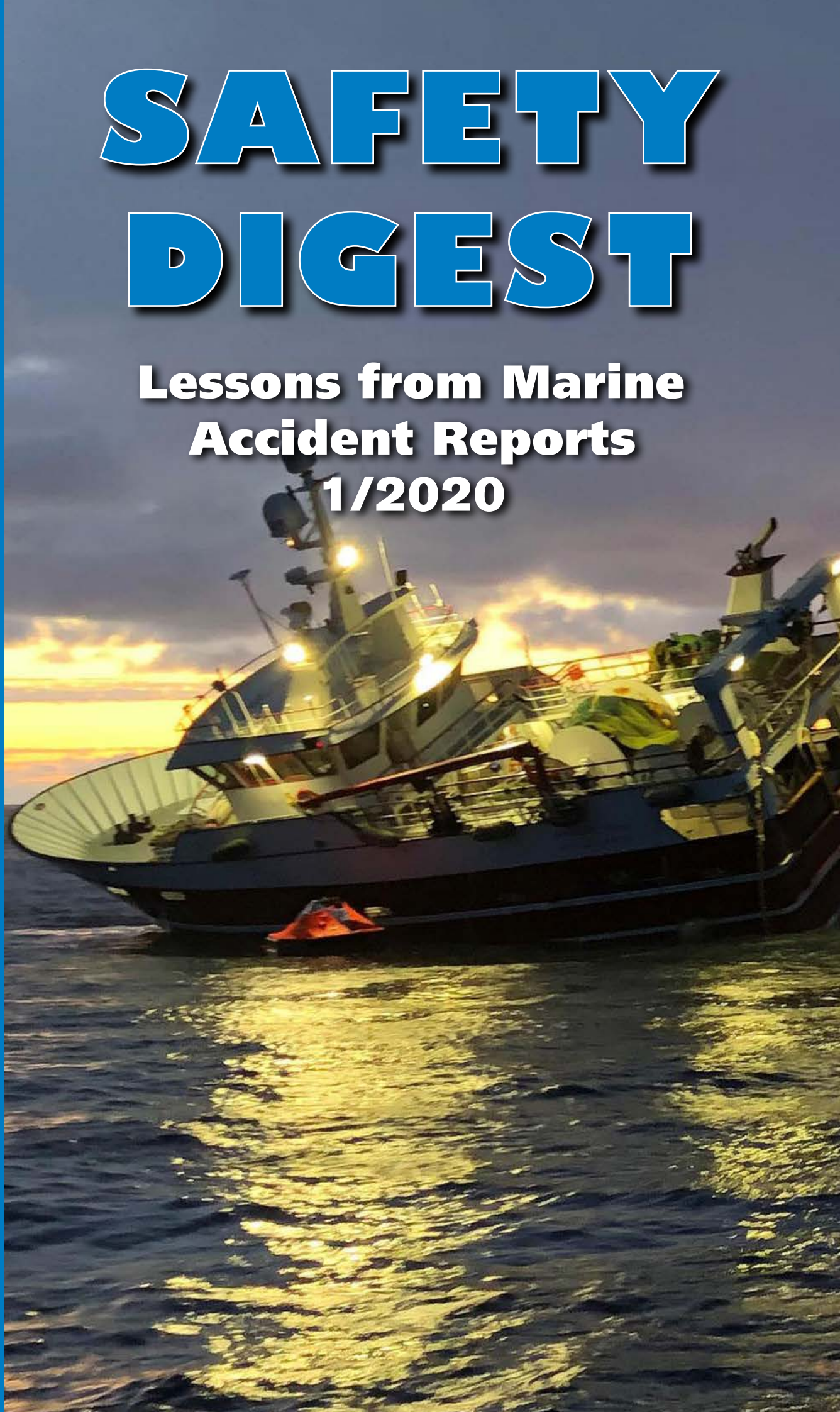
MARINE ACCIDENT INVESTIGATION BRANCH

MAIB

SAFETY DIGEST

Lessons from Marine Accident Reports 1/2020



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April 2020

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 an 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.

Extracts can be published without specific permission providing the source is duly acknowledged.

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 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."

INDEX

Glossary of Terms and Abbreviations

AB	-	Able seaman
AIS	-	Automatic Identification System
BA	-	Breathing Apparatus
BNWAS	-	Bridge Navigational Watch Alarm System
C	-	Celsius
CCTV	-	Closed Circuit Television
DSC	-	Digital Selective Calling
ECDIS	-	Electronic Chart Display and Information System
HP	-	horsepower
ILO	-	International Labour Organisation
m	-	metre
"Mayday"	-	The international distress signal (spoken)
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
OOW	-	Officer of the Watch
"Pan Pan"	-	The international urgency signal (spoken)
PFD	-	Personal Flotation Device
RIB	-	Rigid Inflatable Boat
RNLI	-	Royal National Lifeboat Institution
Ro-Ro	-	Roll on, Roll off
RYA	-	Royal Yachting Association
VHF	-	Very High Frequency
VTS	-	Vessel Traffic Services

Introduction

I will start my opening comments by thanking Kathryn Neilson, Derek Cardno MNM and Paul Glatzel for the introductions they have written for the main sections of this edition of the MAIB's Safety Digest. Their individual perspectives provide some insightful comments and, as ever, some useful pearls of wisdom. Do please take time to read their words, which contain some powerful advice.

Only a year ago, I wrote in my introduction about safe means of access, and that the MAIB had just started two investigations into fatal accidents. One accident occurred as a crewman was attempting to leave his vessel to receive mooring lines, and the other as a crewman was trying to board having just let go the lines. Unfortunately, we have just commenced yet another fatal accident investigation, this time involving a workboat landing a crewman ashore. In common with the previous accidents, the workboat was not effectively secured against movement when the crewman stepped off. They say that bad things come in 3s, and I hope this is the last time someone dies because either the mooring/unmooring operation has not been properly thought through, or a shortcut has been taken. The investigation report into this latest accident will be published later in the year, but in the meantime may I again encourage you to review your procedures for berthing/unberthing and the passing and letting go of mooring lines to ensure your operation is not putting anyone's life at risk.

If I had a £1 for every time a manager has asked me how they can ensure that their staff are 'doing the right thing' I would be a rich man by now. There are no simple answers: if there were, people would not be asking me the question. However, the rapport that the 'office' has with the 'coal face' has a lot to do with developing a good safety culture. Office-based personnel, no matter how experienced, will not always draft workable procedures. Consequently, it is up to those trying to get the job done to provide them with constructive feedback. Back in the office, the task is then to take on board the feedback and react positively to it. Saving a few minutes here or a few pounds there can seem pretty smart at the time, but it is unlikely to convince the next-of-kin. Plan > Do > Review; it works.

Finally, it is the time of year when many leisure boaters are starting to think seriously about getting afloat again. It is also the time of year when the MAIB is inundated with reports of breakdowns, material failures and other accidents involving leisure craft. If you and your boat have had the winter off, could I encourage you to start gently, know your own and your boat's limitations, take time to practise, and build up slowly to the more challenging trips.

When you have finished reading this edition of the MAIB's Safety Digest, please pass it to someone you feel will genuinely benefit from reading these articles. If you are reading this on-line, then send on the link: there is no limit to the number of people who can learn from the experiences of others.

Be safe.

Andrew Moll
Chief Inspector of Marine Accidents

April 2020

Part 1 - Merchant Vessels

Fatal, catastrophic, serious are just some of the words used by the MAIB when reporting accidents and incidents at sea. We know fatal incidents involving our seafarers can be caused by human error and inadequate training, complacency and fatigue are amongst the most common causes of accidents and incidents at sea. Whilst the MAIB accident investigations are limited to establishing cause, promoting awareness of risks and preventing recurrence is a huge part of the work they do and must be highlighted and communicated across the industry if we are to reduce the number of accidents currently being reported.

So how can we ensure the next generation of seafarers understand the importance of a strong and effective safety culture on board? And how can we instil the message that safety is not one person's responsibility, but everyone's responsibility?

Throughout every phase of our seafarers' training, our Maritime cadets and apprentices receive the best possible education to ensure they are equipped with the necessary skills to operate a vessel safely and effectively whilst protecting the lives of the seafarers and in some cases, the passengers on board. They are taught that there are no half measures where safety is concerned and the thinking they adopt on Safety at Sea is always "ABOVE AND BEYOND COMPLIANCE!"

All too often the Merchant Navy Training Board receive reports from cadets and ratings returning from sea who have witnessed serious incidents whilst on board. Incidents involving experienced crew carrying out tasks under hazardous conditions without the required PPE, no work permits or risk assessments completed and no understanding of the serious implications of not following safety procedures.

Whilst we review and discuss findings and lessons learnt from accident reports, we must remember the great work already being implemented by Shipping companies and maritime organisations pushing to raise safety standards on board to change the way their workforce manage safety. The Chamber of Shipping's Safety Culture Charter launched last year by the Shipping Minister at London International Shipping Week is designed to be used to supplement and complement the work already being done by shipping companies in terms of their safety objectives and safety management systems (SMS).

The aim of the Charter is simple: to reduce incidents and accidents at sea. Shipping companies are already addressing their safety culture and working with their employees to improve it, but the Charter allows a collaborative way of working where shipowners share lessons learned and the barriers faced in the pursuit of making shipping safer.

Many shipping companies continue to support their employees in all aspects of safety in the workplace and have instilled a strong and effective safety culture on board. By simply changing shift patterns to reduce fatigue, designing and implementing more relevant, task specific training programmes, providing better fitting PPE, these small changes can and do have a positive impact on safety standards.

Changing the way people think about safety is a challenge, but we must ensure our young seafarers in training are equipped with the knowledge and the confidence to challenge any colleague when they find themselves in a situation where their safety and the safety of others is compromised.

KATHRYN NEILSON, DIRECTOR, MNTB

Kathryn started her career as a teacher and spent much of the early part of her career working within the training and development sector. When the opportunity arose in 2011 to branch off into Maritime Training, she jumped at the chance.

For seven years, she worked for Royal Caribbean Cruise Line as their Safety and Compliance Officer responsible for the UK fleets certification and Compliance and was also responsible for overseeing their UK and International Cadet Training Programmes. She took over the responsibilities of MNTB Director in August 2017.

As the Director of the Merchant Navy Training Board, she is responsible for the overall operation of the MNTB, overseeing and facilitating its technical work, new entrant training programmes, careers promotion strategy, the new Recognition Services and managing the charitable work of the Maritime Educational Foundation.

Distracted by a Mobile Phone

Narrative

A small cargo vessel was on sea passage and heading towards the coastline of the country of its next port of call. The OOW had taken over at 0200 and soon thereafter had started watching music videos on his mobile phone. Between about 0230 and 0430 the vessel was slowly set off the planned track by the tidal stream in the area. This resulted in the vessel heading towards some outlying, uninhabited rocky islands, marked by a lighthouse. However, the risk of grounding had not been observed by the OOW.

The vessel was also proceeding towards an area where there was a voluntary reporting zone and a VTS area. Watchkeepers ashore noticed that the vessel was heading into danger, and made verbal warnings. However, the OOW did not respond in sufficient time to prevent grounding heavily on rocks (figure).

The vessel was badly damaged by the accident and remained aground for several days until the cargo had been removed and sufficient tugs were available to haul it off the rocks.

Figure: The cargo vessel aground with the lighthouse visible in the background

The Lessons

1. The accident happened primarily because the OOW was distracted from navigation by the use of a mobile phone. This is a hazard that must be guarded against by appropriate policies for the use of mobile phones at sea.

2. Fatigue was also a potential causal factor. It was the middle of the night and the OOW was alone and bored on a warm bridge. These were conditions that induced a high risk of falling asleep - and he might have done so from time to time.

   Combatting boredom and fatigue is about ensuring high levels of supervision and that safeguards, such as the bridge navigation watch alarm (BNWAS), are in use. In this case, the BNWAS was switched off and there were no other alarms in place to warn the OOW of the looming danger.

3. The shore authorities offered verbal warnings to the OOW that the vessel was heading into danger. These warnings were made in sufficient time for action to be taken to avoid the grounding.

   Bridge teams need to heed warnings from shore and establish exactly what is being reported and what action to take. In this case, the OOW was not comprehending the importance of the warnings being transmitted.

4. Passage planning is not limited to the intended track on the chart or in the ECDIS. A comprehensive passage plan should identify all the hazards ahead and determine the safest route. This should include identifying all navigation marks, lights and buoys, which should then be positively identified when observed and cross-checked with other navigational data to ensure accuracy of the passage. This vessel was approaching land and the rocky area where it ran aground was marked by a lighthouse, which would have been visual for a long time as the vessel approached. This was vital, visual navigational information that did not feature in the passage plan and was not subsequently utilised for navigational safety on board.

