MAIB

MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY DIGEST

Lessons from Marine Accident Reports

1/2022

Featuring introductions by Bob Baker | Pete Dadds | Pip Hare

MARINE ACCIDENT INVESTIGATION BRANCH

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

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

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

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

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The editor, Clare Hughes, welcomes any comments or suggestions regarding this issue.

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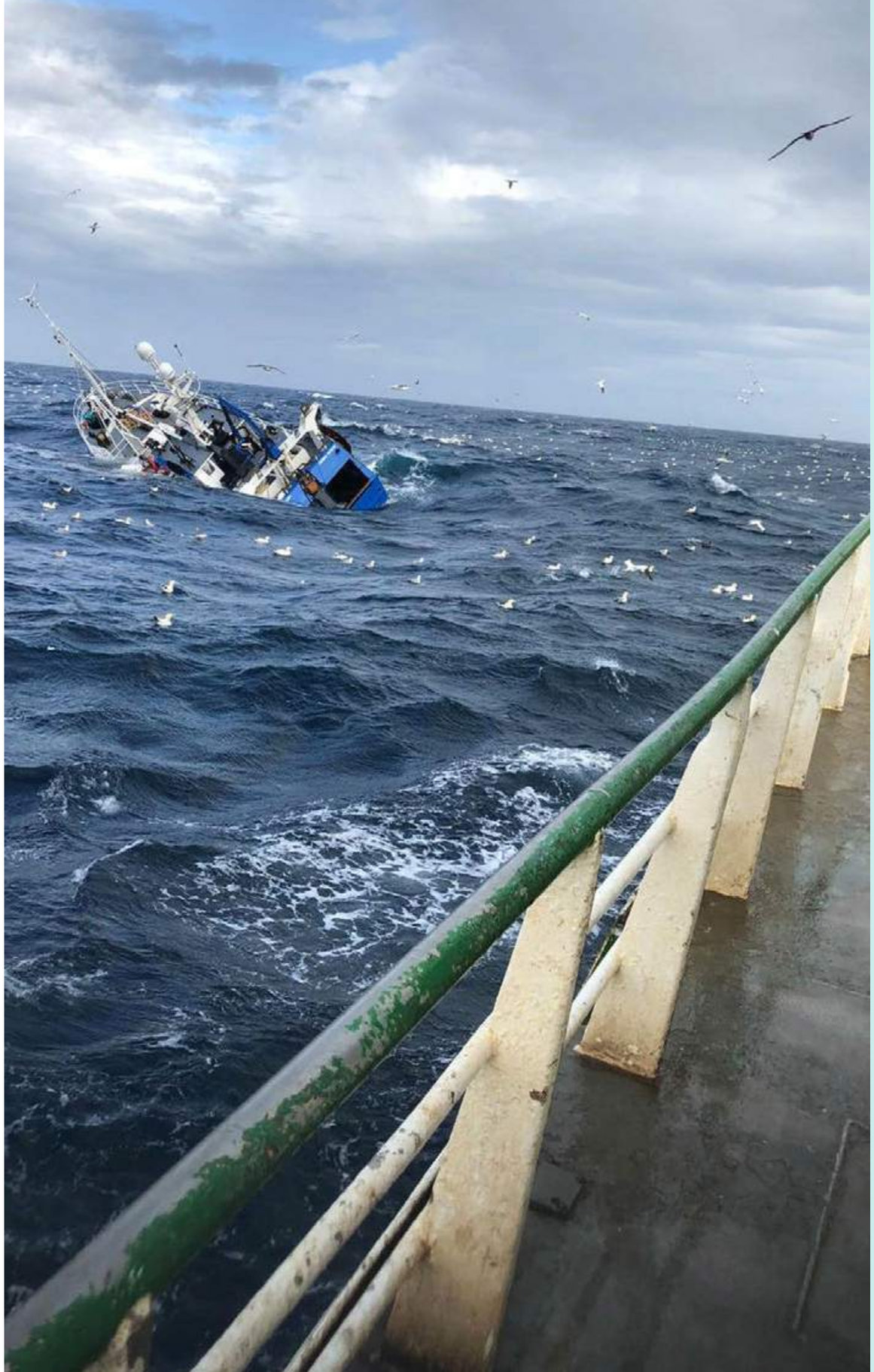

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GLOSSARY OF TERMS AND ABBREVIATIONS

°C	° Celsius
2/E	second engineer
ABP	Associated British Ports
AIS	automatic identification system
ARPA	automatic radar plotting aid
CCTV	closed-circuit television
C/O	chief officer
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea (1972)
CPP	controllable pitch propeller
DfT	Department for Transport
ECDIS	Electronic Chart Display and Information Systems
EEBD	emergency escape breathing device
FAME	Fatty Acid Methyl Ester
IMO	International Maritime Organization
kts	knots
LOTO	lock-out/tag-out
MGN	Marine Guidance Note
nm	nautical mile
OOW	officer of the watch
PEC	Pilotage Exemption Certificate
PFD	personal flotation device
RIB	rigid inflatable boat
RNLI	Royal National Lifeboat Institution
RoPax	roll-on/roll-off passenger ferry
ro-ro	roll-on/roll-off
VHF	very high frequency
VTS	vessel traffic services

CHIEF INSPECTOR'S INTRODUCTION

Welcome to MAIB's first Safety Digest of 2022. I would like to start by thanking Bob Baker, Pete Dadds and Pip Hare for their introductions to the merchant, fishing and recreational sections of this digest. They each have a wealth of experience in their respective fields, and their introductions are very thought-provoking. If nothing else, please read their articles. That said, I hope you will read much more than that. There is a cautionary tale here for everyone, and when you have finished reading the digest please pass it on so others can benefit too.

Bob Baker asks the questions, *Why did the officer of the watch switch off guard alarms on radars/ECDIS? And why is failure of the bridge team and poor communications such a fundamental issue and the most frequent cause of incidents in coastal/port waters?* He goes on to talk about the need for a cultural change in the way we embrace safety and in our approach to understanding why accidents happen. I could not agree with him more.

Like Bob, I started bridge watchkeeping in the pre-digital age. Satellite navigation was in its infancy, radars were unreliable, ARPA did not exist, and the ship's position was plotted and projected ahead on a paper chart. In coastal waters, watches were busy, sometimes hectic, and if the watchkeeper did not collect and assimilate the necessary information, they would not know what was happening around them. Compare this to the modern bridge where all that manual work is being done automatically, and all the watchkeeper needs to do is look at the screens (and out of the window!) to see what is going on. Watches have ceased to be as stimulating and occupying as they were, but the watchkeeper still keeps a 4 or 6-hour stint on the bridge. The frequency of accidents that have occurred when a watchkeeper has decided to keep alert or awake by occupying themselves with their mobile phone, tablet or PC seems to be on the rise, probably because they are insufficiently engaged by their duties. I would therefore add to Bob's call for a cultural change to safety and say that the role of the human in the digital workplace needs a serious rethink; if we don't, it is us that will be asleep at the wheel.

Few people have the courage to tell a "*When I…*" story as powerful as Pete Dadds' account of his capsize, and I am grateful that he shared his experience with us. The first thing that stands out for me is the old saying, "*Never turn your back on the sea*", because it always has the capacity to be unpredictable. The second is that Pete and his crew were wearing PFDs and so were able both to survive the initial shock of immersion in cold water and stay afloat long enough to be rescued. I think the message about wearing PFDs when on the working deck is slowly getting around. However, too many of MAIB's customers were unfortunately not wearing a PFD when they entered the water, with often tragic results. Pete's story shows that it is possible to survive going over the side, but to do so you need to be wearing a PFD.

Pip Hare writes about the risks of being a single-handed round the world sailor, about mitigating the foreseeable risks in advance, and being ready to change her plans in the face of changing circumstances. At MAIB we often talk about safety margins, and how easily these are eroded. Going a bit fast in poor visibility, rushing a maintenance task, loading more catch than is safe, staying out for one more haul in deteriorating weather, show-boating (in all its forms); it is all too easy to erode the safety margins. A few years ago, the Royal Yachting Association ran a campaign entitled *Know Your Limits* and the detail is still available on its website:

https://www.rya.org.uk/knowledge/safety/know-your-limits

Whatever your means of getting afloat, it is worth a read.

Andrew Moll
Chief Inspector of Marine Accidents

MERCHANT VESSELS

I am now well into my 47th year in the marine industry. When I went to sea there were very few electronic navigational aids available, technology was limited and the processes and procedures we use today, such as risk assessment, passage plan, bridge team, ISM, etc., had yet to be developed. I have therefore had the benefit and privilege of seeing the maritime industry improve, develop and expand safety training, culture and systems. I have also seen the advent of smaller crews, quicker turnaround in port and ever-increasing use of technology and sophisticated systems.

The human interface and what can be described as human and organisational contributory factors constantly feature in incident reports, not just the MAIB's but all of our own. In an industry that continues to introduce new procedures, processes, safety systems and technology, we still seem to fail when it comes to understanding the human element.

Everyone should be aware of their cultural as well as technical competence

It is therefore vitally important, and even more so now as the concept of alternative fuels, autonomous vessels and artificial intelligence are coming over the horizon, that our ship personnel, VTS officers, pilots, tug crews, harbour masters, etc., are properly trained and experienced enough to meet the challenges of this fast-evolving industry. Everyone should be aware of their cultural as well as technical competence, developing and improving on skills such as collaborative communication, empathy and patience. The marine industry has traditionally been built around command and control rather than a structure that encourages the watch officer to question the master or pilot; "I was just trying to get the job done" is a fateful phrase that I have heard many a time.

Until improvements are made in these softer skills, we will struggle to understand why individuals take the decisions that ultimately lead to incidents and accidents. I am sure the MAIB has the statistics, but how many incident investigations attributed the cause either fully or substantially to human error rather than delving deeper into the underlying contributory factors that influenced the incident? Do investigators or companies take the time to establish and explore why an individual decided not to follow the procedures, conduct a risk assessment or follow their training? Why did the officer of the watch switch off guard alarms on radars/ECDIS? And why is failure of the bridge team and poor communications such a fundamental issue and the most frequent cause of incidents in coastal/port waters?

I do think we are all sometimes guilty of taking action after an incident that focuses on producing another procedure rather than evaluating why the existing procedures or training, which are probably perfectly fit for purpose, were not followed. To understand why these issues occur, the cultural approach to investigations and the actions stemming from the recommendations need to become more open, collaborative and cooperative. If we can be less defensive and more open when being investigated, we may learn more as to why individuals act the way they do. Unfortunately, in a society where liability, compensation and litigation appear to be the priority, these become major barriers to establishing this.

As with everything safety-related, if we are going to shift the cultural dial it is everyone's responsibility to willingly participate. Yes, companies and management have to create the right environment for this more collaborative approach, but everyone involved needs to adopt the same attitude and training, while needed, must be appropriate. Changing culture seems to be one of the most difficult things to achieve, yet it is the subject most frequently raised and discussed in training courses, seminars, companies' strategies, etc. The word culture and examples of poor safety or professional culture even feature heavily in our day-to-day life and it is frequently mentioned in mainstream news reports into incidents and failings.

It seems obvious and simple when discussed; however, it is not, and to make that step change to improve safety everyone in the marine industry must embrace new thinking.

Finally, it is good to see the MAIB include the serious issue of pilot ladders in this edition of the Safety Digest. This is a critical part of our operations, particularly for pilots and port authorities. Pilot ladder deficiencies top our Port of London incident report statistics by a considerable margin. After a long campaign involving all elements of the industry, we are starting to see a gradual improvement in the condition and rigging of pilot ladders, but focus cannot be lost in ensuring this vital piece of equipment is correctly rigged. Asking a pilot to step from a moving boat onto a rope ladder and climb up the side of a ship demands the highest standards of safety, without compromise.

We are all human and we all make mistakes. Acknowledging this and asking, "*Why?*" will hopefully contribute to the provision of a safer work environment.

BOB BAKER | Chief Harbour Master, Port of London Authority

Bob became the Port of London Authority (PLA) chief harbour master in May 2016. He is responsible for all operational and navigational matters, including vessel traffic management, pilotage, harbour services and port security. He sits on the PLA board and is a member of the authorities Licensing Committee. Bob joined the PLA from Forth Ports, where he was chief harbour master and a director of Forth Estuary Towage from 2001. Bob's seagoing career lasted from 1975 to 1991, mainly sailing on bulk carriers that traded worldwide. Following his sea career Bob worked as a superintendent in Africa for a number of years, primarily overseeing the discharge and distribution of aid cargoes. Returning to the UK, he worked at the Port of Tilbury, latterly as general manager of conventional cargo operations and harbour master.

Bob chairs the UK Major Ports Group (UKMPG)/British Ports Association (BPA) Marine Pilot Group and sits on the Department for Transport's steering group for the Port Marine Safety Code. A Master Mariner, Bob also holds an MBA from Henley Management College.

Best of intentions, worst of outcomes

cargo vessel | flooding

A small dry cargo vessel was in harbour and its engineers were investigating why ballasting operations were taking longer than normal. Their plan was to clean the ballast system's seawater strainer and then check the ballast pump's condition.

To isolate the strainer, the second engineer (2/E) went to the ballast control panel and shut the automatic butterfly hull valve between the hull inlet and the strainer (Figure 1). The hull valve indicated as shut on the ballast control panel. The 2/E then went to the engine room and manually shut the isolation valve between the strainer and the pump (Figure 1).

With the chief engineer present, the 2/E loosened the strainer lid's retaining bolts and tried to lever the lid off with a screwdriver, but it would not budge. The engineers then rigged a chain block to the strainer lid, having completely removed all the bolts. As the weight came onto the chain block the strainer lid flew off and seawater began flooding into the engine room. The engineers tried unsuccessfully to replace the lid, then decided to evacuate the engine room and raise the alarm.

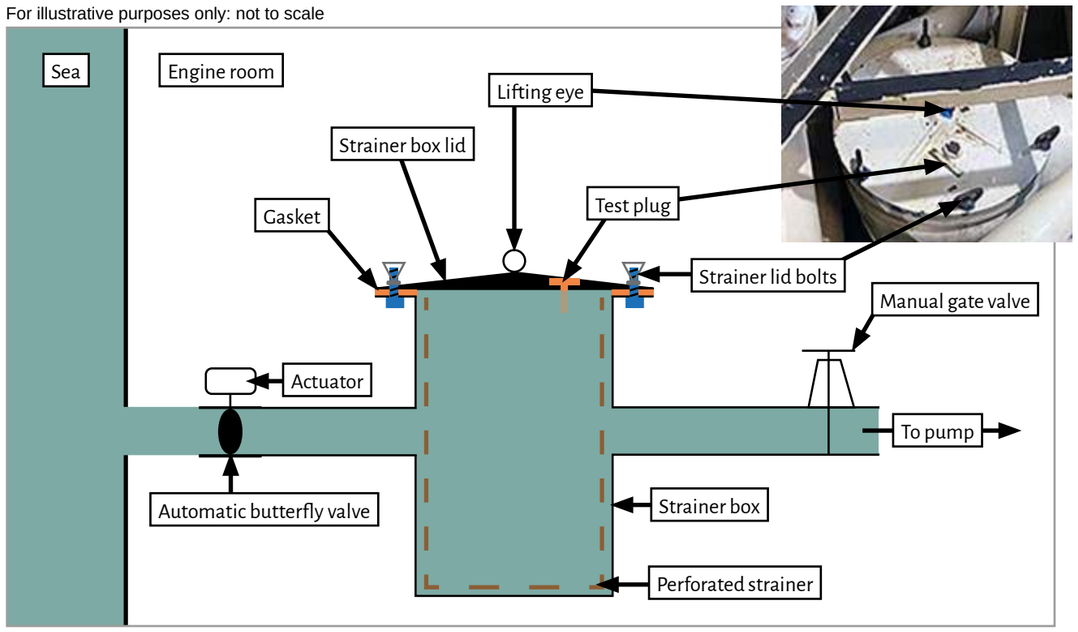

Figure 1: Ballast water valve and strainer arrangements

In the engine room, the water level rose over the bottom plates until the seawater pressure equalised and the vessel settled with the engine room partly flooded (Figure 2). The vessel was made watertight after a diver fitted an external patch over the hull valve. Thereafter, the contaminated water was pumped out to road tankers for disposal and the vessel was dry docked for repairs.

