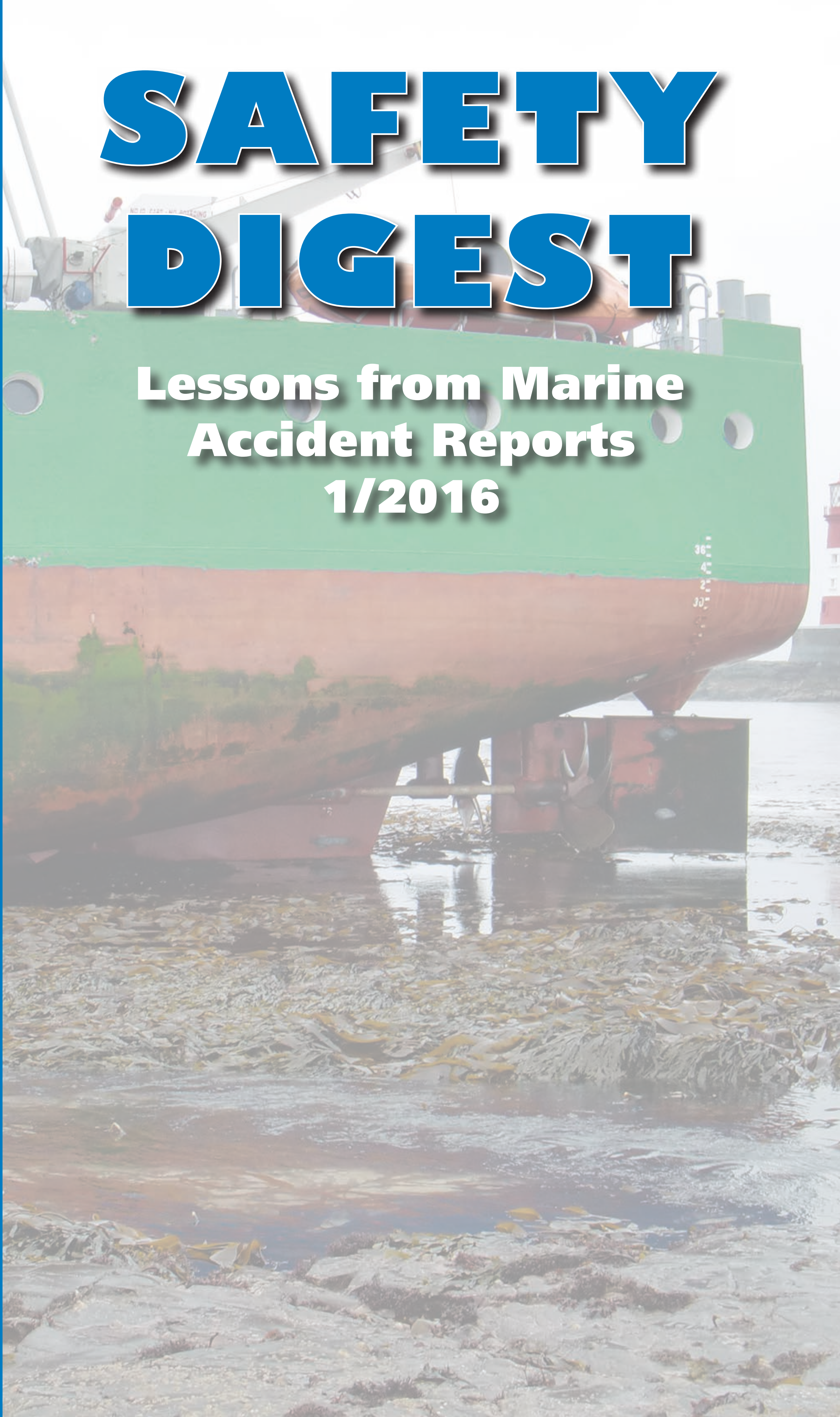
MAIB

MARINE ACCIDENT
INVESTIGATION BRANCH

SAFETY DIGEST

Lessons from Marine Accident Reports 1/2016



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Lessons from Marine Accidents

No 1/2016

MAIB

is an

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April 2016

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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MARINE ACCIDENT INVESTIGATION BRANCH

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

Extract from
The Merchant Shipping
(Accident Reporting and Investigation)
Regulations 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

2/O - Second Officer
AIS - Automatic Identification System
BA - Breathing Apparatus
BNWAS - Bridge Navigational Watch Alarm System
C - Celsius
CCTV - Closed Circuit Television
COLREGS - International Regulations for the Prevention of Collisions at Sea 1972 (as amended)
CPP - Controllable Pitch Propeller
CPR - Cardio-Pulmonary Resuscitation
ECR - Engine Control Room
EPIRB - Emergency Position Indicating Radio Beacon
FPD - Fall Preventer Device
GPS - Global Positioning System
IMO - International Maritime Organization
LPG - Liquid Petroleum Gas
m - metre
"Mayday" - The international distress signal (spoken)
MCA - Maritime and Coastguard Agency
MGN - Marine Guidance Note
OOW - Officer of the Watch
PA - Public Address
PFD - Personal Flotation Device
PLB - Personal Locator Beacon
RIB - Rigid Inflatable Boat
RNLI - Royal National Lifeboat Institution
Ro-Ro - Roll on, Roll off
SOLAS - International Convention for the Safety of Life at Sea
STCW - International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended
VHF - Very High Frequency
VTS - Vessel Traffic Services

Introduction

A recent article in a UK newspaper reported on the comments made by a Coroner during the inquest of a 7 year old child who had drowned in a hotel swimming pool while on holiday overseas. The Coroner had said that she would write to travel agents asking them to review the provision of lifeguards (there had been none at the pool where the child died.) Case 11 describes an accident in which a passenger drowned in the pool of a cruise vessel. In that accident, there was also no lifeguard poolside – in fact no attempt had been made by the ship's operator to assess the risk to its passengers when using the pool. The MAIB has recently investigated a number of similar accidents which have occurred on cruise vessels. In every case, the ships' operators have rejected suggestions that lifeguards be stationed poolside citing that the provision of additional warning signage about the potential risks of drowning is a proportionate response. The mix of holiday makers, swimming pools, food and alcohol provides an obvious pre-cursor for an accident, while the logistics and cost of providing a lifeguard to sit poolside on a cruise liner seem trivial compared to the benefits of preventing someone from drowning. However, in the interest of preventing the further loss of life, I sincerely hope the operators' assessment proves to be the correct one.

Regular readers of the MAIB Safety Digest will be aware that I often write about the poor risk awareness demonstrated by the crews of vessels which feature in MAIB investigations. I make no apology for repeating myself. A cautionary approach should be second nature to every mariner about to start a task or embark on a course of action on the bridge, in the engine room or on deck. It doesn't matter whether you are sailing on a large commercial vessel, fishing boat or small leisure craft; taking the time to ask oneself "what can go wrong?" and then making sure bad things can't happen before committing yourself to, for example a change of course or, an entry into a confined space is clearly a sensible thing to do. Sadly, MAIB Safety Digests contain many examples where this simple lesson has been forgotten or ignored - this edition is no exception.

Case 14 details how a failure to properly understand the risks of opening a main sea water line, or take appropriate measures to ensure the planned task was executed safely almost resulted in the loss of a ship. Think before you act; plan the task in hand and ensure you monitor the plan carefully. Above all, ensure that everyone involved in the task understands the plan and his/her role. Toolbox talks (see Case 16) can be a particularly useful way of ensuring a common understanding of how even the most basic tasks are to be carried out. If you don't already conduct toolbox talks on your vessel, give it a go! You will be surprised at how effective these are at improving risk awareness and encouraging better, safer ways of working.

In closing, I would like to thank Ian McNaught, Frankie Horne and Andy Proudfoot for their informative introductions to the relevant sections of this Safety Digest.

Until next time, keep safe.

Steve Clinch
Chief Inspector of Marine Accidents

April 2016

Part 1 - Merchant Vessels

The modern ship has become a very technology driven environment and that change has happened throughout my forty years at sea, and continues today. I can remember at the beginning of my career when Blue Star Line ripped all their radars off their bridges to avoid radar assisted collisions, and early ships I sailed on where the radar was only to be used in an emergency. Things have certainly changed since then.

We now live in a world of ECDIS and cockpit style bridges, but even so, I recently read a report from IALA stating that the number of groundings and collisions remains unacceptably high, imposing significant cost on the maritime community, the environment and the general economy.

I also recently read a letter from a Master of a large LNG carrier, who was especially interested in the design of modern bridges. He had observed how the OOW now sits in his chair surrounded by a plethora of navigation equipment, but also when the ship is UMS, he/she is expected to monitor the machinery spaces as well as handle communications. He also hopefully has a lookout at night. The Master pointed out that when he is sitting at his console the OOW is virtually precluded from looking out of the window by being so focussed on his internal screens and, as ever, he was concerned about technology driving down the size of the crew.

Both these points, a distracted OOW, reduced crew leading to fatigue, and indeed problems with technology on the bridge are reflected in this digest. There is clearly something going wrong, whether it is the standard and style of training which forms the attitudes of modern officers who are on the bridge, the equipment being put aboard ships, the style of management from ashore or the interface between them all perhaps. The technology is here to stay and we must embrace the benefits, but we must also ensure we train our officers accordingly.

For us at Trinity House, one of the more obvious results of this is that more of our physical aids to navigation are being damaged by collision from vessels. Using AIS data, it is quite clear that ships are being taken closer to danger and that passage plans are perhaps not as cautious as they once were. Over reliance on technology seems to allow the navigator to take a few more risks than perhaps is prudent, and looking at the screens from his chair, watching the ARPA and ECDIS presentations, with all the information provided on CPA, TCPA, vectors, AIS messages, the NAVTEX churning out warnings, GMDSS doing its thing and the VHF chattering away, there is a lot going on to distract the OOW.

One of the benefits of all these electronics is that now, of course, we know exactly when and who hit our navigation buoy or indeed one of our lightvessels. And I suppose, in the long run, it is better to hit the Aid to Navigation rather than run aground, although please don't feel encouraged to do this. My advice is that all the electronics are aids to navigation, but so too is the bridge window. Please look out of it, get out of your chair regularly and check the view out of the window. Doing so will give you the best view of the situation around you and that feeling of spacial and situational awareness that will help you make the best decisions to ensure a safe passage, backed up by the information on screen.

The clear narrative and concise advice given by the MAIB in the lessons learned from each incident in this digest are excellent and should encourage all of us to examine our own operations closely to ensure that our seafarers remain safe and that our shores remain free from environmental damage.

Ian McNaught

Captain Ian McNaught MNM

Ian was born in Sunderland. Having spent some time at sea with his father, who was a marine engineer, he decided to join the Merchant Navy and, after attending Fleetwood Nautical College for pre sea training in 1971, went to sea as a Deck Cadet with BP Tanker Company. This was followed by time as 3rd Officer with Bibby Line with service on general cargo ships and LPG tankers. He then moved on to Hullgates Shipping with service as Chief Mate on product and LPG tankers.

In 1987 Ian joined Cunard Line and after service on board QE2, Cunard Princess and Sea Goddess II, he finally gained command of Sea Goddess I, then command of QE2 until she was retired and thereafter Queen Victoria. His final commands at sea were Seabourn Oddyssey and Seabourn Pride.

Having come ashore in 2011, after 40 years at sea, Ian is now Deputy Master of Trinity House in London which is the General Lighthouse Authority for England, Wales, the Channel Islands and Gibraltar and is also the UK's largest endowed maritime charity. Ian is also now a trustee for RNLI, the Marine Society and Sea Cadets and is a Board Member at the Standard P&I Club.

Ian is married to Sue and their son, Steven, is the Navigating Officer on board P&O Cruises Britannia.

Turn on Time – Stay on Your Line!

Narrative

A tanker in ballast was on coastal passage but navigating near well charted and buoyed sandbanks; visibility was good in daylight, traffic was light but there was a strong northerly tidal stream. The master had directed the OOW to fix at 5-minute intervals when passing in close proximity to the sandbanks. The OOW, who was also the navigator, was alone on the bridge and correcting charts that had been delivered to the vessel just before sailing and were required later in the passage. When on a northerly heading (Figure 1), the radar alarm sounded on the bridge as the vessel crossed the safety corridor, 5 cables south of the new north-westerly heading. The OOW was not expecting the alarm and was unaware of the approaching turn; nevertheless, he plotted a fix then returned to working on the chart corrections.

Eleven minutes after the first radar alarm, it sounded again, this time to indicate that the vessel was exiting the 5 cable safety corridor plotted on the radar (also Figure 1). When this alarm sounded the OOW realised that he had missed the turn to the new course, so applied port helm and steadied on a westerly heading with the intention of regaining the planned track. The OOW did not fix the ship's position until 12 minutes after the turn was complete; this showed that the vessel was still significantly to starboard of the planned track so the OOW made a correction of a further 3° to port.

Fifteen minutes later, the OOW correctly recorded a fix in the bridge logbook but incorrectly plotted it 1 mile south of the vessel's actual position. This error led him to assess that the vessel was regaining track; however, a few minutes later, the strong northerly tidal stream caused the vessel to ground on a sandbank.

The Lessons

1. The first duty of the OOW is the safety of the ship. It is understandable that the OOW, as the ship's navigator, had a strong desire to correct the newly delivered charts as soon as possible. However, this proved a very significant distraction and the OOW lost situational awareness at a crucial point in the passage leading to the grounding. Without realising the immediate danger ahead, he also did not call for help.

2. Bridge management is about teamwork; there were sufficient qualified bridge watchkeepers on board for the master to have temporarily relieved the OOW so he could finish the corrections and complete the passage plan. The master's direction to use a 5-minute fixing interval when passing the sandbanks was not effective mitigation of the navigational risk that had been identified. It would have been more appropriate for the lookout to close up and for the vessel's master to have been on the bridge to monitor the navigation.

3. When the OOW took over the watch, he did not calculate the anticipated tidal stream, so was unaware of its effect. This proved critical as the heading adjustments made were insufficient to counter the tide's effect. Other measures could have been taken to closely monitor the track of the vessel, such as radar parallel index lines and close observation of the available visual clues such as the buoys.

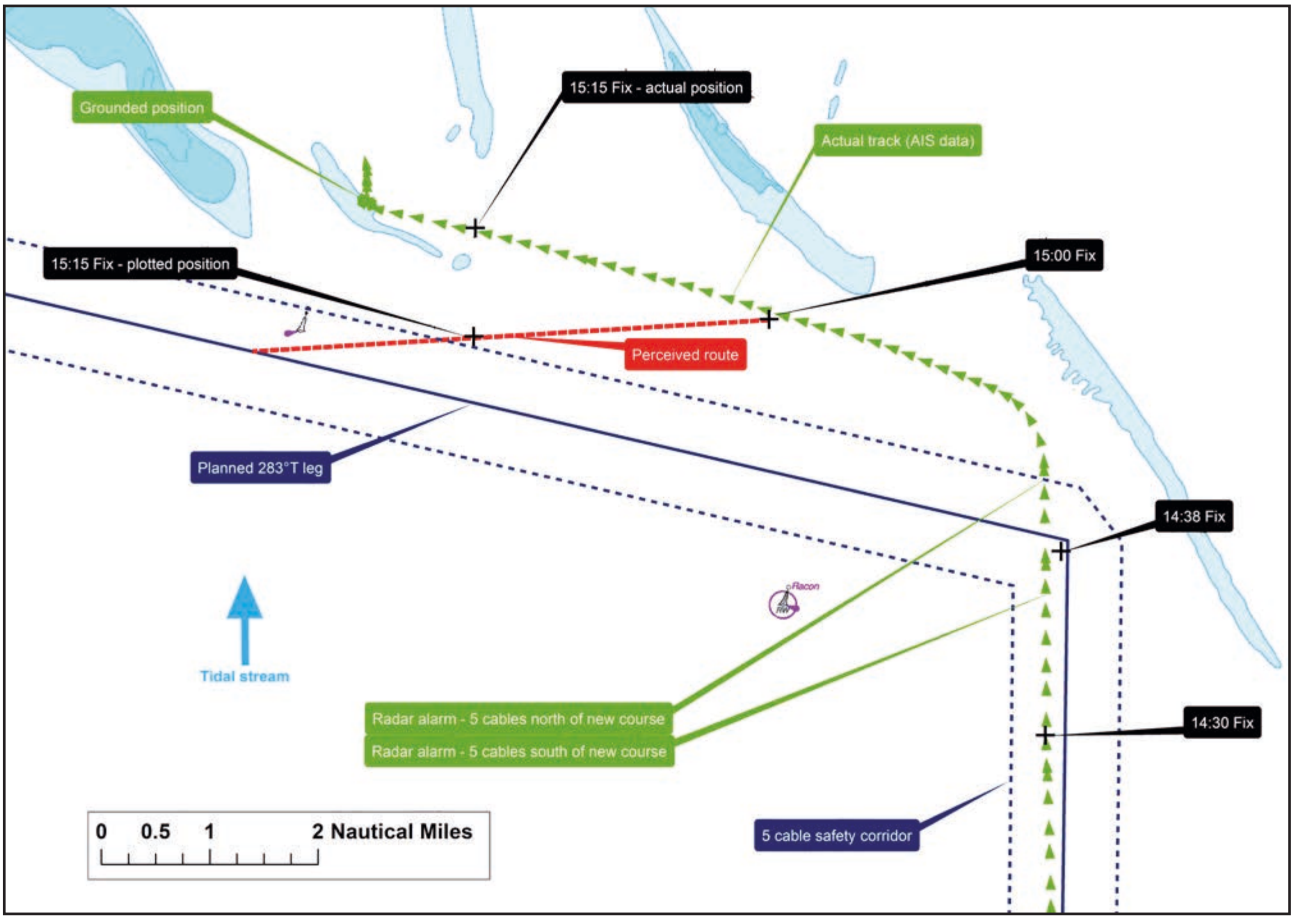


Figure 1: Analysis of perceived route

Lifeboat Drills - Practise, Practise, Practise!

Narrative

A Port State Control inspection on a refrigerated cargo vessel in a UK port found deficiencies in the crew's safety knowledge and training, leading to the vessel being detained. During the inspection, crew were required to conduct an abandon ship drill.

The port lifeboat was used for the drill, with six crew on board. It was lowered into the water and was manoeuvred away from the vessel before being returned for retrieval. With some difficulty the boat's crew managed to reset the lifeboat's hook release gear and attached the davit wire suspension links to the hooks.

Fall preventer devices (FPD)[1] (Figure 1) were connected to the fore and aft hook assemblies and the boat was recovered to deck level, where the crew disembarked before it was hoisted into its davit.

The crew then began to secure the lifeboat in its davit. Two crewmen entered the boat and a third, the bosun, was on deck below the boat to position and secure the gripe wires. The bosun had instructed the men in the boat not to release the FPDs until the gripes were both connected.

[1] The FPD comprised a synthetic sling with a shackle at each end, which was connected between the suspension link and the hook maintenance shackle of the forward and aft hook assemblies.

The aft gripe wire had been secured and the forward gripe wire was still being connected when a senior officer, who had not previously been involved in the task, instructed the crew in the boat to release both fall preventer devices.

The crew obeyed the senior officer and released the FPD shackles. When the forward FPD was disconnected, the forward hook opened and the davit suspension ring released. The forward end of the boat then fell onto handrails on the deck below, striking and injuring the bosun and damaging the lifeboat's hull (Figure 2).

Emergency services were summoned to attend the injured crewman, who was taken to hospital for observation. Fortunately, he was found to have suffered only minor injuries and was able to return to the vessel the following day. The lifeboat was removed for repairs and additional liferafts provided. The vessel was released from detention after the crew had undertaken training in emergency response situations.

Following the accident, it was established that statutory emergency drills, although recorded, were found not to have been carried out. This led to the crew's poor knowledge of how to operate the lifeboat release gear and other essential safety equipment on board the vessel.

The Lessons

1. **Emergency drills are a statutory requirement but, more importantly, realistic drills provide seafarers with the training to instinctively respond to emergencies in an effective way.**

2. **Always ensure that the crew are trained to understand the operation of essential lifesaving equipment and are encouraged to challenge orders or ask for clarification if they don't understand or agree with instructions.**

3. **Ensure that lifeboat release and retrieval gear is checked regularly and maintained in an operational condition.**

Figure 1: Fall preventer device

Figure 2: Lifeboat hull damage

Distraction Leads to Contact With Towering Structure

Narrative

An officer was at the helm of a domestic passenger vessel operating a scheduled river service when he became distracted by a VHF radio broadcast. The broadcast stated that a pier, which the vessel was heading for, had been temporarily closed.

The radio broadcast was made by the local VTS, and was received as the vessel approached a road bridge over the river. The vessel's course had been set to pass between the piers of the bridge.

The officer was aware that a local notice to river users had been issued by the harbour authority, which stated that the berth would be temporarily closed at a certain time for a ceremonial event. However, the VHF broadcast stated that the pier had already been closed - an hour earlier than the time given in the notice.

