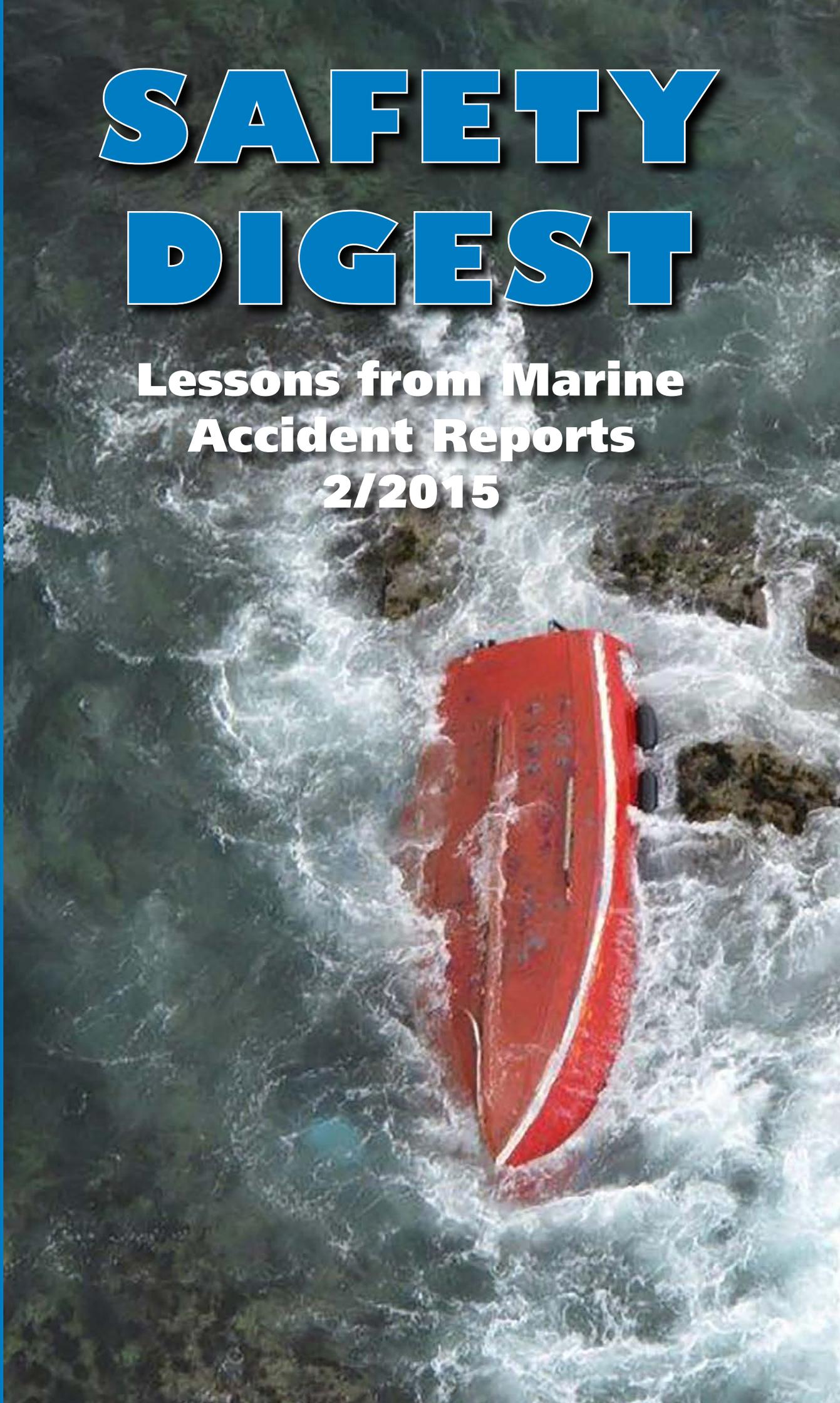


SAFETY DIGEST

**Lessons from Marine
Accident Reports
2/2015**



SAFETY DIGEST
Lessons from Marine Accidents
No 2/2015

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October 2015

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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MAIB

