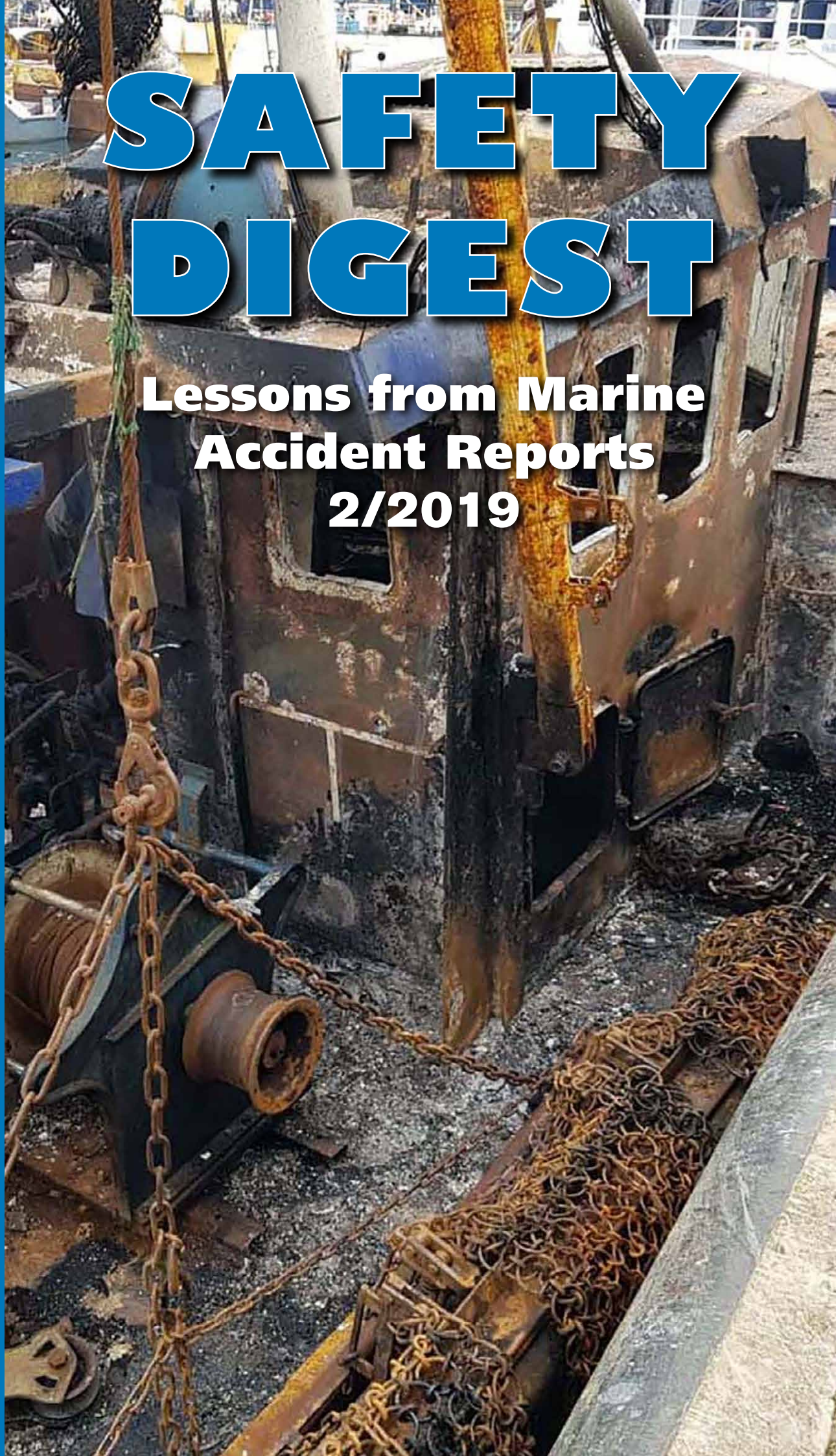
MAIB

MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY DIGEST

Lessons from Marine Accident Reports 2/2019



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October 2019

MARINE ACCIDENT INVESTIGATION BRANCH

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

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

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

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

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
AC	-	Alternating current
AIS	-	Automatic Identification System
ARPA	-	Automatic Radar Plotting Aid
C	-	Celsius
CCTV	-	Closed Circuit Television
cm	-	centimetre
CO_2	-	Carbon Dioxide
COLREGS	-	International Regulations for the Prevention of Collisions at Sea 1972 (as amended)
CPR	-	Cardio-Pulmonary Resuscitation
DC	-	Direct current
DSC	-	Digital Selective Calling
ECDIS	-	Electronic Chart Display and Information System
ECR	-	Engine Control Room
ECS	-	Electronic Chart System
EPIRB	-	Emergency Position Indicating Radio Beacon
GPS	-	Global Positioning System
HSE	-	Health and Safety Executive
ILO	-	International Labour Organization
hp	-	horsepower
kt	-	knot
m	-	metre
"Mayday"	-	The international distress signal (spoken)
MCA	-	Maritime and Coastguard Agency
MOB	-	Man Overboard
OOW	-	Officer of the Watch
PA	-	Public address
PPE	-	Personal Protective Equipment
RIB	-	Rigid Inflatable Boat
RNLI	-	Royal National Lifeboat Institution
Ro-Ro	-	Roll on, Roll off
RYA	-	Royal Yachting Association
UHF	-	Ultra High Frequency
V	-	Volt
VHF	-	Very High Frequency

Introduction

As always, I will start my opening comments by thanking Hans Hederström, David Dickens and Keith Colwell for the introductions they have written for the three main sections of this edition of the MAIB's Safety Digest. We ask guest introduction writers to make insightful comments from their own perspective and to pass on pearls of wisdom. They have not let us down. Do please take time to read their words which are, as ever, very powerful.

Throughout my seagoing career, and especially since joining the MAIB, it has been true to say that 'every day has been a school day'. There is always something new to learn. I would therefore like to thank Hans for introducing me to his tactful but effective approach to raising concerns when things are not going according to plan. You will read more about his acronym PACE – Probe, Alert, Challenge, Emergency – over the page, but it seems to provide a simple method of escalating expressions of concern, and I will be adding it to my toolkit. Of course, it does require all members of the team to understand the plan beforehand – that shared mental model – so they can spot when things are starting to go awry, and this edition contains a number of examples where this has been the case.

More than half the articles in this edition's Fishing Section recount stories when the actions of the crew were significant, either in resolving the situation or reducing its consequences. One of my former captains once told me, "it's not what happens, it's how you deal with it that matters". His point was that you cannot always prevent bad things happening, but dealing with them effectively can help prevent a drama from becoming a crisis. The fire-fighting tale (Case 17) and abandonment story (Case 19) provide good examples of when drills and training before the event significantly improved the crew's ability to deal with an emergency.

Is the message about wearing lifejackets when on deck getting through? I hope so. The deckhands in Cases 18 and 20 would probably have perished had they not been wearing lifejackets when they went overboard. While both these cases had a positive outcome, they also help make the point that surviving the initial immersion and remaining on the surface to be rescued is only the first part of the story. A man overboard is not safe until he or she is back on board. Hopefully, you already review and practise your manoverboard recovery procedures but, if you do not, now would be a good time to start.

Some years ago, I was training to become a powerboat instructor. Our teacher told us that it was important to assess the abilities of the students right at the start of the course, and that a good way to do this was during the opening session to invite everyone to introduce themselves and say a bit about their boating experience. Those who were completely new to powerboating would probably say so, but others might claim extensive prior experience. The difficulty was knowing how much value to place on an individual's self-account. The teacher suggested one simple method for assessing prior experience that was, simply, to quietly invite anyone who might perhaps be overselling themselves to coil up a discarded rope. His theory was that a good seaman would instinctively coil up and secure unused lines. In doing so, they would not just be tidying up. They would be checking the condition of the line as it passed through their hands, ensuring it was kink free, and that it was ready for immediate use when required. His ethos was that professionalism and safety go hand-in-hand. I think he was right.

Andrew Moll
Chief Inspector of Marine Accidents

October 2019

Part 1 - Merchant Vessels

Intervention - an Important Tool for Safety

It was a cold January evening in 1983 in Stockholm when I for the first time was welcomed on the bridge of a Silja Line ferry by the master, Captain Kari Larjo. This ferry was trading the challenging archipelago between Stockholm and Turku 364 days and nights per year sometimes in dense fog, thick ice and strong winds. When I introduced myself as Gothenburg pilot, Captain Larjo, in his typical short cut Finnish manner said "A pilot without a passage plan is not a pilot." The passage plan was for this legendary Captain one of the corner stones for successful navigation in the archipelago providing all team members on the bridge with a reference tool.

Another corner stone for this captain was the bridge design and layout of controls and instruments, which he had arranged similar to an airline cockpit with two navigators sitting side by side in front. They operated their own set of radars and between them there was a centerpiece containing all control functions. The navigator on the left side, the company line pilot, normally had the con and the other navigator, the officer of the watch, was tasked with supporting and cross checking the person conning. The Captain himself had his own radar just behind those two navigators in order to get a good overview of the operation. On this bridge the traditional hierarchical way of working had been replaced by a coordinated team approach. "Ideally", Captain Larjo said, "for optimum safety those two navigators should have the same level of competence."

"So how can you get two navigators with the same level of competence?" I asked.

"One of the most important tasks for a Captain is to train and coach the officers, if possible, all the way up to my own level" the Captain replied. "We don't expect to get experienced and well-trained officers directly from the nautical colleges, the college is just the starting point of a lifelong maritime learning."

What Captain Larjo had put in place was an early version of BRM with the aim to avoid that error by one person escalating into negative consequences. He had realized that all actions in time critical operations must be cross checked and for that reason the operators must have a shared mental model based on an agreed passage plan.

After my meeting with Captain Larjo I presented my passage plan on every pilotage I was assigned to until I resigned as a senior pilot in 2000.

Reading the cases 1, 2, and 12, it appears to me that there are at least two things missing for a different outcome. First of all, nobody knew when to intervene/challenge as the ship started to run into an undesired state. Secondly, this lack of intervention was probably due to the absence of a detailed passage plan with clear margins for when to intervene. To make it clear when to intervene the passage plan should be planned with a track surrounded by a corridor or navigable area to be used under normal conditions. Outside the planned navigable area there should be a margin of reserve to the NO GO area. This margin of reserve should be fully navigable waters, which provides flexibility to be used in abnormal situations. The speed should be planned in a range of values for each leg or section, e.g. 4 – 6 kn, making it easy for anybody to raise their voice if the speed is outside the stated range. When the passage plan is discussed during the team briefing and the master - pilot exchange the set values should be highlighted in order to clarify the importance to intervene in case of a deviation.

Traditionally ship handling has been and, by some people, still are considered as a one-person operation. However, accident and incident reports often show that incidents are the result of one person's unsafe control actions not being cross checked resulting in a negative outcome. It is therefore essential to realise that BRM should be practised at all times the ship is underway, from berth to berth. It is the responsibility of the Captain to establish coordinated teamwork based on an agreed plan and effective communication during all critical operations to mitigate risks.

Effective communication by the person conning the vessel is to verbalise his/her **intentions**, the **reason** for this and the expected **outcome**, we

can call it "thinking aloud." This is one way of creating and maintaining team situational awareness.

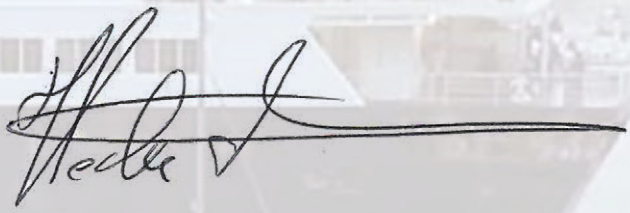
If for some reason the person conning, be it an officer, captain or pilot, seems to lose situational awareness, the ship is about to deviate from agreed values, it is time for the team to intervene. Clear and unambiguous margins for the planned navigation area and for the speed range makes it so much easier to intervene. Intervention can start with a **probing** question like: "What's your intention?" If there is no reaction from the person conning it is time to **alert** by stating: "The speed is now 9 knots, our planned speed is 6 – 8 knots!" This would normally trigger some reaction, if not, it is time to **challenge**: "I suggest to slow down to bring the speed within the agreed range!" It is important to note that probing, alerting and challenging is based on the outcome, not what the person conning should do. Bridge team members should refrain from giving direct advice or orders as this will mean a 'de facto' but not formal taking over of the conn. If those three steps do not bring about the desired result or an adequate explanation it is time to go to the final step and declare **emergency**. If you are the captain, you can just say "I take over!" if you are an officer when a pilot is conning you can say "I'm calling the captain."

The purpose of BRM is to avoid incidents and accidents by a variation in performance of one person and the above tools are in my experience some of the most helpful ones to meet the objectives of BRM.

My first meeting with Captain Larjo was followed by many more, he became my role model. I also had the privilege to work with him in 1991 – 1993, as we were both members of the development group converting the Scandinavian Airlines CRM course into a maritime version, which is still used under different names such as BRM, MRM and MCRM.

In 1995 Captain Larjo was awarded the Gold medal by the Royal Institute of Navigation for his work related to the development of the NACOS Integrated Navigation Systems.

I was very sad to learn that Captain Kari Larjo died at home in Turku in August 2018.



HANS HEDERSTRÖM, FNI

Captain Hans Hederström holds a Master Mariners (class 1) licence, a Marine Engineers Certificate from the Maritime College in Gothenburg, Sweden. He has also studied Human Factors and Adult teaching at the Vast college in Sweden.

Captain Hederström has sailed in all ranks up to and including Master. In 1978 he continued his career by becoming a Harbour Pilot in the Port of Gothenburg, Sweden.

In 2001 Captain Hederström became the Director of Star Cruises Ship Simulator Centre, in Port Klang, Malaysia.

In 2005 he moved back to Sweden, where he led the specification and establishment of a new Full Mission simulator at Chalmers University of Technology, Gothenburg, Sweden.

In 2008 Captain Hederström moved to the Netherlands with the task to build and establish the CSMART simulator training facility. He retired as managing director at CSMART in December 2018 and is now working part time as an independent consultant to the maritime industry.

More Haste Less Speed

Narrative

A fully laden 363m container ship was arriving in port. When the pilot arrived on the bridge he requested full ahead. The master pilot exchange was brief and there was no agreed plan for the inbound passage. The berthing manoeuvre involved turning into a basin and then swinging the vessel off the berth, but this was not discussed by the pilot; additionally, the vessel's crew did not have a berth to berth passage plan.

Helm orders were given to begin the turn into the basin, but the vessel did not respond as the pilot expected. Subsequently, the pilot made a series of engine and helm orders in an attempt to avoid making contact with another large container ship that was berthed nearby. However, the inbound container vessel was not under full control and made heavy contact with the quay at a speed of over 5kts.

The contact caused significant damage to the container vessel and the shore infrastructure, including two cranes collapsing. Ten port staff were injured.

Figure: The container ship's bow making contact with a crane

The Lessons

1. **The entire bridge team needs to have a thorough understanding of the plan before any act of pilotage commences. The plan that is discussed and agreed between the pilot and the bridge team as part of the master pilot exchange should include critical information such as the manoeuvre, desired speeds, use of tugs, anticipated environmental conditions and traffic. Once agreed, this 'shared mental model' among the bridge team will result in effective monitoring of the plan.**

2. **Commercial pressures do not apply only to vessels' crews. In this case, the pilotage times were recorded as part of the port authority's continuing drive for efficiency. This prompted the pilot to make haste, and meant that the approach was too fast, resulting in the contact. Time pressures imposed in the quest for efficiency can have a negative effect on safety management.**

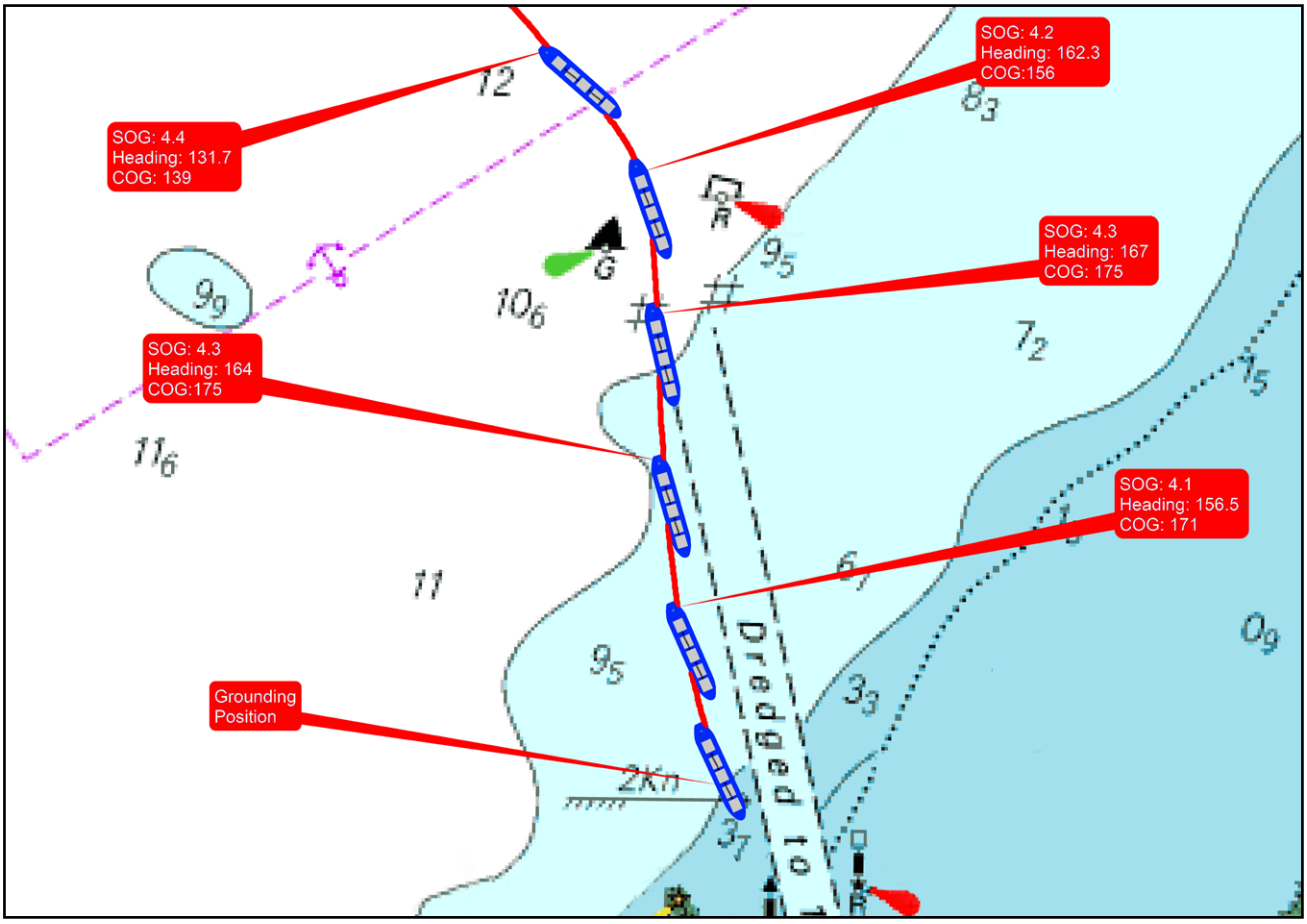
3. **The tugs had not been positioned to assist effectively and were not able to slow the container ship down or assist with the turn into the basin. The correct positioning of tugs is vital in the manoeuvring of very large ships, and their intended use should be discussed and agreed between the pilot and the master in good time.**

A Soft Landing

Narrative

A large bulk carrier was approaching a port. It was heading towards a narrow, 100m wide channel at a speed of 4kts with the master, second mate, a helmsman and two harbour pilots on the bridge. None of the vessel's deck officers had visited the port before and little information about it was available. The pilots had embarked immediately after piloting an outbound vessel, which had been their first pilotage act in the port. One of the pilots had the con and was navigating solely by eye. He did not expect any difficulty with the passage or expect any tidal stream across the channel. The tidal stream had been negligible on his outbound passage and it was now close to the predicted time of high water. The only tidal stream information available was a tidal arrow on the paper chart indicating an easterly flood stream at a rate of 2kts.

