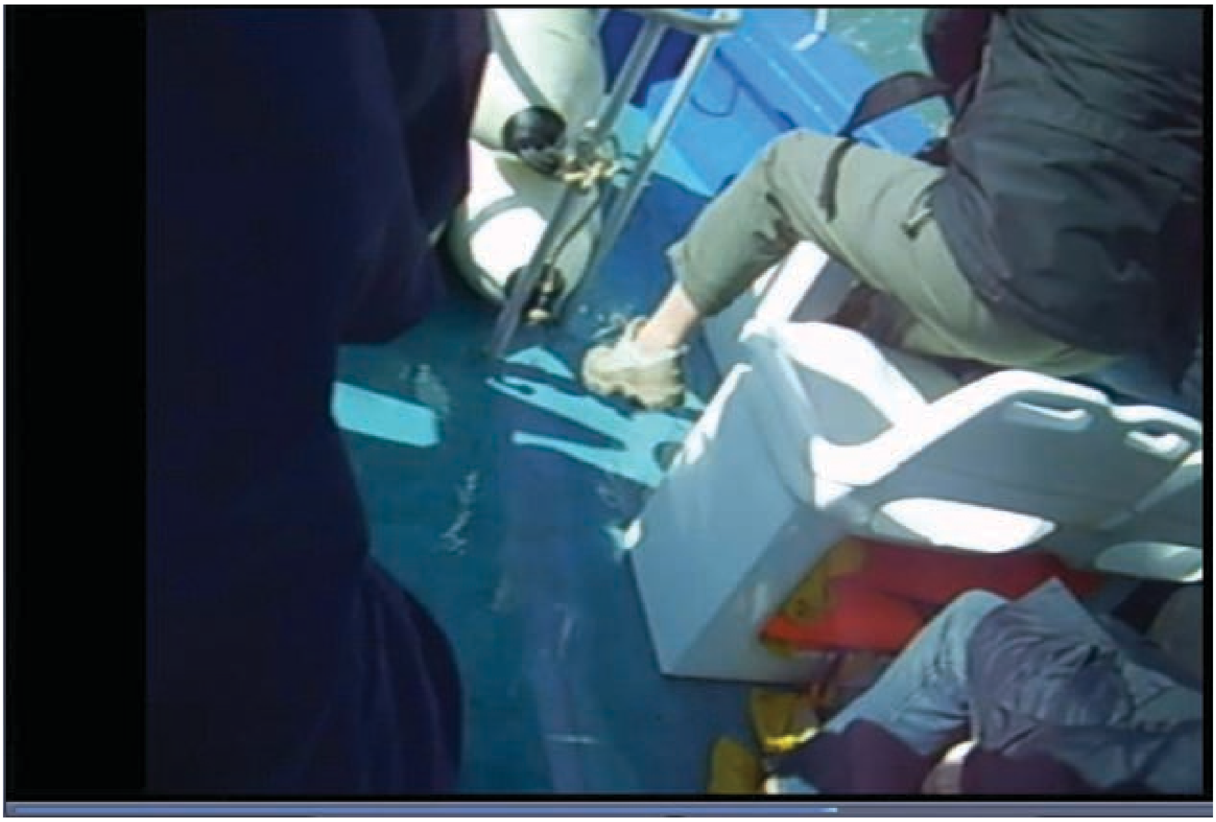


Figure 2: Photograph of a passenger being lifted from her seat by a wave

their seats as the vessel slammed down. A man seated at the front of the vessel collapsed to the deck in great pain, and many of the other passengers reported they were injured.

The crewman attended to the passengers while the skipper called the Coastguard. An initial injury assessment was provided and the skipper informed the Coastguard that the vessel would be back at the boarding point in 15 minutes.

Once at the boarding point, those able to walk stepped ashore and were attended to by paramedics. The man who had collapsed to the deck was winched off the boat by SAR helicopter and taken to hospital, and two others that had been transferred ashore at the slipway were also taken to hospital by air ambulance. One passenger suffered a shattered vertebra; another, a fractured sternum. The other passengers suffered less serious back injuries and bruising.

