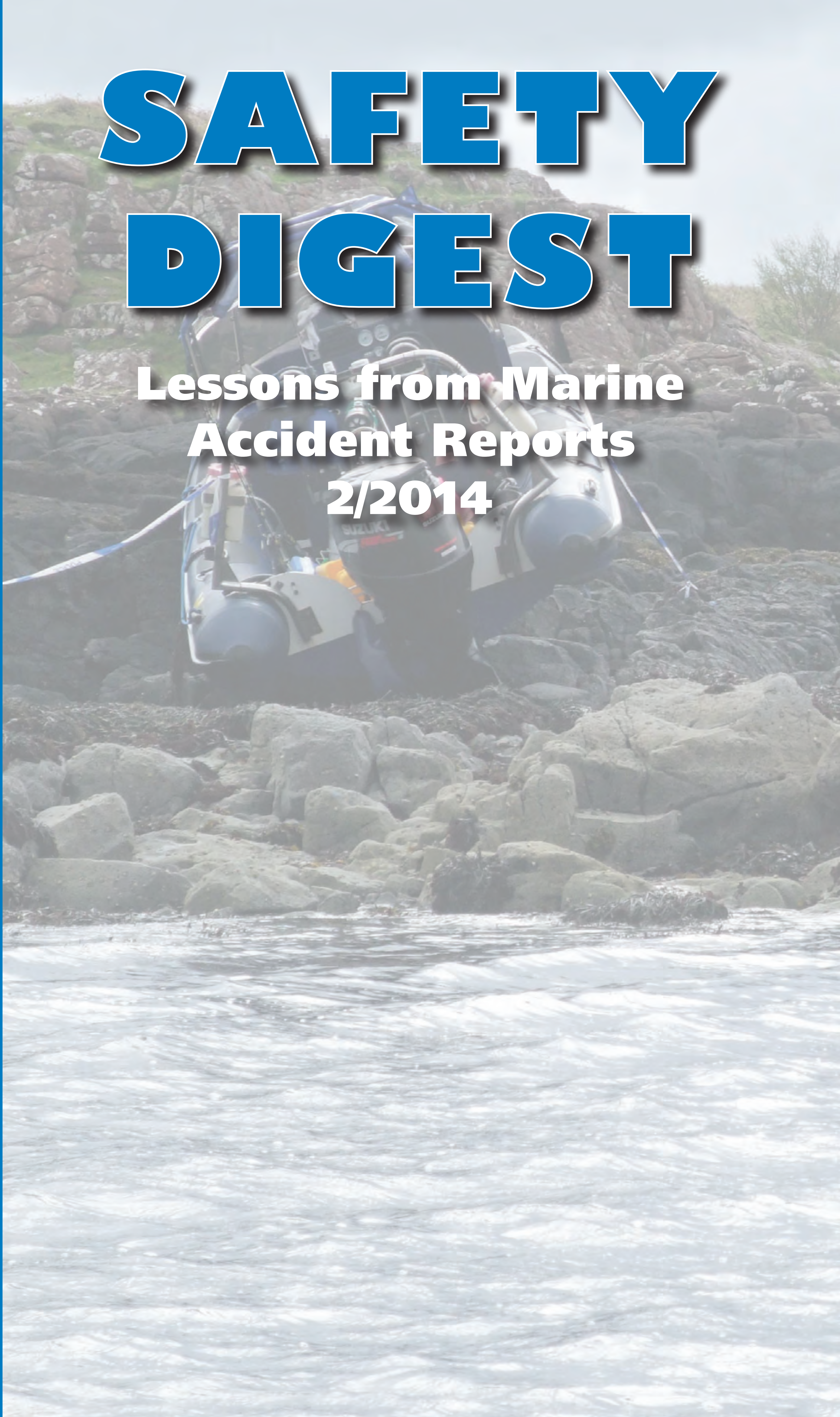
SAFETY DIGEST

Lessons from Marine Accident Reports 2/2014



MARINE ACCIDENT INVESTIGATION BRANCH

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SAFETY DIGEST

Lessons from Marine Accidents

No 2/2014

MAIB

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INVESTOR IN PEOPLE

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October 2014

MARINE ACCIDENT INVESTIGATION BRANCH

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

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

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

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

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

The Editor, Jan Hawes, welcomes any comments or suggestions regarding this issue.

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MARINE ACCIDENT INVESTIGATION BRANCH

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

Extract from
The Merchant Shipping
(Accident Reporting and Investigation)
Regulations 2012 – Regulation 5:

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

INDEX

Glossary of Terms and Abbreviations

AB	-	Able Seaman
AFFF	-	Aqueous Film Forming Foam
AIS	-	Automatic Identification System
ALB	-	All Weather Lifeboat
ASD	-	Azimuth Stern Drive
BA	-	Breathing Apparatus
BNWAS	-	Bridge Navigation Watch Alarm System
C	-	Celsius
CCTV	-	Closed Circuit Television
CO	-	Carbon Monoxide
COLREGS	-	International Regulations for the Prevention of Collisions at Sea 1972 (as amended)
CPP	-	Controllable Pitch Propellers
ECS	-	Electronic Chart System
FRC	-	Fast Rescue Craft
GPS	-	Global Positioning System
GRP	-	Glass Reinforced Plastic
ISM Code	-	International Safety Management Code
kts	-	knots
m	-	metre
"Mayday"	-	The international distress signal (spoken)
MCA	-	Maritime and Coastguard Agency
MCR	-	Machinery Control Room
MGN	-	Marine Guidance Note
MGO	-	Marine Gas Oil
mph	-	miles per hour
OOW	-	Officer of the Watch
PFD	-	Personal Flotation Device
PPE	-	Personal Protective Equipment
RIB	-	Rigid Inflatable Boat
RNLI	-	Royal National Lifeboat Institution
Ro-Ro	-	Roll on, Roll off
RYA	-	Royal Yachting Association
SOLAS	-	International Convention for the Safety of Life at Sea
SOP	-	Standard Operating Procedure
STCW Code	-	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended (STCW Convention)
UHF	-	Ultra High Frequency
UMS	-	Unmanned Machinery Space
VHF	-	Very High Frequency
VTS	-	Vessel Traffic Services

Introduction

On the 7th August, the MAIB commemorated its 25th anniversary. As I write this introduction, I cannot help but ponder the dreadful maritime disaster that provided the rationale for the establishment of this organisation.

On the 6th March 1987, the cross channel ferry *Herald of Free Enterprise* capsized soon after leaving the port of Zebrugge. 193 passengers and crew lost their lives. The immediate cause of the accident was that the bow doors of the vessel had been left open as it left the harbour, allowing sea water to enter the main vehicle deck in large quantities. The resulting free surface effect destroyed the vessel's stability and the vessel capsized very quickly. The events leading to the capsize were a mix of complacency, poor shipboard procedures and inadequate leadership, both afloat and ashore. One could argue that the disaster proved to be a watershed for maritime safety, leading to not only the formation of the MAIB, but also greater emphasis on the direct responsibility shore managers have for safety, and which culminated in the industry's adoption of the ISM Code in 1998.

Whatever the ultimate benefits such dreadful accidents may have in shaping and improving international maritime legislation, I cannot avoid reflecting on the human cost. Even today, the surviving next of kin and loved ones of the 193 who lost their lives, and the others who were injured or mentally scarred during the accident are still trying to cope with the effects and consequences of that fateful day. I was particularly struck by a recent magazine article in which the daughter of one of the victims of the *Herald of Free Enterprise* disaster described how she was still grieving the loss of her father today.

One of the consequences of a significant anniversary is that you become quite reflective about past achievements. Here are a few facts and figures which will probably not feature in any pub quiz but are none the less quite fascinating:

Since its formation in 1989, the MAIB has:

- raised reports on over 40,000 marine accidents and incidents
- conducted 1500 investigations
- published nearly 500 investigation reports, and
- made more than 3000 safety recommendations.

Looking ahead, an objective for this Branch should be to work even harder to influence and improve maritime safety such that seafarers, the travelling public and their friends and families no longer have to suffer the consequences of avoidable accidents and there is no longer a need for accident investigation organisations like the MAIB - sadly, intuition gained from more than 40 years in this industry tells me this is an unlikely goal and leads me to expect an invitation to commemorate the MAIB's 50th anniversary, should I live that long.

I am indebted to John Garner, Robert Greenwood and Mark Ranson for their insightful introductions to the three sections of this edition of the Safety Digest. I hope you will find the following articles, and the safety lessons they contain useful and instructive.

Until next time, keep safe.

Steve Clinch
Chief Inspector of Marine Accidents
October 2014

Part 1 - Merchant Vessels

P&O Ferries Holdings Ltd has long been respected the world over and has a long tradition for excellence dating back to 1837. The Company was founded by Brodie McGhie Willcox and Arthur Anderson, then known as “Peninsular Steam Navigation Company”, and was awarded the Government contract to carry the mail from UK to Spain and Portugal.

As a ferry company which proudly bears the P&O name, the day to day business of P&O Ferries Holdings Ltd brings the Company into contact with many government organisations. As such, it is recognised that the role of the MAIB, of improving safety at sea through the promulgation of lessons learned from marine accidents, is of the highest level of importance.

P&O Ferries Holdings Ltd works with regulators of four Flag States, various Port States, the European Commission and the International Maritime Organization (IMO) to further enhance the Safety and Environmental Standards which are already in place. However this MAIB Safety Digest brings together a range of case studies which is very rich in data and provides learning opportunities for us all. Through this Digest the MAIB portray the very ethos of the International Safety Management (ISM) code which is, to “seek best practice”, and provide an ethos of “continuous improvement” and as such I recommend this Digest to you all.

In reviewing the cases presented within this Part 1 - The Merchant Vessels section, I have noticed a number of themes which I would like to share with you. These include technical matters such that in almost a third of these case studies the requirement to maintain a proper look out by all means available in accordance with COLREGS Rule 5 when a vessel is underway, has not been fully discharged. The basic fundamental principle of maintaining a safe look out at all times cannot be under estimated. Even with the support of Bridge Navigation Watch Alarm Systems (BNWAS) (which although fitted were found not to be switched on) in case a watch keeper becomes incapacitated for any reason. Unfortunately, the signs of fatigue have not been recognised in these cases and supporting arrangements such as a seafarer posted as a look out during the hours of darkness or the use of additional/alternative seamen have not been taken into account when clearly they could have been.

Apart from the above technical requirements of operating ships I also notice trends of complacency and a lack of situational awareness leading to a lack of Bridge/Marine Resource Management in almost two thirds of the case studies within this section. Being responsible for a large ferry fleet ex UK Ports conducting Circa 56,000 voyages per annum these are areas that we particularly focus on within P&O Ferries Holdings Ltd. Plying the same route for a number of years can lead to complacency, something that all ferry operators need to guard against. In my own company we introduced Maritime Resource Management (MRM) in November 2009 following research we conducted with other transport industries such as the Aircraft industry.

I met with the Chief Pilot of British Airways who conduct Crew Resource Management (CRM) training which is mandatory in the airline industry. Airline pilots are trained to communicate effectively and accept feedback. Co-pilots are taught to speak out when they see their senior pilot and colleagues about to make a mistake. This is known as “challenge and response”.

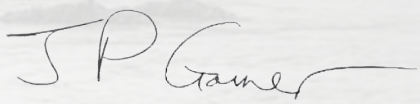
The Maritime Resource Management (MRM) training we have introduced into our fleet is a further development of the original SAS bridge resource management training first delivered in about 1993. MRM is the use and coordination of all skills, knowledge experience/expertise and resources available to the crew to accomplish or achieve the established goals of safety and efficiency.

- MRM aims to **change attitudes and behaviours** - not technical skills, hence simulators are not utilised in this training.
- MRM includes the understanding of the importance of good management and team work and the **willingness to change behaviours.**
- Importantly, **Engineers and shore based Fleet personnel are included with the Deck Officers and Captains** on MRM training courses.

The use of common terminology is emphasised and MRM training aims to improve coordination, communications and team work.

Maritime Resource Management is a training programme that builds upon well-established facts as well as the latest research within the human factors area. An important purpose of the course is to establish safe attitudes and provide a set of "tools" that the participants will be able to take with them to use in their working environment such as on board ship or in their shore office. Another objective is to increase knowledge about human performance and limitations with the purpose of creating a better understanding of what can lead humans into a lack of situational awareness and complacency. In summary, MRM training further develops and improves the "Safety Culture" within a company.

The value and benefits of Resource Management training have been recognised by the 2012 amendments to the STCW Convention in Manila. These amendments give a five year period during which officers need to be trained in Human Element, Leadership and Management (HELM) techniques. At P&O Ferries Holdings Ltd we welcome this development having already commenced this journey through the introduction of MRM, which I recommend to you all.



John Garner
P & O FERRIES HOLDINGS LTD

John Garner is Fleet Director of P&O Ferries Holdings Ltd which provides ferry services to Tourist and Business customers through the deployment of 20 Ro-Ro passenger and high speed craft from UK ports. John joined P&O Ferries in November 2004 and is responsible for all ferry operations, chartering and new building as well as being a member of the Divisional Board. John is well known at the Chamber of Shipping having initially been Chairman of the Passenger Issues Committee and in 2010 becoming the Chairman of the Safety and Environment Committee. John is also well known through Interferry being a member of the European Committee and current Chairman of the Steering Group.

Prior to joining P&O Ferries Holdings Ltd John held senior management positions both in the public and private sectors. Between 1999 and 2004, John served initially as Deputy Director of Operations and then as Director of Standards at the UK Maritime Coast Guard Agency and prior to that John was responsible for the Stena UK Fleet including the integration of Stena HSS vessels into the UK Operations. For the first 23 years of John's career he served at sea in all ranks from Cadet to Senior Master and accrued 10 years' experience as Master of Ro-Ro Passenger Ships and High Speed Craft.

John is a Fellow of the Nautical Institute, a Fellow of the Institute of Marine Engineers, Scientists and Technology, and a Chartered Marine Technologist.

Ship That Went Bump in the Night

Narrative

Shortly after 0300 a dry cargo vessel ran aground on a rocky coastline at almost 12kts. All the off duty crew were awakened by the impact, but when the master arrived on the bridge he found the chief mate asleep on the bridge chair and the vessel still in gear and driving ahead.

Two days previously, the vessel had berthed in the afternoon ready to discharge her cargo the following morning. The chief mate would normally have been asleep in the early evening prior to taking his 0000-0600 watch, but instead he went ashore during this time and went to bed when he would normally have been on watch.

At 0700 the following morning the chief mate and two ABs were on deck to oversee the cargo discharge. At 1500 the vessel sailed, and hold cleaning and preparation for the next cargo continued until 1900 when the chief mate and ABs were able to finish on deck. After supper, one AB went to the bridge to act as night lookout for the master (despite having just spent 12 hours on deck). The chief mate and the other AB turned in.

The master was aware that his lookout had now been working close to the maximum permitted hours and, as he would be required to assist with pilot embarkation at 0300, at around 2200 the master sent him below to rest. It did not cross the master's mind to call the well-rested cook for lookout duties, despite it being in his contract to act as lookout "when required".

The chief mate relieved the master at midnight. The master instructed him to contact the pilot 2 hours before the vessel was due to arrive at the pilot station, and to call all hands 30 minutes before the pilot boarded. At that time, the vessel was due to arrive at the pilot station in about 3 hours. The vessel was being steered by autopilot and, although a bridge navigation watch alarm system (BNWAS) was fitted, it was not switched on. Additionally, neither radar guard zones nor echo sounder shallow water alarms were set.

The chief mate forgot to radio the pilot station as instructed and, like the master, he sent his lookout below at 0130 to rest. Soon after the lookout went below, the chief mate fell asleep in the quiet, cosy bridge. Despite there being a significant impact when, at 0300, the vessel hit the coast, when roused by the master the chief mate was disorientated and shocked to find the ship aground.

Fortunately it was quickly established that the hull was not holed and, although sitting on rocks, because of the fine weather the vessel was not pounding. The vessel was refloated 9 hours later when it was discovered that substantial plate and frame buckling had occurred, requiring almost 50 tonnes of steelwork to be replaced.

Vessel aground

The Lessons

This crew was extremely fortunate; had there been more traffic in the area the vessel could have been in collision and, once aground, had the sea been rougher the vessel's hull might have breached. Either event could have resulted in lives being lost.

The chief mate fell asleep probably due to lack of stimulation compounded by fatigue induced by a change to his work/rest pattern the day before. These issues can affect all seafarers at some point, and are not unusual. Therefore all the more reason to take precautions to guard against them. The fact that the chief mate did not radio the pilot is indicative of his weariness at the time, while sleeping through the grounding impact gives some indication of how deeply he was sleeping.

1. The STCW Code requires lookouts to be on duty during the hours of darkness. The master and chief mate were aware of this, but chose to send their ABs below as they were both close to their maximum hours of work for the day. The master could have delayed sailing until the crew were adequately rested, or he also could have employed the well-rested cook as a lookout to ensure the lookouts' work/rest hours were shared equitably.

2. If modern technology is not employed intelligently, the bridge watchkeeping environment can lack stimulation. In this case, the radars and echo sounder alarm functions were not used to advantage. Although they might not have awoken a deep sleeper, there is a chance the alarms would have alerted the chief mate that the vessel was approaching the shore. However, this vessel also had a BNWAS installed. This equipment's primary function is to alert other crew members if a watchkeeper becomes incapacitated for any reason. Good use of alarms is of paramount importance when technology is doing much of the watchkeeper's work. If fitted, use them.

3. If attacked by weariness while on watch, do the sensible thing: walk about the bridge, open windows, drink some coffee or call another watchkeeper. Whatever you do, react positively to the signs of fatigue and do not close your eyes for even a few moments as these moments can so easily become minutes, or even hours.

Lookout! Teamwork is Vital

Narrative

It was a calm night on the east coast of England and the visibility was good when a pilot boat collided at speed with a container vessel. The pilot boat suffered significant damage to its bow area (Figure 1) but was able to return to harbour under its own power. One of the crew on board was injured and required evacuation by lifeboat.

The pilot boat was well equipped with navigation and communications equipment. There were two crew on board: the coxswain and a relief coxswain. The relief coxswain, acting as the second crewman, was at the helm. He had planned to approach the container ship's port side, then pass around its stern before collecting the pilot from the ship's boarding ladder on its starboard side (Figure 2). However, as the pilot boat approached the container ship, instead of turning to starboard to pass under the container ship's stern, it made a slow turn to port and collided with the container ship's side. At the point of collision, the pilot boat was still at full speed.

It is evident that the relief coxswain lost situational awareness, but he had no recollection as to why. During the final approach to the container ship, the coxswain was not monitoring the pilot boat's position as he had become distracted by completing an entry in the ship's log.