After the accident, a technical investigation identified that the automatic butterfly hull valve was defective, and had remained partially open when indicated as shut on the ballast control panel. This investigation also found that the strainer was clean but that a ballast pump defect had caused the slow ballasting operations. The company has provided a revised safe system of work for strainer cleaning.

Figure 2: The flooded engine room

The Lessons

1. **Procedure →** The strainer lid was fitted with a test plug (Figure 1), provided to make sure the system was not still under pressure before the lid was removed. However, the engineers involved in this accident neither followed an approved procedure for the strainer clean nor opened the test plug and so were unaware of the faulty hull valve that meant the system was still open to sea pressure. Additionally, when they tried to remove the lid with a screwdriver, the absence of any leakage underpinned their assessment that the system was isolated.

2. **Check →** Given that the hull valve indicated shut on the ballast control panel, it was reasonable of the engineers to assume this was correct. However, where there is doubt or, for instance, when reducing a system to single valve isolation to sea, it is good practice to visually inspect the valve's mechanical position indicator as well as checking its remote indication. A further precaution is to loosen the nuts, then use wedges to crack the lid open; if water floods out, the retaining nuts can be retightened to seal the strainer lid.

“I didn’t know that… !”

passenger ferry | grounding

In the early hours of a stormy winter’s day, a roll-on/roll-off passenger ferry (RoPax), which was laid up for the festive period, broke free from its moorings in winds gusting up to 55 knots (kts) (Figure 1). The master had anticipated storm force, off-berth winds but was confident in the mooring arrangement. The engines were on immediate standby, and a good lookout was being maintained, so by the time the master had been called and arrived on the bridge the steering and propulsion plants had been brought online.

Unfortunately, the master was unable to regain control of the vessel and to prevent damage to the propellers the engines were declutched as the vessel’s stern grounded on a soft mud bank. The bow was held close to the berth by the linkspan structure (Figure 2).

A pilot boarded shortly afterwards and a plan was discussed and agreed with the master. With two tugs made fast on the starboard quarter, the RoPax’s stern was pulled free of the mud bank. Tugs and the bow thruster were used to manoeuvre it clear of a hotel ship moored astern of their position before the pilot asked for the engines to be clutched in.

Unfortunately, the pilot was unaware that, due to the shaft generator arrangement, the load had to be taken off the bow thrusters before the propellers could be clutched in. The master stopped the bow thrusters, but the pilot was not told, and the bow started to drift downwind toward another ferry berthed nearby.

Noticing what was happening, the pilot asked the master to apply more thrust to be told that it was not possible while the engines were being clutched in (Figure 3). Concerned that the bow would contact this moored vessel, the pilot ordered the tugs to stop pulling the stern round and shortly afterwards, with astern momentum already in place, the RoPax made light contact with the moored hotel ship as it drifted downwind (Figure 4).

With all engines and thrusters available soon after the light contact, and with the assistance of the tugs, the ferry was berthed without further incident.

A dive survey and damage assessment concluded that the RoPax had suffered minor damage.

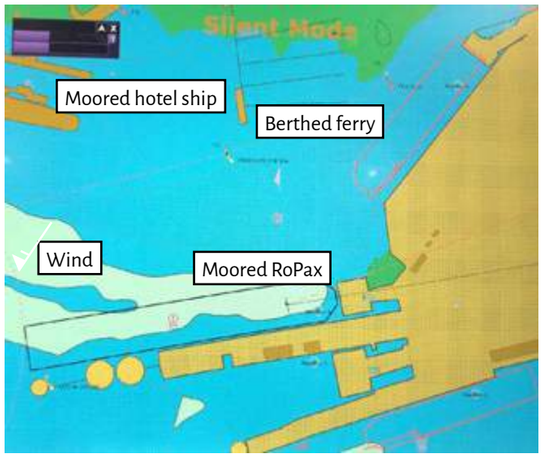

Figure 1: RoPax alongside before the moorings parted

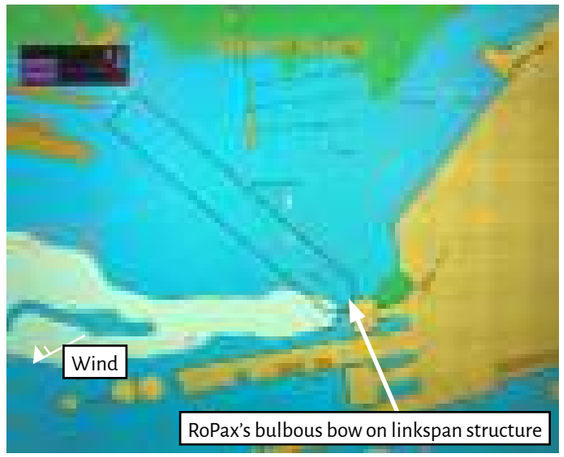

Figure 2: RoPax’s stern aground on a mud bank

Figure 3: The point where the pilot was told that the bow thrusters were unavailable

Figure 4: Light contact was made with the hotel ship

The Lessons

1. **Margin of safety →** The master considered his mooring plan sufficient and had taken steps to increase the readiness of the vessel should engines be needed. However, the almost simultaneous failure of the stern lines meant there was not enough time to get the propulsion plant online before the stern ran aground. The day before, the duty tug had offered to push up against the ferry overnight due to the forecast winds. It cannot be established why the RoPax’s master did not accept this offer, but this incident would have been largely mitigated had the tug been in place. Calculating the strength of a mooring plan based on the nominal breaking strains of the ropes is fraught with danger, and a healthy safety margin should always be employed.

2. **Communicate →** Although the RoPax was aground when the pilot boarded, it was safe and there was time to conduct a full exchange with the master and agree a plan of action. Despite this, and having previously completed movements on the vessel, the pilot was unaware that the bow thrusters would be unavailable while the engines were clutched in. Without this critical piece of information, he had an incomplete mental model of how the manoeuvre would unfold. A well-considered pilot card should act as a prompt for the master to share critical information such as this when a pilot joins the bridge team. In this case, the consequences were fortunately minor.

Stick to the plan

workboat | contact

The crew of a 7m workboat were tasked with patrolling an oil terminal overnight, which included checking pipelines for signs of leakage, monitoring terminal infrastructure and general security of moored vessels.

At 1830, the two crew joined the vessel. With a strong south-westerly wind (24 to 37kts), and a strong outgoing tide causing wind against tide conditions, the sea had a steep chop and the crew knew that they were in for an uncomfortable night. They conducted a short informal dynamic risk assessment but did not make notes.

In fair conditions it was usual to conduct the patrol passing inside of the berths (Figure 1) but, with the high sea state during the previous midnight patrol, they decided to conduct their patrol from the offshore side of the jetty. However, in an attempt to finish it quickly, the coxswain took the workboat under the access roads (Figure 1). The vessel safely passed under the first two access roads in a westerly direction, but when passing under the third it was pushed bodily to starboard by a wave and the port bow made heavy contact with a pile.

The deckhand briefly lost his footing but was otherwise uninjured. He then proceeded inside the boat to check on the coxswain, who was also unhurt. Damage was found at the bow and a small amount of water was entering the boat. Bilge pumps were sufficient to stem the ingress while the coxswain informed the company and drove the boat to a nearby pontoon to further assess the damage. Once at the pontoon, the coxswain was taken to the facility's medical centre for a drugs and alcohol test, which proved negative.

The patrol boat returned to its base when an escort was available and was taken out of the water the following morning. Subsequent surveys revealed significant damage to the bow, with delamination of the glass-reinforced plastic as far back as 2m from the bow (Figure 2). The boat was out of action for several weeks for repairs.

Figure 1: Workboat patrol route

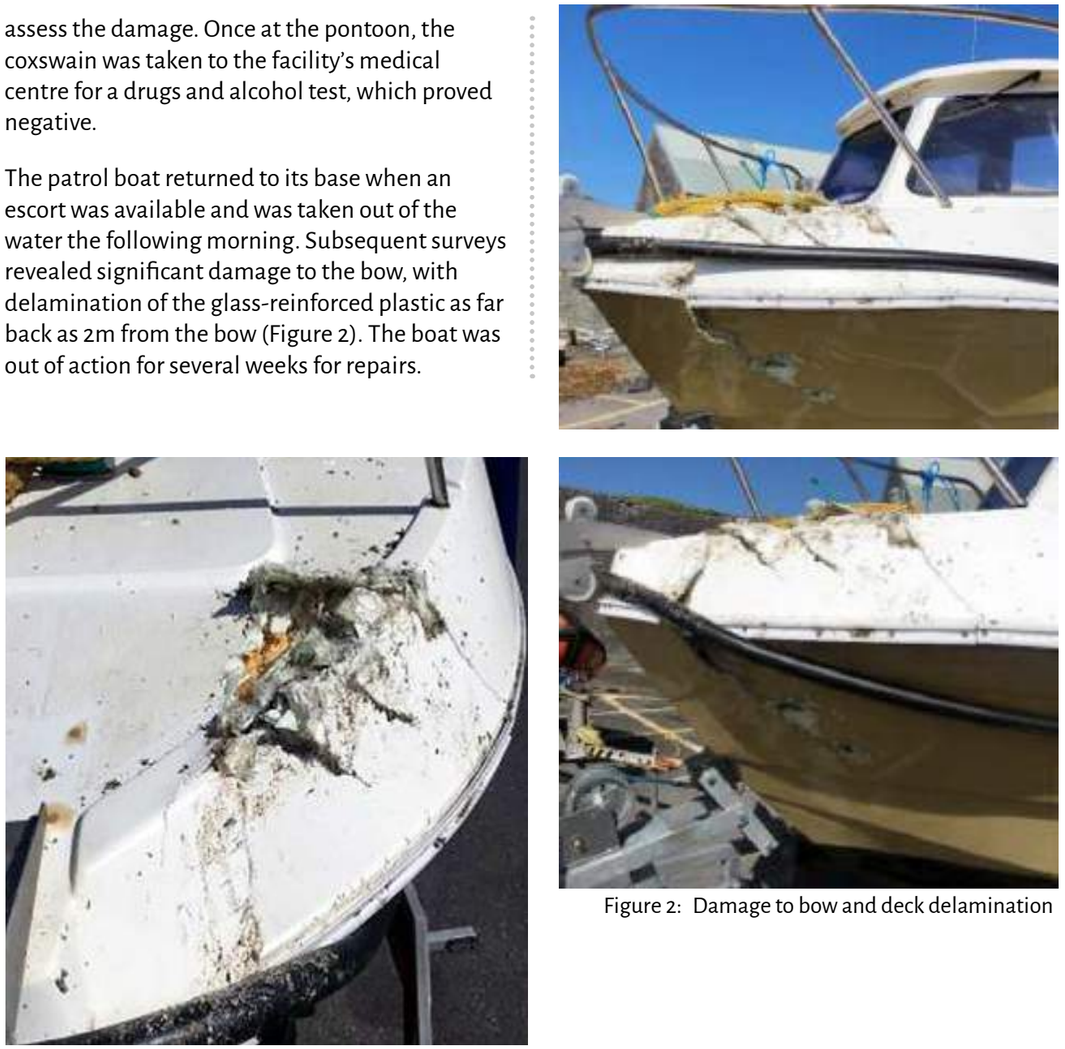

Figure 2: Damage to bow and deck delamination

The Lessons

1. **Margin of safety →** Due to the prevailing conditions, the crew had already decided to conduct the patrol on the outboard side of the main jetty. However, to speed it up the coxswain took the boat under the roadway access to the terminal berths. At night, the waves and pilings were more difficult to see, and in marginal conditions it would have been prudent to stay on the offshore side of the terminal throughout the patrol. This might have lengthened the patrol but would have increased the margin of safety and minimised the risk to boat and crew.

2. **Guide →** With the weather assessed by the crew as marginal for the relatively small vessel, a larger more capable boat, which was available, might have been a better choice. Incorporating a matrix into operational instructions, which matches suitable conditions for tasks against available assets, can assist crew to plan essential tasks in marginal conditions when there is limited onsite supervision.

4

Don't throw in the towel

survey vessel | fire

A survey vessel crew member was settling back into his cabin after a period of leave. Shortly after turning up the temperature on the cabin thermostat he noticed a faint burning smell and reported it to the duty engineer.

After a brief discussion and check of the cabin, the crew member and duty engineer decided that the smell probably originated from someone vaping on an outside deck. The crew member left the cabin for a little while, but when he returned he noticed smoke coming out of a ventilation duct. He raised the alarm and shut the cabin door as he left. The ship's emergency response team mustered and entered the cabin once the electrical supply and ventilation system was isolated. They discovered a fire in the ventilation duct and tackled it with a water fire extinguisher. The emergency response team removed the cabin ceiling panels and confirmed that the fire was out (Figure 1).

The shipping company conducted an internal investigation and found that a passenger had previously used the cabin and stuffed a towel into the ventilation duct to prevent a cold air draught (Figure 2). The towel caught fire when the ventilation duct's automatic heating element turned itself on.

Figure 1: The ventilation duct post-fire

The company reported that a similar incident had occurred on the same ship approximately eight years before, the details of which were shared fleetwide. Safety signs were installed in the cabins, providing occupants with guidance on how to immediately report defects. The vessel was recently sold and no known cabin ventilation system modifications have been undertaken.

Figure 2: The towel that was stuffed into the ventilation duct

The Lessons

1. **Observe →** Fairly innocuous actions can lead to potentially dangerous scenarios. Ship's crew are reminded to be vigilant for ad hoc alterations to cabin fixtures and fittings.

2. **Revise →** It is important to learn lessons from previous incidents and take action to improve safety. In this case, had a simple modification to the cabin ventilation duct been made after the previous incident it might have prevented the passenger from placing a towel in the duct and inadvertently causing a fire.

3. **Action →** Good emergency preparedness and swift action by the emergency response team prevented this becoming a major incident; well-trained crews are good news.

Pitching into trouble

tanker | collision

A chemical/product tanker was approaching its berth; weather conditions were fine, a pilot was on board, and the master was controlling the vessel. The vessel had a single shaft with a controllable pitch propeller (CPP) and a bow thruster.

In the final stages of the approach, the master set the CPP control from '20 ahead' to '20 astern' to reduce speed; the bow thruster was also in use. The vessel did not seem to be responding to the CPP, so the master selected '40 astern'; however, the vessel then appeared to increase speed. The master decided to abort the berthing and managed to steer the vessel safely back into the river, avoiding the berth and some adjacent obstructions. Meanwhile, the bridge and engine room teams attempted to regain control in backup and local modes but were unable to do so.

None of the crew's actions were successful in regaining CPP control, so the master activated the bridge main engine emergency stop and both anchors were dropped as the speed reduced. Despite these actions, the tanker eventually came to rest when it collided with a barge moored in the river (see figure). There was no significant damage to either vessel.

Figure: The tanker and the barge in contact just after collision

The Lessons

1. **Maintain →** A post-accident technical investigation found that a CPP hydraulic control valve had malfunctioned, resulting in a loss of system pressure and consequent loss of propeller pitch control. The defect was determined to be excessive wear and tear on the valve. However, the investigation also identified that, although probably not contributing to the loss of control, some 'non-approved' spare parts were found in use on the system. It is important that manufacturer-approved spare parts are used, particularly in critical systems such as propulsion and steering.

2. **Teamwork →** Faced with a loss of control in a confined navigational environment, the crew, aided by the pilot, worked as a team to try to bring the situation under control. The early decision to abort the berthing and steer clear of danger unquestionably avoided a more severe outcome. Dropping the anchor when still making headway can be hazardous but, given the lack of time and space, almost certainly contributed to minimising the consequences of this accident.

