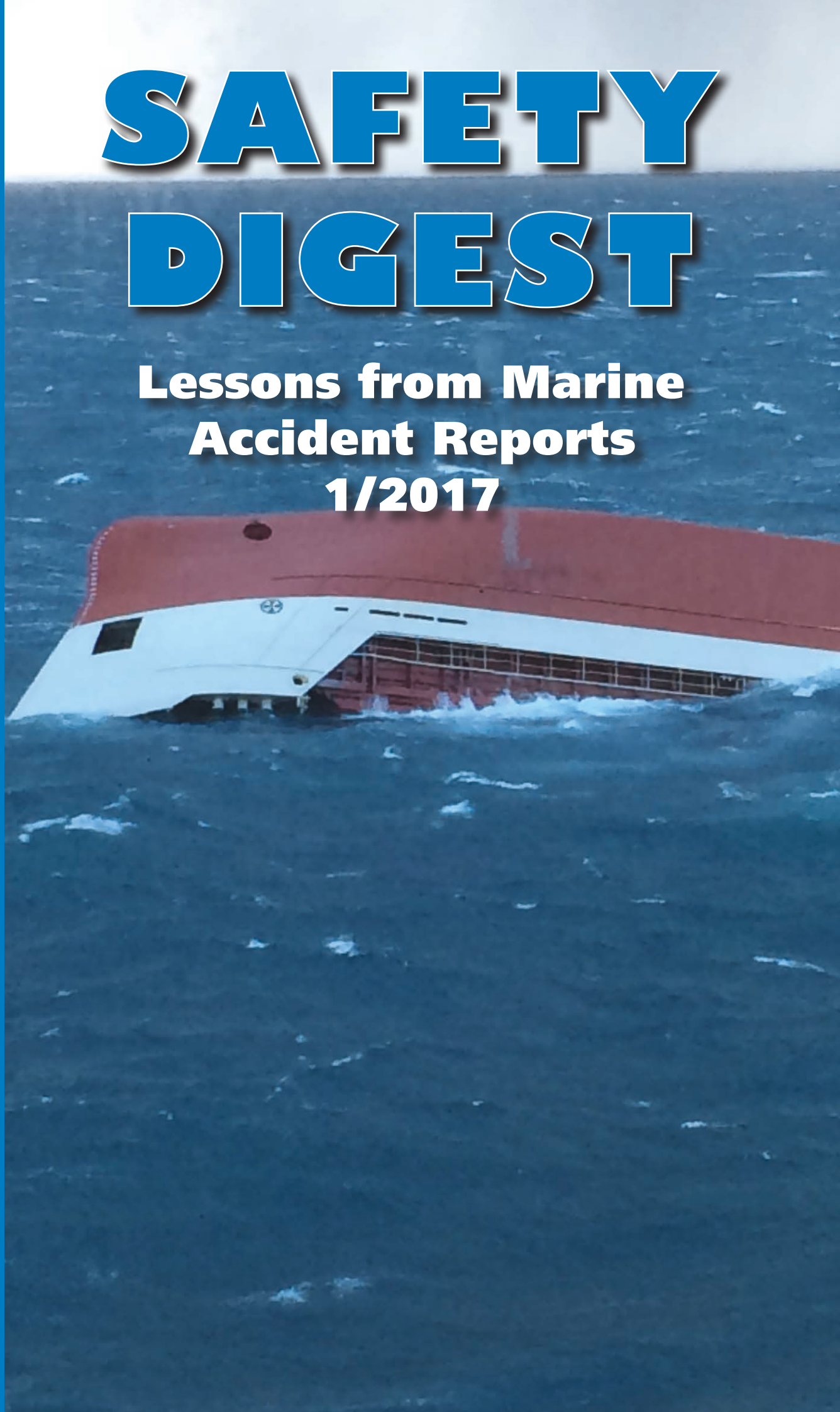
MARINE ACCIDENT INVESTIGATION BRANCH

MAIB

SAFETY DIGEST

Lessons from Marine Accident Reports 1/2017



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Lessons from Marine Accidents

No 1/2017

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April 2017

MARINE ACCIDENT INVESTIGATION BRANCH

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.

Located in offices in Southampton, the MAIB is a separate, independent branch within the Department for Transport (DfT). The head of the MAIB, the Chief Inspector of Marine Accidents, reports directly to the Secretary of State for Transport.

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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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 2012 – Regulation 5:

"The sole objective of the investigation of a safety investigation into an accident under these Regulations shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of such an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

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Glossary of Terms and Abbreviations

AB	-	Able seaman
AIS	-	Automatic Identification System
C	-	Celsius
CCTV	-	Closed Circuit Television
CO2	-	Carbon Dioxide
CPR	-	Cardio-Pulmonary Resuscitation
DSC	-	Digital Selective Calling
ECDIS	-	Electronic Chart Display and Information System
EPIRB	-	Emergency Position Indicating Radio Beacon
ESD	-	Emergency Shutdown
gt	-	gross tonnage
IMO	-	International Maritime Organization
kt	-	knot
LPG	-	Liquefied Petroleum Gas
m	-	metre
"Mayday"	-	The international distress signal (spoken)
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
MOB	-	Man Overboard
MSC	-	Maritime Safety Committee
OOW	-	Officer of the Watch
P&I	-	Protection and Indemnity
PFD	-	Personal Flotation Device
PLB	-	Personal Locator Beacon
PPE	-	Personal Protective Equipment
rpm	-	revolutions per minute
SRV	-	Safety Relief Valve
UHF	-	Ultra High Frequency
VHF	-	Very High Frequency
XTD	-	Cross Track Distance

Introduction

As I write this introduction, one of the first of the winter storms to hit the UK in 2017 is driving the rain hard against the windows of my office in Southampton. Ashore, the ravages of the weather can be inconvenient, a distraction that mercifully rarely ends in disaster. However, at sea most mariners quickly learn that to ignore the vagaries of wind (and tide) is, at best, foolhardy. Case 1 of this edition of the Safety Digest provides a sobering example of the power that can be generated when gale force winds oppose strong tidal streams; a small laden cargo vessel was overwhelmed and capsized when the ship entered an extremely hazardous channel at the very worst time possible. Sadly, none of the ship's crew survived.

When compiling this edition, I was struck by a common theme that runs through many of the accidents – taking an unnecessary risk to save time or get a job done more quickly. This is something that we probably have all been guilty of doing at some point in our careers whether afloat or ashore. Again, Case 1 is a strong example of why it's important to take the time to plan carefully any voyage and be ready to amend that plan should the circumstances change. However, Cases 10,12,13,15,16,17,19,20,22,23,24 and 25 also illustrate why it is so important to pause and ask yourself "what could go wrong?" and then ensure the appropriate barriers and controls are in place before commencing any task.

2016 was not a good year for our fishing industry. Too many fishermen died when they fell, or were taken overboard from their vessels. Full details will be contained in my Annual Report when published later in the year. However, these fishermen have mostly succumbed to the effects of cold water shock, which can be debilitating and cause drowning within minutes of entering the water (Case 15). I fully support the views expressed by Simon Potten in his excellent introduction to the Fishing Vessel section of this Safety Digest: boat skippers need to take more responsibility for the safety of their crew by ensuring onboard working practices reduce the risk of going overboard and insisting their crews wear PFDs when working on the open deck. I would also add that it is crucial that the skipper leads by example.

With the approach of spring, many readers will be preparing to go back on the water in their small craft. Some of you may also be considering carrying spare petrol on the boat. Please don't! or at least keep the quantities you need to carry to the absolute minimum and always stow it on the open deck in sealed containers that can be quickly jettisoned. Case 25 explains why this is so important.

In closing, I take this opportunity to thank Guy Platten, Simon Potten and Steve Usher for their thoughtful introductions to this edition of the Safety Digest.

Until next time, keep safe.

Steve Clinch
Chief Inspector of Marine Accidents

April 2017

Part 1 – Merchant Vessels

It is an honour to be asked to write the forward to this MAIB Safety Digest. The Marine Accident Investigation Branch undertake a vital role in investigating and reporting on the sadly far too many accidents and incidents which take place in our industry every year. The inspectors do this in a way that seeks to establish the facts and causes so lessons can be learnt rather than apportion blame – imperative if we are to prevent further accidents. These incidents can happen at any time and in any sector and tragically all too often result in serious injury or loss of life.

This digest provides a timely round up of the breadth of incidents from the capsize of a coastal cement carrier with the loss of all hands to an exploding grinding disc. It is written in a style that draws the reader in and makes individuals think very carefully about the sequence of events leading to the accident and how we can learn the lessons to ensure that they do not take place again. I have always been an avid reader both during my time at sea and now ashore and as always the common thread throughout the reports is all too often complacency, communication and perceived commercial pressures that cause individuals to act in a way that set off the series of events which ultimately ends in tragedy.

We must never forget that shipping is about seafarers who go about their work in often difficult and harsh conditions. The most important thing to their families is that they return home safely at the end of each trip. It can't be right that our industry has a fatal accident rate 20 times that of the average British worker and five times that of construction. Here at the UK Chamber of Shipping in 2017 we are embarking on a new leadership role on safety, bringing together seafarers, managers and regulators to work together to enable a step change in safety performance. The MAIB will undoubtedly play a central role in this and ultimately we want to be able to look the families in the eye and tell them their father, mother, son or daughter works in the safest industry in the world.

So I would urge you to read each of the reports carefully and ask yourself the question 'how would I have reacted in this situation?' At all levels of the industry we need to change the way we think, to change our safety culture so that we always 'do the right thing' because 'it's the right thing to do'.

GUY PLATTEN
CHIEF EXECUTIVE, UK CHAMBER OF SHIPPING

Guy Platten is a master mariner with a long background in the marine industry.

He was appointed Chief Executive Officer of the UK Chamber of Shipping in January 2014. His role includes responsibility for the UK shipping industry's relations with government and other relevant bodies (national and international) on all fiscal, economic, employment, safety and environment, security and other issues.

Prior to this, he was Chief Executive of Caledonian Maritime Assets (CMAL) Ltd. Establishing CMAL and building it into a respected company delivering vital transport infrastructure. He oversaw construction and delivery of two innovative hybrid ferries along with a number of significant harbour developments.

Before joining CMAL, Guy was Director of Marine Operations for the Northern Lighthouse Board and was responsible for the NLB fleet, Oban port facility, 24 hour monitor centre and providing navigational advice regarding the provision of Aids to Navigation around the coast of Scotland and the Isle of Man.

His career at sea began in 1982 with the Royal Fleet Auxiliary Service. Joining the RNLI as an Inspector of Lifeboats, latterly as Inspector for Scotland. He served with the MOD as a Salvage Officer..

A Catastrophic Outcome

Narrative

A small, laden cement carrier capsized while on passage through a coastal channel that was notorious for its powerful tidal races and associated extreme sea conditions.

As the vessel approached the channel, the weather deteriorated and gale force winds were opposing the strong tidal stream; this was creating treacherous conditions that were dangerous for small vessels. On entering the channel, it is evident from AIS evidence that the bridge team slowed the vessel down, almost certainly to reduce the risk of pounding or ploughing as they headed into the dreadful sea conditions (Figure 1). Due to the direction of the tidal stream, it is also evident that course alterations were required to maintain a safe navigational track over the ground. However, these course changes had the effect of placing the large sea increasingly on the vessel's beam.

When close to the area of worst sea conditions, the vessel capsized and remained afloat upside down for a considerable period of time; none of the crew survived. The alarm was not raised until about 25 hours later when the upturned hull was spotted by a passing ferry (Figure 2). The accident had gone unnoticed because: the capsize was so rapid that there was insufficient time for the crew to call a "Mayday", the EPIRB almost certainly became trapped and did not float free, and the AIS transmissions ceasing was not observed ashore.

The hazards presented by the tidal races were well publicised and the channel was impassable to small vessels during certain tidal conditions. The ship and its master had passed through the channel many times before and the master had previously taken action, normally by altering course, to avoid entering the channel at the dangerous times. About 3 months prior to the accident, the master had altered course across the sea in the approaches to the channel in order to avoid the extreme tidal races; however, this caused the vessel's cement cargo to shift and resulted in a dangerous stability situation.

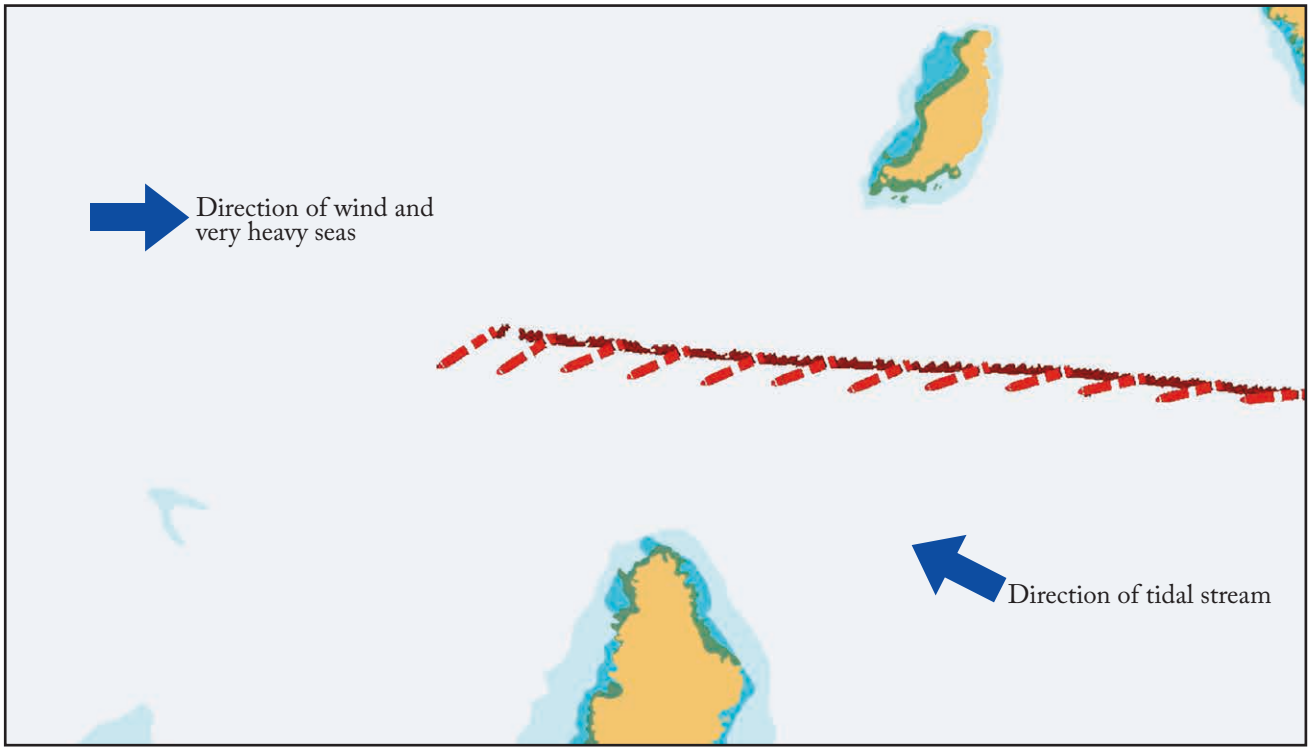
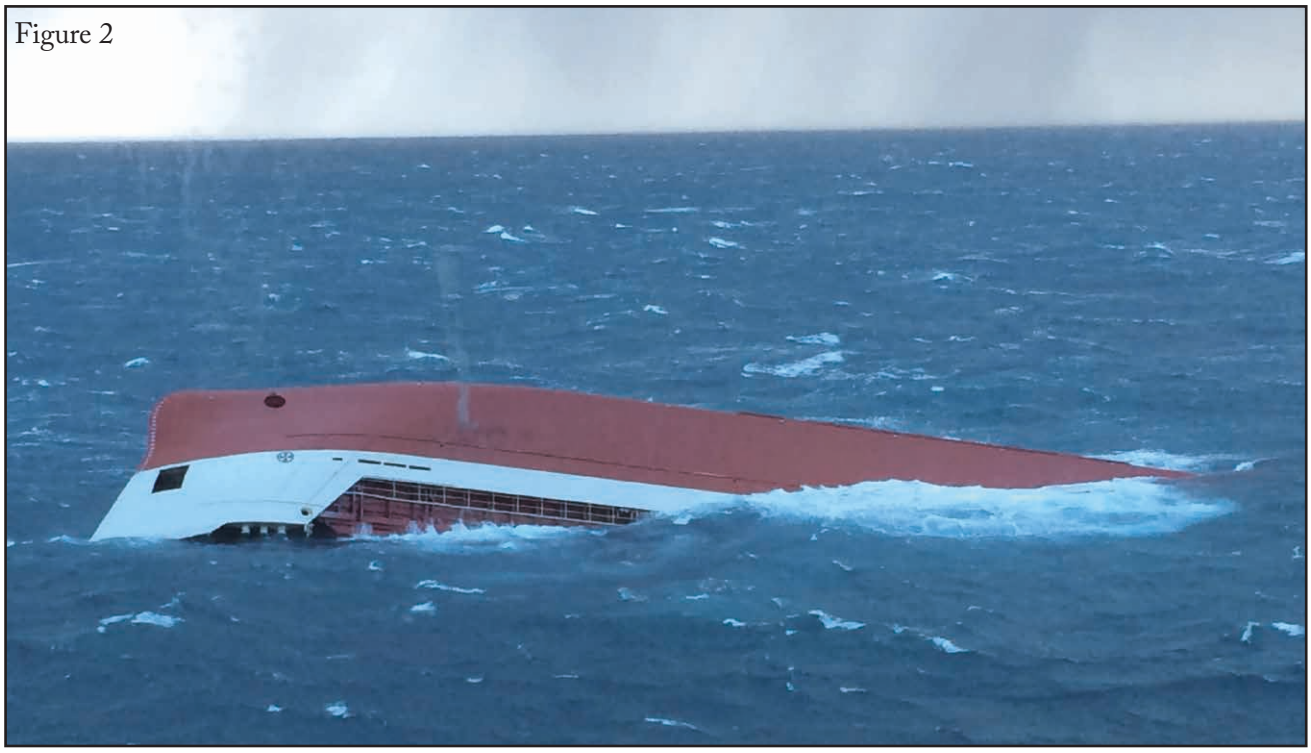


Figure 1: Vessel's track showing headings through the water (vessel shown 10 times actual size)

Figure 2



The Lessons

1. Passage planning is critical for every voyage; it needs to take into account all potential hazards and should include abort plans where necessary. In this case the ship entered the extremely hazardous channel at the very worst time of maximum opposing wind and current, creating the fatal sea conditions. Options were available to seek shelter or avoid the area. However, the decision to press ahead with the voyage resulted from poor passage planning, a likely under-estimation of the environmental conditions, over-confidence in the vessel's sea-keeping capability and an unwillingness to alter across the sea after the recent experience of a dangerous cargo shift.