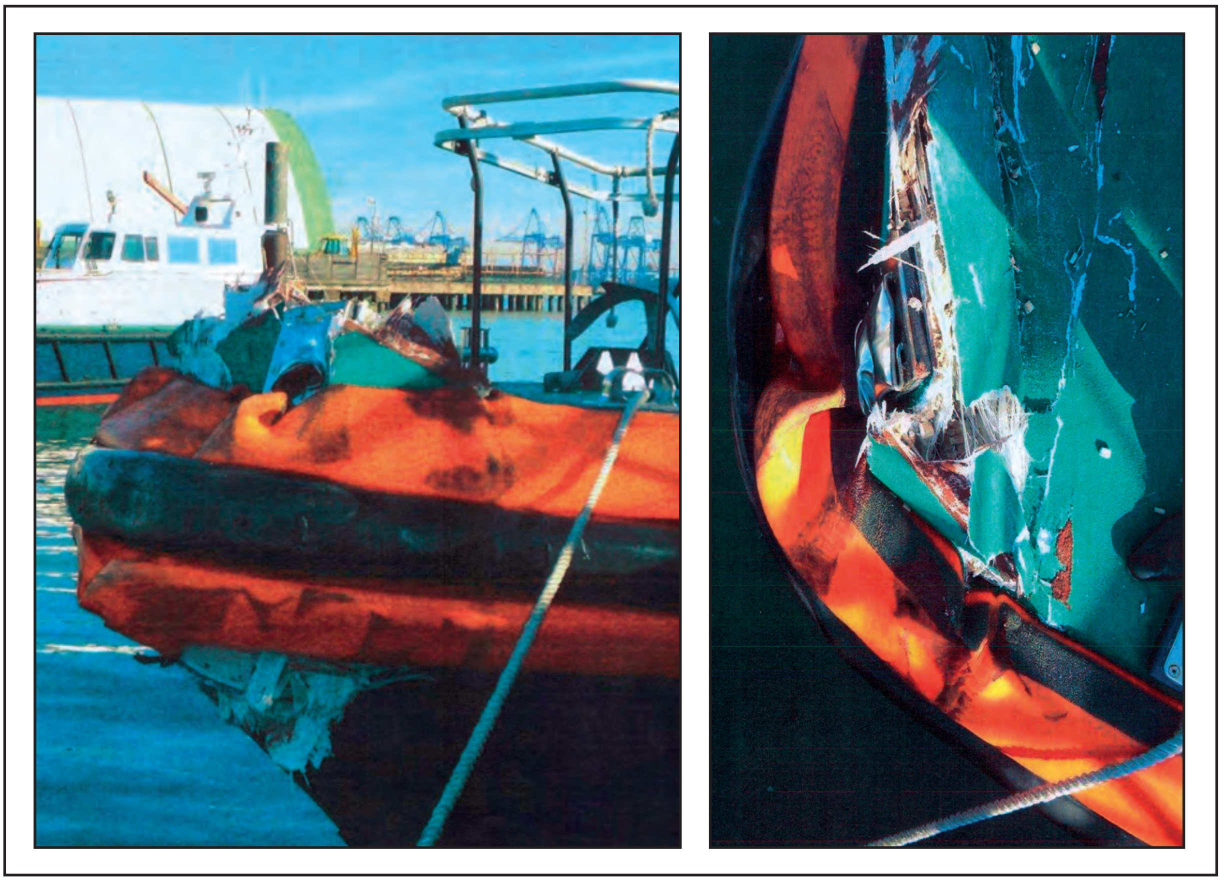


Figure 1: Damage sustained to the pilot boat

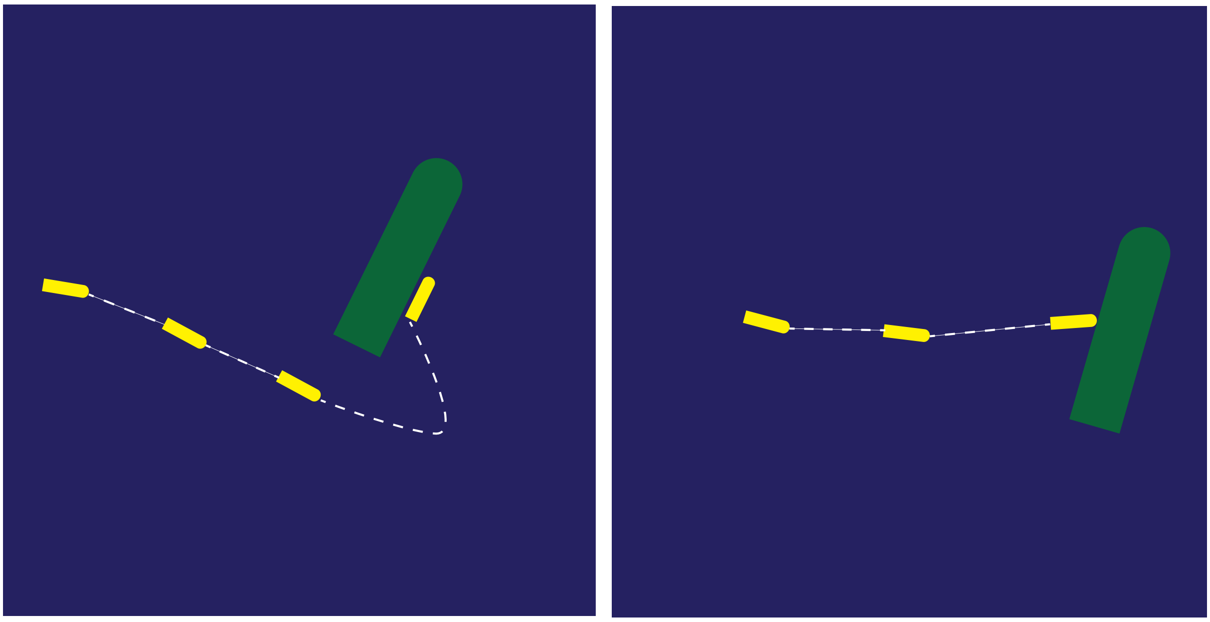


Figure 2: Pilot boat approach to departing container ship

The Lessons

1. Maintaining a proper lookout, by all means available, in accordance with the COLREGS Rule 5 is essential at all times when underway. But the rule also sets out the responsibility to make a full appraisal of the situation and the risk of collision. Therefore, as the pilot boat approached the container ship, such an appraisal would have demanded full attention to the manoeuvre by both crew. It was therefore not appropriate for the coxswain to be undertaking an administrative task such as filling in the log at that critical moment.

2. Working as a team is vital. Good communication between the crew, and a mutual understanding of the plan and the proximity of danger should alert them to the risks and dangers ahead and ensure that corrective action is taken when something unexpected happens.

3. Irrespective of who is at the helm, the coxswain is 'in command' of the pilot boat and should be fully aware of the intended plans and manoeuvres.

Oil and Water Don't Mix

Narrative

A diesel-electric tanker was operating in the Caribbean. The ship was running at slow speed on one diesel generator, which was being supplied with marine gas oil (MGO) from one of two fuel oil service tanks. Overnight, the ship operated with an unmanned machinery space (UMS).

When the engineer OOW came on duty in the morning, he decided to switch from one fuel oil service tank to the other, which was a daily requirement. Prior to the changeover, he opened the drain valve at the bottom of the tank being put into service and started to drain off water. Once the duty engineer was confident there was no further water remaining in the tank, by examining an oil sample in a jar, he switched over the fuel supply.

A short time later, the two running fuel oil service pumps seized. The standby fuel pump started, but this too seized soon after. A fourth fuel pump was started manually, and this also failed. The diesel generator remained running only because of a fuel supply from its emergency header tank. Despite the electrical load on board being reduced to a minimum and the vessel being stopped, the vessel suffered a total electrical failure once the header tank was empty.

The repairs, which included un-seizing the fuel oil service pumps and removing water from the fuel system, took 14 hours to complete. At this point electrical power was restored and propulsion was available about an hour later. The vessel then proceeded to its intended destination with a tug in attendance.

The ship manager's investigation concluded that there had been a significant quantity of water in the fuel oil service tank in use. The water had entered the fuel oil system, causing the fuel pumps to seize, and this led to the blackout. The investigation also identified that, although the vessel was operating in an area with high humidity, the possibility of more water than usual accumulating in the service tanks was not considered. In addition, the tank drain and sample area was poorly lit, which made the sampling procedure more difficult.

More stringent changeover and sampling procedures have since been put in place on board the vessel, including:

- A requirement for service tanks to be drained of water at least 1 hour before the intended time of changeover.
- Oil samples from the service tanks are now collected in a clean glass bottle and taken to the engine control room to be checked.
- The time taken to drain water from the tanks is recorded.

The Lessons

1. **Oil and water do not mix. Fuel oil quality management is fundamental to safe and reliable operation of main and auxiliary diesel engines. Care must be taken to ensure that there is no water in any service tanks that are supplying machinery.**

2. **Fuel oil samples must be taken in areas that are well lit, using sample containers that are clean and allow the contents to be accurately verified. If in doubt take another sample and get another engineer's opinion.**

3. **Fuel and oil storage tanks should be checked for, and drained of, water at regular intervals - such as during machinery space rounds. This is especially important if operating in areas with high humidity and thus high levels of condensation.**

'Weather' or Not to Fit Storm Shutters - Don't Let it Dampen Your Day

Narrative

An Emergency Response and Rescue Vessel had been standing by an offshore accommodation rig for several days. Weather conditions during this time were severe, with wind speeds in excess of 50kts throughout. Despite these conditions, the bridge window storm shutters had not been fitted.

On the day of the accident, the vessel's master had received a weather forecast predicting winds averaging 36kts and gusting up to 50kts. A Significant Wave Height of 6 metres was predicted, with a maximum wave height of 9.6 metres. As the predicted weather conditions were more favourable than those that had been experienced over the previous few days, the master was confident that the bridge window storm shutters would still not be required based on the vessel's satisfactory performance without them.

The master kept the 2000-0000 watch on the bridge, during which the vessel experienced wind speeds of up to 40kts, but moved comfortably in the rough sea conditions.

The master was relieved at midnight by the second officer. Wind conditions at that time were decreasing and the vessel was slow steaming at about 1.5kts into a 7-8 metre sea. Satisfied that the second officer was content with the situation, the master left the bridge for his cabin.

Some 30 minutes into the watch, the vessel encountered three distinctly larger waves than normal. The second wave caused the second officer to feel that the vessel had 'fallen into a hole', and the third struck the vessel hard on its port shoulder, causing two of the bridge windows to fail.

Now open to the elements, the bridge quickly flooded, resulting in water damage to several of its electrical systems, including the engine and steering controls.

The master quickly returned to the bridge, assessed the situation and gave instructions for blanks to be fitted to the open window frames. The bridge was then bailed out, and steering and engine control was regained locally. The vessel was then navigated back to port using its magnetic compass.

Bridge after window blanks fitted

Subsequent investigation identified wind speed gusts recorded by the accommodation rig of up to 67kts, and a maximum wave height of 11.03 metres around the time of the accident. About 1½ hours later, a maximum wave height of 15.3 metres was recorded.

The Lessons

The vessel's performance in similar weather conditions over the previous days convinced the master that when he received the weather forecast on the day of the accident no additional precautions, including the fitting of the bridge window storm shutters, would be required.

1. The weather forecast received by the master on the day of the accident predicted a significant wave height of 6 metres and a maximum wave height of 9.6 metres. However, research indicates that for a prolonged period of adverse weather, the maximum wave height that can be expected is more than twice the significant wave height.

   One reference[1] indicates that 1 in 100,000 waves will be 2.46 times the significant wave height. It should therefore come as no surprise that a maximum wave height of 15.3 metres was recorded at a time when a significant wave height of 6 metres was predicted. Mariners need to be prepared accordingly.

2. This vessel had been provided with storm shutters to be used in conditions such as those experienced. Don't allow yourself to be lulled into a false sense of security because everything has been okay up to that point. It's better to employ a barrier unnecessarily than to regret not having used it after an accident has happened. However, make sure that you are able to maintain an effective lookout once barriers have been fitted.

3. In this case, the company investigation identified weaknesses in the window glass securing arrangements, including corroded screws, and silicone sealant having been used instead of a rubber gasket. Take the time to carefully inspect your bridge window securing arrangements to ensure that they are appropriate and in good condition.

[1] Price W.G. and Bishop R.E.D. Probabilistic Theory of Ship Dynamics. Chapman and Hall Ltd 1974

Look Out B(u)oy

Narrative

The crew arrived for their morning shift aboard a fast catamaran operating on a domestic ferry route. The vessel had been laid up overnight and the master and mate went through the pre start-up checklist. After rectifying a minor defect with the starboard inverter, the engines were started and the vessel shifted over to its loading berth without incident.

After embarking five passengers the vessel sailed, on time, for its 25-minute crossing. The weather was fine, with a light breeze and rippled sea. Although it was dark the visibility was at least 2 miles.

Having let go the mooring lines at the aft mooring station, the mate proceeded to the bridge to support the master for the passage. By the time he arrived, the vessel had completed its swing and was entering the buoyed channel. The master was increasing the vessel's speed for the passage while also reporting the number of passengers on board to the local VTS by VHF radio.

The mate set about completing the vessel's logbook, which was located on the aft facing chart table at the back of the bridge. The master, having completed his VHF radio call, noticed that the starboard main engine was not increasing revs as fast as the port main engine; this became the focus of his attention.

Once he had completed the logbook the mate joined the master at the console. The master was still looking at the engine monitoring system display, attempting to ascertain the reason for the starboard main engine slow response. The mate looked at the radar and realised that the vessel was significantly to starboard of where he expected it to be, so he checked the position of the vessel displayed on the electronic chart system. This also showed the vessel to be way over to starboard of the usual track, and travelling at over 30kts.

The mate glanced out of the window and noticed the flashing red light of a lateral buoy ahead. He shouted for the master to turn 'hard to port'. Unfortunately, with the buoy only about 5 vessel lengths ahead, the master had insufficient time to react and the ferry hit the buoy, riding straight over the top of it. The buoy rattled between the two hulls as the vessel passed over it, causing damage to both hulls and the cabin underside.

Fortunately, nobody was injured as a result of the accident and, despite there being damage to the vessel, it was all above the waterline. The vessel was able to make its own way back to the berth to discharge its passengers before proceeding for repairs.

The Lessons

The slow responding starboard main engine provided a distraction for the master, as did the logbook for the mate, at a time when the vessel was proceeding at high speed. By the time the mate had realised the vessel's position and shouted his warning to the master, it was far too late for avoiding action to be taken.

1. Maintenance of a good lookout is important on any vessel - it is vitally important on vessels travelling at high speed. In this case, despite the presence of the master and mate on the bridge, both had been distracted and therefore no effective lookout was being continuously maintained. The value of a lookout and the maintenance of a proper lookout, as required by Rule 5 of the COLREGS, cannot be underestimated, particularly when navigating in close proximity to navigational hazards and other traffic.

2. Good bridge team management could have prevented the accident. Once something out of the ordinary has been identified, it is important that available resources are used effectively to combat the additional risk posed. In this case, had the mate been instructed to monitor the vessel's passage and maintain the lookout, or fault-find the slow response of the starboard main engine while the master monitored the passage, any deviation of the vessel from the intended track could have been addressed immediately.

3. Given the routine nature of the vessel's passage, it is possible that the master was more prepared to reduce his normal level of lookout vigilance than he would otherwise have been. If you ever become distracted and find yourself thinking 'it will be ok', it is usually best to assume it will not be - and act, or adjust the plan, accordingly.

No Time to Fall Asleep on the Job

Vessel aground

Narrative

The crew of a small general cargo vessel enjoyed a rare overnight stay in port while discharging of its cargo was stopped. This gave them the opportunity to obtain both a run ashore and a full night's sleep in bed.

The next day's discharge was completed in the afternoon, and the vessel sailed for its next port. During the short 20-hour passage, the three deck officers (master, chief and second officer) resumed their normal sea-watch routine of each officer doing 4 hours on duty with 8 hours of rest; the second officer took the 0000-0400 watch.

After the second officer had finished his watch he went to his cabin and slept from about 0430 until he was woken at 1100 by the noise made by the vessel berthing. While in port the chief and second officers shared the cargo watches equally, both doing 6 hours on duty with 6 hours' rest. One of the two ABs was assigned to each of the sea and port watches. The chief engineer and cook remained on day work at all times except when required for port arrival and departure. The master took the 8-12 watch at sea and changed to day work while in port.

During this particular port call the vessel was required to have timber loaded in its hold and then on deck, which caused the normal port call routine to quickly unravel. Despite the second officer and an AB being assigned to the 1200-1800 watch, the chief officer remained awake throughout, as did the chief engineer, the other AB, cook and master - all of whom remained on standby until they were needed. This enabled the second officer to finish other non-cargo related tasks, with the chief officer remaining awake to carry out draught surveys on completion of loading.

Certain operations necessitated additional manpower, such as when rigging stanchions or lashing deck cargo. These additional resources were required towards the end of the second officer's watch, when loading within the hold was completed. The stanchions needed to be rigged, the hatch cover closed, and a draught survey completed in preparation for loading deck cargo. The chief engineer, chief officer, master, cook and both ABs assisted the second officer with conducting these tasks.

Loading of the deck cargo was completed at about 1930. As he was still awake, the second officer reportedly assisted with cargo lashing. He managed to get about 30 minutes' sleep before being called to assist with unmooring the vessel. As both ABs and the cook would also be required to assist with unmooring, they also remained awake until after the vessel had departed. The chief officer, who would normally have been required to assist with unmooring, had been on duty since 0400 and was sent by the master to get some rest, as was the 0000-0400 AB after departure due to the long hours he had worked during the day.

The second officer relieved the master at midnight for his normal watch. After the handover, the master left the bridge to obtain some rest, having been awake since 0800.

He did not switch the BNWAS on, and no lookout was engaged. The master believed that the vessel's proximity to land during the second officer's watch would be sufficient stimulation for him, and therefore the risk posed by not having a lookout was minimal.

The declared primary method of navigation was by using paper charts, and watchkeepers were required to plot a GPS position on the chart every 2 hours. In practice, the actual method employed was to monitor the GPS cross track error, and to use a 0.2 mile distance to waypoint alarm to alert the watchkeepers to make a planned course change. The design of the bridge meant that the GPS, ECS and autopilot could all be either viewed or operated by a watchkeeper sitting in the comfortable bridge chair. And so, as was normal practice, the second officer sat down in the chair and remained there for extended periods of time. What was not normal practice was that this time he fell asleep and missed a waypoint about 15-20 minutes before the vessel grounded. He had been on watch for about 3 hours. The conditions at the time were perfect for encouraging sleep: warm, slight sea, light winds and a gently moving vessel.

The Lessons

The lessons from this accident are all too familiar. If the conditions are right, a lone watchkeeper will fall asleep in the middle of the night if insufficiently stimulated - regardless of whether fatigued. Failure to utilise important barriers, such as lookouts and a BNWAS, meant that having fallen asleep the resting crew remained unaware of the sleeping watchkeeper and were therefore unable to prevent the inevitable grounding of the vessel.

1. While the provision of the additional watchkeeping officer enabled the deck officers to follow a more favourable 4 on/8 off watchkeeping rotation at sea, failure to engage the second officer fully within cargo operations meant that the chief officer remained on watch despite being scheduled to rest.

   The same was true of the two ABs. Failure to maintain their assigned port cargo watches meant that all of the ratings remained awake, and 'stood by' for something to happen. With limited resources, it is important to maintain continuity of watchkeeping routines to prevent disruption to a person's circadian rhythm, and to utilise personnel efficiently. In this case, non-watchkeeping personnel could have been used to assist with the labour intensive operations, allowing watchkeepers to maintain continuity of their routines.

2. In this case the master was content to excuse the lookout for the overnight watch which, in hindsight, was a costly mistake. The true value of a lookout at night stretches far beyond his or her duty to report other vessels and objects ashore. A lookout who is fully integrated into the bridge team provides valuable support to the watchkeeping officer and, in this case, through normal interaction with him could have prevented the second officer from falling asleep as well as identifying that he had done so.

3. A BNWAS is fitted to prevent accidents such as this one from occurring. It cannot work if not switched on and operating - BNWAS usage needs to be an integral part of a vessel's operation where its use is expected and not optional.

4. The method of navigation employed was unconventional, provided little stimulation to the watchkeeper and allowed him to remain inactive for prolonged periods of time. Two-hourly chart position fixing was inappropriate considering the vessel's proximity to danger. The ergonomically efficient design of the bridge, combined with the method of navigation employed encouraged watchkeepers to sit down and to remain sitting down - beware. It may well be comfortable, but such conditions can encourage sleep. Make sure your method of navigation keeps you active, engaged and stimulated.

Mustn't Forget

Narrative

A ro-ro passenger ferry left port with the second officer on watch. As the voyage progressed, the second officer decided to deploy the port fin stabiliser to reduce the vessel's rolling motion.

Prior to arrival at the next port, the master and chief officer were woken and called to the bridge. After discussing the weather, berth and status of the fin stabilisers, the master took the con. The second officer had completed most of the arrival checklist before leaving the bridge to prepare for mooring stations. The check box for the housing of the fin stabilisers had not been ticked as the port stabiliser was still deployed.

With the additional steering motors and bow thrusters running, the master transferred control from the centre to the port bridge wing. Transfer was confirmed by the chief officer, who then positioned himself half-way between the centre and port bridge wing consoles, ready to communicate with the mooring teams.

Just short of the intended berthing position the vessel stopped. The master applied more thrust and the vessel moved slowly ahead. An alarm then sounded and the master and chief officer realised too late that the port stabiliser was still deployed.

The engineering department investigated and found the port stabiliser head severely damaged. The pump room was also flooding where the fin stabiliser had punctured the hull. Watertight doors were closed and the ship's three separate bilge pumps were started to discharge the flood water overboard. The ship's loading computer was then used to check that the vessel was safe with the pump room flooded.