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

INTRODUCTION 1

PART 1 - MERCHANT VESSELS 2

1. Rule 13* – Unlucky For Some 4
2. Uninsulated Exhaust Leads to Boat Loss 9
3. Blind Pilotage 11
4. Changing the Plan Alters the Risk 13
5. Overlook, Overfill, Overflow, Overboard 15
6. Unsupervised Mooring Operation Proves Fatal 18
7. Retain Control to Achieve Your Goal 20
8. Assess the Risk and Maintain the Controls 23
9. No Pitch = No Steering! 26
10. The Weakest Link 28
11. The Unaware Meets the Unqualified 30
12. Lack of Maintenance Can Result in You Coming Unstuck 33
13. Messenger Rope Kills Ship's Carpenter 35
14. Mirror, Signal, Manoeuvre 37
15. A Bridge Too Near 40
16. From Rags to Riches 42

PART 2 - FISHING VESSELS 44

17. Three Lives Lost When Angling Boat Capsizes 46
18. Carbon Monoxide – the Silent Killer 48
19. Got a Screw Loose? 50
20. Flood, Flood, Flood 53
21. Bilge Alarms: Disconnect at Your Peril 55
22. Singled-Handed Fishing Needs Proper Planning 57

PART 3 - SMALL CRAFT

60

23. Family Boating Trip Ends in Tragedy When Engine Kill Cord Was Not Used	62
24. Wayfarer Capsize in January	65
25. The Case for Clear Communications	67

APPENDICES

69

Investigations started in the period 01/03/15 to 31/08/15	69
Reports issued in 2015	70
Safety Bulletins issued during the period 01/03/15 to 31/08/15	71

Glossary of Terms and Abbreviations

AB	- Able seaman	MCR	- Machinery Control Room
AED	- Automated External Defibrillator	MOB	- Man Overboard
AIS	- Automatic Identification System	MSN	- Merchant Shipping Notice
ALB	- All-Weather Lifeboat	OOW	- Officer of the Watch
ARPA	- Automatic Radar Plotting Aid	PFD	- Personal Flotation Device
BA	- Breathing Apparatus	PMS	- Platform Management System
C	- Celsius	PPE	- Personal Protective Equipment
CCTV	- Closed Circuit Television	RA	- Risk Assessment
CO	- Carbon Monoxide	RIB	- Rigid Inflatable Boat
COLREGS	- International Regulations for the Prevention of Collisions at Sea 1972 (as amended)	RNLI	- Royal National Lifeboat Institution
CPA	- Closest Point of Approach	Ro-Ro	- Roll on, Roll off
CPP	- Controllable Pitch Propellers	RYA	- Royal Yachting Association
CPR	- Cardio-Pulmonary Resuscitation	SMS	- Safety Management System
DSC	- Digital Selective Calling	SOLAS	- International Convention for the Safety of Life at Sea
GRP	- Glass Reinforced Plastic	SOP	- Standard Operating Procedure
ICS	- International Chamber of Shipping	TSS	- Traffic Separation Scheme
LPG	- Liquefied Petroleum Gas	VHF	- Very High Frequency
m	- metre	VTSS	- Vessel Traffic Services
“Mayday”	- The international distress signal (spoken)		

Introduction



This latest edition of the Safety Digest contains 25 articles about mariners who have had a bad day at the office – sometimes with tragic consequences. The sole purpose of the Safety Digest, as explained in the preamble to this document, is to prevent similar accidents from happening again. My hope is that, by reading the articles, mariners will learn from the mistakes of others, become more risk averse and avoid similar outcomes. When you are reading the articles, please take time to consider how you might have avoided the problems they describe. Better still, use the opportunity to discuss the articles with your shipmates or colleagues. The safety lessons listed at the end of each article are not necessarily exhaustive, you may identify others, and discussion of such issues is an excellent way of improving safety awareness.

I am once more indebted to three very experienced individuals from our industry for providing their thoughts about the issues highlighted in this edition. Chris Adams', Mike Montgomerie's and David Pugh's comments are based on many years' experience in their respective fields and I would urge you to read their introductions carefully. Some of David's comments struck a particular chord with me: in essence David reminds us that anyone who goes afloat, be it on a commercial vessel, or simply for pleasure, should constantly ask "what could go wrong?" and take precautionary action accordingly; he also highlights the responsibility of every skipper to lead by example and be seen to be following the safe working practices he/she may urge their crews to adopt.