After the vessel passed between the outer of the channel's lateral buoys on a heading of 167° (see figure), it was set slowly to the west. The pilot ordered the helmsman to steer 165° and requested that the engine telegraph be set to 'dead slow ahead'. The master advised the pilot of the vessel's continued set towards the western side of the channel. In response, the pilot ordered a heading of 163°. Soon after, the echo sounder alarm went off and the second officer reported that the course over the ground was 174°. In response, the pilot ordered a heading of 157° and then steadied on 155°.



Two minutes later, the second officer advised that the speed was 4.1kts, and the pilot requested that the engine telegraph be set to 'slow ahead'. By that time, the bulk carrier was outside the channel and making good a course of 167°. The vessel's speed then slowly reduced as it took the ground in the shoaling waters near the next channel marker buoys.

The pilot tried to manoeuvre the bulk carrier towards the channel by putting the engine telegraph to 'half ahead' and the rudder to port. However, the vessel remained aground on the sandy bottom. It was refloated 12 hours later with tug assistance. There was no damage and no pollution.

The Lessons

1. **Harbour pilots are generally relied upon for their local knowledge, but port authority requirements vary worldwide and masters have no way of knowing or verifying pilots' qualifications or experience. Although confidence during an initial information exchange can provide an indication of a pilot's competence, it can also be misleading. A few polite questions in normal conversation might be more enlightening.**

2. **Comprehensive and accurate tidal stream data does not exist for many areas and, where tidal information is charted, it can be sparse and/or unreliable depending on the source. Although the predicted times of high and low water provide an indication of tidal flow and are useful when planning, during execution the saying 'what you see is what you get' is relevant. The actual tidal stream experienced is what matters, and this is available through plotting on paper charts, or via the ARPA and ECDIS.**

3. **Big ships in tight places leave little or no margin for error, and any set or drift away from an intended track must be identified and countered immediately. This is very difficult to achieve when navigating in a narrow, buoyed channel without a leading mark, radar parallel indices, or the benefit of real time positioning through an ECDIS or ECS. To delay or to 'nibble' can also leave a ship on the edge of a channel and the bridge team with their fingers firmly crossed.**

Wrong Place, Wrong Time

Narrative

A bulk carrier was at anchor and discharging its cargo of sawn timber to barges. During the sea passage, the deck cargo had been secured by top-over lashings (Figure 1), which were removed prior to commencing the discharge (Figure 2). Access from the accommodation area to the forecastle could only be achieved by walking over the deck cargo.

During discharge operations the bosun was conducting security rounds, which involved walking over the deck cargo. The stack of deck cargo that he was standing on collapsed, and he fell with the timber into a barge. Despite being administered first-aid, the bosun did not survive the fall.

Figure 1: Timber deck cargo secured with top-over lashings at sea

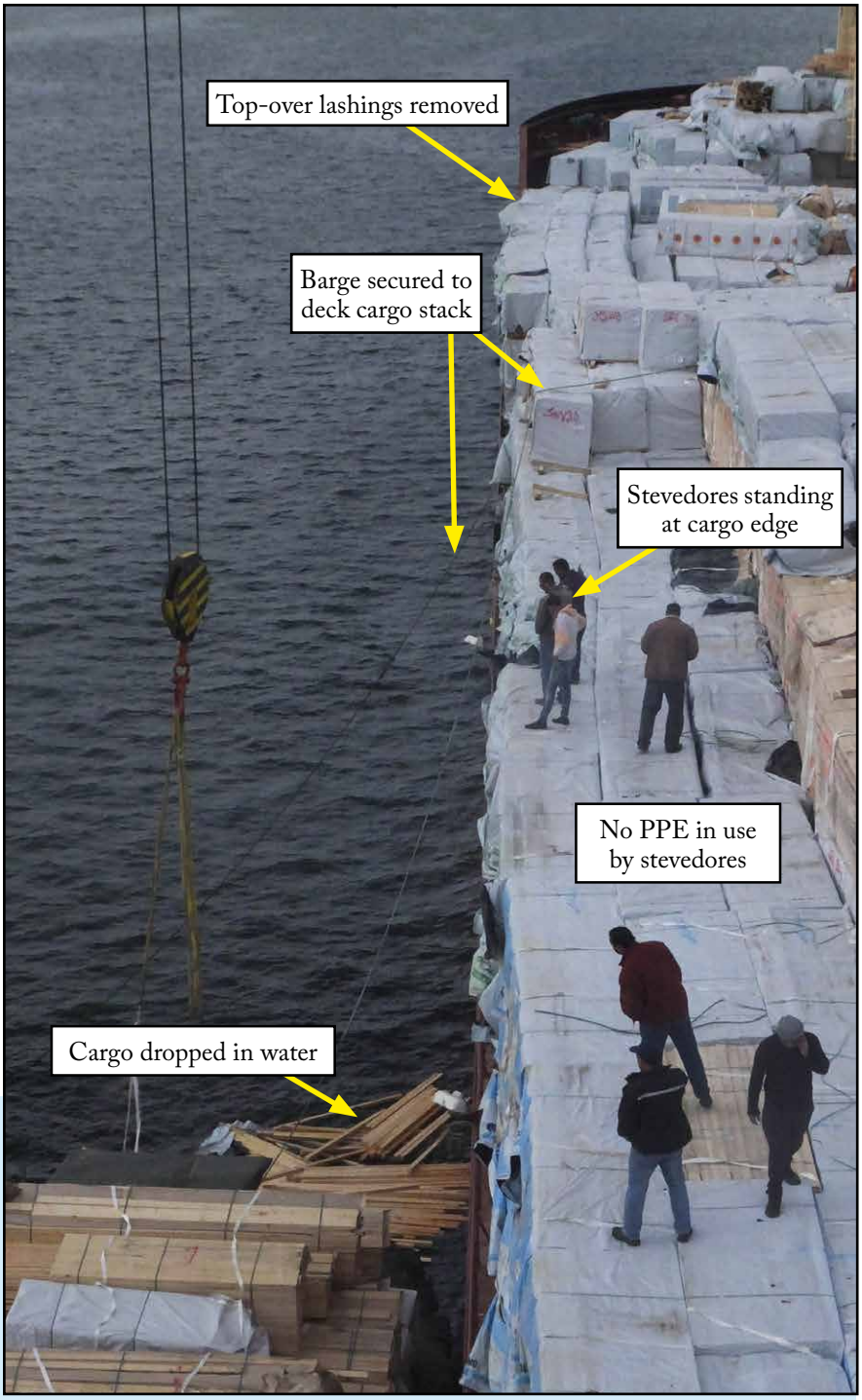


Figure 2: Unsecured deck cargo during discharge

The Lessons

1. Although it was a very hazardous working environment, the risks had not been properly assessed. Safe access over deck cargo using ladders and catwalks needs to be provided. Alternative methods of monitoring security, such as the use of CCTV cameras, can also be considered.

2. Vessel crews should challenge poor stevedoring practices. During this discharge operation, the vessel's crew had witnessed a series of poor safety practices by stevedores, including barges being secured to the cargo, cargo being dropped, stevedores not wearing PPE and cranes being used to lift personnel. When a vessel's crew witness significant safety shortcomings of this nature, proactive engagement with the stevedoring supervisor is necessary to ensure safe working practices are in place for everyone.

There's None so Blind as Those Who Do Not Look

Narrative

On a fine early autumn afternoon a ro-ro passenger ferry started a routine short passage in a usually busy waterway. As it transited a buoyed channel at 13.5kts the ferry's master and OOW were both seated on the bridge. They were familiar with the ferry and the waters, and were navigating by eye. The wind was light, and the sun was bright and low in the south-west sky. During a slow turn to starboard of about 75° to follow the channel, the master and the OOW discussed several small, slow-moving recreational craft that were off the starboard bow. These were outside the buoyed channel and none were thought to be a concern.

As the ferry was steadied on a heading of about 216° the bright sun was about 25° off its starboard bow. Significant glare was being reflected off the water, but the master intended that the ferry remain on this heading for only a very short period before turning to the south, and did not close the solar blinds fitted on the sun-drenched windows. He and the chief officer remained seated, with their attention focused on a yacht off the port bow, which was impeding the next intended alteration. They decided to delay the turn to the south until the yacht was clear down the ferry's port side.

The master and chief officer did not see a motor cruiser with four persons on board that had just entered the channel (Figure 1). The motor cruiser was within 365m off the ferry's starboard bow, heading south at just over 7kts. It was obscured by the sun and might also have been 'wooded' by the bridge window frames. The motor cruiser's owner/driver had a very limited knowledge of the collision regulations and local guidance. He usually went much faster and generally overtook other vessels, and he did not see the ferry because he was looking directly ahead.

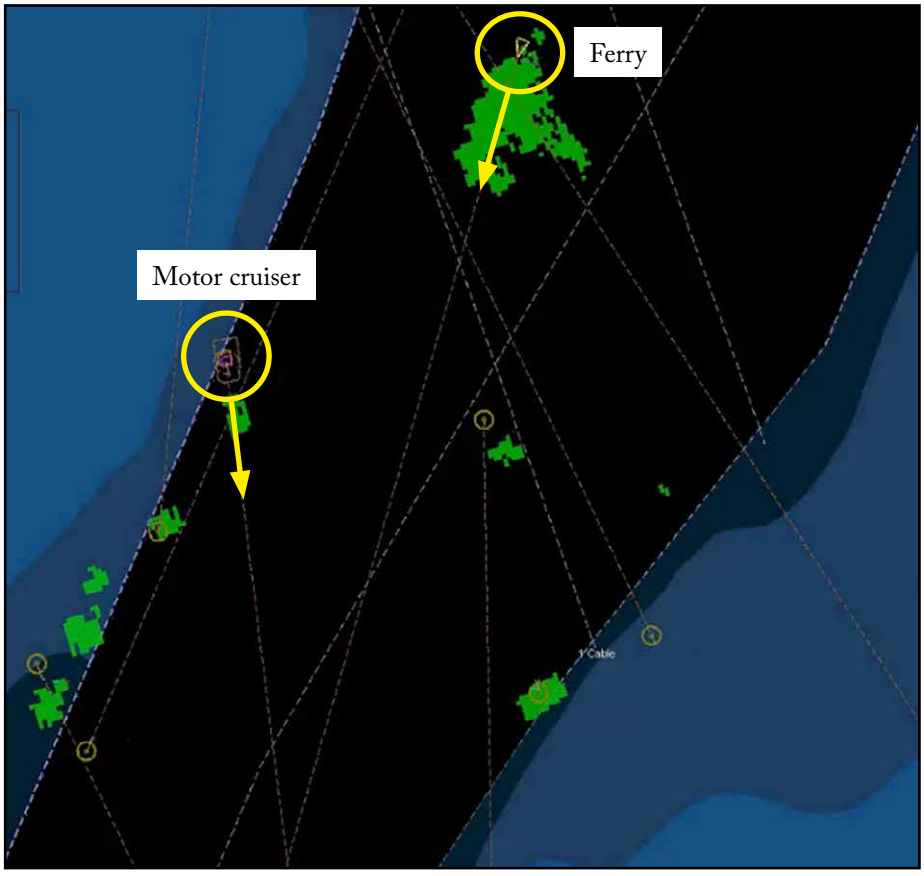


Figure 1: Motor cruiser entering the channel

Soon after, the ferry started to alter course to the south as planned. As it did so, it collided with the motor cruiser, which remained pinned against the ferry's bow (Figure 2) for almost 20 seconds before it fell away. The motor cruiser was swamped, and its engines stopped. Fortunately, there were no injuries and, although badly damaged, the motor cruiser was able to make its way alongside on one engine. Meanwhile, the ferry's bridge team remained unaware of the collision until prompted by passenger reports, which were verified by a review of CCTV recordings about 30 minutes later when the ferry was secured on its linkspan.

Figure 2: Motor cruiser pinned against the ferry's bow

The Lessons

1. **Even on a fine day with good visibility, other vessels can be easily missed if nobody is looking out for them. In busy waterways, vessels of all shapes and sizes are likely to approach from all directions. Distractions are also plentiful, which makes staying on the ball critical no matter how light traffic might seem. A vessel that is on a steady bearing behind an obstruction such as a crane or a window frame, or is obscured by the sun, is likely to remain unseen unless proactive countermeasures are taken, such as moving around the bridge from time to time, using window blinds, and occasionally having a quick look at the radar. Such measures are tried, tested, and achieved with minimal effort.**

2. **The sea is there for the use of leisure and commercial vessels alike, but in busy and congested waters safe navigation relies on vessels following the COLREGS as well as local byelaws and guidance. Tuition in the application of the 'Rules of the Road' is available in many forms, and local guidance and regulation is usually available at local marinas and yacht clubs. Ignorance is no defence!**

3. **The use of manoeuvring signals highlights a vessel's proximity, and it also gives warning of the actions the vessel is taking. Being heard is sometimes just as good as being seen.**

4. **AIS is a great tool for recreational boaters. It improves situational awareness and enables other vessels to be monitored with minimal effort. However, possibly more importantly, it helps to ensure that small craft, which might not be readily detected by radar, are seen by larger vessels. In today's modern world bridge watchkeepers' use of technology is ever-increasing, and as many larger vessels have limited visibility ahead and are slow to manoeuvre, being seen on a screen is one way that contributes towards staying safe.**

Working in Isolation

Narrative

The crew of a ro-ro ferry needed to replace a section of pipework on the vessel's aft waste water system. The pipework requiring replacement carried grey water, untreated from the outlets of showers and sinks.

Two senior engine room ratings and an assistant motorman had been assigned to the task and, after a briefing in the engine control room (ECR), they went to the aft waste water plant. The task was started by setting valve isolations intended to divert grey water away from the affected pipework. At this time, one of the senior ratings was called back to the ECR for the entering harbour 'standby' requirement.

When the two remaining crew released flange bolts to remove the pipework, grey water started to pour out. They tried to reseal the flange by replacing the bolts, but this was unsuccessful and both were then soaked in grey water. One of the soaked crew went to seek help, but slipped and injured his back on the way to the ECR. While a first-aid party attended to the casualty, the second engineer proceeded to the aft waste water plant, where he quickly realised what was wrong and isolated the flow of grey water.

After the incident, the crew who had become soaked felt ill and started vomiting, so they were admitted to hospital. They were released later that day.

An investigation identified that the cross-over valve between the forward and aft waste water systems had been left open, allowing grey water from the forward system to enter the section of pipework being removed from the aft system. The investigation also identified that the 'tag out' procedure for isolating live systems had not been used and there was no risk assessment for the task.

The Lessons

1. **Exposure to grey water is potentially very hazardous and could result in serious illness. Therefore, maintenance on waste water or sewage treatment systems must be fully risk assessed to identify and protect against all the hazards. In this case, the exposure led to vomiting, and it was fortunate that the affected crew could be taken to hospital quickly and receive treatment.**

2. **When undertaking work of this nature, the plan for isolating that part of the system requiring maintenance should be subject to a detailed plan and appropriate 'tag out' isolations. This will ensure that onboard services are maintained while system isolations are effective. The second engineer realised what had happened when he arrived in the plant room; this indicates that the plan for isolations was either incomplete or had not been undertaken correctly.**

3. **The opportunity for in-service maintenance on ro-ro ferries will often be limited due to busy schedules and short turnarounds. Nevertheless, planned work should take these constraints into account, ensuring that the correct level of manpower and oversight is in place. It was unhelpful in this case that one of the team of engineers was called away.**

4. **PPE is an important layer of defence to protect crew. If there is any risk of exposure to hazardous material, consideration should be given to wearing suitable PPE just in case things go wrong.**

Astern Demanded, Ahead Delivered

Narrative

A twin-screw, aluminium-hulled crew transfer vessel was approaching a wind turbine tower. The skipper placed both engine control levers to astern to slow the vessel down, with a plan to nudge up against the turbine to facilitate the transfer of personnel. However, the vessel did not reduce speed and made heavy contact with the tower before the skipper could take any avoiding action. The bow fendering of the vessel was damaged (see figure) and one of the crew was injured after falling over on impact.