After berthing the vessel, and passenger and vehicle disembarkation had taken place, the master requested assistance from the shore emergency services. The fire brigade arrived and rigged further pumps, but within 2 hours of the initial contact the water level within the pump room equalised with the level outside. Flood water was also leaking slowly through bulkhead glands into the main engine room. At some stage the ship's emergency generator started, after the ship's main diesel generators stopped as a result of lack of cooling water.

After divers had partially plugged the puncture and a high capacity shore pump had been rigged, the flood level in the pump room was reduced to below floor plate level, enabling a cement box to be constructed to prevent further flooding.

Port fin stabiliser view from below, while ship was in dry dock

The Lessons

1. Leaving the port fin stabiliser deployed was a simple lapse of memory and would have been prevented had effective arrival procedures been employed. Firstly, a thorough handover from the OOW to the chief officer as well as the master would have enabled the chief officer to prompt the master. Secondly, the checklist was not consulted before a predetermined go/no-go point, and consequently was ineffective as a reminder. Thirdly, the indication on the stabiliser panel - that a fin was deployed - was discrete and not obvious to the bridge team. There will always be a heavy workload for the bridge team when arriving in port. Make sure your bridge arrival procedures actually help the bridge team and that checklist completion adds value.

2. It was very fortunate that the ship was fitted with a loading/damage computer so that it could be readily determined that the flooding did not threaten the ship's survivability. Flooding drills could have ensured that the response to flooding was more effective. For example, the overboard discharge for one of the bilge pumps had previously been disconnected, but this was forgotten. A high capacity ballast pump could have been used at the outset, but its use was only considered later when power to the ballast pump was no longer available.

3. Although the vessel's design complied with SOLAS, this accident highlights the weakness of positioning all of a ship's cooling water pumping capacity in one watertight compartment. In essence, the ship was only able to employ one bilge pump running from the emergency generator, which alone was unable to cope with the rate of flooding. Having some redundancy so that cooling water was still available to a main diesel generator would have ensured the main switchboard could have remained powered up, providing more emergency response options.

'Fouled' Lines of Communication - A Close Call

Narrative

Two standby safety vessels from the same company were conducting a personnel transfer operation using their FRC. It was daylight with a moderate sea and strong north-westerly winds.

Vessel A's FRC was launched to clear its davit in preparation to receive and hoist an FRC from Vessel B. This enabled the personnel transfer to take place clear of the water, which had been assessed as being safer than a waterborne transfer under the circumstances. Each FRC was manned by three trained crew members wearing appropriate - and as one of them would soon find out - potentially lifesaving PPE.

Vessel B's FRC came alongside Vessel A and was hoisted on board with no difficulties. The personnel transfer was completed and the FRC was then lowered back into the water. As the FRC entered the water the engine was started and the hook released by the aft boatman in accordance with the usual procedure. However, when the coxswain ordered the painter to be released by the forward boatman, things quickly took a 'turn' for the worse.

Expecting Vessel A's deck crew to recover the painter immediately following its release, as was the procedure on Vessel B, the forward boatman held on to it ready to let it go as the deck crew recovered it. Unfortunately, the procedure on Vessel A was not to recover the painter, so as the FRC was manoeuvred ahead, the painter was set beneath the FRC's hull and became caught in the propeller. This caused a sharp tug on the line and the FRC to veer rapidly away from the vessel. Unable to release his grip quickly enough, the forward boatman was dragged overboard into the water, and struck his head hard on the ship's side.

Fortunately, he was wearing a safety helmet and lifejacket, and was quickly recovered from the water. He received bruising and a cut above his eye, which was treated by the first-aider on board.

The Lessons

This was a seemingly routine operation between two vessels operating by the same company procedure. Unfortunately each vessel's crew had a different interpretation of the procedure for recovering the painter.

1. It's never a good idea to leave lines trailing in the water during any operation, be it small boat launching, recovery or mooring operations. If a line is slack and not attached to anything, recover it as quickly and safely as possible.

2. Regardless of the procedure in place for recovering the painter, the coxswain remains in charge of the boat and must be alert to potential danger. Make sure the painter is clear of the propeller before manoeuvring. If things start to go wrong, and not as you expect, ensure you warn your team; it may just give them enough time to react to danger.

3. Despite a procedure and risk assessment being in place, there was a disconnect between the FRC crews and the launching parties on their respective vessels. This could have been identified and resolved had a 'tool box' or pre-work briefing taken place between all those involved. This would have outlined the plan, intended sequence of events and communication method. A briefing is an ideal time to review the appropriate risk assessment with all those involved, ensuring their familiarity with it and the associated procedures. Such discussions should always take place, even for seemingly routine operations. It was particularly important in this case as the crews did not normally work together.

4. Once again a life has potentially been saved through the use of PPE - the last line of defence following the breakdown of all the other risk management barriers. Wear your PPE and ensure that it is maintained correctly so that it will operate and provide the necessary protection when needed.

Manoeuvring on (or over) the Limit

Narrative

During a period of high winds, two passenger/ro-ro cargo ferries, operating different routes, lost control while manoeuvring within a harbour area.

Vessel A

Vessel A was being manoeuvred astern to berth starboard side alongside in a wind speed of 36kts (force 8), gusting to 45kts (force 9) (Figure 1). Only three of the vessel's four main engines were operational. The wind was acting on the vessel's starboard side and was of sufficient strength to counter the effect of its two bow thrusters, which were attempting to push the vessel alongside its intended berth. Although the eyes of two stern lines had been passed over bollards ashore and their respective winch brakes applied, the winches were forced to pay out the lines under tension as the vessel moved bodily across the dock towards another ferry that was secured alongside a parallel berth.

The vessel's starboard anchor was let go in an attempt to prevent a collision with the berthed ferry. However, this was unsuccessful and resulted in damage to the vessel's port side. The vessel was then manoeuvred clear of the berthed ferry and proceeded to an anchorage outside the harbour entrance. It later berthed without further incident following the other ferry's departure.

The management company's standard operating procedures set a wind speed limit of 27 knots (force 6) for manoeuvring in the harbour, given the prevailing wind direction and four operational main engines.

The master, who was experienced with the vessel and its route, was following alternative operational limits documented by a previous master on board. These alternative limits were unknown to the management company.

Vessel B

Vessel B was berthed starboard side alongside and was preparing to depart (Figure 2). The wind speed had been variable and was now 40-45kts (force 8-9), acting on the vessel's port side. The master decided to employ a tug to assist manoeuvring, which resulted in a delay to the vessel's departure until after another ferry had berthed immediately astern.

With the tug secured on the vessel's port quarter, the vessel was manoeuvred astern with the tug applying 20% power away from the berth, and the bow thrusters on full power to port. The vessel increased speed astern at an angle of about 10° from the berth until it became apparent that the bow would not clear the ferry berthed astern.

The master instructed the tug to stop pulling and set the propeller pitch combinators to zero in a conscious attempt to bring the vessel bodily alongside the ferry and so minimise any resulting damage. Following the collision, the master succeeded in manoeuvring the vessel clear. He then awaited the arrival of a second tug, which assisted in re-berthing the vessel alongside.

The master acted in accordance with the management company's standard operating procedures in employing a tug on the port quarter in the prevailing wind direction and speed. However, he had limited experience of manoeuvring the vessel with a tug and had not previously carried out the manoeuvre in similar wind conditions.

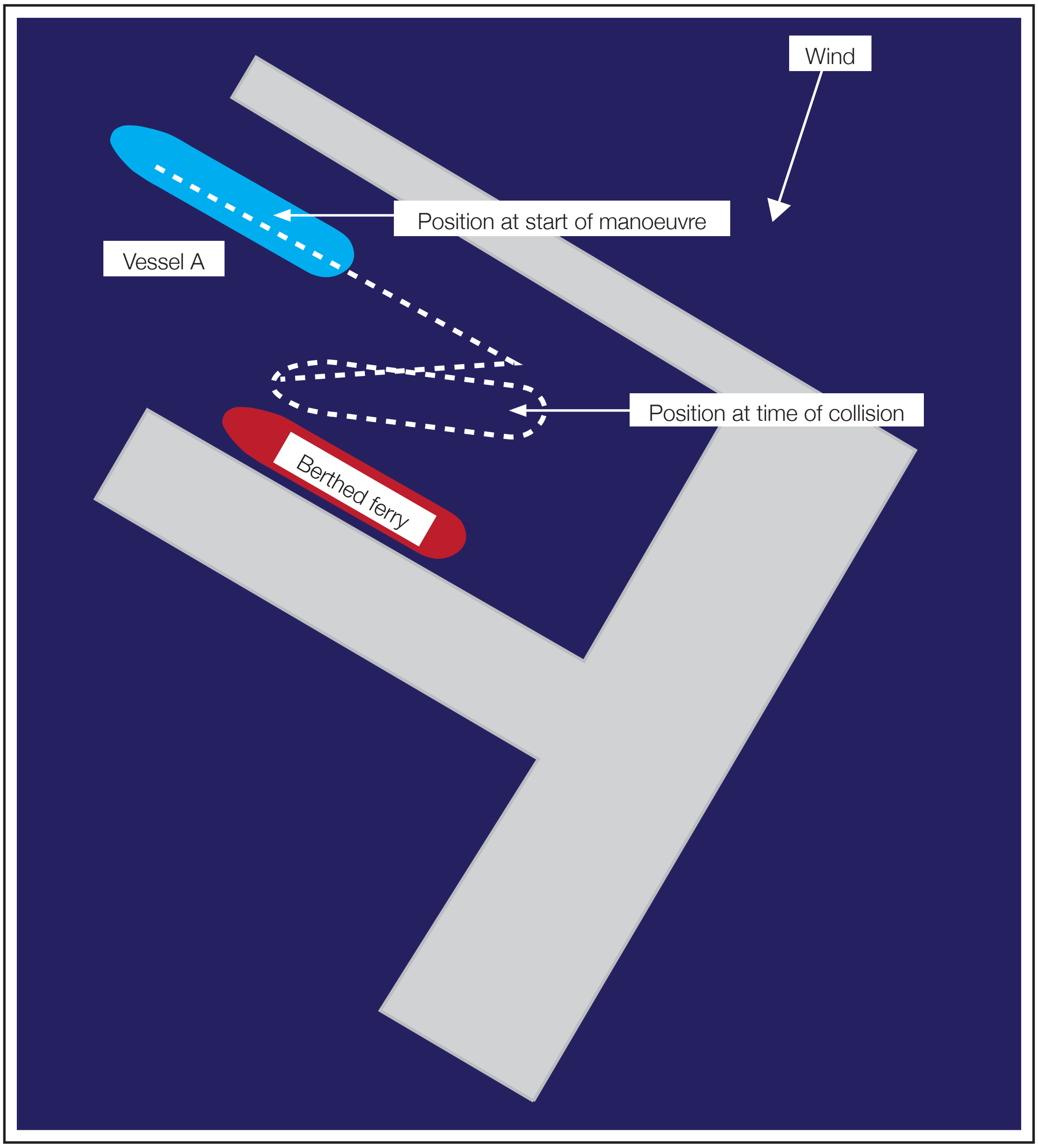


Figure 1: Movement of Vessel A

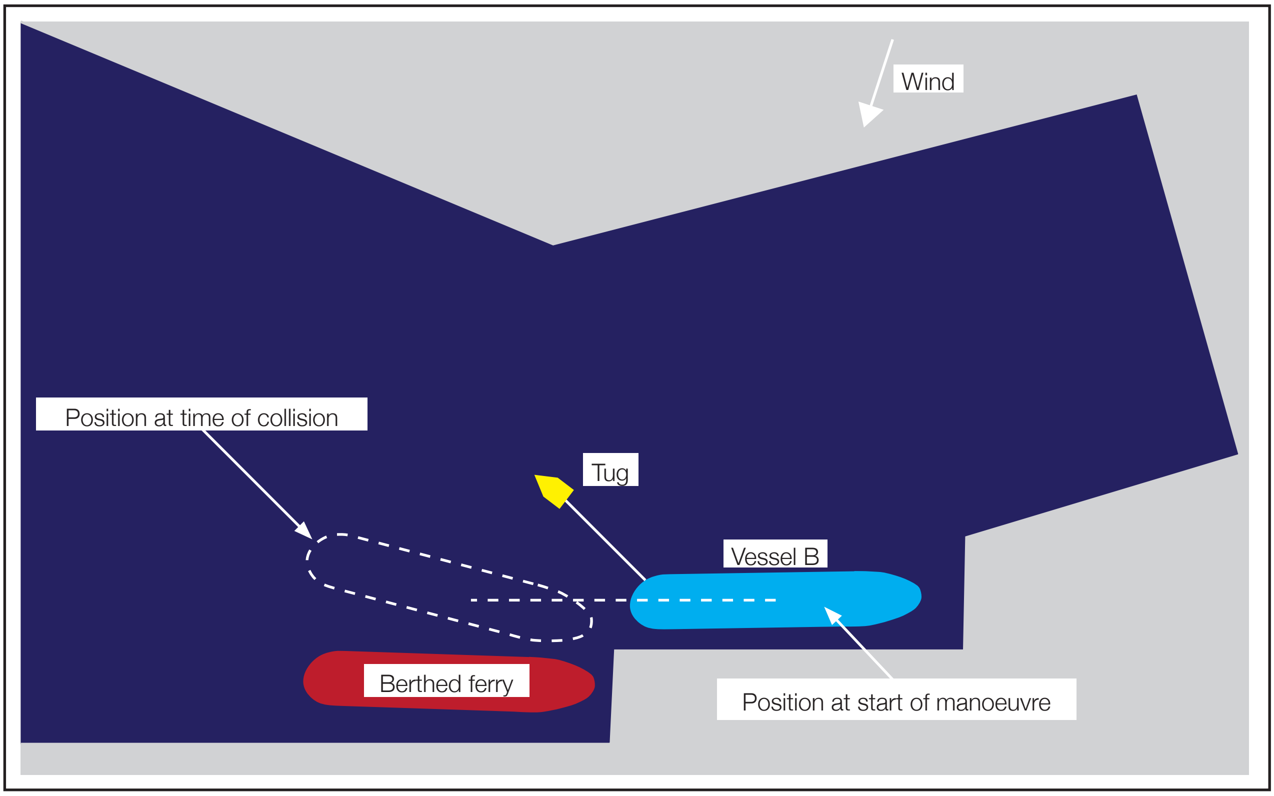


Figure 2: Movement of Vessel B

The Lessons

1. Although Vessel A's management company had developed operational limits for wind direction and speed, these had been superseded on board outside the formal safety management system (SMS). Under the ISM Code, the master has a responsibility to periodically review the SMS and report any perceived deficiencies to the shore-based management. This implies that the master and shore-based management should work together to identify and remedy any deficiencies, and that any resulting changes to operational practice, including the imposition of operational limits for wind direction and speed, should be on the basis of changes made to the SMS. Make sure the operational limits you are using are those formally documented in your SMS.

2. The manoeuvre carried out by Vessel B's master reflected his normal departure procedure from the berth and did not take full account of the extent to which the strong wind would counter the effect of the bow thrusters and tug. It also did not take account of the reduced sea room available in which to manoeuvre the vessel as a result of another ferry having berthed directly astern; the changed circumstances required a review of his original plan, and an updated briefing of his intended manoeuvre with all parties involved.

Refrigerated Container Unit Fire - Are You Prepared?

Narrative

A fire alarm sounded on the bridge of a passenger / ro-ro cargo vessel, indicating a fire on the vehicle deck. The OOW sent a crewman to investigate and then monitored the nearest CCTV camera to the indicated location, which showed a hazy atmosphere. He then instructed the lookout to call the master and to then proceed to the vehicle deck.

The master arrived on the bridge and a fire party was tasked. A motorman was in the process of unplugging the power supply to the refrigerated container units on the vehicle deck in preparation for the vessel's arrival in port. The crewman arrived on the vehicle deck and informed the motorman of the fire's location.

The motorman identified a refrigerated container unit that was on fire. After isolating its power supply, he started boundary cooling, working towards the seat of the fire, when he was joined by the lookout. They were then able to bring the fire under control. Shortly afterwards, the fire party arrived and extinguished the fire, the source of which appeared to be the electrical contacts of the refrigeration unit.

The Lessons

1. The actions of all involved enabled the fire to be brought quickly under control and extinguished. This demonstrates the benefits of emergency planning and regular drills.

2. In addition to emergency preparedness, the ISM Code promotes the concepts of accident investigation and the review and evaluation of safety management system procedures. As a result of its investigation of this accident, the management company identified the following safety issues which resulted in mitigating action:

   - A number of exposed cable runs were noted above some other refrigerated containers units which would have been directly in the flame path of a similar fire.

   - Internal UHF radio communications between ship's personnel were found to be sub-standard due to signal shielding when the vehicle deck was fully loaded.

   - No immediate means were available for the crew to access the top of the refrigerated container unit.

Reversal of Fortune

Narrative

An azimuth stern drive (ASD) tug was berthed alongside in the vicinity of an oil terminal. Routine preparations were being made to depart to assist the berthing of an inbound ship. On this occasion, the regular master was accompanied in the wheelhouse by a trainee master and was familiarising him with the manoeuvring console layout and controls. This included a demonstration of the different ways in which the autopilot could be selected.

In readiness for departure, the regular master clutched in and set the port and starboard azimuth unit control levers to a side-step position to hold the tug alongside. He then handed the con to the trainee master, who gave the order to let go the mooring lines.

As the last line was being slipped, the trainee master noticed that the tug was creeping ahead. He set the port control lever in the astern position and increased power. Noticing no change in movement, he further increased power and informed the regular master, who then took back the con. Applying more astern power to the port control, the tug was noted to be increasing ahead speed towards a pipeline gantry.

The regular master operated the emergency controls to declutch the azimuth units, but this was too late to prevent the tug's wheelhouse top contacting the overhead gantry. Although there were no resulting injuries, the impact caused significant damage to the wheelhouse structure and misalignment of the gantry pipelines.

Investigation found that following the familiarisation demonstration, the regular master had not deselected the autopilot on the port azimuth unit. Although he then moved the control lever to the correct position for a side-step manoeuvre, neither he nor the trainee master recognised that this was different to the actual position of the azimuth unit. Consequently, the act of increasing the unit's astern power had the undesired effect of increasing, rather than arresting, the tug's movement ahead.

The Lessons

1. **The regular master's decision to apply more astern power to the port control was based on an assumption that the port azimuth unit was in the same position as the control lever. Given the tug's rapidly closing distance to the pipeline gantry, he was conscious of the limited time available in which to make his decision. Although indication of the unit's misalignment was displayed on the manoeuvring console, the master saw no reason to check the display and so delay his decision. Consequently, he lacked situational awareness; he had not perceived the fact that the unit was misaligned and, therefore, did not understand the true significance of his intended action and what was likely to happen as a result. Perception is the first step to effective decision-making. Information is displayed for a reason. Don't be complacent. Use it at the planning stage of a manoeuvre - it's often too late when things have started to go wrong and time is running out!**

2. **Although it did not prevent the accident, the regular master's decision to declutch the azimuth units had the effect of reducing its consequences. It was a last resort action as he had not previously experienced a similar situation and remained unaware of the fact that the port unit was misaligned. The various autopilot configurations were not normally selected while the tug was alongside, and it was only because a trainee master was attending that the regular master decided to demonstrate them on this occasion.**

CASE 12

FIRE - Oil and Water (Too Much of One, Too Little of the Other)

Narrative

A vessel sailed without incident and began a routine passage. Once clear of port limits, the master handed over the watch to the chief officer and went below.

In the engine room, the engine room rating had left the machinery space to shut down the diesel engine-powered bow thruster and close the associated deck vents, leaving the third engineer on watch in the machinery control room (MCR). At about this time, the engine setting was increased so that the required passage speed could be achieved. Shortly afterwards, the third engineer noticed oil spraying onto the MCR windows, rapidly obscuring his view of the engines. The third engineer reported the oil leak to the bridge and the chief officer immediately reduced the CPP to the dead slow ahead setting. The third engineer now noticed smoke rising from the engines, and left the MCR to investigate. He saw smoke and a glow above the engines and abandoned the engine room, reporting directly to the bridge. The master had returned to the bridge and, under his direction, the third engineer operated the combined main engines emergency stop.

The master sounded the fire alarm and made a public address announcement ordering all hands to their emergency muster stations.