As the pier was located immediately after the road bridge, the officer decided to replay the VHF message in order to confirm the timing of the closure. The vessel was about 50 metres from the road bridge, making about 8 knots, when the officer replayed the VHF broadcast, which lasted 14 seconds.

While adjusting the VHF set and listening to the message the officer did not notice that the vessel had veered towards one of the bridge piers. When he looked up, the stone pier was close ahead, and although he put the vessel's engine controls to full astern and applied full helm, he was unable to prevent the vessel from making heavy contact with the bridge pier.

The master, who had been on the bridge wing, then entered the wheelhouse and made a public address (PA) announcement to warn passengers to hold on as contact was imminent. Unfortunately, the PA system had previously been set to broadcast an automated guided tour recording, so the master's warning was not transmitted to the passengers. This resulted in them being unprepared for the contact, and led to some of them being injured.

After the accident the vessel, which had been holed above the waterline (Figure 1), proceeded to a nearby berth where the emergency services boarded and assisted the injured passengers. The vessel was taken out of service for a few days while repairs were carried out. The bridge was undamaged.

Figure 1: Vessel was holed above waterline

The Lessons

1. Avoid becoming distracted when at the helm, particularly at critical parts of a passage. Although the information in the VHF broadcast was important, the officer should have ensured the vessel was able to remain on a safe course while replaying the message.

2. The ergonomics of the wheelhouse equipment resulted in the officer not maintaining a proper lookout while he replayed the VHF message. The location of wheelhouse equipment should be carefully assessed - preferably with input from bridge watchkeepers - before its installation.

3. The PA microphone did not override the automated guided tour recording. The ability to quickly inform passengers of emergency situations should be the main consideration when installing communications systems on passenger vessels.

4. The closure of the pier occurred at a different time to that given in the local notice issued by the harbour authority. It is important that event organisers update harbour authorities with any changes to their schedules so that the harbour authority can update users in a timely manner.

No Excuses – Wear a Lifejacket

Narrative

Two crewmen went ashore from their anchored workboat in a borrowed open dinghy (Figure 1). It was a hot summer's day in the Mediterranean and the crewmen thought that it was a good opportunity to stretch their legs and get some provisions. The short passage to the nearby marina, which was less than a mile away, passed without incident and the crewmen spent the next few hours in the town. They had a couple of beers and wines in local bars and bought a trolley full of provisions from a supermarket.

The crewmen loaded the provisions into the dinghy and returned the trolley back to the supermarket. However, by the time they were ready to leave the wind had picked up and the sea outside the marina was noticeably choppy. Consequently, the crewmen decided to wait in the marina bar until the conditions improved.

About an hour later, the crewmen decided it would be alright to return to the workboat. They were hungry and had no means of communicating with the two crewmen who had remained on board. The waters inside the marina were protected by a breakwater and the crewmen had no difficulty navigating towards the marina entrance. However, as soon as the open dinghy rounded the breakwater and headed towards the open sea, waves started to come over the gunnels. To reduce the water ingress, the dinghy was slowed and its heading was adjusted.

However, when the dinghy was turned again into sea about 100m from the workboat, it was quickly overwhelmed in the choppy seas. The dinghy flooded rapidly and started to submerge. The crew remaining on board the workboat saw what had happened and quickly collected two lifejackets, a life-ring and line. One of the crew then climbed into the life-ring, jumped into the sea with the two lifejackets and swam towards the men in the water. Unfortunately, one of the men in the water had lost consciousness and could not be revived.

Figure 1: The dinghy (circled)

The Lessons

1. The operating limits of small open boats can be easily exceeded when used in open and exposed waterways. Although conditions might look good when setting off, they can change for the worse very quickly. Don't take chances. Know the limitations of small boats and tenders, and carefully plan all trips taking into account the potential effects of changing weather, tide and visibility. Where necessary, delay, postpone or cancel.

2. It is always safer to wear a lifejacket when travelling in an open boat than not to. The effects of shock, injury or lack of fitness have the potential to reduce a person's chances of survival no matter how good a swimmer they are, how warm or calm the water is or how close they are to the shore. Lifejackets might not be a fashion accessory when going ashore – but they are not meant to be.

3. It does not take a lot of alcohol to impair judgment or make a person more likely to take risks. This is worth remembering when there is work to be done and lives are at stake. One drink can hurt.

Propelled Onto the Berth

Narrative

A large roll-on roll-off passenger ferry, operating on its regular route between two European ports, suffered significant damage when it made heavy contact with a linkspan as it was being manoeuvred onto its berth. There were over 500 passengers and crew on board but no one was injured and there was no pollution.

At about midday, the ferry's master arrived on the bridge and took over command from the OOW in preparation for entering port. The OOW remained on the bridge to assist the master. The master was manoeuvring the vessel from the bridge's centre console and was finding it difficult to identify which of its indicator lamps were illuminated. Realising the lamps had not been returned to full brightness after being dimmed overnight, the master attempted to adjust the brightness. Distracted by a conversation with the chief officer, he pressed the wrong button (Figure 1) and inadvertently switched the vessel's starboard controllable pitch propeller (CPP) from its normal control mode to its back-up mode.

The error was not spotted by the master or his bridge team as they continued towards the port. However, a few minutes later the engineers in the engine control room noticed that the starboard CPP back-up control system indicator lamp was illuminated on their console. Having not seen this before, they discussed its significance before deciding to take no immediate action.

As the vessel entered the port the master reduced speed by decreasing the pitch settings on the port and starboard CPP control levers. When the vessel's regular berth and vehicle linkspan came into view, the master went to the port bridge wing console and took control of the vessel's propulsion, steering and bow thrusters. The OOW confirmed that the transfer of control had been successful and then joined the master on the bridge wing. However, neither of them noticed the faint glow from the CPP back-up indicator lamp on the bridge wing console (Figure 2).

With the vessel closing on the linkspan at about 7.5 knots the master continued to reduce the propeller pitch settings. The OOW assessed the speed of approach to be too great and advised the master. The master made further adjustments but quickly recognised that the vessel was not slowing sufficiently, and attempted to swing the bow away from the berth by setting one CPP to zero pitch and the other to full astern. However, the vessel's bow swung rapidly the other way, towards the berth. In a final attempt to avoid heavy contact, the master set both control levers to full astern and the bow thrusters to full thrust away from the berth.

The master's actions proved ineffective as the vessel tore through the linkspan at a speed of about 7 knots and made heavy contact with the concrete berth (Figure 3). Almost immediately, bilge alarms, indicating water ingress into the vessel's forward spaces, began to sound. The pitch on both propellers was brought to zero but the main engines were kept running. The bridge team made safety announcements to the passengers, alerted the port authorities and requested tug assistance. The ship's crew conducted an initial damage assessment and carried out emergency damage control measures. While these efforts were underway, one of the vessel's CPPs was seen to be thrusting ahead, so its propulsion engine was stopped.

The vessel suffered significant material damage and had to be removed from service and put into dry dock for repairs. No one was injured and there was no pollution.

The investigation found that when the starboard CPP back-up control mode was inadvertently selected, the master lost bridge control of that propeller. The starboard CPP continued to thrust at over half ahead throughout the vessel's approach to the berth and up until its engine was stopped (about 2 hours after the contact).

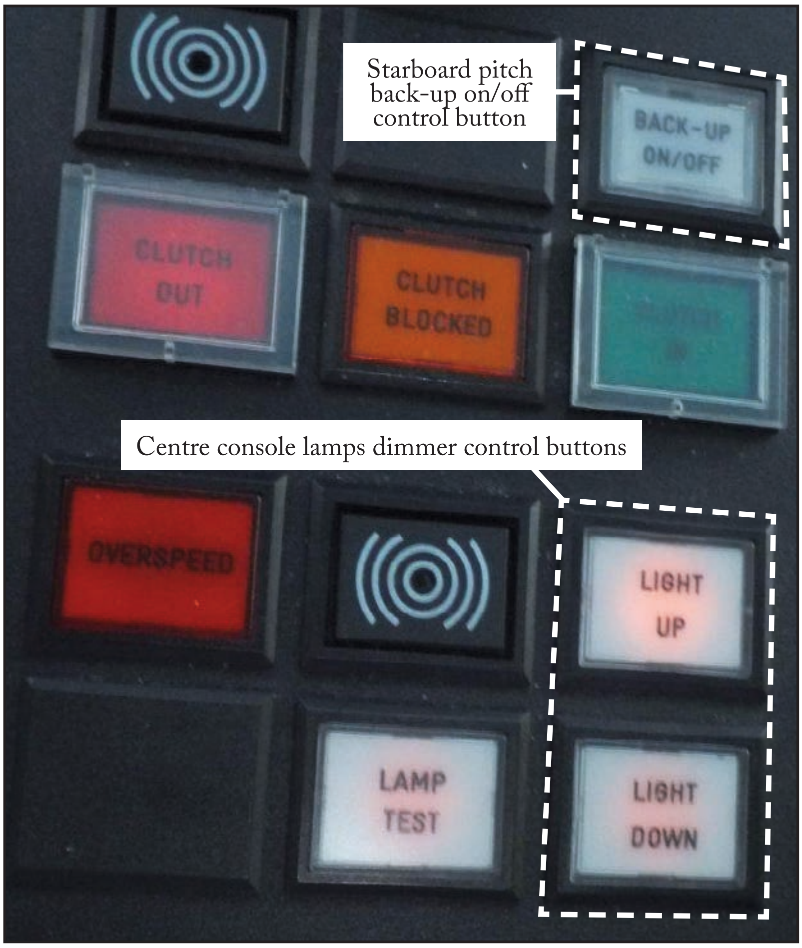


Figure 1: Part of bridge centre console indicator lamps

Figure 2: Bridge wing console CPP back-up control system indicator lamps

Figure 3: Damage to linkspan, mooring towers and berth

The Lessons

1. Ergonomically, the layout of the bridge console was not well designed. The close proximity of the safety-critical propulsion control buttons and the similar looking everyday use dimmer buttons, increased the likelihood of the type of human error seen in this case. There is always a risk that watchkeepers and equipment operators will inadvertently press the wrong buttons, particularly if they are tired or distracted. This type of risk is typically reduced on bridges and in engine control rooms by the fitting of protective covers over safety-critical buttons, switches and knobs.

2. The master was confident that he had control of his CPPs and did not look at the pitch indicators located on the control consoles. Had he done so he would have realised the starboard CPP was not responding to his orders.

3. The ship's engineers recognised that something was untoward well before the master had committed to his approach, but chose not to alert the bridge team. Had they done so, it is likely that the bridge team would have diagnosed and rectified the problem. Engineers are put on standby in control rooms during manoeuvring operations for a reason; not least to keep the bridge team informed of the status of all safety-critical systems.

4. The vessel's crew were all experienced and many of them had spent most of their career operating similar types of vessels with the same company. However, the bridge and engineering teams did not fully understand the vessel's propulsion control system and had not routinely tested their back-up and emergency controls. Regular testing of back-up and emergency control systems, and the conduct of machinery breakdown drills, provide the most effective method of ensuring the crew fully understand their ship's systems and are best prepared to respond in an emergency.

Overexcited Overboard

Narrative

A group outing for three mothers and their four children nearly ended in tragedy when one of the children fell overboard from a river ferry after standing on a seat next to the ship's side rails.

The ferry had docked and one of the children, a 3-year old girl, was standing on an upper deck seat to get a better view. Whilst her mother was distracted by the other children, the girl climbed further up the slatted seat back and balanced on her stomach on the top handrail to look over the side at the quay (Figure 1). Suddenly, she over-balanced and fell overboard, cartwheeling down into the river between the ferry and the quayside. Luckily, the tide was at slack water, and the quick thinking and bravery of one of the crew on board, who jumped into the river to rescue the child, prevented this accident from becoming a tragedy.

Figure 1: Position of child prior to falling overboard

Ships' side rails are installed to protect individuals and reduce their chance of accidentally falling overboard. On this particular vessel the side rails were 1100mm high, which was higher than the mandated minimum. However, seating was arranged next to the side rails, which meant that if someone stood on the seating, the effective height of the rail from the seat to the top was reduced to approximately 635mm. This then introduced a hazard, which had been recognised by the management through its PA safety announcements which were made before each crossing of the river. These asked passengers .. *not to stand on the seats...* There were also safety signs posted on the seats stating *'No Standing on Seats'*.

The warnings provided by the safety announcement and on the safety notice attached to the seats proved to be insufficient to prevent the passengers from standing on them occasionally.

Figure 2: Promenade deck with guard rail seating removed

The Lessons

1. Passengers – both adults and children – enjoying a river cruise are often keen to get a good view, and therefore will want to look out from the vessel rather than face inboard. It is therefore not at all surprising that young children will want to stand or kneel on seating. By rearranging it such that it is away from the ship's side, this ferry operating company has significantly reduced the risk of a child falling overboard. All passenger vessel operators should review and risk assess the positioning of passenger seating.

2. It is important that passengers listen and adhere to safety instructions; they are there to prevent accidents. It is particularly important that parents remain vigilant as children do not always appreciate the dangers on board ships and boats.

3. Ships' crews must remain vigilant and be prepared to issue clear instructions to passengers who may be behaving in a manner that could place themselves at risk.

A Day at the Beach

Narrative

At high water, a cargo vessel in ballast was approaching its berth in a remote location. The plan was to conduct a turn adjacent to the berth before securing alongside in preparation for reloading the vessel. No pilot was embarked and tugs were not immediately available. The master had manoeuvred the vessel alongside the same berth many times without incident. Visibility and sea state were moderate and there was negligible tidal stream; however, there was a strong south-south-westerly wind blowing, gusting up to gale force.

During the turn and when abeam the wind, the master lost control of the vessel as it was blown sideways, resulting in the stern area making heavy contact with the berth (Figure 1).

In order to avoid further damage the master decided to abort the berthing operation, but he was unable to regain control of the vessel before it grounded, approximately 60m from the berth (Figure 1). Despite attempts to refloat the vessel, it was hard aground and, as the tide fell, ended up high and dry (Figure 2).

Three hours after the accident, a local policeman called the coastguard to report that a vessel was aground on the shore; this was the first notification to the coastal state of the incident. At high water the following day and with tug assistance, the vessel was safely refloated. Although there was no pollution and no injuries to any of the crew, the vessel required repairs to the damaged stern area.

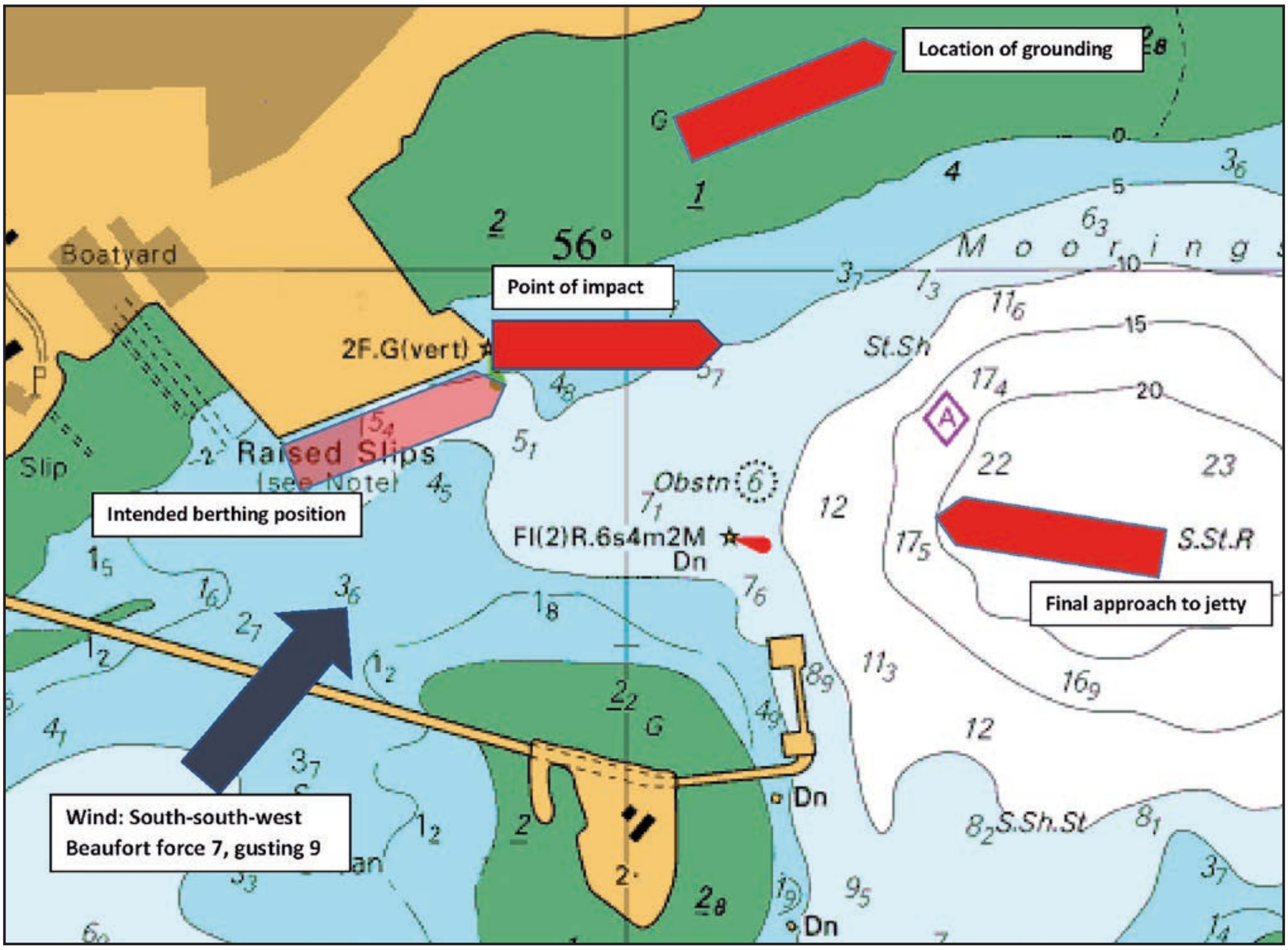


Figure 1: Chart showing intended berthing position, point of contact and location of grounding

Figure 2: Vessel aground at low water

The Lessons

1. Passage planning is 'berth-to-berth' for good reason: to ensure that every aspect of the voyage is properly assessed. In this case, the berthing plan did not take into account the predicted environmental conditions, especially the likely effect of the strong to gale force wind. Had this been taken into account, an alternative course of action could have been considered such as anchoring to wait for better conditions.

2. Irrespective of how familiar the master is with the berth, each approach should have a contingency plan in case events do not go to plan. This could include decision points where safe alternative courses of action could be taken. In this case, once committed to the turn off the berth, there was little the master could do when the wind started to act strongly on the vessel.

3. In the event of any accident, it is an obligation on the master to inform the coastal authorities of what has happened. This is to ensure that immediate, appropriate action can be taken to manage the situation and minimize the potential for loss of life and/or pollution. It also ensures that plans can be put into action for recovery of the situation; in this case, refloating of the vessel. The 3-hour delay in notifying the coastguard was unacceptable and in other circumstances could have led to a far worse outcome for the ship and its crew.

Maintenance Induced Fire

Narrative

A fully loaded ro-ro passenger ferry was en route to its next port when the engineers in the control room acknowledged a low oil pressure alarm on one of the generators (Figure 1). On the CCTV they observed that oil from this generator was spraying on to the adjacent generator. While they were investigating the source of the leak oil that had been sprayed on the exhaust casing of the adjacent engine caught fire.

Fortunately the crew were able to quickly identify and isolate the source of the leak and extinguish the fire before it was able to spread. No one was hurt in the incident.

Subsequent investigation revealed that:

- The oil had come from a loose plug on the generator's engine-mounted lubricating oil pump (Figure 2a). This had vibrated loose as a result of it being insufficiently tightened by shore staff during a recent dry dock.
- A section of the adjacent generator's exhaust piping had been left unlagged following its overhaul during the recent dry dock (Figure 2b). This was hidden from view by the exhaust casing.
- Fine oil spray ignited when it came into contact with the hot exhaust casing.