A Tight Squeeze

Narrative

A tug was on a sea passage relocating to a new harbour when the fire alarm sounded. The chief engineer went to the engine room and saw flames around the port main engine. He immediately isolated the fire by shutting off the fuel supply to both engines, shutting all ventilation flaps and stopping the fans. The vessel's fixed fire-fighting system was not initiated as the chief engineer's actions had been effective in extinguishing the fire.

The alarm was raised with the coastguard and the tug was subsequently towed back to harbour, where the local area fire brigade attended. Some of the port main engine exhaust pipe lagging was found to still be hot, so this was cooled with water by the fire brigade as a precaution against re-ignition.

Figure: The failed compression fitting (olive not shown)

The Lessons

1. **Post-accident analysis established that the source of the fire was from fuel that had sprayed onto the port engine from a failed compression joint (figure) on small bore pipework to a fuel supply pressure gauge. This stainless steel fitting had failed because it had been sealed with a brass olive (or compression ring). In metal compression fittings, the pipework should be a 'softer' metal than the olive. In this case, the brass olive was 'softer' than the steel pipework and it had deformed and failed, rather than compress and seal the pipework, which would have been the case had a 'harder' stainless steel olive been used.**

2. **The chief engineer's response to the fire was both rapid and effective. These actions contained the fire, bringing the situation under control and preventing further damage or risk of injury. The fixed fire-fighting system remained available had the situation deteriorated. The crew's actions were a result of good system knowledge and worthwhile crew training. The benefits of conducting regular drills to ensure that safe practices are in place cannot be overestimated.**

Installation Pressure

Narrative

A landing-craft style fish farm support vessel was alongside with contractors on board who were completing the installation of storage tanks for hydrogen peroxide, a delousing agent used at fish farms. One of the contractors was on top of a tank (figure) and was releasing the securing nuts on a valve seat (figure inset) when a hissing noise was rapidly followed by the release of pressurised hydrogen peroxide, spraying onto the contractor. The crew doused the contractor with fresh water to rinse off the hydrogen peroxide and he was treated by paramedics then taken to hospital. Fortunately, the contractor did not suffer any long-term injuries.

Figure: The hydrogen peroxide tanks as seen from the wheelhouse (inset: the valve being removed)

The Lessons

1. Whatever the size and nature of a vessel, all installation or maintenance work must be risk assessed and undertaken in accordance with an agreed plan. After the accident, it was discovered that the contractor thought that the tanks were empty and was, therefore, unaware of the hazard he faced in undoing the securing bolts of the valve. Had a risk assessment been undertaken and a 'toolbox talk' get together happened at the start of the day, it is highly likely that this risk would have been avoided.

2. The crew's response of dousing the casualty with fresh water was quick and appropriate, and it is highly likely that these prompt actions saved the contractor from serious injury.

Breaking the Chain of Events

Narrative

A commuter passenger ferry was approaching the berth when control was lost due to a combination of the local tidal effect and a strong wind. The ferry's starboard bow was damaged after making heavy contact with the quay (figure); thankfully none of the 42 passengers was injured.

The ferry's normal berth was not available so an alternative quay was in use. However, the relief master who was making the approach was not familiar with the alternative berth or the local environmental conditions.

Figure: Structural damage to the ferry's starboard bow after the impact

The Lessons

This case is a good illustration that accidents rarely have a single causal factor. Instead, there is often a chain of events that can set the conditions for something to go wrong. In this case, the unusual berth, the relief master's lack of familiarity with the environment, the tidal stream and the breezy conditions all added up to create a potentially hazardous situation.

Passage planning is key. Every vessel, irrespective of its size or purpose, needs a passage plan that takes into account all the hazards that could be encountered. Even for a small passenger ferry undertaking a short commuter route, the crew and the vessel's managers need to think through all the imaginable scenarios and provide the best mitigation possible. In this case, some additional supervision could have been provided for the relief master until he was fully familiar with the alternative berth.

Unplanned Inclination

Narrative

Having completed loading, a container vessel was preparing to sail; the weather was fine with a gentle breeze. The chief officer decided to pump additional water into the starboard ballast tanks to level up tank volumes. This decision was based on his observation of port and starboard ballast tanks' contents from the tank capacity gauges on the operating panel.

As the volume of water in the starboard tanks increased, the vessel started to list heavily to starboard (figure). As the situation deteriorated, all the crew evacuated ashore.

After an assessment by the managing company, the master and the port authority, it was deemed safe for the crew to return on board and recover the situation by pumping out the ballast water from the starboard tanks.

After the incident, manual soundings were taken, which showed that one of the port ballast tanks' gauges had been reading full when the tank was actually empty, and the fault was almost certainly an airlock in the gauge system.

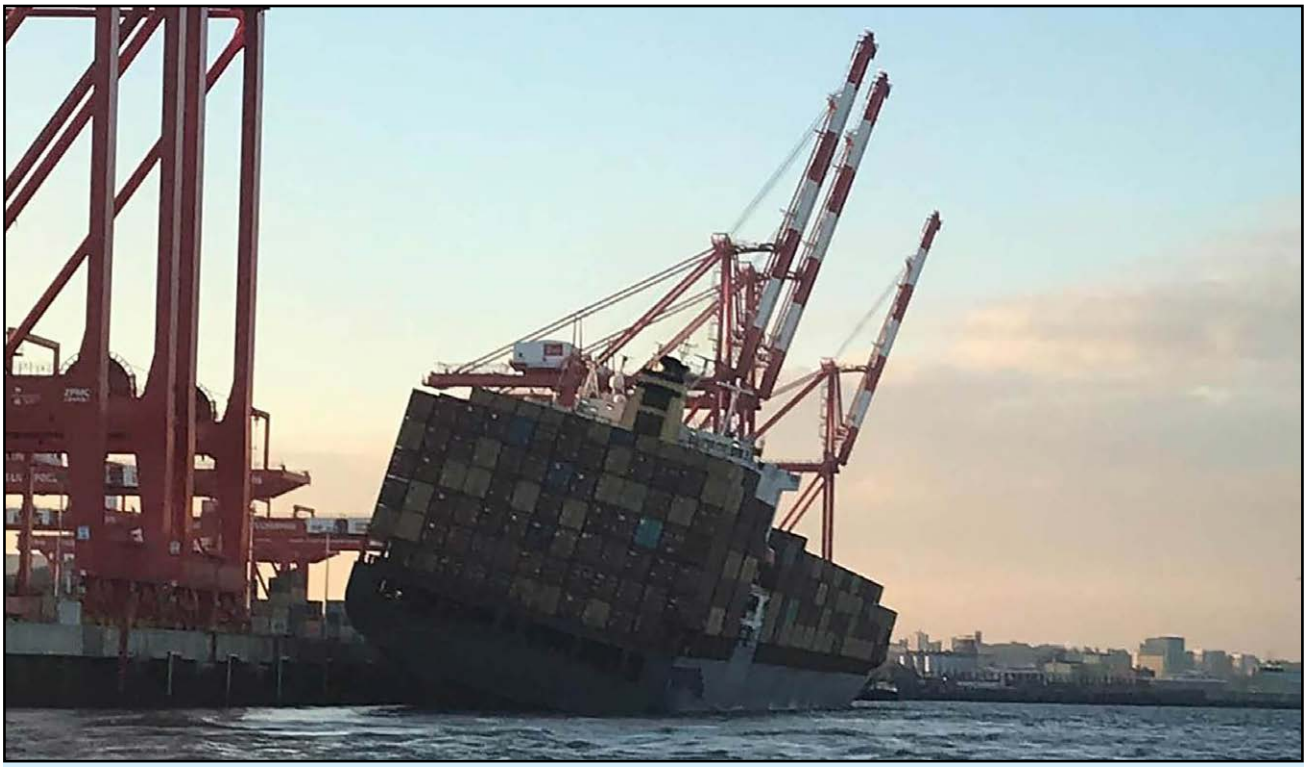


Figure: The container vessel listing alongside

The Lessons

1. **Ballasting operations should be planned, and maintaining an accurate picture of the state of the ballast system is critical for the safety and stability of the vessel.**

2. **Given the vessel was upright, it should not have made sense to add water to one side. When the vessel started to list, it would have been readily apparent that the ballasting was the problem, and this should have been stopped immediately.**

3. **Ballast system gauges are prone to inaccurate readings, so tanks should be sounded regularly with the levels recorded in the ballast logbook. This information can then be compared with gauges to check for discrepancies.**

A Roaring Engine

Narrative

A wind farm transfer vessel was underway with passengers on board when the port engine lost power and a fire alarm activated. Moments later, the skipper saw on the CCTV monitor that there was a fire in the port engine compartment; at about the same time, smoke started billowing from ventilation grills on the upper deck.

The port engine stopped by itself and the crewman went on deck to close the ventilation flaps to the compartment and isolate the fuel supply. The skipper then initiated the fixed fire-fighting system; however, this did not immediately extinguish the fire, so boundary cooling was started on the deck above the burning engine compartment.

Meanwhile, the passengers donned lifejackets and mustered on the foredeck away from the scene and clear of the smoke. Escorted by a lifeboat, the wind farm vessel made it back to harbour using the starboard engine. Once alongside, the passengers were safely disembarked and the local fire and rescue service assisted the crew in establishing that the fire had been extinguished.

The Lessons

1. **Post-accident investigation established that the fire started when an oil feed pipe for the port engine turbocharger failed (Figure 1), causing pressurised oil to spray onto the hot engine and ignite. Further technical assessment suggested that the pipe might have been vulnerable to fracture due to heat-related hardening. Regular inspection of oil pipework, particularly joints, connections and brackets is vital to maintain system integrity.**

2. **The engine and its compartment were extensively damaged (Figure 2). This included soundproofing material melting onto the engine and damage to the fiberglass structure. Even though the fixed fire suppression system was activated, the fire carried on smouldering for about an hour. This happened because the compartment ventilation flaps did not seal correctly, allowing air to feed the fire and smoke to escape.**

3. **The crew managed the situation very well. The fire was tackled as effectively as possible in the circumstances and the passengers' safety was ensured by raising the alarm and preparing to evacuate.**

Figure 1: The failed turbocharger oil feed pipe

Figure 2: Fire damage to the port main engine and its compartment

It's Raining Containers

Narrative

The reefer engineer on a large container vessel was checking refrigerated containers during cargo loading. He had been working alone in bay 22 and was aware that loading was progressing further aft around bay 26. Once the checks were complete, the reefer engineer moved aft to bay 26 to check the containers there as the crane was, by then, loading bay 30.

At this time, there was a very heavy shower of rain and the engineer did not notice that the crane had returned to his vicinity. As a container was being lowered into bay 26, it struck the engineer, who had not been visible to the crane driver. Soon after, the engineer was found trapped; once freed, he was taken to hospital, where surgery was required for his injuries.

The Lessons

1. **Working alone on the deck of a container vessel during cargo operations can be extremely hazardous. Containers are moved with surprising speed and multiple cranes can be utilised to load several bays simultaneously. If you cannot see the crane driver, then they cannot see you.**

2. **Investigation of this accident discovered that the stevedore who had been fulfilling the role of 'checker', monitoring safety on deck, had taken shelter from the rain shower. This meant that he had not been monitoring bay 26 at the time of the accident. Had the 'checker' been in place, it is almost certain that he would have seen the engineer and could have prevented the accident.**

Nodding off the Track

Narrative

A workboat was on station undertaking 'guardship' duties; the task was to patrol close to the shore where an undersea power cable was being installed. There were four crew on board; the skipper, a mate and two deckhands, working in pairs in a 6-on/6-off watchkeeping routine with handovers at 0200, 0800, 1400 and 2000 daily.

After taking over the watch at 0200, the mate and one of the deckhands continued patrolling on an east-west 'racetrack' roughly parallel with the shore. At about 0715, the crewman went to the galley to start preparing breakfast. Unfortunately the mate, who was then alone in the wheelhouse, fell asleep. A short while later the workboat ran aground on a sandbank.

The skipper was woken by the grounding and came to the wheelhouse and tried to free the vessel, but this was unsuccessful. The tide was falling, and at low water the workboat was high and dry (figure). There was no pollution, injury or damage and the workboat refloated without assistance at the next high water.

Figure: The workboat aground at low water

The Lessons

1. Fatigue is one of the most enduring causes of incidents and accidents, and must be guarded against. In this case, the mate was alone in the wheelhouse, in the early morning towards the end of a long watch. This was a time when there was probably a very high risk of him falling asleep. Repetitive work can also induce boredom, reducing stimulation and attention to the task in hand.

2. Alarms can provide a safety barrier to help prevent incidents. A BNWAS can help to combat this risk. However, the workboat's BNWAS was defective at the time of the accident, and there were no other alarms that were effective in waking the watchkeeper before the grounding.