A fire-fighting team dressed in BA went to the engine room under the direction of the chief officer. They entered the space with charged fire hoses and progressed towards the scene, only for the fire hoses to lose water pressure. However, they were able to fight the fire with locally positioned aqueous film forming foam (AFFF) portable extinguishers. They noticed that the starboard engine was still running and returned to the control position to inform the chief officer.

In the meantime, the second engineer went to the emergency generator compartment to check the emergency fire pump. He found that the emergency generator was running but that the fire pump had stopped. A quick look showed that the breaker on the emergency switchboard was open; this was immediately rectified and the fire pump re-started.

The chief engineer entered the engine room in an attempt to stop the starboard engine. He tried the emergency stop in the MCR and, when this failed, went to stop the engine locally by pulling back the fuel racks. Again the engine failed to stop. He considered closing the fuel run-down valve from the daily service tank, but was unsure which valve was the run-down and which was the spill return. He was also conscious that closing the wrong valve could over-pressurise the system and add fuel to the fire.

Running short of air, the BA team exited the engine room and the compartment was then shut down.

The master consulted with the chief engineer regarding utilisation of the fixed fire-extinguishing system; however, there was concern that if the ship lost main electrical power, the bow thrust would also stop due to the loss of compressed air supply. The bow thrust was now an important asset as the vessel was drifting towards a navigational hazard. There was also concern that the starboard engine, which was still running, could evacuate the fire-extinguishing medium through its air intake and negate its effect. The master therefore decided to delay activating the fixed fire-extinguishing system.

Boundary cooling efforts continued as the BA team prepared to re-enter the engine room. On entry, they confirmed that the fire was extinguished and that the starboard engine had now stopped.

The vessel was taken under tow and returned to harbour for investigation and repairs.

The subsequent investigation revealed that the fire had started as a result of a leak on the main gearbox cooler spraying oil at high pressure (18 bar) onto the engine room deckhead and falling onto the starboard engine exhaust manifold. The cause of the leak was poor engineering practice; the cooler end cover plate retaining studs had not been correctly fitted, the cooler joints were not of an approved type, and one of the joints had been cut for ease of fitment. Furthermore, there were no spray guards over the cover joints.

Tests of the engine control system concluded that the reason for the initial failure of the starboard engine to stop was a partially jammed fuel rack.

The problem with the emergency fire pump appears to have been lack of familiarity with the operation of the emergency generator and associated switchboard. There were no instructions posted locally to the machine and little record of training. The failure of the emergency pump was compounded by the main engine room fire pump not being ready to operate; the discharge valve was closed and the engine room could not be entered to enable the valve to be opened.

The concern over the air supply for the bow thruster engine was erroneous as the air was only required to fill the starting air reservoir and set the initial position of the exhaust flap. Notwithstanding this, the bow thruster would have failed on the loss of main generators as the lubricating oil pump was powered from the main switchboard with no emergency supply.

The Lessons

1. SOLAS Chapter 11-2 Regulation 4 paragraphs 2.2.5.3, 2.2.6.2 and 2.4 require precautions to be taken to prevent pressurised oil from spraying onto hot surfaces with a temperature above 220°C. This fire would have been prevented had these regulations been observed.

2. Poor engineering standards, both during the overhaul of the cooler and subsequent watchkeeping routines, allowed this situation to develop; proper professional standards at all stages of maintenance are imperative to reduce the likelihood of mechanical failures.

3. The loss of fire-fighting water compromised the safety of the BA team and could have resulted in the loss of the compartment; it is vital that all crew members are familiar with operating emergency equipment. Regular, realistic drills and locally posted operating instructions are key to ensuring that emergency responses are appropriate and effective.

4. Main fire pumps should be left configured such that they are immediately available in the event of an emergency (particularly important in the case of an engine room fire).

5. System familiarity is essential. In this case, it was poor in respect of the main engine fuel system, emergency equipment and operation of the bow thruster unit. These failures compromised initial fire-fighting and subsequent operation of the fixed fire-extinguishing system, which could have had a major impact on the outcome of this incident.

Snap - (keep) Back

Narrative

A small gas tanker was moored alongside a terminal berth; all mooring bollards were in use due to bad weather. Six mooring lines were put out forward and seven lines aft - all were of synthetic plaited construction. Cargo loading had stopped because the winds were gusting above the terminal's safety limits. During the night, engines and thrusters were started as the wind speed continued to increase.

At 0720, the aft spring line parted. The crew were called and within 10 minutes the chief officer, third officer and an AB had the line re-connected. High tides and strong winds caused the ship to surge along the berth, causing the forward lines to slacken. The mooring team moved forward.

As the crew tightened the forward lines, weight came on the spring ropes and one of the springs parted. The rope snapped back, striking the AB and breaking his leg in two places. The crew raised the alarm on board and the master requested medical help from the terminal.

Within minutes, the terminal emergency and medical team arrived on board and treated the injured AB. As they did so a second spring line parted, striking a first-aider on the back.

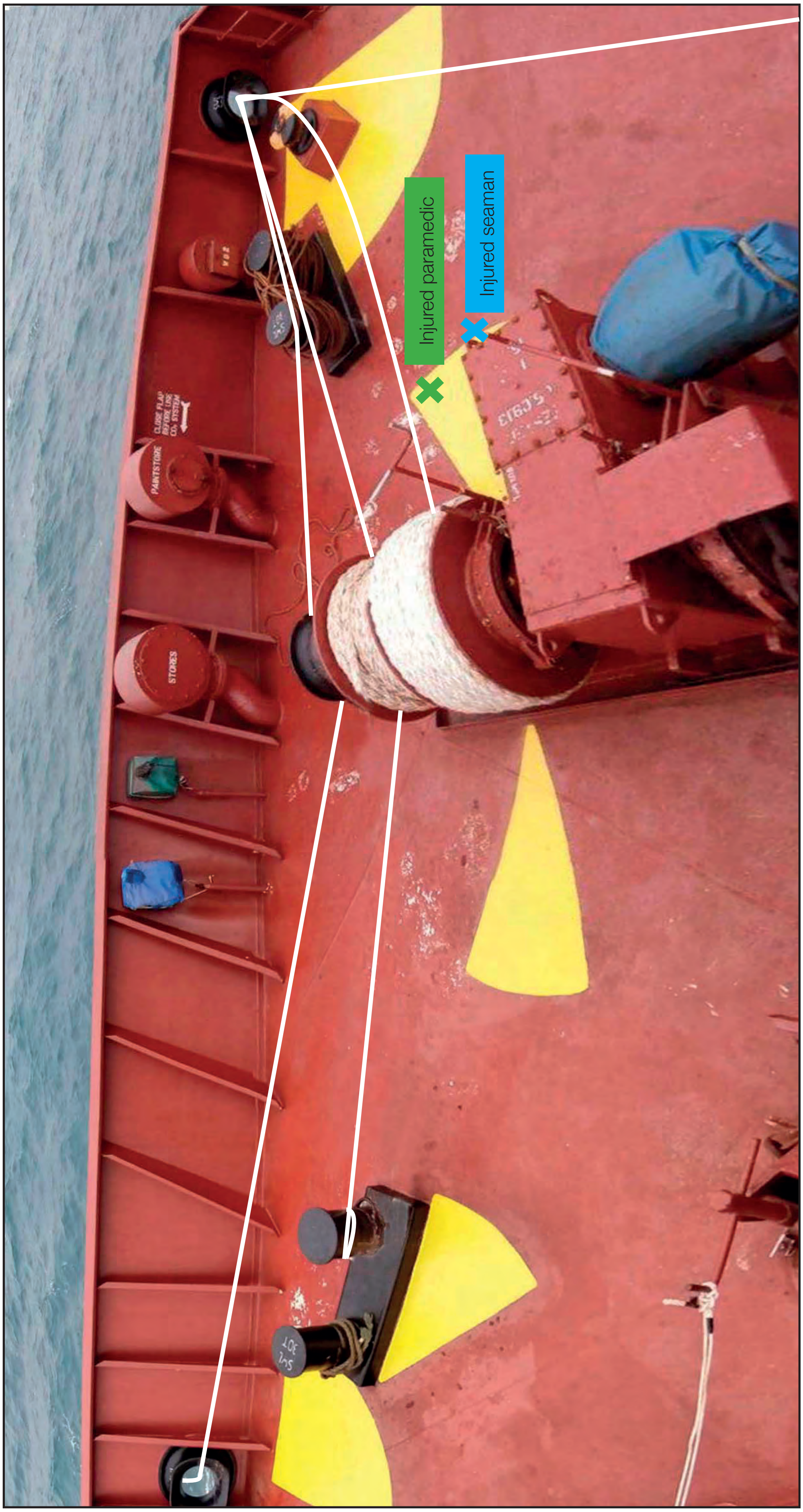
Tug assistance was requested and shore-side medical assistance was called. Both the AB and the first-aider were evacuated from the vessel and taken to hospital. A line boat and a work boat were then used to hold the vessel alongside. After a fourth line parted, a large harbour tug was used to hold the vessel alongside until the wind decreased.

The Lessons

1. Synthetic fibre ropes provide little or no audible warning that they are about to part. When they do part, the snap-back effect can be lethal as the rope ends reach speeds of up to 500mph as they recoil. In this case, no 'snap-back zones', which are invaluable in preventing death or serious injury, had been painted on the deck. Information on "snap-back" zones can be found in several publications including the Oil Companies International Marine Forum (OCIMF) "Mooring Equipment Guidelines" and Chapter 25 of the Code of Safe Working Practices for Merchant Seamen.

2. During poor weather in port, mooring lines are subjected to huge loading. The ropes that parted in this case broke as the rope passed through the fairlead, an area where the rope is subjected to immense pressures and chaffing. While in port, mooring ropes must be regularly inspected and the use of chaffing gear is recommended.

3. If a mooring line parts, additional pressures are immediately placed on the other ropes. Therefore, even greater care needs to be taken and the use of tugs sooner rather than later should always be considered.



Focsle mooring arrangement

Fire Danger - Don't Fret, Take Action

Narrative

A pilot boat had just transferred a pilot to a container vessel and was returning to harbour when an engine coolant high temperature alarm operated concurrently with engine room smoke detectors sounding. A fire was found to have broken out in the engine room. Following an unsuccessful attempt to fight the fire with a portable dry powder extinguisher, the engines were shut down and the air vents closed. At this point the coxswain raised a "Mayday" and an attempt was made to operate the vessel's fixed fire-fighting system. The activation controls for the fixed fire-fighting system were located in the compartment adjacent to the engine room, but this area had become smoke-logged during the initial fire-fighting effort; consequently, the system could not be operated. With smoke still evident in the vicinity of the engine room, the crew were evacuated to a tug which had come to assist. The tug then towed the vessel into port, where the local area fire brigade attended and extinguished the residual fire.

Subsequent investigation revealed that the fire was initiated by an oil leak from the inboard turbo-charger lubricating oil pipe on the starboard engine, spraying an oil mist onto the hot turbo-charger casing. The resultant fire caused extensive damage to both engines, their controls and engine room fittings (Figures 1 and 2).

It was found that the leak was the result of an oil pipe chafing on a heat shield, which led to a pin-hole in the pipe. The heat shield was a post-installation modification - originally the turbo-chargers had been fully clad with heat-resistant insulation. However, a spate of turbo-charger bearing failures had been linked to overheating. Removal of the cladding solved the bearing overheating issues. The modified heat shields were designed to protect personnel from contact with the hot surfaces which had been exposed by removal of the cladding. The new shields took the form of a shaped guard manufactured from stainless steel, and were only fitted to the inboard turbo-chargers, which were located adjacent to a centreline walkway (Figures 3 and 4).

Figure 1: Starboard inboard turbo-charger

Figure 2: Engine room damage

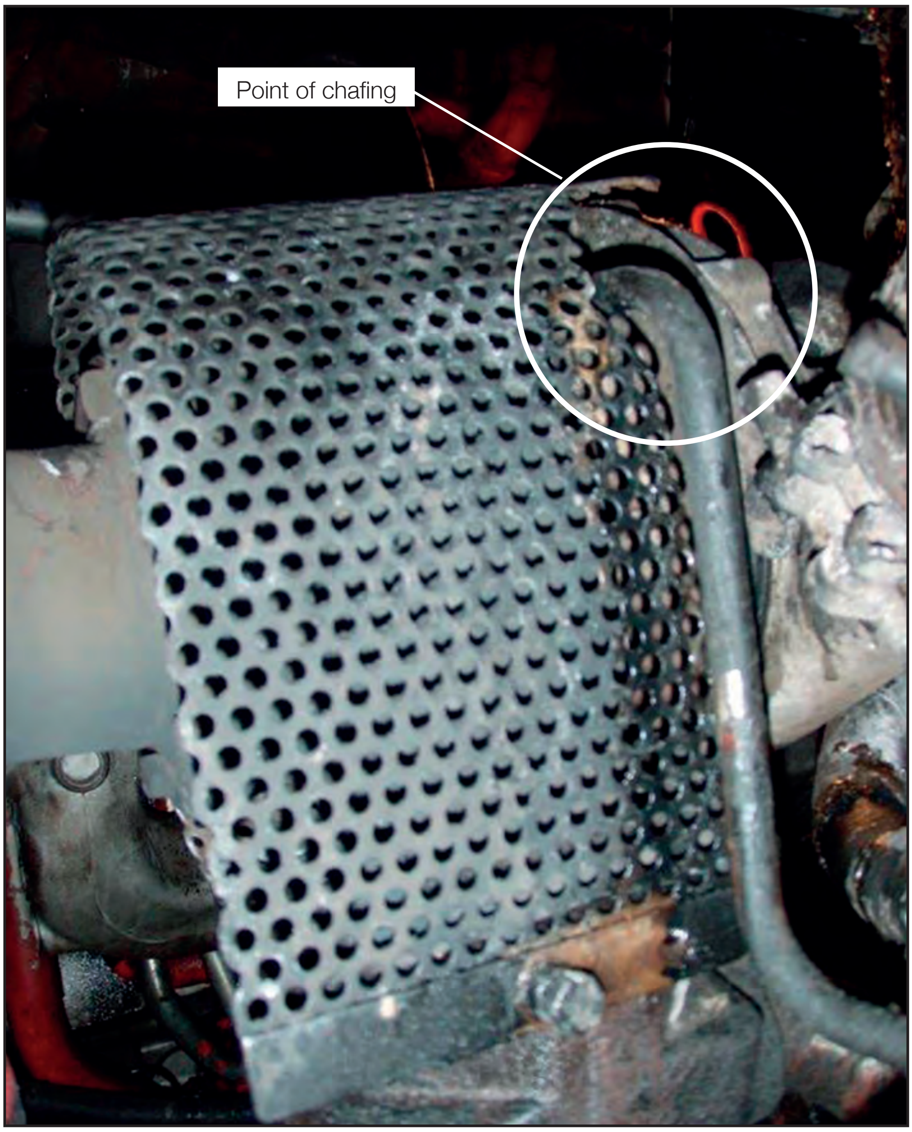


Figure 3: Point of chafing

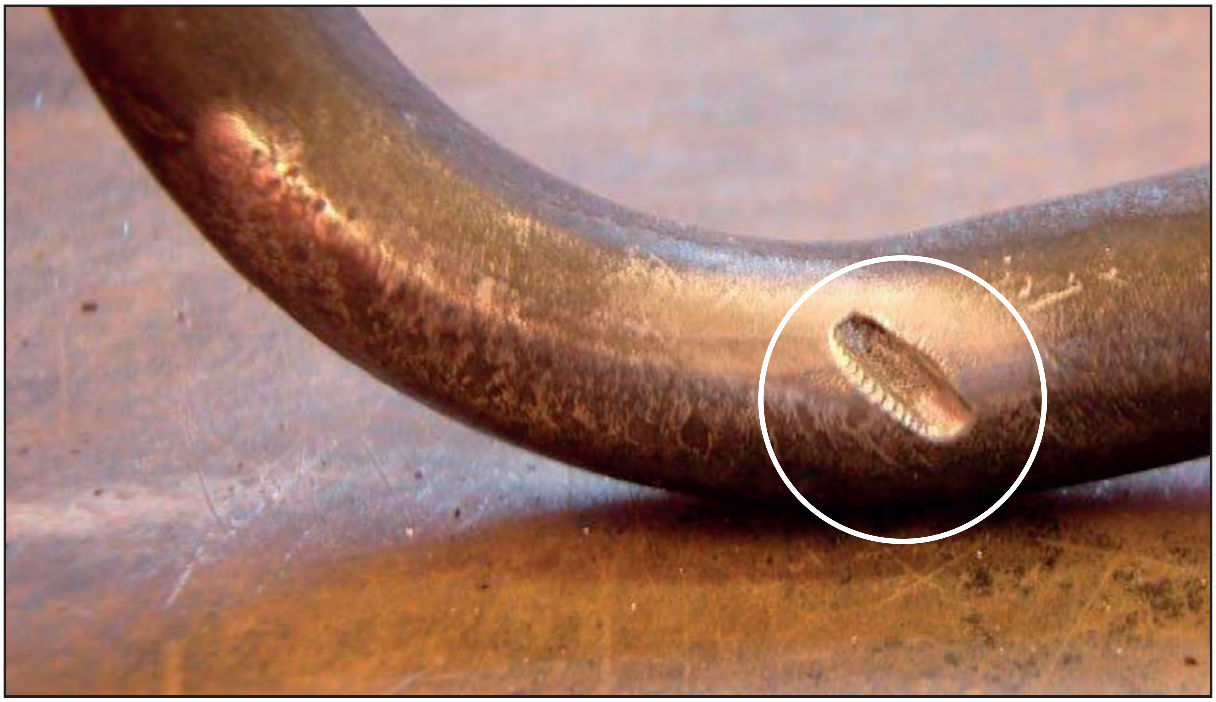


Figure 4: Lubricating oil pipe point of failure

The Lessons

SOLAS requires that all surfaces with a temperature above 220°C which may be impinged as a result of oil system failure shall be properly insulated, and that oil pipes shall not be located above or near equipment required to be insulated (i.e. operating temperature above 220°C). It also requires oil lines to be screened or otherwise protected to prevent oil spray or leakage onto sources of ignition. In this case, the original cladding might have offered suitable protection, but the removal to prevent bearing failure introduced a fire risk. While SOLAS is not directly applicable to pilot boats, the same hazards in relation to fire risks exist.

1. When implementing changes and modifications to rectify a problem, take due cognisance of any new risks associated with the changes.

2. Review the operating position of fixed fire-fighting systems to ensure that activation of the system will not be compromised by the very fire it is designed to extinguish (a remote position in fresh air could be considered).

3. Consider remote viewing for the engine room to allow an early decision on activation of the fixed fire-fighting system and a reduction in the risk of collateral smoke-logging - this could be CCTV or a fire-proof viewing port in the engine room door.

4. Chafing of fuel or oil pipes continues to occur. Regular inspection of pipe runs should be carried out and, where there is a risk of metal to metal contact which could result in fretting, consideration must be given to re-routing pipework. The old adage that prevention is better than cure continues to be as relevant as ever.

Sit Down, Feet Up; There's Nothing To Do (Apparently)

Narrative

On re-joining a small general cargo vessel after a short period of leave, the chief officer planned the next voyage. The vessel's second officer had left the vessel while the chief officer had been on leave, and he had not been replaced. This was the first time the chief officer had planned a passage on board. The intended voyage was planned using a selection of pre-set waypoints in the GPS receiver (Figure 1).

The vessel sailed a couple of days later and it wasn't long before the chief officer took over the bridge watch from the captain. It was dark and the weather was bleak with rain showers and high winds. No additional lookout was posted.

The ship was in autopilot and was following a track displayed on the GPS receiver and on the radar display, both of which the chief officer could see while seated in the pilot chair. The vessel's position was not plotted on the paper charts available and there were few other vessels in the vicinity. The chief officer was warm, comfortable, inactive and unstimulated, and he probably fell asleep for some periods.

After being on watch for almost 3 hours, the chief officer suddenly noticed a lateral buoy close on the vessel's starboard side. At the same time, the vessel's speed began to decrease. The chief officer realised that the vessel was on the wrong side of the buoy, and he immediately put the vessel's engines to 'full astern'. However, this did not prevent the vessel from grounding on a sandbank (Figure 2). It was 30 minutes before low water.