2. Other factors were likely to have played a part in the decision making on board. The master and chief officer were in a 6-on / 6-off routine at sea and both also had duties to fulfil in harbour. Such a routine can be exhausting in the short sea-trading routes that the vessel was undertaking; this situation can be made worse by poor weather and constant ship movement, disrupting crew rest.

3. Safety at sea must always be a priority ahead of commercial pressures. The crew had experienced some difficulties loading the vessel and this had caused a delay in departure. The delay in sailing might have created additional pressure on the crew to press ahead with the voyage in an attempt to regain the lost time.

4. It is important to understand your vessel's stability condition and, for bulk carriers, the cargo bulk density value is critical. The vessel's stability condition was not accurately determined after the accident; however, it was established that the assumed bulk density value for the cargo was greater than reality, which could potentially have generated a false impression of stability. This created a situation where the vessel was potentially more vulnerable to capsize than the stability calculations would have indicated.

Fatal Short-Cut to Using the Gangway

Narrative

A small passenger vessel was alongside a berth it used regularly on its scheduled service to an off-lying island. The crew were waiting for the arrival of provisions and additional crew members before departure when a shore worker, whose job was to handle the vessel's mooring lines from the quay, boarded via the vessel's gangway for a cup of coffee with the crew.

The vessel was fitted with a shell door on each side of the main deck and an external belting that ran most of the length of the hull (Figure 1). When there were no passengers on board, the shell doors would normally be left open in port to improve lower deck ventilation. There were no barriers to guard the resulting openings.

The berth was close to the harbour entrance, and after the shore worker had boarded, the gangway was withdrawn as the vessel was rolling moderately at the berth in the swell.

When the crew had finished their drinks they returned to deck to continue preparations for departure, leaving the shore worker alone in the main deck saloon. A few minutes later they heard a cry from the side of the vessel and looked down to see that the shore worker was trapped on the belting, between the vessel's side and a quayside fender (Figure 2). He had apparently decided to leave the vessel through the shell door and walk along the belting to an area where he would have been able to step across onto the quay.

The crew went to the man's assistance but were unable to recover him back onto the vessel and they had to lower him into the water. One of the crew jumped into the water to keep the man afloat and conscious until a lifeboat arrived. The lifeboat was quickly on scene and recovered the man ashore for medical assistance.

Tragically, despite the best endeavours of the crew and the emergency services, the shore worker died in hospital a short time later.

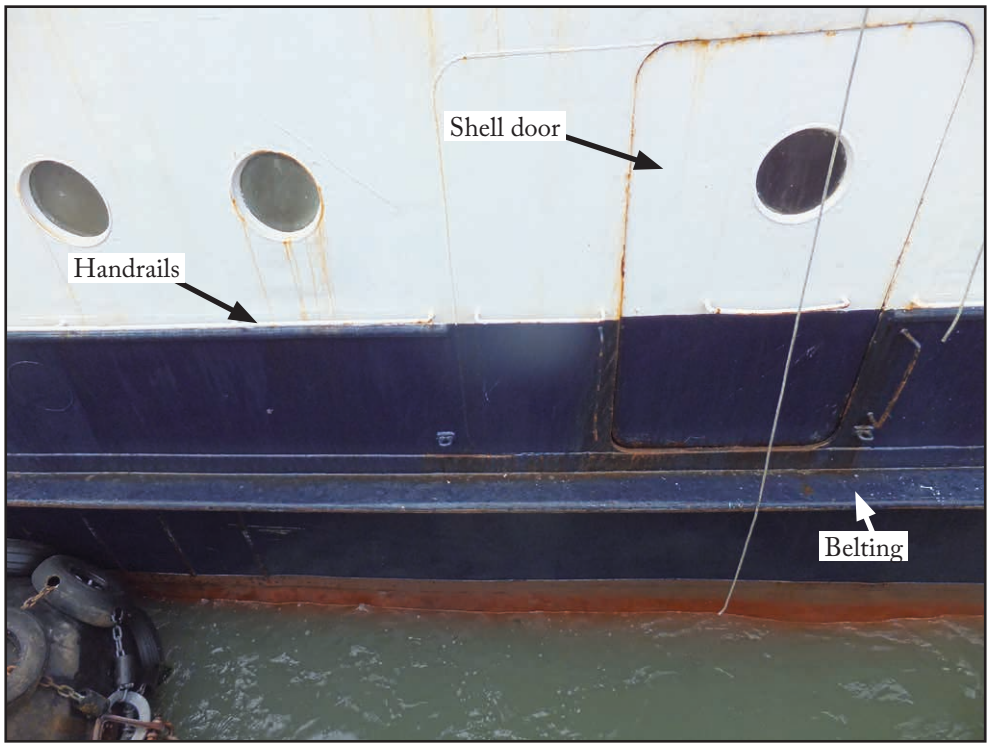


Figure 1: Shell door, ship's side belting and handrails

The Lessons

1. The shore worker's training had not included shipboard operations and so he did not recognise the danger of using the shell door to disembark instead of the gangway.

2. Owners should ensure that anyone they allow to access their vessels unescorted is trained in the potential hazards they may encounter on board.

3. The crew regarded the line handler as a co-worker rather than as a visitor to the vessel.

4. Procedures need to be in place to ensure that crews understand the importance of supervising and/or training visitors.

5. The hazards associated with leaving the shell doors open and unguarded when in port, with no passengers embarked, had not been recognised. Owners and crews should ensure that risk assessments cover all aspects of their vessels' operations.

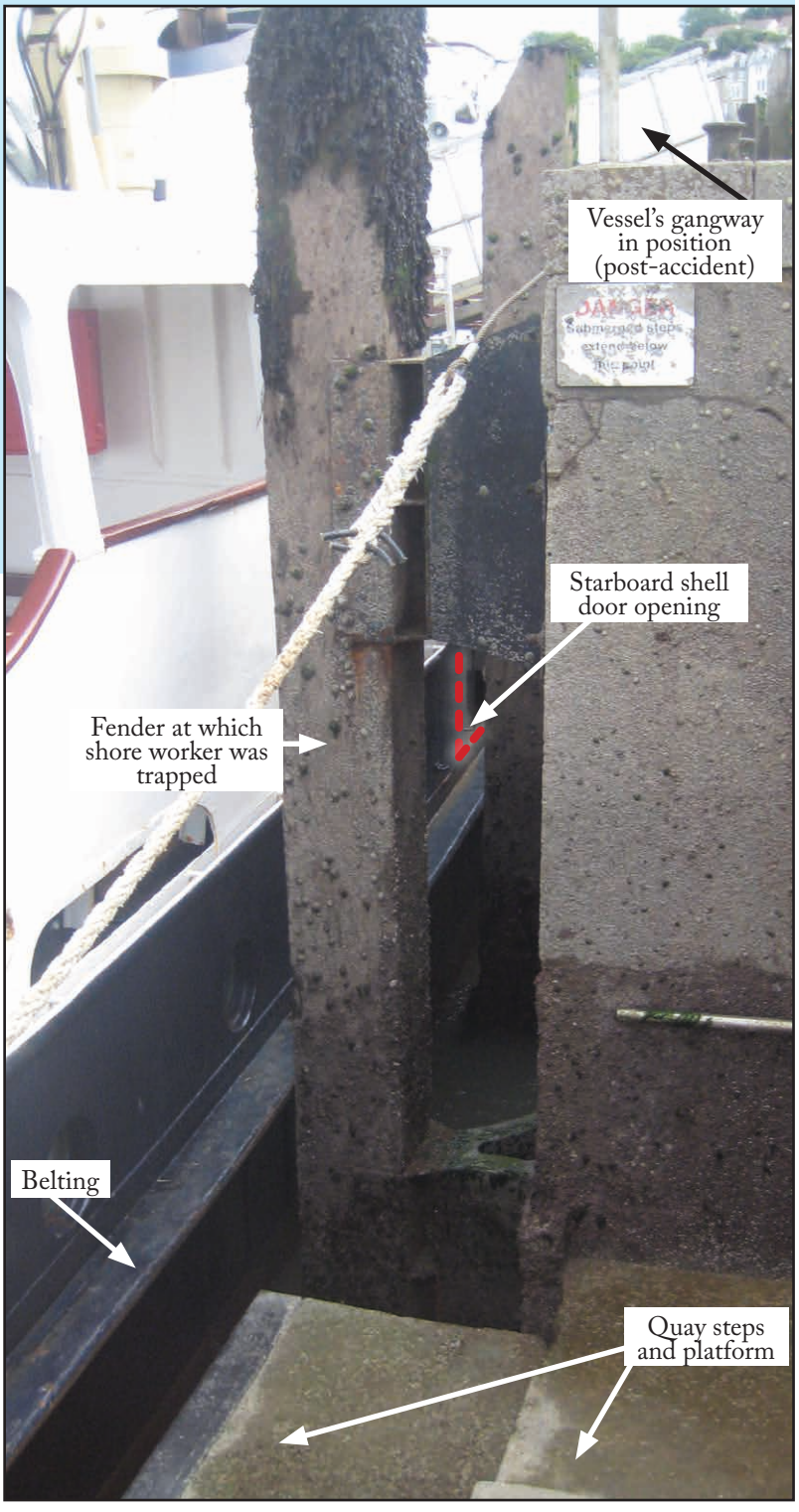


Figure 2: Location of entrapment

Isolated Working Leads to Girting

Narrative

A 2,500gt chemical tanker was berthed port side alongside and had completed discharging its cargo. It was dark, near high water, with good visibility and a force 4 to 5 wind blowing onto the berth.

A pilot boarded the tanker in preparation for departure. He advised the master of his intention to use a mooring launch to assist, if necessary, in lifting the tanker's stern off the berth. The mooring launch, which had a bollard pull of 13t, arrived alongside. Its towline was then passed and secured through the tanker's starboard quarter fairlead (see figure).

Using port rudder, ahead propulsion and starboard bow thrust, the pilot manoeuvred the tanker bodily off the berth with only the forward spring still secured ashore. The forward spring was then let go and the tanker was manoeuvred ahead. The pilot ordered the launch coxswain to run with the tanker and then to approach the tanker and let go. Both orders were acknowledged by the launch coxswain, who was attempting unsuccessfully to turn the launch to port.

Load had come onto the towline, causing the launch to list heavily to port. The coxswain then attempted to operate the towing hook emergency release by pulling on the handle suspended from the wheelhouse deckhead.

Meanwhile, on being notified by one of his crew that the mooring launch was in difficulty, the tanker's master brought the propeller pitch to zero. The launch then capsized with the towline remaining attached to the tanker. Although the launch deckhand was able to swim clear, the coxswain remained trapped in the wheelhouse until he was sighted and rescued over an hour later.

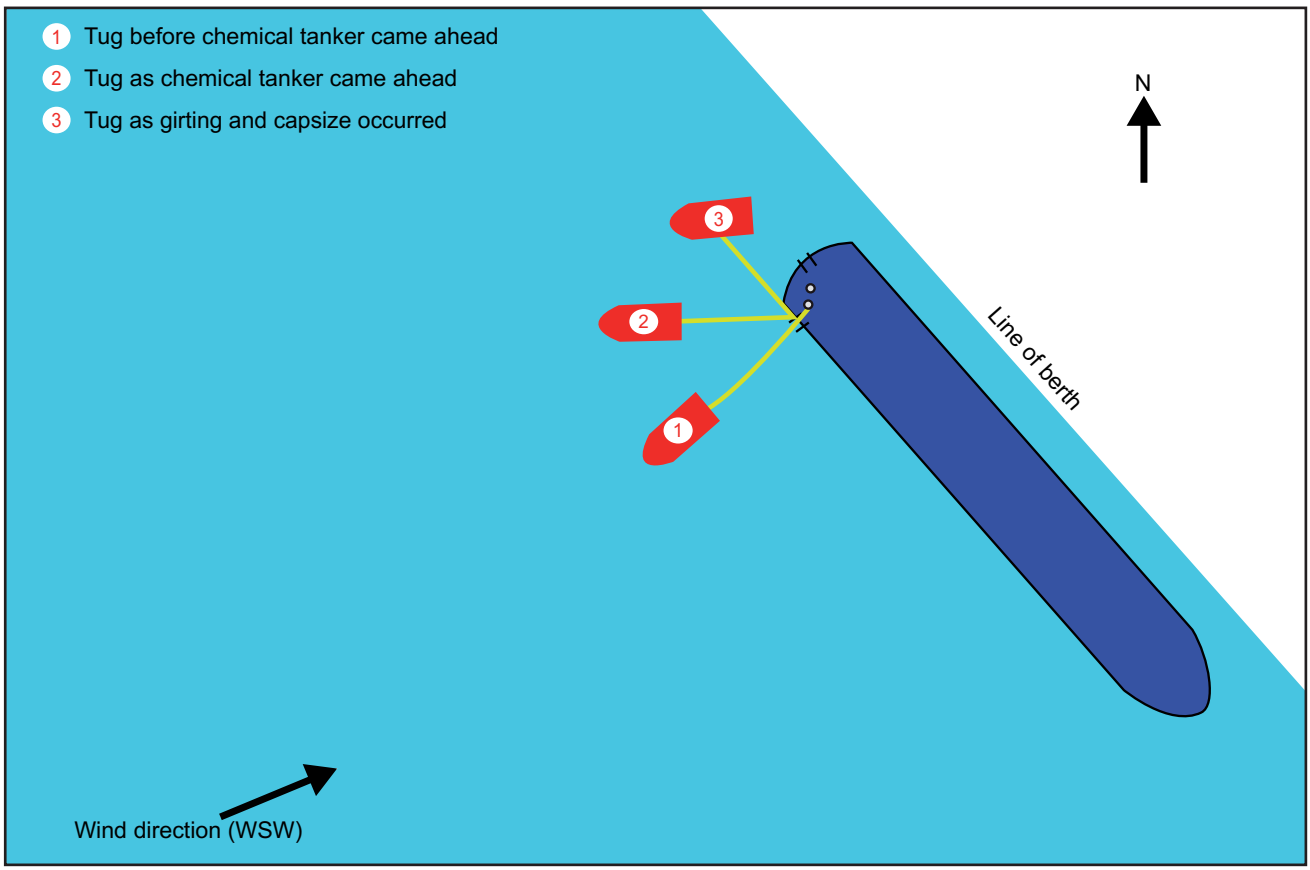


Figure: Indicative relative movement of the mooring launch

The Lessons

1. A gog rope is commonly used to move the effective towing point closer to a towing vessel's stern. This prevents the towline from being taken across the towing vessel's beam, and therefore reduces the danger of girting[1]. The mooring launch's management company recognised the danger of girting and, consequently, required a gog rope to be used on every tow. However, it incorrectly assumed that the mooring launch crew were proficient in adjusting the gog rope to maximise its preventive effect.

2. In this case, the gog rope was set at an intermediate length that was neither short enough to move the towing point sufficiently aft to prevent girting nor long enough to facilitate the coxswain's intended turn to port once load had started to come onto the towline.

3. A thorough assessment of the task prior to commencement, underpinned by appropriate training highlighting the risk of girting and how to prevent it, would have enabled the mooring launch coxswain to make a more informed decision on what the optimum gog rope arrangement should have been.

4. Effective proactive communications between the tanker's pilot and the mooring launch coxswain at defined stages of the operation would have reduced the risk of girting. In this case, the pilot relied on the coxswain to act autonomously and to inform him when in doubt or difficulty.

   Had the launch coxswain been warned that the tanker was about to be manoeuvred ahead or had already started to move ahead, he might have been able to turn the launch to port before additional loading came onto the towline. Alternatively, he could have informed the pilot of any doubt he might have had in his ability to turn the launch before the tanker gathered headway.

   The need to establish communications, agree a plan and continually exchange information, including engine movements, is promoted in the Code of Safe Working Practices for Merchant Seafarers and has been a significant finding in a number of MAIB safety investigations concerning towing operations.

5. With no mechanical assistance, the towing hook emergency release relied on the crew to operate the manual pull in order to release the towline.

   Tests of the towing hook following the accident demonstrated that, under load conditions, a steady pull required significantly more force to operate the release mechanism than a sharp pulling action, and that the required effort increased in proportion to the loading on the hook.

   The emergency release had not been practised as part of a drill, and so the crew lacked preparedness to take appropriate and rapid action in the event of a developing emergency. How prepared are you?

[1] 'Girting' means the risk of capsizing due to high athwartships towing forces.

No Pool Attendant, No Rescue

Narrative

A passenger was noticed lying motionless at the bottom of a swimming pool. He had been under water in the unsupervised pool for 10 minutes before a fellow passenger saw him and recovered him to the surface.

The alarm was raised and, following his removal from the water, CPR was started by fellow passengers until the ship's medical team arrived shortly afterwards. Despite further attempts to resuscitate him, he was pronounced deceased by the ship's senior doctor.

At the time of the accident, there were at least four other passengers in the swimming pool.

The subsequent autopsy examination determined the cause of death as drowning.