6

A bumper catch of workboats

workboats and cargo vessel | collision

For illustrative purposes only: not to scale

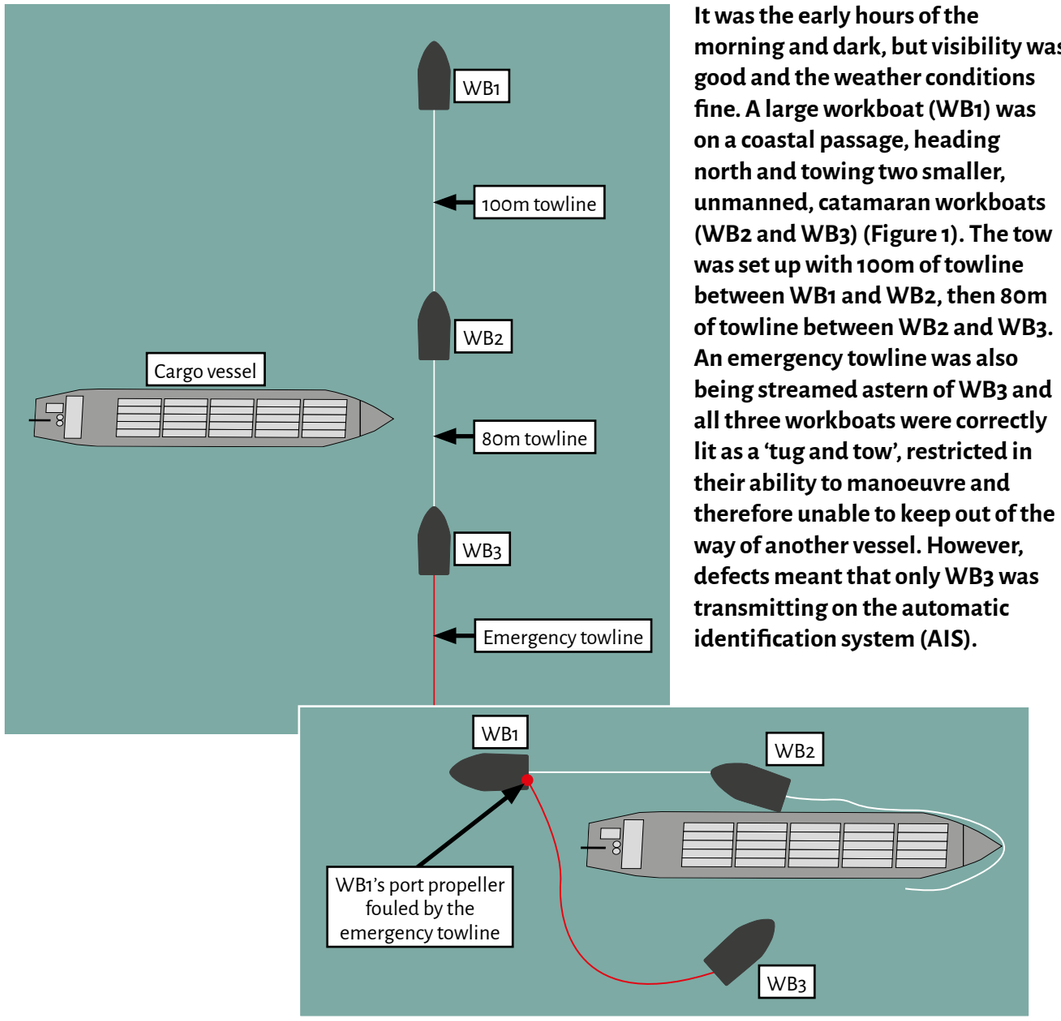

Figure 1: Schematic of tow and (inset) post-collision situation

It was the early hours of the morning and dark, but visibility was good and the weather conditions fine. A large workboat (WB1) was on a coastal passage, heading north and towing two smaller, unmanned, catamaran workboats (WB2 and WB3) (Figure 1). The tow was set up with 100m of towline between WB1 and WB2, then 80m of towline between WB2 and WB3. An emergency towline was also being streamed astern of WB3 and all three workboats were correctly lit as a 'tug and tow', restricted in their ability to manoeuvre and therefore unable to keep out of the way of another vessel. However, defects meant that only WB3 was transmitting on the automatic identification system (AIS).

A small general cargo vessel was heading east on passage in the same area and had observed a vessel ahead by AIS and visual observation. The cargo vessel's officer of the watch (OOW) did not alter course and intended passing close by the contact.

WB1's crew were increasingly concerned about the situation and used a searchlight to try and attract the cargo vessel OOW's attention. WB1's crew also tried hailing the cargo vessel by very high frequency (VHF) radio; this warning came too late and the cargo vessel passed between WB2 and WB3, severing the towline and casting WB3 adrift (Figure 1, inset).

Realising what had happened the cargo vessel was stopped, then both WB1's skipper and the cargo vessel's OOW called the coastguard to report the incident. When trying to recover the situation, WB1's port propeller shaft became fouled by the emergency towline (Figure 2). Once the tow had been re-established and everyone safely accounted for, the coastguard agreed that the vessels could continue their passages.

Figure 2: The emergency towline caught in WB1's propeller

The Lessons

1. **Observe →** The International Regulations for Preventing Collisions at Sea (COLREGs) require a constant cycle of keeping a good lookout, assessing the situation and taking action to avoid collision when judged necessary. As the cargo vessel was approaching the tow, the OOW identified that there was a vessel ahead; however, inadequate action was taken to properly assess the situation. The primary means of assessing collision risk is visual and radar information and sufficient evidence should have been available to the cargo vessel's OOW to see that action was necessary (as the 'give-way' vessel) to pass at a safe distance.

2. **Risk →** The cargo vessel's OOW had observed an AIS contact ahead. AIS is useful to assist the OOW with situational awareness, although should not be relied upon as the primary means of collision avoidance. In this instance, close scrutiny of the combined radar, visual and AIS information could potentially have indicated that more than one vessel was ahead. Under these circumstances, or where there is uncertainty, reducing speed would allow more time to accurately assess the situation.

3. **Action →** As the situation developed, WB1's skipper used a searchlight and VHF radio to alert the cargo vessel's OOW. However, these actions came too late to be effective. In any collision situation, it is incumbent upon both vessels taking steps to avoid collision. This includes the 'stand-on' vessel taking evasive action where it is judged the 'give-way' vessel's actions alone will be insufficient to avoid collision.

7

The stress of catastrophic engine failure

cargo vessel | machinery

The main engines of a roll-on/roll-off (ro-ro) cargo vessel were regularly maintained by an engineering contractor. Over the years the contractor had slowly taken over the work from the engine manufacturer to reduce costs. The contractor was approved to work on the large diesel main engines on board the ship and undertook their work in accordance with the ship's planned maintenance system. Although they had access to most of the engine manufacturer's maintenance instructions, they did not have the detailed information to perform the work on the engine connecting rod bearings. Nevertheless, their own instructions were similar.

The engine manufacturer advised that the replacement of a connecting rod bearing should be undertaken at one of their specialist centres due to the difficult machining and reinstallation process; because of its interference fit in the bearing housing, this involved cutting the bearing shell axially to a fine tolerance to enable it to collapse and then using liquid nitrogen to contract the new shell for installation in the housing. The ship's operator was aware of this instruction but had no oversight of how the contractor completed the work.

The contractor, having undertaken similar work on different manufacturers' engines, considered that the other manufacturers had a simpler and easier approach to the connecting rod bearing replacement. The contractor chose to remove the bearing shell with a disc cutter and use a gas cutting torch to heat up the bearing housing to slide the shell into position. In doing so, they introduced notches and heat marks into the bearing housing (Figure 1).

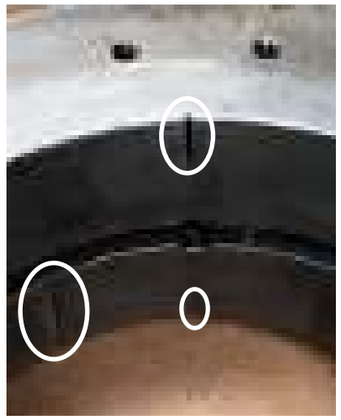

Figure 1: Bearing housing notches from disc cutter

Some months later while on passage, a sudden and increasingly loud sound emanated from the main engine. The duty engineer recognised that something serious was occurring and took cover as the main engine catastrophically failed. Major internal engine components were thrown out through the crankcase and a large fire engulfed the engine room (Figure 2). The duty engineer was fortunate to escape through the thick black smoke that enveloped the engine room as he struggled out of the compartment via the secondary escape route, without the use of an emergency escape breathing device (EEBD).

Figure 2: Post-failure engine component debris in sump

Once the vent flaps had been closed and the duty engineer accounted for, the engine room was flooded with carbon dioxide, which extinguished the fire. However, it was some days before the engine room could be re-entered as it was unclear whether all the carbon dioxide bottles assigned to the main engine room had been discharged.

The Lessons

1. **Qualified →** It is not unusual for contractors to undertake major maintenance work on board a ship; however, it is imperative that they can provide assurance that they have the skills and equipment to meet the original equipment manufacturer's expectations of how it should be done. Operators and managers must endeavour to maintain a level of oversight that ensures work is completed to a satisfactory standard.

2. **Maintain →** Whereas components were overengineered and could withstand poor treatment in the past, this is not always the case for modern, technically advanced machinery. Engine components, particularly on modern engines, are designed to maximise the power output while keeping component mass and size to a minimum. The components are thus highly stressed and their correct maintenance is critical. What may seem an innocuous cut or heat mark from using inappropriate tools can have serious consequences when the component is heavily loaded or operating at high revolutions. This type of damage affects the component metallurgy and introduces stress raisers, which can lead to fatigue failure.

3. **Equipment →** The duty engineer was lucky to escape from the smoke-filled engine room. While the ship had the correct number of emergency escape breathing apparatus as required when the ship was constructed, it did not have to comply with a 2003 International Maritime Organization (IMO) circular that required one EEBD to be positioned on each deck or platform level near the secondary means of escape. Ship managers and operators should consider increasing and improving EEBD distribution to maximise the likelihood of escape from a smoke-filled space.

4. **Signage →** The carbon dioxide fixed firefighting system was activated and successfully extinguished the fire. However, it was unclear in the bottle room which gas bottles discharged to which space and therefore impossible to confirm that all bottles had been discharged. This led to delays in gaining entry to the space, which in some circumstances could be critical. Such a problem can be avoided with clear labelling and a means of checking that the necessary bottles have been discharged, as outlined in MGN 389 (M+F), *Operating Instructions and Signage for Fixed Gas Fire-Extinguishing Systems*.

Washed away

passenger ferry | risk assessment

A high-speed passenger ferry was berthed at a pier, embarking passengers via a shoreside gangway that rested on the deck at the ferry's stern embarkation point. The ferry was made fast aft with a stern line and a spring. A similar ferry was berthed at the same pier in a stern-to-stern configuration.

After the last passenger embarked, the crew member at the aft embarkation point raised the gangway and let go the stern line in preparation for departure (Figure 1). At the same time, the master informed the crewman that there were still a few passengers at the pier, so the crewman lowered the gangway back down onto the deck for them to embark.

As the final passengers were stepping on board, the second ferry propelled ahead. The second ferry's propeller wash caused the stern to swing out and the gangway fell off the embarkation point. The passenger on the gangway at the time stumbled (Figure 2) and could have fallen into the sea; the crewman realised what was happening and grabbed the passenger, preventing this.

Figure 1: Shore gangway raised, and the stern line cast off

Figure 2: The stumbling passenger as the gangway fell off the ferry's embarkation point

For illustrative purposes only: not to scale

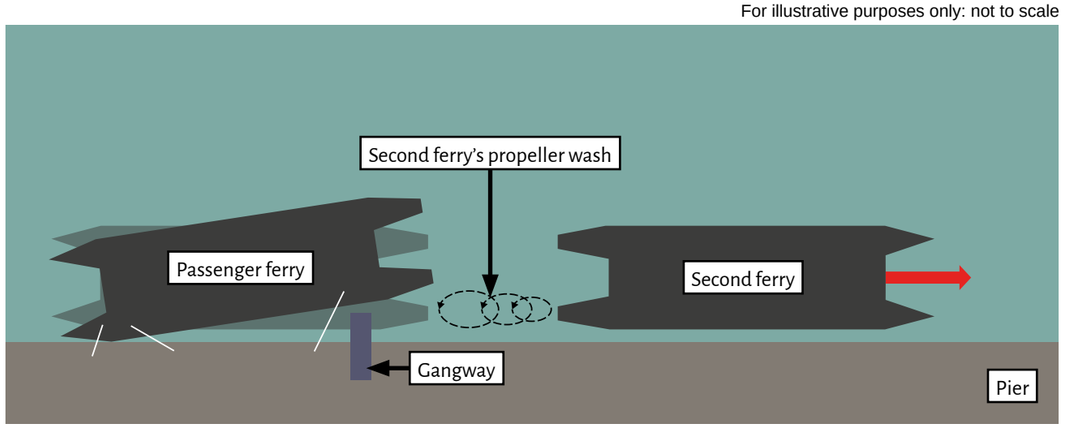

Figure 3: The effect of the second ferry's propeller wash, with no stern line attached

The Lessons

1. **Observe →** It was unsafe to embark more passengers after the stern line had been released. The ferry was not properly made fast and became vulnerable to the effect of the second ferry's propeller wash (Figure 3). Communication between the bridge and the mooring deck is key to ensuring that crew know and understand the full situation, particularly where such evolutions can be very repetitive. It is also important for bridge teams to monitor the embarkation point closed-circuit television (CCTV), if provided, to maintain a good awareness of passenger movements.

2. **Procedure →** The company issued a fleet circular because of this accident, reminding its crews of the importance of all mooring lines being in place whenever the gangway is lowered.

9

Belt and braces

cargo vessel | accident to person

Two engineers on board a moored cargo vessel were performing routine planned maintenance to a deck air compressor (Figure 1). The engineers met in the machinery control room, prepared a risk assessment for the work, and isolated the power to the compressor in line with the company's lock-out/tag-out (LOTO) procedures. After completing the maintenance, but before replacing the v-belt guards, the engineers switched the power back on to test the compressor.

One of the engineers was making some final adjustments to the compressor's drive belt when the compressor automatically started, trapping his hand between the pulley and the belt and severing part of his index finger (Figure 2). After hospital treatment, the engineer returned to the vessel.

The company conducted an internal investigation and issued a safety bulletin that reminded ship's staff of its LOTO procedures and the importance of risk assessments.

Figure 1: Deck air compressor belt

Figure 2: Severed finger at the time of the accident (top) and after hospital treatment (bottom)

The Lessons

1. **Hazard →** Risk assessments are best conducted on site so that all potential hazards, such as automatic starting of equipment, can be identified. The benefits of reviewing generic risk assessments and undertaking dynamic risk assessments cannot be underestimated.

2. **Risk →** If it is necessary to test or adjust equipment without safety guards in place, as in this case, the risks associated with the task should be identified and mitigated in the risk assessment.

3. **Procedure →** LOTO procedures must remain in place until all maintenance tasks are completed. If adjustments are required to systems after a test run, then a second LOTO procedure should be instigated.

No going back

passenger transfer vessel | contact

A passenger transfer vessel was approaching a wind farm turbine with three crew and three windfarm technicians on board. It was the first trip of the day and weather conditions were favourable with good visibility, a light breeze and gentle sea. The vessel propulsion system's landing mode gave the skipper precise manoeuvring control when approaching wind turbines to embark or disembark passengers.

As the vessel approached the turbine's landing platform, the skipper reduced speed and selected the landing mode in preparation for the technicians' transfer. The skipper moved the propulsion control lever to astern to further reduce speed. However, the vessel did not respond as expected and so he increased the lever fully astern. This had no effect and the transfer vessel made heavy contact with the landing platform.

The impact caused a bow indentation (Figure 1) and buckling damage to the hull plating (Figure 2). One of the technicians was injured when he was thrown against the table in front of his seat; he was treated by ambulance paramedics when the vessel returned to harbour.