Figure 1: Location of the generator with the loose oil plug and the adjacent generator with the uninsulated section of the exhaust piping

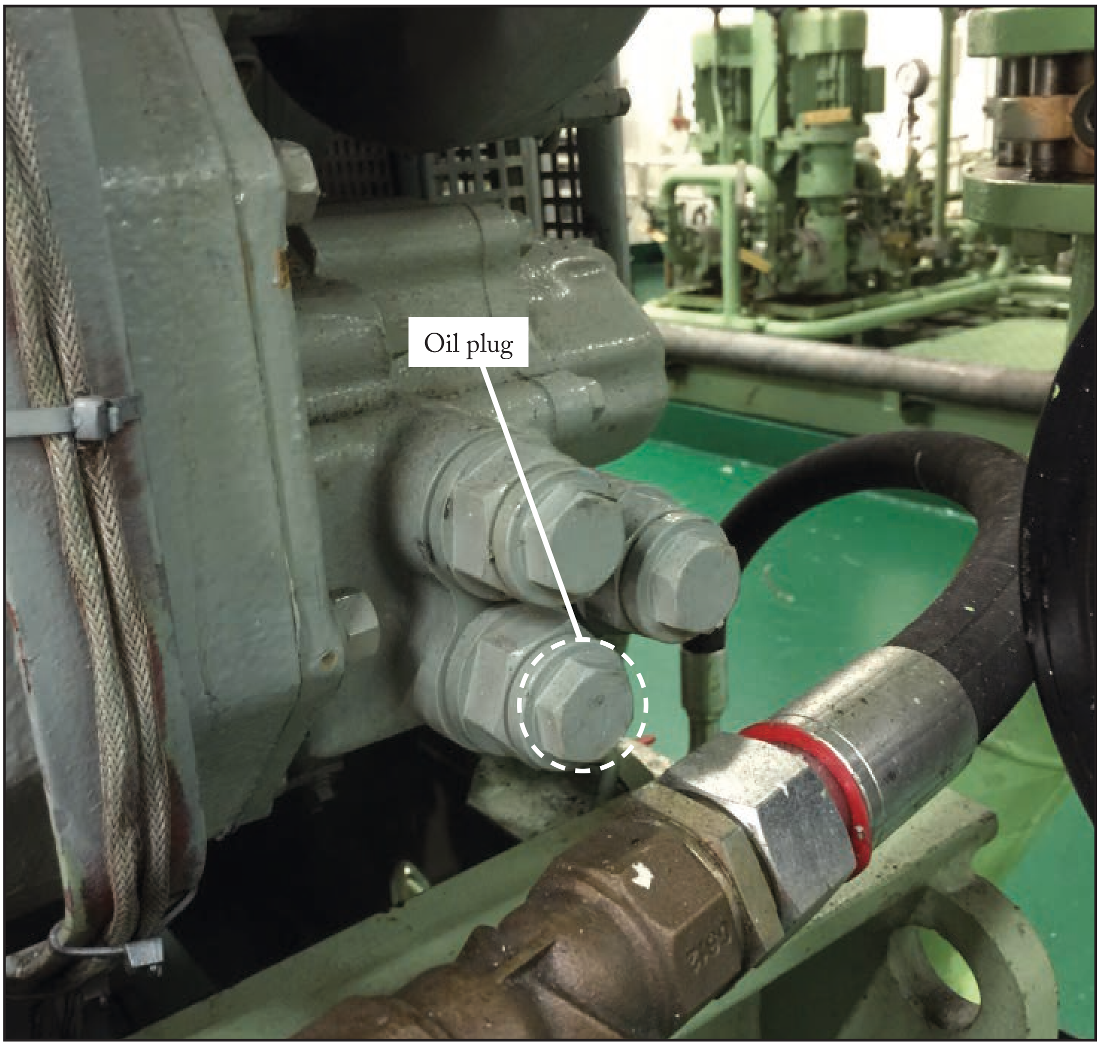


Figure 2a: Oil plug on lubricating oil pump which vibrated loose

Figure 2b: Section of exhaust casing concealing the uninsulated section of exhaust piping

The Lessons

1. Unlagged sections of exhaust piping will radiate heat to the protective casing, causing it to attain temperatures sufficient to ignite an oil or fuel spray.

2. These temperatures are not visible to the eye unless the surface is glowing. However, a thermal image will immediately identify unlagged sections (Figure 3).

3. All vessels are required to comply with SOLAS regulations regarding the maximum allowable temperature of an exposed surface (Chapter II/2):

   - *All surfaces with temperatures above 220°C which may be impinged as a result of a fuel system failure shall be properly insulated.*

4. All fittings including nuts, bolts, screws and plugs can come loose if the vibration levels on the engines exceed acceptable limits. Overall vibration velocity can be measured with very simple instruments. If excessive, frequency analysis of the vibration waveform can often identify the root cause of excessive vibration levels.

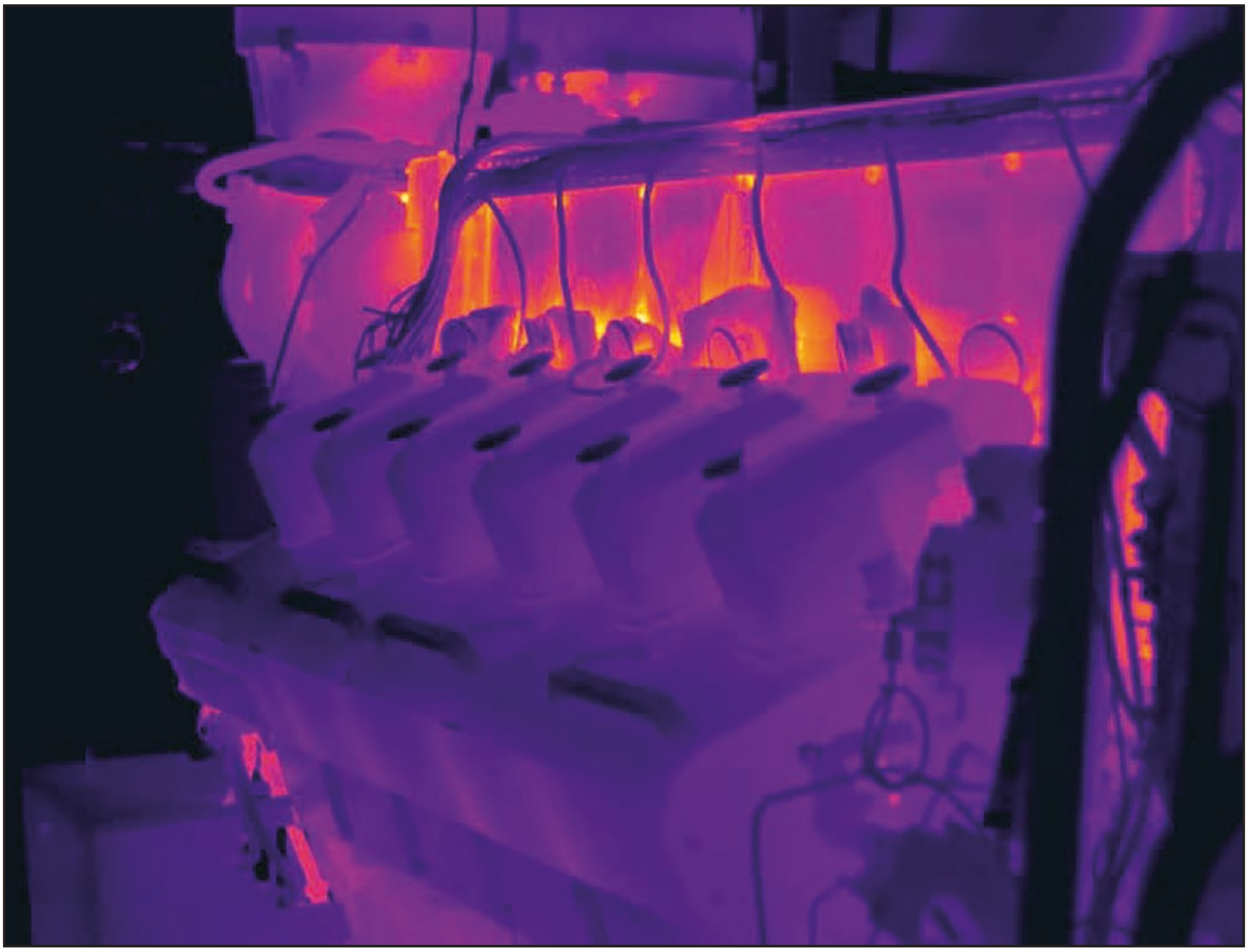


Figure 3: Example of a thermal image showing 'hot spots' on uninsulated sections of the exhaust system

Sluggish Pitch Control Causes Serious Accident

Narrative

A chemical tanker was being manoeuvred to its designated jetty. As the vessel approached the quay, the pilot ordered an astern movement to enable a turn into the lock. The vessel did not respond and continued to proceed ahead. Despite placing the pitch control to full astern, the CPP did not respond in time and the vessel's bow struck the quay. The bulbous bow was holed, but fortunately the damage was above the waterline (Figure 1).

The subsequent investigation identified that the vessel had a history of sluggish astern response. However, the crew had accepted this as a 'characteristic' of the vessel and usually compensated for it by demanding astern movements well in advance.

The CPP control panel on the bridge had a back-up control button (Figure 2) for use in an emergency. Activation of this button bypassed the feedback control system, giving direct control of pitch to the pitch control lever. However, the master was not familiar with its use, and therefore lost the opportunity to bring the vessel back under control before it struck the quay.

It was also revealed during the investigation that the system parameters for astern pitch control had been incorrectly set during the commissioning of the propulsion system when the vessel was delivered from the yard.

The Lessons

1. **If you are expected to manoeuvre a vessel, you should make every effort to familiarise yourself with the controls at your disposal. The function of back-up controls should be well understood and tested. They can help prevent serious accidents.**

2. **Regular drills simulating propulsion system failure and recovery should be carried out. These drills will give operators confidence in the back-up systems and help them react effectively in an emergency.**

3. **Frequent engine response tests should be completed, both ahead and astern. This is particularly important before entering and leaving port or congested waters**

Figure 1: Bulbous bow damage caused by contact with the quay

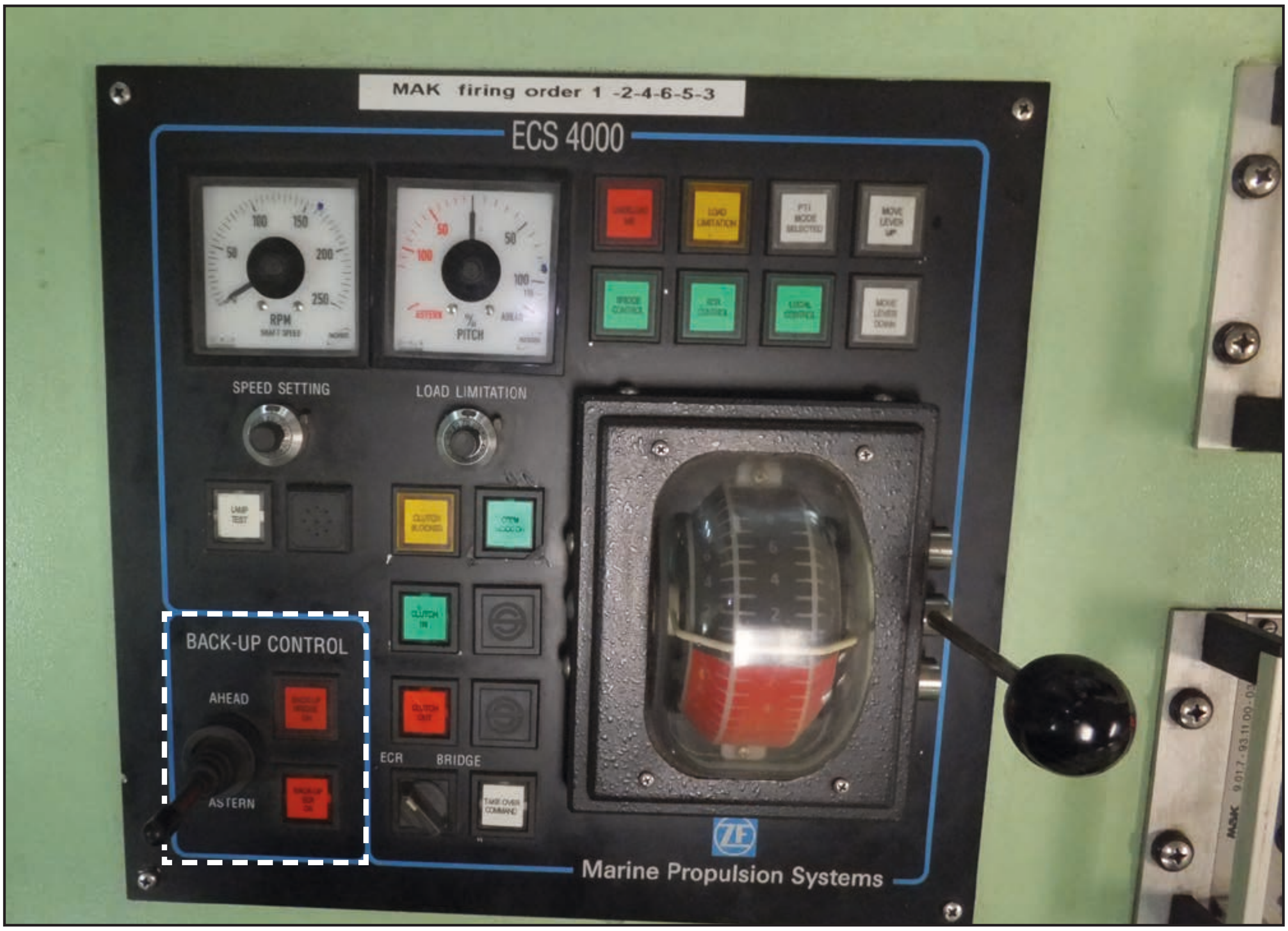


Figure 2: Bridge control panel of CPP system showing back-up controls

Officer Fatigue Causes 5 Months Off-Hire

Narrative

The chief officer of a coastal general cargo vessel was alone on the bridge for his 6-hour watch, which had started at midnight. No lookout had been posted and the bridge navigational watch alarm system (BNWAS) was switched off. The vessel was on a steady course that was being monitored on an electronic navigation system. Within a short time of taking over the watch, the chief officer sat down on a sofa on the bridge and fell asleep.

Just before dawn, the vessel ran aground (Figure 1) on a rocky island at 9 knots. The chief officer woke up on impact and placed the engine controls astern in an attempt to re-float the vessel. However, this proved futile, and with the changing tides over the next 24 hours the vessel settled further onto the rocks, causing severe damage to the vessel's internal structure aft and the starboard propeller and rudder.

Due to adverse weather and insufficient water depth, the vessel remained stranded on the island until the next spring tide 12 days later. Subsequently, it was towed to dry dock, where extensive repairs were required, including the replacement of both propellers, rudders and a gearbox. A substantial quantity of steelwork was also required and the vessel was out of commission for more than 5 months, resulting in significant financial losses for the owners.

The investigation into this accident identified that the master and chief officer kept 6 on 6 off watches at sea. The vessel made frequent port calls, and in the absence of any other deck officers the chief officer was responsible for all cargo work. This had resulted in him getting very little rest in the 3-month period that he had been on board, and he was suffering from significant cumulative fatigue. It was also revealed that the BNWAS was always kept switched off as it was considered more of a nuisance than an aid. Furthermore, lookouts were never posted during navigation watches - even during hours of darkness.

The Lessons

1. Keeping 6 on 6 off watches at sea in addition to performing cargo work in port will invariably lead to cumulative fatigue in an individual. It is not surprising that the chief officer fell asleep while on watch.

2. Given the vessel's operating pattern, not employing a third deck officer was a false economy that nearly bankrupted the company. Another officer to share the workload would have enabled the chief officer to be well rested and would have significantly reduced the likelihood of him falling asleep and having a costly accident.

3. The use of BNWAS and the posting of lookouts, in addition to the main watchkeeper, during the hours of darkness, are international requirements. Contravening these requirements can lead to detentions and fines. More importantly, it can result in serious and costly accidents.

Figure 1: The vessel aground

Training and Risk Assessment Could be Lifesavers

Narrative

A cruise ship was at sea when a number of passengers in one of the ship's swimming pools began screaming. A passenger at the poolside heard the screaming and immediately noticed another passenger, floating face-down in the pool, with bubbles coming from her mouth. Assisted by another passenger, he recovered the casualty to a tiled area at one end of the pool. Some of the ship's catering staff, who were working in the vicinity, quickly arrived and assisted with rescue efforts.

Attempts were then made to drain water from the casualty's lungs. The rescuers noted that the casualty was not breathing.

One of the crew made a call from a deck telephone to summon the onboard emergency services. The ship had a multinational crew and, owing to language difficulties, the person receiving the emergency call could not understand the caller. Another crew member then took over the call, and the information was passed to the ship's emergency medical team. In the meantime, fellow passengers began to administer CPR.

Following receipt of the emergency call, a medical response team, including the ship's senior doctor, proceeded to the scene. They arrived on site within a few minutes of the emergency call and noted that five or six passengers and four or five crew members were in the vicinity of the casualty, but no CPR was being carried out. The doctor and a nurse began CPR while the other nurse fetched the ship's automated external defibrillator; the pads were applied to the victim's chest but the device indicated 'no shock advised'. CPR was then resumed with supplementary oxygen administered.

Despite comprehensive attempts, including administration of adrenaline, it was not possible to revive the casualty. With obvious evidence of irreversible signs of death, the casualty was pronounced dead.

The casualty had last been noticed sitting in the vicinity of the pool approximately 30 minutes before the alarm was raised. There was no evidence as to how long she had been in the water.

The ship diverted to an appropriate port where the body was transferred to the police, who examined it and subsequently issued a death certificate indicating drowning as the cause of death.

The pool was approximately 5m long by 2.5m wide, with a depth of 2m at its deepest point and 1.6m at its shallowest point. There was a large tiled area at one end, which is where the recovery took place. Forward of this was an area with food outlets and a bar. The pool was enclosed by a low wall with seating and sun loungers on the adjacent deck area (Figure 1).

No documented risk assessment relating to hazards involved in the use of swimming pools was available to the ship's crew. There were no designated attendants present or CCTV coverage of the pool areas. A parental advisory notice warned passengers with children that there were no lifeguards on duty and that use of the pool was at their own risk. Health and safety notices to this effect were displayed adjacent to the pool.

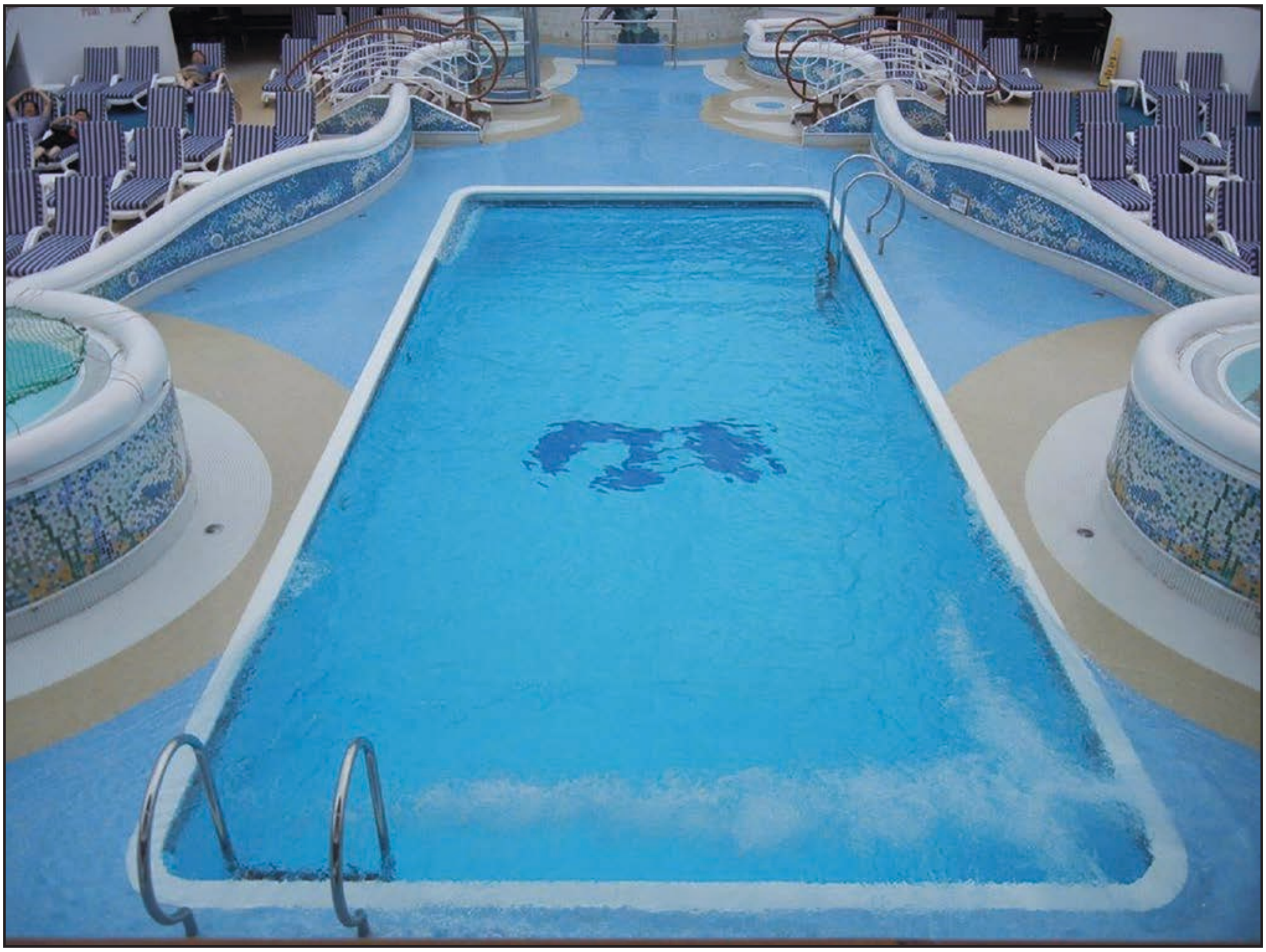


Figure 1: Ship's swimming pool aft to forward

The Lessons

1. The lack of a documented risk assessment might not have prevented this accident from occurring. However, it is essential that both ship's crew and passengers are fully aware of all hazards associated with the use of swimming pools, and that effective control measures are in place to counter unacceptable risks.