The Lessons

Travelling at speed on rough water, or even just encountering a single large wave, such as experienced here, can expose occupants of RIBs or similar vessels to high acceleration forces and shock loads as the vessels they are in slam into the water. These forces can result in serious injuries, especially back injuries, being sustained. A number of actions can be taken to reduce this risk, including:

1. Providing proper seating, handholds and, if appropriate, restraints for all passengers and crew.

2. Briefing passengers to adopt the correct posture to minimise the risk of injury by maintaining a straight spine, using handholds, and absorbing some of the shock through slightly bent legs. The safety brief should also emphasise that an inappropriate posture could increase the risk of injury.

3. Limiting the ride to those who are able to use the seats, hold on, and brace themselves effectively. For example, key to effective bracing is the ability to place both feet firmly on the deck, and the height of the seating might therefore dictate that passengers should be of a certain minimum height.

4. Prior to a trip, identifying anyone with a condition that could place them at greater risk, for example if they have a pre-existing back problem, are infirm or are pregnant, and determining whether the trip is suitable for them.

5. Ensuring helmsmen are alert to the risks to people from slamming, and that they drive their vessels appropriately. This should be emphasised where the helmsman is positioned behind the passengers, and is exposed to less violent motion.

6. Considering the suitability of the vessel for the intended trips. Planing hulls with 22-28 degrees of deadrise angle at the transom will provide a reasonable ride in moderate waves. In general, the shallower a vessel's deadrise, the greater its propensity to slam in steep or confused seas.

Injured, But Lucky to be Alive

Narrative

A yachtsman was attempting to board his yacht from a tender when he lost his balance and fell into the water. The man had rowed out to his yacht, which was at its mooring, and had just stood up prior to climbing on board, when the tender moved away from the side of the yacht. The man then made a grab for the rail but could not hold on, and fell in.

He was alone, and no one from the shore had seen him rowing out to his boat. Furthermore, he was not wearing a lifejacket and was not a strong swimmer. He quickly became tired as he tried to keep his head above the water while being pushed away from his yacht by a freshening wind and a strengthening tidal stream. He was passing close to a boat on an adjacent mooring and managed to hold onto its mooring chain long enough to call out for help.

Very fortunately, two men on a nearby yacht then heard his cries and motored towards him. On arrival they threw the man a lifebuoy, with a line attached, which the man was able to grasp. However, the men's yacht had a high freeboard, and it proved impossible for them to lift the man from the water, so they decided to tow him gently towards shallow water.

Unfortunately, as the yacht manoeuvred towards shore in the freshening wind, the man was struck by the yacht's propeller, which fractured and lacerated his left leg.

Despite his injuries, and being in shock, he was able to make his way onto the beach and was subsequently airlifted to hospital.

Later, reflecting on the accident, he realised that although he had been seriously injured, he was very lucky to have survived. He promised his wife that, once recovered, he would never again set out without wearing a lifejacket.

The Lessons

1. **This incident demonstrates that, even on a short trip, things can go wrong. Be prepared – always wear a lifejacket.**

2. **The man did not consider the risks of boarding his boat from his tender. He knew the tender was prone to being unstable when he stood up to board his yacht but, as he had previously always managed to steady himself on the rail, he had taken no additional precautions. Doing the simplest routine tasks, without thought, is often when we put ourselves at most risk.**

3. **Recovering a person from the water is much more difficult than people imagine. In this case, two men could not recover the man overboard. How would you cope in your vessel?**

4. **Finally, towing this victim into shallow water was probably the only feasible means of saving his life, despite the risk presented by the rotating propeller. However it does illustrate the ever present danger of propellers – always keep people (and lines) away from them.**

APPENDIX A

Preliminary examinations started in the period 01/07/09 – 31/10/09

A preliminary examination identifies the causes and circumstances of an accident to see if it meets the criteria required to warrant a full investigation, which will culminate in a publicly available report.

Date of Accident	Name of Vessel	Type of Vessel	Flag	Size	Type of Accident
04/07/09	*Stolt Petrel*	Chemical Tanker	UK	3206	Contact
09/07/09	*King Everest*	Tanker	Marshall Islands	23217	Contact
12/07/09	*Laser Stratos 132*	Pleasure craft	UK	4.94m	Capsize/Listing (2 fatalities)
01/09/09	*Velox*	Dry cargo	Isle of Man	2033	Accident to person
07/09/09	*Silves*	Dry cargo	Portugal	2956	Contact
10/09/09	*Ever Elite*	Dry cargo	UK	76067	Accident to person (1 fatality)
15/09/09	*Maersk Kendal*	Dry cargo	UK	74642	Grounding
02/10/09	*Sea Charente*	Dry cargo	Netherlands	1638	Hazardous incident
04/10/09	*Thames Fisher*	Tanker/combination carrier	UK	2760	Machinery failure
09/10/09	*Noronya*	Fish catching/ processing	UK	138	Accident to person (1 fatality)
10/10/09	*Olivia Jean*	Fish catching/ processing	UK	242	Accident to person
29/10/09	*Port of Ayr*	Fish catching/ processing	UK	254	Machinery failure