Figure 1: Indentation damage to the passenger transfer vessel's bow area

Figure 2: Deformed internal frames

Figure 3: Water ingress damage (unrelated to the propulsion control loss)

The Lessons

1. **Risk →** A post-accident technical analysis identified that the loss of propulsion control resulted from a seizure of the mechanical arm controlling propeller pitch. This occurred because the installation arrangement resulted in excessive wear, with a consequent risk of the pitch control arm locking when in use; something that the manufacturer was able to replicate in post-accident trials. Although not the cause of the accident, technical analysis found excessive water ingress in an electrical terminal box (Figure 3) on the propulsion control system. It was further established that the water ingress was caused by previous maintenance to an adjacent seawater cooler, when residual water had been allowed to drain over the electrical control box. Since the accident, the company has taken action to improve the installation arrangements of the propeller pitch control system and relocated the seawater cooler.

2. **Communicate →** It is important to keep passengers informed if things are going wrong. Although this accident was hard to prevent, post-event CCTV analysis indicated that there was about 10 seconds between the skipper realising that control was lost and the impact. This is a very short timeframe in which to deliver an emergency response; however, taking any opportunity to warn passengers and call for them to 'brace' would potentially reduce the risk of injury.

3. **Maintain →** Take care with maintenance and repairs. The residual water that drained away during the seawater cooler maintenance should have been prevented from flowing over electrical components. Taking time to protect other equipment from damage during maintenance tasks will prevent damage and future breakdowns.

4. **Check →** Always check the propulsion manoeuvring control response. The vessel was on its first trip of the day out to the wind farm. At the end of the passage, and before the precise manoeuvring, a full function check of all propulsion modes, including 'testing the brakes' by going astern, may have detected the problem in advance of the heavy contact.

Fretting failure in gearbox

live fish carrier | machinery

It was a poor night with high winds and rough seas when a live fish carrier lost propulsion due to a gearbox failure. Without propulsion, the vessel lay beam on to the sea and began to roll heavily, making life extremely uncomfortable for the four crew on board. The vessel was less than 2 nautical miles (nm) from land and was being blown quickly onshore by the prevailing wind. The master of the stricken vessel raised a VHF distress transmission. Fortunately, another fish carrier heard the distress call and was near enough to get a towline onto the drifting vessel before it grounded on the rocky shoreline. A little later, a lifeboat and emergency towing vessel arrived and accompanied both vessels to a safe harbour.

An inspection the following day found that the main input shaft (see figure) along the top half of the gearbox had failed. The damaged parts were dismantled and dispatched to the gearbox manufacturer who established that the most likely cause of failure was fretting (micro movement) between the gearwheel and shaft, which introduced a crack to the area and resulted in failure. Examination revealed that the failure occurred where the shaft transitioned to the flange for the gearwheel.

The vessel was out of service for nearly a month while a new shaft was fabricated and fitted.

For illustrative purposes only: not to scale

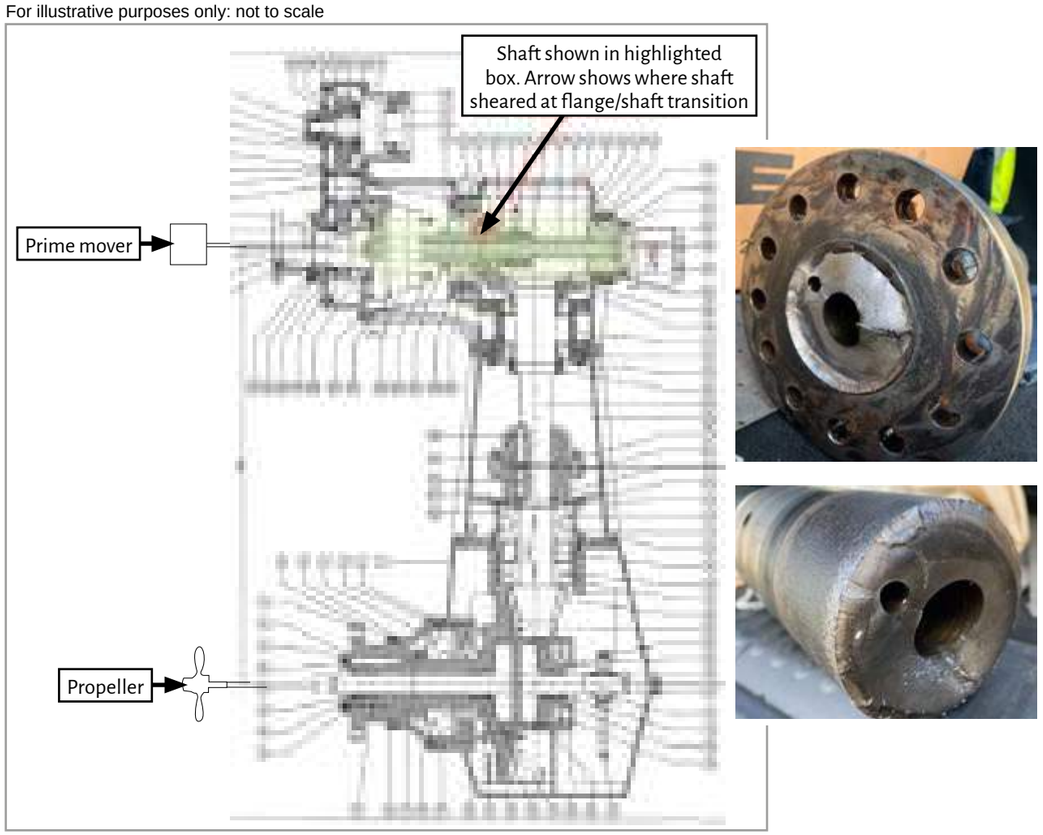

Figure: Gearbox damage and (inset) broken shaft

The Lessons

1. **Maintain →** The vessel had a history of propeller fouling and minor groundings. The controllable pitch propeller had developed a malfunction, during which the response was erratic and jerky.

   - Intermittent problems with propulsion should not be left unattended. Defective propulsion could lead to navigational accidents if vessel control is erratic, especially in shallow and busy waterways.
   - Events that stress the propeller can cause significant loading on the driving gear, resulting in relative movement between gearwheel and shaft. Failure is almost inevitable when a crack develops.

2. **Check →** Since its delivery in 1996, the manufacturer had not serviced or inspected the vessel's gearbox. Routine inspections and regular gearbox oil analysis were not conducted.

   - The gearbox is a complex item of machinery. It needs routine inspection and frequent monitoring to ensure that incipient failures are detected early and corrective actions taken. Regular gearbox oil analysis can be used to detect particles, and therefore provide an early indication of excessive or uneven wear on the components.

The fog of illusion

freight ferry | grounding

Navigating in fog can mean that emerging situations are difficult to understand and, sometimes, stop.

A ro-ro freight ferry was inbound to its destination port on a summer morning. The weather was fine and the seas slight, although there were numerous fog patches in the area. The bridge team comprised the master, OOW and a Pilotage Exemption Certificate (PEC) holder. The PEC holder had the con and was using the radar to navigate; he was also steering the ferry himself.

It was two days after spring tides and entry into the port was planned for the middle of the ebb tide. The tidal stream was predicted to set across the harbour entrance to the north-west at about 0.8kts, reducing in the confines of the breakwaters.

As the ferry approached the breakwaters of the port at a speed of 10kts, the visibility reduced to about 150 metres. The master asked the PEC holder if he was happy to continue and the PEC holder confirmed that he was.

The planned track into harbour was 237° but the ferry was making good a 253° course over the ground. The PEC holder altered the heading to 225° and, as the ferry returned close to track, further adjusted the ferry's heading to 234°.

Once the ferry was in the channel, the PEC holder reduced its speed to 6.5kts. The ferry's heading was altered to 245° and the ferry then moved to the north of track. Neither the bridge team nor the PEC holder, who was observing the ferry's movement by radar, immediately noticed the change of track. The ferry had moved to the edge of the navigable water before the master and PEC holder saw the northern breakwater and realised the danger.

The PEC holder applied port helm to counteract the tidal stream. With 30° port helm, the ferry rapidly returned to track before crossing to the south. After about 15 seconds, the PEC holder realised that the ferry's bow was approaching the southern limit of the channel and applied full starboard helm. The manoeuvre was too late and could not prevent the ferry from grounding on the rocks that lay at the edge of the channel.

The ferry was eventually refloated with the assistance of a harbour tug, but not before suffering substantial damage to the port side of the hull (see figure), port propeller and rudder. There was no pollution and nobody sustained injuries.

Figure: Damage to the port side of the hull

The Lessons

1. **Teamwork →** Bridge teams play an essential part in maintaining ship, crew and cargo safety. To be effective, a bridge team must have a shared mental model of the task in hand and each member of the team must be clear about their duties. When the task includes pilotage, the pilot or PEC holder must be incorporated into the bridge team and the plan discussed in detail.

2. **Procedure →** Navigational equipment continues to develop and advancements bring greater capability for improving the bridge team's awareness of progress and navigational hazards in proximity of the ship. However, this equipment can only improve safety if used correctly.

3. **Plan →** Restricted visibility is a game changer. Bridge teams should always plan for the unexpected and a well-placed abort position can prevent a ship from being placed in potential danger. It is usual for companies to require bridge manning to be increased in poor visibility. This is so that tasks can be shared and no-one becomes overloaded.

Making your mark

bulk carrier | contact

A small, coastal bulk carrier was heading upriver towards its intended berth. It was early morning and there was a moderate breeze on the port quarter and the last of the flood tide (Figure 1); visibility was good but in darkness.

The master, second mate, lookout and a pilot had been on the bridge for the passage upriver. In the approach to the berth the second mate and the lookout went to the forward mooring station, leaving the master and pilot to conduct the berthing manoeuvre. The master's plan was to swing the vessel to port through 180° and berth starboard side to the quay (Figure 1). As a matter of routine, the master had set a radar range marker 20m offset from the bow as a safety reference to avoid contact with the quay during the turn.

The pilot thought the speed was slightly high just before the turn began, but did not raise concern. The master was controlling the vessel and started the turn using port rudder, slow astern and full bow thruster to port.

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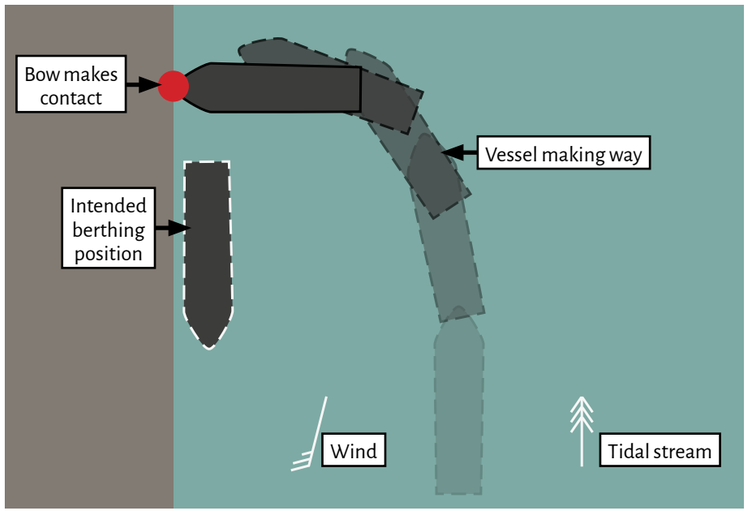

Figure 1: Vessel's track, including environmental effects

After swinging almost 90°, the second mate radioed the bridge, warning that the bow was passing too close to the quay; however, this came too late for the master to take effective avoiding action and the vessel's bow made heavy contact. The bow was scraped and dented and the impact left a paint mark on the quay wall, although it was undamaged (Figure 2).

Figure 2: Damage to vessel and (inset) paint mark on the quay

The Lessons

1. **Plan →** Passage plans are 'berth-to-berth' for a reason: to ensure that there is a careful plan for every phase and that it is properly executed. In this case, neither the wind and tidal stream effects nor the optimum speeds were considered in the berthing plan. A safer course of action might have been to reduce speed earlier and then use the wind and tidal stream to aid a turn at rest, with little or no headway.

2. **Communicate →** Pre-arrival briefings that incorporate the pilot are significant milestones in delivering a shared mental model. Such briefings should include the forecasted and actual weather conditions, planned speeds, and expected safe passing distances of navigational hazards. Only then can navigational decisions or deviations from the plan be challenged. The master should encourage all crew and the pilot to speak up where there is uncertainly; such challenge should then be acted upon or the reason given for why it is not.

3. **Action →** The forward mooring station did not provide regular updates on the distance to the quay. A single report was made, which came too late to take avoiding action. To avoid misunderstanding, early and regular reports on closest points of approach and actual distances should be clearly communicated.

4. **Monitor →** Use of a radar range marker was a reasonable safety barrier to aid the turn; however, it needed to be monitored. The master directed his attention to handling the vessel and other crew members, who could have assisted him, had left the bridge and gone to their mooring stations. Good bridge team management can help to alleviate these situations by making sure everyone knows their role and that navigation aids are effectively monitored for signs of danger.

Drip, drip, drip, bang

naval auxiliary vessel | machinery

A naval auxiliary vessel was in harbour undergoing a maintenance period. The purser, who was working in her cabin, heard a loud bang followed by the noise of the lifeboat davit deploying on the adjacent upper deck.

The alarm was raised and the chief officer, bosun and other duty personnel attended the scene. The lifeboat davit was found to have partially deployed (see figure) but with no control input. It was apparent that the loud bang occurred when the lifeboat's gripe pins sheared. After ensuring that the lifeboat was safely held on its wire falls, the bosun used the pendant operating controller (see figure) to return the davit and lifeboat to the stowed position.

Figure: The partially deployed davit and lifeboat

The Lessons

1. **Hazard →** A post-accident technical investigation established that the incident happened because of water ingress to the pendant operating controller, causing an electrical short that activated the 'dead ship' launch system. The water ingress into the electric pendant controller occurred because its cable gland and grommet had deteriorated over time, allowing water to pass along the cable into the controller's housing. The davits and lifeboats had recently passed a statutory inspection with no defects or operating failures reported. The davits were also subject to regular weekly and monthly onboard maintenance checks by the crew. However, similar deterioration of the other pendant controller on board was also found.

2. **Maintain →** Checks on electrical equipment, especially when permanently stored on the upper deck, need to be rigorous and any risk of water ingress eliminated. The pendant controllers were stowed on the davit arm when not in use, exposed to the environment with the consequent risk of degradation. Although not specifically mentioned in the maintenance instructions, such controllers should be examined for wear and tear as part of safety and maintenance routines.

15

On the rocks!

cargo vessel | grounding

A general cargo vessel being navigated using an Electronic Chart Display and Information System (ECDIS) was sailing through coastal waters on a dark night with a large following sea. The chief officer (C/O) received a call from a local fishing vessel to warn him he was heading into shoal waters, which he acknowledged by replying that he was about to alter course. He then instigated a slight alternation to starboard as per the passage plan. Moments later the vessel came to a juddering stop as it grounded on a well-charted and marked shoal (Figure 1).

The crew were mustered but, after an initial assessment of the damage, the movement of the vessel on the rocks became so violent that they had to lie on the deck of the bridge. The master informed the local coastguard that he intended to abandon ship and within 3 hours the entire crew had been safely evacuated by helicopter.

The vessel was successfully refloated by salvors after temporary repairs but declared a constructive total loss and subsequently towed to a scrapping facility.