An inspection of the engine control system by the manufacturer found that the pitch control rod on the starboard controllable pitch propeller system was stuck. When the skipper had selected astern propulsion, the starboard shaft did not respond. Although the port shaft was functioning normally, the defect on the starboard system was sufficient to cause the heavy contact.

The Lessons

1. **Before approaching any structure, or if entering an area where manoeuvring is going to be critical, it is prudent to test that full control of all systems is available. Try to find time to slow your vessel down, stop if necessary, test ahead and astern propulsion, test the steering and thrusters, and proceed only when satisfied that everything is working as expected. This procedure will only take moments but will help ensure that there are no unexpected surprises.**

2. **Ensure that manufacturers' recommended maintenance routines are in place for all equipment, and that there is sufficient time in the schedule for maintenance. The analysis of this system determined that the starboard control rod had not been greased properly. Greasing of components may be mundane, but it is essential, and time should be allocated to these tasks - even on vessels with busy schedules.**

3. **Consider 'what if'? On twin screw propulsion systems include the loss or malfunction of one engine or propeller in your risk assessment, and consider how to recover from such a situation in an emergency.**

Figure: Damage to the crew transfer vessel's bow fendering

Did Not Know We Had a Trap Door

Narrative

A tug was secured alongside undergoing scheduled maintenance when contractors arrived to start some work on the fire alarm system. The tug's regular crew were not on board so an AB from a different tug of the same company helped them initially. To undertake the work, the contractors had to remove an access panel from the wheelhouse (see figure).

When the tug's master and crew embarked, the AB from the other tug explained that there were contractors on board, but gave no further details. The master went to the wheelhouse to complete some paperwork and was badly injured when he accidentally fell through the unguarded hatchway into the space below.

Figure: The wheelhouse access hatch shut and access hatch open

The Lessons

1. Any openings in the deck should be guarded by suitable barriers. These barriers should remain in place until all work has been completed and the opening has been shut and secured. An appropriate risk assessment should be carried out before any work commences. Such a risk assessment would have identified the hazard in opening a deck hatch and would have helped identify suitable control measures to protect the health and safety of the contractors and the crew.

2. Safety management systems should include arrangements for contractors working on board. Contractors should be made aware of the requirements of the safety management system and comply with it to ensure that their work does not endanger themselves or the crew.

3. It is important to ensure that when any handover takes place all of the pertinent details are included. The AB was aware of the location of the work and was also aware that the hatch had been opened on the wheelhouse deck. Unfortunately, this critical information was not passed to the joining crew.

Anything Can Happen in the Next Half Hour…

Narrative

A small inter-island ro-ro passenger ferry ran aground shortly after one of its two Voith-Schneider propulsion units stopped. It was a fine day with a moderate breeze, and the ferry was on a regular sailing with passengers and vehicles on board.

Five minutes after the ferry had left its berth, the aft propulsion unit shut down. The vessel's engineer went to the engine room, but his attempts to restart the aft engine were unsuccessful because the propulsion unit's blades were not in 'neutral'. He was not aware of a button that enabled the start interlock system to be overridden in an emergency (see figure).

Meanwhile, the ferry drifted towards navigational dangers. The master, who had remained on the bridge, assumed that the engineer had taken control of both engines and consequently did not try to manoeuvre the ferry clear using the forward propulsion unit. However, he called the harbour authority and asked for tug assistance. The master also stopped the forward propulsion unit engine as the ferry approached the shallows to reduce damage to its blades.

Minutes later, the ferry grounded, but assisted by a local tug it soon refloated. There was no damage and no pollution.

Investigation found that the aft propulsion unit had stopped due to a fault in its shutdown system. It also found that the crew were unfamiliar with the vessel's controls, the onboard technical information was unclear on the operation of the propulsion system in reversionary modes, and the vessel's emergency drills did not include machinery breakdowns.

Start interlock override button

The Lessons

1. Operating a vessel safely when everything is working as it should be is one thing, being able to respond and keep it safe when something goes wrong is another. By their nature, emergencies are unpredictable, cause stress, and can test crews to their limits. Without regular drills and detailed knowledge of systems and procedures, the likelihood of successful outcomes is reduced significantly.
2. Just because machinery breakdown drills are not mandatory, it does not mean they are not useful. Not only do drills test a crew's systems knowledge and decision-making, they provide good opportunities to review the technical information held on board, and to develop and test aide-mémoires and decision support aids.
3. When on watch, occasionally asking the question 'what if?' costs nothing and helps prepare for the unexpected. It might also occasionally prompt a bit of personal revision or research.

Give 'em Enough Rope…

Narrative

A ferry was preparing to leave harbour when a mooring line became caught in its propeller.

The ferry had completed loading, the order to 'single up' had been given from the bridge, and the aft spring line had been slackened off. As the line became slack, the linesman on the jetty took this as the signal to let go. He removed the line from the mooring bollards and dropped it into the water. He then walked the line along the jetty, holding onto the attached messenger, and waited for the line to be heaved on board (Figure 1).

On board the ferry, the mooring station was not manned to its normal level. One seaman was on the winch controls and another was handling the rope from the drum end. The bosun who normally supervised local operations was still closing watertight doors in preparation for sailing, and a third seaman, who should have been involved in line handling, was completing cargo lashing.

The seaman at the drum end had set the line up with three turns on the drum and the remaining tail from the mooring bitts coiled on a pallet. He held the line in his hands facing the pallet and winch, and slackened it out waiting for the seaman at the controls to tell him to stop. But he heard no instruction from the winch operator. On the jetty, the linesman was not concerned about the additional slack in the line as the ship occasionally let out extra line to remove any twists.

The linesman remained holding the messenger and waiting for the line to be hauled on board. At this point, the slack line became entangled in the ferry's propeller (Figure 2), the messenger was pulled from the linesman's hand and the remaining mooring line was pulled rapidly from the ferry's deck.

There were no injuries either to shore or ship's personnel. The ferry sailed without the master being aware that the incident had occurred, but was forced to return to port due to vibration caused by the rope being tangled around the propeller shaft. Divers were able to remove the rope and there was no damage to the vessel.

Trials to establish the circumstances of the incident indicated that approximately 10m of slack line had been allowed to enter the water.

The Lessons

1. **Both the ferry and the port had safety management systems that detailed safe systems of work for berthing and unberthing operations. On this occasion there was no communication between ship and shore, the ferry manning was insufficient and the shore linesman had acted without instruction from the vessel. Safe systems are developed through risk assessment, identifying hazards and implementing risk reduction measures. Taking shortcuts and bypassing safe processes is a sure way to create an accident.**

2. **Routine operations allow safe practices to develop, be implemented and to be tested. However, routine operations can also become hazardous when familiarity and a desire for efficiencies lead to a deviation from safe practice.**

3. **Ship procedures should be realistic and achievable. Where concurrent tasks (watertight preparation, cargo securing and unberthing) are being conducted, it is essential either that sufficient and appropriate manpower is available, or operations are delayed until it is.**

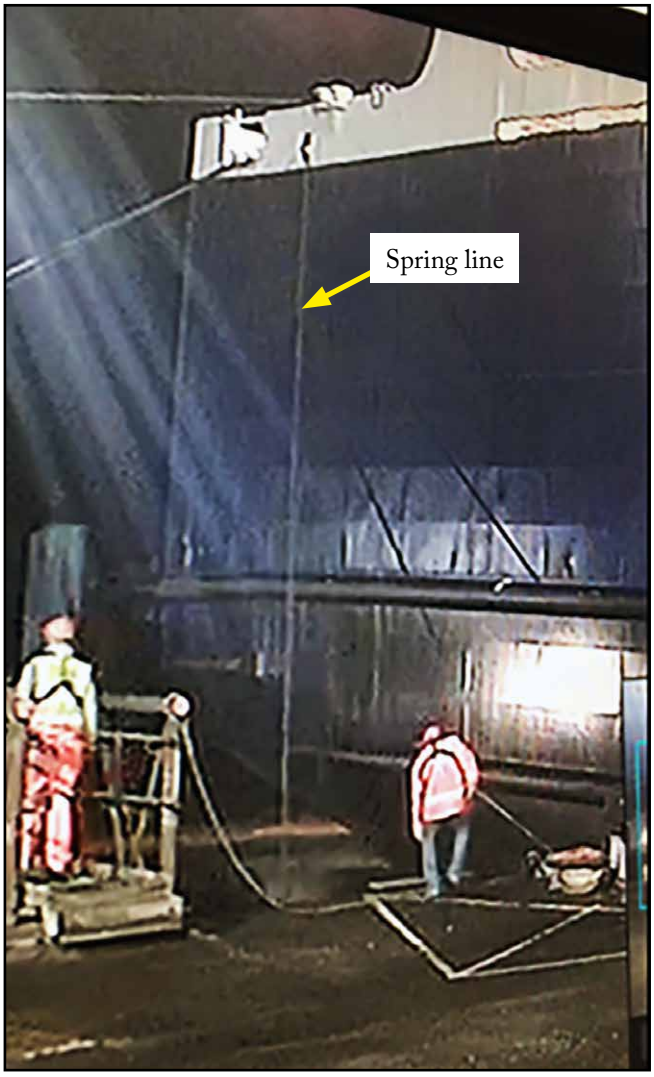


Figure 1: Spring line vertical and slack as linesman picks up messenger

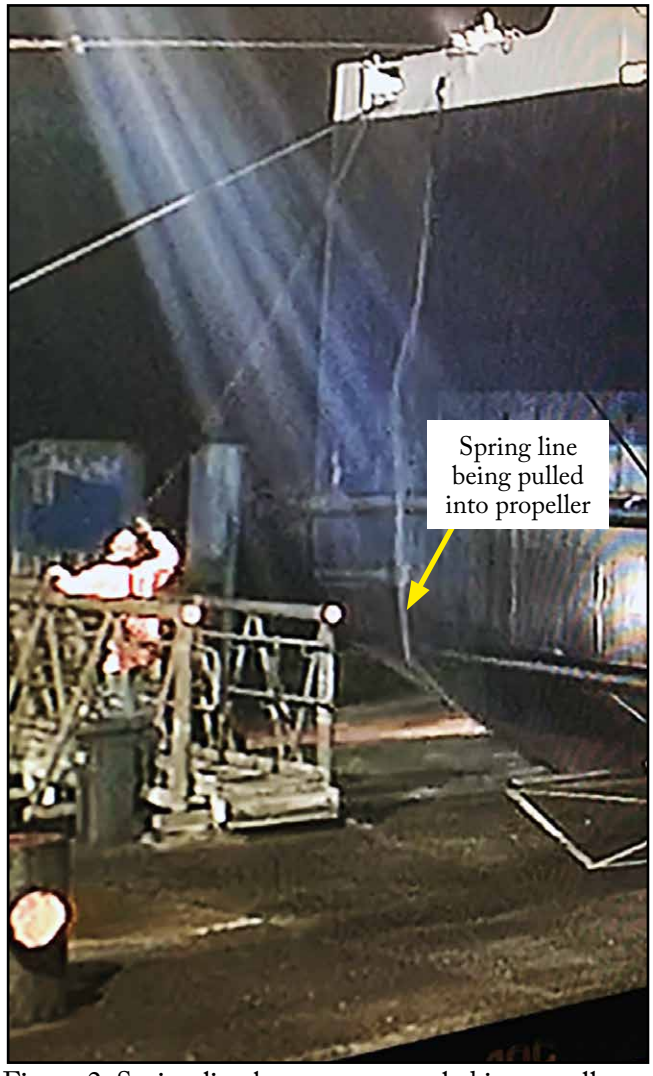


Figure 2: Spring line becomes entangled in propeller

Delicate Balancing Act

Narrative

A small historic ferry was berthed alongside its slipway at the western side of a narrow sea passage that it crossed several times each day. The ferry had two crew and one passenger on board. The sea was calm and visibility was good, but there was a strong north-westerly wind, gusting up to force 8.

With the lines slipped, the skipper applied astern power and drove the ferry away from the slipway before propelling ahead, intending to turn around to starboard to make the short crossing. However, as the starboard turn commenced, the ferry was caught by a strong gust of wind and blown sideways towards the shore (Figure 1). Realising that grounding was inevitable, the skipper stopped propelling so that the ferry made contact with the slipway rather than the adjacent rocky shore.

Once the vessel was aground, the skipper called for assistance using VHF radio channel 16. Two nearby fishing boats attended the scene, but could not get close enough to assist. Meanwhile, the local coastguard station responded to the VHF call by sending two lifeboats to assist. Everyone on board the ferry was safely evacuated ashore and lines were rigged to hold it in place as the tide fell (Figure 2). The grounding occurred 3 hours before low water and the ferry was safety refloated with the assistance of a lifeboat on the rising tide about 6 hours later.

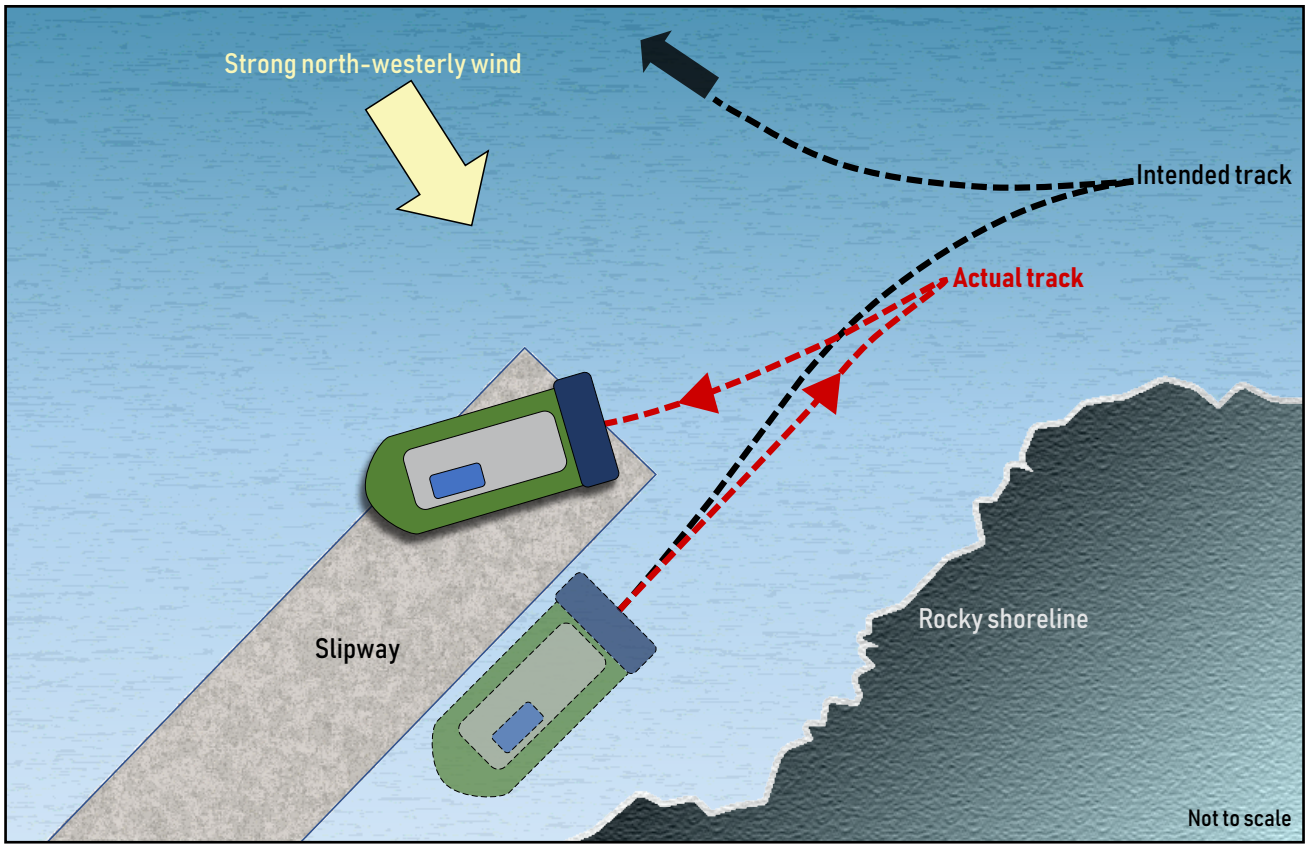


Figure 1: Diagram showing the intended and actual tracks of the ferry

Figure 2: The ferry balanced on the slipway at low water

The Lessons

1. A passage plan is always required, even for short, frequent and repetitive journeys. In this case, a quick assessment of the weather conditions was necessary, in particular the likely effect of the wind needed to be taken into account. Given the strong north-westerly breeze and the sea room available, the skipper could have gone further astern than normal to allow for the wind's effect. Had the skipper assessed that the situation was not tenable, the crossing could also have been cancelled until the strong wind abated.

2. Be ready to act when things start to go wrong. When the skipper realised it was not going to be possible to prevent the grounding, he made a very sensible decision to ensure that the ferry came to rest on the slipway. This minimised the risk of damage to the ferry as it came to rest safely on its keel rather than the rocky shoreline. It also meant that the evacuation was easier to execute.

Self-discharging CO_2

Narrative

The CO_2 discharge alarm on a ro-ro passenger ferry alerted the engineers to a potential release of CO_2 gas from the engine room's fixed fire extinguishing system.

When an engineer approached the CO_2 room he heard a loud hissing noise. On opening the door, he found that one of the cylinder outlets had frosted up around the junction of the flexible outlet hose and the main gas manifold, and a white cloud was forming in the space (Figure 1). The main control valve to the engine room remained closed and no gas had been released into the engine room.

The service supplier who maintained the CO_2 system was informed and arrived on board when the vessel came alongside. Donning a breathing apparatus, he entered the CO_2 room and disconnected the flexible outlet hoses from all 26 cylinders. All the cylinders were subsequently landed ashore and weighed. It was established that all but the two master cylinders had discharged either partially or completely.