The Lessons

1. **It is unknown whether or not the passenger's life could have been saved had an emergency response been initiated sooner. As there was no dedicated pool attendant, his situation was not identified until 10 minutes had passed.**

2. **Although patrolling personnel can provide a degree of swimming pool supervision, this accident demonstrates that, ideally, constant supervision is required to effectively identify and respond to a passenger in immediate risk of drowning.**

3. **No formal documented risk assessment for swimming pool use was in place at the time of the accident. Although a risk assessment might not have prevented the accident, it would have identified relevant hazards and control measures, including those aimed at reducing the risk of a passenger drowning.**

4. **The frequency of near drownings in unsupervised swimming pools is uncertain. It is therefore important that this uncertainty is taken into account when conducting risk assessments and justifying any decision not to provide constant supervision.**

A Snake's Wedding

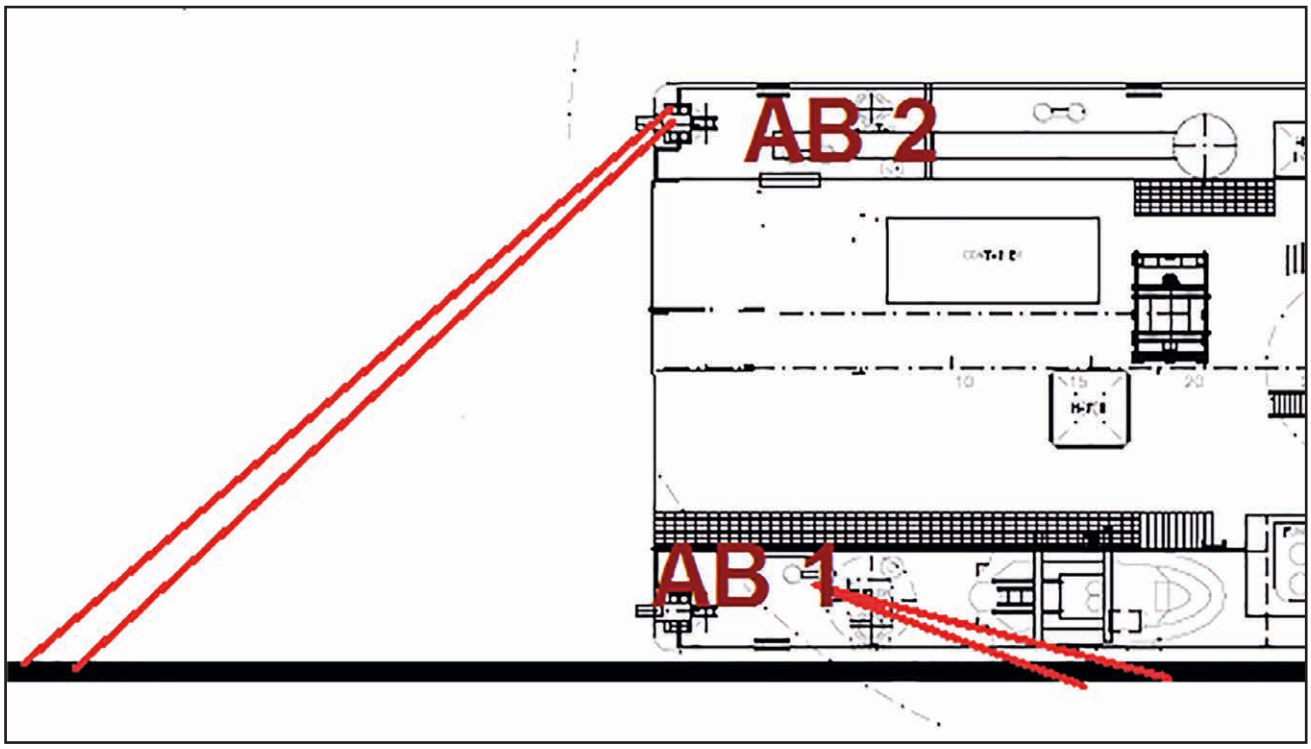
Narrative

An offshore support vessel was moored starboard side to. The mooring arrangements on the stern comprised two spring lines made fast on bitts on the inboard side and two stern lines made fast on bitts on the outboard side (see figure). In preparation for the departure, the vessel's mooring and bridge teams conducted a tool-box talk.

At the time of departure, the tidal stream was setting onto the vessel's stern at a rate of about 1.5kts. For letting go, the inboard (starboard) azimuth thruster was set to counteract the tidal stream and the outboard (port) azimuth thruster was set to keep the vessel alongside. The master, chief officer and a harbour pilot were on the bridge. The master and pilot had discussed the manoeuvring aspects of the departure plan, but not the method or expectations for unmooring. Communication between the bridge and the mooring teams was via hand-held UHF radio. The pilot was talking with the shore linesmen via VHF radio.

The aft mooring team comprised two ABs, one by each set of bitts. The shore linesmen first cast off the spring lines from the quayside bollards. The aft spring lines were recovered on deck by the AB at the starboard bitts. The AB on the port side then slackened both of the stern lines. The shore linesmen then let go the head and stern lines from the quayside and dropped their ends into the water. The lines were too heavy for the AB to recover simultaneously and, as he heaved in one of the stern lines as fast as he could, the other line was sucked into one of the azimuth thruster suction inlets. To make matters worse, the line being tended by the AB soon twisted around the line that was fouling the thruster.

The AB handling the stern line quickly alerted the bridge to his predicament and asked for both thrusters to be stopped. However, the master realised that this would leave the vessel without any means of control. The master did not know which of the thrusters was fouled so



he set the pitch of the port azimuth to zero and adjusted the starboard azimuth to keep the vessel alongside, as well as counteracting the tidal stream.

Meanwhile, the AB from the inboard bitts moved to the port side to assist. Even so, the two ABs were unable to hold on to the stern lines, which were pulled out of their hands. At the same time, one of the ABs inadvertently stepped into a bite in one of the lines that quickly tightened around his foot and then carried him toward a fairlead as the line ran overboard. The second AB saw what was happening so grabbed the other AB and managed to push his boot off just before it became fast in the fairlead. Fortunately, injury was limited to a bruised foot, and the vessel was re-secured alongside without further incident.

The Lessons

1. **Letting go all lines when doubled up is asking for trouble. It is best practice to single-up before casting off unless there are sound reasons to do otherwise. It is also useful to take into account the practicalities of letting go when securing lines on arrival and to include the intended procedure and method for letting go during departure briefs and tool-box talks.**

2. **People are not mind-readers and cannot predict the actions of others. Do not assume that others will do as expected and don't slacken two lines if only one is intended to be let go.**

3. **In an emergency situation quick thinking is key, but taking a few moments to weigh up the pros and cons of alternative courses of action is just as vital. In this case, just a couple of seconds of thinking time was all that was required for the master to realise that stopping the thrusters would have led to his vessel being set upriver without any means of control.**

Exploding Grinding Disc

Narrative

The engineers on a large container vessel were overhauling a slow speed 2-stroke main engine cylinder. They had removed the cylinder head and piston and were getting ready to clean and calibrate the liner. The wear ridge formed at the top end of the cylinder liner had to be ground off before the new piston could be inserted. However, the grinding disc normally used for this was worn out. The second engineer found another one in the store, but the hole in the centre of the disc was larger in diameter than the original and did not fit the spindle of the hand-held pneumatic grinder. The second engineer promptly fabricated a spacer redesigned to make the disc fit. The grinder had a maximum rated speed of 22000rpm.

The second engineer put on a protective face mask and entered the liner with a ladder. However, as soon as he started grinding, the grinding disc exploded into several pieces. One piece smashed through his mask, hitting him just above his left eye, leaving a deep gash. He lost consciousness and had to be lifted out of the liner. He was hospitalised immediately and made a full recovery.

The crew could not determine the speed rating of the exploded grinding disc as there were no more similar discs on board. It was most likely to have been rated well below 22000rpm as most general purpose grinding discs are rated between 5000 and 15000rpm.

Figure: Damaged face mask with inset showing the exploded grinding disc

The Lessons

1. **Exceeding the safe operating speed of a grinding wheel can cause it to crack or disintegrate. When the wheel speed is doubled, the stresses it experiences are quadrupled. Always ensure that the tool's rotational speed does not exceed the maximum allowed speed of the grinding disc.**
2. **Face protection masks are not designed to withstand the impact of high momentum objects striking them. It was extremely fortunate that the second engineer did not lose an eye or suffer fatal injuries.**

Damaged Butterfly Lets in Water

Narrative

A fisheries survey vessel sank while alongside a marina berth. The vessel, a 17m long aluminium catamaran, had two independent engine rooms, each located in the port and starboard side hulls. The vessel was unmanned at the time of the accident.

When the vessel was salvaged it was noted that there was water leaking into its port engine room, through a ship side valve connected to the port main engine exhaust system.

The vessel had undergone maintenance, carried out by contractors in the week leading up to the foundering. The crew had reported water ingress and exhaust gas leaks in the port side engine room. Contractors had attended and had identified a defective section of corrugated exhaust pipe connected to the port main engine turbo charger. The decision was taken to remove the defective section of pipe (Figure 1) and to fabricate a new one at the contractor's workshop.

The vessel had a single butterfly ship side valve that was connected to the exhaust piping by a short section of rubber hose. The butterfly valve was closed by the contractors and the defective section of corrugated exhaust pipe removed. The remaining exhaust pipe, still connected to the butterfly valve by the rubber hose, was secured by a rope that kept the open end of the pipe above the waterline. There was no water ingress at this time.

Crew from the vessel attended on the day prior to the foundering and nothing amiss was noted.

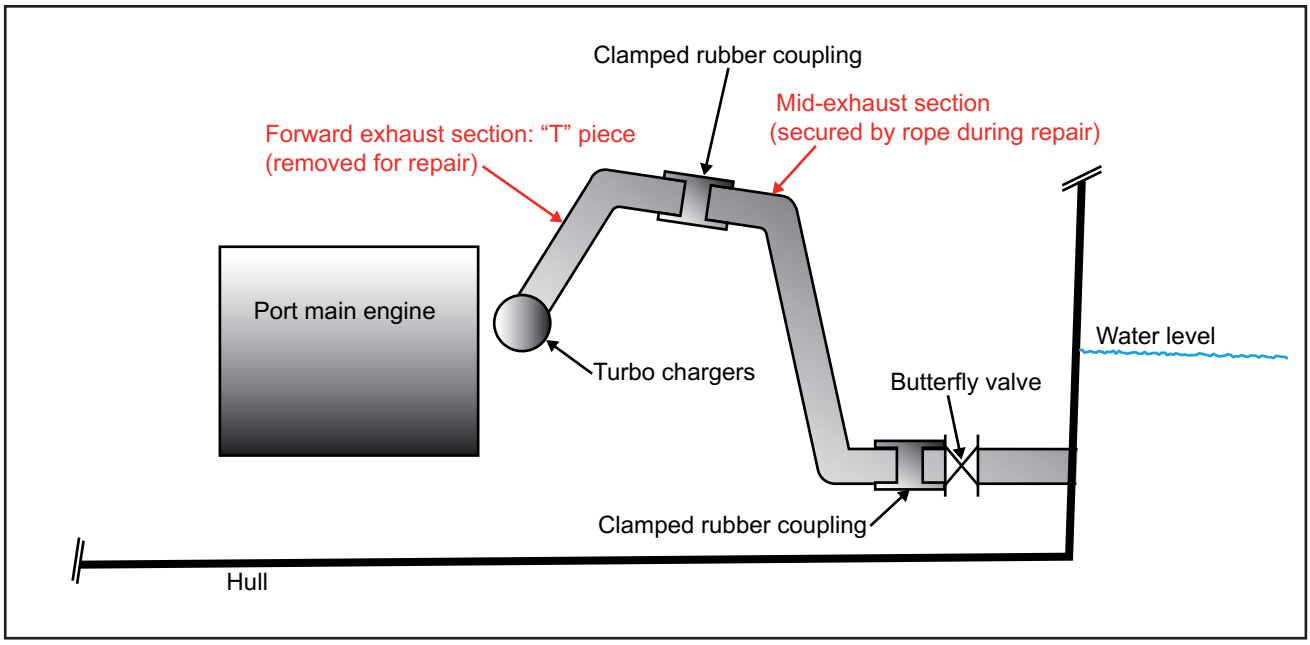


Figure 1: Port main engine exhaust

Conclusion

Following the vessel's recovery the affected ship side valve was checked in situ and it was found that it could not be fully closed. The valve was removed from the vessel; on inspection it was noted that the valve body was damaged (Figure 2). As found it would not have been possible to fully close the valve; this was not apparent to the contractors or the vessel's crew prior to the accident. The water ingress and subsequent flooding occurred as either the rope, holding the remaining section of exhaust pipe above the waterline, failed, or the short section of rubber hose connected to the valve lost its seal as it was lifted by the rope.

Figure 2: Defective butterfly valve

The Lessons

1. In order for this work to be successful the ship side valve needed to be fully closed. It was assumed that the valve was fully closed and no additional checks were made. Best practice, when working on any ship side valve and associated pipework is to make sure the valve is fitted with a suitable blank prior to any pipework being removed.

2. A single ship side valve is a single point of failure. Any associated works on a system connected to such a single point of failure must be fully risk assessed and appropriate control measures put in place prior to maintenance being undertaken to vessels afloat.

3. The vessel was unmanned, except for brief periods, between the pipework being removed and the vessel foundering. There was no alarm or monitoring system put in place to alert the crew to the water ingress and the problem was noticed only when the vessel began to sink. It would have been prudent to maintain some form of watch, or at least to have attended the vessel at frequent intervals during the period that the pipework was removed.

Maintenance Blindness

Narrative

Three crew members on board a 190m long bulk carrier were injured during berthing operations in a UK port when the accommodation ladder they were rigging collapsed.

Once the bulk carrier was moored alongside, the three crewmen were sent to rig its starboard accommodation ladder. The accommodation ladder was in its stowed position and needed to be un-stowed, lowered to the quayside and rigged ready for use.

Figure 1: Similar arrangement of accommodation ladder

The top of the accommodation ladder was hinged onto a turntable, which in turn was mounted on a platform attached to the ship's deck (Figure 1). The access platform at the bottom of the ladder was fitted with a set of collapsible handrails on either side.

The crew initially released the ladder's stowage securing arrangements and lowered it from its vertical stowage position to a horizontal position outboard and parallel to the hull of the ship, over the quayside. The bottom platform of the ladder was then lowered to a position just above the quayside. With the free end of the ladder still suspended from its winch wires, the three crew members started to descend the ladder in order to rig the handrails. As they did so, the turntable at the top of the ladder fell away from the ship and onto the quayside below. All three crew members fell off the ladder and were injured when they landed on the quayside. They were all taken to hospital for treatment and made full recoveries from their injuries.

The turntable at the top of the accommodation ladder was secured to the platform with a bolted central pivot pin, and was supported by two sets of roller bearings.

Upon investigation it was found that the failure of the accommodation ladder was due to the corrosion of the central pivot pin, which had caused the turntable to detach from its support platform (see Figures 2 and 3). In addition, the turntable's roller bearings were completely rusted and had seized solid. The surrounding metal structure of the platform was also wasted due to corrosion.

According to the ship's maintenance management system, the ladder, turntable and support platform should have been inspected and greased on a monthly basis. It was evident from the post-accident inspection, that the greasing point in the centre of the turntable had not been used for some time. It was also evident that the roller bearings could not be inspected or greased without unbolting the turntable from the platform, and dismantling it. There was no record of this task ever having been done.