Figure 1: The general cargo vessel aground on the shoal

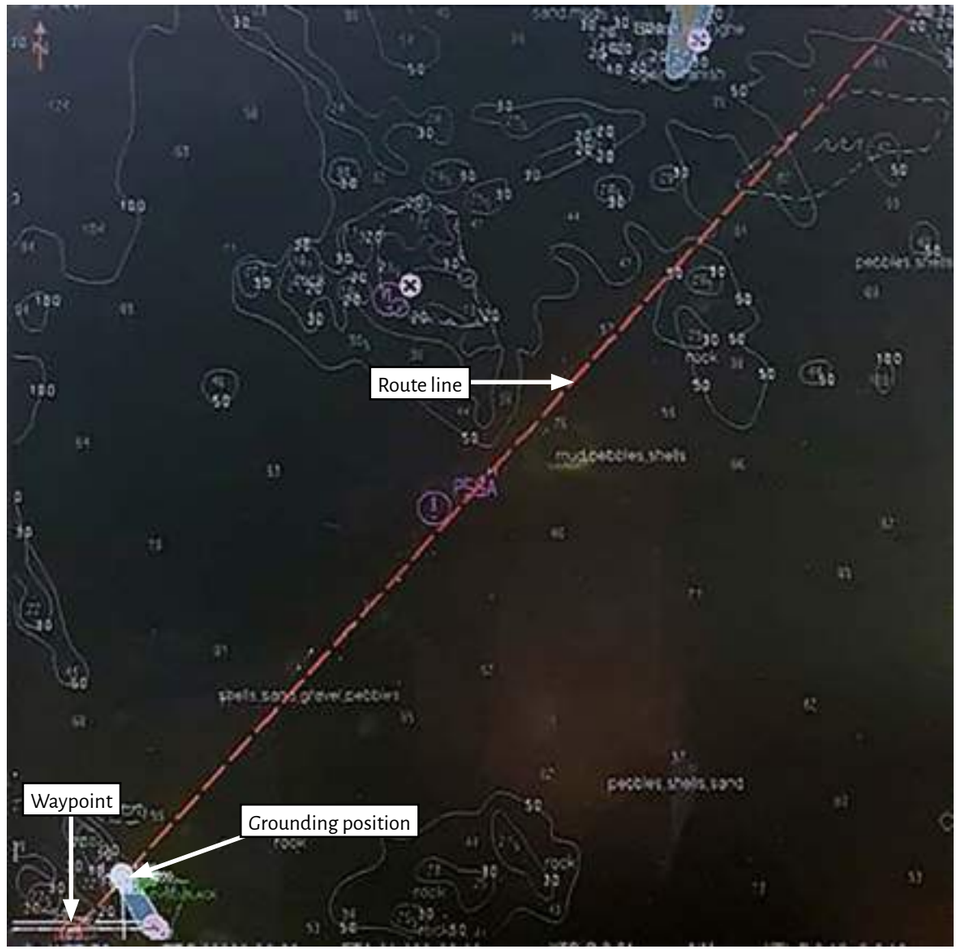

Figure 2: The passage plan took the vessel directly over the shoal

The Lessons

1. **Plan →** The ship's master prepared the voyage plan within approximately one and a half hours while alongside in the previous port. Information had been insufficiently appraised before the master started plotting courses on the vessel's ECDIS and so an IMO recommended route, which would have taken the vessel safely past the shoal that the ship grounded on, was missed. It is essential that information is fully assessed before plotting a route, and that enough time is allocated for the critical task of voyage planning.

2. **Check →** The manning on the vessel did not allow time for the C/O to conduct the voyage plan in line with the safety management system and so the master completed it, which inadvertently led to no second check of the plan. The officer conducting the voyage plan should undertake a full check of the route on appropriately-scaled electronic navigation chart cells before, in most cases, passing it to the master for verification. To supplement the visual checks, all ECDIS have a route check function, which will highlight any conflicts with charted data, whether selected or not, that fall within the cross-track limit of each leg defined in the voyage planning process. The master did not use this tool and so an important safety barrier was ignored; in circumventing the checking process, the master became a single point of failure.

3. **Observe →** Although the C/O followed the master's planned route, he ineffectively monitored the vessel's safe progress along the planned track and conducted a planned course alteration that took the vessel onto the charted shoal (Figure 2), despite acknowledging a warning from a local fishing vessel. The ECDIS look ahead alarms had been deactivated and so the crossing of a safety contour and proximity to an isolated danger, although charted, did not generate a warning. The C/O and his lookout also failed to see that the vessel was heading to the north of a south cardinal mark, which should immediately have caused concern. It is vital that bridge teams use all available tools to monitor the safe passage of their ship.

16

One small step for man

pilot ladders

A review of the 200 plus pilot ladder incidents reported to the MAIB in 2021, several of which involved failures during pilot use, has highlighted some key safety messages:

The pilot ladder should be in good condition and regularly inspected. Many reported instances involved frayed or damaged side ropes, particularly at the lower end (Figures 1 and 2). Post-incident reports have identified that the failures were a consequence of the side ropes' poor condition, which a routine visual inspection would almost certainly have detected. If the side ropes are frayed, or in any way degraded, do not use the ladder. Pilot ladders should be less than 30 months old; the year of assembly or reassembly can be found on the identification plate usually located on the lower spreader (Figure 3).

Figure 1: Example of an elderly ladder with its side ropes (inset) in an unsatisfactory condition

If the side ropes are frayed, or in any way degraded, do not use the ladder

The pilot ladder should be safely rigged. Reported incidents include inappropriate rigging arrangements such as the use of shackles or ladders attached to guardrails. Pilot ladders should be secured to deck strong points by a rope stopper lashed to the ladder's side ropes. When rigged, the steps should be horizontal, clean, in good condition and evenly spaced. There should be a maximum of two replacement steps.

Other considerations include the availability of communication and lifesaving appliances at the access point, an obstruction-free surrounding deck area, and adequate ladder and deck lighting at night. Pilot embarkation and disembarkation must be overseen by a suitably qualified crew member, with available communication to the bridge. When not in use, the pilot ladder needs to be covered to avoid exposure to contaminants or other elements that may cause rope degradation and failure.

Further guidance is available in the *Pilot Boarding Arrangements – Best Practice* poster (Figure 4) produced by Associated British Ports with the cooperation of other industry bodies.

Figure 2: Example of a failed pilot ladder side rope

The year of assembly or reassembly can be found on the identification plate

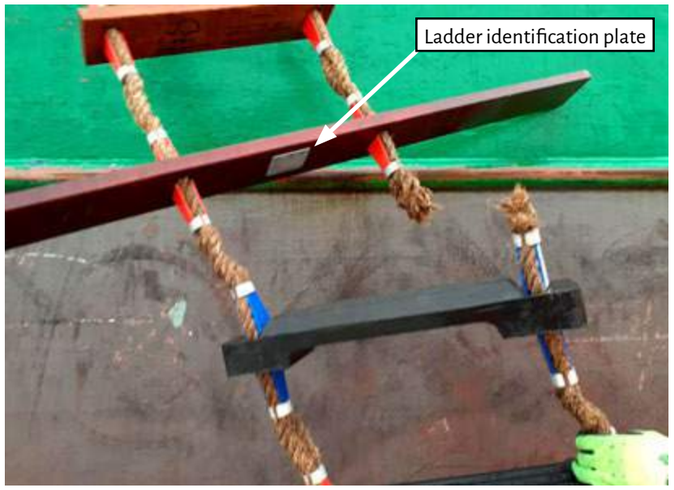

Figure 3: Failed pilot ladder, showing ladder identification plate location

16

When not in use, the pilot ladder needs to be covered to avoid exposure to contaminants or other elements

Figure 4: ABP's poster promoting best practice for the rigging of pilot boarding arrangements

FISHING VESSELS

I suppose we can all look back on our past and think of a few 'close calls' or incidents that have occurred while fishing. Some probably stand out more than others. I guess I can say that I carry a few 'I owe you' cards. I have been overboard twice, once with a rope around my leg while shooting pots away on a crabber. On that occasion, I chose to take a chance and jump over the side with the pot before I lost my leg; luckily, I managed to get my foot out of my boot and make it to the surface. I was not wearing a PFD and could not tell if I was swimming up or down in the darkness but, as I broke the surface, I saw the boat facing me in the water, waiting to pick me up.

My closest 'scrape' was a few years ago when potting on Christchurch Ledge. The forecast was SW 4-5, decreasing 3, with a 1.2m swell. The wind had already gone through by the time we left port so all we had to contend with was a hard spring flood and a 4ft swell. We aimed to haul just 100 pots and be back to meet the lorry at 1000, so a nice short day, or at least that was the plan. Unfortunately for myself and Martin, everything was literally about to go sideways!

We hauled the first few strings of pots and were catching above average numbers of good-sized lobsters. The sun shone and the wind had gone completely, leaving a glassy sea with a 3ft swell set coming through every few minutes – a lovely morning. At 0845, with one string left to haul, a nearby fisherman radioed to say he was going home and that I was now the only boat there. I went out on deck to tell Martin that we would finish hauling this string and head back in earlier than planned. The next pot came on board with a repair needed, just as a set of swells started to roll through. Martin was on the winch and he removed the backline from the pot hauler so we were not attached to the seabed, while I went into the wheelhouse to get the mending kit for the pot on the gunnel. As I headed back to the pot, I noticed that it was being pulled over the side of the boat as the bow lifted rapidly on a larger than usual swell, and I can only describe what I saw out of my forward windows as like something from a Hollywood movie.

The noise was like nothing we had ever heard before

On the horizon, coming towards us about half a mile in the distance, a large unbreaking black wall now obscured the views of the land 7 miles on the other side of the bay. I shouted to Martin that we were shooting away "*NOW*!" as I put the boat hard to starboard and increased the power to my port engine, which was already in gear going up the tide. I ran outside and threw two pots over the starboard side to give me slack to get the back rope into my pot ramp between my outboards and, as I was stood at the stern, the wave ran on us. The noise was like nothing we had ever heard before; I have seen a few waves over the years, but this one was as far as the eye could see inshore and out and breaking. The bow dropped vertically and 10ft of water was above us – I was falling headfirst into the bow when I was knocked out.

What on earth would I tell his wife and kids?

The boat was upside down when I came to, directly facing me and 15 metres away. As I floated in the water supported by my PFD and trying to take in what had happened it suddenly dawned on me that there was no sign of Martin! My fish boxes and life rings had floated free but I could not see my crew: What on earth would I tell his wife and kids?

I saw him bob up from under the bow and climb onto the upturned hull and we locked eyes for a few seconds. Another swell rolled through but nothing like the one that hit us, and I swam over to the boat and climbed out of the water. I remember asking him if he was okay and then whether I was; he said I was bleeding. I was so full of adrenaline that I was unaware I had split my head open and was covered in blood. The next 4 hours were spent trying to stay on the bottom of the boat, which was now the top. The flood tide eased and the ebb started to push us back to where we went over, on top of Christchurch Ledge.

The wind was up, the swell was up, we were very cold and we now faced the possibility that, although we had survived the original upending, we were both doubtful of going back through it as there was now a wall of breaking seas of wind over tide.

The bottom of the hull was only just out of the water by a few inches, but it was enough for us to hang on. It had snowed in the previous weeks and so the temperature was cold and we were feeling the effects of that as well as being in wet clothing. After 4 hours, a passing yacht saw us in between the swells and called the coastguard who in turn paged Mudeford RNLI – the station I helm. The lifeboat crew were told we were a sailing dinghy, so they had more than one surprise when they turned up to find us instead!

I have replayed the event many times, both in my head and in my sleep, and asked myself what I could have done differently to change the outcome.

The boat was in very good condition, well looked after with all the safety kit on board, and our training certificates were up to date. Martin had been working with me for 15 years and between us we had 50 years' experience of fishing that bit of water.

The MAIB read the files regarding the incident, but their conclusion was the same as mine: it was a rogue wave – we could not have predicted it or known it was going to happen. The boat, equipment, paperwork, etc. were all in order, we had the forecasts, we had a plan – there was nothing we could have done to prevent it.

PETE DADDS | Fisherman (skipper/owner) and volunteer helm at Mudeford RNLI

It was inevitable that Pete would grow up to work on boats, having spent his early childhood in and around the boatyard where his dad was a foreman. When he was 13 years old, his brother took him fishing and he was literally hooked, spending every spare moment of his teenage years either fishing on the beach or out on a boat. During school holidays and weekends he would earn his pocket money helping out on the mackerel boat trips. When Pete left school, he enrolled on the Seafish Youth Training Scheme where he worked on a variety of boats and built up the knowledge and experience that eventually allowed him to buy his own boats, the latest of which is a 6.9m Cheetah catamaran that he has owned and worked for the past 17 years.

In 1993, Pete joined Mudeford RNLI at a time when most lifeboat crews consisted of fishermen and is proud to still be there as helm and their lifeboat trainer/assessor. He is also vice chairman of both the Mudeford and District Fishermen's Association and the South Coast Fishermen's Council.

17

A handy solution

stern trawler | accident to person

On board a large stern trawler, a crew member's hand was crushed when it became trapped between a hydraulically operated trawl wire guide pin and the deckhead at the stern of the vessel. The crewman needed surgery on his damaged hand and fortunately made a full recovery.

The vessel was fitted with three 15cm diameter pins on each side of the boat. Hydraulically operated, they rose out of the deck and located into sockets in the deckhead (Figure 1).

The crew had just completed moving their vessel to another berth within the port and had secured its mooring ropes. As an additional security measure, a further stern line was in the process of being put out, with the intention that the vessel end would be looped over one of the large diameter trawl guide pins in the transom to secure it.

The injured man had rested his hand on the top of the pin just before it was raised by another crew member operating the hydraulic controls. His hand was then caught between the pin and the deckhead (Figure 2).

The company that owned the fishing vessel completed an accident investigation and a review of its risk assessments. Among the mitigating measures identified, it undertook to paint warning marks both on the top and bottom of each pin so that the red warning paint on the bottom appeared when the pin was raised (Figure 3).

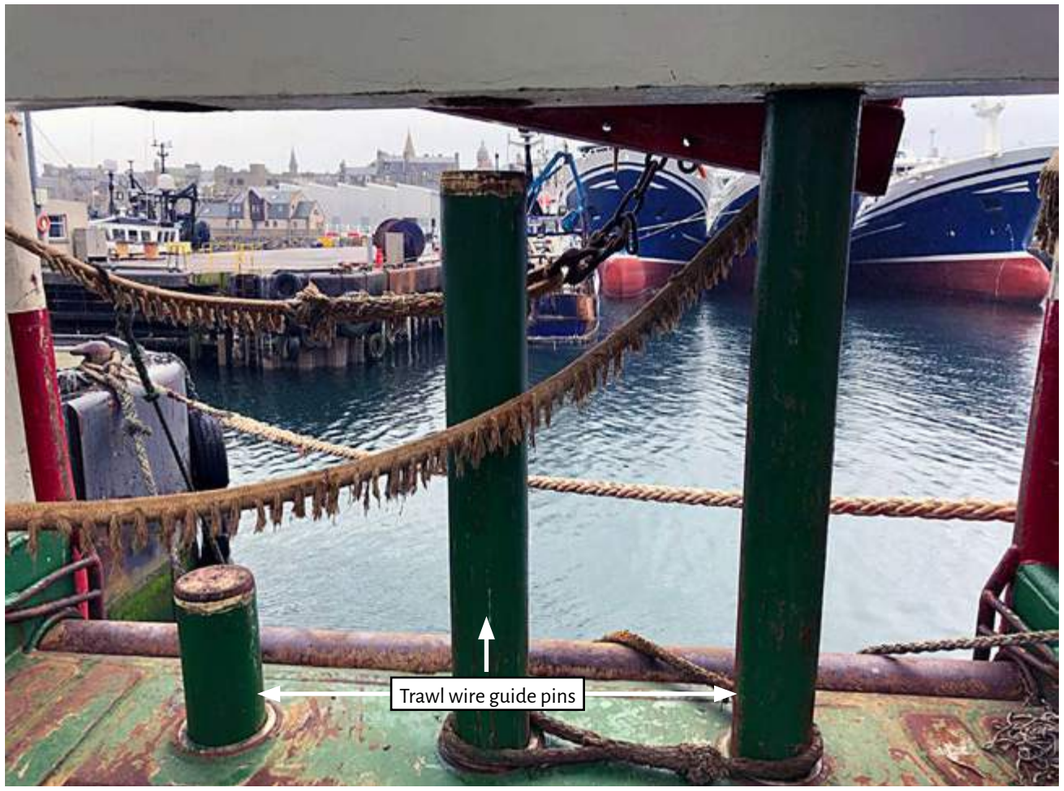

Figure 1: Hydraulic trawl wire guide pins at stern of vessel

For illustrative purposes only: not to scale

Figure 2: Top of guide pin and deckhead socket

The Lessons

1. **Check →** Working on any vessel is hazardous, particularly if there is moving machinery in the vicinity. If machinery can be started or be caused to move remotely, then the machinery operator must check that the workspace is clear before doing so.