3. Although a 6-on/6-off routine is not unusual at sea in small vessels, it can be a punishing routine for watchkeepers, especially if they have any difficulty sleeping. After the incident, the workboat's owners took actions to improve levels of comfort on board, intended to improve the quality of crew rest time.

A Barrel Load of Trouble

Narrative

One of the last cars loaded onto a ro-ro ferry was a large sport utility vehicle towing a trailer that was loaded with pipes, barrels, building and agricultural equipment (figure). One of the ferry's ABs noticed a strong smell, like garlic, coming from a blue barrel that was covered with a black plastic bag on the trailer. Concerned about the smell, the AB called over the third officer; when he arrived, vapours had also started to emanate from the barrel. The third officer called the bridge and suggested that sailing be delayed until the situation was resolved; this call also alerted the chief officer to the danger.

The public address system was used to summon the owners of the vehicle back to the car deck. When they arrived, they claimed that there was nothing hazardous on the trailer. The chief officer then asked the vehicle's owners to open the barrel so that the contents could be inspected. As the black bag was opened, flames and smoke erupted out. The chief officer informed the bridge of a fire on the vehicle deck and the other crew members attacked the fire with portable extinguishers. The chief officer then activated the vehicle deck drench system to extinguish the fire, and the other crew members manhandled the trailer ashore.

Figure: The trailer before the fire started, with the suspicious barrel

The Lessons

1. **Post-accident analysis identified that the barrel contained a phosphine-based substance. Phosphines are widely used as fumigants in the agriculture industry. Phosphine gas is a colourless, toxic, flammable gas with a garlic odour. It is categorised as a hazardous cargo and should not have been carried on the ro-ro ferry.**

2. **The driver of the vehicle had not declared the hazardous cargo, either when the booking was made or at the ferry terminal security check-in. Not declaring a dangerous cargo placed lives in danger due to the severe risk of starting a fire on a ro-ro vehicle deck.**

3. **The ferry's crew managed the situation commendably. The suspicion about the trailer was investigated and the decision to delay sailing was sensible and appropriate. The crew also extinguished the fire rapidly and removed the hazard from the ship. This incident illustrates the benefit of training drills, which build crew skills and confidence in safety procedures when a real emergency occurs.**

Toxic Gas Inhalation, Plus Severe Burns

The oily water separator on board a ro-ro vessel was persistently registering high oil content in the treated water. This meant that the bilge holding tank on board the vessel could not be emptied. In consultation with the chief engineer, the engineer on watch decided to open the bilge holding tank manhole door, intending to skim the oil from the tank into another one.

The engineer on watch went down into the bilges in the engine room and removed all but one of the bolts on the manhole cover. When he then turned the cover 180° to inspect the contents of the tank he became aware of a very strong smell.

The engineer on watch coughed as he tried to make his way out of the bilges, but passed out near the bottom of the access ladder a short distance away from the open tank (Figure 1). He fell backwards onto an uninsulated steam pipe. He recovered shortly afterwards and though disorientated, made his way to the purifers, where he was seen by another crew member. The crew member raised the alarm. The ship's medical team immediately arrived and carried out first-aid. The engineer was taken to hospital, where he was treated for gas inhalation and serious burns to his back. He was unable to return to work for a number of weeks.

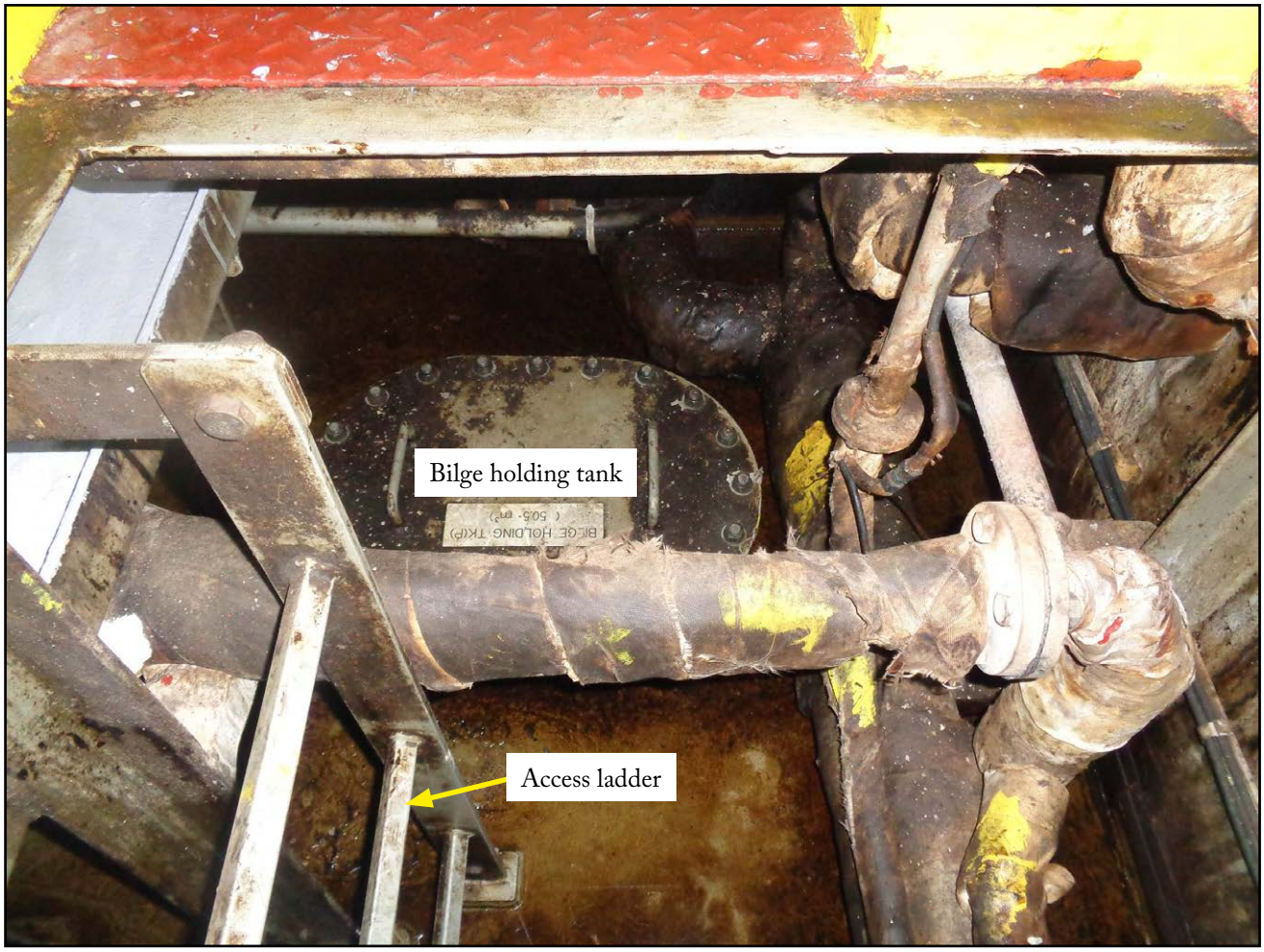


Figure 1: Access to bilge holding tank manhole cover

Immediately after the accident, the ship's crew sampled the atmosphere in the bilge holding tank at the mouth of the sounding pipe. The hydrogen sulphide (H_2S) content had crossed the upper limit of the instrument's measurement capability and the carbon monoxide content was 658 parts per million (ppm) (Figure 2).

The vessel had experienced blockage of sewage lines in the past and some sewage water had been discharged into the bilges in an attempt to clear the lines. This water had been pumped into the bilge holding tank.

Figure 2: Multi-gas meter readings immediately after the incident

The Lessons

1. Do not put yourself at risk by working alone in restricted spaces, especially if the task involves opening tanks.

2. Do not pump water from the sewage system into bilge tanks. Hydrogen sulphide gas could have been generated from the sewage water.

3. Hydrogen sulphide and carbon monoxide are both extremely toxic and are immediately dangerous to life above concentrations of 100 parts per million.

4. If possible, test the atmosphere of the tank before opening the manhole cover.

5. Carry out a thorough toolbox talk and discuss the risks before attempting to open tank manhole covers. Use of breathing apparatus and gas monitors should be considered as appropriate.

The Vibrating Oil Filter

Narrative

An offshore passenger transfer catamaran was in the process of picking up passengers when the crew were alerted by the sounding of the fire alarm. They located the fire at the aft end of the starboard engine room, so immediately shut down the engine, isolated the fuel supply, and closed down the ventilation to the engine compartment. The master transmitted a digital selective calling distress message followed by a "Mayday" and then operated the fixed fire suppression system. This extinguished the fire.

The passengers were transferred to another vessel and a lifeboat towed the catamaran to safety. The fire service attended and established that the fire had been completely extinguished.

Post-accident investigation established that the cartridge oil filter for the gearbox clutch mechanism had worked itself loose (figure), allowing hydraulic oil at 25 bar pressure to spray onto the exhaust shielding of the engine. The oil then seeped through to the bare exhaust pipe and ignited, resulting in the fire.

Figure: Clutch hydraulic oil filter cartridge

The Lessons

1. **Pressurised oil and fuel spraying onto a hot surface has caused a large number of engine room fires. No effort should be spared to ensure that leakages of oil and fuel are kept to a minimum.**

2. **Ensure that all fuel and oil fixtures and fittings are securely fastened and, in the event that they come loose, the release of their contents is protected and directed away from hot surfaces.**

3. **Excessive vibration can result in machinery components working loose or cracking. Ensure that the vibration levels are kept below acceptable limits.**

Opening a Soft Patch Should Not be Hard

Narrative

A ro-ro passenger ferry with 40 persons on board was approaching its berth when one of its four main propulsion engines exploded. The engine had been completely rebuilt and after 5 hours of operation failed. The vessel's engineer was standing next to the engine at the time and suffered serious burns to his hands and face. Fortunately, the engineer's cotton boiler suit protected the rest of his body from the blast.

The engine's crankcase shattered and fragments of the piston, gudgeon pin, connecting rod and big end bearing were ejected out of it during the explosion (Figure 1). Fortunately, again, the engineer was not hit by the shrapnel. The accident was witnessed by an engine room rating, who helped the engineer out of the engine room.

Plastic covers and other combustible material on the engine caught fire and the vessel's fire alarm activated. The master was on the bridge and could see the fire on his CCTV monitor, so he activated the water mist fire suppression system in the engine space. This extinguished the fire within 2 minutes.

Less than 10 minutes after the explosion the vessel was berthed and was met by the fire and ambulance services. The engineer was hospitalised and, although discharged within 7 days, he suffered severe post-traumatic stress disorder and was unable to return to work.

The vessel's engine room had a large soft patch that could be removed to allow complete engines to be lifted out and onto the vessel's car deck above (Figure 2). However, removal

Figure 1: Main propulsion engine explosion captured

of this soft patch was difficult because exhaust pipes and other large fittings had to be removed first. To save the time needed to remove the soft patch, the vessel's managers and service engineers had agreed that it would be easier to remove and replace engines by partially dismantling them so they could be shipped via a small emergency escape hatch from the engine room.

The engine maker's investigation report suggested that the engine's failure was probably a result of dirt lodged between a main bearing and its journal. This caused the bearing shells to turn and block the oil supply to the adjoining big end bearing, which then seized. The most likely cause of this dirt ingress was through the oil channel on top of the engine block. This channel had been exposed during the transport and storage of the partly assembled engine block.