The master soon arrived on the bridge and saw that the vessel was not moving, and he put the engine telegraph to 'stop'. He also switched on the echo sounder and plotted the vessel's position on the paper chart. The master saw that his ship was well off the planned route. The waypoint displayed as the next destination waypoint in the GPS was also not as he expected; the vessel had been heading towards the wrong waypoint.

To try and move the vessel clear of the bank, the master manoeuvred its engines between 'full ahead' and 'full astern'. The vessel eventually re-floated after about 1 hour on the rising tide. However, it would not respond to the helm so the master ordered the anchor to be let go. Soon afterwards, the master reported to the coastguard that the cargo ship had anchored due to steering difficulties; he did not mention the grounding. Subsequent inspection identified that the vessel had lost its rudder (Figure 3). The vessel had to be towed to port for repair.

Figure 1: GPS receiver

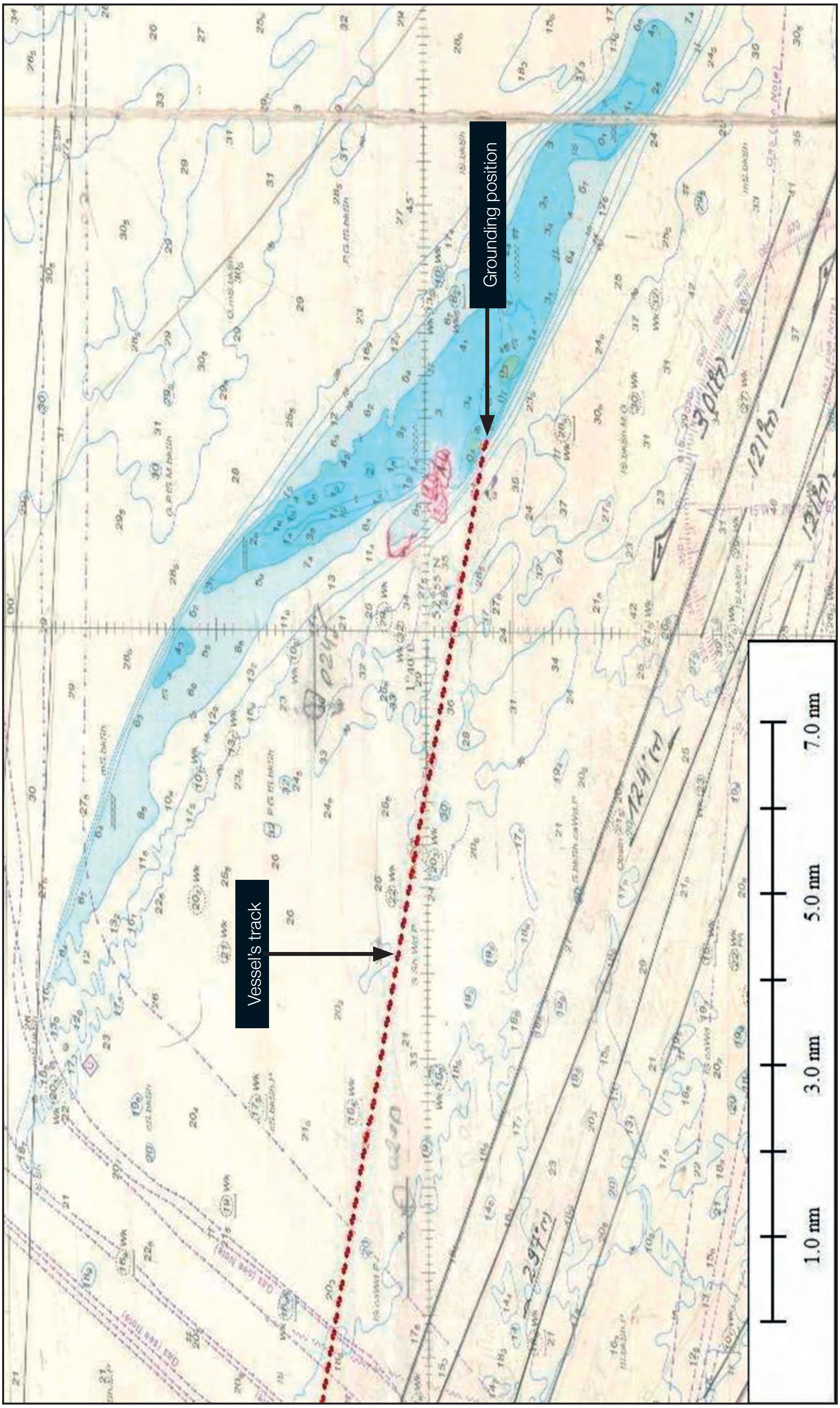


Figure 2: Vessel's track to grounding positions with extract from chart in use

Figure 3: Broken rudderstock

The Lessons

1. GPS has transformed the lives of bridge watchkeepers, and the majority of seafarers would now struggle to operate without it. However, although the positional information that GPS provides is usually both real-time and accurate, the importance of cross-checking this information by other means cannot be overstated. Human programming and system errors do occur and the only way to prevent these errors leading to accidents is to spot them as quickly as possible. More often than not, this can be achieved by regularly plotting the vessel's position by alternative means and by frequently looking out of the bridge windows and making sure that what you see is what you are expecting to see. To do anything less is asking for trouble.

2. OOW fatigue contributes to a significant proportion of all groundings. A recently joined officer will not necessarily be well rested. Frequently, large distances and several time zones will have been crossed. Also, a fatigued OOW who is alone on the bridge at night, and who is warm and comfortable and isn't staying active and stimulated, will find it very difficult not to fall asleep at some point.

3. Although the use of an additional bridge lookout during darkness is a mandatory requirement, many vessels continue to operate with a lone watchkeeper at night. The reasons given for such behaviour are usually related to crew working hours, and also some OOWs do not see any benefits of having an additional lookout and prefer to be on watch by themselves. However, a lookout is not just an additional pair of eyes, he/she is an integral part of a bridge team and someone who should help to maintain an OOW's situational awareness. Importantly, a lookout is also company for an OOW when a watch is quiet and unstimulating.

4. When a vessel runs aground, many OOWs and masters instinctively try to immediately manoeuvre clear by using the main engine. However, time should always be taken to properly assess key factors such as the vessel's position, damage, the depth of water available, the nature of the seabed and the tide before considering whether it might be prudent to attempt to manoeuvre the vessel clear. Otherwise, as in this case, the attempts to re-float a vessel will result in further damage.

5. Do keep the coastal authorities, such as the coastguard, closely informed of accidents or developing situations that might require assistance. Failure to do so is not only unprofessional, it also risks delaying the help you might ultimately depend on to save your ship, crew and cargo.

Part 2 - Fishing Vessels

It's with great pride that I write this introduction to the second MAIB Safety Digest of 2014. Like many of you, I prefer learning to being taught and MAIB publications have been a way of learning for me ever since I first picked one up more than twenty years ago. Often when I read a report on these pages, I'm reminded of a previous case that I've read before. We can learn from our mistakes; but it's better to learn from someone else's misfortune and avoid the same mistakes ourselves.

The ingredients for an accident are there on every vessel, waiting to become part of a sequence of events that lead up to a recognisable incident. In this edition I see fatigue, distraction and vessel condition are the common causes of numerous accidents. All you need to add is a couple of unexpected problems and you have a life-threatening situation that need not have happened.

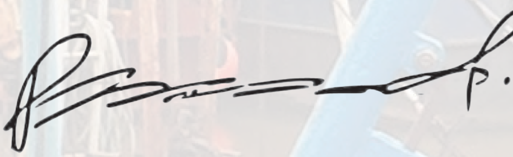
Responsibility is the biggest issue to address in fishing safety, it's human nature to find a reason or excuse for why something happened. The responsibility for any vessel's safety at sea rests squarely and solely on the shoulders of the skipper. Taking responsibility for it is essential to improve safety. There are a few simple steps that all skippers should take that cost nothing, but which could dramatically improve the safety of their vessels.

These are:

- Induction training of new crew
- Safe working plans (Risk assessments)
- Safety drills

MAIB Reports and Digests are essential tools for the improvement of safety, both as individuals and on an industry-wide scale. As individuals, by having read these reports you have the insight needed to make small changes that will reduce the chance of similar accidents occurring. I always make a point of taking handfuls of MAIB Safety Digests with me when I am teaching, and often find that many fishermen have never seen a copy before. It's worth taking the time to spread the word of the work the MAIB does by encouraging someone you know to subscribe by email or post to the MAIB's publications.

Thank you for reading my introduction, and please take the time to learn from these cases and appreciate the important work of the MAIB in improving the safety of our industry.



Robert Greenwood

Robert comes from a long-established fishing family and went fishing right after leaving school. His background is in the crab and lobster fishery around Selsey Bill and he has always had a strong interest in improving and promoting safety at sea. In 2011 he wrote and launched the UK's first online safety management system for fishing vessels, www.safetyfolder.co.uk. This service is free for anyone to use. It is supported by Seafish and is now part of the mandatory Safety Awareness course, along with his Safety Folder.

In 2014 Robert was appointed by the National Federation for Fishermen's Organisations (NFFO) as their Safety and Training Officer and is actively involved in the Fishing Industry Safety Group. This is a role that enables him to work on behalf of the UK Fishing industry as a whole, as well as for NFFO members.

CASE 16

Rock Solid - The Perils of Distraction

Narrative

The 5-day fishing trip had netted good hauls and the fish hold was full. The skipper and three crew were keen to land the fish and return to the fishing grounds as soon as possible.

As the 20 metre, wooden-hulled vessel entered the port's approach channel the skipper loaded an historical port entry track into the chart plotter. The track had been passed on 16 years previously by another skipper, but its accuracy had not been validated against recent charts. In any case no paper charts were carried on board because the chart plotter was used as the primary means of navigation. Unfortunately, the chart on the plotter was of poor quality and although it displayed an outline of the coastline it did not show all of the aids to navigation.

The skipper navigated by eye and occasionally glanced at the chart plotter displaying the track. The vessel passed close to a detached rocky outcrop on its starboard side, which was marked by a beacon. At about 1230, the boat tied up alongside and, throughout the afternoon, she was re-fuelled and re-stored, the catch landed, and ice loaded for the next trip.

In preparation for sailing, the two radars, two chart plotters and the two echo sounders were also switched on, as was the wheelhouse television set.

At about 1820, the skipper notified port control,on the VHF radio working channel 12, that he was about to sail, and this was acknowledged. Because there was a lot of interference on channel 12, the skipper turned the radio volume control down to its minimum setting. The weather conditions were good with light airs and excellent visibility. There was no other traffic in the vicinity and, as the vessel made its way up the channel, the mate went to the galley to prepare a meal and the two fishermen went to the mess room. The skipper once again navigated by eye and roughly followed a reciprocal course to that of the morning entry, while occasionally glancing at the track on the plotter. He made no use of the radar other than to check the position of buoys.

At 1834, the skipper took a telephone call on the vessel's satellite telephone located in the wheelhouse. He then noticed the beacon on the rocky outcrop (Figure 1) on the starboard bow and adjusted the autopilot to bring it fine to port. At 1835, the port control watchkeeper noticed the vessel's radar echo moving towards the rocky outcrop, and tried twice without success to alert the skipper to the danger on VHF channel 12. The skipper then ended his telephone call, but instead of checking on the vessel's position, he went to check the wheelhouse computer for emails.

Within a few seconds the vessel grounded at a speed of 7.5kts, the fish hold bilge alarm sounded and the vessel immediately listed to about 15° to port (Figure 2).

Checks of the vessel confirmed that flooding was restricted to the fish hold, which was by now half full. Port control contacted the skipper on VHF radio channel 16 and confirmed the vessel was aground. He then despatched a port tug to the scene. At the same time the local all-weather lifeboat (ALB) offered assistance. In the meantime the vessel's pumps were started, but were unable to lower the water level in the fish hold.

Although the vessel's stability was unknown, no consideration was given by the crew to prepare the liferafts for possible abandonment, and only one of them wore a lifejacket despite plenty being available.

The tug and ALB arrived a short time later. Additional salvage pumps were supplied, but despite a total pumping capacity of about 200 tonnes/hour the water ingress could not be stemmed. At 2040, the vessel floated free of the rocks on the rising tide. It was decided that the ALB would tow the vessel away from the main channel, assisted by the port's tug. With the fishing vessel crew now on board the ALB, the vessel was taken under tow. However, it adopted an angle of loll and the towline was cut. The tug gently pushed the vessel towards the shore but it foundered in 15 metres of water (Figure 3) a short time later.

Fortunately there were no injuries, and pollution was negligible. The vessel was salvaged and there was extensive damage in the vicinity of the fish hold (Figure 4). The vessel was later declared a constructive total loss.

Figure 1: Beacon marking the rocky outcrop

Figure 2: Vessel aground

Figure 3: Vessel foundering in 15 metres of water

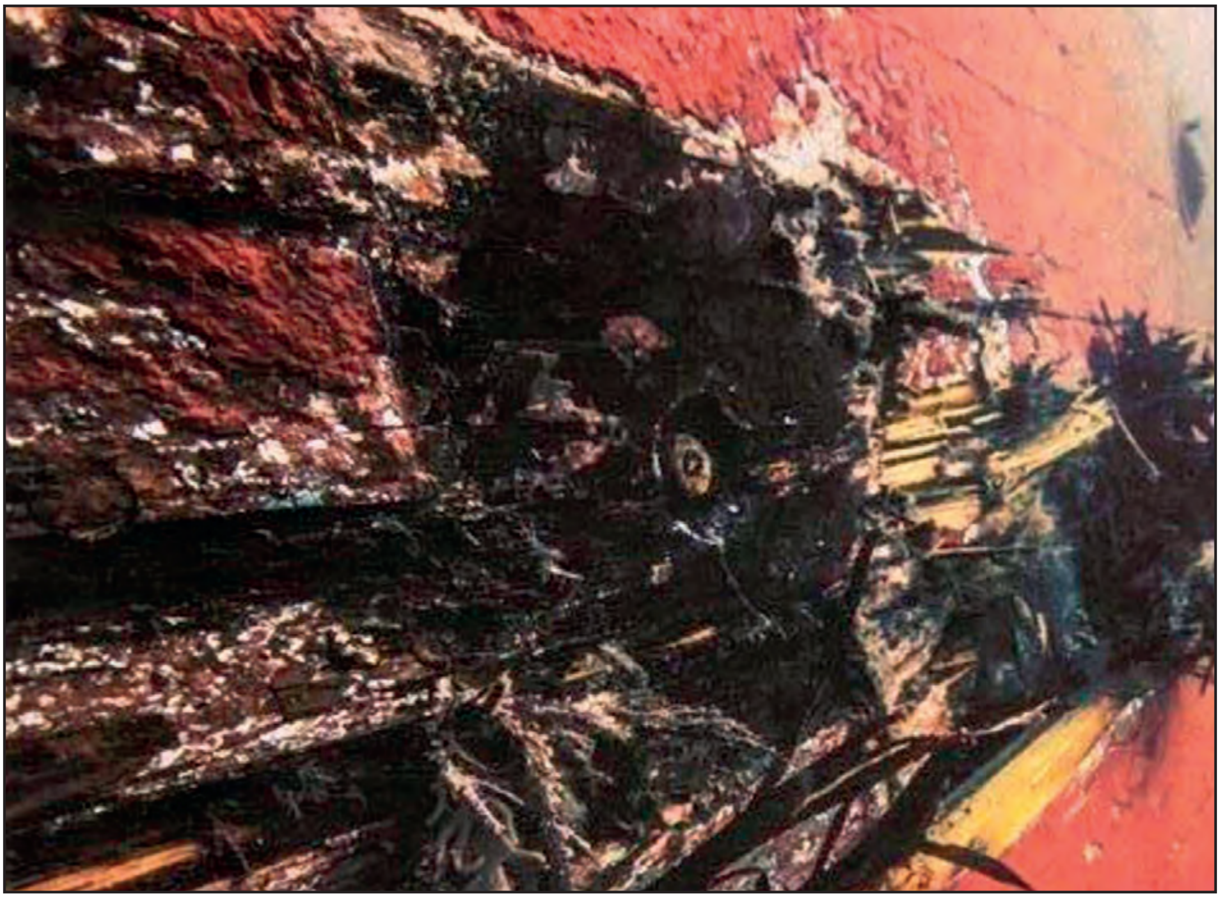


Figure 4: Underwater damage in way of the fish hold

The Lessons

This accident, with its potential for loss of life and damage to the environment, including fish farm industries, was entirely avoidable. The vessel grounded because the skipper lost his positional awareness after he made the course alteration to starboard. He became distracted by continuing his telephone call, checking for emails and, possibly, by the television which was switched on. It is likely during this period that the tidal stream set the vessel onto the rocks. Although he was reportedly aware of the tidal conditions the skipper did not take sufficient account of its potential influence.

1. Do familiarise yourself with the content of MGN 313 (F) - Keeping a Safe Navigational Watch on Fishing Vessels. The publication provides guidance on navigation and watchkeeping practices, including the need to use all navigation aids, to ensure a proper lookout is maintained at all times and to avoid distractions.

2. Be very cautious about accepting and using tracks from friends. Check them against current publications and charts for accuracy.

3. Ensure that voyages are properly planned and include all navigation hazards. Once again, MGN 313 (F) provides guidance.

4. Do undertake monthly drills, and record that they have been carried out. Drills are the very best method on board to ensure that crews deal with an emergency in an instinctive and competent manner. Your life, and those of others may well depend upon how you react in an emergency.

5. Some skippers find it difficult to organise drills. MGN 430 (F) - Fishing Vessels: Checks on Crew Certification and Drills, provides surveyors with guidance on the conduct of drills, which can also be used by owners and skippers to help with planning.

Know Your Loading Limits

Narrative

An under 15m fishing vessel had undergone a refit in the summer and had been day fishing for sprats for a week or so since returning to sea. The three crew were very familiar with the operation and had been landing reasonable catches due to the abundance of fish.

On the day of the accident, the vessel had sailed from her home port as usual and had then headed for the fishing grounds. The net was shot away and hauled about 90 minutes later. In preparation for loading, the fish room hatch and a deck scuttle were opened.

There was a force 3-5 breeze with a slight to moderate sea, and the vessel was left to drift with the wind and waves on her beam. The cod end was then lifted over the starboard side and released into the deck scuttle, allowing the fish to flow into the fish room below. This operation was then repeated a number of times.

With fish still left in the net, the cod end was lifted again. This time a wave broke over the stern, swamping the deck and causing flooding into the fish room. The cod end was lowered back into the sea and the two crew lifted the fish room hatch cover back into place and managed to secure one of the dog clips on its port side, the starboard side being jammed into a pound board. The skipper went below and redirected the bilge pump suction to the fish room. Meanwhile, a further wave swamped the stern. By this time, the vessel was listing with the deck's starboard side awash.

The skipper called the skipper of a nearby fishing vessel on VHF radio and informed him that he may need assistance. The crew of the fishing vessel concerned had just hauled their nets and were 3-4nm away, so began heading in the direction of the stricken fishing vessel. Meanwhile, the skipper of the listing fishing vessel tried slowly to bring the vessel round into the wind and waves, but within a few minutes it slowly rolled to starboard and capsized.

The two crew managed to swim clear and were able to hold on to flotsam to keep them afloat. However, the skipper was trapped in the wheelhouse and tragically was lost with the vessel when it foundered a short time later. The two crew were rescued by the fishing vessel that had been alerted.

The Lessons

1. The fishing vessel had been provided with a stability information book, and lightship checks had been conducted up until 2002 when the regulations changed, no longer requiring a fishing vessel of under 15m to satisfy stability criteria. Although recommended, the owner/skipper did not conduct any further lightship checks, therefore negating the benefit of having a stability information book. If you are fortunate enough to have a stability information book for your vessel, make sure it remains valid by conducting lightship checks at least every 5 years.

2. The stability information book had stipulated the forepeak ballast tank be pressed full when the fish room was loaded, and imposed a loading limit to ensure the vessel satisfied the stability criteria. This advice had regularly not been adhered to and, as a result, the vessel had been operated with a minimal freeboard aft and a low reserve of stability. Ensuring a fishing vessel satisfies standard stability and freeboard criteria provides a sufficient reserve so that it can survive external loads such as those resulting from swamping, flooding, snagged nets or heavy weather. Ignoring the instructions and loading limits stipulated in your stability information book places you and your crew in great danger. Don't do it!