2. **Hazard →** In this case, the crew member absentmindedly placed his hand into a dangerous location. The company has taken steps to visually highlight the danger zone to remind workers of potential hazards. Emphasising hazards or hazardous areas around a vessel is a simple, cheap and effective means of reducing risks and can become part of onboard training. Getting crew to identify hazards and then to highlight them can be an effective means of safety management engagement on board any vessel.

Figure 3: Guide pins with warning paint on the top and at the base

Water, water, everywhere

fishing vessel | fire

A large ocean-going squid fishing vessel was moored alongside in a ship repair facility, undergoing scheduled maintenance. Most of the crew had gone on leave and the ship had been left in the shipyard's care. A welder was carrying out repairs in one of the ship's insulated cargo holds and inadvertently set fire to some insulation. Fortunately, he escaped from the hold and managed to raise the alarm.

As the fire intensified, it quickly spread to adjacent holds and the ship's accommodation. The local fire service fought the fire, assisted by a harbour tug equipped with firefighting capability. The firefighters and tug deluged the vessel with water (see figure), which began to flood its hull. Because its crew were unable to start the ship's equipment and pump out the water, the ship became increasingly unstable as the hull continued to fill and it eventually capsized and partially sank on the berth.

Figure : The fishing vessel

Post-accident investigations identified that no fire watch was maintained to help the shipyard welder and no hand-held fire extinguishers were available where he was working.

Several months later the vessel was refloated, but the fire and flood damage resulted in it being declared an insurance total loss and it was scrapped.

The Lessons

1. **Risk →** Hot work is always hazardous and a hot work permit should be in place before work begins. Risk reduction measures should include maintaining a fire watch in and near the hot work site and ensuring first response firefighting equipment is close to hand.
2. **Procedure →** When placing a vessel into a shipyard facility, its management and crew should check that safe operating procedures are in place for the planned tasks; this includes ensuring availability of staff sufficiently conversant with ship's systems to be able to deal with most emergency situations.
3. **Equipment →** Vessel instability due to large volumes of water is an additional hazard when fighting fires on board ships. To prevent this, make sure there are available means to remove water from decks and compartments.

The price of FAME?

beam trawler | machinery

A 15m beam trawler suffered engine failure while fishing and had to be towed back to port by a Royal National Lifeboat Institution (RNLI) lifeboat. Nobody on board was injured and there was no external damage to the vessel.

A service engineer's investigation found that the engine failure was caused by clogged engine fuel filters, serious damage to the engine fuel system and contamination within the fuel tank, which resulted in extensive engine repairs and complete fuel system cleaning.

The trawler's fuel supplier had recently started to provide fuel containing Fatty Acid Methyl Ester (FAME), commonly known as biodiesel. DfT's Renewable Transport Fuel Obligation required that certain non-road mobile machinery vehicles burned FAME fuels; this regulation applied to some inland waterway vessels, but not to seagoing vessels. However, some suppliers mistakenly believed it was mandatory to supply seagoing vessels such as pleasure yachts and fishing boats with a marine gas oil fuel that contained up to 7% FAME.

FAME-based marine fuels present certain challenges to safe engine operation:

- FAME is hygroscopic so tends to attract the moisture often found in marine environments;

Figure: Fuel filter clogged with diesel bugs

- FAME and the associated water provide an ideal culture for microbial biological contamination, more commonly known as diesel bug (see figure);
- Diesel bug can cause expensive fuel system problems, resulting in blocked filters, damaged fuel pumps and injectors, a contaminated fuel tank and, ultimately, engine failure. Modern common fuel rail engines may be especially sensitive to this problem due to high operating fuel pressures and temperatures and large fuel return flow back to tank;
- FAME can be corrosive to rubber and copper and lead to fuel system damage such as leaking seals;
- FAME fuels tend to oxidise quickly and should not be stored for long periods.

The Lessons

1. **Communicate →** Suppliers should inform their customers that their fuel contains FAME.
2. **Maintain →** Fuel suppliers who choose to supply FAME to seagoing vessels should make sure moisture does not accumulate in their shore tanks and that the fuel is regularly tested for bugs.
3. **Check →** Vessel owners should check FAME fuel compatibility with the engine manufacturer.
4. **Procedure →** Vessels choosing to burn FAME fuel may require additional fuel filtration.
5. **Action →** FAME suppliers and users should use fuel stocks quickly to reduce the risk of oxidisation.

It came off in my hand

trawler | man overboard

During the early hours of the morning, before daylight, the two crew on board a 10 metre trawler (see figure) were preparing for their second haul of the night. The weather was fine with a slight swell as the skipper and crewman, neither of whom was wearing a personal flotation device (PFD), made their way onto the deck. The boat was underway, steering by autopilot as the nets were hauled to the surface. The skipper was working the winch while the crewman waited for the net to be positioned so that he could release the catch from the cod end into the reception hopper on the shelter deck. However, as the cod end was raised it became caught on the lip of the hopper so the crewman climbed up onto the net drum to pull it into the correct position.

When the crewman pulled on the netting to reposition the net, the section he was pulling suddenly broke and came away in his hand. The crewman lost his balance and fell from the net drum to the deck below; landing upright on his feet he almost sat on the bulwark, but his momentum carried him backwards over the bulwark and into the sea.

Figure: The trawler

The skipper witnessed the crewman's fall and quickly threw a lifebuoy into the sea before making his way down from the shelter deck and into the wheelhouse. He was able to turn the boat and steer back to the area where the deckhand had gone overboard before stopping and calling out to him. The skipper was happy to see the crewman only a few feet away, the unseen lifebuoy floating a short distance from him. The skipper threw a mooring rope towards the crewman who was able to grasp it and be pulled alongside. With difficulty, the skipper helped him back on board.

The Lessons

1. **Risk →** Ultimately, it is better not to go into the water in the first place. In this case, the crewman was working in a position where he was pulling towards the side of the boat and any failure would almost inevitably lead to him going overboard. A moment to consider the risk of any activity, especially when something changes, is a moment well spent.
2. **Cold water shock →** The sea temperature that night was about 11°C. Falling into water below 15°C can kill a healthy person in minutes. The initial gasp due to the shock of the cold water on your skin may result in water entering your lungs, followed by hyperventilation and a dramatic increase in heart rate and blood pressure, which can lead to cardiac arrest. If you are fortunate enough to survive the cold shock period, your body will soon begin to react to the cold and you will be unable to swim, climb a ladder or keep hold of a rope. In this case, the skipper was extremely lucky that he found the crewman quickly and was able to assist his recovery. The outcome could have been very different if the skipper had been unable to locate the crewman or help recover him back on board.
3. **Equipment →** Wearing a PFD when working on the open deck is strongly recommended and is also common sense. Wearing a PFD increases your chances of survival and gives your rescuers more time and a better chance of locating you. Put simply, a PFD can save your life if you end up in the water.

21

Lookout for anchored vessels

fishing vessel and yacht | collision

Departing harbour around midnight, two fishing vessels set off to deploy several fixed nets. The standard routine was to leave the nets in place for about 3 hours before recovering them, at around sunrise, and then head back into port.

Having shot away their first net, one of the two fishing vessels started to sort out their second net on the aft deck. The net had become tangled so the skipper went aft to deal with it, leaving his crewman in the wheelhouse. The vessel was steaming along at around 3kts when there was a loud bang.

It soon became evident that the fishing vessel had hit a yacht anchored in the bay. The yacht's crew came on deck to see what had happened. Discovering a split in the port side of their yacht, which was now taking on water, the yacht crew agreed to be towed into the nearest harbour. The anchor rope was released and the yacht's crew donned lifejackets and started bailing the flood water out of their vessel. The partner fishing vessel arrived to check on the situation and its skipper remarked that his fishing vessel had earlier passed near the same spot; he had been travelling at 6kts and had not noticed the anchored yacht.

The tow into harbour was uneventful and the yacht was placed on a slipway to assess the damage. The split in the yacht's side was larger than first appreciated and the water ingress had caused some internal damage, but there were no injuries. The fishing vessel was undamaged.

Figure 1: The anchored yacht post-accident against background lights from the shore

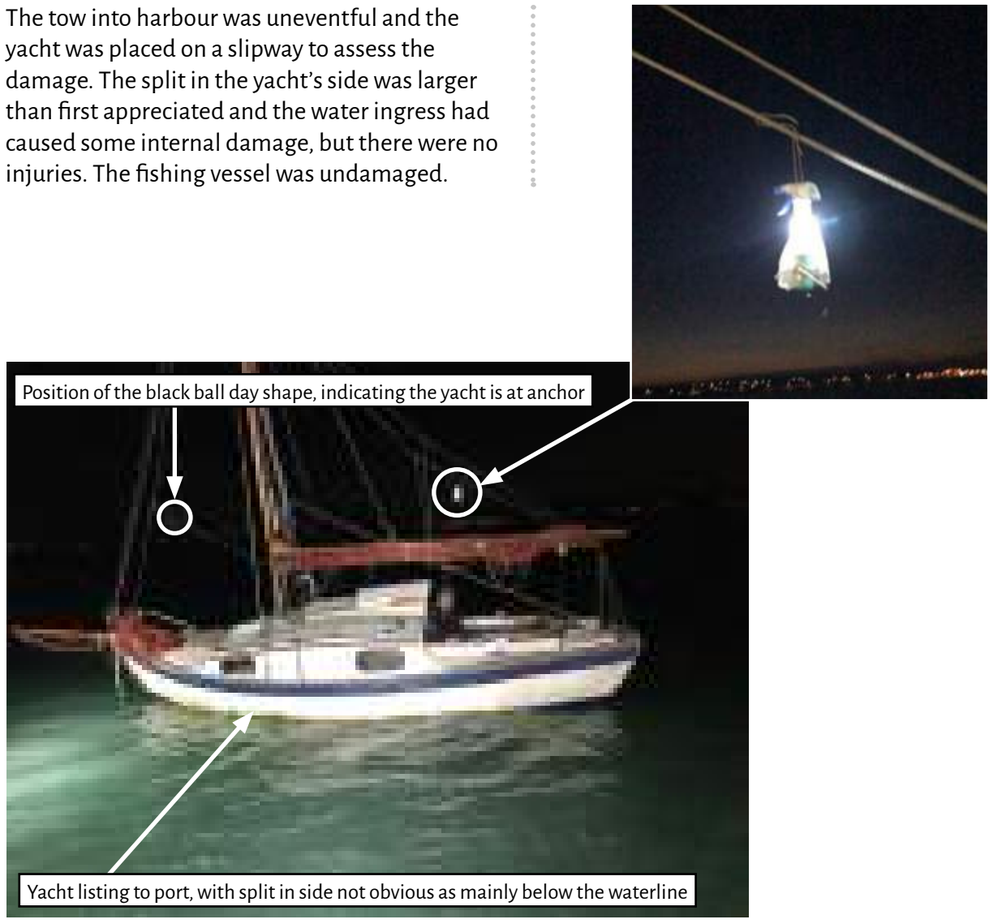

Figure 2: The anchored yacht listing to port, with (inset) the unorthodox anchor light visible

The Lessons

1. **Observe →** The COLREGs are clear about the need to maintain an effective lookout *by sight and hearing as well as by all available means appropriate*. The fishing vessel was fitted with a modern radar and AIS, though the AIS had not been switched on. The fishing vessels were operating close to shore and the presence of background lights made seeing the anchored yacht more difficult (Figure 1). The fishing vessel crew were not varying the radar range scale and had not obtained early warning of the risk of collision.

2. **Action →** The yacht was 6.7m in length and anchored close to shore. The yacht was equipped with a radar reflector and had made some efforts to be visible at a reasonable range (Figure 2), but was not transmitting on AIS. When at anchor and without a watch on deck it is prudent to make yourself as visible as possible to other vessels in the vicinity. AIS can improve the visibility of small vessels and yachts to others operating nearby; however, a well-placed all-round anchor light with visibility of at least 2nm should be the minimum action taken to maximise an anchored yacht's chances of being seen.

Figure 3 Preparing the tow

3. **Prepare →** The fishing vessel crew realised that their bulbous bow would likely have damaged the yacht below the waterline and quickly offered to tow the yacht into harbour (Figure 3). This decision reduced the risk to life posed by the significant damage to the yacht's port side. Emergencies rarely occur at a convenient time; it pays to know where lifejackets are stowed, the location of leak repair equipment, that the bilge pump works and is effective, and how to contact the local coastguard.

22

A simple step... into danger

workboat | fatal accident

It was mid-afternoon and the fish farm technicians, who had been on the water since about 0800, were cold, tired, and hungry. The site team leader, who had missed the opportunity to have lunch, asked one of the fish farm's workboat skippers for a lift to a moored barge where he would be able to eat his lunch in the warmth of the control cabin.

The short passage to the barge was uneventful and the workboat skipper and team leader, who had often worked together, chatted on the vessel's bridge. They did not specifically discuss the transfer from the workboat to the barge, which was regarded as routine. During the final approach to the barge, the team leader made his way onto the deck in preparation for the transfer.

The sea conditions were slight as the workboat approached the barge and its skipper began positioning the vessel. The team leader, wearing a PFD with unfastened crotch straps, stood ready by the open bulwark gate. As the workboat's bulwark gate came level with the barge access ladder, but while the workboat was still moving slowly ahead, the team leader stepped through the gate (see figure) and onto the ladder. Before the workboat's skipper could react, the team leader's torso was crushed between the bulwark gate and the barge ladder fender.

The seriously injured team leader shouted in pain as the workboat drifted away. A worker on the barge rushed to assist and took hold of the team leader's PFD collar to prevent him falling from the ladder. The team leader could not feel his legs and shortly afterwards slipped out of his jacket and PFD and fell into the water. He surfaced seconds later, floating on his back but apparently unconscious.

Despite being quickly recovered onto the workboat, and the valiant efforts of the workboat crew, farm technicians and emergency services, the team leader could not be resuscitated.