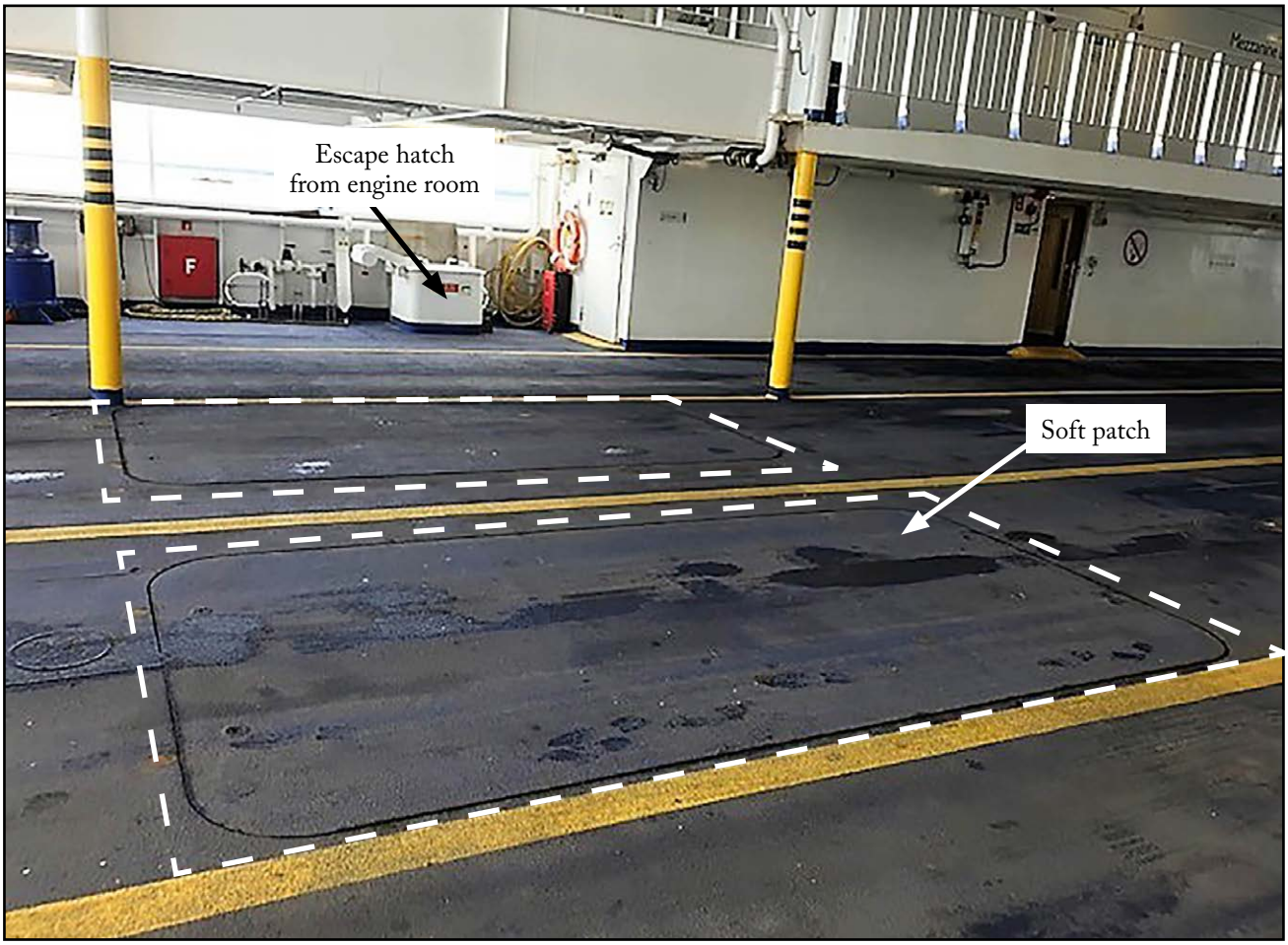


Figure 2: Soft patch and escape hatch

The Lessons

1. **Engines should be assembled and tested in accordance with the manufacturer's guidelines. In this case, that meant assembly and test ashore in the service company's workshop before transportation to the vessel.**
2. **If your vessel has soft patches that can be removed to create shipping routes for moving large machinery, when planning maintenance ensure that sufficient time has been allowed for their removal and reinstatement.**

Illuminated Dashboard

Narrative

A ro-ro ferry was on routine service; it was morning twilight and there were 38 cars and eight commercial vehicles on board. One of the lorry trailers had been embarked using a tug master unit (Figure 1), and was located on the open, external, floodlit area of the car deck. It was raining during the passage.

A passenger reported to a member of the crew that smoke had been seen emanating from a vehicle on the car deck. This was reported to the bridge and the second officer went to investigate; very soon he discovered that the tug master unit was on fire.

Two members of the deck crew were called to assist and immediately started fighting the fire with portable extinguishers. The master alerted the crew and passengers using the public address system and also called the coastguard by radio.

In the meantime, the second officer activated the fire monitors and a water jet was trained on the tug master unit. A second team of crew using BA arrived on scene; however, at about the same time, the chief officer entered the tug master unit and confirmed that the fire had been extinguished.

When the ferry arrived in port, the local fire service attended to assess the situation. The tug master unit was extensively fire damaged internally (Figure 2); however, there was no damage to the vessel and no passengers or crew were injured.

Figure 1: The tug master unit and lorry trailer on board the ferry

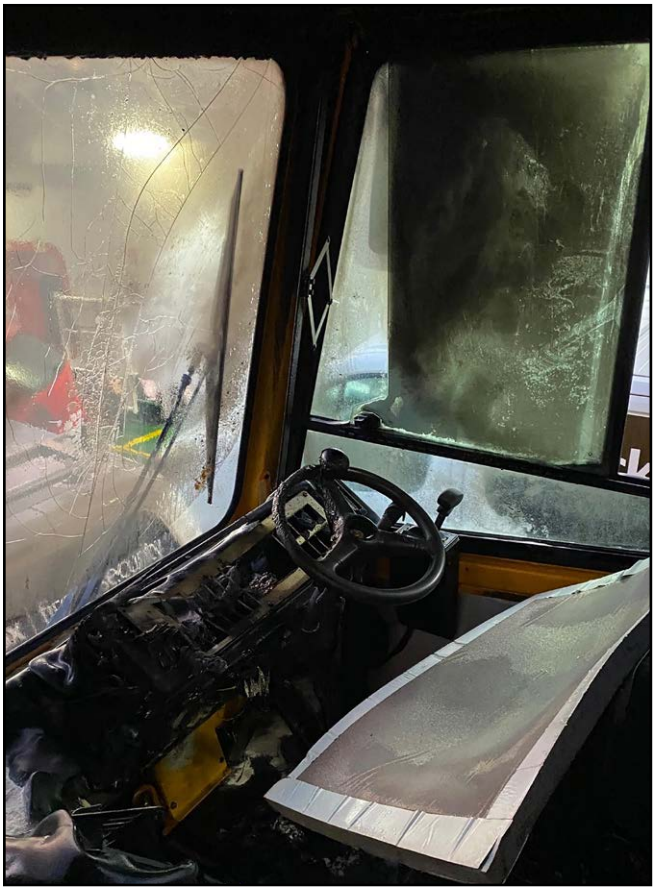


Figure 2: Fire damage to the cab of the tug master after the fire had been extinguished

The Lessons

1. Vehicle fires present a major hazard on board ferries, and every precaution should be taken to minimise the risk. Post-event analysis identified that the cause of this fire was almost certainly an electrical short-circuit; the cab driver's window had been left open, letting rainwater in; the key was in the ignition; and the battery isolator was not in use. This was not an appropriate condition for the cab to be left in, particularly on an open car deck in the rain. CCTV imagery also spotted that the tug master's headlights switched on prior to the smoke being sighted. Since the accident, the ferry operator has instructed tug master drivers to electrically isolate their cabs when unoccupied; a precaution that should be a consideration throughout the industry.

2. Vehicle deck fires have the potential to spread rapidly. However, the crew's reactions were quick and efficient, ensuring that the situation was brought under control and preventing the fire from spreading. This case highlights the importance of conducting regular crew drills to test that procedures and safety equipment will work when a real emergency occurs.

Good Kit Saves Lives

Narrative

A small sports fishing boat (figure) manned by two crew was being used to transfer a technician from shore to a merchant ship at anchor. The three men had arrived at the boat late in the morning. It was prepared for sea and a safety brief was delivered by the skipper.

Just after midday, the three men donned auto-inflating lifejackets and the boat departed for the anchorage. As the boat left the shelter of the land the wind and sea state increased. By the time the boat arrived at the merchant ship, the skipper had decided that it was too rough to transfer the technician safely. Following a discussion with the master of the anchored vessel, the skipper decided to return to port and reattempt the transfer the following day.

The skipper turned the fishing boat into the rough 1-2m sea and headed back to the harbour. Initially the fishing boat coped well with the conditions, taking only a small amount of spray onto the deck area aft. However, as one of the crew checked the self-drainers at the stern he noted, and reported to the skipper, that the boat was very low in the water. Concerned that the engine compartment might be flooding the skipper switched on the electric bilge pump.

A few moments later the fishing boat hit a large wave and the internal diesel engine stopped unexpectedly. The engine was re-started, but ran for only a short period before stopping again. On opening the engine hatch they saw that the compartment was flooded and that the engine was nearly fully immersed. The crew and passenger started to bail the water out as the boat took on a severe list. However, without power the fishing boat quickly swung beam to sea, causing it to roll violently and waves to break over the side.

The skipper realized the boat was about to sink so made a "Mayday" call on his VHF radio. The call was acknowledged by the coastguard and the local RNLI lifeboat was launched. The skipper also called the merchant ship at anchor using his mobile phone to inform them of his boat's predicament.

The fishing boat continued to flood rapidly, and the men were forced to abandon the vessel as it sank. Once in the water, their auto-inflating lifejackets operated and kept them afloat. The AIS transponders fitted to each lifejacket were quickly picked up by the merchant ship at anchor, which directed the lifeboat straight to the casualties in the water. Each was quickly rescued, but the fishing boat was subsequently lost.

It was not possible to determine the cause of the sinking with certainty. However, the most likely cause is thought to have been catastrophic failure of the engine cooling water hose or hull fitting.

Figure: Similar boat

The Lessons

1. The lifejackets worn by the three men undoubtedly contributed to their survival. The lifejackets operated correctly, and each was fitted with an AIS transponder that helped the lifeboat crew quickly locate the survivors in the water.

   The operating company of the ship at anchor has retro-fitted similar transponders to working lifejackets on all company vessels.

2. A bilge alarm would have quickly alerted the skipper to the emergency and would have given the crew time to activate the bilge pump before the flood became too serious. Had the pump been unable to cope, the crew could then have aborted the transfer and returned to harbour.

   Boat owners should review their bilge pumping arrangement and consider installing bilge alarms and automatic bilge pumps if they have not already done so.

3. The flooding was most likely caused by the catastrophic failure of the engine cooling water system hose or a hull fitting. It is essential that boat owners ensure that these items are inspected regularly and consider trying suitably sized bungs to through hull fittings and valves. If a failure does occur while underway the outcome, as in this case, can be unwelcome.

Part 2 - Fishing Vessels

For many fishermen 2019 was another challenging year for many reasons, but for the industry there was some encouraging news. Healthier stocks for some species and a level of new build investments not seen for many years was welcomed by many. Sadly, however, when fishermen in the UK continue to have fatal accidents while harvesting the finest seafood, it puts everything into perspective.

Since I started the fishing over 32 years ago, it has been frustrating that at times more effort has been put into caring for the stocks (which is important) than caring for the fishermen themselves.

When engaging in meetings on the quest to see the best industry in the world being a safer industry, I never lose sight of the huge responsibility on our shoulders. It is vital for me to remember that every fisherman lost leaves a family with the aftermath.

We can read lots of MAIB publications into the loss of life and question the decision-making process that has led to a tragedy. We all make thousands of instant decisions on a daily basis, some good, some bad. However, a bad decision made on shore can be excusable, but at sea it can cost a life.

As we now enter a new decade I ask myself: will this be the time that we start as an industry to see zero deaths annually? I believe 100% that this is possible.

Sadly, I don't have the golden nugget to make this possible, but the tide is turning. We now find ourselves in a place where mindsets are changing towards fishing safety and safety is being talked about more within the working environment. I talk to lots of fishermen in my role at SFF and as a working fisherman and they are passionate about doing their jobs in a professional way from the minute they leave home till they return. Fishing is a professional job and it takes skill, dedication and commitment to make it work.

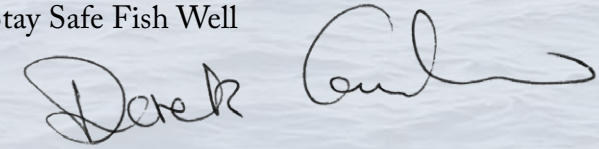
In 2011/12 a journey began to raise awareness of the use of Personnel Flotation Devices (PFDs) and to give every fisherman in Scotland a free PFD. This has been a journey beyond what I could have imagined. In the beginning we declared if one fisherman's life was preserved by wearing a PFD the effort would be worth it. A fisherman's life has been saved on more than one occasion because he was wearing a PFD.

A PFD's role is to give the wearer a second chance should they end up in the water and to give others time to aid a rescue. The positives for wearing a PFD will always outweigh any negatives for not wearing a PFD. Over the years more and more fishermen have been wearing PFDs, but still not enough.

As an industry we have to make it our priority to provide a safe place of work for all fishermen by removing as much of the risk as possible for going overboard. However, when we do that on any size of vessel we must back that up by insisting on the wearing of PFDs while on the open deck.

2019 saw the biggest change in legislation terms for the fishing industry when ILO 188 Working in Fishing Convention became law. One of the main guidance documents on the new regulations is MGN 588[1]. I urge all fishermen to read this marine guidance note. It will not only help you to be legally compliant, but it could save a life.