In closing, I draw your attention to the MAIB Safety Bulletin at Appendix C. Although the accident which prompted the Bulletin related to the use of mooring ropes used mainly by larger commercial vessels, many of the safety lessons are pertinent to all sectors and vessel sizes. Handling of mooring ropes is a task that seafarers do on a routine basis – it is also one that regularly leads to serious injury or worse. When you are on mooring stations please ensure you remain vigilant and aware of the potential risks involved when handling ropes under tension. If you are acting in a supervisory role, ensure you are always able to maintain an overview of the task in hand so that risks can be identified and dealt with. "Tool Box Talks" before any mooring operation are a good way of ensuring that everyone involved has a good understanding of the plan, especially when crew are also empowered to stop operations should the plan begin to go wrong.

Until next time, keep safe.

A handwritten signature in black ink that reads "Steve Clinch". The signature is written in a cursive, flowing style.

Steve Clinch
Chief Inspector of Marine Accidents

October 2015

Part 1 - Merchant Vessels



This edition of the MAIB's Safety Digest contains summaries of the factual circumstances of sixteen accidents involving merchant ships. In bringing together this condensed

collection of incidents that it has been called upon to investigate, the MAIB provides an enormously valuable service to the shipping industry.

More importantly, it is our seafarers who have the most to gain from studying this review since human conduct is almost invariably at the root of maritime incidents. It is often the case that the hardest lessons we learn in life are those that we learn from our own mistakes. The impact of those can be keenly felt and as we learn sometimes painful lessons from those mistakes, we tend not to repeat them. In the absence of our own mistakes to use as an educational tool, the next best thing is to learn from the mistakes of others. It is for this reason that the MAIB's work in publishing this digest is so valuable.

The incidents covered by this review vary considerably in their severity. It is extremely regrettable that two of these resulted in fatalities. Two others might well also have done so as their circumstances had the potential to result in much more severe injuries than those actually sustained. Two individuals had lucky escapes and should count their blessings.

It is notable that of the four cases that involved either fatality or personal injury, three occurred during mooring operations or whilst handling lines. The hazards involved in such operations are well known and yet

seafarers continue to succumb unnecessarily to well-recognised risks such as those involved with stepping into the bight of a rope. It is one thing when death or injury results from an unforeseeable or novel cause, but such needless loss of life or injury from a risk that all seafarers should be trained to foresee, is cause for concern.

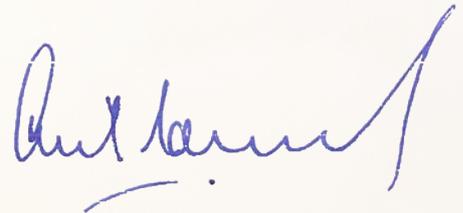
Another notable feature of this edition of the Safety Digest is the number of collisions that are reported. Three of these occurred whilst vessels were underway at sea and involved familiar issues of lookout, assessment of the risk of collision, and action to avoid collision. In two incidents the lack of qualification or inexperience of the watchkeeper was a contributory factor. Once again issues such as this are not new and training, superintendence and shipboard procedures should properly address and control these risks.

Also reported are three incidents in confined waters where the vessel was being assisted by a local pilot. In two of the cases there were inadequacies in the master/pilot exchange of information that contributed to the causes of these accidents. It is vitally important that there is a full and detailed exchange of information at the outset of any passage under pilotage so that there is full understanding of the passage plan, contingency response, the responsibilities of the bridge team, and the technical capabilities and/or limitations of the vessel and its equipment. The incidents reported here illustrate very clearly what can go wrong when there are shortcomings in the exchange of information.

Several of the incidents reported may well have been avoided or mitigated with a thorough risk assessment of the intended operation. Properly conducted risk assessments confer the benefit of thorough identification of the risks involved and the controls that are necessary to mitigate these.

There are important lessons to be learned from reading this edition of the Safety Digest that seafarers ignore at their peril. Ship owners and operators are therefore strongly recommended to circulate this publication to their vessels in order to maximise its potential benefit.

If, as a result, behavioural change is achieved and just one personal injury is avoided, this review will have done much to achieve its purpose. It is to be hoped of course that it will do much more.