2. The delay in initially recognising the incident and then reporting it might, in other circumstances, have compromised the effectiveness of the emergency response. In this case, once notified, the response by the ship's emergency medical team was rapid and professional.

3. There was a delay in administering first-aid medical treatment. When CPR did commence, it was only briefly carried out and then only by fellow passengers. The crew members in the vicinity of the pool had not received instruction from the company in medical first-aid. The staffing of pool areas with personnel who are suitably trained would allow a more appropriate response to medical emergencies. Section A-VI/1, paragraph 1.6 of the STCW Code requires each such person to be able to:

   'take immediate action upon encountering an accident or other medical emergency before seeking further medical assistance on board…'

Undetected Wear

Narrative

In preparation for arriving in port, the master of a ro-ro ferry conducted a CPP pitch control check and discovered that the starboard CPP did not respond. The chief engineer, who was in the engine control room (ECR), tried local control, but still with no success. The starboard shaft was then declutched and the two starboard main diesel engines were stopped. Given the favourable weather conditions, the master was content to complete the passage on just the port shaft.

With the ferry a short distance from the berth, a joint in the return line of the starboard CPP hydraulic system suddenly ruptured, spraying oil over the main engine uptakes. The crew in the main engine room evacuated to the ECR just as the fire alarm sounded. Given the ferry's proximity to the berth, the chief engineer activated the hi-fog fixed fire-extinguishing system over the starboard main engines and the associated fuel shut-offs, reconfigured the ventilation fans to clear the smoke, and ordered two of his staff to prepare as the first breathing apparatus (BA) fire party.

The bridge team activated the general alarm in the crew quarters and informed the port authority. The passengers were mustered, awaiting further instructions. The ferry was berthed safely and, following re-entry of the main engine room by the fire party, the extremities of the fire not covered by the hi-fog system were extinguished using a fire hose. The passengers and cargo were then disembarked normally.

Extensive damage was sustained to the main engine room, and the ship was later towed to a repair yard for refit. On examination, it was discovered that the back pressure valve in the starboard CPP system had become worn and had jammed, leading to the return line of the system becoming over-pressurised. The pressure relief valves in the system had not been tested or inspected during their 20 years of service. The flanged joint that had failed was positioned between the two starboard main engine uptakes and had not been fitted with a spray shield (Figure 1).

Figure 1: Failed flanged joint (circled)

The Lessons

1. Just because the return line of the CPP hydraulic system normally operated at a pressure of 8 bar did not mean that higher pressures could not be experienced in this section. The safety relief valve from the supply line was connected to the return line, potentially enabling the return line pipework to experience up to 145 bar. Do not assume that sections of a hydraulic system will always operate at low pressure. Ensure that joints are rated for the maximum pressure that could be experienced.

2. IMO guidance recommends the shielding of pipework joints of fuel oil or lubricating oil systems having an internal pressure of greater than 1.8 bar. The shielding of such joints is a relatively easy and simple task to complete, and may ultimately prevent the start of a fire in the event of a high pressure leak.

3. A sample of the oil from the CPP system had been tested every 6 months and no indication of the wear sustained by the back pressure valve piston had been identified. Although the regular dismantling of hydraulic systems is discouraged, it is vital that critical safety components, such as relief valves, are tested and inspected at regular intervals to prevent failure of the system. Consult with your safety valve manufacturer to determine how often they need to be checked.

4. The CPP system, while having low pressure and high temperature warnings indicating in the ECR, had no warning for high pressure. If it had done so, the actions taken by the engineering team might have been different and prevented over-pressurisation of the system.

5. The resulting fire was a major incident that threatened the safety of the passengers and crew. However, the emergency procedures and regular drills held on board enabled the crew to deal with the incident successfully and with no resulting injuries. Drills can seem tedious, but when an emergency occurs they pay dividends.

Is it Your Turn or Mine?

Narrative

It was dark with about 4 miles visibility. A container vessel was on passage. The OOW was accompanied on the bridge by an officer of a different nationality undergoing familiarisation. The OOW decided to alter course to starboard to pass a group of fishing vessels on the port bow. This resulted in a risk of collision with a bulk carrier, which was crossing the container vessel from port to starboard (Figure 1, point A).

The bulk carrier's OOW called the container vessel on VHF radio and requested the container vessel to pass around the bulk carrier's stern. The conversation was conducted with the officer undergoing familiarisation in a language that the container vessel's OOW did not understand, so he was unaware that the officer had tacitly agreed to the request (Figure 1, point B).

After passing the group of fishing vessels, the container vessel's OOW altered back onto the planned course. The bulk carrier's OOW, assuming that the container vessel had altered course in response to his request, now also altered course to port with the aim of creating more sea room for the passing manoeuvre. However, this resulted in a continued risk of collision (Figure 1, point C).

The container vessel's OOW expected the bulk carrier to alter course to starboard. He stated this to his accompanying officer, who then called the bulk carrier's OOW on VHF radio and requested a port-to-port passing, which the latter reluctantly agreed to. Shortly afterwards, concerned that the bulk carrier did not appear to be altering course, the container vessel's OOW altered course to starboard (Figure 1, point D).

Although the bulk carrier's OOW had also altered course to starboard, the avoiding action taken on both vessels was insufficient and taken too late to prevent them from colliding (Figure 1, point E).

There were no resulting injures. However, both vessels sustained serious damage (Figure 2), and about 600 tonnes of heavy fuel oil were spilled.

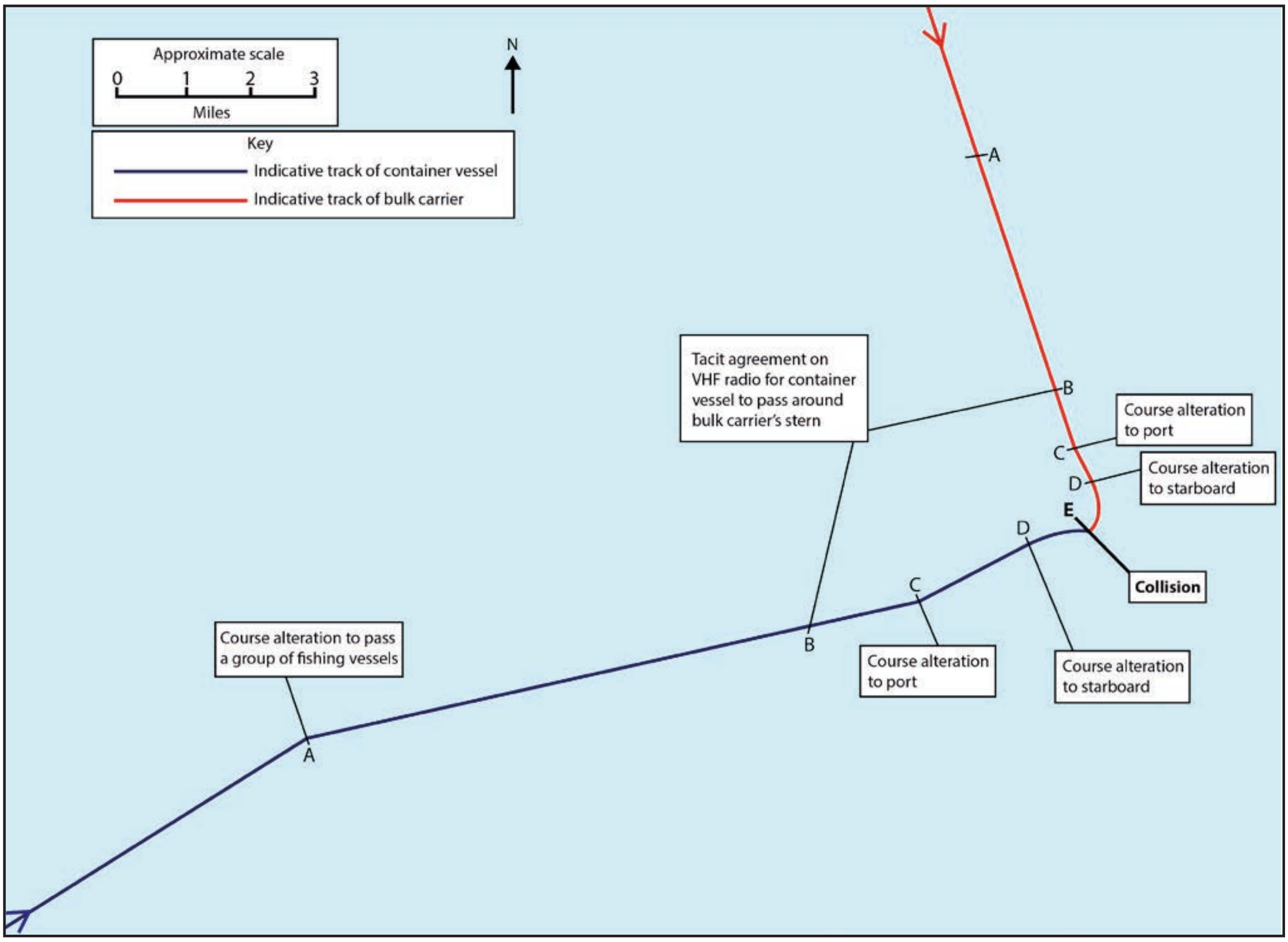


Figure 1: Indicative vessel tracks

Figure 2: Damage to the container vessel

The Lessons

1. All officers involved in this accident considered that it was appropriate to use VHF radio for collision avoidance. Furthermore, the bulk carrier's OOW felt that it was appropriate to use VHF radio for negotiating a passing protocol that was contrary to Rule 15 of the COLREGs.

2. Following the initial VHF radio communication, the OOW of each vessel was left with different expectations. A significant contributing factor to this misunderstanding was that the conversation on the VHF had been conducted in a language that the container vessel's OOW did not understand. Furthermore, his accompanying officer's translation of the conversation was incomplete and did not include what he had tacitly agreed to.

3. By inviting his accompanying officer to communicate on VHF radio on his behalf, the container vessel's OOW unnecessarily put himself in a position of having to deal with the consequences of those communications, which he did not understand and was unable to control.

4. The International Chamber of Shipping's Bridge Procedures Guide recommends against using VHF radio for collision avoidance and warns that, even where vessels have identified each other, misunderstandings may still arise. In this case, the resulting misunderstandings were not only between the vessels concerned, but also between those on the bridge of the same vessel.

5. The use of VHF radio for collision avoidance was unnecessary, was contrary to internationally recognised best practice, and was a significant contributing factor to this accident.

Fail to Plan, Plan to Fail

Narrative

On a fine day, a general cargo vessel was on passage with a cargo of limestone. The master was on watch on the bridge. In the engine room, the chief engineer, motorman and a seaman were undertaking maintenance on one of the two main ballast pumps; the chief engineer had recently joined the vessel and had prioritised this work owing to the presence of leaks and poor pumping rates.

The chief engineer intended to replace the mechanical seals on the ballast pump. He had electrically isolated the pump prior to starting the job. He had also closed both the sea water inlet valve, located between the sea chest and the pump, and the pump outlet valve, located between the pump and the ballast system valve manifold. On instruction from the chief engineer, the motorman disconnected the electric motor from the pump. He then removed the flange bolts connecting the inlet pipe to the pump.

Soon afterwards, water started to flow from the inlet pipe at a rapidly increasing rate. The chief engineer tried to reduce the rate by jamming rags into the pipe, but the flow was too strong. He then sent the motorman to fetch some pieces of wood, which he intended to force into the pipe. He also sent the seaman to collect a portable electric water pump, which was stowed in the forward store.

The chief engineer intended to start the main bilge pump, but as he was configuring the system he became distracted by the rapidly rising water level, which was now above the bottom plates. Worried about potential damage to machinery, he left the bilge system to stop the generator and main engine, and sent the motorman to the bridge to tell the master that the engine room was flooding. With the water level continuing to rise, the chief engineer evacuated the engine room, leaving open the watertight door between the engine room and the accommodation as he did so.

On being informed of the flooding, the master left the bridge to check the engine room for himself. Concerned with the rate of flooding, he returned to the bridge and sounded the general alarm, mustering the remaining crew. The seaman rigged the portable electric water pump on the main deck but, with the vessel now running on emergency power only, he was unable to start the pump.

The master contacted the coastguard by VHF radio and advised that the vessel was flooding. The coastguard transmitted a "Mayday Relay", and RNLI lifeboats from two stations were tasked to assist along with a Royal Navy helicopter. Meanwhile the vessel's crew prepared the rescue boat for evacuation.

Three salvage pumps were put on board the vessel. The pumps were rigged on the main deck with suction via the engine room emergency escape. Despite all three pumps operating at full capacity, the water level in the engine room could not be lowered. Following reports of water ingress to the cargo hold, all six crew abandoned to one of the lifeboats. The vessel continued to flood (Figure 1), with water entering the accommodation areas through the open engine room doorway. The vessel's owner contracted salvors, who were able to stop the flooding and, once stable, the vessel was towed into port.

The Lessons

1. The master was unaware of the work being carried out on the ballast system. A risk assessment had not been completed and no permit to work had been issued. This resulted in basic contingency planning not being undertaken and poor engineering practice being applied. A comprehensive risk assessment would have identified that, with only one valve separating the ballast pump from the sea, it was essential to ensure that the inlet pipe was completely isolated prior to removal of the flange bolts connecting the inlet pipe to the pump. Control measures should have included:

    - Ensuring that all pressure was safely released from the suction side of the pump by using the bleed nut on the suction strainer.
    - Ensuring that the inlet flange was split in a controlled manner with a number of loosened bolts still in situ to enable them to be re-tightened in the event of the isolating valve not holding.

2. The crew's response to the flooding was ineffective because they were not prepared for the emergency. They had never carried out an engine room flooding drill, and half of them had never carried out any form of emergency drill since joining the vessel. Are you prepared for a flooding emergency?

3. Examination of the isolating valve following the accident identified that the valve actuator had been defective, giving an impression that the valve was fully closed when it was not. Although there was a visual indicator located on the side of the actuator, this was not checked to confirm that the valve was closed prior to removal of the flange bolts. The actuator had previously been repaired. However, the chief engineer, who had only recently joined the vessel, was unaware of the actuator's poor internal condition (Figures 2 and 3).

Figure 1: Cargo vessel as found by salvors

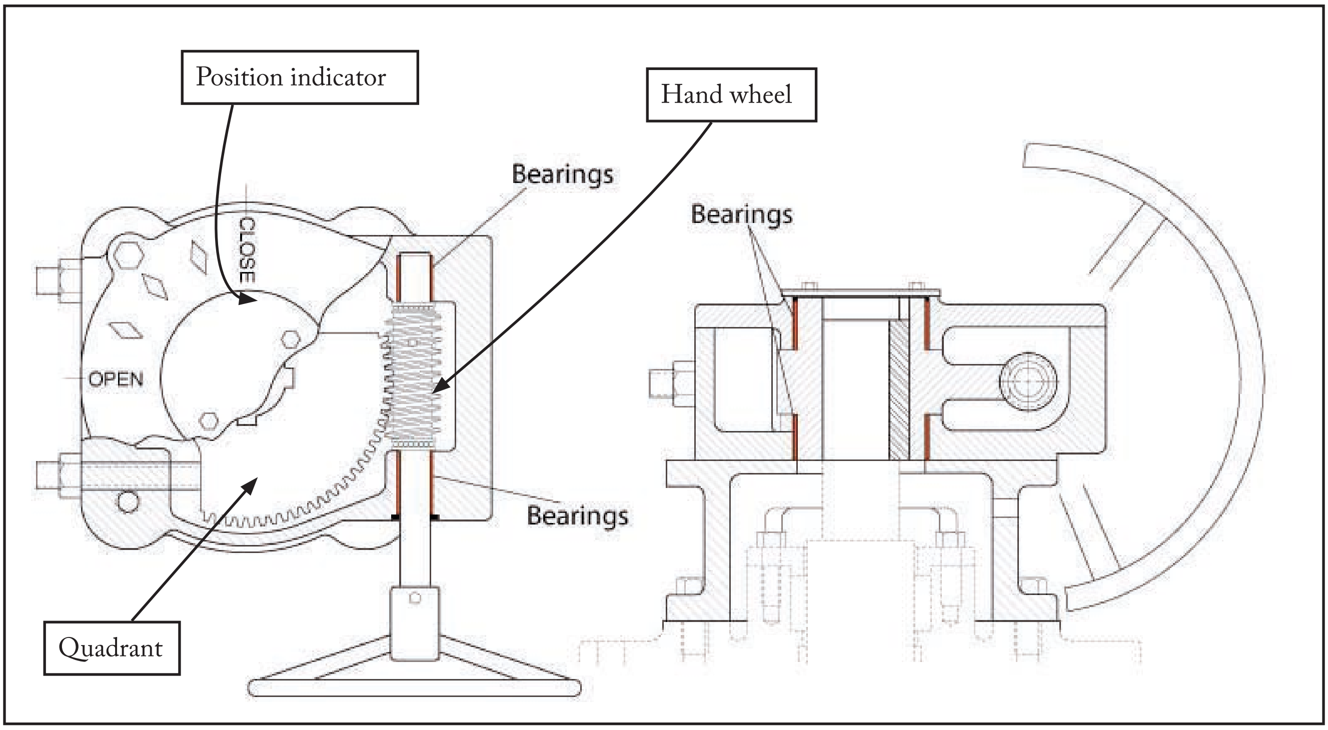


Figure 2: Arrangement of actuator gearbox for valve A104 port

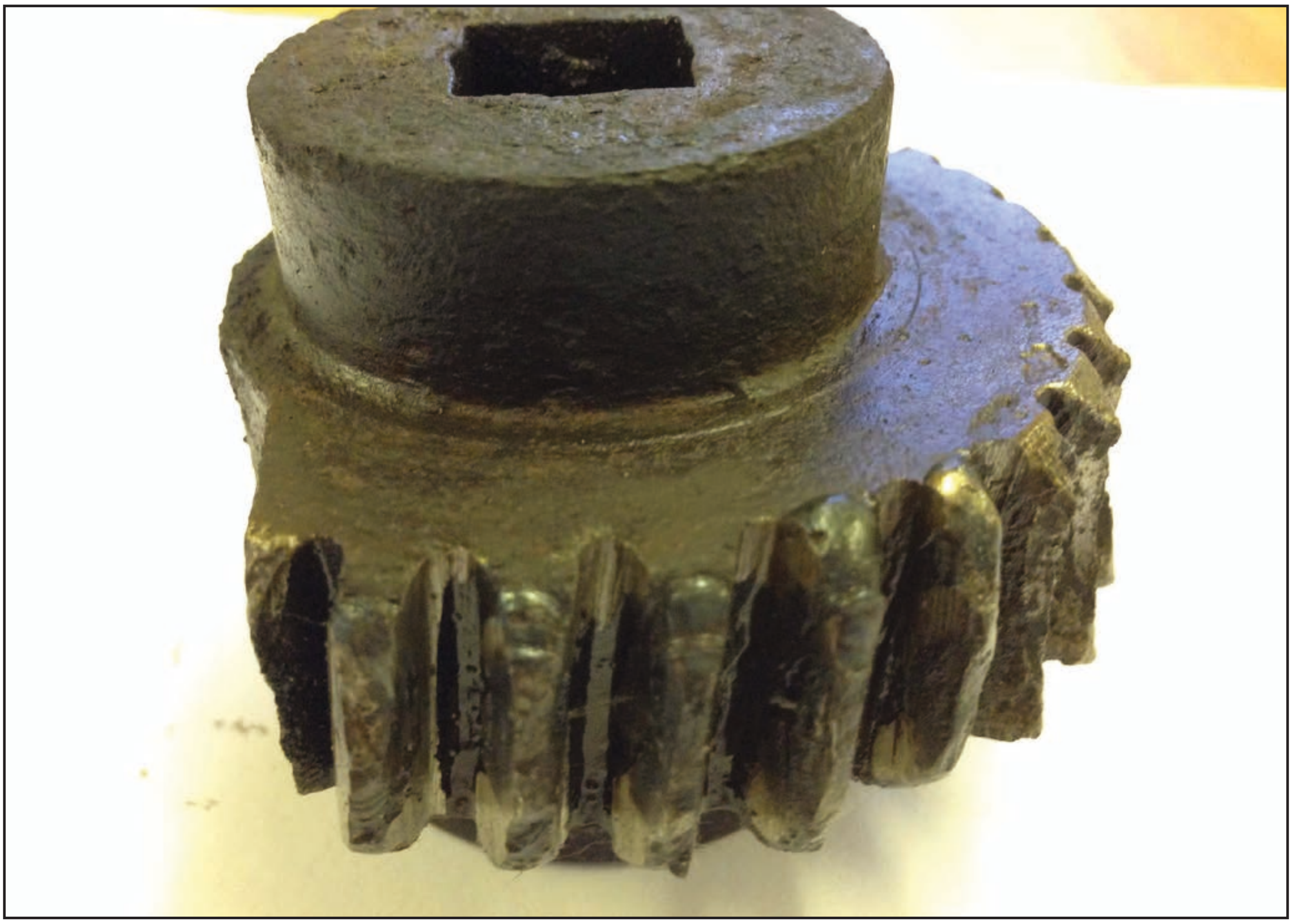


Figure 3: Gearbox quadrant, showing signs of damage and previous repair

There's a Gash in Your Stern Sir

Narrative

A very large car carrier was making its way into a UK port under pilotage on a calm, clear day when it struck the quayside, putting a substantial gash in the hull near the vessel's stern on the starboard side (Figure 1).