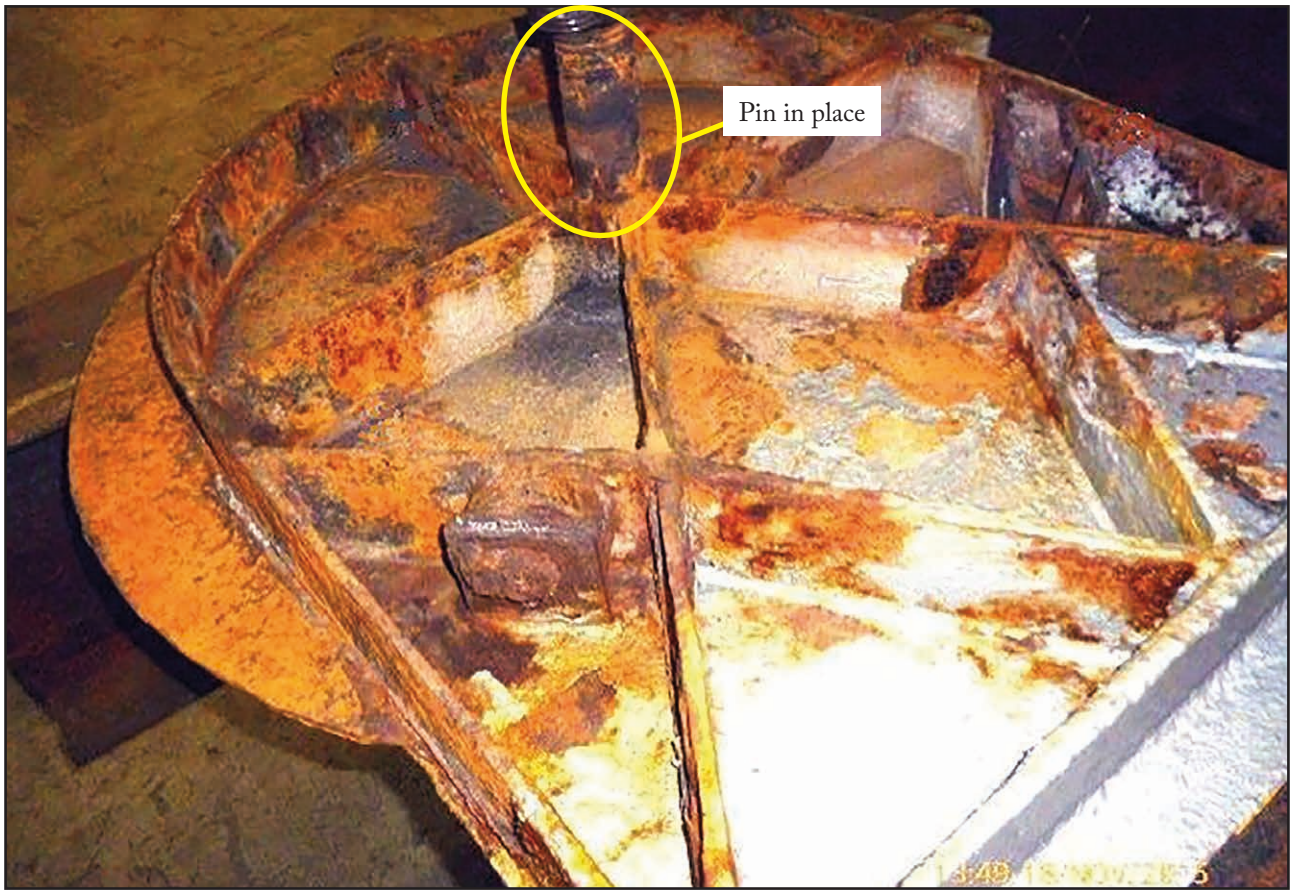


Figure 2: Port turntable (upside down) with pin in place

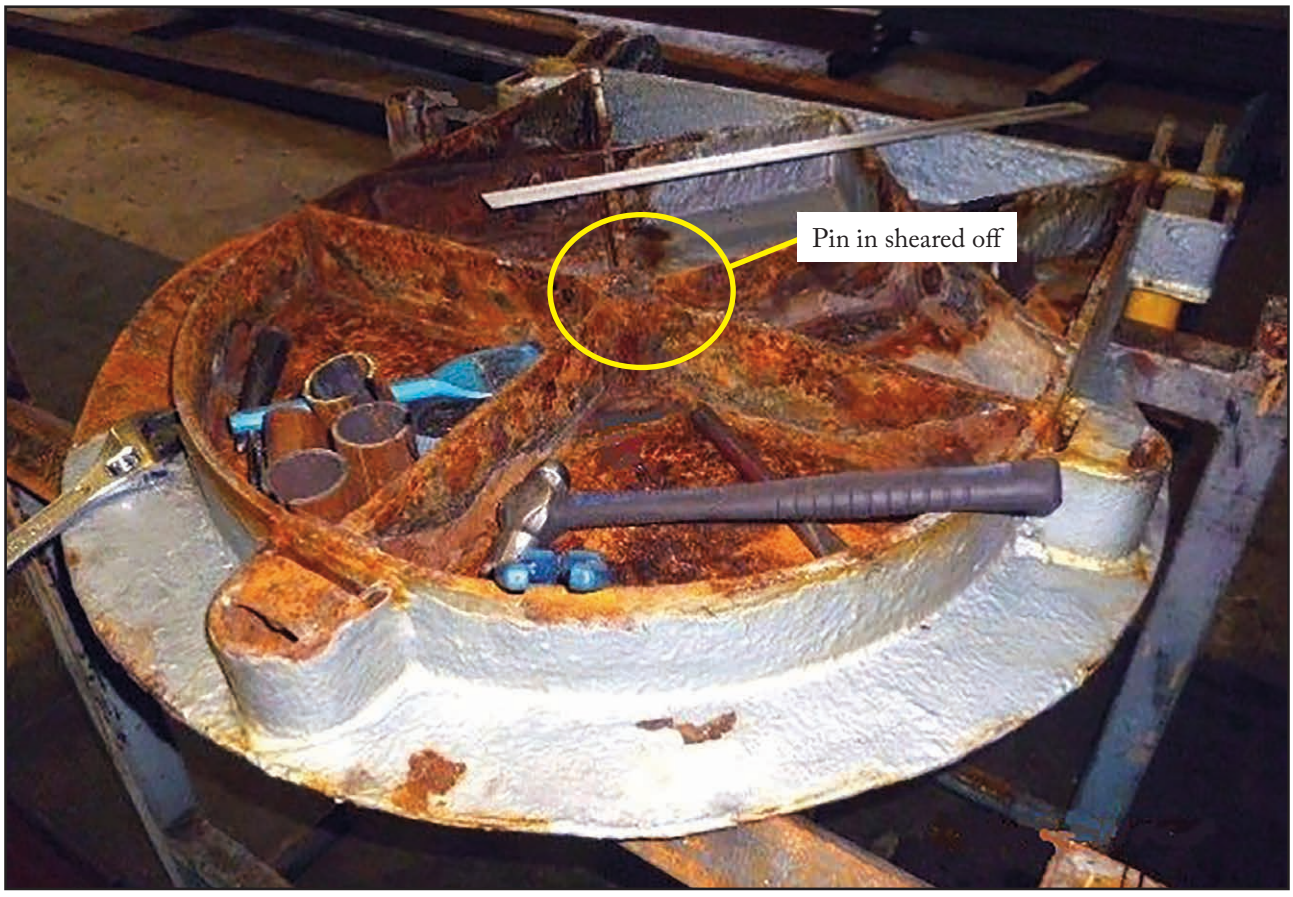


Figure 3: Starboard turntable (upside down) with pin sheared off

The Lessons

1. Accommodation ladders and their supporting platforms are often located in areas exposed to the weather. They are particularly vulnerable to salt water spray, which can accelerate metal corrosion if not adequately protected.

2. The importance of routine preventative maintenance is clearly demonstrated in this incident where three crew members were badly injured. It is very easy to miss out that one inspection or maintenance routine, particularly if at first glance the equipment looks in good condition, and proper inspection or maintenance would be difficult and time consuming. However, as in this case, looks can be deceiving, and the more accessible, well painted topsides of the turntable masked the poor condition of the structure beneath.

3. Maintenance, examination and testing of accommodation ladders have been highlighted in several bulletins from P&I clubs, and was identified as a contributing factor in MAIB report 8/2010 into a fatal accident. Section 4 of the IMO circular MSC.1/Circ.1331 'Guidelines for Construction, Installation, Maintenance and Inspection/Survey of Means of Embarkation and Disembarkation', specifically provides guidance on the maintenance of accommodation ladders and gangways.

Where's He Going?

Narrative

On a fine summer's afternoon, a domestic passenger vessel set off on a river trip with over 350 passengers on board. The crew comprised the master, mate and three customer service agents and the passengers included groups of school children.

The vessel made its way downriver, making good a speed of about 6.5kts against a 2kt tidal stream. The mate was at the helm in the wheelhouse while the master was on the top, open deck giving a light-hearted commentary on the sights and landmarks as they passed by. There were a number of other vessels in close proximity and the vessel was navigating close to moorings on the river's south bank.

The trip was going well until the passenger vessel unexpectedly turned or sheered to port towards a tug towing barges. The tug was only 100m away. Initially, the passenger vessel's mate did not take any action. He had not intentionally applied port helm and he therefore assumed that the tug had turned towards the passenger vessel. After several seconds however, the mate turned the helm hard over to starboard and moved the starboard engine control lever to full 'astern'.

At about the same time, the master saw the tug out of the corner of his eye and shouted a warning to the passengers.

By this time, the tug's skipper had moved the tug's helm hard over to starboard, but this did not prevent the two vessels from colliding. The passenger vessel then struck one of the towed barges, which resulted in significant damage to its bow and passenger saloon (see figure). The passenger vessel was then briefly pushed astern at a speed of almost 5kts before the master regained control and secured it alongside a moored barge. Nine passengers suffered minor injuries.

The passenger vessel was fitted with a rod and gear steering system and considerable force was required to turn the wheel hard over to both port and starboard while the vessel was making way with the engines running at their normal speed. It was also difficult to keep the vessel on a straight course. In addition, the forward and elevated position of the wheelhouse meant that the mate had no visual reference, such as the bow tip, to accurately judge the rate of turn. The rate of turn was frequently assessed by looking aft and watching the movement of the stern. No rudder indicator was fitted.

The Lessons

1. Hydrodynamic interaction is a phenomenon routinely encountered by many vessels in different ways such as 'squat' and 'bank effect'. These effects can be allowed for during passage planning but the effects of interaction resulting from a vessel passing other vessels and objects at close range are more difficult to anticipate. Therefore, when operating in confined water in close proximity to other vessels, the possibility of a sheer should always be borne in mind. Guidance on the dangers of interaction is provided by the MCA in MGN 199(M+F).

2. Effective steering is critical to vessel safety. If a steering system is difficult to use and the helmsman has no indication of the rudder angle and no visual references to gauge a vessel's rate of turn, difficulties are bound to arise. Equipment fit is not just about complying with regulations, fitness for purpose is just as, if not more, important.

The Fatal Consequence of a Routine Task

Narrative

A 29m ASD[1] harbour tug was being manoeuvred alongside an unmanned sister tug with the intention of making fast to it prior to moving it to another berth within a port. This was a routine task, frequently carried out by the experienced tug crews in the port. It was dark. The master was in the wheelhouse, the deckhand was forward and the engineer was on the main deck.

As the tug approached the unlit unmanned tug, the deckhand, who was positioned on the bow, lassoed a mooring rope onto the bitts on the bow of the unmanned tug. Using a portable radio he advised the master, who was in the wheelhouse, of the final positioning. The master made the necessary adjustments to the tug's position and began to thrust the stern of the tug towards the unmanned tug.

During this operation, it was normal practice for the engineer to lasso the midships mooring rope onto the midships bitt of the unmanned tug, and then to pass the stern line from his tug onto the unmanned tug before crossing onto the unmanned tug through a bulwark door to secure and make the ropes fast.

The deckhand made the first rope fast and ran a second line to secure the bows of both tugs together. The master looked aft from the wheelhouse and noticed that the stern rope was still flaked out on the deck; this was unexpected. He left the wheelhouse to obtain a better look and could not see the engineer.

With the bow ropes made fast, the deckhand walked aft. The master called to him, asking if he had seen the engineer; he hadn't. The deckhand noticed that the midships rope had been passed across between the two tugs, but the rope's eye was not over the bitt on the unmanned tug. Furthermore, the stern rope had not been passed across.

The deckhand straddled the bulwark of his tug with the intention of passing onto the unmanned tug to make the midships rope fast. He saw the engineer lying on the rubber fendering between the two tugs. He called to the master for help.

The master raised the alarm, the crew of a second tug came to assist and urgent medical assistance was requested from port control. The engineer was recovered onto the deck of the unmanned tug. Despite first-aid being administered by the tugs' crews and medical assistance arriving promptly, the engineer, who had suffered fatal crush injuries, was pronounced deceased at the scene.

It is probable that the engineer either slipped or tripped and fell forward as he exited an open bulwark gate in an attempt to pass between the two tugs before they had fully come together.

[1] Azimuth stern drive

Figure 1: Reconstruction of how the amidships mooring rope was found after the accident

Figure 2: Two tugs alongside each other

The Lessons

1. It had become common practice for the tugs in the port to be moved when their berths were required by other vessels. While it was possible for manned tugs to move unmanned tugs, as occurred in this accident, other options were available. These included fully crewing and moving each tug individually, or using a crew to provide deckhands to handle the ropes on an 'unmanned' tug so it could be moved by a manned tug. In the event, the crews chose to adopt a method that took them the least time but exposed them to the greatest risk as it required them to make the most transfers between vessels to unsecure and secure the mooring ropes.

2. Although tugs were frequently relocated within the port, the operation had not been the subject of a formal assessment, and the tug operating company had not issued specific instructions on how the task should be accomplished.

3. The job of moving unmanned tugs had become routine over time. The company had safe systems of work in place for mooring operations and for barge handling; both of these safe systems of work contained risk assessments and control measures that could have easily been applied to the task of moving an unmanned tug. A 'Tool-Box Talk' should be conducted before any hazardous task is attempted, even when the perceived task is deemed routine; this will allow all of those involved in the task to be briefed, hazards identified and an agreed safe procedure adopted prior to commencing the task.

4. No one witnessed this accident. As such it was not possible to determine exactly how the engineer ended up between the two tugs. It is most likely that he slipped, tripped or fell as he attempted to pass a mooring rope between the two tugs before they were alongside each other. No attempt should be made to pass between two vessels until they are firmly alongside each other, have stopped moving, and permission has been given by the master to cross.

The Engine That Ran Away

Narrative

A passenger vessel carrying 151 people made heavy contact with a pier when control of one of its two engines was lost and it 'ran away' (i.e. it suddenly increased to full speed). Although the pier and the vessel suffered significant material damage, the crew had instructed the passengers to sit down and brace themselves before the impact and none suffered serious injury.

A bottom end bearing bolt on one of the engines had failed, resulting in the connecting rod and piston assembly being ejected through the side of the engine casing. The engine's governor's fuel control linkage was broken by the flying debris, causing the fuel racks to be set to their maximum position. The engine began to 'run away', despite the absence of one piston. The skipper was unable to control the vessel with the other working engine, resulting in the accident.

The engine room was unmanned at the time of the accident. The first indication of trouble was the sounding of several machinery alarms in the wheelhouse. The engine speed was then seen to be rising uncontrollably. When the engineer went to the machinery space to check, he found that the engine room had filled up with smoke. He also found a piston, connecting rod and gudgeon pin of one unit on the floor plate near the engine.

Due to its age, the vessel was not required to be fitted with a fire detection system and the engine's technical manual included no instructions regarding the fatigue life of bottom end bearing bolts.

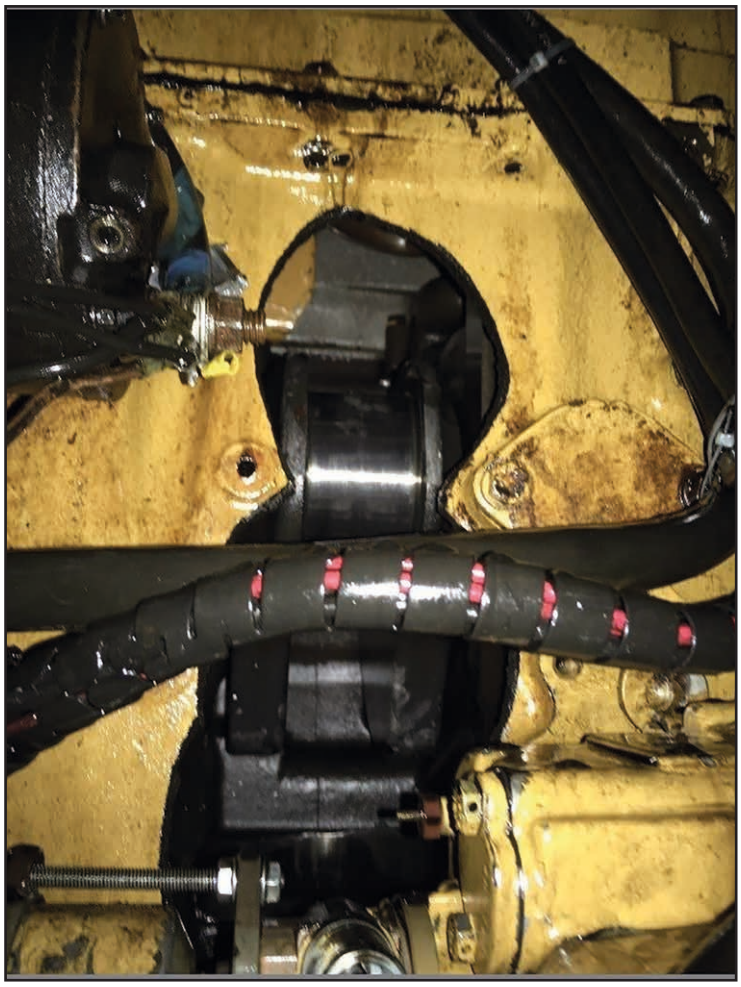


Figure 1: Crankcase damage caused by connecting rod/piston assembly

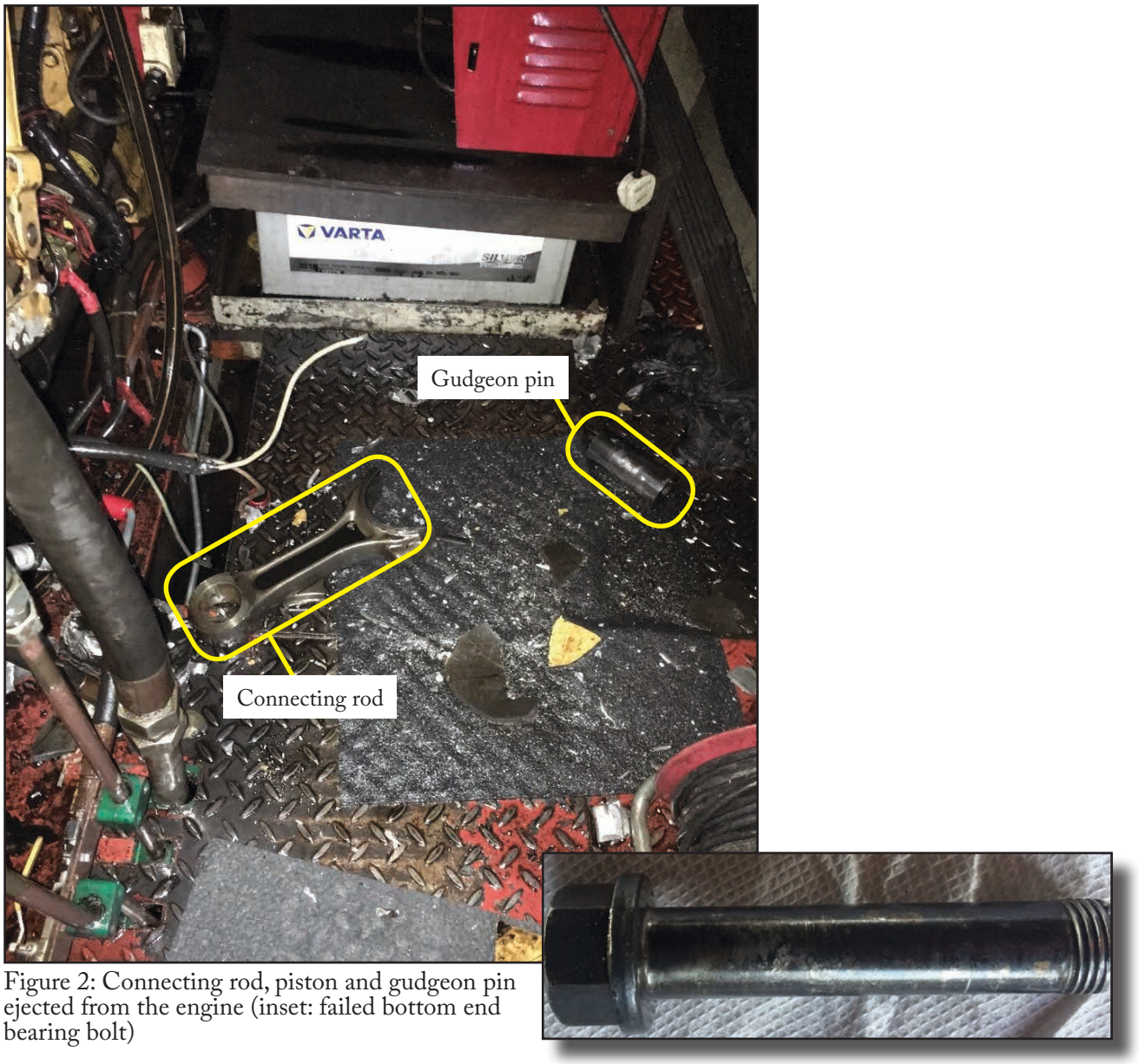


Figure 2: Connecting rod, piston and gudgeon pin ejected from the engine (inset: failed bottom end bearing bolt)

The Lessons

1. Some older vessels are not required to have a fixed smoke/fire detection system in their engine rooms. However, mandatory requirements for these will soon be introduced. Be safe and proactive by fitting an appropriate system before it becomes mandatory.
2. Bottom end bearing bolts have a fixed fatigue life. Consult the engine makers and implement their recommendations for replacing these on your vessels.