**Chris Adams BSc (Hons), AFNI, MRIN
STEAMSHIP MUTUAL**

Chris Adams served at sea as a navigating officer with Ellerman City Liners. He holds a degree in Nautical Studies from the University of Southampton and joined The Steamship Mutual Underwriting Association Limited as a claims executive in 1979, initially specialising in handling collision and other admiralty incidents. He has been a partner of Steamship Mutual's management company since 1998 and is Head of the Club's European Syndicate and Head of Loss Prevention. In the latter role he has developed the Club's series of loss prevention DVDs which include programmes on Collision Avoidance, Groundings and Piracy, the latter winning the Seatrade Award in the Safety at Sea Category. In addition, in over 20 years of cooperation with Videotel Maritime International, more than 90 onboard safety training programmes have been jointly produced, the content of which greatly benefit from the Club's claims experience.

He is an Associate Fellow of the Nautical Institute, Member of the Royal Institute of Navigation, Liveryman of the Worshipful Company of Shipwrights, and a Trustee of the Maritime London Officer Cadet Scholarship Scheme.

Rule 13* – Unlucky For Some

**“any vessel overtaking any other shall keep out of the way of the vessel being overtaken”*

Narrative

A general cargo vessel and an LPG tanker were in collision while proceeding in the same direction of a TSS. The visibility was about 3nm, with fog patches, the wind was light and the sea state was slight. No lookout was posted on either vessel.

The master was the OOW of the geared, general cargo vessel, which was on a course of 231°, speed 22kn¹ and, due to the vessel's busy schedule, he had not taken much rest in the previous 20 hours. At 0937 the master acquired a radar target directly ahead of the vessel, range 6.5nm. The target vessel's details were displayed on the AIS receiver but the option to display the target's information on the X-band radar, which was fitted with ARPA, was not taken. The master had elected to show radar targets with true vectors and true trails.

The target vessel was the LPG tanker, which was in ballast and was on a course of 228°, speed 8.0kn. The tanker's OOW was the third officer and he was alone on the bridge. At 0943 the OOW detected the general cargo vessel on radar and noted on the AIS receiver that it was overtaking and its CPA would be 0.3nm to starboard.

The ARPA functionality on the LPG tanker's radar was not working as there was a known gyro compass repeater fault. The vessel had received approval from port state inspectors and its Classification Society to make its voyage, subject to the posting of a lookout when “manoeuvring in coastal waters”.

At 0950 the OOW on the LPG tanker made a 5° alteration of course to starboard to avoid a small fishing vessel that passed down its

port side. At 1000 the OOW noticed on the AIS receiver that the general cargo vessel was 3.0nm astern with a CPA of zero. The OOW could not see the general cargo vessel visually, but as it was overtaking the tanker he was confident it would keep out of the way in accordance with Rule 13 of the COLREGS.

At 1012 the tanker's master, who happened to be outside the vessel's accommodation, looked up and saw the general cargo vessel very close astern and on a collision course. He ran to the bridge and put the helm hard-a-port. The tanker began to swing to port and its heading had changed from 233° to 194° when the collision occurred.

On the general cargo vessel two guests were on the bridge with the master and they were joined at 1008 by the second officer, who arrived to take orders for goods from the bonded store. At 1013, after a light-hearted conversation, the second officer left the bridge, and a minute later the master exclaimed “*Oh look ahead – we're going to hit*”.

The general cargo vessel's port bow collided with the LPG tanker's starboard quarter and the hulls of both vessels were breached above their respective waterlines. Both vessels were directed by the coastal state to a nearby port of refuge for inspection and repairs.

The general cargo vessel was repaired and resumed normal service a week later while repairs to the LPG tanker lasted a month. The coastal state authorities prosecuted the master of the general cargo vessel for COLREG offences, and he was fined \$2,400.