The vessel, loaded with cars from the Far East, had to turn off the dock entrance and manoeuvre astern to berth. Due to its size, three tugs and two pilots were allocated. The tugs were positioned with one forward and attached, one aft and attached, and one in the middle to act as a pusher if needed. All tugs were under the control of the lead pilot via VHF radio. The vessel's Korean crew were at their mooring stations, with the captain, third officer, cadet, helmsman and the two pilots on the bridge. Both of the pilots had VHF radio handsets. On the berth, the mooring gang were under the control of the berthing master, who also had a VHF radio handset.

During the berthing operation the lead pilot positioned himself on the starboard bridge wing and the second pilot on the port bridge wing. The lead pilot was using a tablet computer to gather a range of information, including the vessel's distances from the quay. However, as the vessel was being swung off the dock entrance the battery for his wireless internet link device ran out of power and the berthing information on the pilot's tablet computer was lost.

After the vessel had turned into position, it was manoeuvred astern toward the berth using the vessel's main engine and the assistance of the tugs. The aft tug was being used to push the vessel toward the quayside whilst the ship moved astern, and the bow thruster used in combination to keep the heading parallel to the jetty.

As the vessel closed to the berth the mooring parties communicated to the bridge in their native language. The captain spoke directly to the pilots in English on the bridge but he did not pass any information on the vessel's distances from the berth.

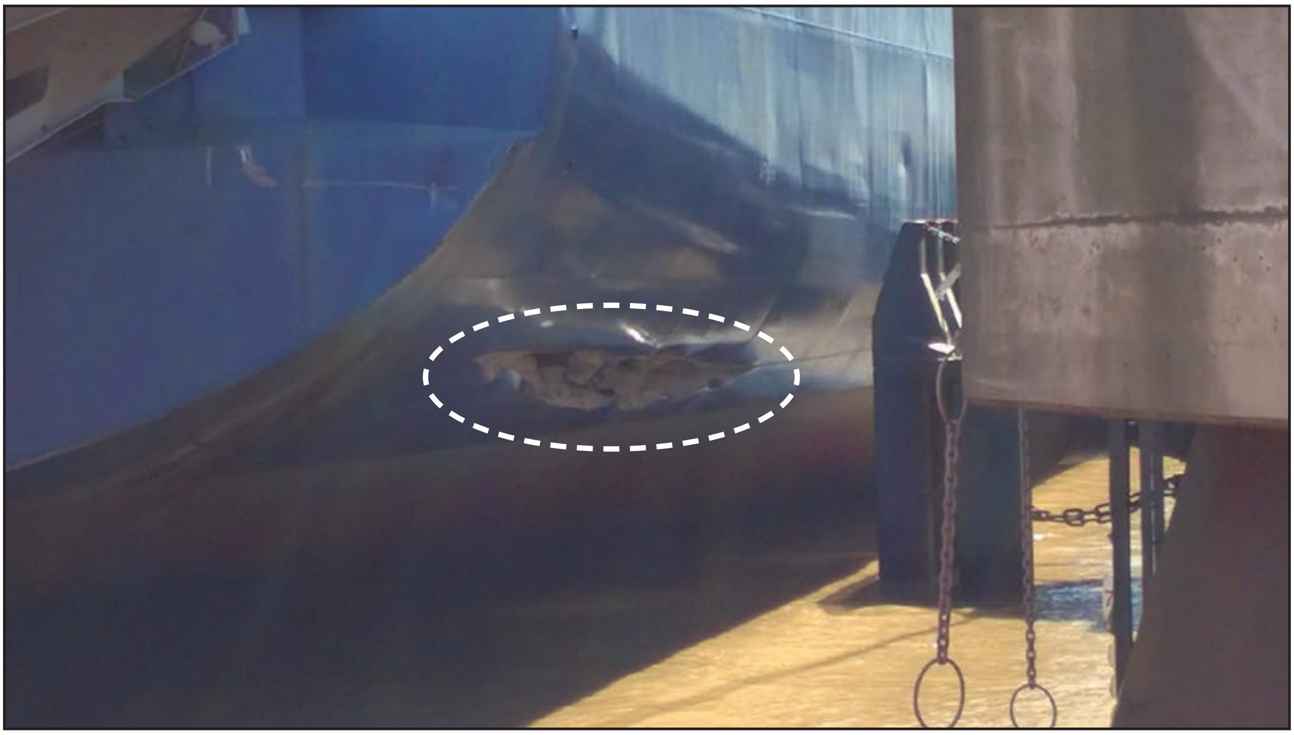


Figure 1: Damage sustained to the vessel

Without any accurate information on distances the pilot lacked situational awareness and failed to recognise the developing situation. A few minutes later, the starboard quarter of the vessel struck the quayside, damaging the vessel and the quay fenders (Figures 2, 3 and 4).

The berthing master, who had not communicated with the pilots up to this point, used his VHF radio to tell the lead pilot "*yep, there's a gash in your stern sir*".

It was fortunate that the damage to this vessel was above the waterline and into a ballast tank. Had this been below the waterline, there could have been serious flooding. Had the damage been in way of a bunker tank, this could have resulted in a pollution incident. It was clear that the lead pilot had lost situational awareness; once he lost his electronic aid he did not properly utilise the resources available to him.

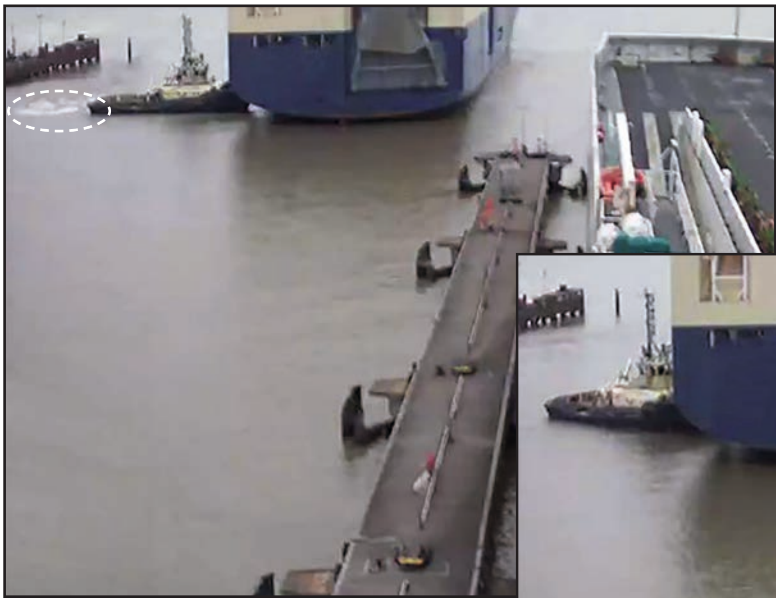


Figure 2: Vessel making approach astern toward berth – tug pushing

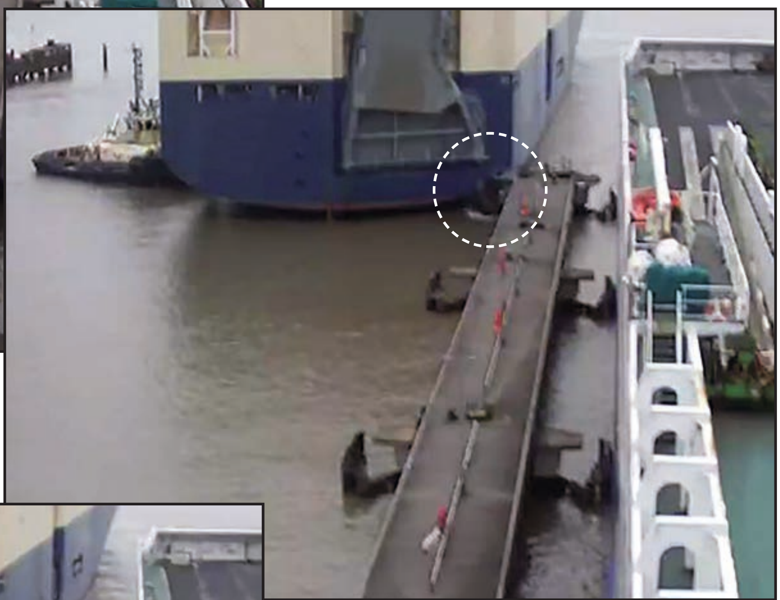


Figure 3: Contact with the end of the jetty

Figure 4: Vessel engine and rudder used after collision and damage to tank causing leak

The Lessons

1. Effective Bridge Resource Management is critical to a successful and safe voyage. Pilots should be considered to be part of the bridge team during their time on board, providing guidance to the captain and bridge officers. It is the responsibility of both the vessel's crew, and also the pilot, to engage and ensure that all staff are aware of vital communications.

2. Where the working language of the vessel differs from that understood by the pilot, there must be clear and effective information exchange, and key information should be translated into a common language. In this case, the pilot did not ask for clearance distances from the vessel's crew, and they were not provided to him by the master.

3. Pilots must ensure that a briefing is given to key members of the ship's management team involved so that all have a clear understanding of the forthcoming proposed operations. Part of the teamwork on the bridge should include the ability for staff to be able to challenge decisions, actions or emerging situations. This was not done by any of this vessel's crew, berthing master or the 2nd pilot. Pilots on board vessels provide a valuable service, but they are not infallible. The master or the OOW must have the confidence to seek clarification on decisions, actions and orders. Pilots must be prepared and willing to accept challenges.

4. The role of the berthing master was to direct his team and to provide the pilots with information regarding the position of the vessel on its approach, and position when alongside. However, the berthing master did not communicate effectively with the pilots before the vessel struck the quay, and the pilots did not contact the berthing master to ask for any information. The successful completion of any berthing operation requires good communications and for all the participants to be aware of their roles. In this case, both were missing.

Preparation is Key

Narrative

A ship was required to relocate to a nearby berth to allow another vessel to come alongside to load cargo. The master had a discussion with the bosun, and it was decided that they only required two crew forward and two aft tending the mooring lines. A further two crew would move the ship's boat that was moored alongside the ship, and then act as linesmen on the quay.

After retrieving the gangway, the forward and aft mooring stations were manned. The bosun, who was in charge at the forward mooring station, was wearing a safety helmet with an integral VHF radio. This was to ensure that he could communicate clearly with the master, who was on the bridge, as it could be noisy at the forward mooring station when the bow thruster was running.

The order was given to let go, and the two forward mooring lines were then slackened to allow them to be released from the quay. The two crew ashore lifted the mooring lines off the bollards and dropped them into the water. The bosun and crewman at the forward mooring station then each manually hauled a mooring line.

As the bosun pulled his mooring line, he suddenly lost his footing and fell onto his back, his head catching a raised hatch cover behind him. The crewman told the bosun to lie still, and radioed the master, who summoned medical assistance. The ship was made fast and the bosun was then evacuated to a local hospital, where it was determined that he had dislocated his left shoulder. His safety helmet was instrumental in preventing a serious head injury.

The Lessons

1. **No toolbox talk was conducted prior to the operation. All too often, tasks that are regarded as simple or routine are carried out without fully planning and briefing those involved. Stopping for a few minutes, and considering the risks and any safety measures required, will pay dividends in the long run.**

2. **It should have been recognised that there were insufficient crew to complete the task safely. Mooring operations were normally conducted with three crew at each mooring station, one of whom would be the responsible officer in charge. The bosun was the responsible person in this case, but he could not keep an adequate overview of the operation while manually recovering a mooring line.**

3. **The mooring line being heaved in by the bosun was new and heavier than the ship's other mooring ropes. It also did not float, thereby increasing its drag after it had been dropped into the water. These factors should have led to a decision to use the drum end of the windlass to haul the rope, rather than relying on manual handling.**

4. **The deck at the forward mooring station had just been repainted, but its non-slip properties were insufficient when the deck was wet. The ratio of aggregate to paint needed to be higher in this case to ensure a coarse finish, and so increase grip for those working on deck.**

Part 2 - Fishing Vessels

When asked to write the introduction to the fishing vessel section of MAIB's Safety Digest I immediately said yes, because I believe that the lessons within MAIB reports can assist myself and other fishermen to change our behaviour to make a safer industry. Unfortunately, the human impact behind many of the more tragic MAIB reports is often not apparent to the casual reader. The way families are affected and people's lives are changed is the real price of an accident.

Fishing is statistically the most dangerous peace-time occupation. As a fisher you face many unpredictable situations: tide, wind, sea state and problems with fishing gear or your vessel. However, if we stand back and take time to do so, there are some things that can be predicted. There are themes and trends that appear in many MAIB reports, and it is apparent that frequently, fishing injuries and fatalities are caused by the same type of accident or incident:

- Man overboard
- Entanglement in gear, ropes or machinery
- capsize
- carbon monoxide poisoning

In my role as a Seafish Instructor, I use MAIB reports and safety digests as case studies to help fishermen identify and discuss how to make their fishing vessel safer. During the exercise, fishermen are easily able to identify the causes of accidents. However, sometimes the classroom exercise becomes detached from our own operational practices and we overlook the shortcuts and potentially dangerous actions on our own boats. Our confidence in the way we do things, the length of time operating without an accident and focus on getting the job done means we overlook unsafe behaviour. Particularly when working alone, it is important to pay close attention to the way the vessel is rigged and that equipment like winches will stop if the operator lets go of the operating lever. Time spent assessing your equipment and the way things are done on board your boat could save your life.

Identifying things that are likely to fail or cause us harm should be part of a fisherman's working day. However, it is important to ensure risk assessments are not neglected when the fishing is heavy or the pressures of work take over.
A simple change of behaviour like wearing a lifejacket or carrying a PLB is a big step towards being safer.

In my RNLI role, I travel the UK and Republic of Ireland extensively, talking to fishermen on a daily basis. In my experience the industry is becoming more receptive to safety messages and skippers and crews are taking responsibility for their safety.

Safety within the fishing industry is a collective responsibility; we all have a part to play in this to make the industry safer. I would like to think that we can leave this industry safer than when we joined it. I would urge fishermen to read the Safety Digest articles and take a long hard look at where safety improvements can be made on your boat or in the way you operate while fishing.

Frankie Horne
RNLI COMMERCIAL FISHING SAFETY MANAGER

Frankie Horne has been a fisherman for 38 years, 30 as a skipper/owner. Most of that time has been spent trawling, scalloping or potting in under 15m vessels. Frankie has also been a lifeboat crew volunteer at Peel in the Isle of Man for the last 25 yrs. He is an accredited Seafish instructor and is the RNLI Fishing Safety Manager for the United Kingdom and the Republic of Ireland. Frankie's role is to help reduce accidents and incidents in the fishing industry using mine and my teams' knowledge and experience of the hazards fishermen face while at work.

Making a Big Impression

Narrative

Two similar wooden-hulled stern trawlers (vessels A and B) had both been fishing all day and into the night on grounds about 20 miles east of their home port. Weather conditions were fine with calm seas, light winds and good visibility.

At 2330, vessel A hauled its nets and all three crewmen started sorting the catch. The vessel then stopped in the water and the skipper switched on the 'not under command' lights as he needed to shut down the engine to conduct some engineering maintenance. After completing this work, the skipper told his crewmen to go to the wheelhouse periodically to check for other vessels; he then went below to get some sleep. Vessel A remained stopped in the water with its decklights and 'not under command' lights on. The vessel's AIS was also transmitting its position.

Meanwhile, at about 0030, vessel B, which was to the east of vessel A, hauled its nets and set a westerly course for home with the intention of landing the catch early the following morning. On board vessel B, the skipper was sitting in the wheelhouse chair, steering was by autopilot, the AIS was switched off and the two crewmen were working on deck. In the wheelhouse, the skipper's visibility directly ahead of the vessel was obscured by the radar display.

At about 0115 there was an extremely loud noise and frightening shudder, heard and felt by both crews as vessel B ran into vessel A. The skipper of vessel B realised what had happened and called vessel A by VHF radio to find out what the situation was. It took a few moments for vessel A's crew to realise what had happened, but all became clear when vessel B called them. Having established that no-one was injured, the skipper of vessel B informed the coastguard and both vessels proceeded back to the home port together. Vessel A had suffered significant damage above the waterline near the port bow (Figures 1 and 2) and, although there was no flooding initially, it began to take on water during the passage home; vessel B was effectively undamaged.

Figures 1 and 2: Damage to vessel A's port bow area

The Lessons

1. This collision occurred because neither vessel was keeping a proper lookout in accordance with the International Regulations for the Prevention of Collisions at Sea. These Regulations require all vessels at all times to keep a proper lookout by all available means, so as to make a full appraisal of the situation and of the risk of collision. On this occasion, visual, radar and AIS information could have been used by either vessel to detect the other and then take the necessary actions, in accordance with the rules, to avoid collision.

2. There is further guidance on keeping a safe navigational watch on fishing vessels in the MCA Marine Guidance Notice (MGN) 313(F). This states that a fishing vessel's wheelhouse must not be left unattended at any time and that it is essential for watchkeepers to keep a proper lookout at all times. The MCA MGN 314(F) also gives guidance on the requirement for wheelhouse visibility in fishing vessels. It states that '*a clear view in all directions is preferred, but it is essential to see ahead, and especially directly ahead*'.

3. In the case of vessel A, the wheelhouse was unmanned at the time of the collision so there was no chance of avoiding the accident. The skipper had not given sufficient attention to this matter and had not ensured that the wheelhouse was continuously manned by appropriately experienced crew, capable of keeping a lookout and reacting to a developing situation.

4. In the case of vessel B, the skipper's visibility right ahead was obscured by the radar display, which meant that vessel A was never sighted; however, he was also not paying any attention to other information available such as radar or AIS.

5. It was extremely fortunate that the damage to vessel A was above the waterline. Had such damage resulted at or below the waterline, the resultant flooding would have been catastrophic and could possibly have led to the loss of the vessel.

Don't Get Carried Away

Narrative

A lone skipper was preparing to shoot a string of 40 creels stacked on the deck (Figure 1) of his 9m boat. The skipper threw the end buoy over the stern and took a turn on a towing cleat by the stern door (Figure 2). He then went into the wheelhouse and steamed towards a mark on the plotter at about 6kts.

On reaching the mark, the skipper put the boat into autopilot and returned to the vessel's aft deck. His release of the rope on the towing cleat then allowed the creel rope to stream astern, pulling the end weight through the stern door followed by the first of the creels.

As the skipper walked back to the wheelhouse, the creel rope became caught around his foot and dragged him towards the stern door. He tried to grab hold of the creels on deck and then the transom, but he was unable to stop himself from being carried over the stern into the water. The skipper was initially pulled under the water. Fortunately, however, the rope around his leg slackened, possibly as the first creel reached the seabed, and the skipper managed to free himself and swim to the sea surface.

The skipper immediately removed his boots, oilskins and gloves, which were weighing him down and making it difficult for him to swim; his lifejacket and personal locator beacon were in the wheelhouse. The skipper saw his vessel disappearing into the distance so he started to swim towards the cliffs 2 miles to the west. However, he soon realised that the shore was too far and grabbed a nearby creel buoy to help keep him afloat while he regained his breath. He then used a second buoy to try and flag down two nearby boats.

The skipper was eventually seen by the crew of one of the boats. After spending about 35 minutes in the water, he was recovered on board and taken ashore. Meanwhile, the skipper's boat continued in autopilot until it was intercepted and stopped some time later.

Figure 1: Creels on deck

The Lessons

1. The working decks on fishing vessels are hazardous, particularly when shooting and hauling gear. However, where possible, keeping fishermen and moving nets, wires, pots, ropes and associated fishing gear apart significantly helps to prevent serious injury or worse. Following his accident, the skipper moved the towing cleat from the stern to the back of the wheelhouse (Figure 3) so that he can now release the end buoy without walking across the deck. The risk of entanglement when first shooting the creels has been eliminated.

2. The occasions when lifejackets and PLBs will be needed in an emergency cannot be predicted. Therefore, they must be worn at all times when on deck, not just until their novelty wears off. Repeated fishing trips that pass without incident might diminish the apparent need and importance of safety equipment, but it is vital that this does not lead to complacency. Keep each trip at least as safe as the last.