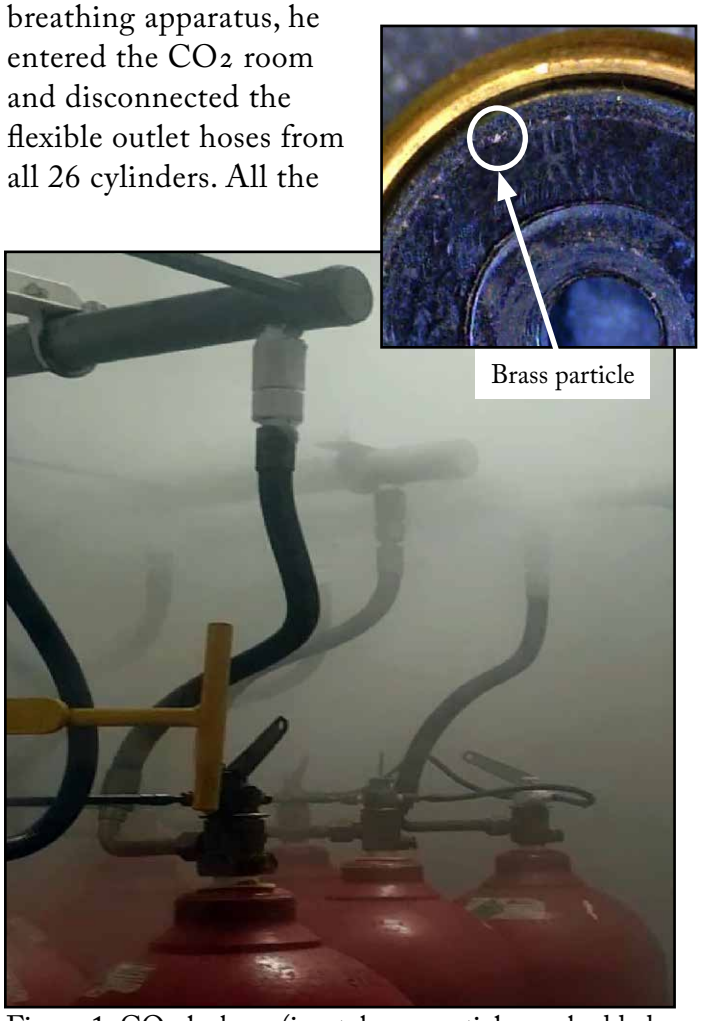


Figure 1: CO_2 leakage (inset: brass particles embedded in cylinder valve seat causing it to leak)

The investigation of this incident established the following:

- The main manifold had been pressurised, most probably as a result of a leaking discharge valve on one of the cylinders.
- When the pressure in the main manifold rose above 4.5 bar the release mechanism was activated, causing the entire system (except for the two master cylinders) to discharge (Figure 2 – schematic reproduced).
- The main manifold pressure alarm, which should have alerted the crew at a very early stage to the leakage into the manifold, was damaged and did not function as intended.
- The manifold was not fitted with any vent valves that would release any minor gas leakage into the manifold before it led to a build-up of pressure, although these were available from the cylinder valve manufacturer.
- It was common practice for service suppliers to overhaul the cylinder valves, despite the manufacturer's instructions requiring all cylinder valves to be returned to them for refurbishment.
- During servicing the service supplier would typically apply service air from the ship's compressed air reservoirs to the manifold instead of using dry air or nitrogen as recommended.

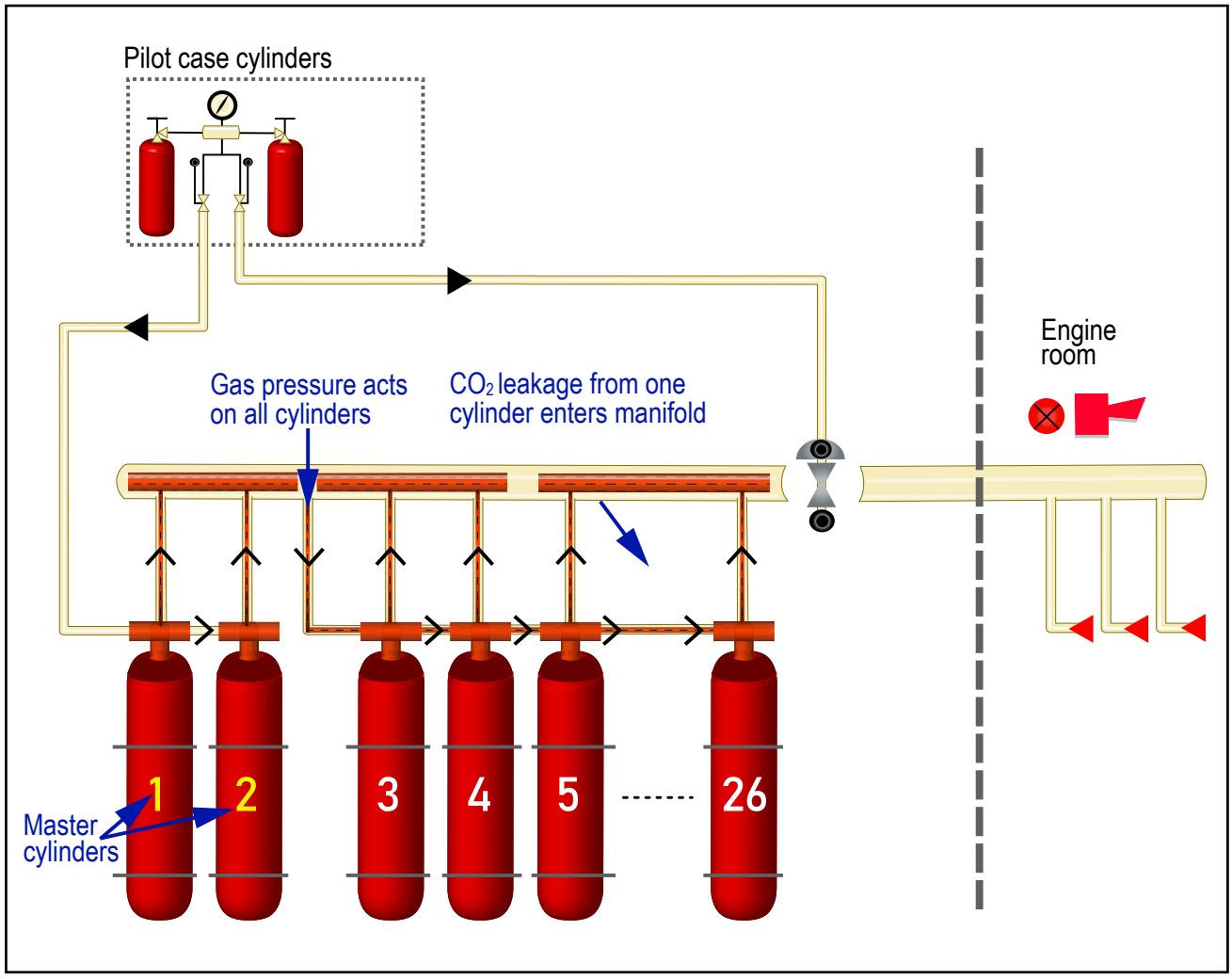


Figure 2: CO_2 system showing how leakage of one cylinder caused the entire system to be discharged

The Lessons

1. CO_2 is a colourless and odourless gas that can prove fatal within 1 minute if the concentration in a space exceeds 17%. Small mistakes can lead to major accidents.
2. It is crucial that CO_2 systems are always maintained correctly and in accordance with the manufacturer's instructions.
3. Ensure that your service suppliers are competent and fully understand the specific design and operating requirements of the fixed fire extinguishing installation on your vessel.
4. Make sure that all protection systems fitted to your installation, such as pressure switches and alarms, are understood, maintained and tested regularly.

Another Big Ship in a Tight Space

Narrative

The passengers on board a 165m cruise ship were looking forward to visiting a small fishing town located a short way up a narrow river. The fine weather was ideal for exploring the town's quaint shops and winding streets.

The harbour authority and the cruise company had planned the port entry and the ship's anchorage well in advance, taking into account the ship's draught, length, manoeuvring characteristics and the expected tidal conditions. However, ships over 150m visited the port infrequently and the harbour pilot, who was also the harbourmaster, had little experience handling large ships in the river.

After joining the ship in the river's estuary, the pilot discussed the entry with the master. The exchange included topics such as the meteorological conditions and the expected effects of the tidal stream and river current. The ship's speed was then increased to 6kts and the pilot took the con.

Initially all went well, with the ship negotiating the first planned turn without difficulty. During the next turn, which was to starboard, the effects of the tidal stream were not as expected and the ship turned wider than intended. It started to head towards shallows on the river's south bank.

In response, the pilot increased the rudder angle, which resulted in the cruise ship's stern swinging rapidly to port. Although the pilot then requested the bow thruster, he was quickly advised by the captain that the ship was going too fast for the thruster to be effective. The pilot continued to try to regain control, but the cruise ship's stern hit a yacht moored in the navigable channel. The pilot used astern power, but this did not prevent the cruise ship's stern from hitting a further two moored yachts (see figure). At this point, the captain realized the pilot was in difficulty, and took the con. He then slowed the ship and used the bow thruster to manoeuvre clear of the moorings before continuing to the intended anchorage.

Damage to the yachts was superficial. The position of the yacht's moorings, which reduced the width of the navigable channel by 30%, had not been shared with the cruise ship's manager during the initial planning of the visit, or with the master during the master/pilot exchange.

Figure: Cruise ship colliding with moored yachts (circled)

The Lessons

1. A port entry, especially one involving a large ship, is a complex operation that requires detailed planning and communication. Unforeseen or unplanned changes can take everyone by surprise, and potentially have catastrophic consequences. Time spent planning is never wasted, as the old saying goes "fail to plan, plan to fail"!

2. Developing a 'shared mental model' between a pilot and a ship's bridge team helps to ensure that all those involved in a ship's entry or departure are aware of the intended plan. As a result, unintended and/or unavoidable deviations from the plan can be quickly detected, and timely interventions and challenges made where appropriate.

3. Pilots are usually experienced seafarers used to handling ships of all shapes and sizes. However, they are not born this way, which inevitably means that at some point a pilot will be on a ship with unfamiliar manoeuvring and handling characteristics. As many pilots are strangers, politely enquiring about their experience would seem a logical precaution to take, particularly when entering unfamiliar, confined and potentially congested waters.

When the Forecast is Spot On

Narrative

A ro-ro passenger ferry was berthed starboard side alongside; severe weather with storm force conditions was forecast for overnight. The stern door had been closed and additional mooring lines had been rigged in anticipation of the storm.

In the early hours of the morning the wind increased as forecast and a gust of 56kts was recorded on board; at the same time the stern lines parted in quick succession due to the extreme force of the wind (Figure 1). The ferry's stern started to swing away from the

Figure 1: CCTV imagery of the ferry's stern lines parting during the storm

berth and the movement was exacerbated by the tidal stream until the port side made heavy contact with the adjacent quay, causing some damage (Figure 2). By this time only one mooring line remained intact forward.

The officer on watch on the bridge alerted the crew by UHF radio and made a general PA announcement. The duty engineer went to the engine room and started the engines and thrusters. The harbour authority was also notified and a tug was soon on the scene.

With the tug in attendance and the engines and thrusters in bridge control, the ferry was moored port side alongside and the tug remained pushing until the storm had passed.

Figure 2: Detail of hull damage to the ferry's port side after impact with the adjacent quay wall

The Lessons

1. **Always prepare for the worst; the weather forecast was accurate and the strong winds coincided with high tide, which exposed most of the ferry's superstructure to the wind. It was prudent to rig extra mooring lines in anticipation of the weather. However, additional precautions could have been taken, such as keeping propulsion, steering and thrusters at immediate notice and having a tug standing by.**

2. **Is it safe to remain in harbour? If severe weather is forecast, always consider all the options available. This is particularly important for high-sided vessels or those on exposed berths. The master, in consultation with the harbourmaster, should decide if it is better to remain alongside, move to a more sheltered berth or consider getting underway. Each vessel will have its own characteristics, which the master should consider.**

3. **Once one mooring line parts, the load on other lines inevitably and rapidly increases, increasing the likelihood of further breaks - as happened in this case. Therefore, careful consideration should be given before sending crew on deck in such conditions until engines and thrusters or a tug is available and the load on the mooring lines can be eased.**

A Fall From Grace

Narrative

With orders to proceed to a port with an extremely cold climate, the master of a freight ro-ro vessel was more than a little concerned. He was aware that a sister vessel visiting the port had experienced problems with frozen water pipes in the port side corridor, referred to by the crew as 'the wind tunnel'. The corridor was exposed to the elements at its forward end, and the relative wind caused by the vessel's movement created a strong local wind effect.

The master and chief engineer discussed the issue and decided that a temporary curtain arrangement should be rigged in the corridor to protect the pipework. The master then instructed the bosun to create a curtain, which could be hung at an opening in one of the frames in the port side corridor to reduce the wind effect. This was to be in position by the time they reached the colder weather in 3 weeks' time. The bosun immediately fashioned the curtain and instructed the duty AB and the day-work AB to help him rig it. The curtain needed to be fitted at deckhead height, a distance of 3.5m. The bosun had already placed a ladder in position; at 5.4m length, it had a pitch angle of approximately 38º (Figure 1).

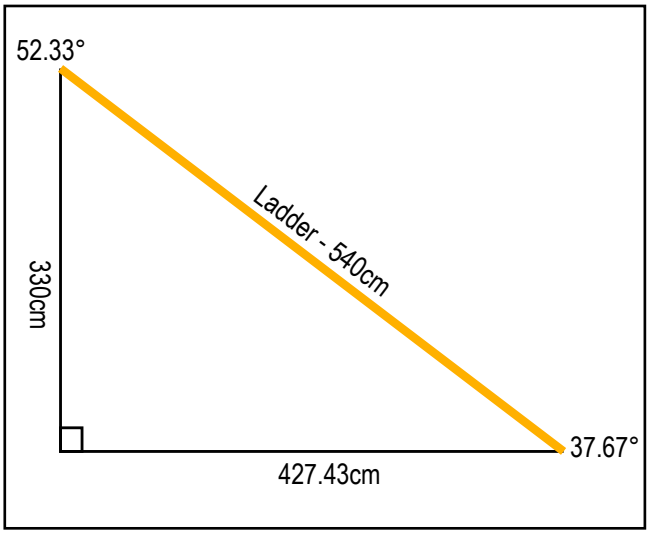


Figure 1: Diagram showing the height of the ladder and the pitch angle

With the duty AB footing the ladder, the bosun climbed to the top of it and asked the day-work AB to pass him the dowel that he had already cut to size. However, the dowel was too short.

After lunch, the afternoon duty AB made up the team with the bosun and day-work AB. The duty AB saw the ladder arrangement and thought it was a little 'dodgy' but, being new to the vessel, he decided not to say anything to the bosun. Instead, he tied a small gauge rope around the ladder, securing it to the rail on one side approximately a third along its length (Figure 2). With the duty AB footing the ladder, the bosun once again climbed the ladder and asked the day-work AB to pass him another dowel. He then measured the length required at the deck height, marking the dowel with a pen. The bosun then asked the day-work AB to fetch a saw.

The duty AB was growing uneasy with the ladder arrangement as he struggled to maintain a decent footing. He asked the bosun to come down, but the bosun reassured him that all was well. A short time later the ladder slipped without warning and, as it cleared the bulkhead, the ladder twisted, throwing the bosun to the deck. The bosun landed heavily onto the opening's raised coaming.

Following first-aid administered on board, the bosun was airlifted to hospital. He had suffered fractures to his shoulder and hip and had a small brain bleed. The bosun remained in hospital for 5 days before being discharged home.

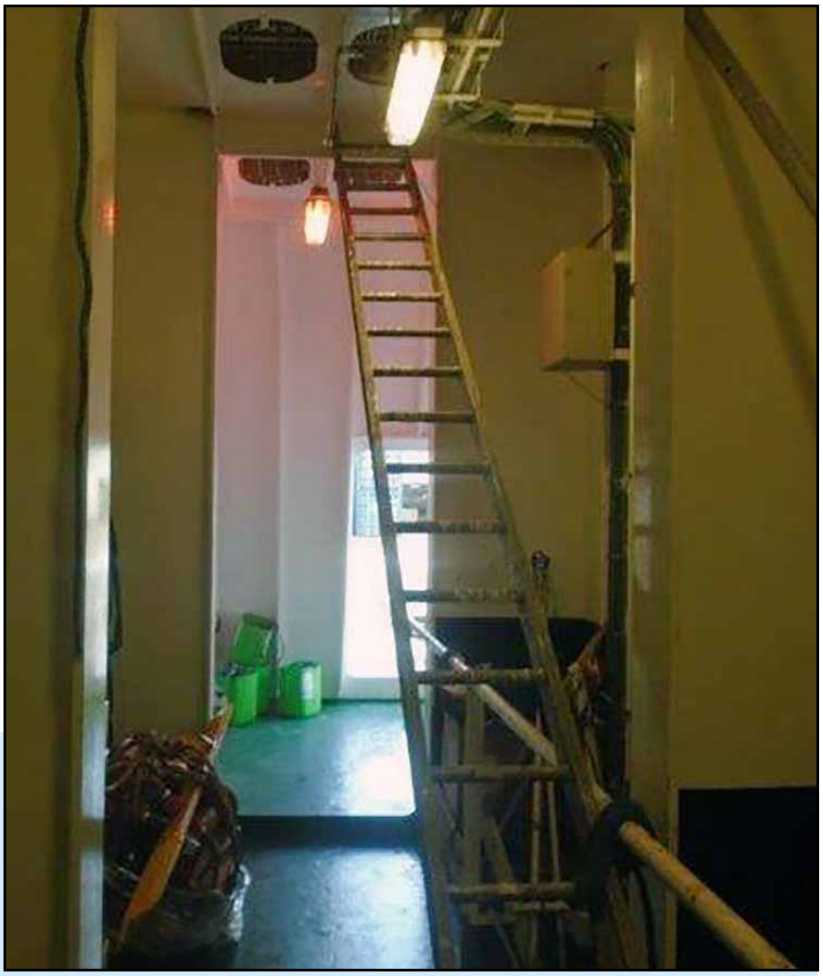


Figure 2: Reconstruction of the scene

The Lessons

1. Contrary to the onboard ship safety system, the bosun did not obtain a permit for working at height. Safe systems of work exist to ensure that all factors are taken into consideration before a task is started. A permit to work may extend the time required to complete a task, but the risk assessment element is vital to the safety of all concerned. In this case, had an assessment been completed, it is likely that another method of rigging the curtain would have been identified, eliminating the requirement to work at height altogether.