Investigations started in the period 01/07/09 – 31/10/09

Date of Accident	Name of Vessel	Type of Vessel	Flag	Size	Type of Accident
20/07/09	*Aquila*	Fish catching/ processing	UK	29m	Capsize/listing (3 fatalities)
08/08/09	*Sleepwalker* Harwich 2011 speedboat	Pleasure craft Pleasure craft	UK UK	Unknown Unknown	Collision (1 fatality)
10/08/09	*Saetta*	Tanker/combination carrier	Greece	58418	Contact
	Conger	Tanker/combination carrier	Marshall Islands	44067	Contact
10/09/09	*Ever Elite*	Dry cargo	UK	76067	Accident to person (1 fatality)

Reports issued in 2009

Abigail H – flooding and foundering of the grab hopper dredger in the Port of Heysham on 2 November 2008.
Published 1 July

Antari – grounding near Larne, Northern Ireland on 29 June 2008.
Published 19 February

Astral – grounding on Princessa Shoal, east of Isle of Wight on 10 March 2008.
Published 29 January

Celtic Pioneer – injury to a passenger on board the RIB, Bristol Channel on 26 August 2008.
Published 21 May

Eurovoyager – entrapment of an engine room fitter in a watertight door while approaching Ramsgate on 3 November 2008.
Published 7 July

Hurlingham – loss of a passenger overboard, Westminster Pier, River Thames on 17 August 2008.
Published 9 June

HMS Westminster/Princess Rose – person overboard during a passenger transfer on the River Thames on 24 November 2008.
Published 2 July

Maersk Kithira – fatal injury of a crew member, and the serious injury of a second crew member in heavy weather, South China Sea on 23 September 2008.
Published 28 April

Maersk Newport – heavy weather damage, 50 miles west of Guernsey on 10 November 2008, and fire alongside at the container berth in Algeciras, Spain on 15 November 2008.
Published 17 June

Maggie Ann – manoverboard accident in Cardigan Bay on 12 February 2009 resulting in one fatality.
Published 8 September

Moondance – electrical blackout and subsequent grounding in Warrenpoint Harbour, Northern Ireland on 29 June 2008.
Published 10 February

MV Norma – hazardous diving incident, Dover Strait on 21 June 2008.
Published 21 January

Pacific Sun – heavy weather encountered by the cruise ship, 200 miles north north-east of North Cape, New Zealand on 30 July 2008.
Published 24 June

***Plas Menai* RIB 6** – capsize of the RIB 6 while undertaking unauthorised RIB riding activity near Caernarfon, Wales on 1 July 2008, resulting in one injured student.
Published 18 February

Pride of Canterbury – grounding in "The Downs" – off Deal, Kent on 31 January 2008.
Published 14 January

Riverdance – grounding and subsequent loss of the ro-ro cargo vessel at Shell Flats, Cleveleys Beach, Lancashire on 31 January 2008.
Published 3 September 2009

Saga Rose – fatality on board the passenger cruise ship in Southampton, England on 11 June 2008.
Published 6 January 2009

Scot Isles/Wadi Halfa – collision in the Dover Strait on 29 October 2008.
Published 14 May

APPENDIX B

Sooty – grounding at high speed of the RIB, Calve Island, Isle of Mull on 18 May 2009, resulting in one fatality.
Published 22 October

Stena Voyager – shift of an articulated road tanker in Loch Ryan on 28 January 2009.
Published 1 October

Vallermosa – contact made by the tanker, with two other tankers, at the Fawley Marine Terminal on 25 February 2009, resulting in damage to all three vessels.
Published 12 November

Ville de Mars – fatality of a chief officer in a ballast tank on board the container ship, Gulf of Oman on 28 January 2009.
Published 10 September

Vision II – fire on board the fishing vessel alongside at Fraserburgh on 1 August 2008, resulting in three fatalities.
Published 25 March