3. Single-handed fishing is one of the most dangerous occupations and should be avoided if at all possible. Not all single-handed fishermen live to tell the tale; many are never found. Employing a crewman might reduce profitability but it could be the wisest investment you will ever make if it enhances the safety of your boat.

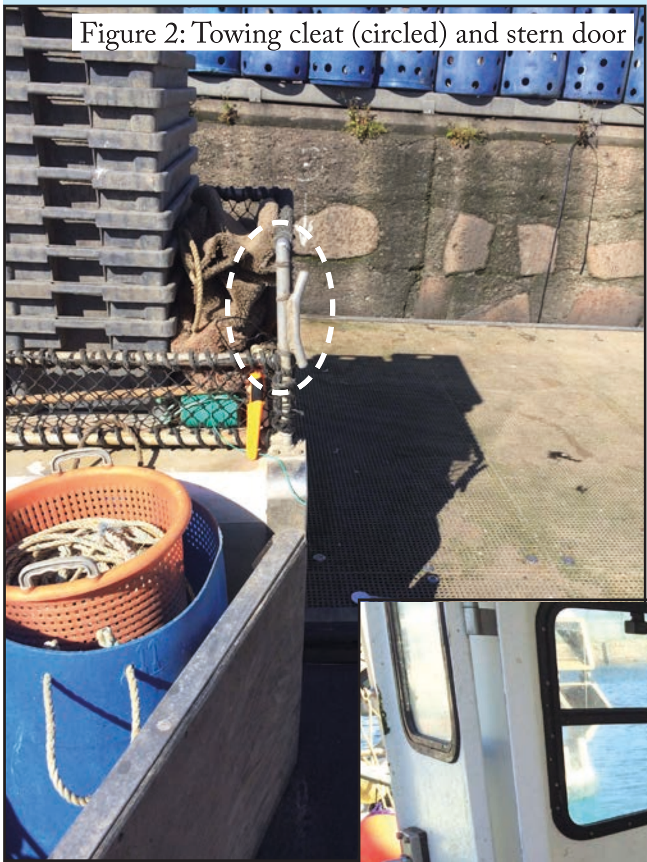


Figure 2: Towing cleat (circled) and stern door


Figure 3: Re-positioned towing cleat

How Very Quickly Life Changes

Narrative

A well respected and very experienced fisherman suffered life changing injuries as a result of not taking a few simple safety precautions. The skipper was working single-handed on a 10.8m steel beam trawler (Figure 1), which had been worked hard but was well maintained and structurally sound.

Soon after sunrise on the morning of the accident, the skipper shot his nets and began fishing. A short while later a troublesome fish hold bilge pump tripped out. The pump was located in a bilge well, close to the propeller shaft, under the fish hold deck boards.

The skipper decided to investigate why the pump had tripped out and attempt to rectify the problem whilst the boat was in autopilot and engaged in fishing. This meant that the engine was working with the propeller shaft engaged and rotating, pushing the vessel ahead. The skipper climbed down a short vertical ladder into the fish hold and began to lift the central boards that were covering the propeller drive shaft and bilge well. As he did so, he either slipped or stepped down into the space forward of the bilge well, where a coupling bolt on the rotating propeller shaft snagged his oilskin trousers and pulled his leg rapidly into and around the propeller shaft (Figure 2).

The skipper managed to cut himself free and, although very badly injured, was able to make his way out of the fish hold to the wheelhouse. The boat's VHF radio was mounted in a bracket suspended from the wheelhouse roof, and was out of reach of the severely injured skipper. However, he had a mobile telephone and fortunately was able to use it to summon assistance. By the time help arrived, the skipper had lost a lot of blood and was semi-conscious. He was taken to hospital for emergency surgery; his injuries were so severe that they resulted in amputation and a long period of remedial therapy.

Figure 1: 10.8m steel beam trawler

The Lessons

1. The hazards associated with working single-handed on small fishing vessels are well documented; when something goes wrong there is no-one there to help you or to raise the alarm if you are incapacitated. For these reasons, it is particularly important to proceed with care and carefully assess the hazards associated with every task and activity you undertake.

2. Working close to unguarded machinery and rotating drive shafts is an extremely dangerous thing to do. Safety guards and barriers (in this case the deck boards) should never be removed while machinery and rotating drive shafts are still in motion. The skipper should have de-clutched the propeller and safeguarded against unintentional re-engagement before lifting the deck boards and starting the work.

3. It took incredible strength of will and desire to survive for the skipper to free himself from the rotating propeller shaft and climb out of the fish hold. Once in the wheelhouse he could not reach the VHF radio. Fortunately he had a mobile telephone to hand, it had battery power and the boat was within range to pick up a signal. The ability to raise the alarm and communicate is vital in these circumstances. Options that should be considered include the carriage of PLBs.

4. The fitting of an AIS unit on fishing vessels under 15m is not mandatory, however as an aid to safety it is recommended. In this case, the AIS, although fitted, had been switched off due to commercial sensitivities. Had it remained switched on, the ability to locate the boat and the rescue of the skipper would have been swifter.

Figure 2: Propeller shaft and fish room bilge well

Lone Working

Narrative

On a calm crisp day, the skipper of a 9.98m scallop dredger (Figure 1) was hauling his third catch late in the morning when he was fatally injured after becoming entangled on the starboard warping drum of the vessel's winch.

The skipper was operating the vessel single-handedly, and it is most likely that he was pulled onto the winch when one of the shoulder straps of his bib and brace trousers became snagged on the rotating warping drum. He was unable to free himself or stop the winch before succumbing to his injuries.

The vessel had been modified to operate as a scallop dredger from its original design as a whelk potter. These changes had resulted in a complex system for shooting and hauling the gear that was not suitable for single-handed operation (Figure 2). The winch installed was in a poor condition and was not fitted with any safety cut-off devices. As the skipper was working alone, there was no-one on board able to stop the winch, raise the alarm or provide first-aid once he became trapped.

The skipper had previously worked on well-run vessels and was very experienced both with the fishing activity and also vessel management. However, the investigation revealed shortcomings in the maintenance of his vessel, working machinery and safety equipment, which, although not directly related to this accident, were contributory factors.

Careful consideration of the tasks to be conducted during the day to day operation of a vessel, and the hazards associated with them, can help to identify safe systems of work that considerably reduce or even remove many of the risks faced by the crew.

In this unfortunate case, the risks associated with poor maintenance, complex operation and lone working were either not appreciated or largely ignored.

The Lessons

1. **Single-handed operation of small fishing vessels is a well-documented hazard and all too frequently is highlighted in MAIB reports when something goes wrong. Safe systems of work need to be put in place following careful assessment of risks.**

2. **Emergency stops, safety cut-off and guards around machinery reduce the risk of an accident occurring. These should be fitted where possible and appropriate.**

3. **Working near unguarded rotating or moving equipment is hazardous. Ill-fitting or incorrectly worn clothing can introduce an extremely dangerous snagging hazard. Check for loose straps, tie cords and jewellery.**

4. **Maintenance forms a crucial part of any vessel's safety management, and can ensure costly breakdowns are rare. Incorrect or insufficient maintenance can lead to the premature failure or incorrect operation of machinery and equipment at safety-critical times.**

Figure 1: Single-handed scallop dredger

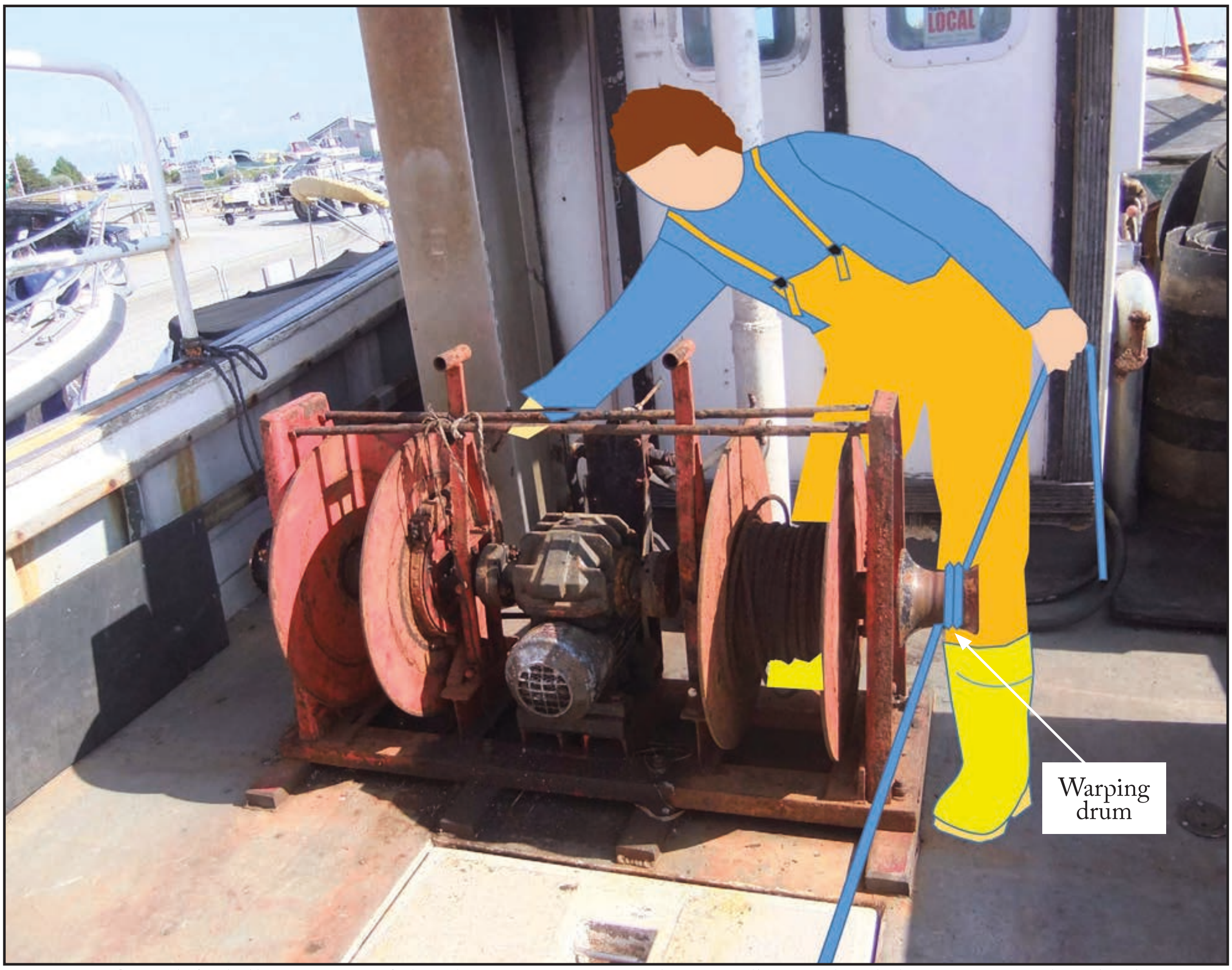


Figure 2: Simplified illustration of the skipper operating the vessel's winch while recovering his dredging gear on board

Lost in the Fog

Narrative

At sunrise on a foggy, spring day, the skipper of a small, open fishing boat (Figure 1) departed harbour with a plan to tend his creels then return home later that morning. His grandson, who had no seafaring qualifications, was on board as crew and they took some water and biscuits with them.

The boat, rigged as a side-hauling creeler, was commercially registered for fishing and rarely operated more than about a quarter of a mile from the shore. The only navigation equipment carried was a magnetic compass. The skipper had no means of electronic communications; he left his VHF radio and mobile phone at home and did not have an EPIRB or PLB.

Soon after leaving the harbour, sight of land was lost; nevertheless, the skipper assessed that visibility would improve, so decided to press on towards the location of his creels. However, the fog persisted and the skipper soon became completely lost and disorientated.

Later that morning, the skipper's wife raised the alarm when the boat was overdue. This triggered an extensive search using lifeboats, helicopters, other vessels in the area and coastguard rescue teams ashore. The search extended up to 30 miles offshore (Figure 2); however, after 2 days nothing had been found and the men were assumed to have been lost at sea.

The fishermen were cold, hungry and exhausted. With the weather conditions deteriorating, they were almost resigned to their fate when they sighted a deep-sea trawler approaching. Having gained the attention of its watchkeeper, the lost crew were rescued from their boat and transferred ashore to be reunited with their family. The rescue took place 44 miles offshore (Figure 2).

Figure 1: Picture of vessel under tow after recovery

The Lessons

1. Irrespective of the size of the vessel or its operating patterns, it is vital that every voyage is properly planned taking the likely weather and any navigational limitations into account. In this case, the skipper was unaware of the forecast that had predicted fog all day and the vessel was equipped with only a magnetic compass. Had the skipper properly considered these issues, it would have become apparent that proceeding to sea was unsafe.

2. It is vital that appropriate methods of raising the alarm are available. Carriage of a marine VHF radio is a requirement of the Code of Practice for the Safety of Small Fishing Vessels. Despite owning a suitable radio, the skipper did not take it to sea – this resulted in an unnecessary search and a very difficult experience for his family.

3. Small, light, reliable safety devices such as an EPIRB or PLB are lifesavers. Like the VHF radio, had such a device been carried then the fishermen could have been rescued soon after they realised the danger they were in.

4. It is vital that crewmen know how to operate their navigation equipment. Despite persistently trying to use the compass to head towards land, the boat ended up many miles out to sea. This was because the compass was not installed, set up or operated correctly. However, had it been used properly, the compass could have helped guide the boat back to land.

5. Training is critical. The skipper's grandson, who fished regularly, had completed no safety or fishing training whatsoever and should not have been crewing a commercial fishing boat. It also meant that he was of little help to his grandfather when the situation deteriorated.

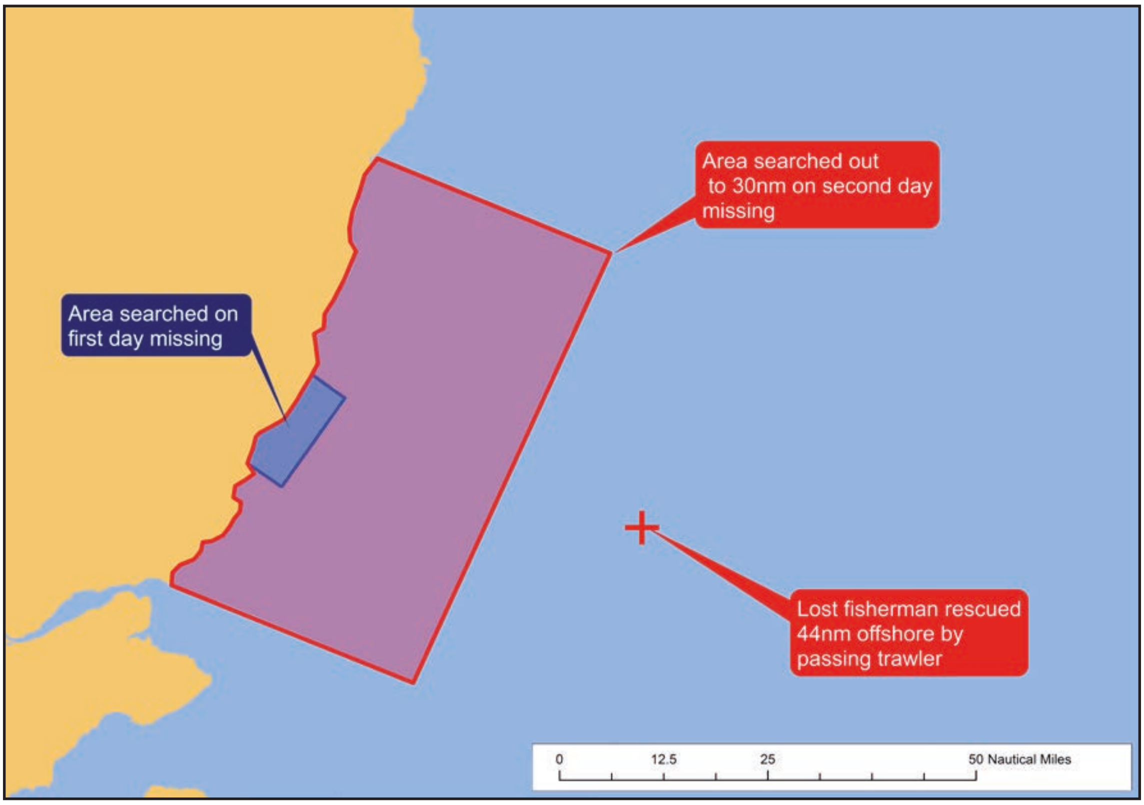


Figure 2: Area searched for missing small fishing vessel and positon where it was found after over 2 days at sea

CASE 22

Supper Would Have Been on Time if the Vessel Had Not Sunk

Narrative

A 24m steel hulled fishing trawler, with a crew of six, was fishing in calm seas when its engine began to make unusual noises. No-one was in the wheelhouse; the skipper, who was on watch, had gone to the mess room to prepare supper and the majority of the crew were on deck sorting a previous catch.

The skipper returned to the wheelhouse to investigate the noises and found that the engine room bilge high level alarm was illuminated and sounding.

The skipper instructed the engineer to go to the engine room and investigate. The engineer observed that water was almost level with the top of the main engine and was rising quickly. He started the bilge pump but could not reach the two sea water inlet valves as they were already more than a metre below the water level.

The main engine then stopped and the engineer told the skipper that nothing could be done to stem the ingress of water. The

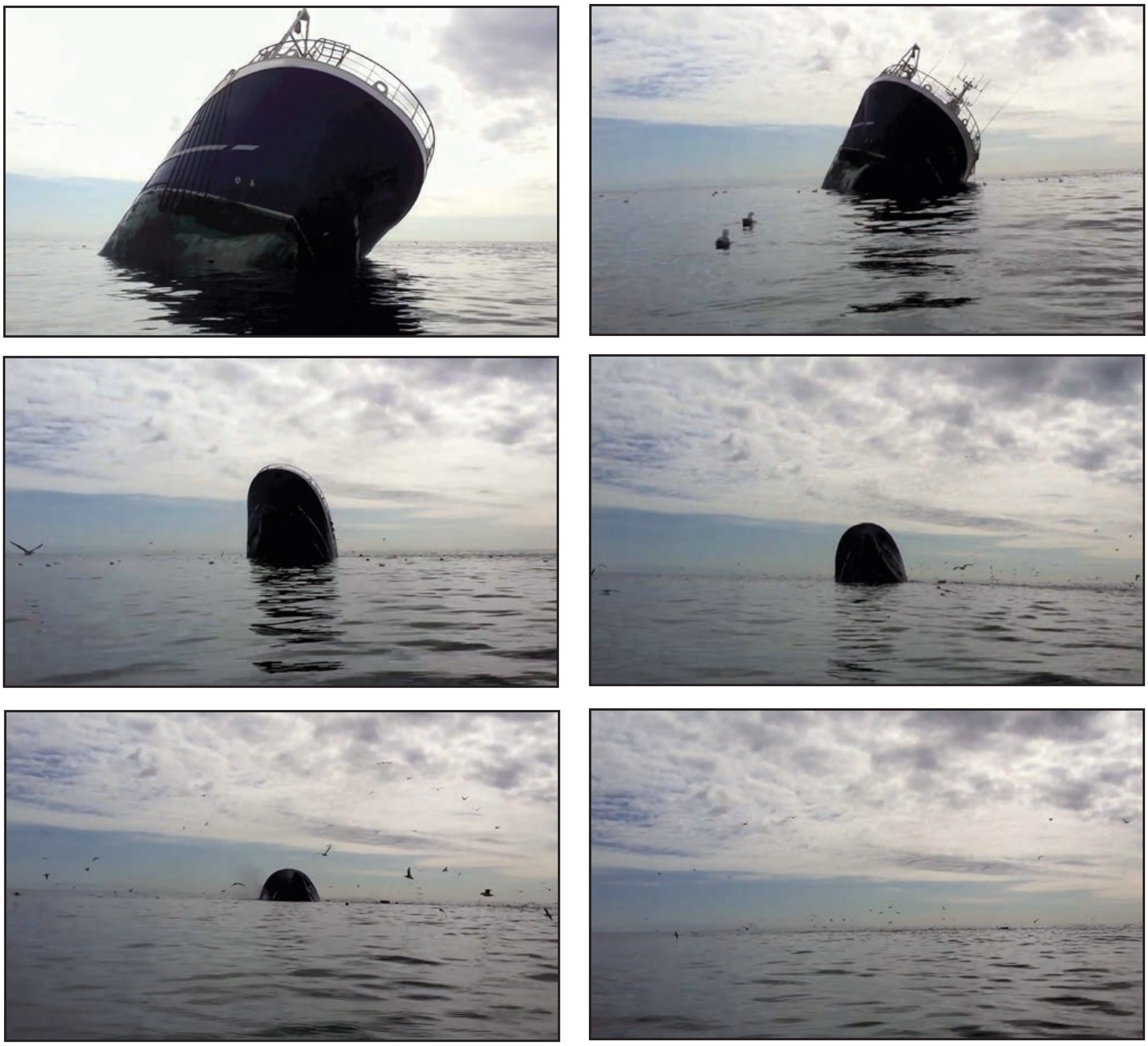


Figure 1: Sequence showing fishing vessel sinking

skipper, who had remained in the wheelhouse, then broadcast a "Mayday" message on VHF radio, which was received and relayed by the coastguard to all vessels in the area.