Stay Safe Fish Well



[1] https://www.gov.uk/government/publications/mgn-588-ilo-work-in-fishing-convention-health-and-safety-pfds

DEREK CARDNO MNM

Derek was born in Fraserburgh, Aberdeenshire, and still lives in this very successful fishing community with his wife and family. He started his fishing career in 1987 and over the next 10 years sought to gain his Class 1 deck and Class 2 engineering certificates of competency. Over his fishing career he has enjoyed a mixture of good times and hard times, but in 2017 the family business took delivery of a 69m pelagic trawler, Grateful, which he is mate onboard.

In 2005, Derek began teaching fishermen during his time off between fishing seasons at his local college. In 2009, he took on the role at the Scottish Fishermen's Federation as the Training and Safety Officer while continuing to work at sea.

In his SFF role, Derek is an active member in the UK Fishing Industry Safety Group (FISG) and chairs the Fishermen's Training Project group. In his work for industry in fishing safety and fishermen's welfare he became the first fisherman to receive the Merchant Navy Medal for Meritorious Service in 2018.

In 2019 Derek, along with Marine Scotland officials under the auspices of Cabinet Secretary Fergus Ewing, set up the Scottish Fishing Safety Group. Derek has high hopes for this group of fishermen who have joined together to make fishing in Scotland safer.

Derek says life is very busy between fishing and meetings for SFF but he feels privileged to have the support of his wife Jacinth to be able to serve the industry that has provided him with a most fulfilling and rewarding career.

There is Not Always a Splash

Narrative

It was early on a fine summer's morning when a skipper and deckhand set off across a bay in a tender (figure) towards their prawn trawler. The sea was calm and there were light winds. The sea temperature was 12.8°C.

It was usual practice for the crew to use the tender when boarding and leaving the prawn trawler. It was also used to transfer partially filled boxes of langoustines to and from a storage raft, which was anchored near the entrance to the harbour.

When the tender reached the prawn trawler the skipper climbed on board before taking the bait and empty boxes from the deckhand, who remained in the tender. The deckhand then took the tender to the storage raft to retrieve two more boxes that were partially filled with prawns from the previous day's fishing.

Approximately 10 minutes after boarding the prawn trawler the skipper saw the tender approaching the trawler's stern. In anticipation of the tender drawing alongside the trawler, the skipper walked to the port side to help secure it. However, when the tender did not draw alongside as expected he looked over the side and saw his colleague floating motionless in the water between the prawn trawler and the tender, which was drifting away with its engine at tick-over.

The skipper used a boathook to bring the deckhand back alongside and then attempted to haul him on board. The skipper was unable to lift the deckhand out of the water but managed to secure him to the storage raft before returning to shore to seek assistance.

The deckhand was eventually recovered from the water 45 minutes after the accident. However, despite medical attention he could not be revived and was pronounced deceased at the scene.

Figure: The tender

The Lessons

1. The 12.8°C water would have quickly affected the deckhand's ability to remain afloat. A PFD would have kept his airways clear of the water and allowed the skipper time to recover him on board the prawn trawler. Without a PFD, once unconscious the deckhand's chances of being recovered alive were slim.

   Since this accident, the MCA has provided more direction on the use of PFDs when there is a risk of a person falling overboard.

2. Had regular manoverboard drills been carried out on board the prawn trawler, the difficulties involved in single-handedly recovering an unconscious crew member from the water would have been identified. Such drills do not need to be lengthy or complicated, but the value of doing them is often not recognised until it is too late.

3. The risk assessments carried out on board did not identify the hazards associated with a lone person using the tender. Risk assessment templates are available from the Seafish safety folder[1] and cover means of access to fishing boats, including the use of a tender.

[1] www.safetyfolder.co.uk

The Lure of the Pub Ends in Pollution

Narrative

After several days at sea the skipper of a fishing vessel decided to go ashore to fetch some provisions when the vessel arrived in port. Before he left, to correct a port list the skipper started a transfer of fuel from the port fuel tank to the starboard tank. Having bought the provisions, he was returning to the vessel when he decided to visit the local pub. Meanwhile, the fuel transfer continued, leading to the starboard fuel tank overflowing into the sea.

Seeing the pollution emitting from the overflowing fuel tank, the harbourmaster went to the quay and called out to a crewman on deck. But the crewman spoke little English and did not know what the harbourmaster was saying. Unable to find a member of the crew who could halt the fuel transfer, the harbourmaster boarded the vessel and tripped the running generator. This arrested the transfer of fuel, but by that time approximately 1000 litres had overflowed into the sea, polluting the harbour waters (figure).

The Lessons

1. **The transfer of fuel is a task that must be taken seriously, and it is a time when due diligence and care must be applied. Environmental damage caused by pollution is significant, especially if lower grade fuel is used, such as heavy fuel oil or lubricants. Furthermore, causing pollution is illegal and is a punishable offence. Those responsible can incur a heavy penalty, such as a hefty fine, or even imprisonment.**

2. **All fuel transfer operations must be constantly monitored by a competent and responsible member of the crew. Do not leave the operation unattended - even for a short time.**

3. **Those responsible for monitoring fuel transfer operations must understand the system well enough to ensure that they can react quickly and effectively during an emergency.**

Figure: Pollution from the overflowing fuel tank

Survival of the Luckiest

Narrative

The skipper of a single-handed fishing vessel set out in the early hours of a December morning for a day of crab potting. The sea was calm, there was a light breeze and the sea temperature was around 10°C.

The skipper fished for 3 to 4 hours working approximately 6 miles from port. After shooting away the last of his pots, he set the vessel's autopilot to return to the harbour. He then ate his lunch, cleaned the vessel and began preparing for the next day's fishing. The vessel was doing a speed of approximately 6 knots.

The vessel's net hauler was secured in a bracket on the starboard gunwale to keep it out of the way of the crab pots (Figure 1). The skipper had planned to do gill net fishing the following day. With the intention of moving it to its position for the next day he lifted the hauler, weighing around 40kg, but as he walked it forward the rubber mat under his feet slipped and he lost his balance. The hauler tipped over the gunwale and fell into the water.

As it fell, the securing shaft caught the skipper between his legs, carrying him overboard as well.

The skipper managed to grab hold of the hauler's hydraulic hoses and rested his knees on the hauler body, which was suspended by them below the surface of the water. He was wearing oilskins, steel toed wellingtons and a winter jacket. He was not wearing a lifejacket and did not carry a personal locator beacon. He stayed in this position for nearly an hour while the boat made its way towards harbour. As the vessel approached the pier, he let go and started swimming to safety. The vessel continued ahead and made heavy contact with the pier.

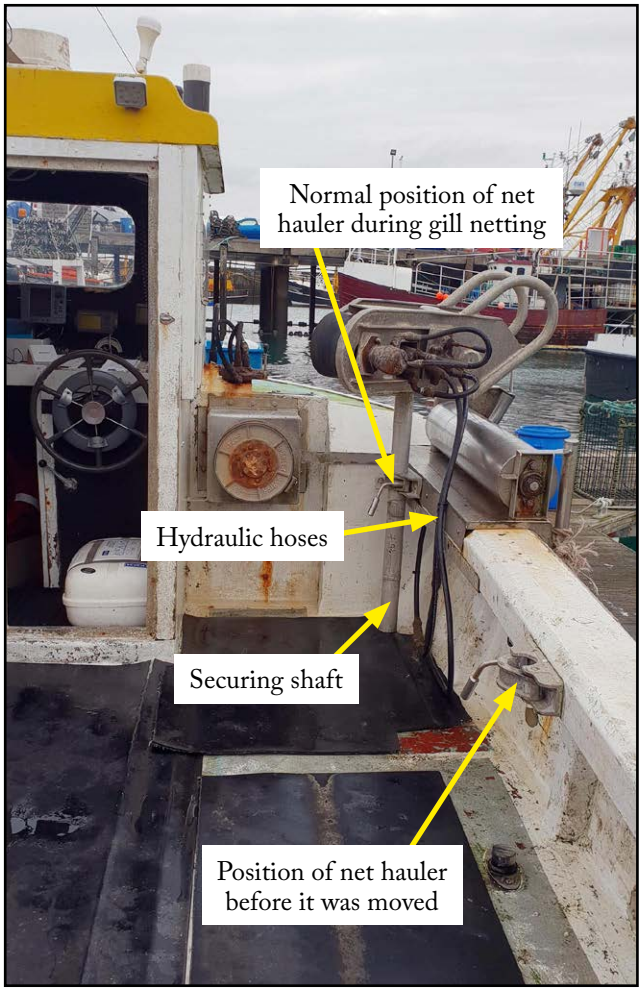


Figure 1: Fishing gear

Seeing the vessel with its bow hard against the pier, the skipper of another fishing vessel in the harbour attempted to make contact. He was unaware that the skipper was in the water. Not getting a response, the fishing vessel's crew alerted the local lifeboat station. They then spotted the skipper in the water and went to his aid, throwing him a lifeline and helping him to maintain his head above the water (Figure 2).

The lifeboat arrived within minutes, its crew retrieved the skipper from the water and called for an ambulance. The skipper was suffering from severe hypothermia; his core body temperature had dropped to dangerous levels. The ambulance crew treated him for an hour before transferring him to a local hospital. He made a full recovery and returned home to his young family.

The Lessons

The skipper was extremely fortunate to have survived this ordeal. The following factors contributed to his survival:

- The sea was calm, and although the temperature was 10°C it was a relatively mild day for the end of December.
- Had the autopilot not been set for port before he fell overboard, he might not have been found.
- The skipper's winter clothing and oilskins provided some insulation against the cold.
- He was able to hold on to the hydraulic hoses and rest his knees on the hauler.

Figure 2: Skipper being rescued

1. Single-handed fishing is dangerous. Make sure you always carry a personal locator beacon with you so that if you fall overboard it will raise the alarm and give your location.
2. Always wear your lifejacket when there is any risk of falling overboard. Water temperature below 15°C can result in cold water shock incapacitating you and rendering you unconscious within seconds. A lifejacket will help keep your head out of the water and prolong your survival time.
3. Moving heavy equipment, such as a hauler, should preferably be done in port, and not when alone at sea when there is no one around to help if you suffer an accident.
4. Make sure the deck is fitted with good quality rubber matting with non-slip backing.

Saved From a Blaze

Narrative

A small two-handed fishing boat was trawling a few miles off the coast on a calm, sunny day when smoke entered the wheelhouse from the engine compartment. The skipper tried to fight the fire with a hand-held extinguisher; however, this was not effective so he shut the engine compartment hatch. The fire developed and spread quickly so the two fishermen abandoned into their liferaft.

From the liferaft, the fishermen were able to raise the alarm as they had a good mobile phone signal. They were both rescued by an RNLI lifeboat soon after making the distress call and then taken safely to shore. The abandoned fishing boat (figure) eventually burnt out and sank.

Figure: Smouldering vessel prior to sinking

The Lessons

1. **It is a good news story when life is in danger and the crew successfully abandon ship unharmed. However, it was fortunate in this case that there was mobile phone signal available after the crew were in the liferaft. Mobile phones are an excellent means of communication, but they are not guaranteed to be waterproof, network availability at sea cannot be relied upon and battery life may be limited. Use of the VHF digital selective calling (DSC) emergency button is a highly reliable method of raising the alarm and takes only about 5 seconds to activate. A significant advantage of this method of raising the alarm is that the DSC system can include the distressed vessel's position, which is probably the most important piece of information the coastguard needs.**

2. **Although both fishermen were working on deck, neither was wearing a PFD. If, for any reason, the crew had ended up in the water, a PFD could have been critical in sustaining life. The MCA requires that[1], unless measures are in place that eliminate the risk of fishermen falling overboard, all fishermen must be provided with and must wear PFDs or safety harnesses when working on the open deck. This is primarily a safeguard where there is a significant risk of falling overboard. However, this case shows that there are other risks, such as a rapidly spreading fire, that make the wearing of a PFD essential for safety.**

[1] Marine Guidance Note 558 (F), published November 2018: https://www.gov.uk/government/publications/mgn-588-ilo-work-in-fishing-convention-health-and-safety-pfds

A Tragic Turn

Narrative

A trawler with three crewmen on board was nearing the end of its final tow for the day. The skipper commenced a turn to starboard and the plan was to steady up, haul the nets then return to harbour. It was dark, but sea conditions and visibility were good.

When turning, the vessel started heeling to starboard and the two crewmen, who were below decks, were concerned so went to the wheelhouse. Very soon after, the boat capsized to starboard and floated upside down; only one of the three crew managed to escape as it overturned.

The capsize was witnessed by crew from a nearby vessel who rescued the crewman from the water and raised the alarm. Despite the efforts of other vessels, the fishing boat could not be kept at the surface, and it eventually sank. The one crewman who initially escaped was the only survivor.