2. The ladder's pitch angle of approximately 38° was clearly not suitable. The Code of Safe Working Practices, section 17 provides the following advice:

   Portable ladders should be pitched at 75° from the horizontal, properly secured against slipping or shifting sideways and be so placed as to afford a clearance of at least 150 mm behind the rungs. Where practicable, the ladder should extend to at least 1 metre above any upper landing place unless there are other suitable handholds.

3. The deck rating did not voice his concern about the method being used to reach the work site because he was new to the vessel. Raising a question about a task can be tricky, especially when it requires challenging a senior crew member. However, if you were placing yourself, perhaps unwittingly, in danger, would you not want someone to stop you before you came crashing down to earth (or deck)?

4. Working at height should be avoided whenever possible but, if it is necessary, the correct equipment must be used and rigged correctly. Advice on how to use ladders safely can be found in both the MCA's Code of Safe Working Practices and the HSE's leaflet INDG402 – Safe use of ladders and stepladders.

Part 2 - Fishing Vessels

On joining the Fishermen's Mission as Chief Executive in late 2011, after some 36-plus years as a deck officer in the Royal Navy, I was concerned to learn of the relatively high rates of deaths and serious injuries in the commercial fishing industry.

During my naval career, the Royal Navy made huge strides in improving safety; for all aspects of operations at sea, from seamanship to aviation, proper risk assessment and management have become deeply embedded in culture. A key factor in this progress was a move away from 'lessons identified' to 'lessons learned'. In addition, spreading of good practice has been seen to be as important as driving out the poor.

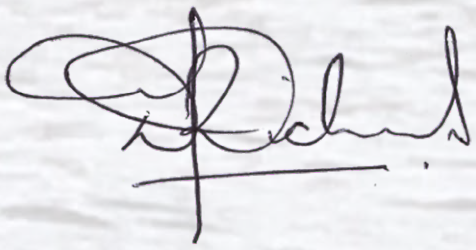
The Marine Accident Investigation Branch (MAIB) reports fulfil a vital element in identifying lessons, good and bad, from accidents and incidents in fishing. But, a bit like owning a personal flotation device and not wearing it, improvements to safety will only come if the MAIB's recommendations and advice result in changes to practice, equipment etc. that reduce the risk of similar incidents in the future.

Too often the MAIB's conclusions are that incidents could have been avoided and yet the same or similar tragedies continue to appear on the pages of these digests. While improvements to safety management are in train along with the safety focus of the Work in Fishing Convention legislation, the need to learn from mistakes and experience will endure.

As a member of the Maritime and Coastguard Agency's Fishing Industry Safety Group, the Fishermen's Mission has sought to contribute to the improvement of safety. From sponsorship and distribution of Personal Flotation Devices, to advocating safe practice and promoting health and wellbeing as integral parts of safety, Fishermen's Mission staff are all keen to do their bit.

Much of the Fishermen's Mission motivation on safety flows from our support to families, friends and colleagues in the often-heart-breaking aftermath of deaths or life-changing injuries following accidents at sea. 'Your family is relying on you to work safe.' may seem a statement of the obvious, but all of us involved need to make this a keystone of how the fishing industry does business.

As many have said before me, a consistent focus on prevention is the answer to minimising the risk of tragedies at sea. Only by putting safety first can we make this work in practice.



COMMODORE DICKENS

Commodore Dickens joined the Royal Navy in 1975. His initial career was in submarines, both diesel and nuclear.

On leaving submarines he qualified as an anti-submarine expert in ships. Following service in HM ships Arethusa and Hermione and a tour in Fleet operations HQ, he took command of the frigate HMS BOXER in early 1993. His time in command included operations in the Adriatic supporting allied efforts in Bosnia while after a tour ashore in Intelligence, he returned to sea as 2nd in Command of the aircraft carrier HMS ILLUSTRIOUS, participating in air operations over Iraq.

As a Captain he later served with the Portsmouth Flotilla as the first Captain Surface Ships, for which he was made OBE in 2002. He then toured as Captain HMS NEPTUNE, the nuclear submarine base at Faslane in September 2006. Promoted to Commodore in December 2007 in the role of Director Naval Personnel, his final job in the RN was Naval Assistant to the Naval Secretary in July 2009.

He has been Chief Executive of The Fishermen's Mission since December 2011.

Deathly Entanglement

Narrative

The crew of a creel fishing vessel were engaged in shooting creels 16 miles offshore in rough seas. Although the vessel was equipped with a self-shooting system, the sea conditions were too rough to allow it to be used, so three deckhands were engaged in the shooting of creels (see figure) by hand. The crew were almost halfway through the fleet when the deckhand toggling the creels onto the back rope became entangled in the rope. Another crewman tried to hold onto him, but before a knife could be found to release him he was dragged overboard, followed by the last creel that he had toggled on.

The crew quickly led the back rope on to the hauler to winch the deckhand back on board. However, the crew's actions were uncoordinated and it took 10 minutes for the deckhand to be recovered on board. On recovery, the crewman was unresponsive and not breathing, so the crew immediately began CPR.

Meanwhile, the skipper, who was alone on the bridge, tried to stop the vessel as soon as he saw from the vessel's CCTV that the deckhand had become entangled in the gear. Unfortunately, he was unable to take all the way off the vessel before the deckhand was dragged overboard. Seeing that assistance was needed, he immediately pressed the DSC alert button and tried to contact the coastguard on VHF radio. However, due to the distance between the vessel and shore, he was unable to hear the coastguard's responses. In desperation, he called the vessel's owners, who then notified the coastguard.

Although able to reach the fishing vessel, high wind and the rough sea state made it impossible for the coastguard rescue helicopter to transfer a medic on board or to lift the casualty from the vessel. Eventually, the helicopter left the scene, and after nearly 90 minutes the crew stopped performing CPR. The fishing vessel then began a long voyage back to port.

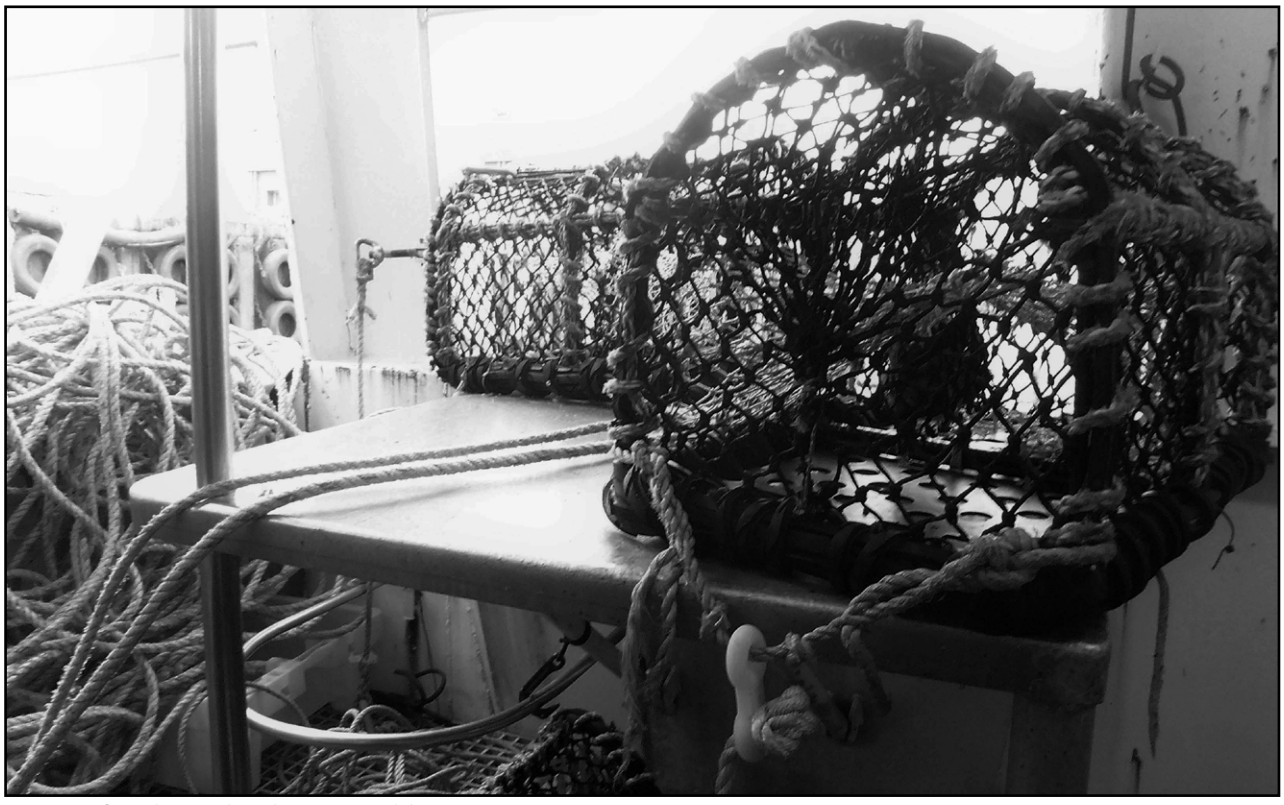


Figure: Creels on the shooting table

The Lessons

1. It is all too easy to become complacent when engaged in a repetitive task. The importance of drills and safety talks should never be underestimated as they can lead not only to best practices being shared and implemented, but also to continuous assessment of actual working practices on board.

2. When the deckhand became entangled in the gear there was no knife readily available either on the working deck or carried by the crew on deck. There had been previous instances of crew becoming entangled in the gear before this accident, but as crew had always been freed before they were carried over the side, a false sense of security had developed. Had a knife been readily available it is possible that this tragic accident could have been averted.

3. The MCA's Fisherman's Safety Guide, and Seafish's Potter's Safety Guide both contain practical ways of making fishing operations safer. A physical separation of crew and moving gear is undoubtedly the safest way of operating. The UK's ratification of the ILO 188 Convention for working practices and conditions for fishermen reinforces the requirement for all operations on board to be properly risk assessed, and for corresponding control measures to be put in place.

4. None of the deckhands was wearing a lifejacket. Although a lifejacket would not have prevented the crewman going overboard, had he been able to free himself from the back rope while in the water, a lifejacket would have provided much needed assistance for him to reach and remain on the surface.

All Caught Up

Narrative

An 18m gill-netter was moving to new fishing grounds in poor weather following a poor start to its trip. Two deckhands were in the aft compartment using a 'net flaking' machine to take the twists out of the net, clear the weed and arrange the net into a bin ready for shooting. The aft compartment had been designed to allow the nets to be flaked into the bins by one person using the machine with a wired remote control. However, on this occasion an off-duty deckhand had gone to assist.

As the boat rolled in the swell, one of the deckhands reached to the deckhead above with his left hand to steady himself. In doing so, he inadvertently caught hold of the flaking machine's rack and pinion arrangement (Figure 1) just as the other deckhand operated the machine's remote control. The resulting movement of the pinion trapped the deckhand's little finger, causing him to shout out in pain and tell the other deckhand to move the machine back. When the machine was moved, the trapped deckhand again shouted out in pain, which led the other deckhand to think that he had moved the machine the wrong way. He panicked and moved the machine in the opposite direction, causing its pinion to run across the deckhand's trapped fingers.

The other crew members heard the shouting and rushed to help. Once freed from the rack and pinion the injured fisherman was moved into the accommodation, where his glove was

Figure 1: Rack and pinion

cut off and the skipper was able to see that four fingers on the crewman's left hand were partially severed.

A helicopter transferred the injured deckhand to hospital where an X-ray (Figure 2) revealed the extent of his injuries. Fortunately, largely due to the first-aid treatment that had been given to the casualty by his crew mates on board, the hospital staff were able to save three of his partially severed fingers.

Figure 2: X-ray showing extent of injuries

The Lessons

1. Unguarded machinery is an ever-present risk that can - and does - catch people unawares, and often causes life-changing injuries, or worse. If machinery can have a guard fitted, why wait for an accident to happen before doing something about it?

2. During a stressful or traumatic event it is very difficult to keep your head, and panic is a natural reaction. Although such situations generally demand quick thinking, a second or two to take stock and find out exactly what has happened before taking action can prevent a drama from becoming a crisis.

3. It is always hoped that first-aid training will never be put to the test, but in this case its benefits to the injured man were immeasurable. When an injury occurs at sea outside help is seldom close at hand, so it is reassuring to know that those around you know what to do.

Swift Action Prevents Spread of Fire

Narrative

A fishing vessel arrived in port and unloaded its catch before being refuelled from a road tanker on the quay. The ship's main engine and a generator were running to provide power for operations being carried out on deck.

One of the crew suddenly became aware that smoke was emitting from the engine room, so raised the alarm. Refuelling was stopped and the crew mustered on the quay to establish that everyone was accounted for. The engine room vent flaps were all closed down, the fuel shuts-offs were operated and the engine room was flooded with CO_2 from the vessel's fixed fire-fighting system.

When the alarm was raised the port authority called the fire service, and they arrived on scene quickly. They assessed the situation, and roughly 20 minutes after the CO_2 had been released they opened the engine room door and declared the fire extinguished.

The fire had not burned for long and damage in the engine room was limited to wiring and smoke damage. The precise cause of the fire was not determined, but the source was likely to be an electrical control box on the side of the main engine. The fishing vessel was towed to a shipyard for repairs before returning to service.

The Lessons

1. **The benefits of conducting regular fire drills are clearly evident from this accident. Once the alarm was raised the crew were able to react quickly and minimise the spread of the fire. Establishing that all crew were accounted for enabled the fixed fire-fighting system to be released swiftly after closing down the engine room.**

2. **The sooner the fire-fighting system is activated, the greater the chance of success, and less damage may result.**

3. **Coupled with drills is the need to ensure safety equipment is maintained and can be operated effectively. Ensure vent flaps are free to move, can close effectively and that your fixed fire-fighting system is maintained using authorised contractors. This safety equipment may not help you fish, but it may save your life one day.**

4. **Although the fire was not fuel-related, during fuelling operations it is a good idea to minimise running machinery, and ideally a crew member should be posted in or near the engine room. This will ensure that someone is available to react swiftly to any emergency given the higher risk of fire spread during fuelling. Equally, having a crew member in the wheelhouse will ensure any alarm that sounds can be acted upon quickly.**

A Winning Rollover

Narrative

A small two-handed potter headed out to sea with a plan to tend strings of whelk pots by lifting them, recovering the catch, rebaiting and laying them back on the seabed. Conditions were good, although there was a choppy sea. Once at the fishing grounds, the skipper was operating the hauler while the crewman handled the whelk pots.

The first three pots had been recovered and rebaited by the crewman who was standing at the gunwale with the fourth pot in his hand (Figure 1) when, as the boat rolled, he lost balance, stumbled and fell overboard. The crewman was not wearing a lifejacket when he fell in.

The skipper threw a line that the crewman was able to grab and hold on to; however, several attempts to haul the crewman back on board through the stern shooting door (Figure 2)

Figure 1: Position of crewman at time of accident

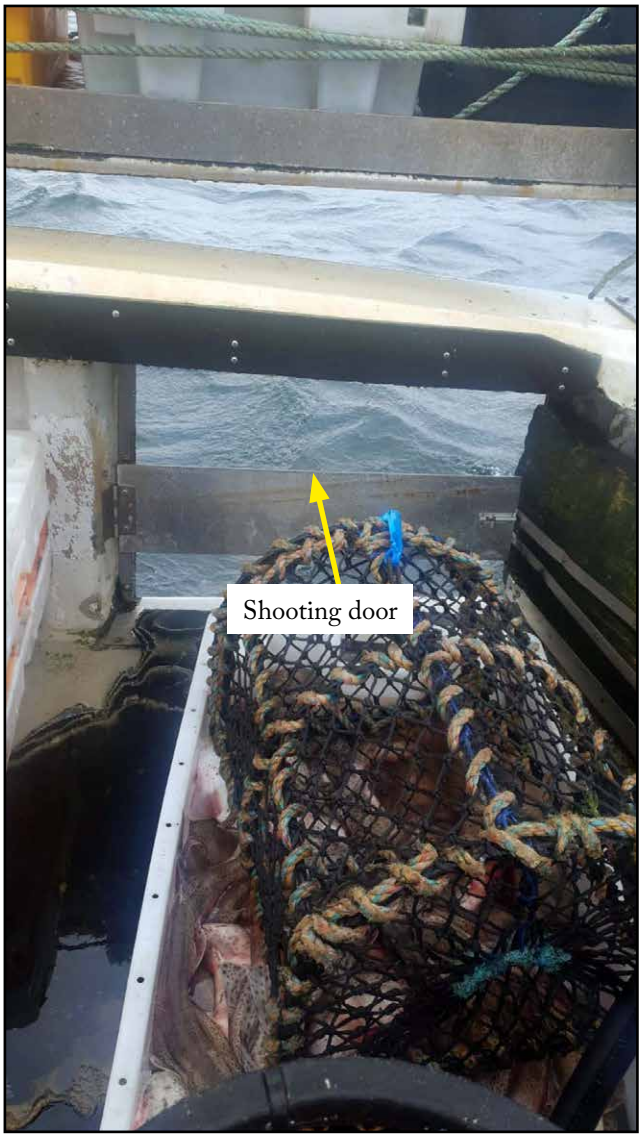


Figure 2: Stern shooting door

were unsuccessful. Having tied the line to a cleat and aware that the crewman was still able to hold on, the skipper went to the wheelhouse to raise the alarm.

When the skipper returned to the shooting door, the vessel's heading had changed and its new angle in relation to the waves meant that it became possible for the crewman to be hauled back on board. The skipper then headed to a nearby jetty, where the crewman was attended by paramedics before being transported to hospital. After medical checks, the crewman was discharged from hospital having suffered no injuries.

The Lessons

1. Even with a shooting door close to the waterline and a conscious casualty holding onto a line, recovering a man overboard can be exhausting and difficult. In this case the skipper persevered and was eventually successful, aided by the sea conditions and the crewman's help. Being prepared for any emergency is an important step to reducing risk, so there is real benefit in realistic crew training. Dedicated manoverboard recovery equipment can also play a key role in recovering a casualty quickly.