¹ ISO 80000-3 2006, knot (symbol kn): 1 nautical mile per hour

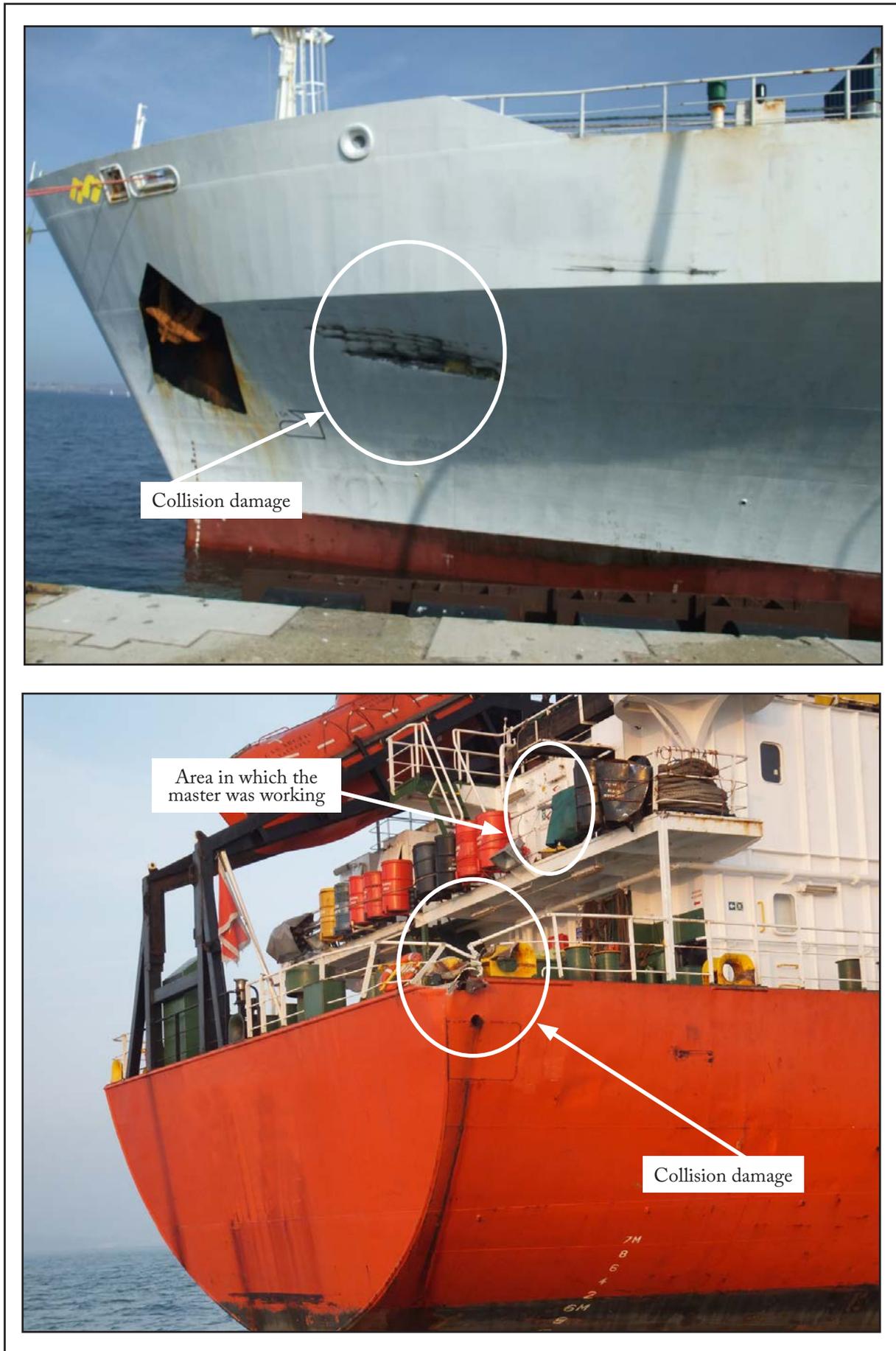


Figure 1: Damage to both vessels

CASE 1

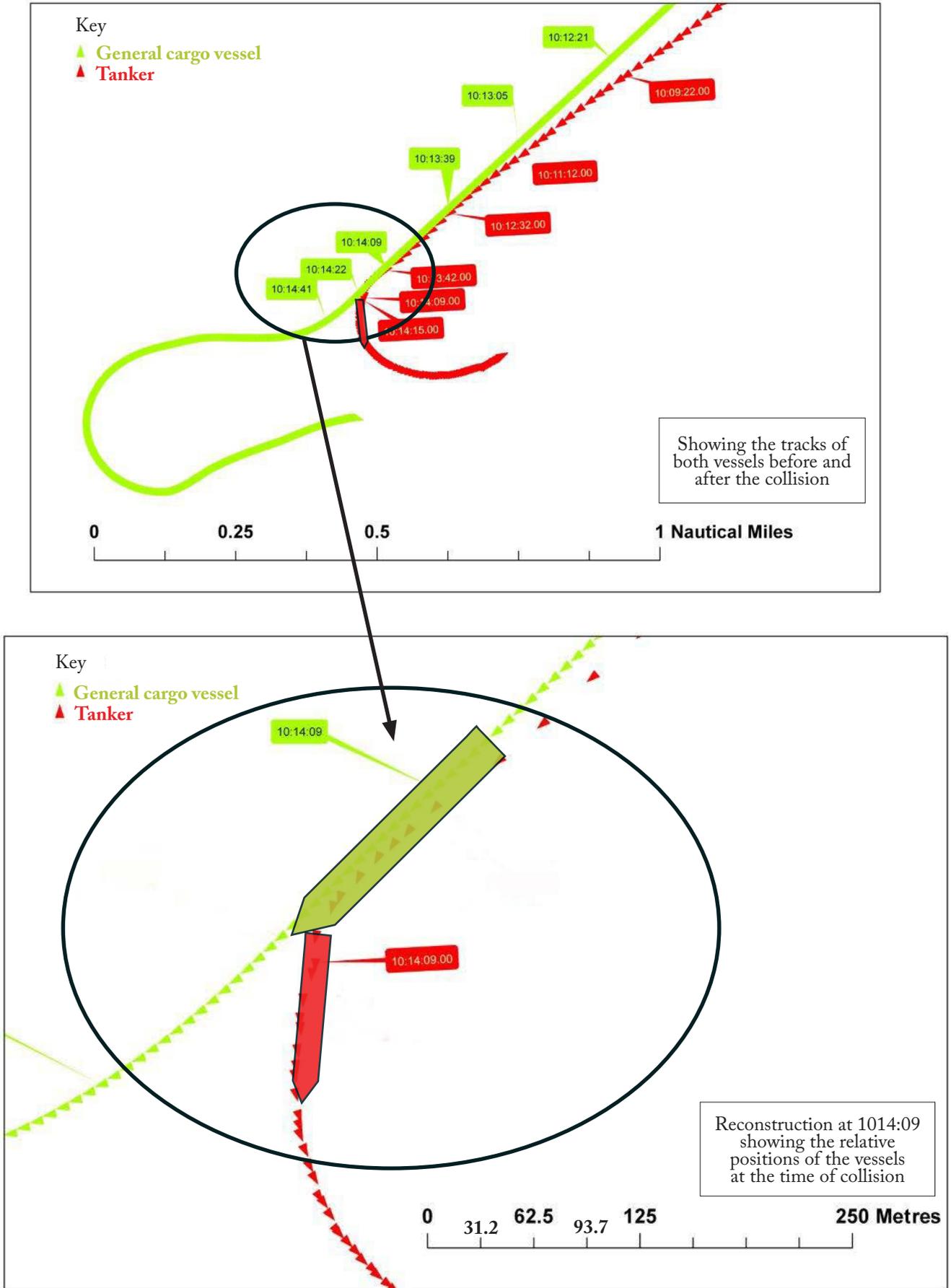


Figure 2: Reconstruction

The Lessons

1. The collision occurred because neither OOW was keeping a proper lookout as required by the COLREGS. Always ensure that a proper lookout is maintained at all times, using all appropriate means.
2. No dedicated lookouts were posted on either vessel and neither OOW monitored the other vessel after the initial detection in order to make an appraisal of the risk of collision. It is prudent to post dedicated lookouts when there are fog patches in the vicinity to ensure a proper lookout is maintained at all times.
3. The cargo vessel's master was probably fatigued due to the cumulative effects of his hours of work. He was also distracted by the presence of various non-operational personnel on the bridge immediately prior to the collision. Access to the bridge should be controlled at all times, especially when a vessel is navigating in areas of high traffic density such as a TSS.
4. By failing to move around the bridge periodically, the master of the cargo vessel did not see the tanker visually until it was too late to avoid collision because of blind sectors ahead created by deck cranes. Always move around the bridge when keeping watch to ensure that target vessels are not hidden in blind sectors. Moving around the bridge will also keep you stimulated and alert!