As the vessel began to sink lower in the water, the skipper ordered the crew to prepare to abandon ship. They went to their cabins, where their lifejackets were stowed, and returned to deck with their personal effects - but without lifejackets!

The skipper then ordered the crew to launch a liferaft. Fortunately, the vessel had two as the first one was lost because its painter had not been secured before the raft was launched. When the second liferaft had been successfully launched and brought alongside, the skipper informed the coastguard that the crew were abandoning the vessel; he then joined them in the liferaft, bringing with him the vessel's EPIRB, which he had activated. The skipper had also collected the valuable trawl sensors from the wheelhouse as he made his way to the liferaft.

Once in the liferaft the crew cut the painter and watched their vessel sink in deep water as they drifted away (Figure 1)

After spending an hour in the liferaft the crew were rescued by the crew of a vessel that had responded to the "Mayday" relay message. They were later transferred ashore, unharmed, by a rescue helicopter.

The Lessons

1. **The wheelhouse was left unattended when the skipper went below to prepare supper. Although the bilge alarm operated as designed, with no one present in the wheelhouse to either see or hear it, it was not detected in time to save the vessel. Never leave the wheelhouse unmanned when underway; doing so is in contravention of the COLREGs and puts you and your vessel at risk.**

2. **The crew were instructed to enter the accommodation to collect lifejackets in preparation for abandoning the vessel, but instead took personal effects from their cabin. The MAIB is aware of several accidents in which lives have been lost when people have re-entered the accommodation on a sinking vessel. Lifejackets should be stowed externally and always worn when abandoning ship. Furthermore, crews should never re-enter a sinking vessel.**

3. **The skipper's decision to take the EPIRB into the liferaft was prudent as this assisted the search and rescue units in locating them. However, his decision to take the time to collect the costly spare trawl sensors was not sensible and could have proved fatal. Never delay unnecessarily when abandoning a sinking ship.**

4. **The rate of water ingress and the speed at which the vessel sank suggests the failure of a main engine sea water cooling pipe. Analysis of maintenance records showed that this pipework had not been inspected or renewed for many years. Sea inlet pipework should be thoroughly checked during planned maintenance periods.**

Part 3 - Recreational Craft

There is no morbid fascination in following the work of the MAIB.

This is valuable stuff. The safety digests and accident reports it produces are a window, through which we get to see how something we do for pleasure can go badly wrong. It's a resource for marine safety and best practices based on real life situations that we can all identify with.

As many of us have pressured work lives, our leisure time becomes more valuable and a boating trip planned some time in advance to coincide with available free time, maybe with our family and friends, can become something that we are unwilling to cancel in the face of marginal conditions.

I keep my boat ashore some twenty-five miles from my house. The area is not blessed with good all tide launching facilities, so getting on the water is a bit of a mission. It requires effort just to get to the top of the slipway, and an investment of valuable time and energy. How many of us pressure ourselves in a similar situation I wonder? Increasingly, the amplification of our personal lives through our use of social media, can add further peer pressure to succeed in our declared adventure activities. Good seamanship and being a good skipper starts before the boat is even in the water. Careful planning and consideration of the weather and tide conditions may well mean you have to postpone or cancel a trip you have been planning for some time. Maybe you could launch and battle through adverse conditions, but it takes a better skipper not to launch, knowing the limitations of their boat, their crew and their own abilities.

It's understandably appealing – in a world seemingly health and safety mad, to be out on the water, in command of your own vessel with no one to tell you what you can and can't do. The sea is a great wilderness, and its accessible right on our doorstep. Getting on the water can be done relatively cheaply and with almost no compulsory legal requirements, so it's not hard to see why our spirit of adventure is piqued. But with great freedom comes great responsibility. In this case, responsibility to those we love, to ourselves, and to those who may have to risk their lives to find us when we find ourselves in trouble. For myself, this responsibility starts with two simple things: always use the kill cord, always wear a lifejacket. From that point, the more you invest in you and your crew's safety at sea, through equipment and training, the more confident you will become and the more enjoyable you will find your time on the water. Those of you reading this and thinking about getting some RYA training, please get some, and for those more experienced boaters, please get some more.

We never think anything will happen to us, I never did, and this safety digest is full of people who thought the same. I am minded of a phrase I read recently. "Opinions never saved a drowning man". Equipment and training will though. In 2013, while boating single handedly and with no accompanying vessels, I misread a wave/trough combination at 24 knots in a 5 metre RIB, en route to the Round Ireland RIB challenge and found myself overboard in the Irish Sea, 18 miles from St Annes Head. My boat drifted away from me faster than I could have caught it, my handheld VHF, despite being firmly attached to my lifejacket, smashed on impact with the water. I spent almost three hours drifting alone in the sea, and several factors contributed to my survival:- correct use of my engine kill cord and wearing a lifejacket, good quality safety equipment, and my RYA training, all these enabled me to survive. The professionalism of those co-ordinating my rescue, and the carrying and deploying of my Personal Locator Beacon, enabled me to be rescued.

The cases outlined in the Leisure digest show ordinary people getting themselves into extraordinary circumstances they never envisaged would happen, and there are useful conclusions to be drawn.

In the case entitled "a swell idea but the gain wasn't worth the risk" – the occupants of the rowing gig were extremely lucky that the RNLI were training close by. Despite the lack of a dedicated support boat, the stowage of lifejackets, a handheld VHF radio plus some basic warm clothing may all have seemed like a little safety "overkill" to the rowing crew, and yet all would be required in the space of a few hours. The Cornish Pilot Gig Association produce some water safety guidelines, which acknowledge that "contending with difficult weather conditions is part of the sports attraction", however the safety of the participants must remain paramount when assessing conditions prior to launch, and the guidelines strongly advise an assessment of weather and hazard conditions including contacting professional bodies such as HM Coastguard and the Met Office. Coxswains have responsibility for the whole crew, and must ensure that everyone is prepared for any adverse conditions encountered.

In the case "Kill Cord and Lifejackets Helped Save the Crew" – I was pleased to read that all the occupants were wearing lifejackets and that the engine kill cord was used and worked correctly. Rigid Inflatable Boats are great fun. They are extremely capable craft, and punch above their weight in their ability to handle difficult sea conditions. It was often explained to me while undergoing training, that I will find my own limits and capabilities before I find those of the RIB, however they do have their limits and skippers should consider adverse conditions, weather and local tides before launching. An adventure can very quickly become an ordeal.

Finding yourself suddenly ejected into the water is a disorientating and frightening experience but firmly attaching a means of calling for help to your lifejacket or clothing will let you raise the alarm. Carrying two methods of raising the alarm will give you a valuable back up should one fail. From my own experience, I strongly recommend a VHF handheld radio, and a Personal Locator beacon.

"One fine day, One not so fine swim" was a case I really identified with. A problem on the boat while underway, that requires you to stop and leave the driving position….yes …I have done that before, and then set off, only to realize ten minutes later that I had not re-attached the kill cord to myself.

I try to think of the kill cord as the boat "seat belt" so that it becomes second nature to attach it when I get behind the controls.

I was pleased to read that everyone escaped from this incident uninjured, but it serves to show how a seemingly innocuous and care free day can quickly go wrong. Every skipper must make sure that their boat's engine and safety equipment is regularly maintained and that faults are investigated at the first opportunity. While the engine is running, a kill cord should be worn.

There is no government department legislating how we UK leisure boaters set out on the water, and who knows if this may change in the future, but while we enjoy the freedom, we should not forget that our safety on the water rests with us. Thanks to the MAIB, we have yet another online resource to help us make informed decisions.

Andy Proudfoot

Andy Proudfoot describes himself as a boating 'Fan'. When not producing live music events around the globe, power boating is his escape, and specifically RIBs and Inflatables.

Based in the north east of England, he has always been keen on big adventures in small boats, whether in the Western Isles of Scotland, Ireland, the coast of California, or the San Juan Islands in the Pacific North West. A participant in the 2013 Round Ireland RIB challenge, when not working or on the water, he also finds time to write as a freelance journalist for Powerboat and RIB magazine.

One Fine Day, One Not So Fine Swim

Narrative

One of the pleasures of owning a boat is the freedom of using it when you wish. On a fine and sunny autumnal day, the owner of a 5 metre RIB (Figure 1) took the opportunity to take his family and their dog out for a short excursion which would include a stop for lunch. Although the RIB's owner held a boating qualification and was conscious of the dangers of boating, the trip very nearly ended in disaster.

After arriving at the beach from where they would begin their trip, the family and the dog all donned lifejackets. The owner launched the RIB from its trailer and then helped his wife and daughter on board. To ensure that the dog remained in the RIB while it was underway, its lead was secured to a handle on one of the buoyancy tubes. As was his habit, the owner secured the kill cord to himself before he started the engine. With the engine running and finding all was well, the group set off in good cheer towards their lunch destination.

As the RIB started to rise onto the plane, the owner noticed that one of the buoyancy tubes appeared to be a little flat and needed to be re-inflated. He put the engine throttle to "neutral" and then disconnected the kill cord before setting about re-filling the buoyancy tube.

With the RIB once again in ship-shape condition, the owner then returned to the conning position and placed the throttle "ahead". He did not re-attach the kill cord.

Despite moving the throttle forward, nothing happened – the owner was puzzled as the RIB had been working just fine before he had stopped. He moved the throttle a little further ahead, but there was still no response. The owner then pushed the throttle even further ahead and the RIB's engine suddenly burst into life, causing the boat to surge forward. The movement dislodged a rucksack, which flew towards the owner's face. As he lifted his left hand to fend off the rucksack, the RIB swerved violently to starboard, ejecting all of its occupants into the water. As the RIB began to encircle the people in the water, the dog somehow managed to slip its lead and swam for the shore.

Fortunately, the three people in the water all swam away from the circling RIB. They were later rescued by another boat owner who had seen the accident. The runaway RIB was stopped by a third boat user who bravely jumped across from his own boat to reach the controls. Although shocked, the family and the dog were uninjured.

The Lessons

1. RIBs are highly manoeuvrable and enjoyable crafts, but when out of control their propellers can be deadly to anyone in the water. When in charge of a powerboat, a kill cord should always be used so that the engine is stopped immediately should the driver be ejected from the boat. No matter how short the distance is, the danger of falling overboard from an open sided boat remains the same, and a kill cord works only if it is connected to both boat and driver.

2. You should always ensure that a boat can safely be put to sea before each use. It might delay your trip by a few minutes but it may very well extend your life by many years. Many boating associations can supply a comprehensive list of what to check before setting off or you can just ensure that you are CLEAR to go:

- Communication – ensure that you have at least one means of communication with shore in case of an emergency
- Lifejacket – or other suitable personal flotation device for each person (and dog!)
- Equipment – check that the boat and all its equipment are in place and ready to go
- Able – have a plan, know where you are heading and how to get there safely
- Ready – be ready to have fun on the water.

Figure 1: The 5 metre RIB

Kill Cord and Lifejackets Helped Save the Crew

Narrative

Four people were on board a high powered 6.2m RIB that had left the safety of an estuary when it encountered heavy breaking seas and capsized.

On a windy autumnal day there was a near gale force onshore (south-westerly) wind, with associated rough sea conditions. The tide was ebbing as the RIB left the estuary and this created large, steep waves over the bar. The admiralty sailing directions for the area stated that "*strong SW winds raise a heavy sea on the bar, particularly on the outgoing tide*".

The driver, who had owned the boat for just a few months, was wearing a kill cord and all the crew were wearing auto-inflation lifejackets with fitted crotch straps.

As the RIB crossed the bar it encountered a steep, breaking wave that lifted the bow vertically upright and clear of the water. The driver lost control and the RIB was overturned bow over stern.

The crew were all thrown out of the boat and into the water, some of them striking parts of the RIB as they were ejected and receiving minor injuries. However, with their lifejackets inflated, they all managed to clamber onto the upturned hull.

The RIB capsized so quickly that there was no opportunity in which to raise the alarm, so initially no-one was aware of the predicament the crew were in. Fortunately the visibility was good and the accident had occurred about a half mile from the shore. A member of the public who had been walking along a nearby beach spotted the crew after they had been clinging to the upturned hull for about an hour.

The coastguard were notified and initiated a rescue mission that resulted in the crew being rescued by the local inshore lifeboat after they had spent about 1.5 hours in the water. They were subsequently transferred by helicopter to a local hospital for treatment to minor injuries.

The boat was subsequently washed ashore and recovered (Figure 1).

The Lessons

1. Always plan your passage with care and know the potential hazards on your route. This accident occurred close to the shore, but could have had a different outcome had the crew not been seen by chance from the beach nearby.

2. Obtain a weather forecast before you depart and consider how that might affect the passage. The fact that heavy seas were likely to be present at the bar in strong onshore winds and ebb tides, was well documented, and should have been considered together with the capabilities of the crew and a 6.2m boat.

3. This accident shows the benefits of wearing a kill cord and lifejackets. Had the engine not been stopped when the RIB capsized, and the crew been in the water without buoyant support, the outcome could have been much worse for its occupants.

4. Although the crew had some good safety equipment they relied on being spotted from the shore to be rescued. If they had carried a personal locator beacon, the alarm would have been raised immediately after the accident and they would have been rescued much sooner. In other circumstances this might improve the chances of surviving such an accident.

Figure 1: Recovered RIB

A Swell Idea, But the Gain Wasn't Worth the Risk

Narrative

It was a cold day when the seven crew of a Cornish rowing gig intended going to sea for some training. Before launching, the cox'n and crew discussed the weather and noted that a ground swell could develop outside the harbour for an hour either side of low water. All agreed that if the swell developed they would stay at sea until it subsided, and that this could mean being out in the cold for several hours.

At the end of the rowing practice the gig's crew rowed towards the harbour to assess the conditions and found that an onshore swell had indeed developed as expected. After aborted attempts to enter the harbour, the cox'n decided to hold the gig beyond the swell line until conditions improved.

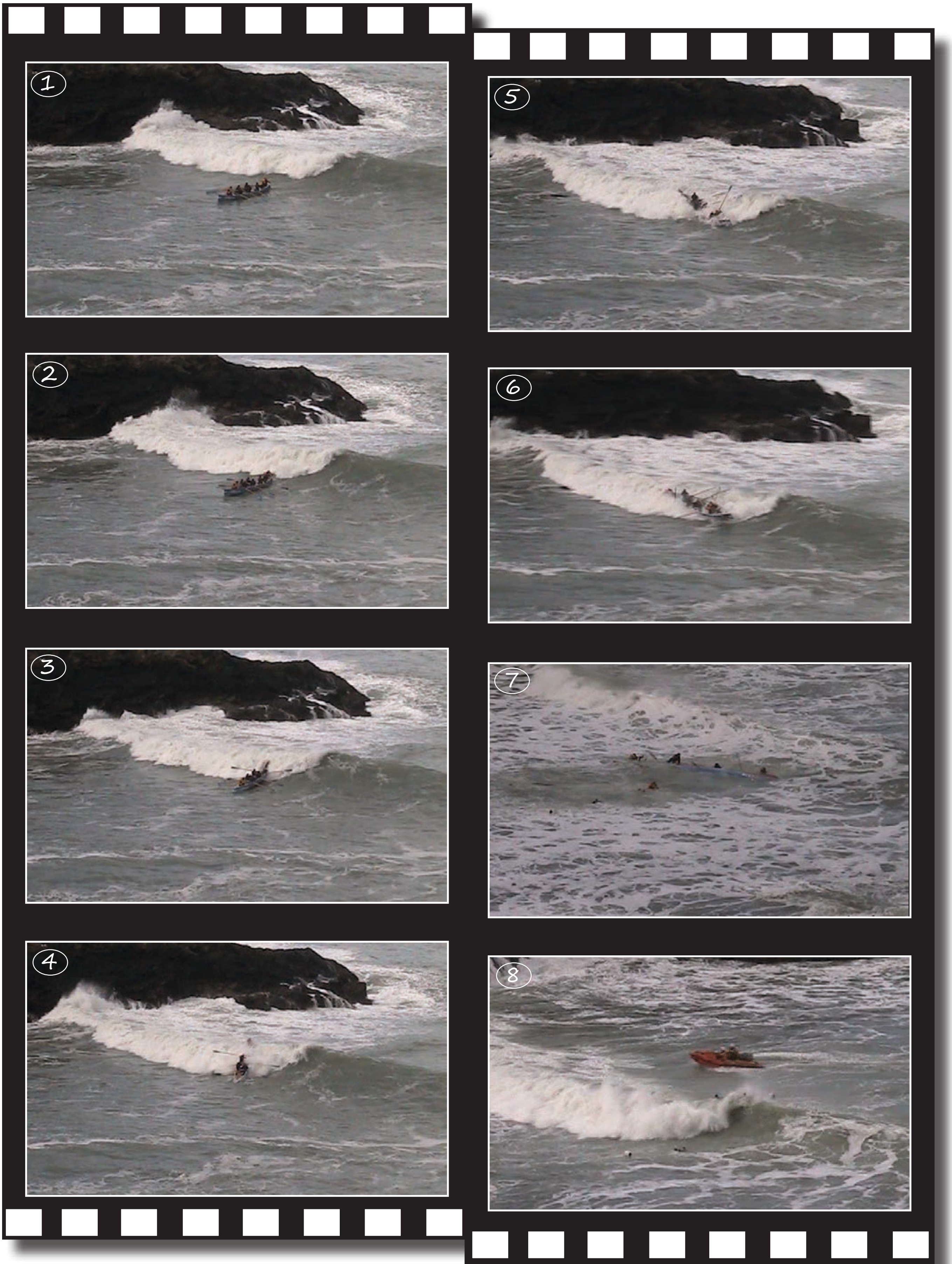
Coincidentally, the local RNLI inshore lifeboat was also training in the area, and the two vessels' crews exchanged banter and discussed the conditions. The lifeboat cox'n offered to collect warm clothing for the gig crew to wear while they waited for the swell to subside, and also suggested that two of the gig's crew should be taken ashore to be replaced by stronger rowers.

The lifeboat entered harbour and returned with two fresh rowers (one of them a seasoned gig cox'n), and all-in-one woollen suits and inflatable lifejackets for each of the gig's crew. The two new rowers changed places with those leaving the gig, following which the seasoned cox'n who had just boarded decided to take control of the gig. The cox'n bowed to what he believed to be the seasoned cox'n's greater experience and superior local knowledge, and ceded command of the craft to him without discussion. Similarly, the gig's crew were content with the change of cox'n and believed they would be in safe hands.

Following a discussion between the new cox'n and the lifeboat crew the decision was taken to attempt to enter harbour before the swell settled. The new cox'n was in communication with observers on a nearby cliff top and, drawing on their guidance he attempted to guide the gig into harbour between lines of swell. Unfortunately the gap between swells was not long enough, and as the craft raced forward it broached and capsized when overtaken by a following wave. The occupants were thrown into the sea.

Most of the inflatable lifejackets supplied by the lifeboat did their job by inflating and supporting their wearers. One lifejacket however did not automatically inflate and the weight of the wearer's waterlogged all-in-one suit quickly sapped his energy as he attempted to stay afloat while successive waves broke over him. Fortunately he was able to grab an oar and gain some support from that.

The inshore lifeboat's crew saw the gig capsize and quickly rescued its occupants from the sea. However, with nine people on board the lifeboat did not have the manoeuvrability to enter harbour safely in the prevailing swell, so the cox'n had to hold the boat outside the swell line until further resources arrived to help take the traumatised gig crew ashore.



Figures 1-8: Series of images showing the gig being caught by the swell and broaching

The Lessons

1. It was known that a ground swell regularly developed at the mouth of this harbour 1 hour either side of low water. There was, therefore, a risk of making a harbour entry in marginal conditions, or having a long cold wait. With hindsight, it is easy to see that a better decision would have been to delay the training until conditions were more favourable.

2. Having decided to proceed with the training session the gig's crew knew they could face a long wait at sea if the ground swell developed. They should therefore have taken appropriate extra clothing in case this occurred. While the all-in-one woollen suits supplied by the RNLI are good at retaining warmth, they are intended to be worn under dry suits; their fleece like construction acts like a sponge in water and, as was shown in this case, when waterlogged their weight can quickly sap the energy of an unsupported swimmer.

3. Many rowers choose not to wear PFDs as they perceive them to restrict their rowing. Given the conditions on the day it would have been sensible, as a minimum, to have stowed lifejackets on board. They could then have been donned before starting any potentially hazardous activity, such as attempting to enter harbour through a heavy swell.