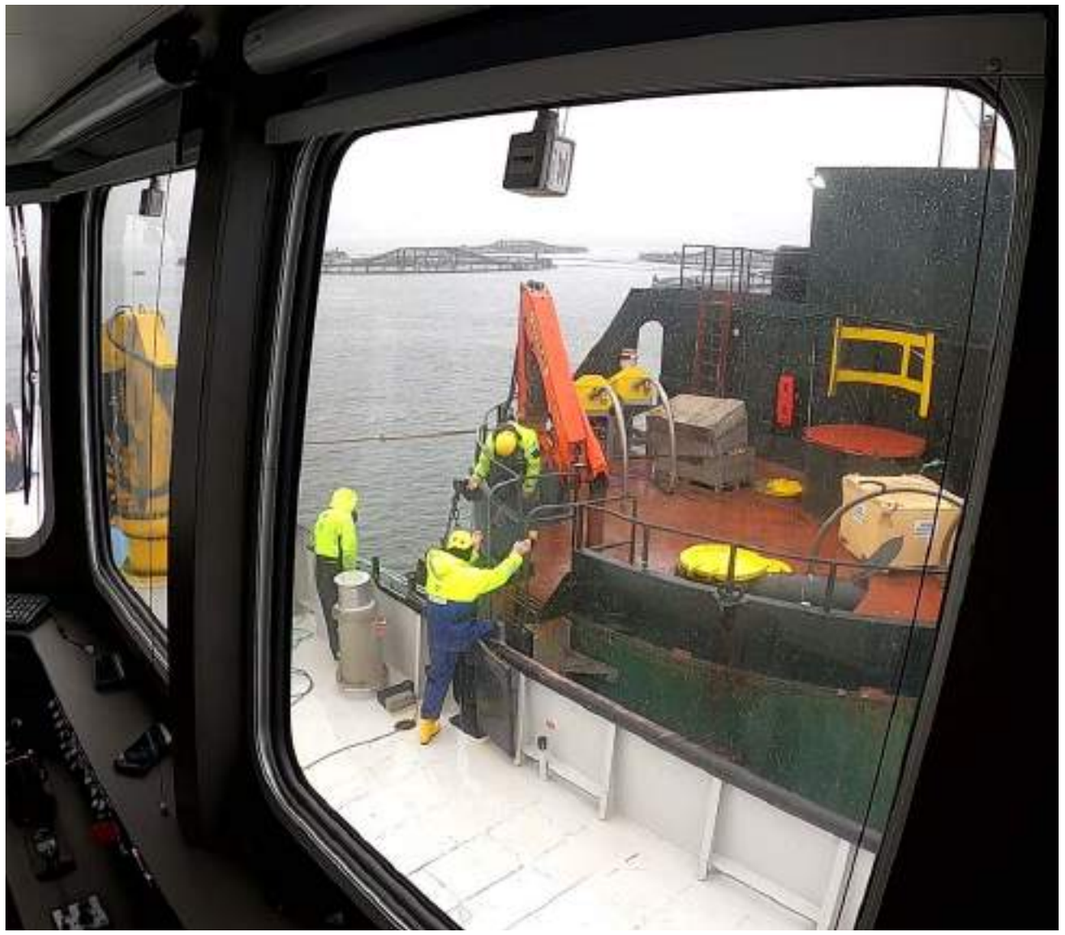

Figure: Reconstruction of the team leader stepping through the bulwark gate

The Lessons

1. **Plan →** The transfer of the team leader from the workboat to the barge was unplanned. Transfers to the barge were usually made by a small rigid inflatable boat (RIB), not the larger workboats. Planning ensures that all involved, regardless of their experience, are aware of what is expected of them and what to expect of others.

2. **Qualified →** On board operations should always be directly supervised or delegated by the vessel's skipper to ensure that at least one person has a safety overview. It is easy to assume that experienced people know what they are doing, but the team leader was primarily involved in small boat operations and was unaware that he was taking a risk by stepping off the slowly moving workboat.

3. **Equipment →** There is usually no warning that you will need personal protective equipment. While it is sometimes hot or uncomfortable to wear, it is designed to save lives or minimise injury. Always make sure PFDs are fitted properly and securely, and with the crotch straps fastened, so that the wearer's head remains above water if they fall overboard.

4. **Procedure →** Bulwark gates should be kept closed unless in use as an open gate poses an unnecessary hazard. On this occasion, keeping the gate closed until the workboat was in position and it was safe to transfer would have avoided this accident.

RECREATIONAL VESSELS

I have made my life and my career on the water. To me being afloat represents ultimate freedom; to learn, to challenge myself, to be self-reliant and to explore our incredible planet. But navigating a vessel on any body of water carries an element of risk and the articles in this section demonstrate the tragic consequences of both underestimating and disregarding the hazards. As a single-handed round the world yachtswoman I myself may be considered a risk-taker, and I would accept that label. However, whenever I go afloat I am aware of the risks that I take, I look them head-on, I mitigate them to the best of my ability and I am always ready to alter my plans with changing circumstances.

The three articles that follow are hard to read but contain important lessons for us all to remember. Our primary role as a skipper is to manage the safety of our vessel and crew, which can be a serious job, and we will not please everyone all of the time. In the first article the flip side of one stunt to entertain some guests was a tragic loss of life, while the mixing of alcohol and boating in the second article also led to tragedy for a novice crew; pushing a friend into the water was a foolish prank that resulted in far-reaching and lifelong consequences for many people. The third article reminds us that heading out to sea without knowledge and experience can quickly leave a crew out of control, reiterating the importance of both carrying and knowing how to use a valid means of calling for help.

It is not just a lack of risk awareness that leads us into danger

No day on the water should end in a fatality and fortunately most do not. We are recreational water users and whatever we seek to find out there, be it challenge, excitement, relaxation or escape, none of us should ever set off without fully understanding what could go wrong and how we would deal with it. Despite shining a spotlight on distressing events, these articles help us as sailors to learn and develop and remind us of the basic but fundamental safety cornerstones, which can often be overlooked when complacency or outside factors pull our attentions elsewhere.

It is not just a lack of risk awareness that leads us into danger. As this digest demonstrates, it is often small and seemingly innocuous actions that can get us into the most trouble. When faced with a big and obvious risk I tend to act appropriately, perhaps in my case because I am scared, but like everyone else I am also human and do not always stick to the rules when conditions appear easy. One thing is clear through reading these articles: if each crew had stuck to a set of safety rules – remaining in the speed limit, not drinking alcohol, reading up about their local area – then the outcomes may have been different. If nothing else, this might pull us up short the next time we seek to cut a corner.

Going afloat gives so much to so many people. Boating is an incredible activity and I would never want to dissuade anyone from giving it a go. I use this digest to 'keep me straight' and it reminds me who I should be on the water and of my responsibility to keep myself and those around me safe.

PIP HARE | British yachtswoman, journalist and sailing coach

Pip's professional sailing career spans 30 years. She has sailed most of the world's oceans but only found the opportunity to break into solo sailing 10 years ago, when she entered the OSTAR race from Plymouth, UK, to Newport, USA. Since completing that race, Pip has worked her way through the international ranks of ocean racing, competing in all of the major classes.

Pip has relied on grit and determination throughout, both in the sailing and to drive her own training, race campaign and fundraising. She has built a solo racing career on her resolve to realise her dream – and refusal to take 'no' for an answer.

Pip's passion and drive is evident every time she gets on a boat and her achievements match her enthusiasm: in 2020, with a tiny budget and a support team made up of volunteers, she qualified for a place on the start line of the world's toughest yacht race.

In June 2020, Medallia joined Pip as title sponsor for the Vendée Globe campaign, allowing her to acquire a boat and recruit a small team to take on the world in November 2020.

Pip emerged as the skipper who smashed expectations and pushed her old boat to a performance few thought possible. With one Vendée Globe complete, Pip is now well on her way to the next solo circumnavigation in 2024.

23

Too close, too fast

motor yachts | fatal collision

Two large commercially operated motor yachts (A and B) had been rafted up at an anchorage so that the guests, who all knew each other, could party together. Towards the end of the day, the crew of yacht A asked their guests to return on board so they could start heading back to their marina berth for the evening.

Once everyone was on board yacht A, the skipper went to the bridge and started the engines. On deck, the mate lifted the anchor and then stowed fenders once underway. Yacht A's skipper opened away in preparation for a close pass by the still anchored yacht B, so the friends could wave goodbye to each other.

During the close pass manoeuvre yacht A's skipper lost control and collided with yacht B's bow (see figure), fatally injuring the crewman who was on the foredeck.

Figure: The damage to yacht B's bow

The Lessons

1. **Risk →** Yacht A's skipper intended to end a great day for the guests by delivering an exciting close pass manoeuvre. However, this was undertaken at short notice without a plan and the decision was heavily influenced by the guests' desire to wave goodbye. The loss of control occurred due to a series of hydrodynamic effects, which would have been difficult to foresee and resulted in making yacht A momentarily difficult to steer. Although guests' wishes can be taken into consideration, professional crews of commercially operated motor yachts must stay in control of their vessels and operate them safely.

2. **Procedure →** At the time of the collision, yacht A was proceeding at over six times the local speed limit for the anchorage. In the constrained limits of harbours and anchorages, speed limits are an important safety barrier, intended to allow plenty of time for vessels to respond to developing situations. On this occasion, yacht A's high speed and yacht B's proximity left no margin for error, with tragic consequences.

24

Don't swim near moving boats

inland waterways motor cruiser | fatal accident

Seven friends hired a motor cruiser (see figure) for a short break and planned to spend a relaxing few days cruising around an inland waterway area, celebrating a member of the group's birthday. On arrival at the boatyard, the skipper was quickly briefed on how to operate the onboard systems but opted not to have a boat handling demonstration as he had previous boating experience. It was a one-to-one briefing due to COVID-19 restrictions.

The group took their luggage on board and set off, cruising for a while before tying up for the night. They left early the next morning, intending to reach their next overnight destination, a large town, by early afternoon. They stopped mid-morning for breakfast and then continued down river, stopping in the late morning for a drink at a pub.

Underway again by midday, and with beautiful sunny weather, the friends started pushing each other into the river as the boat motored along. Each time the person in the water was recovered back on board, the boat had to be stopped and reversed. The motor cruiser had no boarding ladder and was not designed for swimming from and so other members of the group helped those in the water to get out. To keep them clear of the propeller, the swimmers were recovered from the side of the boat.

After a change of driver, and with several of the group drinking alcohol, another person was pushed into the water. As before, the motor cruiser was stopped and reversed towards the swimmer, who made for its stern. From the helm position, the driver could not see the swimmer behind him and was unaware of the swimmer's proximity; despite shouts from those on deck to get clear of the stern, the swimmer did not react and was overrun by the boat, suffering a severe laceration to his left leg from the propeller.

The motor cruiser was stopped and two of the group got into the water to assist the casualty. Unable to get him back on board, they dragged him to the bank and started first aid, including applying a tourniquet to his heavily bleeding leg. The emergency services were called and an ambulance and then air ambulance attended. The casualty was taken to hospital, but had lost a great deal of blood and tragically could not be saved.

Figure: Inland waterways motor cruiser

The Lessons

1. **Hazard →** Whether intended, accidental or because of horseplay, entering the water close to a boat that is underway can be dangerous. In hot conditions a swim might seem appealing, but a rotating propeller presents significant hazards and should be avoided. Additionally, the local authority did not recommend swimming from boats in this area and, in this case, the motor cruiser did not have a boarding ladder.

2. **Risk →** Everyone on board had been drinking alcohol during the morning, which they regarded as part of the fun of being on holiday and unwinding. However, boats can be dangerous, with the capability to cause harm to occupants and other water users. It is sensible to avoid alcohol consumption until the boat is moored securely. Alcohol can also affect your ability to swim and, if you do fall in, reduce your chances of survival.

3. **Equipment →** Hire companies always supply lifejackets and advise that these are worn on exposed decks. If you do fall in, a lifejacket will support you and keep your airways clear of the water until help arrives. An unworn lifejacket is of no use.

25

Last orders at the bar

rigid inflatable boat | flooding

It was late afternoon on a beautiful summer's day, but the sea was choppy and there was a strong breeze. Three young adults were returning from an enjoyable day trip to a local island in their 6m RIB, which was handling the choppy water easily. As they approached their destination the sea suddenly and without warning turned very rough with steeper, confused waves. The crew could not understand why the sea conditions had unexpectedly changed, but the coxswain responded and reduced the RIB's speed.

Despite the coxswain's actions, the RIB encountered a series of short and steep waves that struck the boat heavily, one after the other. These heavy blows caused a fibreglass step fitted to the buoyancy tube at the forward end to partially detach, allowing water into the tube (see figure). The RIB quickly lost most of its buoyancy and started sinking.

With the water level in the RIB rising and its crew beginning to panic, the coxswain had the presence of mind to use the boat's VHF radio and called for help on channel 16. Fortunately, a passing vessel was close by, heard the call for help, and was able to respond quickly and rescue the three distressed youths. Shortly afterwards, a local lifeboat arrived at the scene and recovered the sinking RIB.

The youngsters were unaware of a safety notice published by the local harbour authority, which warned mariners of the hazards presented by a sandbar at the entrance to the harbour. The safety notice highlighted that the tidal streams could be as high as 6kts in the harbour entrance during spring ebb tides and specified there was an 8kts speed limit; mariners were also advised to exercise caution when crossing the sandbar. Further harbour authority guidance indicated that the sandbar area was unsuitable for inexperienced mariners, even in relatively light winds. It also stated that serious consideration should be given to not crossing the sandbar in very strong winds.

Figure: Detachment of fibreglass step from the buoyancy tube

The Lessons

1. **Hazard →** Boating is a fun activity, but a day on the water is not without risk. Each area will have its own hazards, which are liable to change quickly. Harbour authorities can issue Notices to Mariners that alert harbour users to local dangers. These notices are often posted near harbour offices or access points. Always read and understand the safety advice for the waters that you wish to use.

2. **Aware →** This accident was not the first time boaters have been caught out by a sandbar and will not be the last. By their nature, sandbars cause the water depth to become shallow very quickly, shortening and steepening any sea swell into large plunging waves, and can seemingly appear from nowhere, catching boaters unaware. Make sure you know where sandbars are and in what weather and tidal conditions it is safe to cross them.

3. **Margin of safety →** RIBs are often constructed from several materials that vary in properties. For example, fibreglass is rigid and will not flex at the same rate as the rubber tubes on which they are fitted. In this case, the sudden flexing of the RIB's rubber resulted in detachment of the fibreglass fixture. Know your vessel's design and sea condition limitations and take care not to exceed them.

INVESTIGATIONS

started during the period 1 September 2021 to 28 February 2022

Date	Occurrence
19 September 2021	Auxiliary engine room fire on board ***Finnmaster***, a Finland registered ro-ro cargo vessel, while departing Hull, England.
11 October 2021	Poisoning of a shore worker due to inhalation of phosphine gas being used as a cargo fumigant on board ***Thorco Angela***, a Marshall Islands registered general cargo vessel, in Liverpool, England.
16 October 2021	Capsize of ***Goodway***, a single-handed creel boat, with the loss overboard and presumed death of its crew member near Cairnbulg in north-east Scotland.
25 October 2021	Grounding of ***Chem Alya***, a Liberian registered chemical/products tanker in the Needles Channel, west of the Isle of Wight, England.
30 October 2021	Multiple fatalities during a stand-up paddleboard activity on the River Cleddau, near Haverfordwest, Wales.
24 November 2021	The presumed sinking of a migrant boat while attempting to cross the English Channel. The exact circumstances and the number of persons or vessels involved has not been determined. However, evidence indicates that at least 27 migrants either drowned or died of hypothermia. Our investigation will focus on the emergency response to the accident. If it is determined that none of the events leading up to the fatalities occurred in UK waters, the investigation will cease.
13 December 2021	Collision between the UK registered general cargo vessel ***Scot Carrier*** and the Danish registered construction vessel ***Karin Høj*** off the coast of southern Sweden, resulting in 2 fatalities.
12 January 2022	Double fatality on board ***Emma Louise***, a motor cruiser berthed at Hamble, England.