2. Developing a safe system of work for fishing operations is essential. The underpinning risk assessment should consider all measures necessary to prevent falling overboard. However, the hazard can sometimes be unavoidable, especially when handling pots and working near the gunwale. In such circumstances, measures such as wearing a lifejacket are essential to maximise survival time in the event of crew entering the water unexpectedly.

3. Raising the alarm is crucial to triggering responses to an emergency. In this case, the skipper was able to raise an alert and initiate a rescue plan; in other circumstances, particularly single-handed operations, this may not be possible. Carrying a personal locator beacon provides anyone falling overboard with the ability to raise the alarm themselves, which might be key to ensuring help is rapidly available.

Doing it Right When it Goes Wrong

Narrative

A small trawler was on passage to a port to undergo a refit. The skipper, who was alone on board, had worked on fishing vessels for 8 years and had completed all his mandatory safety training courses. However, this was his first time in the role as skipper.

Three hours into the voyage, the skipper noticed that the air in the wheelhouse was getting warm. Initially believing it to be the heat from the sun, he left the wheelhouse to use the toilet. Outside, he saw smoke from the funnel vent by the wheelhouse door (Figure 1).

Figure 1: Funnel vent

The skipper touched the latch on the engine room hatch cover and found it much hotter than normal. He opened the hatch briefly and saw flames in the engine room. He knew immediately that there was nothing that he alone could do to fight the fire using the fire-fighting equipment on board.

The vessel had one dry powder and two carbon dioxide extinguishers in the engine room, and two dry powder and two carbon dioxide extinguishers located in the wheelhouse. The other safety equipment on board included a liferaft on the wheelhouse roof, an EPIRB and a portable VHF radio.

The skipper re-entered the wheelhouse, quickly scribbled down the vessel's position from the chart plotter and took the vessel out of gear. He then climbed onto the wheelhouse roof, released the quick-release clip for the liferaft and threw the liferaft overboard, inflating it by pulling on the painter. He activated the EPIRB to transmit his location and, clutching his grab bag containing the EPIRB, VHF radio and his mobile phone, quickly jumped into the liferaft. Thirty seconds later the wheelhouse was engulfed in flames (Figure 2).

Once in the liferaft, the skipper used the VHF radio to make a "Mayday" call. After receiving no immediate reply, he used his mobile phone to call 999 and asked for the coastguard. Having linked the EPIRB alert to the vessel, the RNLI all-weather and inshore lifeboats quickly arrived on scene and the skipper was recovered ashore, shocked but unhurt. The fire eventually burned out and the fishing vessel was towed back into port, where it was confirmed a total loss (Figure 3).


Figure 2: Wheelhouse engulfed in flames

The Lessons

1. The post-fire investigation identified the most probable cause as being a 24V DC to 230V AC pure sine wave inverter (Figure 4). This had been professionally fitted at a previous refit the year before to power a small, low wattage oven and a kettle.

2. Choosing the right inverter is critical: get it wrong and, at best, your 230V appliance will not work; at worst, it may suffer serious damage or catch fire. Modified sine wave models are cheaper, and for many applications will be suitable, but for certain equipment a pure sine wave unit will be necessary. In this case, even though an appropriate inverter was installed, it probably initiated the fire.

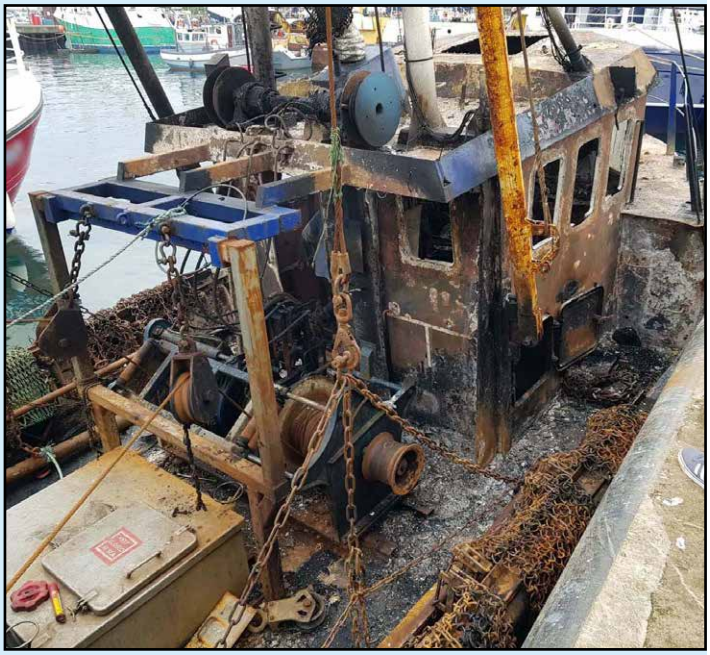


Figure 3: The burnt out vessel

3. This was the skipper's first time in this role. It is therefore commendable that in a rapidly developing emergency situation he made all the right decisions.

   - He identified that the scale of the fire was too great to tackle alone with the safety equipment that was available on board.

   - He was able to put into practice the emergency training that he refreshed every month, quickly disembarking his vessel dry-shod and calling the coastguard, as well as giving his exact position.

   - The EPIRB activation had also alerted the coastguard.

4. The vessel's owner also did his part by ensuring that all the safety equipment was in-date and was checked regularly to ensure that, when the emergency happened, it did what it was designed to do. Once over the shock of the speed at which the fire developed, the skipper was able to return to fishing. The boat was replaceable, his own life was not.

Figure 4: The wave inverter

Lifejackets Save Lives

Narrative

It was dark and the sea was rough when the skipper of a beam trawler decided to return to port. In preparation for recovering the fishing gear he sent one of the crew on deck to secure the cod ends (Figure 1). While on deck, the crewman was washed overboard. The skipper saw the accident from the wheelhouse, raised the alarm on board, called the coastguard on VHF radio and released the lifebuoy and float.

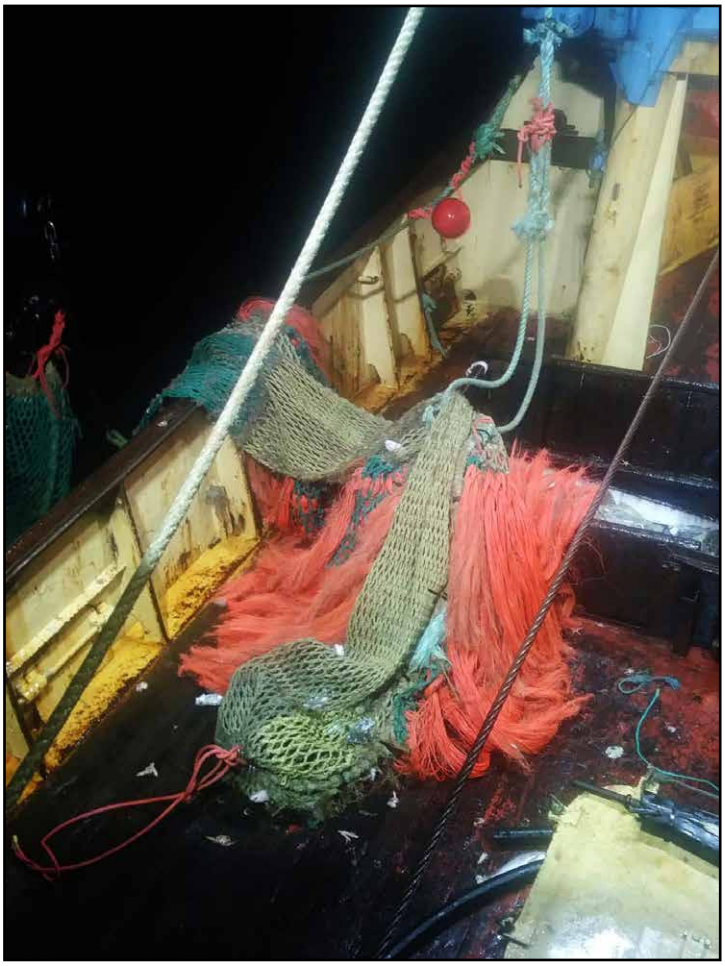


Figure 1: Crewman's location at the time of accident

On entering the water, the crewman's lifejacket automatically inflated and he kicked off his boots. However, as the lifejacket he was wearing was not fitted with a light or personal locator beacon, the fishing vessel crew could not locate him. On coastguard advice the skipper implemented an expanding square search pattern and, on hearing shouts from the MOB, found him approximately 30 minutes later. The wind at that time was westerly force 9 accompanied by a 3m sea; the sea temperature was 9°C.

The skipper manoeuvred the fishing vessel so that the stern was into wind, with the MOB approximately 10m from the vessel's bow. He was concerned that if they got too close the casualty might become snagged or injured by the vessel's fishing gear, which was still deployed, and the skipper was unable to employ the vessel's planned method of recovery. The MOB, who, without a lifejacket crotch strap was desperately hanging on to the jacket's inflated bladder to keep his head above water, saw the vessel's lifebuoy blow past him and was unable to grab it. As a result, the MOB, lifebuoy, and marker float that was supposed to mark his position, ended up over 50m apart.

At 0545, over an hour after the crewman was washed overboard, the coastguard search and rescue helicopter arrived at the scene. They located the casualty by the reflective tape on his lifejacket and winched him from the water. He was taken to hospital and discharged later that day, uninjured.

The Lessons

1. Wearing an inflatable lifejacket saved this crewman's life and kept him afloat until he was rescued by the helicopter crew. Had he not been wearing one, he would almost certainly have drowned in the rough sea conditions.

2. The fishing vessel owner should have ensured that the inflatable lifejackets, issued to the crew for working on deck, were fit for purpose. In this instance the inflatable lifejacket had not been maintained in accordance with the manufacturer's instructions and was not fitted with a light, personal locator beacon, spray hood or crotch strap (Figure 2). This meant that in rough weather and at night it was almost impossible to see the crewman in the water. Furthermore, without a crotch strap the wearer was at risk of not being able to keep his head out of the water, and potentially slipping out of the lifejacket harness.

3. Every fishing vessel must have the means to recover an unconscious or injured MOB. This vessel had documented and practised MOB recovery methods that worked well in daylight without fishing gear deployed. However, on the night of the incident, the skipper on board this vessel was unable to use it to recover the MOB and, as a result, he was immersed for over an hour in the 9°C sea.

Figure 2: The lifejacket post-rescue

4. Studies suggest that in such a temperature, the crewman would have been unable to swim or climb a ladder after 30 minutes' immersion and, after an hour, could have died. The helicopter paramedic assessed him to be hypothermic, but he made a full recovery. Without a documented, well-understood and well-practised and realistic method of MOB recovery, the vessel's crew were powerless to save their colleague. He survived only because of the successful rescue by the helicopter crew.

One in the Eye

Narrative

The crew of a beam trawler were attending to their fishing gear before casting away for the next haul. A crewman was repairing a dredge bag and was using a grinder to remove a shackle. As he cut through the shackle a section of it flew towards him and struck him in the eye. Although not in pain or suffering dizziness, the crewman was unable to see using his injured eye.

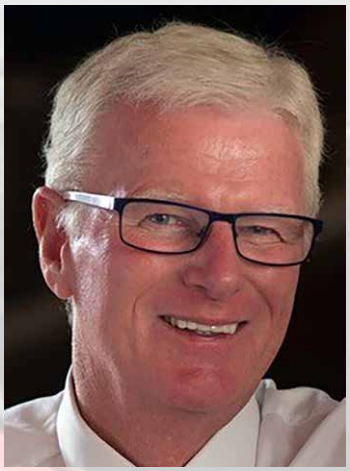
The skipper called the coastguard and a helicopter was used to airlift the casualty to hospital, where he received treatment and went on to make a full recovery.

The Lessons

1. **Although wearing overalls, boots and a hard hat the injured crewman was not wearing any eye protection. The purpose of safety glasses or a safety visor is to protect your eyes from precisely this type of accident. Ensure you employ eye protection if grinding or cutting, and if you see a fellow crewman not using it, remind them. Your eyesight is precious.**

2. **Grinding operations are commonplace in the fishing industry, but all too often crew become desensitised to the risks of using this potentially dangerous equipment. Wherever possible ensure the item being worked on is clamped and that full PPE is worn. As a skipper or manager of a fishing vessel it may be beneficial to conduct refresher training so that crew are reminded how to use power tools safely.**

Part 3 - Recreational Craft



Would you be surprised if I told you that, according to some estimates, you are valued at over £1.6million? Or, to be more exact, you are if you die in a particular type of accident. Governments all over the world calculate a 'Cost to Society' of a citizen prematurely losing their life be it due to an accident, crime or ill-health. For example, the cost to Britain of a worker dying in an accident at work is calculated to be just over that £1.6M mark. For somebody dying in a road accident, the figure is a shade under £1.9M.

To come to these numbers, account is made of the financial costs and the human costs borne by the individual, their family, the government, insurer and, where appropriate, the employer or manufacturer. Such costs take into consideration loss of income to the person's family, loss of tax revenue to the government, cost of providing fire, police, ambulance, coastguard and hospital services and more besides to the casualty.

Such estimates help to justify the financing of providing prevention interventions to the 'powers that be' that hold the 'purse-strings'.

The number of fatalities for some activities can be surprising. They don't always reflect our perceived risk of that activity. Cycling, considered by many to be too hazardous on today's roads, accounted for only 101 deaths out of the 1793 road traffic accident fatalities in 2017. Dwelling fires accounted for 243 deaths in 2017/18. In both examples, fatalities have been significantly reduced over the years by education and legislation.

So how's it done? To make people safer, they have to realise there is a risk, accept the ways to mitigate that risk and then change their behaviour to reduce the risk.

But changing people's attitudes and behaviours takes time. Most organisations use the Nudge Theory. Slowly but surely, they change society's attitudes and behaviours towards safety - gently nurturing and nudging us into safer behaviours.

The wearing of cycling helmets is an obvious example. When I was young, even the thought of wearing a helmet to ride a bike was seen as being absurd. Now, it's socially unacceptable to ride a bike without one.

Despite what 'nanny-state' protaganists say, there's nothing wrong in being nudged. It's better than the 'shove' of legislation and, in the long run, often far more effective.

To see what the 'nudges' are for water-based activities, we have to look to the National Water Safety Forum and their National Drowning Prevention Strategy. Set up in the early Noughties, the NWSF is a voluntary association of government and non-government organisations that have interests and responsibilities for water safety either directly or indirectly.

The strategy's aim is to halve the number of accidental drowning fatalities over the period from 2016 to 2026 by co-ordinating the prevention activities of the group's members. But how many people drown?

Curiously, it's only since 2009 that water-related deaths have been collated. The NWSF's Water Incident Database, known as WAID, is published annually, and gives us an insight into the effectiveness of both the NWSF's over-arching National Drowning Prevention strategy and each individual organisation's targeted interventions to reduce deaths. So while some will be looking at reducing fatalities at sea and around our coasts, others will be more concerned with rivers and lakes. The data covers myriad activities from sailing and motor boating to waterside activities and even drowning in a bath or Jacuzzi. It also covers lives lost due to self-harm.

In 2009, their first figures recorded 405 water-related fatalities plus a further 155 thought to be suicide. In 2016, the year the NWSF is using as its bench mark, the number of lives lost due to an accident were recorded as 265, while lives lost due to suicide rose to 215. In 2018, the accident figure continued its downward trend to 243, but again tempered by an increase in suicide to 232.

At first sight, it may appear as if the organisation is simply getting better at identifying the causes of deaths but when you drill into the figures, it's obvious that the 'nudges' from the MCA, RNLI, RYA and RLSS and the like are having a marked effect. For example accidental deaths while angling have decreased from 27 in 2009 to 11 in 2018. Sailing and motorboating fatalities have also reduced significantly over the last ten years.

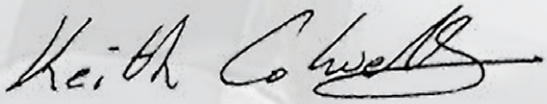
While all this new activity has to be commended, the NWSF should really be considered to be the new boys on the nudging block. The MAIB has been around for a lot longer - set up after the tragedy of the Herald of Free Enterprise in 1987 - they've been way ahead of the rest of the pack for years in influencing safe behaviour.

Generalised advertising campaigns have their place but to my mind what really hits home are detailed examples of what actually happened in an accident.

As an instructor being able to use real-life examples as to why we are teaching our students a particular procedure and why they should have essential onboard rules, is a valuable tool in focusing their minds. I regularly refer to the loss of life and life-changing injuries from the *Milly* in 2005 in illustrating the need for wearing a kill cord and the importance of understanding how tight turns in a fast craft can lead to a deep-Vee hull hooking and throwing its crew into the sea.

It's an example that brings home the real cost of an accident at sea. Despite government figures, the cost can't truly be measured as a monetary value. It's much higher than that. I'm sure that the families and friends of those that lost their lives in the examples on the following pages will attest to that.

When you finish reading the reports in the Digest, don't close the page and move on. Take some time and ask yourself what can you do to prevent a similar event happening to you or your crew. Is there something you need to change on your boat? Or the way you run your boat? Is there something new you need to include in your next crew briefing? Then the value of the work of the MAIB and the loss of these lives will be worth a lot more than the figures on any government's balance sheet.



KEITH COLWELL

Keith trained as a naval architect at Southampton and Sunderland Colleges in the late 1970s. Following a couple of years as a development engineer for a small workboat builder, he was offered the role of Technical Reporter on the magazine *Motor Boat and Yachting*, before moving on to become Technical Editor (Power) and then Deputy Editor of *Practical Boat Owner* (PBO) magazine and finally Development Editor of *Sailing Today*. After a 22-year career as a staff boating journalist testing boats and equipment, Keith made a career change and joined the Royal National Lifeboat Institution (RNLI) as a Sea Safety Manager.

During his 15 years with the RNLI, Keith trained and managed RNLI Sea Safety and Community Safety volunteers to give advice to yachtsmen, boat users and the general public on how to stay safe when on or by the water. He became a RYA sea survival, powerboat and marine vhf radio instructor/assessor in 2004, while working for the RNLI, and currently works as a freelance instructor for Powerboat Training UK.

He is the author of the internationally-published RYA Sea Survival Handbook and the RYA Boat Safety Handbook and continues to write for PBO magazine as their sea safety correspondent.

Are You Safely Clipped On?