4. The crew and original cox'n were content to delay their return to harbour until conditions were more benign, yet allowed a newly arrived forceful character to alter their decision. In this case, the potential gain of an earlier entry to harbour did not warrant the risk of attempting an entry through the prevailing swell. A more comprehensive discussion of the risks/gains should have taken place, which would have enabled the original cox'n to make an informed decision about handing over command of the gig. Had such a discussion occurred, the outcome might well have been different.

INVESTIGATIONS STARTED IN THE PERIOD 01/09/15 TO 29/02/16

Date of Occurrence	Name of Vessel	Type of Vessel	Flag	Size	Type of Occurrence
29/08/2016	*Daroja/* *Erin Wood*	Cargo ship | Solid cargo | General cargo Cargo ship | Liquid cargo | Oil tanker | Crude oil	UK St Kitts and Nevis	51 gt 3 266 gt	Collision
05/09/2015	*CV21*	Recreational craft | Sailboat (aux engine)	UK	49.6 gt	Occupational accident (1 fatality)
04/10/2015	*Karinya*	Fishing vessel | Trawler |Other trawler	UK	120 gt	Fire
04/10/2015	*Annie T*	Fishing vessel | Potter	UK	5.3 gt	Occupational accident (1 fatality)
09/11/2015	*Pacific Dawn*	Passenger ship | Only passenger	UK	70 285 gt	Occupational accident (1 fatality)
03/12/2015	*Primula Seaways/* *City of Rotterdam*	Cargo ship | Solid cargo | Ro-ro cargo Cargo ship | Solid cargo | Other	Denmark Panama	32 523 gt 21 143 gt	Collision
29/12/2015	*Svitzer Moira/* *Svitzer Ellerby*	Service ship | Tug (Towing/Pushing) Service ship | Tug (Towing/Pushing)	UK UK	267 gt 267 gt	Occupational accident (1 fatality)
21/01/2016	*Majestic*	Fishing vessel | Potter	UK	51 gt	Flooding | Foundering
15/02/2016	*Toby Wallace*	Recreational craft | Rowboat	UK	1 gt	Occupational accident (1 fatality)

Reports issued in 2015

Arniston
Two fatalities due to carbon monoxide poisoning on board the Bayliner 285 motor cruiser on Windermere on 1 April 2013
Report 2/2015 Published 16 January

Barfleur/Bramble Bush Bay
Passenger ferry *Barfleur*'s contact with the chain from chain ferry *Bramble Bush Bay* in Poole on 16 July 2014
Report 11/2015 Published 21 May

Barnacle III
Fatal manoverboard from the creel fishing vessel, west of Tanera Beg on 13 May 2014
Report 1/2015 Published 8 January

Beryl
Person overboard from the fishing vessel, with the loss of one life, west of the Shetlands Islands on 10 February 2015
Report 26/2015 Published 2 December

Cheeki Rafiki
Loss of the yacht and its four crew in the Atlantic Ocean, approximately 720 miles east-south-east of Nova Scotia, Canada on 16 May 2014
Report 8/2015 Published 29 April

Commodore Clipper
Grounding and flooding of the ro-ro ferry in the approaches to St Peter Port, Guernsey on 14 July 2014
Report 18/2015 Published 29 April

Diamond
Foundering of the fishing vessel, resulting in the death of a crew member, West Burra Firth, Shetland on 25 March 2014
Report 5/2015 Published 11 February

Dieppe Seaways
Fire on board the ferry on the approach to, and subsequently alongside, the port of Dover on 1 May 2014
Report 20/2015 Published 7 October

Dover Seaways
Contact by the ferry with the South Breakwater at Dover on 9 November 2014
Report 24/2015 Published 19 November

ECC Topaz
Fire and subsequent foundering of the passenger transfer catamaran while conducting engine trials off the east coast of England on 14 January 2014
Report 4/2015 Published 11 February

Ever Smart/Alexandra 1
Collision between container ship *Ever Smart* and oil tanker *Alexandra 1* in Jebel Ali, United Arab Emirates on 11 February 2015
Report 28/2015 Published 9 December

Fletcher speedboat
Fatality following capsize of a Fletcher speedboat, Tor Bay on 2 May 2015
Report 21/2015 Published 8 October

GPS Battler
Two fatalities connected with the operation of the workboat off Almeria, Spain on 13 August 2014 and in Marin, Spain on 6 January 2015
Report 17/2015 Published 29 July

Lysblink Seaways
Grounding of cargo vessel near Kilchoan, West Scotland on 18 February 2015
Report 25/2015 Published 19 November

Millennium Diamond
Passenger vessel's contact with Tower Bridge, River Thames, London on 4 June 2014
Report 7/2015 Published 5 March

Millennium Time/Redoubt
Collision between the passenger vessel and the motor tug with three barges in tow on the King's Reach, River Thames, London on 17 July 2014
Report 13/2015 Published 17 June

Nagato Reefer
Accidental release of a lifeboat from the refrigerated cargo vessel in Southampton on 9 April 2014
Report 9/2015 Published 7 May

Norjan
Chief officer's fall from a hatch cover on board the general cargo ship at Southampton, United Kingdom on 18 June 2014
Report 27/2015 Published 3 December

Ocean Way
Capsize and foundering of the fishing vessel, 100 miles north-east of Tynemouth on 2 November 2014, resulting in three fatalities
Report 23/2015 Published 18 November

Orakai/Margriet
Collision between the chemical tanker *Orakai* and the beam trawler *Margriet* North Hinder Junction, North Sea on 21 December 2014
Report 16/2015 Published 9 July

Pride of Canterbury
Main engine room fire on board ferry while berthing in Calais, France on 29 September 2014
Report 22/2015 Published 29 October

Ronan Orla
Fatal accident to the skipper of the scallop dredger, 3 miles north-east of Porth Dinllaen on 30 March 2014
Report 12/2015 Published 5 June

Sapphire Princess
Drowning of a passenger in swimming pool on the cruise ship, East China Sea on 6 August 2014
Report 19/2015 Published 21 August

Sea Breeze
Flooding and abandonment of the general cargo ship, 11.6nm off Lizard Point, Cornwall on 9 March 2014
Report 14/2015 Published 24 June

Shoreway/Orca
Collision between the dredger *Shoreway* and the yacht *Orca* 7 miles off the coast of Felixstowe resulting in one fatality on 8 June 2014
Report 10/2015 Published 20 May

Stella Maris
Capsize and foundering of fishing vessel 14 miles east of Sunderland on 28 July 2014
Report 29/2015 Published 10 December

Vectis Eagle
Grounding of the general cargo ship in Gijon, Spain on 30 November 2014
Report 15/2015 Published 9 July

Wanderer II
Serious injury to a crew member, 1 mile south-east of Wiay Island, Outer Hebrides on 19 November 2013
Report 6/2015 Published 12 February

Water-rail
Disappearance and rescue of the small fishing vessel in the North Sea on 20-22 May 2014
Report 3/2015 Published 29 January

Reports issued in 2016

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

Vector V40R
Contact by 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 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

Safety Bulletins issued during the period 01/09/15 to 29/02/16

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY BULLETIN

SB1/2016

February 2016

Extracts from The United Kingdom Merchant Shipping (Accident Reporting and Investigation) Regulations 2012

Regulation 5:
"The sole objective 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."

Regulation 16(1):
"The Chief Inspector may at any time make recommendations as to how future accidents may be prevented."

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NOTE
This bulletin is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

All bulletins can be found on our website:
https://www.gov.uk/maib

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Mooring line failure resulting in serious injury to a deck officer on board *Zarga* alongside South Hook LNG terminal, Milford Haven on 2 March 2015

Photograph courtesy of Fotoflite.co

Zarga

1

MAIB SAFETY BULLETIN 1/2016

This document, containing safety lessons, has been produced for marine safety purposes only, on the basis of information available to date.

The *Merchant Shipping (Accident Reporting and Investigation) Regulations 2012* provide for the Chief Inspector of Marine Accidents to make recommendations at any time during the course of an investigation if, in his opinion, it is necessary or desirable to do so.

In co-operation with the Republic of the Marshall Islands, the Marine Accident Investigation Branch (MAIB) is carrying out an investigation into a mooring line failure resulting in the serious injury to a crewman on board the Marshall Islands flagged Liquefied Natural Gas (LNG) carrier *Zarga* at the South Hook LNG terminal, Milford Haven on 2 March 2015.

The MAIB will publish a full report on completion of the investigation.

Steve Clinch
Chief Inspector of Marine Accidents

NOTE

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This bulletin is also available on our website: www.gov.uk/maib

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BACKGROUND

On 2 March 2015, a deck officer on board the LNG carrier, *Zarga*, suffered severe head injuries when he was struck by a mooring rope that had parted while repositioning the vessel at the South Hook LNG terminal, Milford Haven. The officer, who was in charge of the vessel's forward mooring party, was airlifted to a specialist head injuries trauma unit for emergency surgery.

In July 2015, MAIB issued Safety Bulletin SB1/2015 in relation to the same incident. The Safety Bulletin highlighted the dangers of snapback when a high-modulus, low elongation, mooring rope fails when it is connected to a high elongation tail that is intended to reduce excessive dynamic loads on the mooring line during normal or severe operating conditions. This Safety Bulletin should be read in conjunction with SB1/2015.

MOORING ROPE

The mooring lines fitted to *Zarga* were high-modulus polyethylene (HMPE) jacketed synthetic fibre ropes. They had a 44mm diameter and were 275m long with a minimum breaking load (MBL) when new of 137 tonnes. A close-fitting braided abrasion-resistant jacket encased the rope's HMPE load-bearing core, which comprised three, low twist construction strands. Each strand consisted of 32 rope yarns. The core was wrapped in a self-amalgamating tape that assisted in bonding the jacket to the core.

The failed mooring rope had completed 1342 operating hours; it was 5 years old and had been expected to last for at least 8 years. The rope had a documented history and its previous on board visual and tactile inspection assessed it to be in good condition. Through life information recorded for each of the vessel's 20 mooring lines included the port of use, and the prevailing ambient air temperatures and local weather conditions during use.

INITIAL FINDINGS

The rope failed at an indicative load of 24 tonnes. Subsequent non-destructive assessment of the rope by an industry expert did not identify any defects that would indicate that it had been used or operated incorrectly **(Figure 1)**.

When the close-fitting jacket was removed from the rope at each side of the failure point, the rope yarns in all three strands exhibited moderate to severe kinking. The Z-shaped kinks were visually apparent and were found at close intervals with, for example, 22 occurring over a length of 2.78m **(Figure 2)**.

During the rope's dissection, 12 of the 96 rope yarns were found to have separated. The rope yarns were found to have failed at kink points and had separated as if they had been cut with a sharp knife at 45 degrees **(Figures 3** and **4)**.

Following the identification of the kinking and failed rope yarns, a number of additional sections of the rope were inspected. Further rope yarn failures and damage to the rope yarns at filament level were seen **(Figure 5)**. The damage identified was consistent with axial compression fatigue.

Operating ropes around tight bend radii can exacerbate axial compression fatigue and also cause internal abrasion damage. In this case, the failed mooring rope had been run from its winch drum to the LNG terminal hook via a deck roller bollard and a ship's side roller fairlead. The diameters of the rollers for both the deck bollard and deck fairlead were less than the minimum recommended by the rope manufacturer for its 44mm HMPE jacketed ropes.


Figure 1
Failed end
of rope

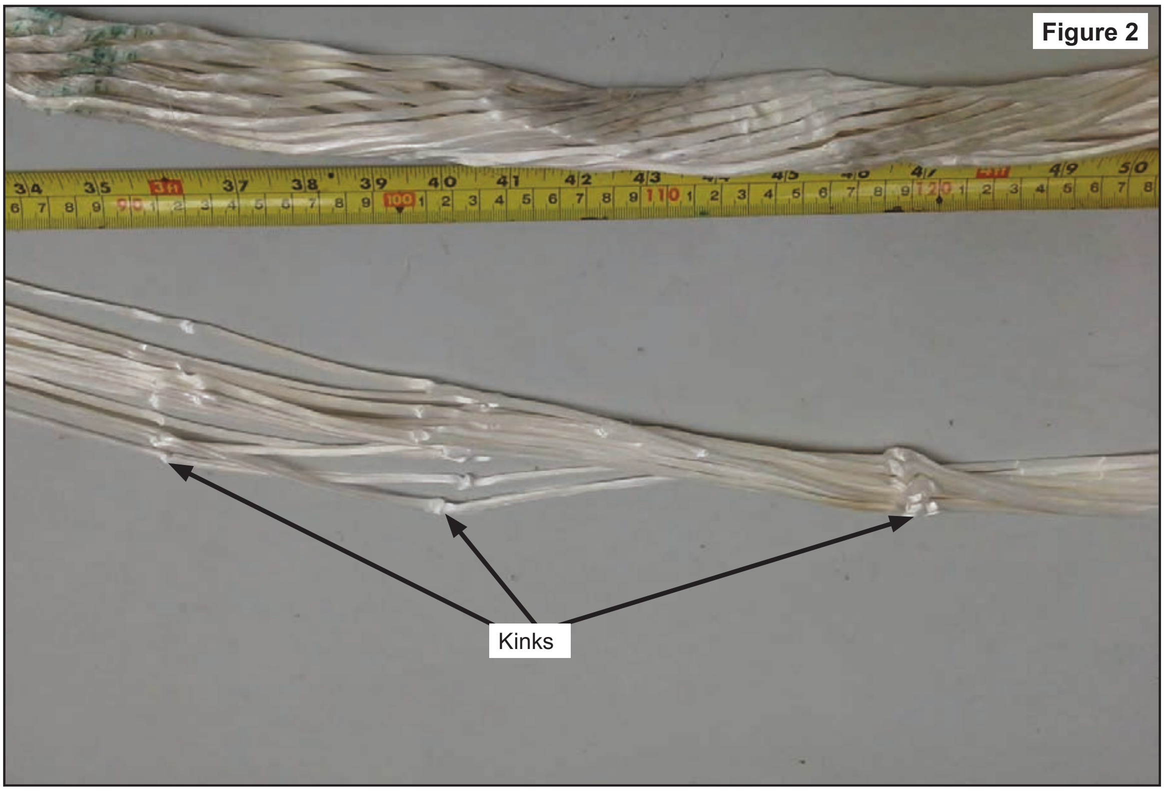
Figure 2
Kinks

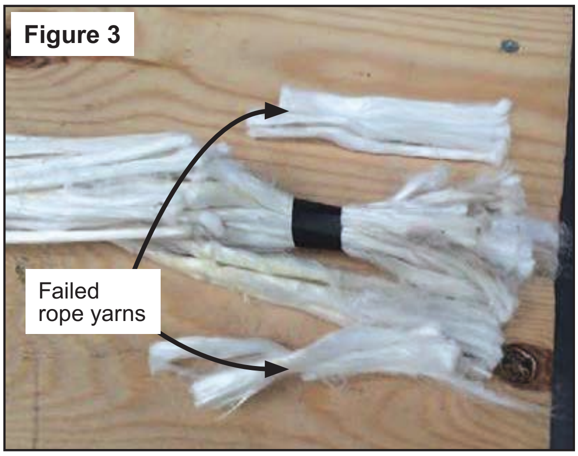

Figure 3

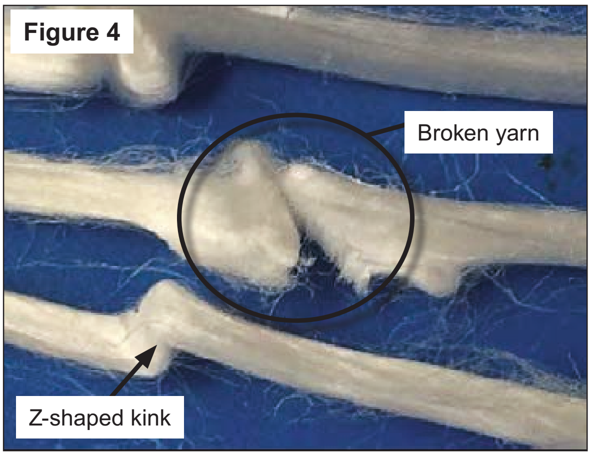

Figure 4

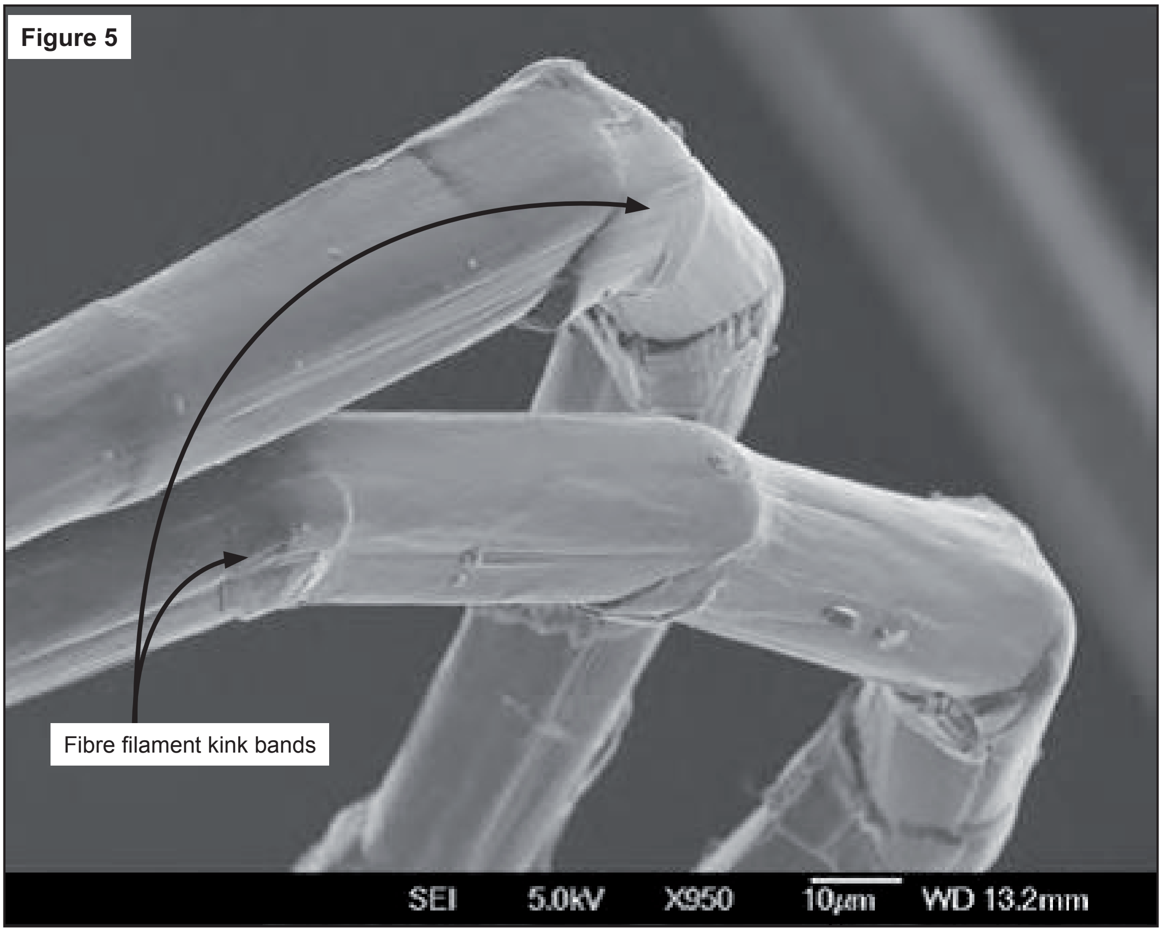

Figure 5

Close-fitting jackets prevent operators from visually inspecting these types of rope for core and yarn fatigue damage, and there are currently no non-destructive tests available to assess the level of fatigue degradation in fibre filaments in ropes. If it had been possible to visually inspect the load-bearing core of *Zarga*'s rope, the rope yarn kinks and the broken rope yarns would have been identified.

The HMPE rope failed at well below its certificated minimum breaking load and well before its anticipated lifetime prediction. This was the latest in a series of mooring line failures that had occurred on board large LNG carriers at, mainly, exposed berths over several years. The investigation into the causes and circumstances of the rope failure is ongoing and will be discussed in the full investigation report, along with other safety issues identified during the investigation.

SAFETY LESSONS

Close-fitting jacketed synthetic fibre ropes with low twist constructions are more prone to failure under normal operating conditions than other mooring rope constructions. This is especially the case where the diameter to diameter (D:d) ratio between a ship's deck fittings and its mooring ropes, is less than that recommended by the rope's manufacturer. The nature of the close-fitting jacket precludes visual inspection of the rope's core for signs of degradation. Operators of vessels using close-fitting jacketed synthetic fibre mooring ropes are strongly advised to contact the rope's manufacturer/supplier to:

- Confirm or otherwise that the rope is suitable for its intended use and envisaged operating conditions including, specifically, that it is compatible with the vessel's deck fittings, and,
- Ensure that an appropriate regime exists to monitor the condition of the ropes in use so as to maintain a high level of confidence that they can be replaced before they become materially weakened or degraded.

Issued February 2016

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