Correct up to 28 February 2022. Go to www.gov.uk/maib for the very latest MAIB news

REPORTS

issued in 2021 and 2022

2021

Minx / Vision
Collision between a motor yacht and an anchored motor yacht at Île Sainte-Marguerite, near Cannes, France on 25 May 2019, with loss of 1 life.
1/2021 Published 28 January 2021

Finlandia Seaways
Catastrophic main engine failure resulting in an engine room fire and injury to the third engineer on board a cargo vessel, 11 miles east of Lowestoft, England on 16 April 2018.
2/2021 Published 25 February 2021

Ocean Quest
Flooding and foundering of a fishing trawler 70 miles north-east of Fraserburgh on 18 August 2019.
3/2021 Published 9 April 2021

Diversion
Carbon monoxide poisoning on board a motor cruiser at the Museum Gardens quay on the River Ouse, York, England on 4 December 2019, with loss of 2 lives.
4/2021 Published 15 April 2021

Olivia Jean
Crush incident on board a scallop dredger north-east of Aberdeen, Scotland on 28 June 2019, with loss of 1 life.
5/2021 Published 12 May 2021

Seadogz
Collision between a high-speed passenger craft and a navigation buoy on Southampton Water, England on 22 August 2020, with loss of 1 life.
Interim Published 20 May 2021

Beinn Na Caillich
Crush incident involving a fish farm worker during transfer from a workboat to a feed barge in Ardintoul, Glenshiel, Scotland on 18 February 2020, with loss of 1 life.
6/2021 Published 26 May 2021

Kaami
Grounding of a general cargo vessel on Sgeir Graidach, the Little Minch, Scotland on 23 March 2020.
7/2021 Published 3 June 2021

Arrow
Grounding of a ro-ro freight ferry in the approach channel of Aberdeen Harbour, Scotland on 25 June 2020.
8/2021 Published 2 July 2021

Stolt Groenland
Cargo tank explosion and fire on board a chemical tanker in Ulsan, Republic of Korea on 28 September 2019.
9/2021 Published 20 July 2021

Globetrotter
Foundering of a wooden hulled motorboat off the coast of Fleetwood, England on 31 May 2020, with loss of 1 life.
10/2021 Published 6 August 2021

Shearwater / Agem One
Immobilisation and flooding of a dredger following repeated collisions with an unnmanned barge on 9 April 2020.
11/2021 Published 9 September 2021

Cimbris
Crush incident on general a cargo vessel in Antwerp, Belgium on 14 July 2020, with loss of 1 life.
12/2021 Published 22 September 2021

Norma G
Capsize of a motor cruiser in the Camel Estuary, near Padstow, Cornwall, England on 25 May 2020, with loss of 1 life.
13/2021 Published 14 October 2021

Talis/Achieve
Collision between a prawn trawler and a general cargo vessel, resulting in sinking of trawler off Tynemouth, England on 8 November 2020.
14/2021 Published 3 December 2021

Key Bora
Grounding of a chemical tanker in the approaches to Kyleakin Pier, Isle of Skye, Scotland on 28 March 2020.
15/2021 Published 16 December 2021

2022

Galwad-Y-Mor
Subsea explosion resulting in crew injuries and damage to a fishing vessel off Cromer, Norfolk, England on 15 December 2020.
1/2022 Published 20 January 2022

Diamond D
Flooding, capsize and foundering of a prawn trawler 20 nautical miles north-east of Tynemouth, England on 16 August 2020.
2/2022 Published 9 February 2022

***Rib Tickler*/personal watercraft**
Collision between a RIB and a personal watercraft on the Menai Strait, Wales on 8 August 2020, with 1 loss of life.
3/2022 Published 17 February 2022

Correct up to 28 February 2022. Go to www.gov.uk/maib for the very latest MAIB news

Stolt Groenland

Shearwater/Agem One

Stolt Groenland

Achieve / Talis

SAFETY BULLETINS

issued during the period 1 September 2021 to 28 February 2022

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY BULLETIN

SB2/2021 NOVEMBER 2021

Extracts from The United Kingdom Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 Regulation 5:
"The sole objective of a safety investigation into an accident under these Regulations shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of such an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

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

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

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Fatal crushing injury of a crewman

on the upper vehicle deck of the roll-on roll-off ferry

Clipper Pennant

in Liverpool, England

on 20 July 2021

Clipper Pennant

MAIB SAFETY BULLETIN 2/2021

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 provides for the Chief Inspector of Marine Accidents to make recommendations at any time during 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 fatal crushing of a crewman on the upper vehicle deck of the roll-on roll-off ferry *Clipper Pennant*.

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

Andrew Moll
Chief Inspector of Marine Accidents

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BACKGROUND

At about 1400 on 20 July 2021, the bosun of the roll-on roll-off cargo ferry *Clipper Pennant* suffered fatal crushing injuries during cargo loading operations.

Clipper Pennant was in Liverpool and the bosun was working on the upper vehicle deck, marshalling[1] tractor unit drivers who were loading semi-trailers. Two other crew members were on the upper vehicle deck, assisting the bosun by locating the resting trestles and lashing the semi-trailers once in position.

The accident occurred after the bosun had directed a tractor unit driver to push a semi-trailer into its stowage location, between a semi-trailer that had already been lashed and the bulkhead at the port forward end of the upper vehicle deck **(Figures 1** and **2)**. As the semi-trailer was being manoeuvred, the bosun had positioned himself between the moving semi-trailer and the vessel's structure, resulting in the crushing accident.

GUIDANCE

The Maritime and Coastguard Agency's Code of Safe Working Practices for Merchant Seafarers (COSWP) provides guidance for safe operations on vehicle decks and Section 27.6.3 states that:

- *Personnel directing vehicles should keep out of the way of moving vehicles, particularly those that are reversing, by standing to the side, and where possible should remain within the driver's line of sight.*
- *Extra care should be taken at the 'ends' of the deck where vehicles may converge from both sides of the ship.*
- *Safe systems of work should be provided in order to ensure that all vehicle movements are directed by a competent person.*

Clipper Pennant's Deck Safety and Procedures Guide included instructions for deck crew, which stated that '*during the loading of trailers, crewmembers must not stand behind the trailer. Never walk behind a moving vehicle or position yourself outside the sight of the tug driver*'.

INITIAL FINDINGS

All aspects of this accident are under investigation by the MAIB and a full report explaining the causes and circumstances will be published in due course. Nevertheless, it is apparent from the initial evidence collected that there is an extreme risk of crushing injuries in stowage spaces adjacent to the vessel's structure, with limited areas to remain clear or escape.

[1] The marshaller, also referred to as the banksman, was responsible for supervising, controlling and directing vehicle movements, using hand, whistle or radio signals with tractor unit drivers and other crew members.

Figure 1: Reconstruction of the semi-trailer parking arrangement, with inset view of the space (post-accident)

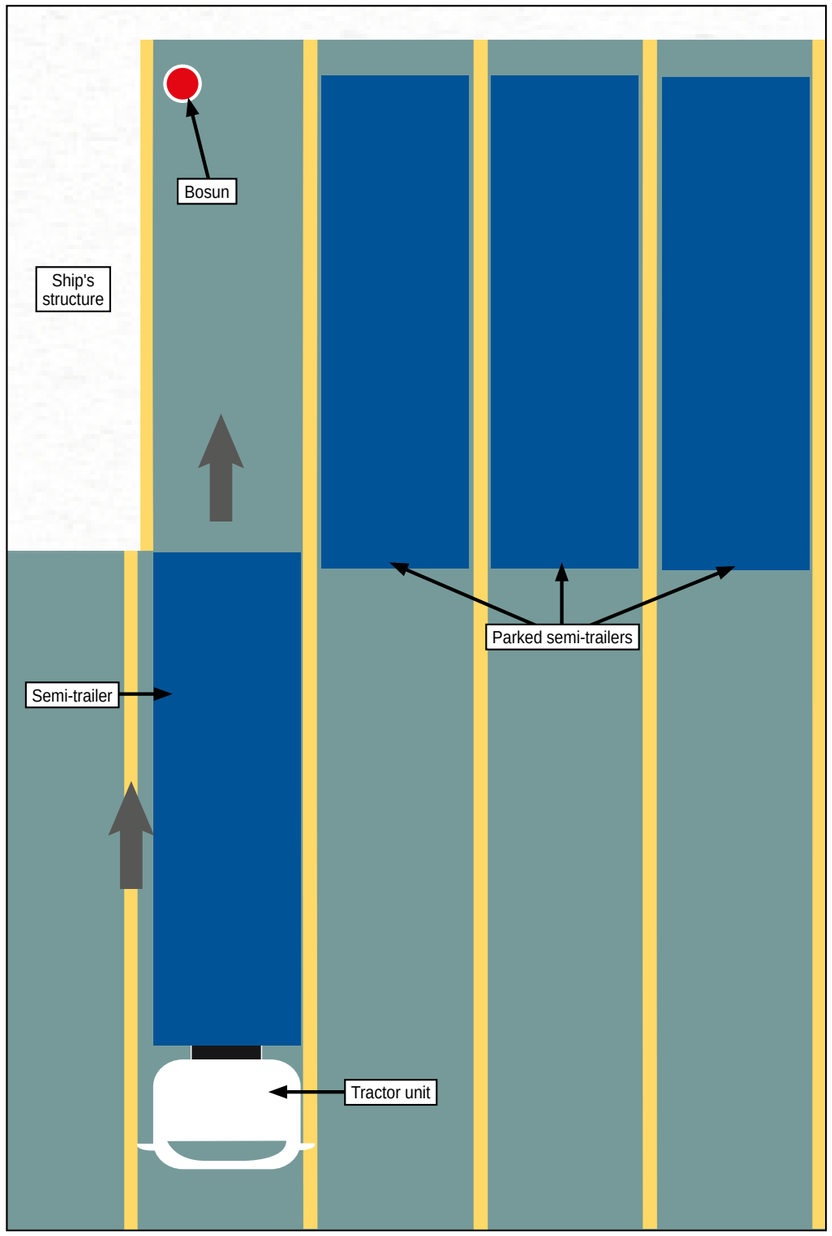


Figure 2: Graphic showing plan view of the semi-trailer's approach to the parking space

ACTIONS TAKEN

Use of the port forward cargo stowage spaces has been temporarily suspended by the vessel's operator, pending futher investigation and assessment.

SAFETY LESSON

Where tractor units are being used to push semi-trailers, safety procedures must be in place to ensure that deck crew are not standing in the vehicle's path.

Operators of vessels with roll-on roll-off vehicle decks are advised to:

- Review their cargo handling procedures to identify the hazards associated with stowage spaces where there may be limited areas for escape.
- Conduct a specific risk assessment for all such spaces. These spaces should then be marked and, unless appropriate mitigating measures can be put in place, not used.
- Ensure that onboard safety procedures and crew safety briefings reflect the guidance in COSWP Section 27.6.3.

Issued November 2021

SAFETY FLYERS

issued during the period 1 September 2021 to 28 February 2022

MAIB

MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY FLYER TO THE FISHING INDUSTRY

Collision between fishing vessel *Achieve* (HL257) and general cargo ship *Talis*, resulting in the sinking of *Achieve* off Tynemouth, England, on 8 November 2020

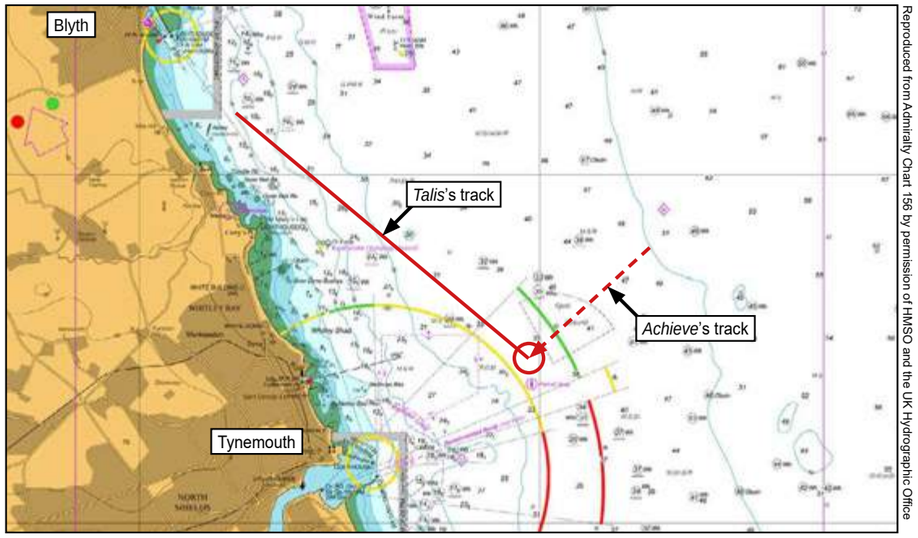
Image courtesy of RNLI (Tynemouth)

Image courtesy of Paul Gowen (shipspotting.com)

Narrative

On 8 November 2020, the 9m wooden prawn trawler *Achieve* collided with the 82m general cargo ship *Talis* in fog. *Achieve* was severely damaged and sank while being towed to port.

Achieve had completed fishing and was heading back to Tynemouth to land its catch. It was on a south-westerly course at 5 knots. The skipper was in the wheelhouse and spent some time familarising himself with a new radar, which he had fitted two days previously. The deckhand was working in the aft shelter deck, sorting the catch. At some point, the skipper went aft to check on the deckhand's progress with boxing the prawns.



Reproduced from Admiralty Chart 156 by permission of HMSO and the UK Hydrographic Office

Chart showing tracks of *Talis* and *Achieve*

Talis was on passage between Blyth and the Netherlands on a south-easterly course at 8 knots. The bridge was manned by the chief officer and an able seaman as lookout. During the passage, the chief officer worked at the chart table and ship's computer.

Achieve was less than a mile away when *Talis*'s chief officer spotted a target on the radar about 30º on the port bow. With the able seaman he looked out from the port side of the bridge and suddenly spotted *Achieve* very close; he could see there was no-one in the wheelhouse. He sounded the whistle then altered course to starboard, but it was too late to prevent the collision

Safety lessons

1. Keeping a proper lookout is fundamental to safe navigation. In fog, different methods are required, which are usually focused on the radar and, if fitted, Automatic Identification System (AIS). A proper lookout was not being kept on either vessel, and prior to the collision the skipper of *Achieve* was not in the wheelhouse.

2. *Achieve* was not fitted with either a radar reflector or AIS, both of which would have made the fishing boat more visible. However, once *Talis*'s watchkeeper had seen *Achieve* on the radar, he lost valuable time assessing the contact rather than taking early action to avoid the collision.

3. Neither vessel was sounding fog signals. With the use of radar and AIS it is tempting to assume that vessels will detect each other long before a fog signal is heard. However, when all else fails, hearing a fog signal can give a valuable warning of danger

This flyer and the MAIB's investigation report are posted on our website: www.gov.uk/maib

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MAIB

MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY FLYER TO THE FISHING INDUSTRY

Flooding, capsize and foundering of the trawler *Diamond D* (SN100) north-east of Tynemouth, England, on 16 August 2020

Diamond D

Narrative

At about 1500 on 16 August 2020, the wooden-hulled 15.67m fishing vessel *Diamond D* capsized and sank after suffering hull damage and subsequent water ingress while trying to uncross its towing wires.

Diamond D was on a relocation voyage when the two crew decided to undertake a trawl before arrival into the River Tyne. While fishing, they picked up a heavy object in the net and accidentally crossed the towing wires. The crew spent several hours working on deck, attempting to uncross the towing wires, haul the net on board and free the heavy object. During this process the trawl doors were heard hitting the hull several times; it is likely that this caused hull planks or caulking to become dislodged. Despite working on deck for a prolonged period neither crewman wore a personal flotation device (PFD). The wheelhouse was left unattended and the bilge alarms, which would have alerted the crew to the flooding, were not noticed until it was too late to take remedial action. The crew grabbed lifejackets and the vessel's Emergency Position Indicating Radio Beacon (EPIRB), launched the liferaft and managed to abandon the vessel as it capsized. The EPIRB provided the rescue services with an accurate location and, about 1 hour later, they were rescued unharmed.

Safety lessons

1. To undertake fishing operations safely, the vessel was normally operated by three crew. The change of plan, from undertaking a delivery voyage only to then trawl for fish, meant that there was nobody available to man the wheelhouse while the other crew were working on deck, or to check for damage after the trawl doors hit the hull. The change of plan introduced additional risks that were normally mitigated by the provision of a third crewman. Any change of agreed plans or deviation from a standard operation should involve a brief step back and a reassessment of the risks. Had this been done, the decision to fish with reduced crew might not have been taken, and the vessel might not have been lost.

2. All unattended spaces should be regularly checked. Had the internal spaces or the wheelhouse been checked periodically, the crew might have noticed the flooding, or the sounding of the bilge alarms warning of the flooding. Additional pumping capacity could then have been brought into action to control the volume of water flooding on board.

3. Neither of the crew was wearing a PFD while working on deck. During the abandonment, the skipper ended up in the water without a PFD and was lucky not to have succumbed to the debilitating effects of immersion in the cold seawater. Because he was not wearing a lifejacket, had he not been quickly pulled out of the water into the liferaft it is possible that he would have drowned. If you do fall or jump into the water, wearing a lifejacket improves your chance of survival because it keeps you afloat.

4. The crew's activation of the EPIRB led directly to their timely rescue. This highlights the importance of being familiar with how to use the emergency equipment on board your vessel.

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