The Lessons

1. **It is vital that all fishing vessels, whatever their size or purpose, have sufficient stability to work safely under all their normal operating conditions. A post-accident underwater inspection showed that the trawler's starboard net had become fouled with mud and debris; this caused the initial heel, but this was not unusual. However, it proved fatal as the vessel had insufficient stability to recover from the initial heel.**

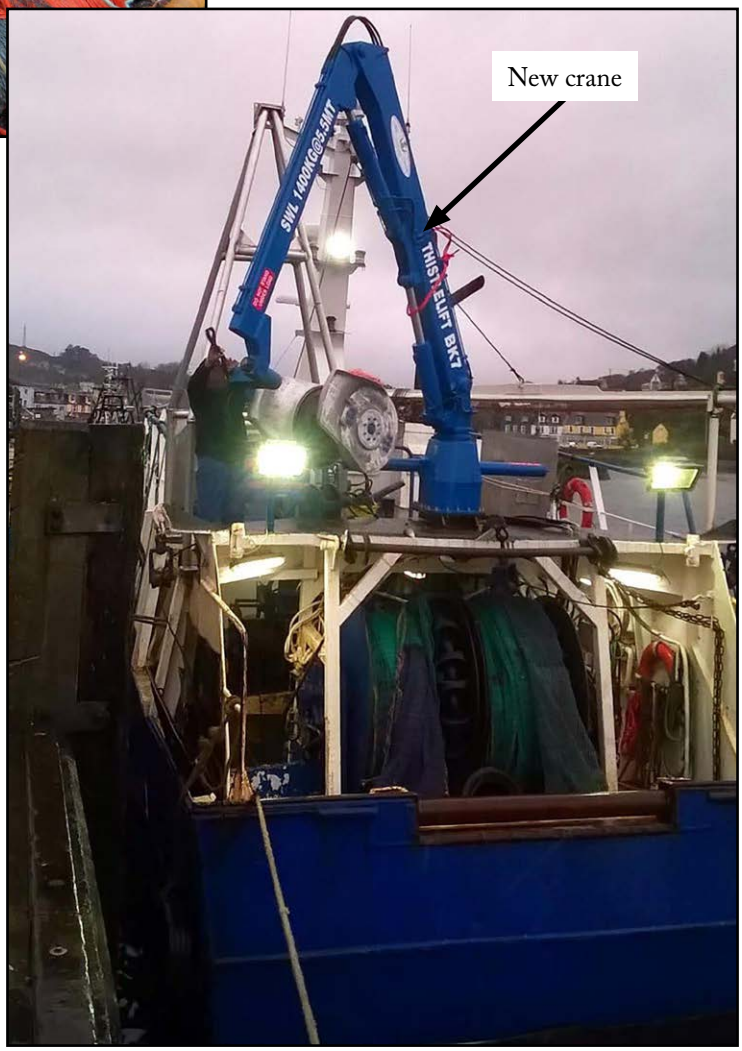
2. **This fishing boat had been built as an under 12m registered length vessel, which meant that it was not required to have stability information or to undergo stability tests. The boat had been extensively modified throughout its life and some of these changes had reduced its stability, significantly increasing its vulnerability to capsize.**

3. **One modification that had reduced the vessel's stability was the replacement of the crane with a new model that was over twice the weight of the original (figure). Although the owners had taken professional advice, post-accident calculations showed that changing the crane had probably reduced the vessel's reserve of stability below safe limits. Stability awareness training is available through SeaFish[1] and there is also advice in the MCA's Fishing Vessel Stability Guidance booklet[2].**

[1] https://www.seafish.org/safety-training

[2] https://www.gov.uk/government/publications/fishing-vessel-stability-guidance


Old crane


New crane
SWL 1400KG@6.5MT
THIS SIDE UP

Perched on a Rock

Narrative

After landing its catch, and a change of skipper, a fishing vessel got underway. It was familiar territory; the skipper had manoeuvred in and out of this harbour countless times before and, although it was dark, the sea was calm and visibility good.

Having negotiated out of the close confines of the harbour, the skipper altered course to a heading that would take the vessel back towards its fishing grounds. With autohelm steering selected, the skipper handed over the wheelhouse watch to a crewman, then went below to have something to eat. A few minutes later, the vessel ran hard aground on an isolated rock.

The skipper dashed back to the wheelhouse and took control, but was unable to free the vessel. He then raised the alarm by calling the coastguard on the radio and, soon after, the local lifeboat and a tug from the harbour were on the scene. Meanwhile the crew prepared to abandon ship by dressing in immersion suits, donning lifejackets and launching a liferaft as a contingency.

An attempt was made by the tug to tow the fishing boat off the rock but this was not successful, so a decision was made for all the crew to be taken ashore by lifeboat. A generator was left running to ensure that the bilge pumps would activate in the event of water ingress.

The following morning, both the vessel's skippers and the chief engineer returned on board with a team of salvage divers. Although the vessel had been damaged, water ingress was minimal and, at high water, the tug was able to haul the fishing boat free; it was then towed back to the harbour for repairs.

Figure: The fishing vessel hard aground with the inflated liferaft nearby

The Lessons

1. Whatever the size or purpose of a vessel, every voyage needs to be planned to ensure that potential hazards are identified and avoided. In this case, the isolated rock was well charted, marked by a lit buoy and lay outside the recommended route for approaching or departing the harbour entrance. A simple plan, checked by the skipper, from the harbour entrance to the fishing grounds, would have spotted the rock hazard.

2. Care should always be taken with electronic plotters. After the grounding, the skipper reviewed what had happened and realised that, when altering course towards the open sea, he had 'zoomed out' the electronic plotter's scale to such an extent that the small, isolated rock was barely visible.

3. When fishing vessel skippers are not in the wheelhouse, a proper navigational watch must still be kept at all times. This means that the watchkeeper should be fully aware of the navigational plan and any dangers ahead. Groundings such as this can occur when the watchkeeper thinks the vessel is in safe water or visual warnings, such as the well lit buoy in this case, are ignored or not understood. More detail can be found in the MCA's MGN 313(F) – Keeping a Safe Navigational Watch on Fishing Vessels[1].

4. Emergency preparation is vital. In this case, the crew managed the emergency very effectively because they had conducted regular training drills and had good safety equipment knowledge. The alarm was raised, help arrived and a liferaft was launched as a sensible precaution had the situation deteriorated rapidly.

[1] https://www.gov.uk/government/publications/mgn-313-keeping-a-safe-navigational-watch-on-fishing-vessels

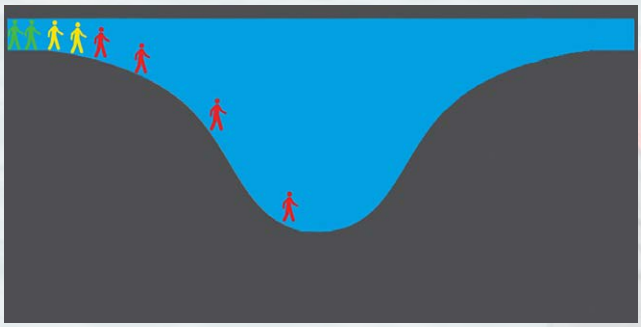
Part 3 - Recreational Craft

A slippery slope…

You are only reading this Safety Digest as you appreciate that keeping people safe when you are the skipper or crew of a boat is a key part of your role on board. Yet as this, and all previous Safety Digests make obvious, incidents continue to occur, and people continue to be injured or perhaps even lose their lives on all types, shapes and sizes of boats. The question this should pose to us all as boaters is what can we all do to make a difference? How can we help to change behaviours and reduce/eliminate incidents?

Many years ago I was introduced to a concept known as the *'incident pit'* as a means to explain how incidents can develop and so lead to, at best, damage to the boat or your pride, or, at worst, injury or death. For me as a commercial skipper and someone teaching boating, the *incident pit* has become the way to explain to others how incidents develop and so how they can prevent them occurring by 'seeing' risk as it presents itself. To understand the relevance of the *incident pit* consider an example.

Let's take an example away from the world of boating for a moment. Let's say it's the start of the dive season. Alongside it being the first dive of the season you are using a new piece of kit that you haven't dived with before. You are diving with a new buddy, they want to dive deep rather than a simple start of season check dive, they want to take their camera so might not be totally focussed on you. The boat had an issue last season and was fixed, but no-one's taken it for a run this year – you're sure it will be okay though. The weather is a bit worse than forecast… and so on. In isolation none of these individual factors are an incident but what they all are little steps towards a steep slope. When something does go wrong the time you have to deal with the problem is very short and the incident can easily and rapidly spiral out of control with the result that you slide uncontrollably down the slope to the bottom of the pit. At the bottom of the slope may await damage, injury or maybe even death.



At any stage you could have reduced your movement towards the slope by recognising the issues as risks, assertively dealing with them and so eliminating them. Tell your dive buddy to do a simple start of season dive, only use kit you have used many times before, tell them you don't want them to take the camera as you want their focus on you, don't take the boat until it's had a really good run. Simple changes but effective in turning you away from the precipice and giving you time to deal with a challenging situation should it arise.

The full MAIB reports and the articles within the Safety Digests are something that I have read for probably about 25 years. It's easy to look at a particular report and discount it because it doesn't seem similar to your sort of boating and perhaps seems to have little relevance to you. Read a little more deeply though and you'll soon spot the common threads between the incidents that are looked at. Think back to the *incident pit* and you'll see the incidents written about in MAIB Reports and the Safety Digests more often than not coming to a head because of the cumulative effect of lots of little things. Reading articles and reports about incidents that you personally may never be exposed to is of real value as the lessons learnt about an incident on a container ship or a trawler can apply to us all as much as those occurring on a RIB or a sailboat.

So what does this mean for you as a skipper or crew? You have the potential to change behaviour and so reduce incidents by educating others how to spot these little steps and inspire them to take proactive action to resolve them, to remove the risk, to move back from the precipice. This doesn't just mean educating experienced boaters as everyone on board can be tasked to spot issues and raise them. In my experience a 10 year old tasked with the job of telling mum or dad they have forgotten to wear their killcord is a very effective way of ensuring they are worn. Ensure that you, your experienced crew and everyone else on board doesn't walk past the problem, make everyone the person that stows the line rather than stepping over it, be the one that fixes the hinge on the hatch making it watertight, or be the one that says 'no' we are not going – the conditions make it unsafe. By being that person you can prevent others from being written about in these pages and you may save a life and eliminate a serious and preventable injury. These articles in the MAIB Safety Digests and the full MAIB Reports are an outstanding resource for us as boaters, they shine a light on the lessons we can all learn from a wide range of incidents and hopefully provoke all of us to be the person that makes a difference.

A final thought, in most of the articles within this section of the Safety Digest what leaps out to me is that the severity of these incidents was mitigated by the prompt and effective action of those involved. Sometimes things do go wrong or you see them starting to do so. Contacting the Coastguard early and getting lifeboat and coastguard support can make a massive difference. Independent lifeboats, the RNLI and coastguard assets always want to be tasked early and be stood down rather than attend an incident that spiralled rapidly out of control. If you ever have an incident call early.

PAUL GLATZEL

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Paul has undertaken Cranfield University's Applied Marine Accident Investigation course and acts as an expert witness for cases relating to powerboats, motor boats and personal watercraft.

Bouncing on the Bank

Narrative

A 12.6m commercial sailing yacht was being repositioned from one popular sailing centre on the south coast of England to another. It was a short passage, which the experienced skipper and vessel had undertaken many times. There was one other crew member on board and it was decided to undertake the passage under engine. It was daylight, the wind was westerly force 6, it was 1 hour after low water and it was 1 day before neaps. The tidal range in that area was predicted to be 1.3m.

A well-known and well-marked sandbank, which dries at low water springs, sat between the yacht and its destination. The skipper outlined a basic passage plan to the crew member who was on the helm. This involved passing to the west of the sandbank while taking care not to impede large commercial vessels using the designated channel in that area. Two buoys, one a starboard lateral and the second a yellow racing mark were to be left to starboard, which would ensure that they avoided the hazard.

The skipper remained on deck while they passed the starboard lateral buoy, and then gave instructions to the helmsman to steer towards the yellow racing mark and to pass to the west of it. Having sighted the yellow buoy, the helmsman acknowledged this instruction, and the skipper went below to visit the heads. Three minutes later the yacht ran aground.

The skipper quickly came back up on deck and saw that they were to the east of the yellow buoy. Taking the helm the skipper put the yacht engine astern, but was unable to float off. The wind was peaking at 28 knots and the accompanying waves were driving them further onto the bank. Soon, the yacht was heeling to such an extent that the engine stopped, probably due to the fuel uptake coming clear of the fuel in the tank.

A "Pan Pan" was put out and assistance was requested. Shortly after, a kedge anchor was deployed over the port-side beam, but the anchor warp snapped as a result of a shock load caused by the sea state. After this the yacht's main anchor was deployed and this held them, albeit uncomfortably and still with an extreme angle of heel.