Narrative

A yacht was 10 days into an ocean passage when it encountered a sudden increase in wind strength during the hours of darkness. The sea conditions deteriorated rapidly and the crew began reefing the main sail to reduce the yacht's sail area. The head sails also needed to be lowered, and once the main sail had been reefed one of the crew was sent below to get extra help from the off-watch crew.

On returning to the cockpit, before she had clipped on her tether to one of the yacht's jackstays the crew member started helping in the cockpit with preparations for lowering the headsails. At that moment a wave caused the yacht to heel to starboard and broke over the deck, throwing her off-balance. She fell to leeward and ended up lying on the deck next to the starboard guardrail. Another wave almost immediately washed her overboard, probably between the lower guardrail and the toe rail.

A shout of 'man overboard' was made and the crew immediately initiated their MOB procedure. The navigation station was manned, the MOB button pressed on the GPS, and a verbal "Mayday" was transmitted. The crewman nearest the dan buoy was unable to reach it due to his tether attachment point, so another of the crew unclipped himself and made his way swiftly aft. The dan buoy was fitted with an automatic identification system (AIS) beacon, which had to be activated before being deployed. The crewman twisted the base of the beacon one way and then the other and, believing it was activated, threw the dan buoy, which was attached to a horseshoe life-ring and buoyant light, overboard.

As a result of the wind strength and very rough sea conditions it was impossible to tack the yacht through the wind, and it took 30 minutes to lower the headsails. By this time an AIS target had appeared 2nm away on the yacht's GPS plotter, and the crew at the navigation station was regularly updating the skipper with a course to steer to make way back to the casualty.

A quarter of an hour later, the crew spotted lights in the water as the yacht neared the AIS position. The first was the buoyant light, so the skipper headed towards the other, which was the light on the casualty's lifejacket. It was apparent that the casualty was still conscious, although the sprayhood on her inflated lifejacket was not deployed over her head. Due to the rough seas it took several attempts until the casualty was successfully recovered on board, by which time she was not responsive. She was quickly carried below, where CPR was begun, but sadly she never regained consciousness.

The Lessons

1. It will never be known why the crew member, who was experienced with ocean sailing, did not clip on her tether. However, this accident is a stark reminder that in rough seas it is vital you remain secured to your yacht at all times when on deck and, ideally, that you secure yourself to the yacht before leaving the safety of the cabin. Being tethered is restrictive and hampers movement around the yacht, but this is no excuse for not clipping on. These difficulties can be addressed with careful consideration of the arrangement of jackstays and secure points and with good crew discipline. For example, ensuring a crew member can reach the dan buoy without unclipping their tether prevents the potential risk of another crew member being lost overboard.

2. Recovering the crew member from the water in the very rough sea conditions encountered at night was not an insignificant achievement, and was testament to the MOB drills the crew had conducted during their training. MOB recovery is a vital operation that a whole yacht crew must be familiar with so that in an emergency the MOB is recovered swiftly and safely.

3. Although the crew member believed he had activated the AIS beacon on the dan buoy, a signal was never received from it. Fortunately the MOB managed to activate her own AIS, secured to her lifejacket, which enabled the yacht to return to her position. Without this piece of safety equipment it is highly unlikely she would have ever been found. Make sure you fully consider the risks of where you may be sailing and ensure you have the appropriate safety equipment.

4. The lifejacket worn by the MOB operated correctly and kept her head clear of the water. However, it appeared that her lifejacket spray hood was not used, for reasons that cannot be determined. A spray hood is an important piece of sea survival equipment that prevents the ingestion of sea water and spray, given that a person floating in the water will naturally turn to face the weather. While perhaps claustrophobic to wear, it can potentially prevent you from drowning, so make sure you are familiar with its use if you have one fitted to your lifejacket.

Splash 'n' Dash

Narrative

A commercially operated RIB was taking passengers on a 2-hour sightseeing trip. The passengers had been given a standard safety briefing before embarkation and all were wearing personal flotation devices. Conditions were good, with no wind and flat, calm waters.

Once underway, the skipper advised the passengers that he was going to perform a series of 'S' turns to familiarize them with the motion of the RIB. As the RIB turned sharply to starboard, one of the passengers at the rear of the boat lost balance and fell overboard and into the water.

The passenger was quickly recovered, and the RIB immediately returned to the jetty. Following a change into dry clothing, the passenger re-boarded the RIB and the sightseeing trip resumed.

The RIB seating was configured with four rows of twin seats on the centerline running aft from the skipper's console, and a row of four seats athwartships at the aft end of the boat (Figures 1 and 2). The centerline seats had handholds for the occupants on the rear of the seats in front of them, but the aft seats had only a single handhold for each outboard passenger on the RIB's tubes.

The passenger who fell overboard was sitting in the outboard starboard aft seat. At the time of the incident he was not holding on and was looking through the viewfinder of a camera. It was also apparent that he had not heard the briefing relating to the 'S' turns over the noise of the engine.

Figure 1: Centreline seating

Figure 2: Athwartships seating

The Lessons

1. Although the skipper considered the manoeuvre to be neither too fast nor too steep, the movement of the boat was sufficient to unbalance an unprepared passenger. And while a warning was issued prior to the manoeuvre, this was inaudible to the passengers at the rear of the boat. When safety instructions are delivered, they must be clearly understood by all passengers and, in the event that noise is an issue, other forms of communication (i.e. hand signals) should be considered and agreed before departure.

2. Operators offering adventurous rides should review their operational risk assessments to confirm that seating arrangements are sufficient to ensure the safety of their customers throughout the ride. The Passenger Boat Association and Royal Yachting Association, with input from a number of other organisations, including the MCA and British Marine, have produced a safety guidance code aimed at small passenger craft high speed experience rides. The primary focus of the guidance is to promote passenger safety. In respect of structural considerations, it states the following: '*Handholds – all seats should have hand-holds located in front of the passenger allowing them to hold on with both hands, these should be roughly at chest height and shoulder width apart*'.

An Unexpected Swim

Narrative

During a leisure excursion at the end of a training course, a young sea scout was thrown into the water from a RIB as it dropped off a wave at high speed. The occupants of a second RIB quickly recovered the sea scout from the water, uninjured.

The youngster was one of a group of sea scouts who had spent a long weekend participating in various water-based training activities at an RYA training centre, one of which was a 2-day powerboat driving course. The aim of the end of course powerboat excursion was to search for dolphins and give the youngsters further opportunities to practise their boat-handling skills.

Two of the RYA training centre's 6m RIBs were used for the trip (Figure 1). Each RIB was driven by one of the training centre's experienced powerboat drivers and carried three sea scouts. The RIBs were powered by 150hp outboard engines and were designed to carry 10 persons: two on the driver's jockey seat and eight on the inflatable tubes. All the sea scouts were wearing wetsuits and buoyancy aids and were sitting on the rib's inflatable tubes for the trip.

When the lead RIB departed the quay, its driver proceeded at slow speed into open clear water; the second RIB followed closely astern. Before increasing speed, the helmsman of the lead RIB asked the sea scouts in his boat if they were sitting comfortably and if they were holding on firmly. After receiving a positive response from everyone, the driver accelerated on to the plane using three-quarter throttle. The engine was also trimmed up slightly to keep the bow up while heading downwind. The sea state was confused, and shortly after reaching planing speed the RIB dropped off a wave. The force of the impact on hitting the next wave caused one of the sea scouts to lose his grip and roll backwards over the side and into the water.

The lead RIB driver was alerted to the incident by the other two sea scouts, however the second RIB's driver saw what had happened and responded immediately. The shocked youngster was quickly recovered into the second RIB and his condition assessed. Although he appeared uninjured, as a precaution the powerboat instructors decided to end the trip and return to the training centre.

Figure 1: Training centre RIB with driver's jockey seat only

The Lessons

1. When passengers are seated on the tubes of a RIB, the hand-holds are often limited to rope lines secured along the outside of the tubes (as in this case). These lines, in common with other types of handle arrangements, rely on the passenger maintaining a good grip throughout the boat trip. Incidents of people being thrown overboard, and also suffering injuries as a result of sitting on RIB tubes, are regularly reported to the MAIB.

2. Passengers should not use rib inflatable tubes as seats during fast rides or long boat excursions. A passenger's ability to maintain a good grip, particularly in cold and choppy conditions, can vary significantly depending on their age, strength and fitness. The risk of falling overboard is significant.

3. A person sitting on an inflatable tube will naturally assume a twisted posture (Figure 2). This will significantly increase the likelihood of them suffering impact-related lower back spinal injuries as the RIB impacts with the water surface. The risk of such injuries is reduced if passengers sit on suitably designed seats, for example jockey seats with handholds, or even full suspension seats (this issue is discussed in detail in MAIB report 1/2011).

4. In circumstances where passengers have to be seated on tubes, care must be taken to ensure that appropriate lifejackets or buoyancy aids are fitted, and that the RIB driver or a crew member can observe them at all times. Consideration should also be given to the use of bump caps/helmets, and fitting propeller guards to outboard engines to minimise the risk of injury to anyone who has fallen overboard.

Figure 2: Passengers sitting on RIB tubes twisted to face forwards

The Tragic Cost of Entering a Flooding Vessel

Narrative

A narrowboat owner, his elderly mother, their dog and a friend set off on a canal journey. The owner's mother was carrying a significant amount of money in her purse. All were very experienced in the operation of narrowboats on canals, and the owner was a qualified Inland Waterways helmsman and instructor.

The 15m narrowboat and its occupants reached the lower section of a staircase lock system, which would raise the boat in stages to the next canal level. The lock was approximately 25m in length, was 2.35m wide and had mitre-type gates.

After entering the lock, the gates were closed behind the narrowboat (Figure 1). The friend operated the lock sluices at the upstream end of the lock, which released water into the lock so that the boat would rise 2m to the first stage. The owner remained at the helm at the stern of his boat while his mother remained inside.

Suddenly water began flooding into the boat at the stern. The owner quickly instructed his mother to get out via the forward access. Before leaving the boat she asked her son to collect her bag containing her purse, which was in the middle of the boat's accommodation.

The friend helped the owner's mother climb ashore, as well as the dog, but her son was nowhere to be seen. She and the friend called out for him. They could see that although flooded, the boat was not fully submerged, and that there was a clear air pocket inside the accommodation. The friend climbed down the lock ladder and on to the boat roof. He banged on the roof and shouted,

Figure 1: Narrowboat in lock

but there was no sign of the owner. Items from inside the boat floated forward, partially blocking the forward access and hampering the owner's rescue.

Some people walking by the canal witnessed the rescue efforts and called the emergency services. Once on scene, paramedics followed the friend inside the boat and found the owner, but unfortunately their efforts to resuscitate him were unsuccessful.

An investigation by the waterway authority established that the boat rudder had become trapped in the mitre of the gates and had prevented the stern from floating freely (Figure 2). The stern button fender was compressed and did not prevent the rudder from becoming entrapped (Figure 3).

Figure 2: Rudder trapped in lock gates

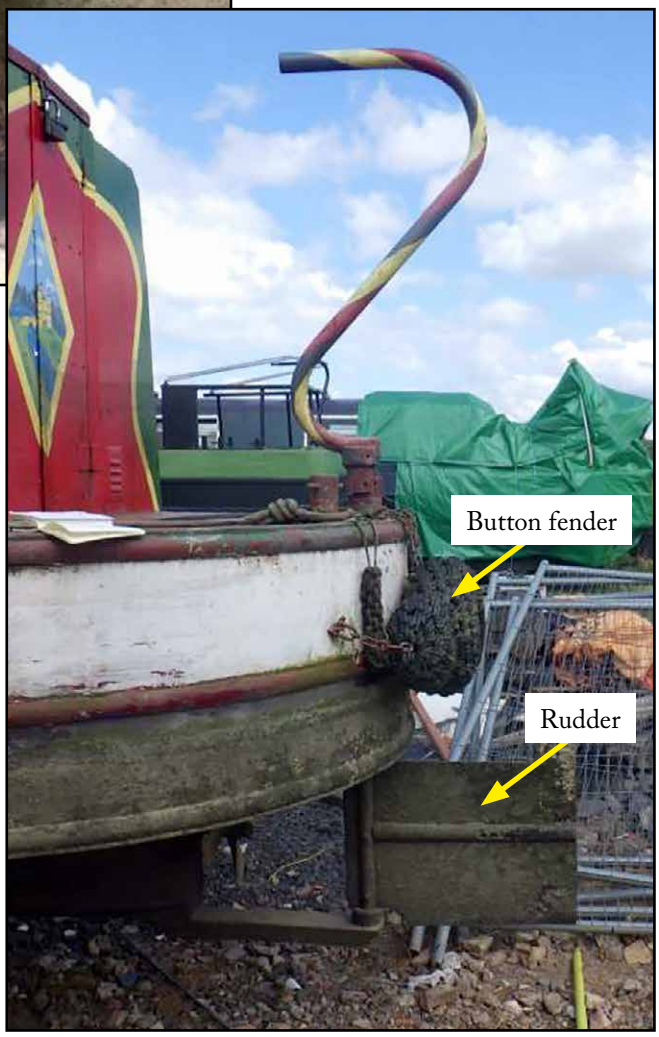


Figure 3: Rudder and compressed button fender

The Lessons

1. The length of the lock provided about 10m of free space, so there was no reason for the boat to have remained so close to the entry gates. Given that the owner was very experienced, it is likely that the inward rush of water from the exit gates pushed the boat back, and the rudder became trapped before the water forced the entry gates tight shut.

2. A constant check must be maintained on a boat during lock operations to ensure that it is floating freely and is clear of lock gates and cills. If it does not float free, close the lock sluices and resolve the problem.

3. The owner's decision to enter the accommodation to collect his mother's bag tragically led to his death. The water depth increased by 1m every 50-60 seconds, so the boat was probably inundated in less than a minute.

   The human cost of entering a flooding vessel is too great a risk, and should not be attempted.

4. Examination of the rudder and gate mitre show that the exposed rudder was held tightly between the gates. To prevent this happening, fenders are used to try and prevent rudder entrapment. However, in this case, the stern fender had become compressed and had not been renewed.

   Ensuring your canal boat is well maintained will help you stay safe.

INVESTIGATIONS STARTED IN THE PERIOD 1/03/19 TO 31/08/19

Date of Occurrence	Name of Vessel	Type of Vessel	Flag	Size		Type of Occurrence
02/03/19①	*Zea Servant* (9741126)	General cargo ship	Hong Kong	11619	gt	Accident to person
27/03/19	*Sea Mist* (BF918)	Fishing vessel	UK	5.65	m	Accident to person (1 fatality)
18/04/19	*Gulnak* (9579028) *Cape Mathilde* (9409120)②	Bulk carrier Bulk carrier	Turkey Panama	22458 92290	gt gt	Collision
29/04/19	*Artemis* (FR809)	Fishing vessel	UK	21.16	m	Accident to person (1 fatality)
08/05/19	*Seatruck Performance* (9506227)	Ro-ro freight ferry	UK	19722	gt	Grounding
15/05/19	*Seatruck Progress* (9506203)	Ro-ro freight ferry	UK	19722	gt	Accident to person (1 fatality)
25/05/19	*Minx* *Vision*	Motor yacht Motor yacht	UK Gibraltar	26.57 28.00	m m	Collision (1 fatality)
12/06/19③	Unnamed	Sailing boat	n/a	4.9	m	Capsize (1 fatality)
28/06/19	*Olivia Jean* (TN35)	Fishing vessel	UK	29.99	m	Accident to person (1 fatality)
24/07/19	*May C* (SY213)	Fishing vessel	UK	5.79	m	Accident to person (1 fatality)
04/08/19	*Coelleira* (OB93)	Fishing vessel	UK	26.55	m	Grounding
18/08/19	*Ocean Quest* (FR375)	Fishing vessel	UK	21.28	m	Flooding | sinking

① the decision to start an investigation was declared on 23/04/2019
② moored vessel
③ a safety bulletin has been issued (see Appendix C)

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 on 29 September 2018.
Report 4/2019 Published 28 March

***Laura Jane* (SE80)**
Capsize of a fishing vessel in Plymouth Sound 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 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

Safety Bulletins issued during the period 1/03/19 to 31/08/19

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY BULLETIN

SB1/2019 March 2019

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

Regulation 5:
"The sole objective of a safety investigation into an accident under these Regulations shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of such an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

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

Press Enquiries:
01932 440015

Out of hours:
020 7944 4292

Public Enquiries:
0300 330 3000

NOTE

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

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Tel: 023 8039 5500
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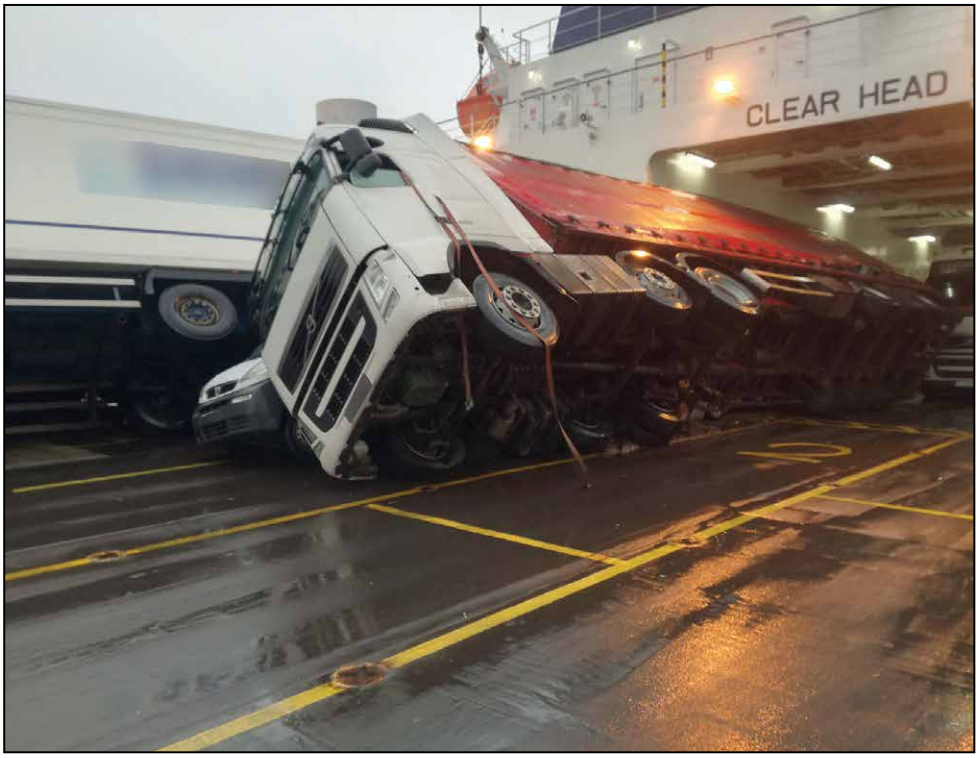
Dangers posed to freight vehicle drivers by remaining in their vehicle cabs while on board ro-ro ferries at sea



APPENDIX C

MAIB SAFETY BULLETIN 1/2019

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

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

The Marine Accident Investigation Branch is carrying out an investigation into the cargo shift of freight vehicles on board the ro-ro passenger ferry *European Causeway* while on passage from Larne to Cairnryan in Scotland.