Blinded By Caustic Soda

Narrative

The chief officer on a loaded chemical tanker was attempting to clear a cargo line blocked with frozen 50% caustic soda liquor (freezing temperature +12°C). There were two other crew members assisting him on deck. They were wearing full alkali protection suits with goggles and face masks. Due to the strong wind, they had all found it difficult to keep the hoods of their suits in place and so had removed them.

Finding that the caustic soda could not be cleared by blowing the line through with compressed air with the drain valve open, the chief officer poured warm water over the line to melt the liquor. A large slug of caustic soda ejected through the drain valve and hit the drip tray under it. It rebounded off the tray and splashed the chief officer, entering under the edge of his protective mask and onto his face. He immediately wiped his face with the sleeve of his jacket, however this was already contaminated and his goggles came off in the process. He suffered serious burns to his face and complained of blurred vision and a burning sensation in his eyes.

The coastguard was informed and within a short time he was airlifted to the nearest hospital. Unfortunately the chemical had entered his eyes, resulting in total loss of vision in both eyes.

The Lessons

1. **Caustic soda is an extremely corrosive substance and should be handled with the greatest care. When solid caustic soda comes into contact with water it produces a significant amount of heat (exothermic reaction).**

2. **PPE should be considered the last defence against accidents. A thorough evaluation of the risks involved should always be carried out before undertaking all potentially hazardous tasks.**

3. **If the PPE does not fit, is not suitable for purpose, or cannot be worn for some reason stop the work until proper protection can be provided. Do not compromise your safety by continuing without effective PPE.**

When Steel Meets Granite

Narrative

During its normal daily service, a ro-ro ferry was approaching harbour at its full sea speed of about 20kts via a particularly narrow channel (Figure 1). It was mid-afternoon, the weather was fine, sea calm, visibility good and it was low water on a spring tide. The unusual tidal conditions in the area meant that there was about 3kts of tidal stream setting the ship off course to port even though it was low water.

The master was very familiar with the route and was using the visual leading transit marks for the harbour approach as the primary means of positional awareness. The chief officer was also on the bridge as well as the OOW and a helmsman, who was steering by hand.

The ship was fitted with an ECDIS system and the crew were certified for 'paperless' navigation. The ECDIS safety contour had not been adjusted for the local conditions and, although the cross-track distance (XTD) settings were appropriate, the audible alarm had been switched off.

As the ferry proceeded down the channel, the master observed visually that it was slightly to port of the intended track and made a succession of 2° heading alterations to starboard; however, these adjustments were insufficient to regain track and the ferry raked over a charted, rocky pinnacle. A heavy, shuddering vibration was felt throughout the ship as the outer hull was damaged along most of its length (Figure 2). The hull was breached in several places but the subsequent flooding was contained in the double-bottom void spaces.

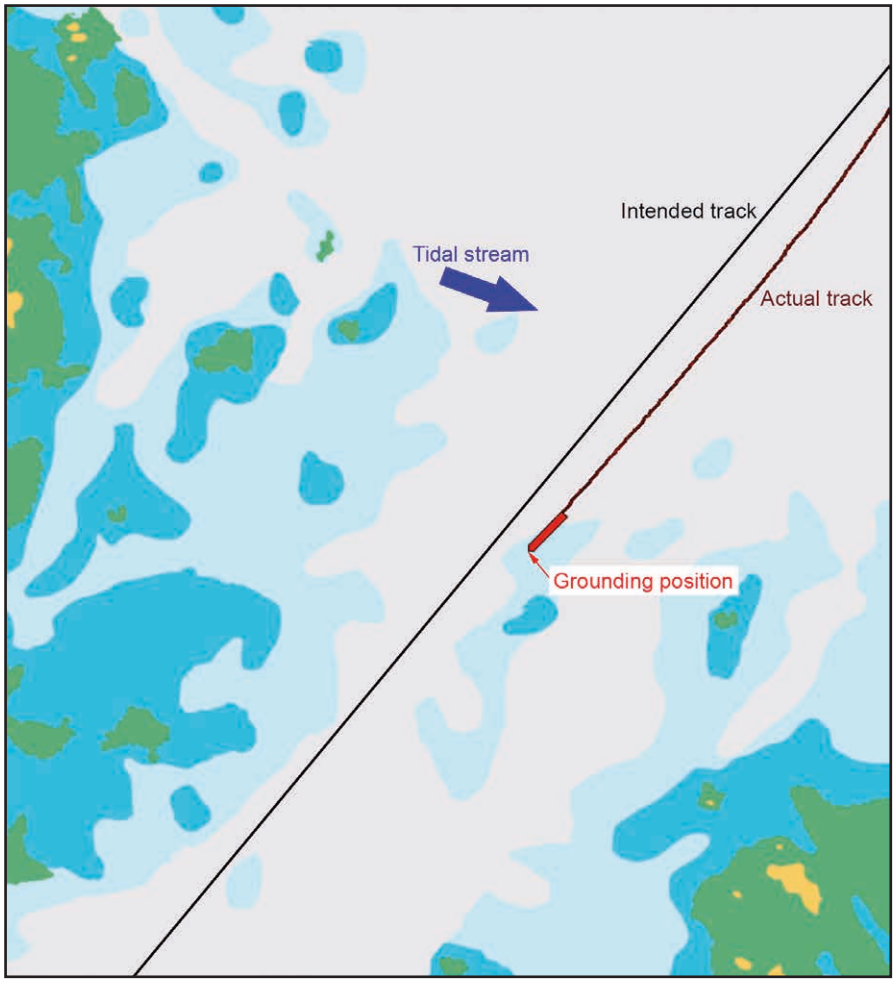


Figure 1: Chart showing the vessel's intended and actual tracks

The master thought that the vibration had been the result of the vessel's propeller or rudder picking up some fishing pots, and instructed the OOW to look astern. Nothing was seen. No alarms sounded on the bridge or in the engine control room and the ship responded normally to wheel and engine orders as the propellers and rudders had not been struck. The crew took no immediate action to identify or assess for damage and the vessel proceeded to its berth as planned. A subsequent, pre-planned dive survey soon found the hull damage.

Figure 2: Hull breach and raking damage

The Lessons

1. Passage planning is critical for every voyage even when the bridge team are extremely familiar with the route. In this case, neither the very low tide nor the effect of 'squat' when at high speed in shallow water had been taken into account. Had either of these factors been properly considered, it would have been apparent that it was going to be unsafe to attempt a high speed passage through the narrow channel. The master, chief officer or OOW could have completed accurate navigational calculations prior to the passage; had they done so, the danger would have been apparent. In addition, the master's alterations of course were insufficient to regain track given the strength of the tidal stream.

2. Bridge teamwork is vital. Because the master had not verbalised his plan beforehand and there had been no briefing, there was no shared appreciation of the plan among the officers on the bridge. This meant that the ability of the chief officer and the OOW to assist the master was limited as they were unaware of his intentions. A shared 'mental model' of the plan and a strong team ethic will help underpin confident, safe pilotage.

3. Even in pilotage waters when visual references are the primary means of positional awareness, ECDIS still has a role to play as an aid to navigation. In this case, the ECDIS was effectively being ignored; it was not set up correctly for the local conditions and the audible alarm was off. Had the safety contour been adjusted correctly, it would have been apparent that the channel was not safely navigable at low water. Equally, when the vessel passed outside the XTD, the alarm could have alerted the crew to danger. Under all conditions of navigation, including pilotage, it is important to ensure that ECDIS is correctly used.

4. Despite a shuddering vibration, the ship was not immediately checked for damage. This is understandable as there were no alarms, the ship was responding normally and the command priority was to enter harbour safely. Nevertheless, the crew should have taken immediate action to check for damage. Had this happened, the void space flooding would probably have been detected sooner.

Uncontrolled Release Clouds Discharge Operations

Narrative

A semi pressurised LPG vessel had arrived at a UK port to discharge a full cargo of propane.

After completing gauging and sampling, discharge operations commenced. The liquid manifold line was connected and discharge was via a cargo heater and booster pump in order to meet the terminal requirements in respect of delivery temperature and pressure.

Shortly after discharge commenced the deck watchman reported a gas release to the cargo control room. The chief officer activated the emergency shutdown (ESD) and informed the terminal. The ESD stopped the pumps and closed all system hydraulic valves. Discharging operations were then suspended.

The gas release was investigated by ship's staff who thought that it was due to the starboard safety relief valve (SRV) lifting. The investigating crew had noticed icing on adjoining vent piping and a hissing noise coming from the starboard SRV. The crew then used a field test kit (carried on the vessel) to re-seat the starboard SRV. Following use of the kit, the gas release stopped.

Shortly after seating the starboard SRV, the crew noticed icing on the port SRV body and vent piping coupled with a hissing sound in the vicinity. A few seconds later, a second dense cloud of gas was emitted from the vent mast.

Following the second release it was concluded that the port SRV had also lifted, and again the field test kit was used to re-seat the valve. However, this time it took almost 1½ hours to arrest the leak.

The vessel was moved from the terminal and anchored outside of the port while investigations continued. All of the SRVs were inspected and found to be free from leaks. The investigation concluded that dirt in the pilot valve line resulting from defective filters had caused the SRVs to leak.

The terminal was not satisfied by the conclusion of the initial report and called for further investigation. The subsequent investigation reviewed CCTV footage and vessel event logs and found that:

A vent high-level pot alarm had actuated just as the vapour cloud was seen. This indicated that the SRV had lifted and that liquid cargo was trapped in the line.

The investigation looked at cargo sampling procedures and found that a sampling line valve at the sampling station, leading to the cargo tank vent riser, had not been confirmed as being shut. Regular practice was to leave the valve open after sampling (to allow the line to drain) and to close it before discharge operations began. It is probable that the sampling valve was left open. Physical verification of the line-up also revealed that the sampling root valve (a lever operated ball valve) was not fully closed.

Crew interviews revealed that sampling had been done at the start of operations and that the sampling valves for the tank were closed. However, there was no recollection of closing the sampling station valve.

With both valves open, the sampling system allowed liquid to find its way into the vent line leading to the vent riser.

The ingress of cargo into the SRV vent pipe caused the vent pipe to cool and eventually fill up with liquid propane. As a result of liquid propane sitting in the discharge stack, a loss of resilience of the perfluoroelastomer o-rings (the SRV main piston seat and seal) could have occurred. If exposed to boiling propane

temperatures of -42°C, this o-ring material could have become rigid and lost its sealing ability. Loss of resilience of the main piston seal could have caused a loss of dome pressure and led to the piston cracking open, as well as the main seat leaking while seated. This led to the SRVs lifting, which resulted in the gas discharge.

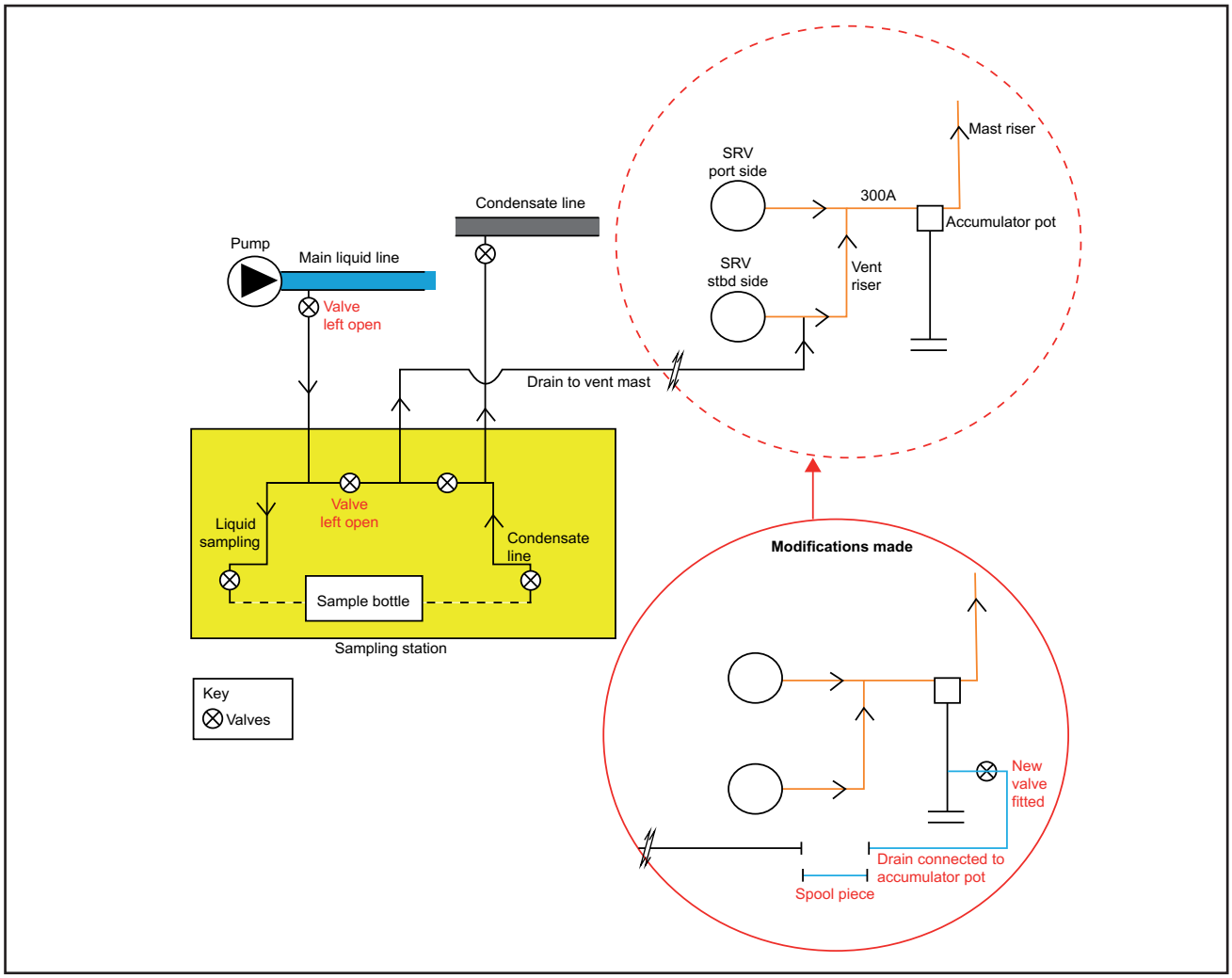


Figure: Before and after modification

The Lessons

1. As a result of the incident and subsequent investigations, deficiencies in both operational activities and system design were identified. The design of the system required operators to leave a valve open to vent the system, which then required the operator to return and complete the process. During discharge operations a number of concurrent activities can result in oversights. If a failsafe system cannot be designed then training and diligent operation are essential.
2. Incident investigation must be thorough and use all of the tools available. In this case, the initial fault diagnosis would not have solved the problem but might have covered up the underlying cause until a similar event occurred with potentially severe consequences.
3. In this case a relatively straightforward modification to the sampling system was carried out to prevent re-occurrence.

Part 2 – Fishing Vessels

I was honoured to be asked by the MAIB to write the introduction for the fishing vessels section of this Safety Digest.

I have spent the last 22 years at Seafish working on fishermen's training and fishing safety. My desk is covered in MAIB publications - accident investigation reports, safety digests, annual reports, research reports - they are all essential reading in helping me plan and prioritise Seafish's contribution to improving fishing safety.

There has never been a year in which no fishermen have died. Fishing safety has improved, but the rate of improvement is too slow. I do not accept that loss of life and serious injuries are inevitable consequences of the dangers of working as a commercial fisherman. Safety and the protection of our fishermen are paramount and must be put above profit. After all, there is little point making a living if you are not alive to enjoy it.

Here at Seafish, our objective is to help the fishing industry eliminate preventable deaths, an objective we share with all our partners in the Fishing Industry Safety Group (including industry Federations and Associations, the Maritime & Coastguard Agency, the MAIB, the RNLI's Fishing Safety Team and the Fishermen's Mission).

So, in terms of safety, there is a fantastic network of support available to fishermen, whether it is guidance on risk assessment and safety management via the Federations, port safety seminars via the RNLI or training via Seafish. However, responsibility for safety ultimately lies with skippers and they need to implement and enforce stricter safety regimes on their vessels.

The single biggest cause of death to fishermen in the UK continues to be when they unexpectedly end up in the sea. A lot of time, money and effort have been put into making Personal Flotation Devices (PFDs) available to fishermen, but they are not being worn and fishermen continue to die unnecessarily. It's time for skippers to show stronger leadership and lay down the law to their crew on basic safe working practices and personal protective equipment.

Anyone who knows me would be disappointed if I didn't say something about training. Training is vital to gain the knowledge and skills needed to do the job, and do it safely, but unless that learning is put into practice onboard the vessel, the full benefit is not realised. "Practice" is the key word. Onboard drills are a legal requirement, but not enough skippers do them. If you've got safety equipment onboard, make sure the crew knows where it is and how to use it, quickly and efficiently. Practice makes perfect. It could be your life that depends on it.

I encourage you to read through the following case studies, considering whether the same thing could happen on your vessel. Would you and your crew know what to do if it did? But most importantly ask yourself, "How do I prevent it happening on my vessel?"

Humans make mistakes. That's how we learn. MAIB publications provide fishermen with a unique opportunity to learn from the mistakes of others. Don't waste it. Read the case studies, then review and re-assess the working practices on your vessel and make sure they are as safe as they can possibly be.

Safe fishing.

Simon Potter

SIMON POTTEN
HEAD OF SAFETY & TRAINING AT SEAFISH

Simon's interest in the fishing industry stems from completing a degree in Fisheries Science at Plymouth Polytechnic in the 1980s. This was followed by eight years spent as a Researcher in the Fisheries Economics team at the University of Portsmouth. In 1995 Simon joined Seafish as a Fishermen's Training Adviser developing training programmes, qualifications and learning materials and supporting Seafish's network of Approved Training Providers and Instructors. Twenty-two years on and Simon is now leading Seafish's work on safety and training, which includes the work of Seafish's Marine Survey and Kingfisher Information Services teams. In his time at Seafish Simon has successfully drawn down many £millions of funding from a variety of sources to encourage and support fishermen wanting to undertake training. Simon represents Seafish on the Fishing Industry Safety Group and strives to ensure that Seafish contributes fully to the shared goal of eliminating preventable deaths in the UK fishing industry..