When the lifeboat arrived on scene a line was taken on board and the anchor was taken up. The lifeboat maintained a tension in the line in a direction away from the sandbank, however for a further 1½ hours the yacht was aground and bouncing on the seabed. During this time, the skipper was checking the bilges for any sign of water ingress as well as the state of the keel bolts.

The yacht eventually came free on the rising tide and was towed into port. A survey was then commissioned by the owner to assess whether the yacht had incurred any significant damage in the area of the keel and rudder.

The Lessons

1. However familiar you are with your home waters, it is important not to let your guard down. The route chosen by the skipper took the yacht very close to what was essentially a lee shore, under engine alone, with a force 6 and accompanying sea on the beam. The yellow racing buoy had to be left to starboard as it was situated very close to the sandbank, leaving no margin for error. A lapse of concentration on the part of the helmsman stood the yacht into danger, and the skipper's decision to go below at the critical moment combined to cause the grounding. A more conservative passage plan, a little further to the west but providing more sea-room, might have been prudent.

2. The skipper quickly realised that they were in a hazardous situation, and quite correctly raised the alarm. With the weather and tidal conditions as they were, there was a danger of incurring serious damage and no guarantee of being able to float off at high water due to the relatively small tidal range.

3. This was a serious grounding in which the yacht was subjected to significant stresses for a prolonged period. The keel was of a fin and bulb design commonly found on modern cruiser racers (figure). The owner followed good practice in commissioning a survey immediately afterwards. Fortunately, no serious damage was detected and the yacht was able to be put back into commission.

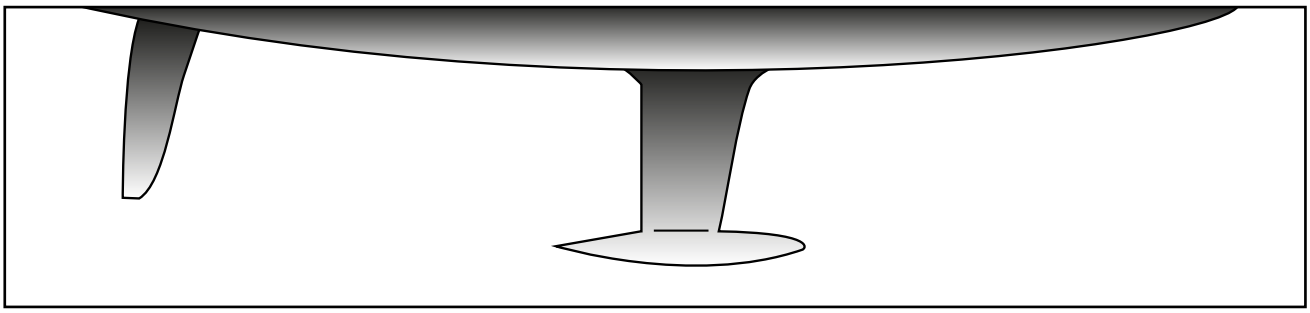


Figure: Modern keel and rudder arrangements are efficient but potentially vulnerable and should be professionally examined following a grounding

Safety Boat Capsize

Narrative

A rowing club had two coxed fours training on a river, and there was a coaching boat in attendance with a coach on board. The coaching boat was a catamaran, commonly used by rowing clubs as it creates low wash. Each rowing boat had four rowers with one oar each and a cox at the stern. One of the coxes was a relative novice, the other was another coach.

The three craft set off upstream rowing towards a bridge that marked the limit, set by the club, of the extent to which they could row. The river was flowing quite quickly, and as the first boat, with the novice cox on board, started to turn round to head back downstream it was swept towards trees on the riverbank. One of the rowers became caught by an overhanging branch.

The coaching boat motored over to assist the crew member who had become caught by the branch, but as it did so the coxed four capsized. Some of its crew climbed onto the coaching boat. Unfortunately, with the additional personnel, the catamaran was taken by the river flow sideways into a tree branch, and it too capsized and inverted.

Some of the six people in the water stayed with the capsized rowing boat, others clung on to tree branches. All the crew members, including those in the second rowing boat, managed to get ashore safely with some assistance. Members of the public raised the alarm and the emergency services attended, providing first-aid to the crew, who were generally just wet and cold.

The Lessons

1. **Overhanging trees and roots represent a significant hazard to those on a river. They can snag boats and, in combination with a moderate river flow can lead to capsize and, in some cases, drowning. When turning in a river make sure you have plenty of space in which to do so and, where possible, do this where the riverbank is clear of hazards.**

2. **It was not appropriate to use the coaching boat as a safety boat. A safety boat should have low freeboard and a good reserve of buoyancy to ensure it can perform its role effectively in an emergency. Although perceived to be a stable platform, the catamaran was relatively high out of the water. Therefore it would easily capsize when caught broadside to the river flow by a tree branch.**

3. **Ensuring rowing boat crews have completed a capsize drill will prepare them for what to do in an emergency. As rowers do not wear lifejackets, they should remain with the boat in the event of a capsize as this will provide their buoyancy. They should only let go of the boat and climb into a safety boat, or ashore if close to the riverbank, once it has been deemed safe to do so.**

4. **Fortunately this accident had a positive outcome. However, it is important to be prepared for difficulties such as this in order to assist emergency services. There was significant effort expended conducting searches for persons in the river when everyone was actually safe. Ensure contact lists are up to date and that key individuals know who is out on the water to enable headcounts to be completed quickly.**

Who Rescues The Rescuer?

Narrative

On a grey, fresh, winter's day three adults were manning a sailing club's safety boat supervising a children's dinghy race. The sea water temperature was about 12°C.

During the race, a gust of wind hit the fleet of dinghies and one of the boats capsized, throwing the occupant into the water. On arrival at the scene, the safety boat crew found the child in the water; he had become entangled in the dinghy's ropes and was beginning to panic. A member of the safety boat crew, dressed in foul weather gear and an auto-inflating lifejacket, jumped into the water to assist.

The rescuer was fully immersed briefly in the cold water before the lifejacket automatically inflated and brought him to the surface. However, the lifejacket malfunctioned and, rather than breaking the cover's quick burst zip the inflatable bladder inflated awkwardly through the collar seam. The partially inflated lifejacket struggled to keep the wearer afloat and pushed down uncomfortably on his neck.

Observing the child and rescuer in difficulty, the other members of the safety boat crew brought them alongside the boat, pulled them both from the water and took them ashore. Once there, they were assessed by a first-aider and, although cold, both were uninjured.

Post-accident note: The lifejacket that was used was inspected. The lifejacket cover that contained the inflatable bladder was secured with a zip that was designed to burst when the bladder was inflated by the inflation cylinder. Testing of a sample of the same model and similar age of lifejacket failed to recreate the malfunction, which could only be replicated when the quick burst zip was significantly constrained, preventing the zip bursting.

The Lessons

1. **Safety boats are an essential part of a sailing club's operation. They are there to assist members when things go wrong. However, in order to do this effectively, safety boat crew must be properly prepared for the role and it is essential that they are ready to enter the water at short notice. In the Royal Yachting Association's Safety Boat Handbook it recommends that safety boat crew '*wear buoyancy aids* (Figure 1) *rather than bulky, inflated lifejackets which can be cumbersome, allow little movement in the water and often snag on rigging*'.**

   Furthermore, the inflated bladders are vulnerable to being punctured by the sharp fixtures and fittings found on a dinghy, thereby potentially placing the wearer at risk.

2. **If the wearer of an auto-inflate lifejacket plans to deliberately enter the water, they should inflate their lifejacket first. Relying on the lifejacket's self-inflation mechanism to operate adds an unnecessary risk if the lifejacket fails to function correctly. Users of inflatable lifejackets should also be aware that if the lifejacket cover is constricted in any way whatsoever their lifejacket may not operate as designed.**

3. **In UK waters the sea is often very cold. On the day of this accident it was just 12°C and thus rendered both the child and the safety boat crew member vulnerable to the effects of cold water shock. Safety boat crew members must be ready to enter the water at short notice and should therefore consider wearing a dry suit (Figure 2) to minimise the effects of water that is 15°C or less.**

Images courtesy of RYA and the RYA's Safety Boat Manual

Figure 1: Safety boat crew member wearing a buoyancy aid

Figure 2: Safety boat crew member wearing dry suit and buoyancy aid

Take Stock of your Rudder

Narrative

A 43ft commercially operated training yacht was on passage with a skipper and six students on board. It was dark and there was a strong breeze with moderate sea conditions.

The skipper was on the helm and the yacht was sailing comfortably on a broad reach downwind when all steering control was lost. The skipper tried to regain steering by rigging the emergency tiller, but this was unsuccessful. A sea anchor was then deployed to control the yacht's drift and the skipper raised the alarm by making a "Pan Pan" distress call on VHF radio.

An RNLI lifeboat was soon on the scene and the yacht was towed to safety. The following day, the yacht was lifted out of the water and it was discovered that the stainless steel rudder stock had sheared through (Figure 1).

The yacht was certified for commercial operations and had been inspected twice in the 5 months before the accident, with no defects being reported in the steering system. There had also been no reported groundings or contacts.

A technical investigation into the shearing of the rudder stock identified that it had failed as a result of weakening caused by crevice

Figure 1: The failed rudder stock showing the effects of crevice corrosion

corrosion. The corrosion had resulted in wastage of the stock of over 50% of its overall diameter. Additionally, it was established that the corrosion had not been identified during inspections as it was concealed from view by the rudder bush.

The sailing school that operated the boat decided to inspect its identical sister yacht, where evidence of pitting on the rudder stock was a clue to potentially similar corrosion (Figure 2). Both yachts were taken out of service until new rudders and stocks could be fitted and the yachts' manufacturer was notified.

Figure 2: The rudder stock of the sister yacht, showing pitting and evidence of corrosion

The Lessons

1. Total loss of steering on a well-maintained yacht is a rare event. In this case the skipper was able to alert the coastguard, deploy a sea anchor and await the lifeboat. Had the yacht been on a lee shore, in an area with a high volume of shipping or in restricted visibility the consequences could have been much worse. Plan for all eventualities, conduct regular drills and ask yourself 'what if?'
2. Stainless steel rudder stocks would not normally be expected to fail on a 15-year-old boat; it is possible that there was some form of defect within the materials at manufacture. The sailing school acted appropriately by inspecting the sister vessel and notifying the manufacturer of its findings. The sailing school has also made the decision to drop the rudders on all of its other boats over 10 years old to allow a full and thorough inspection of the rudder and stock.

Over and Out

Narrative

It was wintertime and four students were undertaking an RYA powerboat level 2 training course at a sail training centre. The centre operated from a sheltered harbour with access to the open sea through a shallow and narrow channel with sandbars on each side (Figure 1). In choppy conditions, particularly when wind and tide were opposed, it was common for waves to break over the sandbars and in the channel.

The students were in two groups of two, each group accompanied by an instructor. One group was training in a 4.9m RIB powered by a 40HP outboard engine (Figure 2) and the other group was in a 4.5m RIB powered by a 25HP engine; buoyancy aids were worn and kill cords always connected.

Having completed manoverboard drills and high-speed runs on the open sea, both RIBs were returning to harbour in company, with the 4.9m boat in the lead. As the 4.9m boat approached the channel, breaking waves could be seen over the sandbars, so the instructor provided guidance to the student helmsman. The boat's speed was reduced and the crew assessed the conditions, waiting for a lull before attempting to proceed into the channel.