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

Andrew Moll
Chief Inspector of Marine Accidents

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

Press Enquiries: 01932 440015; Out of hours: 020 7944 4292

Public Enquiries: 0300 330 3000

BACKGROUND

The MAIB is investigating the shift and toppling over of freight vehicles (**Figures 1**, **2**, **3** and **4**) on board the P&O ro-ro passenger ferry *European Causeway* during heavy weather while on passage from Larne, Northern Ireland, to Cairnryan, Scotland.

In accordance with international regulations and industry best practice, P&O does not permit passengers to remain on the ro-ro decks when at sea.

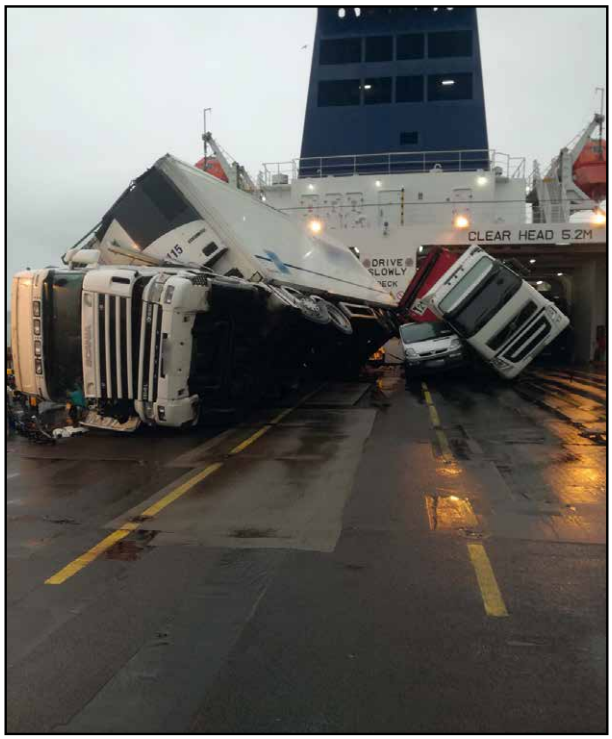

Figure 1: Trucks on upper deck aft

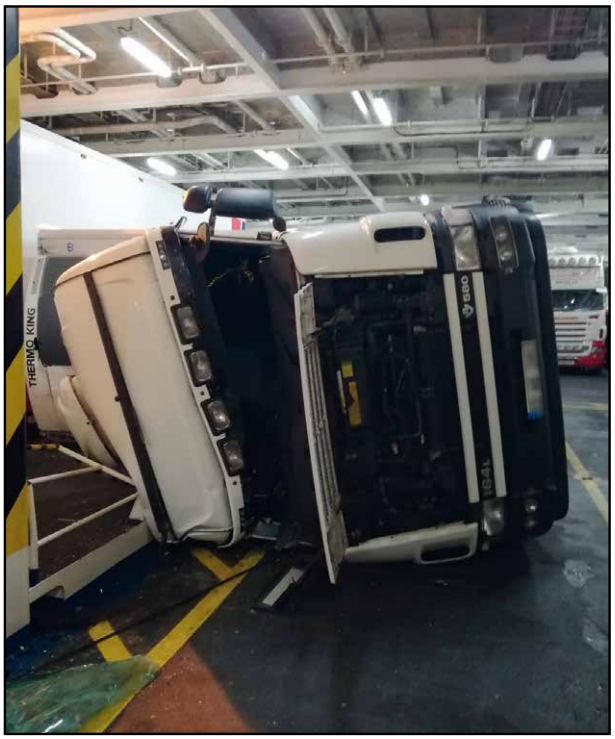

Figure 2: Truck toppled over

INITIAL FINDINGS

On 18 December 2018, *European Causeway* was on passage from Larne to Cairnryan when it encountered very strong winds and very rough seas, which caused the ship to roll heavily. As a result, 9 of the 40 freight vehicles on board toppled over, with several vehicles sustaining damage.

The MAIB investigation has found that at least six drivers had remained in their freight vehicle cabs during the crossing despite being instructed by the ship's crew to vacate the ro-ro deck after they had parked their vehicles.

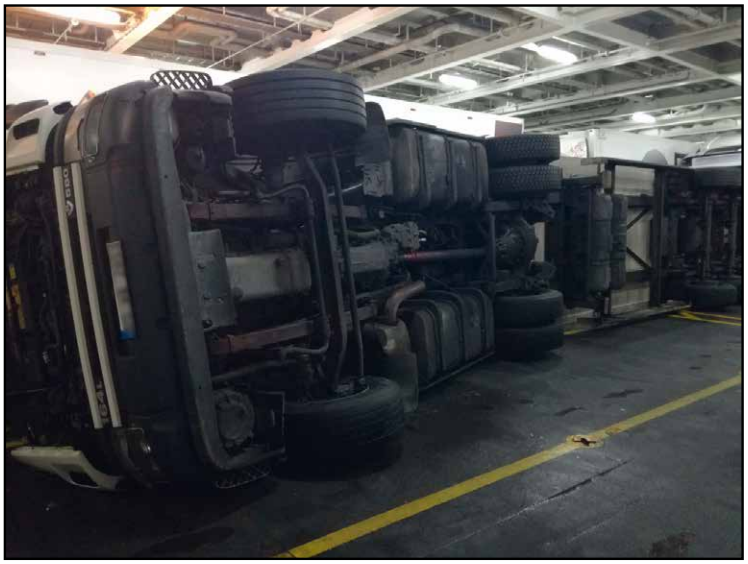

Figure 3: Truck toppled over on main deck

Four drivers were found in the freight vehicles that had toppled over, with one remaining trapped until he could be freed by the emergency services that were waiting in Cairnryan.

Fortunately, nobody was hurt during the accident.

The investigation has uncovered that the problem of drivers remaining in their vehicle cabs on the ro-ro deck while ferries are on passage is not unique to this route or to P&O.

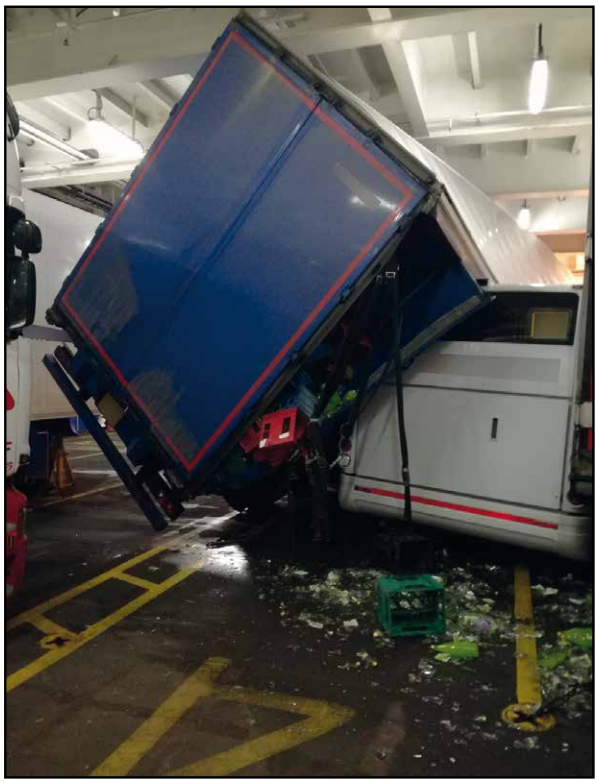

Figure 4: Damaged truck and mini bus

SAFETY LESSONS

A ferry's ro-ro deck is a hazardous and potentially life-threatening environment. While a ferry is at sea, the ro-ro decks should be occupied by only trained professional seafarers who are required to undertake safety and security patrols.

Drivers who remain on the vehicle deck of ro-ro ferries pose a danger to themselves, and can cause a delay to the emergency response, particularly in the event of a fire.

Any delay to the activation of fire suppression systems on the vehicle deck due to the need to undertake a muster and headcount of all persons on board could have catastrophic consequences to the whole vessel, its passengers and the environment.

Furthermore, drivers who have remained in their vehicle cabs could be in danger of asphyxiation by the fire, or as a result of the fire suppression systems that may be released by ship's staff.

ACTIONS TAKEN

P&O Ferries has contacted ferry operators in the United Kingdom who it considers may be affected by the issue of drivers remaining in vehicle cabs on ro-ro decks. Its aim is to encourage operators to contribute to a discussion forum to collectively eliminate this problem.

All companies operating ferries to the United Kingdom are strongly encouraged to engage positively with this safety initiative, to work across the industry to develop a cohesive and co-operative approach to resolve this urgent safety issue.

RECOMMENDATION

The Road Haulage Association Ltd is recommended to:

S2019/106 Distribute this Safety Bulletin to its members and encourage them to take robust action to improve and assure driver safety by helping ferry operators eliminate the issue of drivers remaining in the cabs of freight vehicles on ro-ro decks.

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY BULLETIN

SB2/2019 June 2019

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

Regulation 5:
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Fatality resulting from the inversion of a craft with a retractable keel following a capsize

June 2019

APPENDIX C

MAIB SAFETY BULLETIN 2/2019

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Andrew Moll
Chief Inspector of Marine Accidents

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BACKGROUND

The MAIB is undertaking a preliminary assessment of the circumstances that led to the capsize of an RS Venture Connect sailing boat on Windermere, resulting in the death of a disabled crewman. The boat was manufactured by RS Sailing and was being operated by Blackwell Sailing as part of its RYA Sailability activity. Sailability is the RYA's national programme promoting and supporting people with disabilities to try sailing and to take part regularly.

At the time of the accident, there were two crew on board the boat, an assistant instructor and an experienced crewman who had limited mobility.

The subject of this safety bulletin is the securing of retractable keels and retractable weighted centreboards while the sailing boats are in use.

INITIAL FINDINGS

The sailing boat in use was an RS Venture Connect, a self-righting keelboat version of the RS Venture, built in 2016. It was fitted with a 125kg lead bulb vertical retractable keel that afforded additional stability and could be raised to facilitate recovery from the water and transportation.

The post-accident inspection of the boat, together with photographic evidence from the day, has identified that the restraining device for the keel, a Velcro™ strap, designed to secure the keel in the lowered position, was not in place **(Figure 1)**.

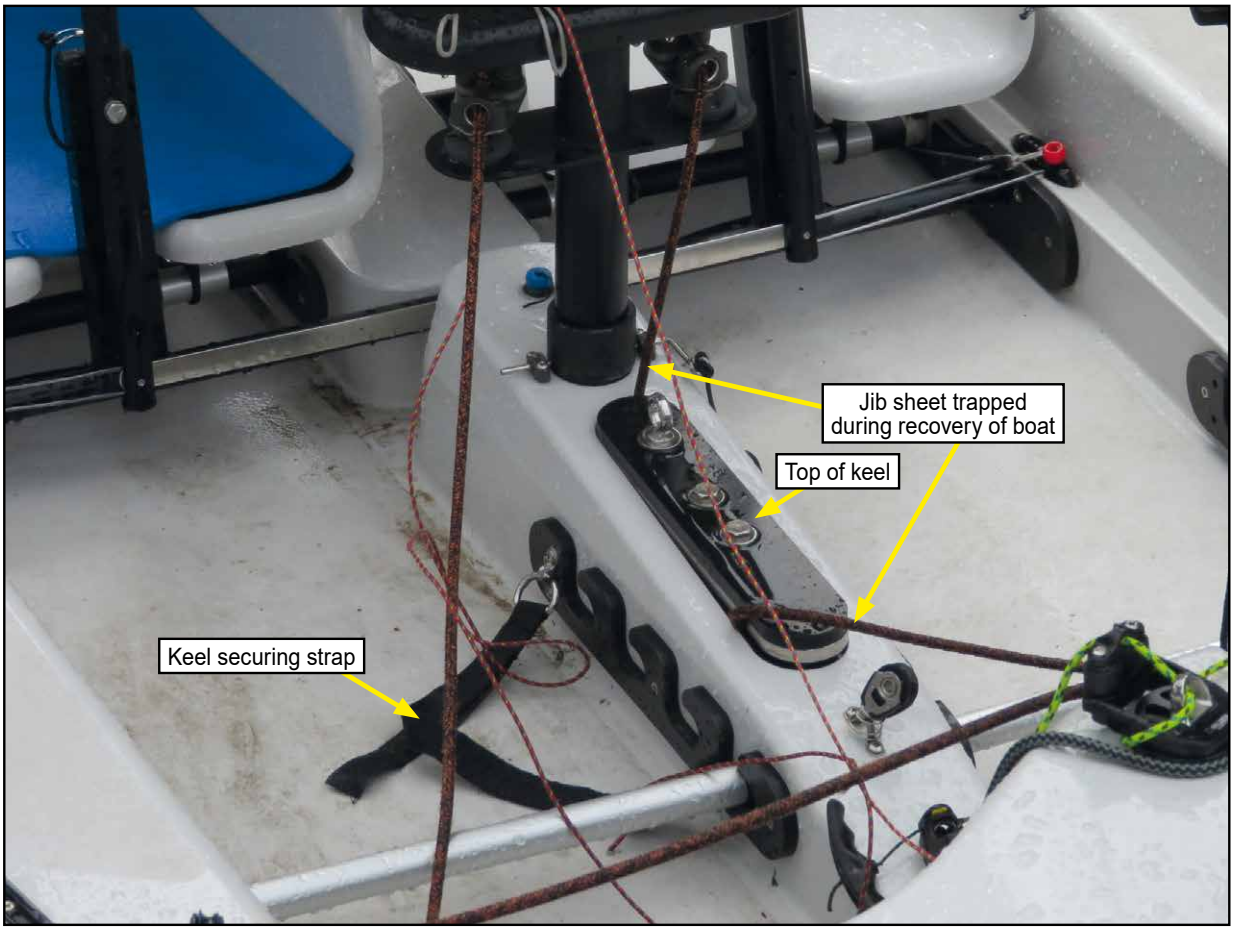

Figure 1: Showing top of the keel with the restraint not in place

In the windy conditions on the day, the boat was knocked down and heeled to such an extent that the keel slipped in its housing, retracting entirely. **Figure 2** shows the boat fully inverted with the lead bulb keel fully deployed, with an inset showing the boat inverted and the keel retracted. During the capsize the assistant instructor was able to swim clear but the disabled crewman became trapped under the inverted hull. The safety boat crew saw the accident and attended the scene quickly, but had difficulty righting the boat and so were unable to reach the crewman in sufficient time to effect a successful rescue.

The importance of securing the retractable keel was highlighted in the manufacturer's rigging guide for the boat **(Figure 3)**. However, this accident demonstrates that some users may not be aware of how critical this is.

Figure 2: Inverted boat with a fully deployed keel bulb
(**Inset:** the keel bulb hard up against the inverted hull)

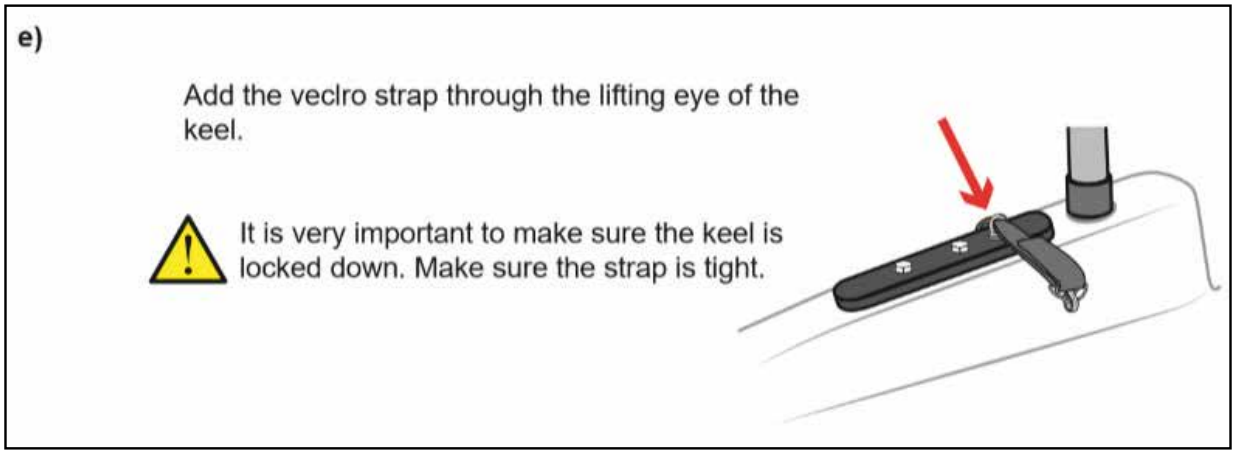

Figure 3: Extract from the manufacturer's rigging guide

ACTION TAKEN

RS Sailing has contacted all registered owners of RS Venture Connect boats, reiterating the instructions regarding the importance of ensuring the keel securing strap is correctly fitted prior to use.

SAFETY LESSON

To prevent a similar accident, owners and operators of boats with either a retractable keel or retractable weighted centreboard, regardless of make or model, are recommended to ensure that:

- Prior to use, checks should be made to ensure the manufacturer's instructions regarding the securing of the keel or weighted centreboard have been followed.
- Their procedures and drills for recovering a capsized boat include the scenario where the keel or centreboard has retracted from its 'lowered' position.

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