Cold Water Can Kill in as Little as 2 Minutes

Narrative

A skipper and his crewman set sail on a fine autumn day to their usual lobster fishing grounds. As usual, they were not wearing lifejackets despite there being two brand new ones on board, unused and in their original packaging. These lifejackets had been supplied to them free of charge.

The two fishermen worked seven fleets of creels and were in the process of shooting the eighth fleet. Their fleets had a steel weight attached at each end of the backrope. Once all the creels had been shot, it was normal practice for the crewman to pick up the second weight from its position just aft of the wheelhouse and walk it to the aft shooting hatch. This was done to avoid the weight damaging the vessel as it was dragged along the deck. On this occasion, as the crewman stepped across the moving rope to pick up the weight, his foot became caught in a bight of the backrope.

The skipper was watching his crewman and, seeing him fall to the deck he immediately put the engine to full astern. However, this was not enough to stop the crewman from being dragged overboard through the open shooting hatch (see figure) and into the sea, which was at 12°C. Being a non-swimmer the crewman struggled to stay afloat as the skipper manoeuvred the vessel to put the crewman on the starboard side. The skipper passed him a rope with a bowline loop at its end and the crewman put it around one leg. The skipper

then lifted him up using the hauler but, as he emerged from the water, the crewman was unable to hold his upper body upright and he fell back into the water and disappeared from view.

Within 2 minutes the skipper saw the crewman floating face down off the vessel's starboard quarter. The skipper again manoeuvred the vessel to place the crewman under the hauler on the starboard side, and managed to haul him back on board using a line attached to a grapple hook. Unfortunately, the crewman showed no signs of life and could not be revived. The cause of death was later given as cardiac arrest.

The Lessons

1. It is not unusual for fishing gear to become tangled and move in unexpected ways across the deck during shooting. The only way to stay safe is to separate the crew from the gear during shooting operations.

2. Falling into water below 15°C can kill a healthy person in 2 minutes. The initial gasp due to the shock of the cold water on your skin may result in water entering your lungs. This is followed by hyperventilation and a dramatic increase in heart rate and blood pressure that can lead to cardiac arrest. From 2 to 15 minutes your body will start shutting down and you will be unable to swim, climb a ladder or keep hold of a rope.

3. It is extremely difficult to recover a man overboard casualty and it is very likely that the casualty will not be able to help themselves.

    - Give some thought to the equipment you may need for recovering a man overboard casualty.
    - Make up a life-sized dummy and practise recovery from the water regularly.

4. Most man overboard accidents happen during calm seas. Always wear a lifejacket when working on the open decks. If you end up in the water it can save your life by:

    - Reducing the load on your heart as you won't have to struggle to swim.
    - Keeping you afloat and your face clear of the water, allowing you to breathe.
    - Assisting those recovering you by providing them with something to grab onto.
    - Increasing your visibility in the water, helping your rescuers find you.
    - Providing additional insulation, helping to keep you warm for longer.

An Unheard Alarm Means No Alarm

Narrative

A 16m wooden twin-rig prawn trawler was shooting nets with the vessel's skipper operating the winch controls located aft of the wheelhouse. It was daylight and the weather was fine.

Suddenly, the skipper smelled burning, which he assumed was coming from the engine room. He entered the wheelhouse, heard the fire alarm sounding, and decided to proceed to the engine room to investigate.

As he began descending the internal stairway, the skipper saw thick smoke coming out of the open doorway at the top of the stairwell leading down to the cabin. He could not get close enough to the door to close it. He shouted to the four crew, who were on the aft deck, to collect their lifejackets and to close the doors.

The crew were unable to collect their abandon ship lifejackets that were stowed in the burning cabin, so instead donned inflatable lifejackets that were stored in a locker on the aft deck. All five then mustered, deployed a liferaft, abandoned the vessel, and were rescued soon afterwards.

The vessel was eventually overwhelmed by the fire and foundered.

The Lessons

1. The fire almost certainly started in the vessel's cabin. Smoke then spread quickly, forcing the crew to evacuate the vessel rather than attempt to fight the fire. The ignition source has not been determined, but it is probable that the fire was caused by a poorly discarded cigarette that was not fully extinguished. Ensure everyone on your vessel knows where it is safe to smoke and that appropriate means are provided to enable cigarettes to be properly extinguished.

2. The vessel was fitted with an automatic fire detection and alarm system which, if activated, provided a visual and audible alarm in the wheelhouse. The alarm did not provide the intended early notification of a fire as it could not be heard from the winch controls, which were located aft of the wheelhouse. At any one time, it should be possible for at least one member of the crew to hear a fire alarm when activated.

3. The vessel's cabin contained a lot of combustible material to fuel the fire. This included spare bedding and the crew's personal effects, some of which might have been prone to spontaneous combustion. Good housekeeping, particularly on vessels in which crew are required to live aboard, is imperative.

4. The rapid spread of smoke could have been prevented had the vessel operated a closed-door policy or had the cabin door been capable of remote closure.

5. The vessel's abandon ship lifejackets were stored in the cabin and therefore were inaccessible due to the volume of smoke from the fire. Lifejackets and all other emergency equipment should be stowed in positions from which they can be readily accessed in an emergency.

6. The rapid and controlled abandonment of the vessel highlights the benefit of conducting regular emergency drills and ensuring safety equipment is properly maintained.

7. This accident demonstrates how quickly a fire can develop. Useful information for fishermen, including appropriate guidance on fire prevention and emergency procedures, is contained in the MCA's Fishermen's Safety Guide.

Fishermen DON'T Have to Die

Narrative

Just before dawn on a summer's day, the crew of a twin rigged stern trawler were repairing their fishing nets while the vessel was pitching violently in rough seas. The catch had not been very satisfactory after 3 days of fishing and one of the nets had been damaged when it hauled up a big rock. The skipper was keen to continue fishing and needed the nets to be repaired as soon as possible.

The skipper, intending to check the progress of the repair, left the bridge without putting on his oil skins or lifejacket, and went to the poop deck. He was wearing a t-shirt, jeans and slip-on shoes. When he saw that progress with the repair was slow, he decided to take over. He started cutting out the damaged section of the net while standing on the cod end, which was laid out on deck between the net drum and an open shooting port (see figure).

The vessel suddenly pitched forward, flinging the skipper against the net drum, and immediately afterwards pitched aft, throwing him on his back. He slid along the slippery net and fell overboard through the shooting port. The sea temperature was less than 15°C and within 15 minutes he had lost the ability to help himself in the cold seawater.

On board the vessel the second skipper did not take command of the situation and the crew's efforts were uncoordinated. They threw lifebuoys into the water, deployed the

manoverboard recovery net and the pilot ladder, and some crew members even entered the water to help him. However, the vessel was not manoeuvred to put the skipper in the lee and, as a result, his recovery back on board was delayed.

The crew finally managed to lift the skipper back on board using the deck crane with the assistance of a crew member in the water. He had been in the sea for 30-40 minutes and was unconscious; he had also inhaled a lot of water. Despite their best efforts to resuscitate him, the skipper died shortly afterwards.

The Lessons

1. Does your vessel have unprotected openings on deck through which crew members could fall overboard?
    a. It is mandatory to maintain a barricade with a minimum height of 1m all around the vessel. If your vessel does not comply, take appropriate action before you are stopped from sailing.
    b. Think carefully, do you really need such openings to shoot the net? Is there a safer alternative?
2. Do you have to mend your nets on exposed decks during rough weather?
    a. Can it wait until the sea calms down?
    b. Can you work in a safer area, such as the other side of the drum?
    c. Can you block the openings temporarily while you work near them?
3. Water below 15°C will incapacitate most people within minutes, stopping them from swimming or being able to keep hold of a lifebuoy. Wearing your lifejacket can save your life if you fall overboard.
4. Have you considered who will take over if the skipper is not available in an emergency? It is very important for a competent person to take charge during a crisis as an uncoordinated response is more likely to fail.
5. Are you holding frequent manoverboard drills? Consider the difficulties in recovering an incapacitated casualty from heavy seas and revise your plans and training accordingly.

Let It Go And Come Back Later

Narrative

A twin rig prawn trawler capsized in very rough seas. The vessel had been creeping for a lost net when the creeper snagged, effectively anchoring the vessel by the stern. Waves up to 9m high broke over the aft deck, swamping the net drum spaces (see figure) and the vessel started to list to port. Within an hour floodwater about 1m deep was found in the cabin space below the aft main deck. Although the crew used an electric submersible pump to remove the floodwater, the water level continued to rise and the port list also increased beyond 35°.

The skipper repeatedly tried to turn the vessel into wind, but he was unsuccessful. Eventually, he recognised the seriousness of the situation and instructed the crew to don abandon ship lifejackets and to prepare the liferafts. He also informed a nearby vessel that the vessel was in danger. Shortly after the skipper told the crew to launch the liferafts, the trawler capsized. Fortunately, he and the crew were able to scramble from the water into a liferaft. They were rescued by a nearby fishing vessel about 90 minutes later.

The trawler's skipper was cold and wet and fell into the sea as he climbed from the liferaft. One of the recuing vessel's crew quickly donned an immersion suit and lifejacket and

attached a safety line. He then jumped into the sea and secured a rope around the skipper, who was then hoisted on to the deck by derrick.

A stability assessment conducted following the accident indicated that the port list was primarily caused by the load on the creeper wire. It also indicated that the floodwater in the cabin space was probably due to downflooding through an air vent in the net drum space. Once the list reached an angle of 45°, the engine room would also have started to flood through its air vents.

The Lessons

1. **Creeping and the recovery of nets caught on fasteners significantly increases the risk of excessive rolling, listing dangerously and capsize, particularly in heavy swells or rough seas. The power and strength of winches, trawl wires and the sea when working together cannot be underestimated. If in doubt, it is safer to release snagged gear and to try again in favourable conditions. Further guidance on the hazards associated with the recovery of lost fishing gear can be found in MGN 415 (F).**
2. **All external doors, vents and portholes are potential sources of flooding. Knowing where they are located is part and parcel of vessel familiarisation. Always ensure that they are properly maintained and are closed in heavy weather.**
3. **When a vessel is listing heavily in rough seas, it is extremely difficult to carry out simple tasks, and capsize can occur without warning. In such situations, consideration of an early abandonment is warranted.**

Stay Dry, Stay Alive

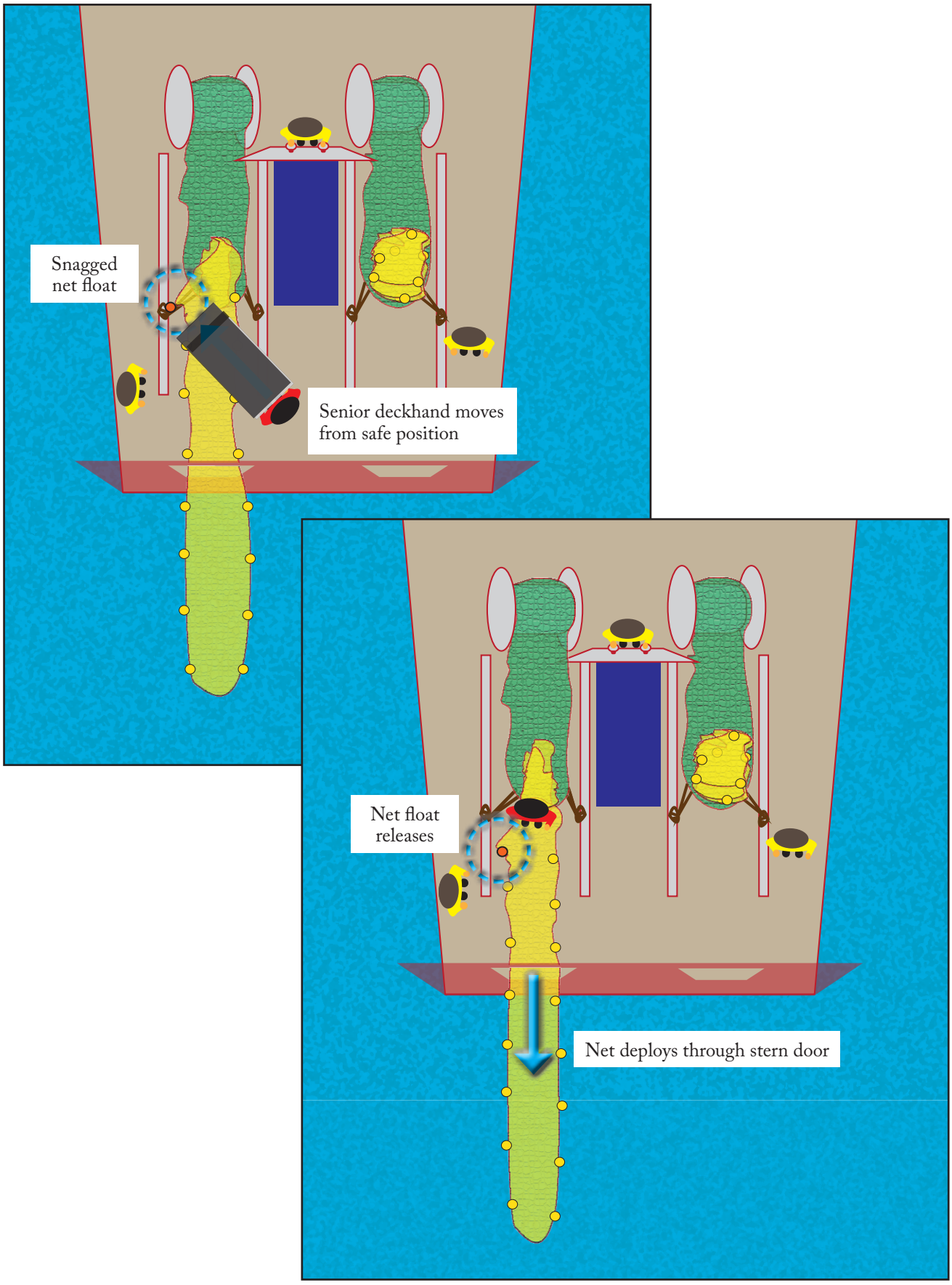
Narrative

It was late winter and the sea was rough as the deckhands on board a twin rig trawler started to shoot away the port net. Initially, the net payed out without difficulty, but it then became snagged. A net float had caught on one of the lashings.

The senior deckhand quickly moved on to the net to free the float. However, the net was under tension and, without warning, it suddenly released, carrying the deckhand through the stern doors and into the cold sea. His PFD automatically inflated and he managed to keep hold of the net.

The skipper was quickly alerted. He took the boat out of gear and the deckhand was soon hauled close alongside. Frustratingly, the vessel's violent rolling in the rough seas made it very difficult for the remaining crew to recover him back on board so the skipper requested the assistance of a nearby vessel. The crew tried frantically to rescue the deckhand. They threw lines, deployed an MOB recovery device and two of them even climbed down a side ladder to try and keep hold of the deckhand.

The crew's attempts were unsuccessful and the deckhand weakened as the minutes ticked by. He was eventually recovered onto a fast rescue craft from the nearby vessel after being in the water for 50 minutes. The deckhand was flown to hospital by helicopter but he did not survive.


Snagged net float
Senior deckhand moves from safe position
Net float releases
Net deploys through stern door

The Lessons

1. Shooting and hauling fishing gear are potentially dangerous activities in which fishermen are at risk of being dragged, carried or knocked overboard. Stay aware, stay vigilant and stay clear of the gear. If things don't go to plan, stop, find the problem, look at the options and decide on a safe course of action. 'Can-do safely' is much more effective in the long run than 'can-do quickly'.

2. Accidents can be avoided by looking out for the safety of others as well as your own. If you see someone standing in a dangerous position, shout and let them know. Encourage and expect others to do the same for you.

3. Manoverboard plans, procedures and drills probably don't seem to be such a waste of time and effort when looking up at your crewmates frantically trying to rescue you from rough, cold seas. PFDs help to prevent drowning, but cold water is still a killer unless rescue is quick and effective.

4. Alerting the coastguard and other vessels in the area should be among the first actions to be taken in the event of a man overboard. Why delay?