3. The standard routine on board was to lift the fish room hatch and deck scuttle out of the way while the loading of fish took place. While fishing vessels inevitably have to breach their watertight integrity at sea to load fish, this is not an excuse to leave your fishing vessel unnecessarily vulnerable to flooding. The fish room hatch cover should have been secured in place and the manhole, fitted in the hatch cover, used instead to access the fish room. The deck scuttle should have at least been rested back in place between loads. Both of these actions would have minimised the quantity of flood water able to enter the fish room when the wave swamped the deck.

4. The vessel was equipped with a liferaft fitted with a hydrostatic release unit. However, due to the mechanism of the vessel's loss, the liferaft became trapped on being released from its stowage position, and it never surfaced. The liferaft was ideally positioned to be manually released and it would have been prudent, following the swamping, for it to have been prepared for launching. It is impossible to position a liferaft to guarantee that it will float free when a vessel is lost, so do not hesitate to release it manually if you have time.

5. The two crew were fortunate to be rescued quickly. However, a sensible precaution would have been to wear a lifejacket while working on deck. Dangerous situations can develop rapidly, leaving little time to don a lifejacket. So get in the habit of wearing one.

Tightening the Grip

Narrative

At 0400, it was yet another early start for the skipper of a small, open-decked, single-handed, multi-purpose wooden fishing vessel (Figure 1). It didn't matter too much because he had been doing this for most of his life and this was going to be just another routine day. Little did he know that today was most definitely going to be very different.

Just after 0700, the skipper hauled his net for the first time and landed the catch onto the deck boards. There was a good deal of sticky mud mixed in with the small catch, which he washed into the bilge using buckets of water collected from over the side. After the gear was shot away, the skipper started the electric bilge pump to empty the bilge, but no water was discharged overboard.

As the boat was on a steady heading at about 2.5kts and the gear was towing nicely, he decided to lift the deck boards and clean the bilge pump suction strum box, which he suspected was probably blocked with the mud he had washed into the bilge. As he put his hand into the bilge, the slightly ragged sleeve of his smock (Figure 2) became caught around the unprotected propeller shaft (Figure 3).

The rotating shaft tightened the skipper's clothing, pulling him initially to the deck and then dragging part of his upper body into the bilge. He was unable to reach the engine throttle, gear selector or very high frequency (VHF) radio, but he managed to grasp his gutting knife and started to cut away the smock's sleeve. Unfortunately, before he finished cutting off his sleeve, he dropped the knife into the bilge - where he could not reach it.

He then remained in this semi-prone position for about the next hour while his clothing was wound tightly around his neck. As he lay on the deck he managed to wave his left leg above the bulwark in the hope that another fisherman would recognise his dilemma. But no help arrived. He then started to lose consciousness.

Some while later he came round, and with great effort managed to get onto one of his knees. He was then able to just reach the engine throttle, which he pulled to the idle position. The engine stalled under the combined towing load and friction caused by the skipper's clothing. Luckily, the skipper then managed to slowly extricate himself from the now stationary shaft and make contact with the local harbourmaster on VHF channel 12 (the port's working channel). He re-started the engine but the gearbox clutch was slipping and he advised the HM that he would need assistance to get alongside in the fast tidal conditions. A short time later, he again contacted the HM, advising him that he felt he may slip into unconsciousness. The HM then contacted the coastguard, who activated the local all-weather lifeboat. The skipper was recovered, landed ashore, and then flown to hospital by air ambulance.

Figure 1: Deck layout of the open-decked fishing boat

Figure 2: Ragged smock sleeve

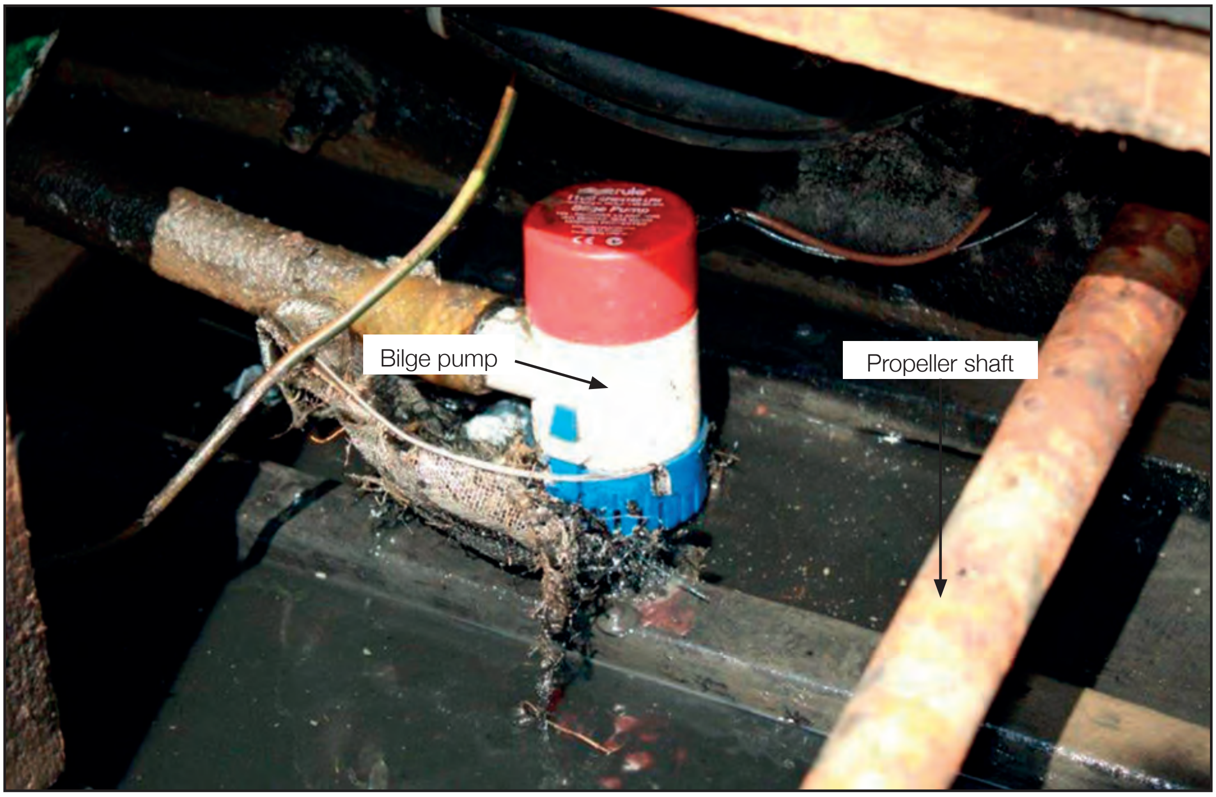


Figure 3: Propeller shaft and bilge pump

The Lessons

Although the skipper found himself in great difficulty, he managed to keep himself calm and carefully considered how he could release himself from the rotating shaft. He was extremely fortunate in being able to reach the engine's throttle and bring the speed down to idle and so stall the engine. Although the skipper suffered severe bruising to his neck and upper torso, and damage to his right arm nerves, it was largely his presence of mind that saved the day.

1. Good housekeeping practices apply to small fishing boats in equal measure to that of ocean-going vessels: avoid flushing debris into bilges where it will block bilge pump suction strainers.

2. Be extremely careful when exposing a rotating shaft, especially if there is a need to work in close proximity to it. It is far safer to stop the shaft. This can be inconvenient, but your life is worth the effort.

3. Always be aware that loose clothing can easily become snagged on rotating machinery. It takes only a momentary lapse in concentration to become caught up, and as this accident demonstrates, the outcome can be severe.

4. Where practical, consider how you may be able to provide caged or boxed-in protection around a rotating shaft to reduce the snagging risk.

5. It is a good idea to have knives readily available on the deck, especially during single-handed operations, so that snags can be quickly released.

6. A readily available hand-held VHF radio can enable others to be alerted immediately to an emergency.

Seeing is Believing

Narrative

It was a clear summer's day. A 16-metre fishing vessel was manoeuvring at a river entrance outside while waiting for the rising tide to allow it to enter port. A 6m, white-hulled, low freeboard pleasure craft was at anchor and engaged in sea angling.

The fishing vessel had operational radar with the range scale set at 1.5 miles. The skipper, who was alone on watch, was keeping a lookout by sight and radar. He was sitting at the starboard side of the wheelhouse with the starboard front window open to assist visibility. The fishing vessel was on an easterly heading in autopilot and proceeding at about 6kts.

The wind was northerly Force 6, giving a choppy sea.

The fishing vessel had been modified some years before by the fitting of a shelter. This had dramatically restricted visibility from the wheelhouse (Figure 1), so a conning dome had been fitted (Figure 2). To operate within acceptable limits, the vessel was required to be conned from this position using modified steering and engine controls. However, the conning dome's Perspex windows had become progressively opaque and the dome was no longer used.

The fishing vessel skipper failed to detect the pleasure craft before the vessels collided.

The sole occupant of the pleasure craft, which had no radar reflector, had seen the fishing vessel approaching and had managed to jump clear before the impact. He had been wearing a lifejacket with an attached portable VHF radio, which he now used to call the coastguard. Having heard and seen the man overboard, the fishing vessel skipper summoned his crew on deck and manoeuvred his vessel towards him. He was pulled from the water and then transferred ashore by lifeboat, with some bruising but, fortunately, no lasting ill-effects.

The pleasure craft capsized as a result of the collision and was later intentionally run aground.

Figure 1: Restricted visibility from the wheelhouse

Figure 2: Conning dome

The Lessons

1. Watchkeepers need to be alert to the presence of small craft operating in recreational areas, particularly in the summer months. A good lookout by all available means is essential; a vessel with low freeboard and no radar reflector can be difficult to spot in windy conditions producing white-capped waves and enhanced radar clutter.

2. As this case demonstrated, a vessel's safety can very much depend on being able to see ahead. The MCA's Marine Guidance Note MGN 314 (F), entitled "Wheelhouse visibility onboard Fishing Vessels", sets out the minimum standards that are acceptable for views from the wheelhouse of a fishing vessel. Where a clear view ahead from the main wheelhouse control position cannot be achieved on an existing vessel, an acceptable standard can be achieved by incorporating an all-round, transparent dome in the wheelhouse deckhead. Unfortunately, in this case the value of such an arrangement had been lost in the passage of time; the skipper considered that he had sufficient ahead visibility from the natural pitching motion of the vessel at sea.

3. Owners of small craft should consider carefully their visibility to other vessels, particularly in choppy seas. Although there is no requirement to fit a radar reflector and/or an AIS transponder, there are distinct advantages in doing so.

4. The pleasure craft owner in this case put his own safety high on his list of priorities by wearing a lifejacket and having an attached portable VHF radio with which he was able to immediately raise the alarm. The outcome might otherwise have been very different.

Engine Access Blocked, Vessel Lost

Figure 1: Burnt out wreck of the fishing vessel (looking aft)

Narrative

The coastguard took a 999 call from crew members on board a liferaft. The two men had just abandoned their fishing vessel, which was burning in front of them. Due to the prevailing wind, the raft was getting blown back on to the vessel and its canopy was beginning to scorch and burn. They managed to move away from the vessel when its pyrotechnic pack exploded and several rockets and flares came in their direction, missing them by inches. Fortunately, a lifeboat arrived in time to tow them to safety.

Earlier that evening the vessel had steamed out of harbour with a deck cargo of a fleet of 40 lobster creels. Also on deck was 1 mile of back rope. On board were 800 litres of diesel and hydraulic and lubricating oils. About 20 minutes after sailing, the crew sensed that the engine tone had changed. It sounded as if a cylinder had stopped firing, but they were unable to verify. The only access hatch to the engine room was covered by the heavy creels. They had two options: shoot all the pots and clear the access, or return to harbour. They decided to turn around and head for the harbour. As they wanted to make port before the tide turned, the engine was run at full power.

Smoke started to fill the wheelhouse as they neared the harbour. Although a smoke alarm was fitted, it was not heard in the wheelhouse. The skipper steered towards a sandbank in order to ground the vessel, but within a minute the wheelhouse was engulfed in flames. As soon as the vessel grounded, the crew launched the liferaft and abandoned. Even though they had brought the engine control to stop, the engine continued to race for a long time as the vessel completely burned down on the dried out sandbank.

Later found among the charred ruins of the vessel was a slack fuel inlet pipe at the engine cylinder immediately next to the dry exhaust pipe.

Figure 2: Burnt out wreck of the fishing vessel (view from port side)

The Lessons

1. When the crew heard the engine sound change, they could not enter the engine room because the access was blocked. Had they been able to, they would have immediately noticed the fuel spray and taken steps to repair it.

    - Make every effort to keep the access to the machinery space clear; you never know when you may need to enter. If you cannot operate without blocking the access, consider the following:
        - Explore the possibility of creating an additional access point, say from within the wheelhouse.
        - Install closed CCTV, preferably colour, which would give you some idea of what is going on in the machinery space.

2. It is not known whether the smoke alarm worked. Even if it had, the crew would not have heard it as it was a domestic battery-powered type, purchased from a hardware store, and the buzzer was audible only in the wheelhouse when the engine was not running.

    - If you have a smoke alarm, make sure you can hear the buzzer, otherwise it is as good as not fitting an alarm. It is neither too expensive nor difficult to fit hard wired smoke alarms with an audible and visual alarm in the wheelhouse.

3. The vessel had only fire extinguishers with which to fight the fire. Even if the crew could access the engine room, opening the hatch would have allowed more oxygen into the compartment, thus fanning the fire. Moreover, it would have been very dangerous to enter the compartment under these circumstances because of the fire and the smoke-filled atmosphere.

    - Consider installing fixed fire-fighting systems which can be operated remotely.
    - Ensure you can shut off the ventilation in an emergency.
    - Consider installing remote stops for fuel supply valves.

4. The engine continued to race even after the engine control lever was brought down to neutral. It is likely that a substantial amount of diesel was sprayed in the atmosphere due to the slack fuel pipe.

    - When the air inlet to the engine is contaminated with fuel, it can continue to provide an air fuel mixture to the engine, sufficient to support combustion. Therefore, stopping the engine with the fuel lever does not always work if you have fuel spraying into the engine room.
    - Regularly check and tighten fuel pipes. It is quite common to find pipe fittings working loose due to vibration, and suffering further damage due to fretting.

CASE 21

Surprised by the Unexpected, But Dressed to Survive

Narrative

It was just another typical winter's day fishing trip, in calm conditions, for an experienced single-handed fisherman, when he suddenly slipped and fell overboard from his small self-shooting potting vessel.

Just prior to going overboard, the skipper had taken his engine out of gear and had gone on deck to prepare a string of pots for shooting. Distracted for a moment by a bit of rope or debris attached to his fishing gear, he slipped on deck and slid overboard through the open stern door. For many years the skipper's usual practice had been to wear his auto-inflation lifejacket; today was no exception. The lifejacket inflated and provided the buoyant support he needed to help him swim back to his unmanned boat.

Once at his boat, he managed to pull himself around to the shooting door at its stern. At first he was unable to pull himself on board as the freeboard was too large and he had nothing to grip onto. He soon realised that he could stand on the frame that supported his rudder, and this enabled him to climb up and grasp the hinges of the shooting door. His first attempt to reach up and grab the hinge failed, but summoning all his composure and strength he succeeded the second time and hauled himself back onto his boat.

Cold and wet, but uninjured, he used his VHF radio to tell the coastguard what had happened and then made his way back into port. The coastguard monitored the potting vessel's progress back to port and arranged for one of its coastal rescue teams to meet the skipper on his arrival.

The Lessons

1. Use of a lifejacket. This skipper might have had good fortune on his side that day, but it is clear that he owes his survival to his discipline and vigilance in making sure he always wore his lifejacket while at sea. The sea does not have to be rough, and something does not have to fail to cause a person to fall overboard; wearing a suitable PFD meant that this skipper was able to return unharmed to his family and live to fish another day.

2. Lifejacket maintenance. The skipper had recently replaced his old lifejacket for a new one. This meant that it was in date for test and was in the best possible condition to work properly on that - once in a lifetime - occasion that he needed it to.

3. Raising the alarm. Following the accident, the skipper assessed what had happened and realised that, had he not been able to pull himself back on board, no one would have known that he was in trouble. As a result of his reflections, he immediately went to his chandler and purchased personal distress beacons for both himself and his fisherman son.

4. Man overboard recovery. This skipper was fortunate to have had the strength, fitness and mental agility to figure out a way of getting himself back onto his boat after having fallen overboard. If you intend to operate single-handed, it is as important to ensure that you have provided a means for yourself to get back on board your boat as it is to provide a means to recover a crew mate from the water.

An example of a typical externally ribbed rudder

Part 3 - Small Craft

Following much of my earlier career in sectors of the marine industry that were very mature and suffering bouts of recession and retrenchment it has now been a very positive change to be working in a relatively young, growing sector of the maritime industry - the Workboat sector.

The development of the sector over the past 20 years or so and particularly in the last decade has been phenomenal - one only has to think of the variety and technical complexity of some of the vessels on display at Seawork recently, to realize how rapidly the industry is developing.

Probably the greatest challenge now for the operators and crews is keeping pace with the changes in the technical design of the vessels, particularly in propulsion and control systems and the wheelhouse equipment, to ensure they are manned by competent crews, trained and familiar with the equipment on board.

Whilst some of the crew have been 'brought up' within the industry, many have transferred in from other sectors - much larger cargo vessels, large yachts or fishing vessels - and these crews need to adapt to these often very different vessels, equipment and areas of operation. It is important that they are given sufficient and effective familiarization periods before taking up an operational role. Another factor recognized in one the following incidents is that for personnel moving from relatively slow vessels such as fishing boats to high speed vessels such as crew transfer vessels, they need time to adapt to the much reduced time frames available to assess and make decisions, which needs a different level of spatial awareness.

We have a huge number of very good 'boat handlers' in the industry but we need to ensure that they are given the relevant training and familiarization to be competent in all aspects of their role, whether as Master or as part of the Wheelhouse team.

The first incident in this section highlights the need to make best use of the equipment provided in order to make safe passage out of a wind farm in poor visibility - the reliance on visual watchkeeping combined with an unlit wind turbine and poor visibility resulted in a collision that might have had more serious consequences.

Conversely, in the 2nd incident, the master was making good use of the electronic chart plotter to monitor the vessel's passage back into port, but unfortunately, in the process of demonstrating the chart plotter to the trainee master on board, he inadvertently moved one of the passage plan waypoints, but was unaware of having done so. This caused the vessel track to be moved, giving a much smaller passing distance to a target buoy ahead, which combined with subsequent course alterations to avoid another vessel on a similar course resulted in the vessel colliding with the Target buoy. Fortunately, whilst the vessel suffered significant damage, there were no injuries to those on board. However, this investigation revealed that the master did not fully understand the chart plotter controls and was not making best use of the equipment available - particularly a good visual lookout, which should have alerted the team to the position of the Target buoy, and that they were well inside the planned track and in good time to have avoided the collision.

The last incident involves the tragic fatality of a diver who fell and subsequently died from his injuries whilst walking across the deck prior to entering the water. He had all the relevant equipment for his dive and had prepared and dressed in his full kit including fins on his feet, but perhaps did not appreciate how difficult it is to walk unaided whilst so dressed.

There is a pattern here that I have seen repeated many times in my career in Safety Management - that the majority of incidents occur not necessarily at the known high risk moments when we are focused on the task in hand e.g. the dive itself, but very often just before or soon after a period of concentration or when performing a routine task and perhaps not fully concentrating on the immediate hazards that are present.

As an industry we are looking to move forward and raise the bar - the recent revision of the MCA Workboat Code will ensure that we maintain an effective standard of build and operation of our vessels, with some of the changes in crew training requirements answering questions raised in these investigations. Within the National Workboat Association we have recently initiated a 'Safety Forum' to better promote Safe Practices and develop a Safety Culture in the industry and have also developed an apprenticeship to give us a better pathway for young persons wanting to join the workboat industry.

However, we still need our crews to be aware and vigilant, on whatever of the wide variety of small craft operating around our shores and to make best use of the training and equipment provided to ensure a safe outcome to each and every voyage.

Mark Ranson – Secretary to the NWA

Following 12 years 'deep sea' with 'Bank Line', I transferred ashore in 1985 with my Master's Certificate to start an extended period in Safety Management with P&O Ferries and P&O North Sea Ferries. I then spent 6 years as Safety Manager with Adsteam and Svitzer Towage in the UK before more recently splitting my time in 2011 between acting as Secretary to the National Workboat Association and also as Marine Advisor to the Survitec Group, working mainly with the RFD Marinark systems.