Despite the wait, as the 4.9m RIB entered the channel, a large breaking wave approached from the stern and began to lift it, so the instructor told the student helmsman to increase speed. However, this corrective action came too late and the wave continued to lift the stern of the RIB, resulting in a capsize,

Background image courtesy of Google Maps

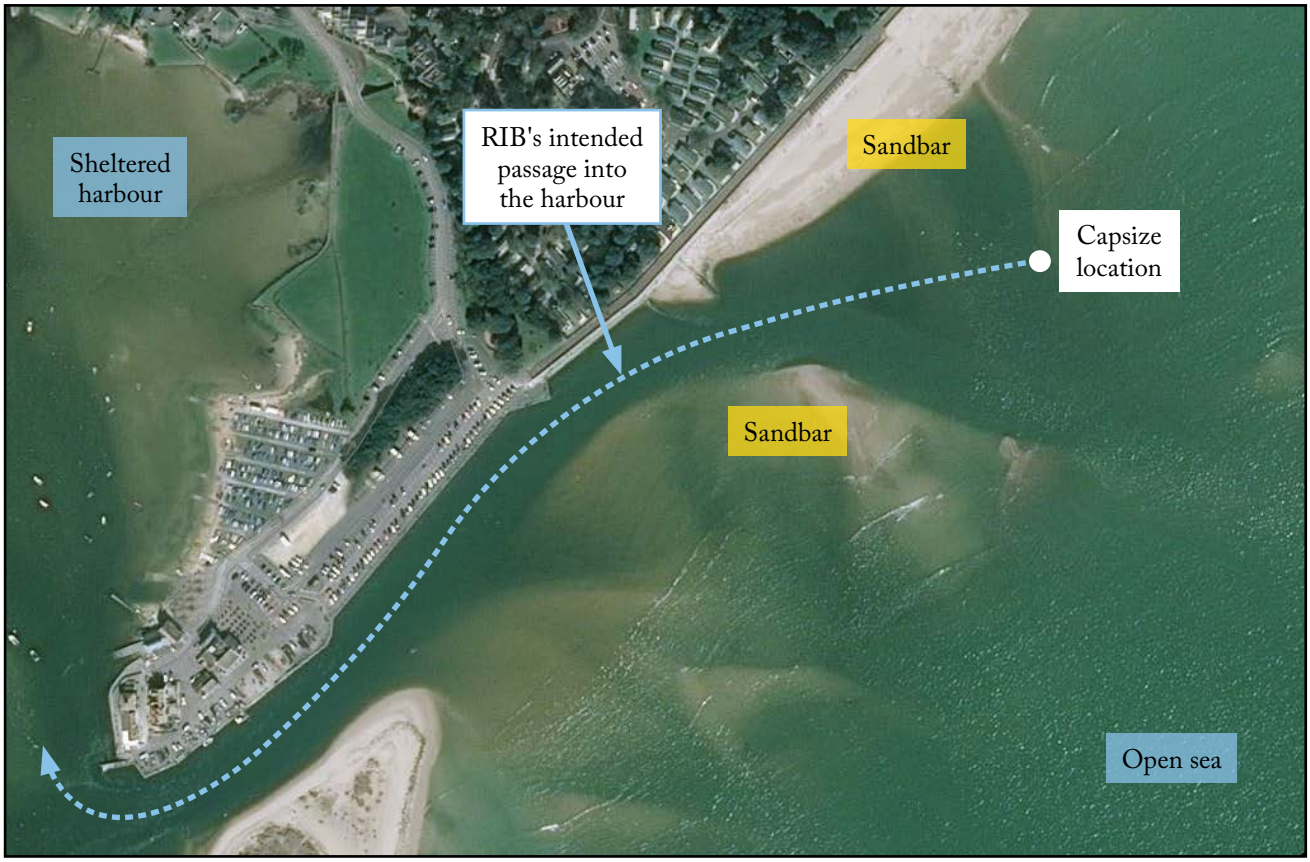


Figure 1: Satellite imagery of the harbour entrance showing the sandbars and narrow entrance

tipping all three occupants into the sea. The kill cord successfully cut out the engine and safely stopped the empty boat.

The instructor in the following 4.5m RIB witnessed the accident and raised the alarm immediately by making a "Mayday" call on VHF channel 16. The instructor in the 4.5m RIB then decided to beach his boat on the adjacent sandbank and rescue those in the water using a throw line. Very soon, the crew of the capsized RIB were safe, cold but uninjured.

Figure 2: The 4.9m RIB involved in the capsize

The Lessons

1. It was winter and the water was cold. Cold water immersion can lead to a shock response and a rapid loss of muscle function, with the increased risk of drowning. Wearing a lifejacket or buoyancy aid greatly assists casualties who unexpectedly find themselves immersed in cold water.

2. Wearing a kill cord is imperative on small open boats. Should the helmsman be ejected, as in this case, the kill cord will stop the engine immediately, greatly reducing the risk to those in the water.

3. The tricky sea conditions at the entrance to the channel were foreseeable due to the wind and tidal conditions. RYA level 2 training does not include teaching the skills necessary for helming a RIB in breaking or confused seas. Therefore, it would have been more prudent for the instructors, who were familiar with the area, to helm the RIBs into the channel.

4. Raising the alarm quickly is key. The response of the instructor on the second RIB was calm and measured and the alarm was raised in good time. This action only took seconds, but ensured that rescue services were immediately aware of the threat to life.

INVESTIGATIONS STARTED IN THE PERIOD 01/09/2019 TO 29/02/2020

Date of Occurrence	Name of Vessel	Type of Vessel	Flag	Size	Type of Occurrence
17/09/19	N207 Rescue 1	Inflatable boat Rigid Inflatable boat	n/a n/a	4.7 m 6.4 m	Collision (1 fatality)
23/09/19	*Anna-Marie II* (WK837)	Fishing vessel	UK	6.2 m	Capsize (1 fatality)
28/09/19	*Stolt Groenland* (9414072)	Chemical tanker	Cayman Islands	25881 gt	Explosion | Fire[1]
15/11/19	*Resurgam* (PZ 1001)	Fishing vessel	UK	23.22 m	Occupational accident (1 fatality)[2]
22/12/19	*Svitzer Mercurius* (9695523)	Tug	UK	447 gt	Occupational accident
18/02/20	*Beinn Na Caillich*	Workboat	n/a	21 m	Occupational accident (1 fatality)

[1] under investigation on behalf of the Maritime Authority of the Cayman Islands
[2] decision to start an investigation was declared on 9/12/2019

Reports issued in 2019

Celtica Hav
Grounding of a general cargo vessel in the approaches to the River Neath, Wales on 27 March 2018.
Report 1/2019 Published 24 January

Unnamed rowing boat
Failure of a throw bag rescue line during a capsize drill in a swimming pool in Widnes, England on 24 March 2018.
Report 2/2019 Published 31 January

Pride of Kent
Contact and grounding of a ro-ro passenger ferry while departing the Port of Calais, France on 10 December 2017.
Report 3/2019 Published 21 February

Red Falcon/Phoenix
Collision between a ro-ro passenger ferry and a motor cruiser in the Thorn Channel, Southampton, England on 29 September 2018.
Report 4/2019 Published 28 March

Laura Jane **(SE80)**
Capsize of a fishing vessel in Plymouth Sound, England on 7 May 2018, with loss of 1 life.
Report 5/2019 Published 25 April

Nancy Glen **(TT100)**
Capsize and sinking of a fishing vessel in Lower Loch Fyne, Scotland on 18 January 2018, with loss of 2 lives.
Report 6/2019 Published 30 May

CV30
Man overboard from a commercially operated yacht while 1500nm west of Fremantle, Australia on 18 November 2017, with loss of 1 life.
Report 7/2019 Published 20 June

Fram of Shieldaig
Man overboard from a fishing vessel on Loch Torridon off Ardheslaig, Scotland on 7 August 2018, with loss of 1 life.
Report 8/2019 Published 28 June

Seatruck Pace
Fall from height on a ro-ro freight vessel while at Brocklebank Dock, Liverpool, England on 17 December 2018, with loss of 1 life.
Report 9/2019 Published 3 July

Tiger One
Collision between a rigid inflatable boat and a mooring buoy on the River Thames, London, England on 17 January 2019, with 4 people injured.
Report 10/2019 Published 18 July

Kuzma Minin
Grounding of a bulk carrier in Falmouth Bay, England on 18 December 2018.
Report 11/2019 Published 1 August

Priscilla
Grounding of a general cargo vessel at Pentland Skerries, Pentland Firth, Scotland on 18 July 2018.
Report 12/2019 Published 3 October

Tyger of London
Keel failure and capsize of a charter yacht off Punta Rasca, Tenerife on 7 December 2017.
Report 13/2019 Published 31 October

Sea Mist **(BF918)**
Man overboard from single-handed fishing vessel off Macduff, Scotland on 27 March 2019, with loss of 1 life.
Report 14/2019 Published 15 November

Millgarth
Fall while boarding tug at Tranmere Oil Terminal, Birkenhead, England on 27 January 2019, with loss of 1 life.
Report 15/2019 Published 5 December

Stolt Groenland
Explosion and fire on chemical tanker in Ulsan, Republic of Korea on 28 September 2019.
Interim report Published 16 December

Reports issued in 2020

Artemis
Fall on board fishing vessel in Kilkeel, Northern Ireland on 29 April 2019, with loss of 1 life.
Report 1/2020 Published 9 January

CMA CGM G. Washington
Loss of cargo containers overboard from container ship in the North Pacific Ocean on 20 January 2018.
Report 2/2020 Published 16 January

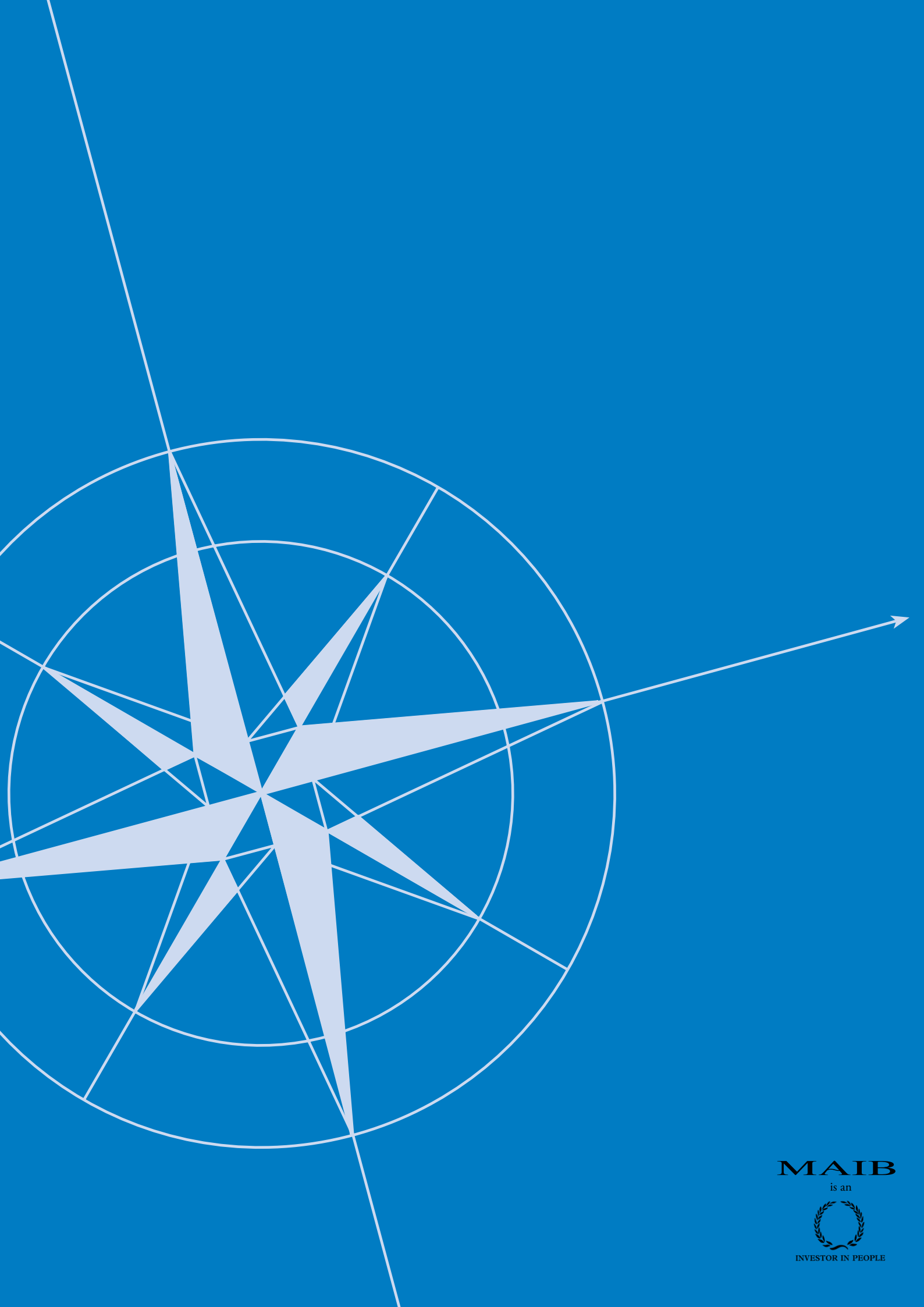
European Causeway
Cargo shift and damage to vehicles on a ro-ro passenger ferry in the North Channel between Scotland and Northern Ireland on 18 December 2018.
Report 3/2020 Published 17 January

Seatruck Performance
Grounding of a ro-ro freight vessel in Carlingford Lough, Northern Ireland on 8 May 2019.
Report 4/2020 Published 6 February

Gülnak/Cape Mathilde
Collision between bulk carrier and moored bulk carrier at Teesport, River Tees, England on 18 April 2019.
Report 5/2020 Published 13 February

Red Falcon/Greylag
Collision between a ro-ro passenger ferry and moored yacht at Cowes Harbour, Isle of Wight, England on 21 October 2018.
Report 6/2020 Published 20 February

Appendix B corrrect up to 29 February 2020, go to www.gov.uk/maib for the very latest MAIB news



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