Keep a Lookout

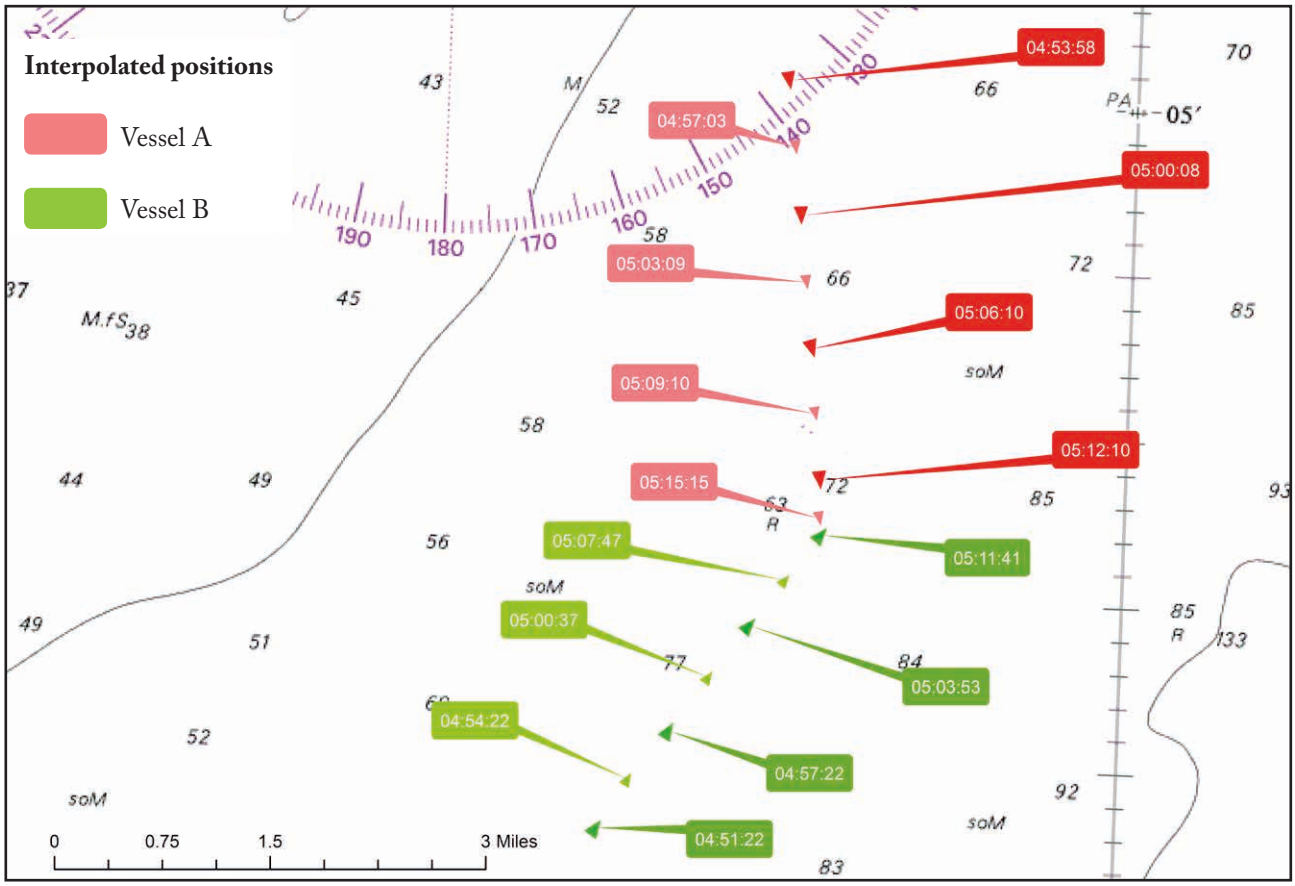
Narrative

Two wooden trawlers collided while steaming to their fishing grounds. One of the trawlers was badly damaged and started to flood rapidly, but the vessel's crew were able to transfer to the other trawler before it sank.

Trawler A was heading south towards the fishing grounds at 8kts. The skipper was alone, seated in the wheelhouse chair and had spent some time planning the day's fishing. He was not monitoring other vessels and he did not see Trawler B until seconds before the collision.

Trawler B had been drifting overnight and was heading north-east towards a pre-planned starting position for the day's fishing. The vessel's watchkeeper had seldom been in the wheelhouse during the 45 minutes before the accident but he stopped his vessel in its intended position and then went to wake the skipper and the rest of the crew. The watchkeeper had not seen Trawler A, which was only 0.6nm away and heading directly for Trawler B. It was only when Trawler B's watchkeeper returned to the wheelhouse that he saw Trawler A extremely close off the port side. Although he put the engine to full astern, it was already too late to prevent the collision.

Trawler A struck Trawler B's port shoulder. Trawler A's planking split either side of the stem and water flooded into the cabin space and quickly spread to the fish hold. Trawler B suffered only minor damage. The two vessels were manoeuvred alongside each other and Trawler A's crew stepped across to Trawler B. A DSC alert was initiated and the coastguard was informed of the situation by VHF radio. Trawler A soon sank; its EPIRB and liferaft surfaced moments later.



The Lessons

1. A vessel that is seen can be avoided. A vessel that isn't seen is an accident waiting to happen. Wheelhouse watchkeepers need to be well rested, alert and use all means available to keep a proper lookout. If you have never seen the guidance in MGN 313 (M) on keeping a safe navigational watch it is worth reading.

2. Leaving the wheelhouse unattended is fraught with danger. It is not only the best place from which to navigate, but it also houses safety-critical alarms to warn of fire and flood. No matter how quiet it is, wheelhouse watchkeeping is a full-time task. Other jobs can wait or can be done by somebody else.

3. Older wooden fishing vessels that do not have collision or other watertight bulkheads are susceptible to rapid flooding and foundering if damaged. Therefore, it is reassuring to know that if a crew cannot abandon before a vessel sinks, its EPIRB will alert the coastguard and its liferaft will provide temporary shelter – providing they are well maintained and correctly stowed.

Entrapment in Winch Leads to Severed Fingers

Narrative

An experienced skipper on a stern trawler handed over the winch controls to a deckhand and instructed him to haul the gear. The skipper was then returning to the wheelhouse when he put his hand on the winch to steady himself as the vessel rolled. The deckhand was looking aft towards the gear and hauled in on the winch, pulling the skipper's hand around and trapping it between the drum and the winch housing.

The crew transmitted a "Mayday" message to the coastguard, who tasked a lifeboat and rescue helicopter to attend. The skipper was airlifted from the lifeboat and flown to hospital, where it was found that his hand had suffered multiple fractures and severe loss of tissue. After lengthy surgery three of his fingers were reattached, but the skipper's recovery required numerous skin transplants over many months (Figure 1).

When he was well enough to return to the vessel and review the circumstances of the accident, the skipper implemented several measures to prevent any similar entrapment accidents:

- The skipper realised that the area in which the accident occurred was unnecessarily restricted due to the wheelhouse door opening towards the winch. He changed the door around so that it opened away from the winch, allowing clear access to the wheelhouse from aft of the winch (Figure 2).
- The side cheeks of the winch were exposed and there were no guards to prevent entrapment. The skipper therefore fitted metal plates to the winch housing (Figure 3) to prevent anyone becoming trapped in the future.

Figure 1

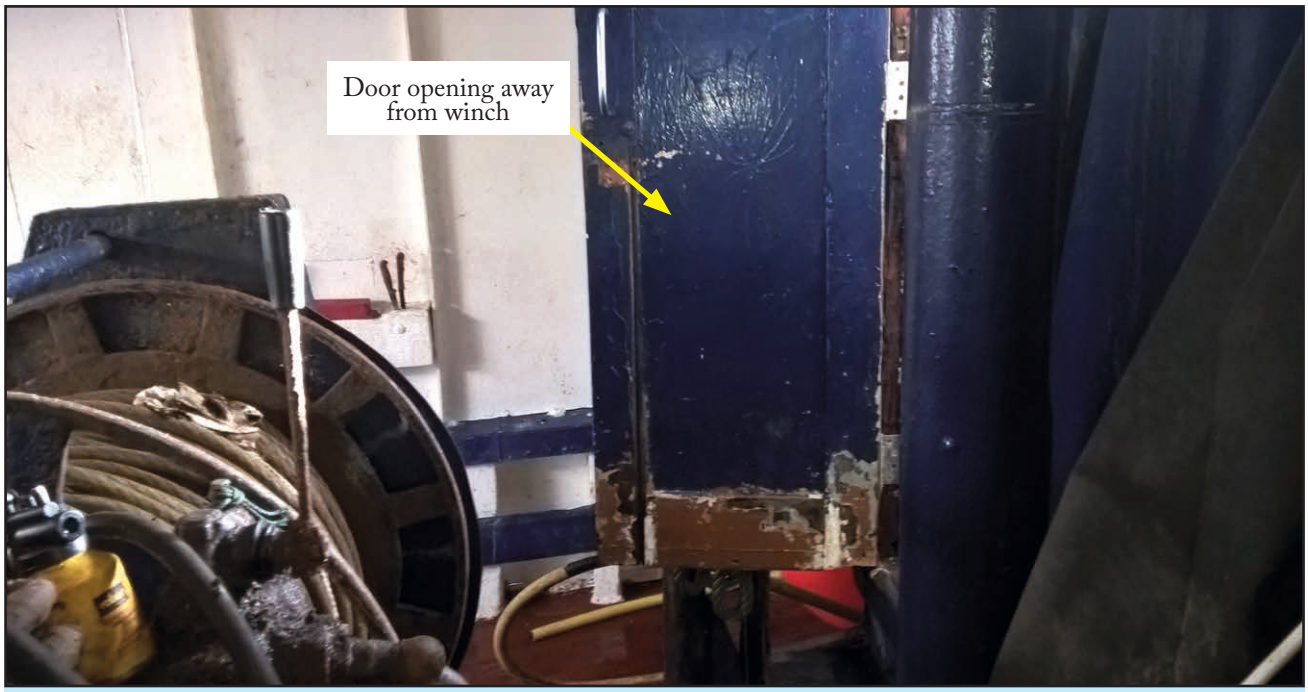


Figure 2

The Lessons

1. The risk assessment process can often cause skippers and crews of fishing vessels to go blank and be unable to think of and write down the hazards they encounter on board. However, one way of ensuring a safe environment on board is to consider accidents that have happened to others and ask yourself – could that happen to me or one of the crew?

2. Have a good look at this skipper's injuries and then look around your decks and winches. Is there anything you can do to prevent a similar accident on board your vessel?

Figure 3

One Hand For You, One For Your Chips

Narrative

Late one evening a local fisherman was seriously injured when he fell from a harbour wall ladder (Figure 1) to the deck of the fishing vessel below. The fisherman had been attempting to board his boat, which was rafted outboard of the one he landed on.

Due to a change in plans, the casualty's fishing vessel had remained in port an extra day, which left him alone on board and with little to do. In the evening, he decided to walk to a local pub. After leaving the pub, he went to a fish and chip shop and bought his supper. He returned to the fishing vessel berth with his food. On the way, he was seen by the boat's skipper, who drove past and saw that his crewman appeared to be under the influence of alcohol.

Later, the skipper decided to check that his crewman had got on board safely. When he arrived at the harbour wall ladder (Figure 2), the skipper saw the crewman lying unconscious on the deck of the vessel below (Figure 3), with his chips spread out around him. He called the emergency services and an ambulance soon arrived. The casualty was treated on the scene by paramedics and then taken to hospital for treatment. Despite suffering serious injuries, he eventually made a full recovery.

The distance from the top of the wall to the deck of the boat was about 6m.

Figure 1

Figure 2

Figure 3: Deck of fishing vessel

The Lessons

1. The, sometimes tragic, combination of excess alcohol and boarding vessels is well known. Everyone who works on board vessels of all types knows the risks they are taking. Access and egress to fishing boats is often more hazardous than most other types of vessels. Yet, the need for that one last drink all too often overrides the thoughts of personal safety. Is that drink really worth it?

2. The fisherman's decision to, not only be under the influence of alcohol, but also attempt to carry his food down a vertical 6m ladder was foolhardy. The effect of the alcohol appears to have increased the value of his bag of chips above that of his own life. Remember, one hand for you, and one for the ship (or ladder!).

3. It was obvious to the fishing vessel skipper that his crewman was intoxicated and his intentions were to board the vessel. Had the skipper intervened immediately, the outcome for the crewman might have been very different. Alcohol abuse on board any vessel should not be tolerated, but if you see a crewmate staggering towards danger, stop and help. Disciplinary action can wait!

Part 3 – Recreational Craft

'*Crossing the Bar*' is one of Alfred, Lord Tennyson's most famous poems. As a newcomer to the world of boats and boating, I appreciate the sentiments within the Victorian Poet Laureate's words. I left behind one world - a world of well-known celebrities, pun headlines and political tittle-tattle - and sailed into the next, the world of bow thrusters and personal locator beacons, carbon monoxide and kill cords.

Quite a sea change, if you'll pardon the pun.

When you enter a new world you need your wits about you for there are many dangers and pitfalls; if you want to stay safe and stick around, you have to pay attention to detail and remain alert at all times.

Familiarity breeds contempt and contempt is your enemy with all things to do with the sea. The reports in this issue highlight that all too clearly.

A skipper's hurried trip to the heads contributes to a collision with a ship and the death of his wife. Off guard while on holiday, he set his autopilot after checking on nearby shipping. But one ship altered course without warning while the yacht skipper was returning from below and the collision occurred.

In our second story, a sports coach in an open launch – rushing to catch up with his team – tumbles overboard. He has no life jacket and he is not attached to the open launch's kill cord. It takes more than a month to find his body.

And story number three highlights just how dangerous a combination of electric motors, engines and petrol fumes can become in the confined spaces of a boat.

You want to be able to relax while boating; it is after all a 'leisure' activity for many of us. Yet the dangers of relaxing too much are obvious.

Marine accidents are all too often the result of carelessness amongst those involved. Safety MUST factor into all your preparation as well as your actual boating, whether your voyage is about fishing, leisure, sport or just messing about on the river.

In my own particular sector, motor boats and yachting, proper use and maintenance of kill cords is of enormous importance.

A kill cord is a device which stops the engine should the helmsperson be thrown out of their seat. It consists of a length of cord or plastic wire connected to a kill switch on the engine or dashboard of the boat and to the helmsperson's leg.

If the helmsperson is thrown from their seat or out of the boat by a surprise manoeuvre, such as hitting the back of a wave or a loss of grip at the stern, the kill cord is pulled from the dash. The engine is cut and anyone in the water is spared further injury from the spinning propeller. It tends to be smaller, faster open boats such as RIBs, sportsboats and tenders that have them fitted.

Although they are not a legal requirement in the Recreational Craft Directive (RCD), the importance of kill cords cannot be overstated; the proper deployment of such devices can save the lives of those in boats or in the water.

The same can be said of the PLBs and lifejackets I mentioned earlier, though the irony of the skipper in our first report being saved partly because his automatic inflation lifejacket was faulty is not lost on me.

The valuable lessons in this report should be read over and over by all of you and committed to memory.

All three stories illustrate the need for constant vigilance or, like Tennyson, you may get your wish, and see your 'Pilot face to face' when you have crost (sic) the bar.

STEVE USHER
NEWS EDITOR, MOTOR BOAT & YACHTING MAGAZINE

I'm a 57-year-old Mancunian and I've spent most of my working life on national newspapers in various roles from sub editor to art director. I was Father of the Chapel of the National Union of Journalists at Express Newspapers for many years. I'm a sessional lecturer in journalism at the University for the Creative Arts.

Never, Ever Assume

Narrative

It was a clear summer's day. A 9.5m sailing yacht departed its marina with its owner, his wife and the two family dogs on board with the intention of enjoying a leisurely day sail. The boat was in good condition and well equipped for cruising. The owner was an experienced yachtsman and had sailed extensively both in the local area and further afield. Both the skipper and his wife wore lifejackets and their dogs wore buoyancy aids.

The yacht was initially motored out of the marina, the sails were set and the engine stopped once clear of a busy harbour. The breeze was light and the yacht was sailing at around 4kts. The sea was calm and visibility was excellent.

The skipper maintained a course to keep his yacht to the south of a busy shipping channel.

Figure 1: The dredger

After enjoying lunch in the cockpit, and in order to utilise favourable tidal conditions for the trip back to the marina the skipper decided to turn around, and he began to steer a course to take the yacht back to pick up the recommended yacht route into the harbour. The yacht was approximately 7 miles offshore. His wife was relaxing, lying on the starboard cockpit bench facing aft, leaning against the cabin bulkhead.

A ship had recently sailed from the port and the yacht's skipper watched this ship to his north proceed out of the harbour following the main shipping channel. He could see another ship a few miles further away, also proceeding out of the port in the main shipping channel.

At approximately 1326 the skipper engaged the yacht's autopilot; he could see the ship outbound from the port was still in the main channel and by looking at its aspect was content that there was no risk of collision. Leaving his wife relaxing in the cockpit he went below to visit the heads.

At about the same time, the outbound ship made a series of small alterations of course to leave the main channel. This was the ship's normal route and it followed the same track several times a day. This alteration of course put the ship on a collision course with the yacht. The yacht's radar echo was clearly visible on the ship's radar, yet the target had not been acquired and the OOW - who was alone on the bridge of the ship - had not visually sighted the yacht.

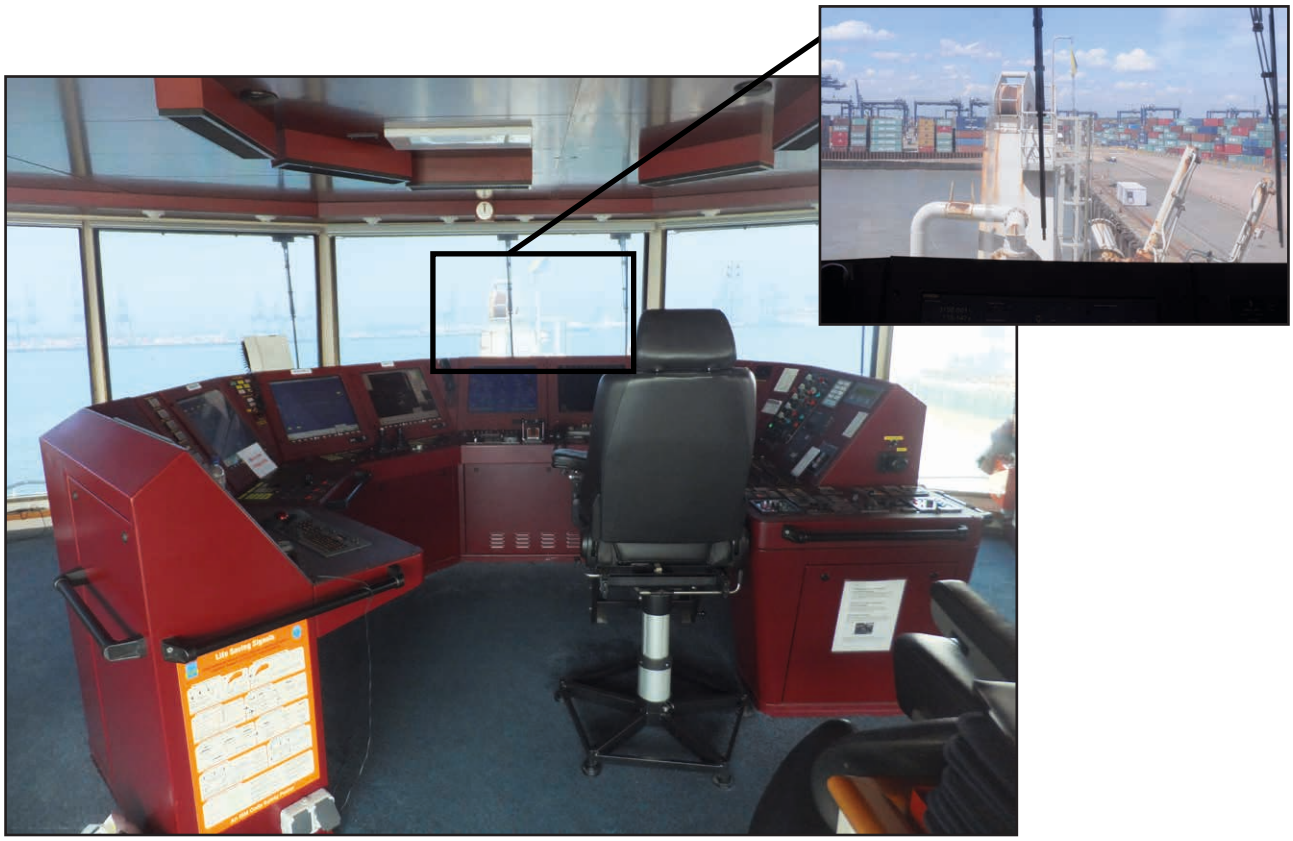


Figure 2: Bridge conning position (inset: obstruction)

Figure 3: Damage to starboard side of yacht

The yacht's skipper was making his way up the companionway steps when he saw the bow of a large vessel through the spray-hood. He shouted a warning to his wife and tried to make a lunge for the tiller. His actions were in vain and the two vessels collided. The force of the impact threw the skipper back down the companionway steps.