A Skipper's Nightmare

Narrative

A catamaran wind farm support vessel had been operating within a wind farm all day. The weather had deteriorated during the afternoon and it was decided to recall all the small vessels operating in the wind farm back to port.

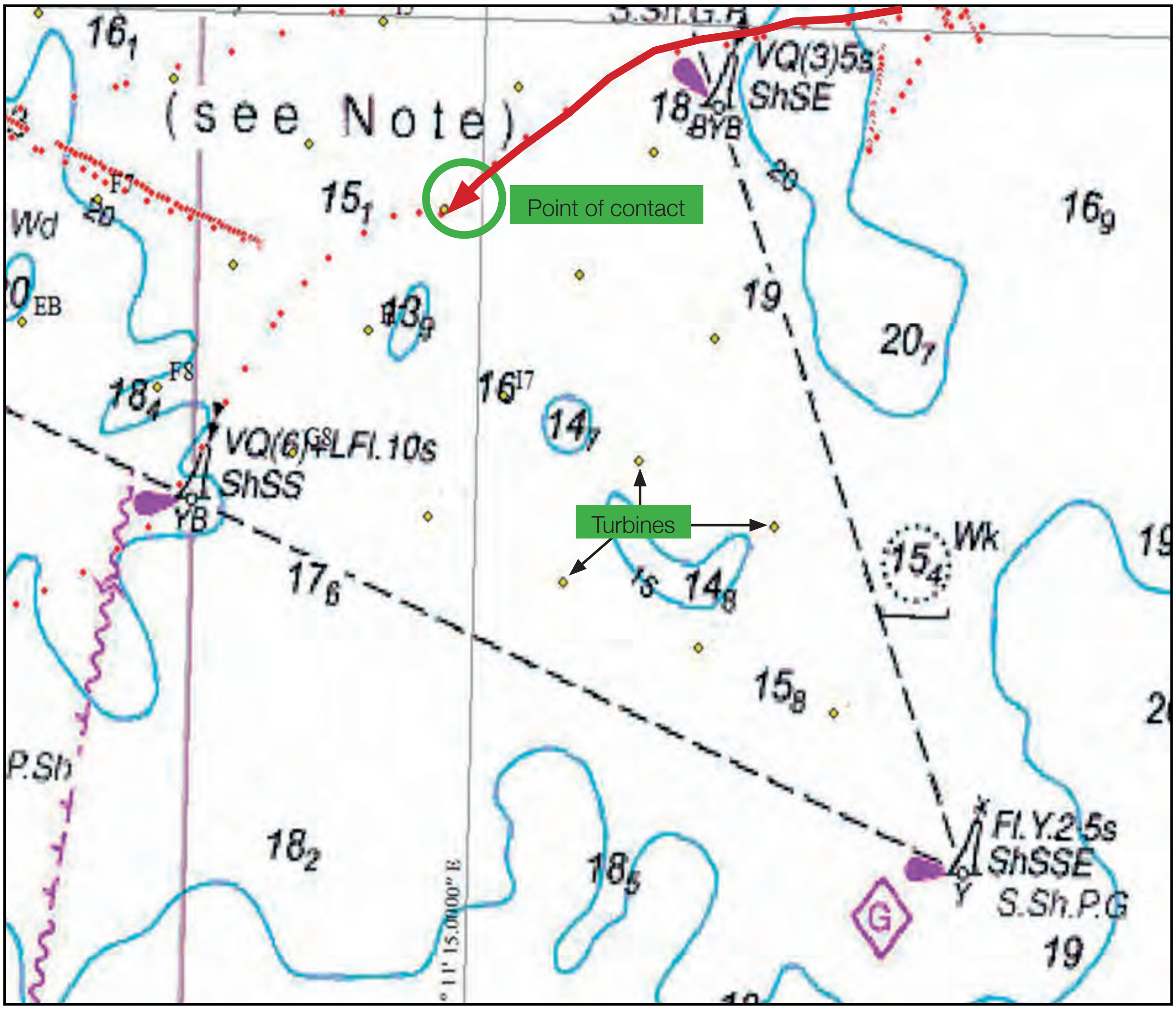
Just before starting the passage back to port, the catamaran's crew changed, allowing the two off-duty crew to go below. The vessel was also carrying one passenger. The wind was now gusting up to force 7, resulting in rough sea conditions. Visibility was moderate to poor with driving rain.

To pick up the approved route back to port, the vessel first had to pass through the wind farm to the designated exit. It was dark and the skipper was able to see the south cardinal navigation light marking the exit on the other side of the wind farm, as well as the rows of red aviation safety lights on the wind turbines. He glanced at the chart plotter display in front of him to confirm his location and then headed the vessel towards the south cardinal light at a reduced speed of 11-12kts. The crewman was sitting next to the skipper with a slave display for the chart plotter set on a higher range to enable him to look for traffic to the south of the wind farm.

A few minutes later, a turbine suddenly appeared out of the darkness, and before the skipper was able to take any evasive action the vessel collided with it head-on, forcing everyone on board out of their seats. One of the off-duty crew attended to the passenger, who had banged his head while the other off-duty crew, although injured, checked for damage to the vessel. The skipper lost steerage of his water jets but was still able to manoeuvre the vessel using differential thrust.

Fortunately the only hull damage was above the waterline. Other nearby support vessels were asked to stand-by and the wind farm marine control room was informed. Contact with the coastguard was eventually established half an hour after the accident.

The vessel headed towards port and was met by two lifeboats at the fairway buoy. Given the sea and weather conditions, it was decided to leave the injured passenger and crew on board. Once there was sufficient tidal height, the vessel entered the harbour, where an ambulance was waiting.



AIS track of vessel

The Lessons

1. Each turbine was fitted with identification numbers illuminated with discrete lights as required under MGN 372 (M+F). Unfortunately the lights on the turbine in question were not working. Although not formal aids to navigation it is understandable that the identification lighting on wind turbines will be useful to vessels within a wind farm at night. However, this accident acts as a poignant reminder not to rely on these lights to navigate safely through a wind farm.

2. A skipper must monitor his passage using all appropriate means at his/her disposal and not be over reliant on just one method. Radar normally would be helpful, but within a wind farm the turbines can produce multiple echoes that can mask real targets. However, the chart plotter would have been an effective aid if utilised fully. Modern electronic navigation equipment can be very capable, and yet many operators are unfamiliar with the range of functionality it can provide. Make sure you are acquainted with any chart plotter fitted to your vessel and ensure you can use the features available.

3. The on-duty crewman was acting as a lookout at the time of the accident. However, as the turbine identification lights were out it was difficult for him to see the turbine in the prevailing conditions. Better use could have been made of the crewman if he had been instructed to monitor the slave chart plotter display set on a lower range, as he might have readily noticed the impending contact. As a skipper or OOW, make sure you make the most of your lookout. Remember, the COLREGS require a proper lookout to be maintained by sight and hearing as well as "by all available means appropriate in the the prevailing circumstances and conditions."

4. Contacting the coastguard should always be a priority following an accident. The earlier they are informed the sooner appropriate resources can be assigned and the best course of action decided and implemented.

Bang on Target

Narrative

After a long day at work, a group of technicians transferred from an offshore renewable energy site to a catamaran. They settled themselves into the passenger cabin for what was expected to be yet another routine uneventful 1½ hour passage back to port.

Little did they know that today was going to be anything but uneventful!

The skipper had the con. The deckhand was at his usual position at the port side of the wheelhouse and was responsible for acting as the lookout, although the skipper had not given him any specific instructions in this regard. There was also a trainee skipper on board who was on his first trip and who was understudying the skipper.

It was dark, with the visibility variable between 2-4 miles and there was a force 5 north-westerly wind. There was also intermittent heavy rain, but the skipper had a clear view through the wheelhouse windows. The radar was set north-up at a range of 1.5 miles and the sea and rain clutter had been adjusted as the vessel gathered speed and settled at 23kts. With everything steady, the skipper concentrated on following the reciprocal course on the chart plotter to that which he had used during the early morning outbound passage. This was his usual practice.

The atmosphere was relaxed, the passengers were comfortable and there was very little traffic about. With the vessel making good progress, the skipper decided that it was a sensible time to demonstrate the plotter's range controls to the trainee skipper. As the skipper manipulated the plotter's tracker ball control, he inadvertently "picked up" the route between two of the waypoints and moved it to the west (Figure 1). He was able to do so because the route had not been locked. The skipper was unaware of how to do this.

An unlit floating target was well known to the skipper and was clearly annotated on the plotter together with a 0.227nm radius guard zone. However, neither the visual nor audible associated alarms had been activated. The skipper had not considered setting them and he was unaware of how to do so.

The skipper followed the now moved route, which caused the vessel to head through the target's guard zone. But this went unnoticed by all those in the wheelhouse.

The skipper then detected on his radar display another transfer vessel off to starboard which was returning to the same port.

There then followed a rapid set of corrections, all at 23kts, which almost ended in disaster.

The skipper now manoeuvred the vessel to the west of the moved route as he applied port helm to "cut the corner" and so get ahead of the other vessel. He then suddenly realised that the vessel was now significantly west of the planned track, and made a starboard helm correction in an attempt to regain the original reciprocal route (Figure 1).

Despite being clearly displayed on the plotter, the position of the target was not considered, and 30 seconds later the vessel's port hull made contact with the steel target.

As the vessel came to an abrupt stop, the technicians were forced onto the deck of the passenger cabin, the port hull compartments' high level bilge alarms sounded and the vessel rapidly adopted a 12-15° list to port, where it settled. As the port and starboard hull compartments were checked the technicians quickly donned their individual survival suits and lifejackets and the trainee skipper transmitted a "Mayday".

The starboard hull was undamaged but the forepeak, void and accommodation spaces and engine room of the port hull were flooded. Despite deploying all the vessel's pumping resources the flooding could not be contained.

With the vessel listed but stable the crew and passengers transferred to another vessel that came to assist. The damaged vessel was subsequently taken under tow to her home port for repairs.

Fortunately there were no injuries, but the vessel suffered extensive penetrations to the port hull shell plating (Figure 2). The port skeg was removed, the port propeller shaft was bent and the port propeller blades were badly damaged (Figure 3). The target also suffered extensive damage.

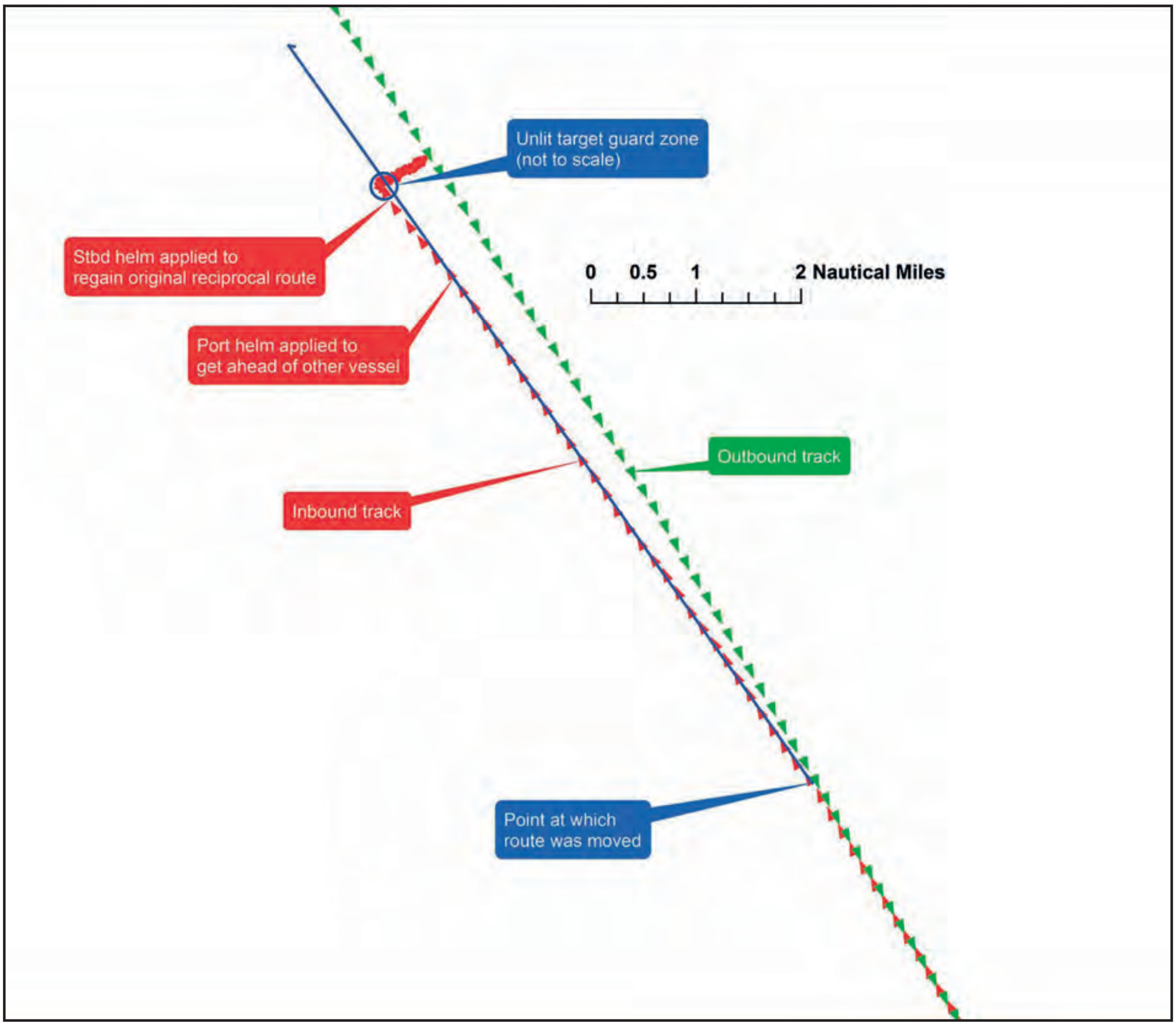


Figure 1: AIS tracks

Figure 2: Penetration to the port hull shell plating

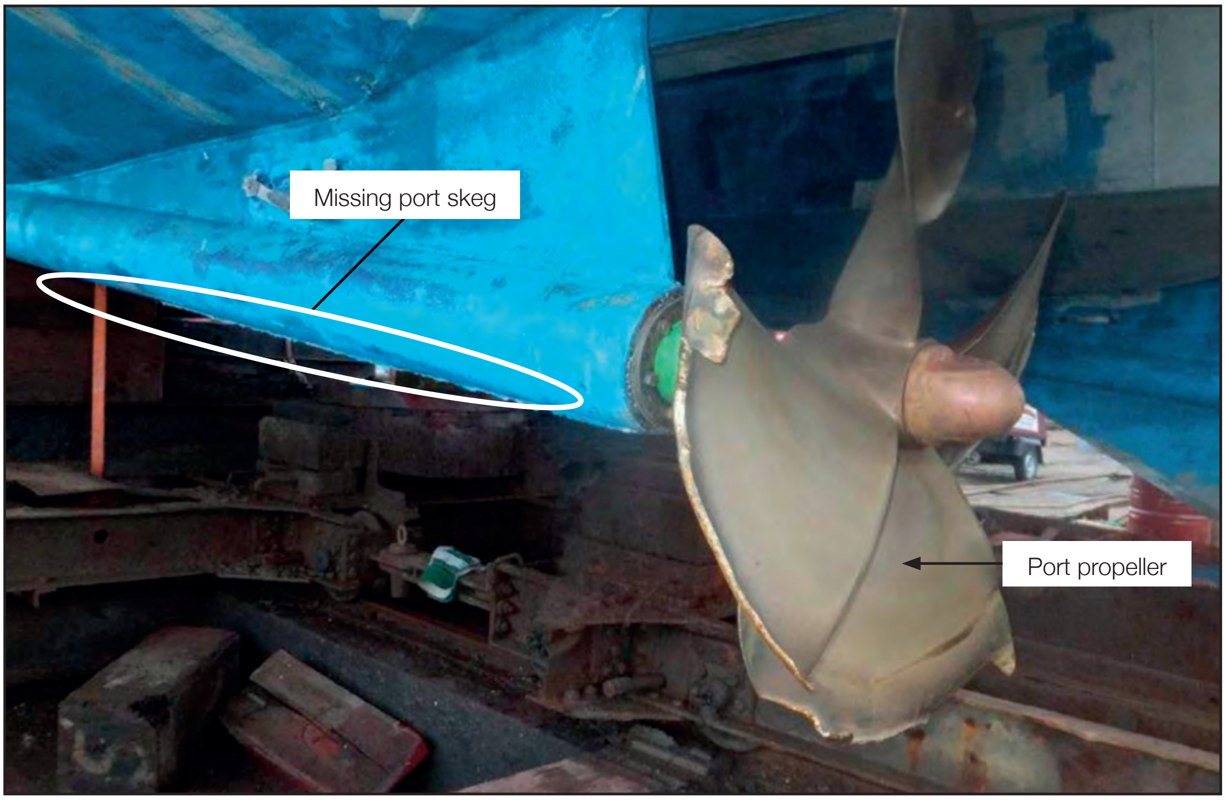


Figure 3: Missing port skeg and port propeller blade damage

The Lessons

The primary reason why this accident happened was poor position monitoring, which caused the skipper to lose his situational awareness, resulting in late, high-speed manoeuvres in close proximity to the target.

The skipper had undergone a period of training with an experienced skipper. However, the level of training was largely left to the discretion of the experienced skipper. Although broad subject headings were provided, there was no detail to support them. To exacerbate the situation, the skipper had not been formally assessed following his training as required by the company's instructions because the assessor's position had not been filled for some 6 months. This had allowed bad practices to develop. Had the assessment been done, the skipper's weak knowledge of electronic navigation aids is likely to have been identified and extra training provided.

1. It is fundamental to safe navigation that effective position monitoring is carried out.

2. The lookout's duties should be clearly understood and skippers should give instructions of particular requirements.

3. The training and assessment processes should be sufficiently robust and properly supported by documented evidence, such as checklists, to ensure personnel are competent to undertake their role.

4. Do ensure that the electronic navaid controls are fully understood, including locking routes, sea and rain clutter adjustments and setting up and activating guard zone alarms.

5. If you are a skipper carrying out wheelhouse -related training, do not forget your primary role of navigating safely.

6. Many ex-fishermen have transferred to the offshore renewable energy sector. There is a vast difference in operating in excess of 20kts compared to relatively slow-speed fishing operations. "Thinking time" is much reduced - give yourself plenty of time, and if in doubt slow down.

An Exhausting Time

Narrative

"Not far to go now", thought the young boy - it was going to be a real treat to be on a narrowboat for the weekend with his father and grandparents. It didn't matter too much that it was a cold March day because the hire company's brochure said that the boats were centrally heated and cosy.

By the time the group of four arrived at the narrowboat company's offices the boat had been cleaned and checked by the maintenance team and there were no defects recorded. They were given a safety briefing on the features of the boat and how to operate it. Just the onboard briefing to get through and they could get underway and make it to the pub for their evening meal before they lost the daylight.

The leader of the group was shown around the boat. The location and use of the emergency equipment was explained as were the engine operation, steering, heating and cooking arrangements. A member of the hire company then accompanied the group for the first stage of their trip to ensure that they were comfortable with the vessel's operation. On completion, he left the boat as it headed up the canal towards the pub where they were going to have their evening meal and berth overnight.

As the group went ashore, the diesel-fuelled heater located in the engine room was running and the radiators were noted to be on. At about 2200, the group returned on board. They immediately noticed that the heating radiators were off and the lights were very dim. The hire company's on-call mechanic was contacted. He discovered that the battery voltage had dropped to below the 10.2 Volt threshold required by the heater to operate its safety features. Consequently the heater had tripped out as it was designed to do, and the heat to the radiators was lost.

The mechanic changed the batteries, checked the engine-driven alternator output and restarted the heater. He decided to wait for a while to double check that the systems were functioning correctly, which they were. The mechanic then left and the group settled down for the night.