Damage to the yacht was catastrophic and it sank within minutes of the collision. The yacht's skipper managed to escape from within the sinking yacht and was rescued from the water by the ship's rescue boat. One of the dogs was also rescued. The skipper's wife could not be found despite an extensive air and sea search. Her body was recovered from the sunken yacht by divers the next day.

The Lessons

1. The yacht's skipper made an assumption that the outbound ship would remain in the channel and follow the ship that was ahead of it in the channel. When the decision was taken to go below, no risk of collision existed. Subsequent alterations of course by the ship resulted in both vessels being on a collision course.

2. It is essential that all vessels maintain a proper lookout at all times. Motor does give way to sail in most cases, nonetheless all vessels have a duty and requirement to keep a good lookout by all available means and to take avoiding action when it becomes apparent that the actions of the give way vessel alone are not going to be sufficient to avoid the risk of collision.

3. Leisure boat users should never assume that they have been seen by other vessels, nor should they assume that the other vessels will always take the correct avoiding action. In this case the yacht had a good quality radar reflector fitted high on its mast, and this provided a good radar echo. Yet due to the good visibility, the officer on watch on the ship was not using his radar and had not seen the target of the yacht that had been visible on his radar display screen for 12 minutes before the collision.

4. Leisure sailors need to be particularly aware of closing speeds between their own vessels and other vessels. In this case the ship was travelling at 12.9kts, but many types of vessels, including ferries, cruise ships and container ships regularly sail at speeds in excess of 25kts and, as a result, distances that initially appear sufficient can be reduced surprisingly quickly.

5. This yacht's skipper's automatic inflation lifejacket failed to inflate on immersion in the water as the CO_2 bottle was not correctly fitted to the inflation mechanism.

   Had the skipper's lifejacket inflated as designed, it is highly likely that he would not have been able to escape from within the sinking yacht. Nonetheless, in the vast majority of cases an automatic lifejacket is a lifesaver, and to remain effective, inflatable lifejackets must be serviced in accordance with the manufacturer's guidelines.

Alone, No Kill Cord, No Lifejacket, No Chance

Narrative

On a cold and dark winter's evening a rowing coach had difficulty starting the outboard engine on an open launch as he prepared to supervise a training session on the water. When he eventually started the engine he was well behind the group of rowers, who were accompanied by a second coach, also in an open launch.

While attempting to catch up with the rowers, the coach fell overboard. There were no witnesses and the first indication that something was wrong was when the launch was seen by people on the riverbank circling in an uncontrolled manner. They shouted towards the launch and heard returned shouts for help, but the coach was not seen so the coastguard was alerted.

The launch continued to circle until it collided with another boat on a river mooring. It then became entangled in the mooring and capsized. The launch was recovered to shore the next day. The body of the coach was discovered 36 days later a few hundred metres downstream of the rowing club; he was not wearing a lifejacket.

The Lessons

1. **The coach was not wearing the kill cord. Consequently, when he fell overboard it remained attached to the engine, which kept running. Therefore, there was no chance of the coach getting back on board and every chance that he would be hit by the circling launch. Kill cords need to be attached to the engine to enable it to be started, but they must be attached to the driver if they are to achieve their purpose.**

2. **It is not known how or why the deceased fell from the launch. However, if the outboard engine stopped after the launch had set off, attempts to re-start it could have resulted in the deceased being thrown overboard, particularly as the outboard engine could be started while in gear and its throttle was sticking. The increased risk of falling overboard when working on outboard engines is frequently not recognised - but it should be.**

3. **On open boats, lifejackets are an essential safety aid at any time, but the additional precautions of reliable communications, adequate lighting and the wearing of PLBs are also invaluable precautions. Particular care needs to be taken when driving a boat alone and at night.**

Petrol Fumes Plus Bow Thruster Equals Explosion

Narrative

A 17m sailing yacht was being manoeuvred in an anchorage in the Mediterranean when the owner, who was at the helm, activated the bow thruster to keep the yacht head to wind. There was an immediate explosion in the forward sail locker that blew many of the hatches out of the deck and badly damaged several bulkheads and other parts of the interior. Two crew members, who were on the foredeck preparing to anchor, were unhurt and the hull remained watertight. The owner was also unharmed.

On the previous day, with the professional skipper having left the yacht for a holiday, leaving the remaining crew member on board alone, a local fuel supplier had asked whether he could sell her any fuel. The 20 litre plastic fuel can that was used for storing petrol for the yacht's tender's outboard motor needed topping up so the transaction took place. The fuel tank was usually stored on deck but on this occasion the crew member stowed the can in the sail locker, which was located forward of the main accommodation areas of the yacht just aft of the anchor locker. The bow thruster was located in a compartment within the sail locker.

Yacht bow thrusters use powerful electric motors that may generate sparks as part of their normal operation. The full petrol can had released vapour, possibly due to a change in temperature or through having not been properly sealed, and this was ignited on the first operation of the bow thruster. Thankfully for all concerned the fuel can did not rupture in the explosion and there was no resultant fire. The yacht was transported to a boatyard for extensive repairs.

Figure 1: Typical bow thruster installation showing electric motor and dedicated batteries

The Lessons

1. Bow thrusters are becoming increasingly common on production yachts, sail and power, and are often located in areas of the interior that are difficult to access. It is worth remembering that they constitute a powerful piece of machinery and that the spaces they occupy need to be treated with respect. Figure 1 shows a typical bow thruster and dedicated battery installation on a similar yacht; in this case under a double berth in the forward cabin. Note that it is separated from the sail that is stowed in the adjacent compartment.

2. The yacht involved in this accident was approved for commercial use under the MCA's Small Commercial Vessel and Pilot Boat Code of Practice (MGN 280). At the time of the accident there were no paying customers on board, but stowage of the petrol can in the sail locker contravened the Code, specifically:

"*7.7.1 When spare petrol is carried on-board in portable containers, for any purpose, the quantity should be kept to a minimum, the containers should be clearly marked and should normally be stowed on the weather deck where they can readily be jettisoned and where spillage will drain directly overboard.*"

Where this is not possible the Code goes on to say that petrol can be stored in a compartment that is:

- vapour tight to the vessel's interior;
- not openable from the vessel's interior; and
- adequately drained overboard and ventilated to atmosphere. (7.6.1.1 of the Code).

APPENDIX A

INVESTIGATIONS STARTED IN THE PERIOD 1/09/16 TO 28/02/17

Date of Occurrence	Name of Vessel	Type of Vessel	Flag	Size	Type of Occurrence
02/09/2016	*Pauline Mary*	Fishing Vessel | Potter	UK	3.9 gt	Occupational accident (1 fatality)
20/09/2016	*CMA CGM Simba/ Domingue*	Cargo Ship | Solid Cargo | Container Ship Tug (Towing/Pushing)	UK Madagascar	11 062 gt Not Known	Capsize/listing
25/09/2016	*Hebrides*	Passenger ship | Ro-Pax Ship | Class B	UK	5 506 gt	Grounding
05/10/2016	*Sunmi/* PV *Patrol*	Cargo Ship | Solid Cargo | General Cargo Pilot Boat	Bahamas UK	2 825 gt 16.00 m	Occupational accident (1 fatality)
12/11/2016	*Vasquez*	Recreation Craft | Motor Cruiser	UK	7.58 m	Occupational accident (1 fatality)
20/11/2016	*Saga Sky/ Stema Barge II*	Cargo Ship | Solid Cargo | General Cargo Cargo Ship | Solid Cargo | Barge	Hong Kong UK	29 381 gt 12.6 gt	Collision
03/12/2016	*Muros*	Cargo Ship | Solid Cargo | General Cargo	Spain	2998 gt	Grounding
05/12/2016	*Typhoon Clipper/ Alison*	Inland Waterway Vessel | Passenger Work Boat	UK UK	181 gt Not Known	Collision
18/12/2016	*Graig Rotterdam*	Cargo Ship | Solid Cargo | Bulk Carrier	UK	24 187 gt	Occupational accident (1 fatality)
13/01/2017	*Nortrader*	Cargo Ship | Solid Cargo | Cargo Ship	Antigua & Bermuda	1934 gt	Fire/Explosion
19/01/2017	*Manhattan Bridge*	Cargo Ship | Solid Cargo | Container Ship	Japan	152 297 gt	Fire/Explosion (1 fatality)

Reports issued in 2016

St Helen
Collapse of a mezzanine deck on board a ro-ro passenger ferry at Fishbourne Ferry Terminal, Isle of Wight on 18 July 2014
Report 1/2016 Published 4 February

Vector 40R
Contact by a powerboat with a navigation buoy in Southampton Water on 13 May 2015
Report 2/2016 Published 24 February

Oldenburg
Fatality of shore worker while disembarking from a passenger vessel in Ilfracombe Harbour on 3 August 2015
Report 3/2016 Published 25 February

Good Intent/Silver Dee
Collision between fishing vessels resulting in the foundering of *Silver Dee* in the Irish Sea on 29 July 2015
Report 4/2016 Published 9 March

Kairos
Foundering of a fishing vessel while 70 nautical miles west of the Isles of Scilly on 18 May 2015
Report 5/2016 Published 9 March

Hoegh Osaka
Listing, flooding and grounding of a pure car and truck carrier on Bramble Bank, The Solent on 3 January 2015
Report 6/2016 Published 17 March

Karinya
Fire and foundering of a fishing vessel in the Moray Firth, 4 October 2015
Report 7/2016 Published 14 April

Cemfjord
Capsize and sinking of a cement carrier in the Pentland Firth with the loss of all eight crew on 2 and 3 January 2015
Report 8/2016 Published 21 April

Pacific Dawn
Drowning of a passenger in a swimming pool on board a cruise ship, while crossing the Coral Sea, South Pacific Ocean on 9 November 2015
Report 9/2016 Published 5 May

Asterix
Girting and capsize of a mooring launch at Fawley Marine Terminal, Southampton on 30 March 2015
Report 10/2016 Published 12 May

Carol Anne
Collapse of a crane on board a workboat, resulting in one fatality on Loch Spelve, Isle of Mull on 30 April 2015
Report 11/2016 Published 9 June

Hamburg
Grounding of a cruise ship in the Sound of Mull on 11 May 2015
Report 12/2016 Published 16 June

Enterprise
Fatal man overboard from a fishing trawler, north of Dogger Bank in the North Sea on 9 July 2015
Report 13/2016 Published 23 June

St Apollo
Grounding and flooding of fishing vessel in Inninmore Bay, Sound of Mull on 24 August 2015
Report 14/2016 Published 30 June

JMT
Capsize and foundering of a fishing vessel, resulting in two fatalities, 3.8nm off Rame Head, English Channel on 9 July 2015
Report 15/2016 Published 7 July

Majestic (LK678)
Foundering of a fishing vessel, 5 nautical miles off Yell, Shetland on 21 January 2015
Report 16/2016 Published 27 July

Arco Avon
Fire in the engine room on a suction dredger off Great Yarmouth resulting in one fatality on 18 August 2015
Report 17/2016 Published 1 September

APPENDIX B

Aquarius
Fatal man overboard from a fishing vessel, 2 miles east of Aberdeen harbour
Report 18/2016 Published 6 October

Svitzer Moira
Fatal accident while manoeuvring tug *Svitzer Moira* alongside an unmanned tug at Royal Portbury Dock, Bristol on 29 December 2015
Report 19/2016 Published 7 October

***Karen*/dived Royal Navy submarine**
Collision between a dived Royal Navy submarine and the trawler *Karen* in the Irish Sea on 15 April 2015
Report 20/2016 Published 12 October

Annie T
Man overboard from a fishing vessel with the loss of one life in the Sound of Mingulay, Scotland on 4 October 2015
Report 21/2016 Published 3 November

Harvester
Man overboard and subsequent loss of fishing vessel with loss of two lives off the Pembrokeshire Coast on 28 April 2016
Report 22/2016 Published 3 November

Apollo
Fatal man overboard from a fishing vessel 30nm north-west of the Orkney Islands on 18 April 2016
Report 23/2016 Published 3 November

Saint Christophe 1
Grounding, flooding and sinking of a French fishing vessel while alongside in Dartmouth Harbour on 10 March 2016
Report 24/2016 Published 16 November

Fredwood
Flooding of a fishing vessel after taking the ground on a drying berth in Maryport, Cumbria on 6 April 2016
Report 25/2016 Published 17 November

Our Sarah Jayne
Man overboard from a potter in the English Channel with loss of one life on 9 June 2016
Report 26/2016 Published 8 December

Daroja/Erin Wood
Collision between a general cargo ship *Daroja* and oil bunker barge *Erin Wood*, 4 nautical miles south-east of Peterhead on 29 August 2015
Report 27/2016 Published 22 December

Reports issued in 2017

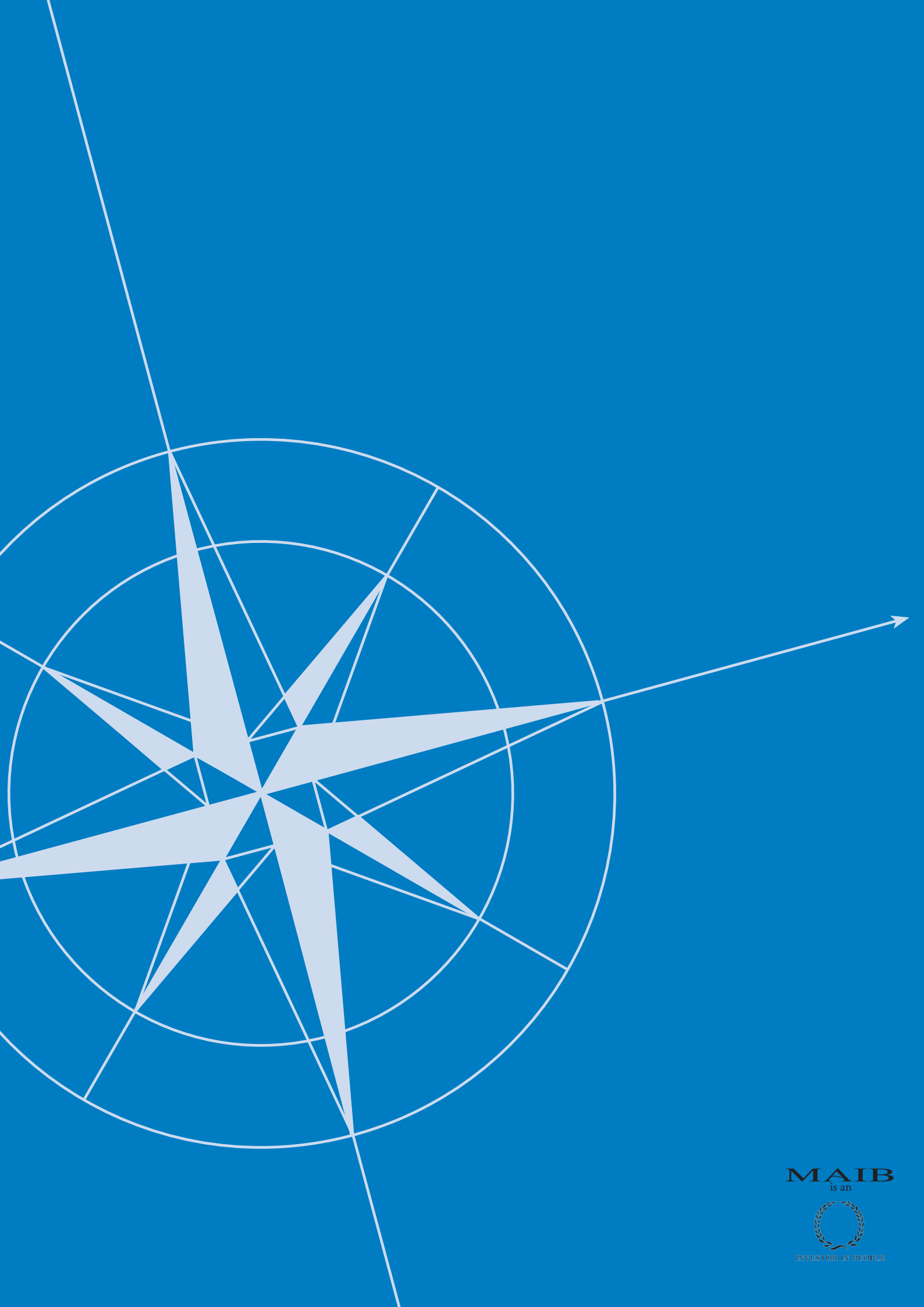
Johanna C
Fatal accident during cargo operations on board a UK registered cargo vessel at Songkhla, Thailand on 11 May 2016
Report 1/2017 Published 12 January

Toby Wallace
Fatal man overboard from an ocean rowing boat in the North Atlantic Ocean on 14 February 2016
Report 2/2017 Published 1 February

City of Rotterdam/Primula Seaways
Collision between the pure car carrier *City of Rotterdam* and the ro-ro freight ferry *Primula Seaways* on the River Humber on 3 December 2015
Report 3/2017 Published 8 February

Petunia Seaways/Peggotty
Collision between the ro-ro freight ferry *Petunia Seaways* and historic motor launch *Peggotty* on the River Humber on 19 May 2016
Report 4/2017 Published 8 February

King Challenger
Fatal man overboard from a scallop dredger off Scalloway, Shetland Islands on 23 June 2016
Report 5/2017 Published 2 March



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