At about 0500 the following morning, the group's leader once again contacted the mechanic to report that the cabin area was full of diesel-smelling smoke. When the mechanic arrived at the boat the group were ashore and were being checked by paramedics. Before they were taken to hospital to be checked to see if they had suffered the effects of carbon monoxide (CO) poisoning, the group's leader showed the mechanic the area, in the vicinity of the engine compartment's forward bulkhead, which he thought the smoke had passed through.

The mechanic waited until the engine compartment had been thoroughly ventilated before investigating the defect. The heater's exhaust system comprised inner and outer corrugated, stainless steel pipes. The exhaust gases passed through the inner pipe and were discharged overboard through a gas-tight connection to the hull. The outer lagged pipe was designed to protect against the risk of burns. Later examination identified there was soot staining around the outer lagged pipe (Figure 1). When the system was dismantled, the inner pipe was found to have fractured, allowing exhaust gases to enter the engine room. It is likely that the gases then migrated from the engine compartment (Figure 2) into the domestic areas through gaps around the services that passed through the engine room forward bulkhead (Figure 3).

Figure 1: Soot staining around heater's exhaust

Figure 2: Smoke-logged engine compartment

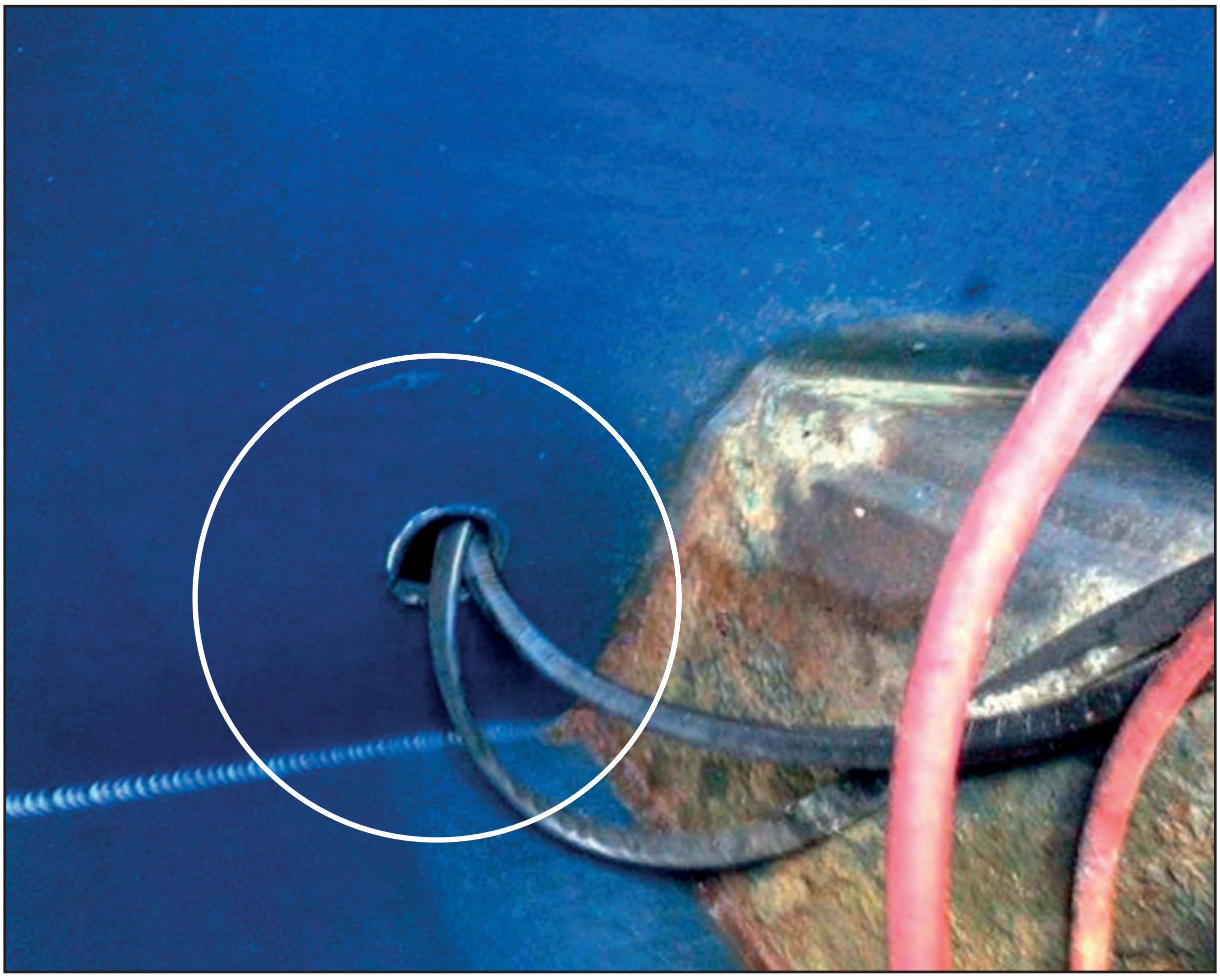


Figure 3: Gaps around services passing through bulkhead

The Lessons

There have been a number of fatal CO poisoning accidents related to incorrectly installed, faulty, badly maintained or misused appliances in boats. In this case the hire group were extremely fortunate to have been woken before becoming incapacitated. If they hadn't, the outcome could have been far worse.

Exhaust systems must be thoroughly checked. In this case the evidence of soot could have prompted a more extensive examination of the system. The fractured pipe might have become weakened through a combination of age, heat cycling and possibly through contact with the hull against the side of locks and other berths.

1. Do ensure that exhaust systems, including those fitted to solid fuel stoves, engines and heaters are clean and undamaged, that connections are tight and that ventilators are unblocked.

2. The presence of soot, staining or other discolouration on surfaces around a flue or exhaust system is generally a warning sign that something is wrong. It will always merit further investigation.

3. While it is not mandatory to fit CO monitors in narrowboats, the Rivers and Canal Trust Boat Safety Scheme's publication entitled Carbon Monoxide Safety on Boats[2] recommends they are fitted. They can be a lifesaver - a few pounds spent can be rewarded by the saving of a life.

4. Guidance on where to fit CO alarms is also provided in the above publication. Do not forget that the alarm should be audible throughout the boat.

5. When fitting a CO alarm, check that it complies with the EN 50291-2:2010 standard and also be aware that alarms become "life-expired", so check the manufacturer's handbook and labelling for details.

6. Where there is a risk of CO being generated and passing to accommodation areas, check the bulkheads. Are they gas-tight and, if not, can something be done to fill gaps or fit grommets around piping systems?

7. Remember CO is the silent killer. It replaces oxygen in the bloodstream, preventing essential oxygen supplies to body tissues and vital organs. By applying the simple precautions above, you will help reduce the risks. Whenever in doubt about the integrity of systems take professional advice from suitably qualified experts - DO NOT DELAY.

[2] The publication, Carbon Monoxide Safety on Boats is endorsed by The Council of Gas Detection and Environmental Monitoring. It is available at the "Stay Safe" tab on www.boatsafetyscheme.org

Falling Into Difficulty

Narrative

On a summer afternoon, a recreational diver stumbled and fell onto the deck of a dive support boat and suffered internal injuries that later led to his death. He was one of a group of experienced 'technical' divers who were enjoying their annual expedition exploring deep water wrecks from on board a converted trawler. Having spent 2 days undertaking preparatory dives in relatively shallow and sheltered conditions, they moved offshore for the first proper, deep wreck dive.

Once the wreck site had been located, each of the nine divers conducted their own detailed, personal preparations and safety checks. However, they did not check each other's equipment and there was no nominated supervisor or formal safety brief. The divers had heavy 're-breather' sets on their backs, and were carrying spare breathing bottles attached to their front and sides, and plenty of additional diving safety equipment.

With the boat in position and the tidal conditions assessed as suitable, the divers began to enter the water. As the fifth diver jumped in, the sixth stood up and started to walk from a dressing bench towards the exit gate into the sea (see figure). This diver was fully prepared for diving, which included wearing fins on his feet and a facemask.

As the sixth diver tried to walk forwards unaided, he stumbled and fell heavily onto the deck. Although it was not immediately apparent, it was likely that the diving gear impacted into the diver's abdomen during the fall and caused significant internal injuries.

Helped back to his feet by the boat's crew, the diver made a positive indication that he wished to continue with the dive and then he entered the water unaided. However, during the descent to the wreck and probably as a result of feeling unwell after the fall, the diver decided to abort his dive and return to the surface. During his ascent, the diver lost control of his breathing and his buoyancy. At a depth of 65m, three of the other divers attempted to stabilize the unconscious diver and help him breathe. By the time the diver was recovered to the surface, he had stopped breathing and, despite the help of his fellow divers, the boat's crew and the rescue services, he did not survive.

Diver's dressing position

The Lessons

1. Even for very experienced divers, moving around a boat at sea requires careful consideration; handrails should be used whenever possible and trying to walk forwards unaided with fins on is ill-advised.

2. During recreational diving trips in boats, if anything untoward happens (such as a fall in the boat) prior to entering the water, where there is even a small possibility of injury to a diver or damage to their kit, then it is probably not appropriate to continue the dive.

3. Safety briefings are critical; everyone should know how to live, work and enjoy the experience of being at sea.

4. There is no reason why deep water recreational diving from a support boat cannot be carried out in a safe and controlled manner. Comprehensive risk assessments for every aspect of such an expedition should be used to spot where things could go wrong.

Investigations started in the period 01/03/14 to 31/08/14

Date of Accident	Name of Vessel	Type of Vessel	Flag	Size	Type of Accident
09/03/2014	*Sea Breeze*	Cargo ship/solid cargo/ general cargo	Barbados	1959gt	Flooding
10/03/2014	*Bayliner Capri*	Recreational craft/sailboat	UK	5.50m	Capsize (3 fatalities)
25/03/2014	*Diamond*	Fishing vessel/trawler	UK	11.50m	Foundering (1 fatality)
31/03/2014	*Ronan Orla*	Fishing vessel/dredger	UK	9.58m	Occupational accident (1 fatality)
09/04/2014	*Nagato Reefer*	Cargo ship/solid cargo/ refrigerated cargo	Panama	7367gt	Damage to ship or equipment
30/04/2014	*Shalimar*	Fishing vessel/ trawler/stern	UK	168gt	Contact
01/05/2014	*Dieppe Seaways*	Passenger ship/ passenger and ro-ro cargo	France	30,551gt	Fire
13/05/2014	*Barnacle III*	Fishing vessel/potter	UK	11.35m	Person overboard (1 fatality)
16/05/2014	*Cheeki Rafiki*	Small commercial craft - yacht charter	UK	12.00m	Capsize (4 fatalities)
20/05/2014	*Water-Rail*	Fishing vessel/potter	UK	4.80	Missing
26/05/2014	*Suntis*	Cargo ship/solid cargo/ general cargo	Germany	1564gt	Occupational accident (3 fatalities)
04/06/2014	*Millenium Diamond*	Inland waterway/ passenger	UK	458gt	Contact
08/06/14	*Shoreway*	Service ship/ dredger	Cyprus	5005gt	Collision
08/06/2014	*Orca*	Recreational craft/sailboat	UK	9.37m	Collision (1 fatality)
18/06/2014	*Norjan*	Cargo ship/solid cargo/ general cargo	Luxembourg	8407gt	Occupation accident
14/07/2014	*Commodore Clipper*	Passenger/ passenger and ro-ro cargo	Bahamas	14000gt	Grounding
16/07/2014	*Barfleur*	Passenger/ passenger and ro-ro cargo	France	20133gt	Collision
16/07/2014	*Bramble Bush Bay*	Inland waterway/ passenger	UK	125gt	Collision
	Morning Star	Fishing vessel/dredger	UK	11.83m	Loss of propulsion power
17/07/2014	*Millennium Time*	Inland waterway/ passenger	UK	270gt	Collision
	Redoubt	Service ship/tug	UK	87gt	Collision
18/07/2014	*St Helen*	Passenger ship/ passenger and ro-ro cargo	UK	2983gt	Damage to ship or equipment
28/07/2014	*Stella Maris*	Fishing/trawler	UK	9.53m	Contact
13/08/2014	*GPS Battler*	Service ship/tug	UK	90gt	Capsize of dinghy (1 fatality)

Reports issued in 2014

Achieve - foundering of the fishing vessel and the death of a crew member, north-west of the Island of Taransay, Western Isles on 21 February 2013
Published 10 January

Apollo - contact of the oil tanker with the quayside at Northfleet Hope Container Terminal, Tilbury, River Thames on 25 July 2013
Published 12 June

Celtic Carrier - fire on board, 24 miles west of Cape Trafalgar, Spain on 26 April 2013
Published 16 July

Christos XXII - collision between *mv* ***Christos XXII*** and its tow, ***Emsstrom***, off Hope's Nose, Tor Bay on 13 January 2013
Published 10 April

CMA CGM Florida and ***Chou Shan*** - collision between the container vessel and bulk carrier 140 miles east of Shanghai, East China Sea on 19 March 2013
Published 1 May

Corona Seaways - fire on the main deck of the ro-ro cargo ferry in the Kattegat, Scandinavia on 4 December 2013
Published 3 July

Danio - grounding off Longstone, Farne Islands on 16 March 2013
Published 2 April

Douwent - grounding of the general cargo vessel on Haisborough Sand on 26 February 2013
Published 29 January

Endurance - loss of a crewman overboard from the motor tug 2.3 miles west-south-west of Beachy Head on 5 February 2013
Published 5 June

Eshcol - carbon monoxide poisoning on board the fishing vessel in Whitby, resulting in two fatalities
Published 11 June

Isamar - grounding of the pleasure vessel off Grand écueil d'Olmeto, Corsica on 17 August 2013
Published 9 April

JCK - foundering with the loss of her skipper in Tor Bay on 28 January 2013
Published 9 January

Karen/Sapphire Stone - collision between fishing vessels resulting in the loss of ***Karen*** 11 miles south-east of Campeltown on 22 January 2014
Published 16 July

Milly - ejection of six people from the rigid inflatable boat in the Camel Estuary, Cornwall on 5 May 2013
Published 30 January

Prospect - grounding on Skibby Baas and foundering in the north entrance to Lerwick Harbour, Shetland Islands on 5 August 2013
Published 19 February

Sea Melody - crewman lost overboard in Groveport, River Trent on 18 December 2013
Published 18 June

Sirena Seaways - heavy contact with the berth at Harwich International Port on 22 June 2013
Published 31 January

***Speedwell* –** foundering, with the loss of its skipper in the Firth of Lorn on 25 April 2013
Published 8 January

Stena Alegra - anchor dragging and subsequent grounding off Karlskrona, Swedenon 28 October 2013
Published 9 May

Tyrusland - fatality of an able seaman on board ro-ro cargo ship in Tripoli, Libya on 15 May 2013
Published 16 July

Safety Bulletins issued during the period 01/03/14 to 31/08/14

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY BULLETIN

SB3/2014

August 2014

Entry of a confined space on board

the cargo ship

SUNTIS

in Goole Docks, Humberside

on 26 May 2014

resulting in three fatalities

MAIB SAFETY BULLETIN 3/2014

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

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

In co-operation with the Marine Accident Investigation Branch (MAIB), the German Federal Bureau of Maritime Casualty Investigation (BSU) is carrying out an investigation into the deaths of three crew members from the German flagged cargo vessel, *Suntis*, in Goole Docks on 26 May 2014.

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

Steve Clinch
Chief Inspector of Marine Accidents

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 not be admissible in any judicial proceedings whose purpose, or one of whose purposes, is to apportion liability or blame.

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

Press Enquiries: 020 7944 3387/3231; Out of hours: 020 7944 4292

Public Enquiries: 0300 330 3000

Background

At approximately 0645 (UTC+1) on 26 May 2014, three crew members on board the cargo ship, *Suntis*, were found unconscious in the main cargo hold forward access compartment, which was sited in the vessel's forecastle (f'ocsle). The crew members were recovered from the compartment but, despite intensive resuscitation efforts by their rescuers, they did not survive.

The vessel was carrying a cargo of sawn timber and, at the time of the accident, shore stevedores were discharging the timber loaded on top of the forward hatch cover. Two of the ship's crew were standing by to clear away the deck cargo's protective tarpaulins as the timber discharge progressed aft. During this time, the two crewmen entered the forward main hold access compartment. The chief officer, who was looking for the two crewmen, found the compartment hatch cover open and shouted down to them before climbing into the space. A third crewman saw the chief officer enter the compartment. When he looked down the hatch, he saw the chief officer collapse.

The alarm was raised and an initially frantic rescue operation was undertaken by the vessel's two remaining crew, and two stevedores. One of the two crew started the hold ventilation fan, and brought a breathing apparatus (BA) set and an emergency escape breathing device (EEBD) to the f'ocsle. He donned the BA set, which did not have a face mask fitted, and entered the compartment. Despite having the breathing regulator in his mouth, it was not supplying him with sufficient air. Two stevedores also entered the compartment during the rescue: one using the EEBD and another without any breathing apparatus whatsoever. While there, they were able to pass lifting slings around the fallen crew so they could be recovered to the deck. The crewman and stevedores suffered severe breathing problems when they returned to deck.

Ambulance paramedics, fire and rescue services and the police subsequently attended. Despite the best efforts of all involved, none of the three crew who were recovered from the compartment survived.

Initial findings

With a timber cargo loaded in the hold and the hatch covers closed, access to the compartment was subject to a permit-to-work and confined space entry procedures. The lid of the hatch into the compartment had signs indicating the potential dangers **(Figure 1)**.

Figure 1

At this stage of the investigation no reason has been identified for the crew to enter the forward access compartment to undertake tasks they had been set. However, it is almost certain that the chief officer and, possibly one of the deceased crew entered the compartment in an attempt to rescue the other(s).

The Fire and Rescue Service analysis of the atmosphere after the accident showed normal readings (20.9%) of oxygen content at the access hatch; the readings reduced to 10% just below main deck level inside the hatch opening and to between 5% and 6% at the bottom of the ladder into the compartment **(Figure 2)**. Such low levels of oxygen cannot support life. Anyone exposed to such levels will faint almost immediately, followed by convulsions, coma and respiratory seizure within a few minutes. It is likely that the timber cargo caused the deprivation of oxygen in the cargo hold and access compartments.

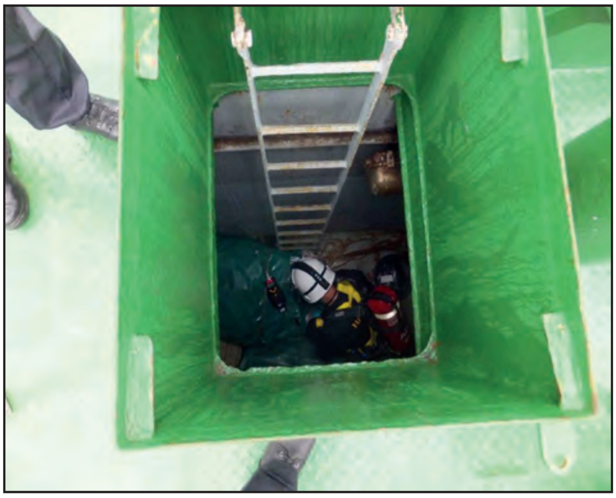


Figure 2

Safety lessons

- The atmosphere within an enclosed space, such as a ship's cargo hold can change rapidly and become lethal dependent on the conditions inside and what is being stored or transported (as the tragic circumstances above illustrate).
- **NEVER** enter a confined space if safer alternatives for carrying out the work are available. If entry into a confined space is unavoidable, robust procedures should be put in place which should include emergency arrangements. These are often referred to as "Safe System of Work" or "Permit-to-Work".
- Warning signs should not be ignored.
- If you are not part of the team designated to work in a confined space DO NOT ENTER. However compelling the desire to enter an enclosed or confined space to attempt to rescue an unconscious colleague is, it must be resisted.
- A ship should have a pre-arranged plan for the rescue of a person who has collapsed within an enclosed or confined space and regular drills should be conducted to test the plan and ensure the crew are familiar with it.
- BA is provided for fire-fighting and rescue; all crew should be trained, drilled and capable of using such critical safety equipment properly in an emergency.
- EEBDs provide a short term air supply to enable crew to escape to fresh air from a hazardous atmosphere. They should never be worn to enter, re-enter or work in a hazardous atmosphere.

Further guidance can be found in the Maritime and Coastguard Agency's (MCA) Code of Safe Working Practices for Seamen (COSWP), Chapter 10, Emergency Procedures, and Chapter 17, Entering Confined Spaces.

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