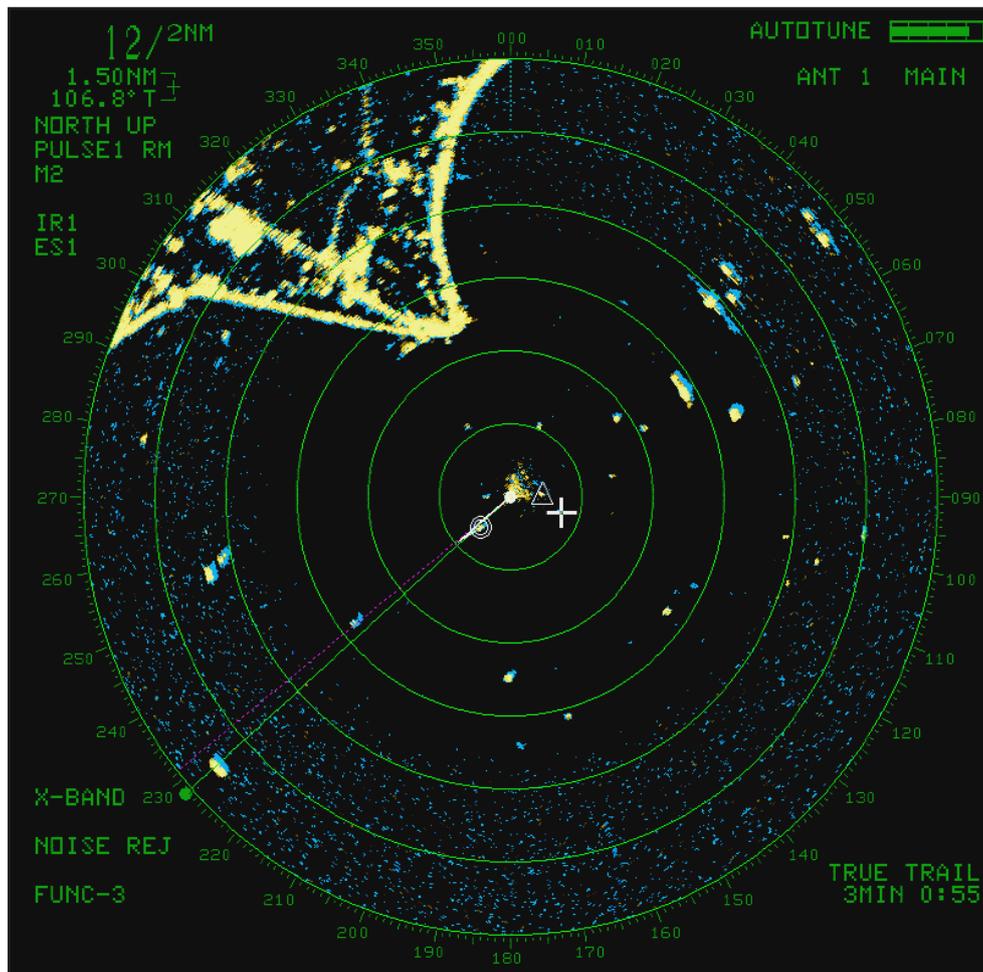


Figure 3: General cargo vessel - ARPA radar display at 1007

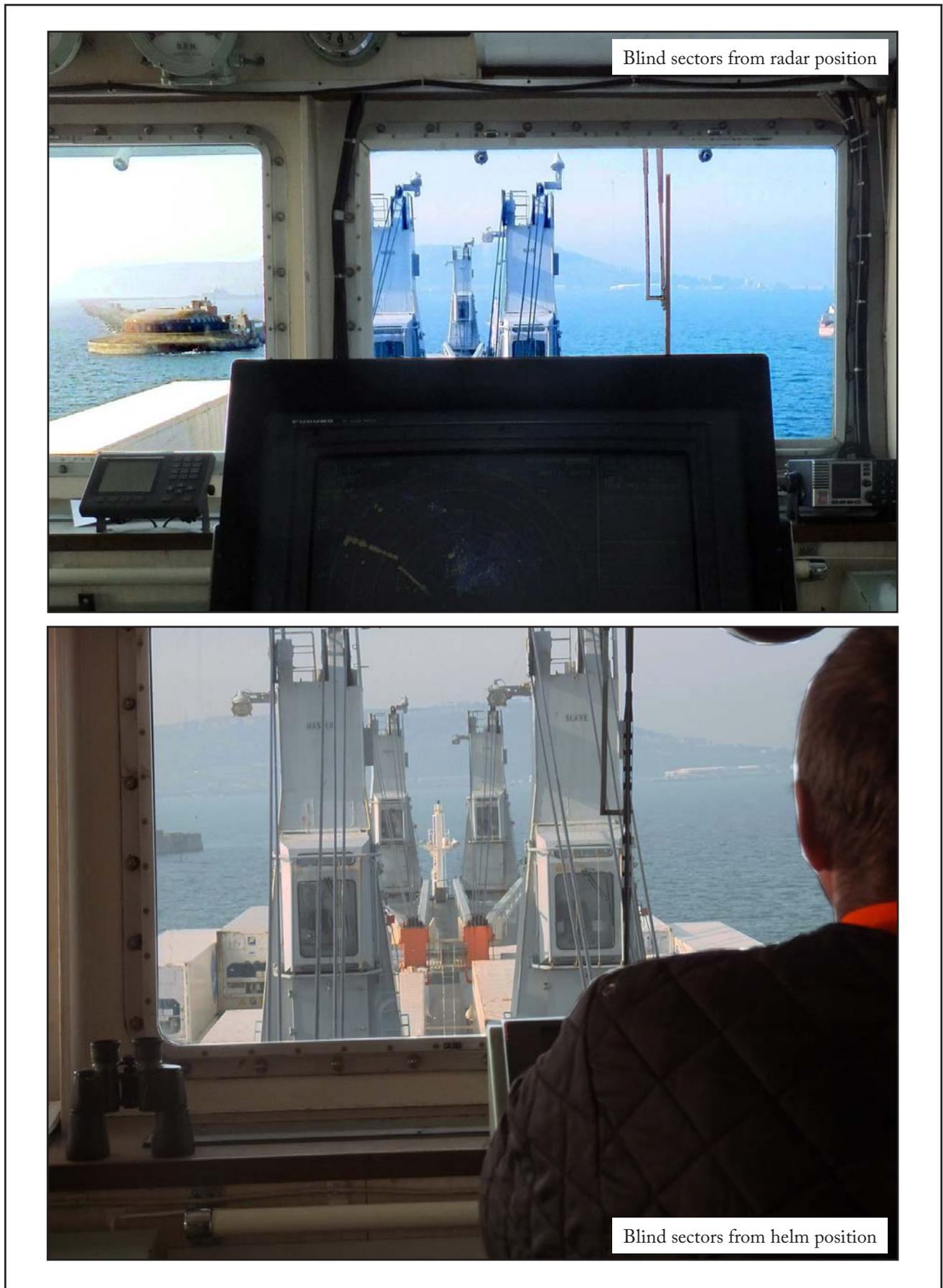


Figure 4: General cargo vessel bridge showing blind sectors from radar and helm positions

Uninsulated Exhaust Leads to Boat Loss

Narrative

On a cold January morning, the three crew members of a workboat set out to conduct engine trials. They steamed out to sea on both engines with the skipper at the wheel and the two crewmen on deck.

Around noon, the skipper noticed smoke issuing from the air heater outlet vents in the wheelhouse. The wheelhouse was heated by a diesel-fired air heater located in a compartment directly below. Within seconds of first noticing the smoke, thick smoke and fire broke through from the heater compartment into the wheelhouse, and the skipper ran to the aft door and alerted his crew. The fire continued to spread rapidly throughout the forward end of the wheelhouse, filling it with thick black smoke (Figure 1).

The crew were unable to extinguish the fire, and abandoned to a liferaft from where they were subsequently airlifted to safety. Shortly afterwards, the burnt out wreck of the vessel

sank. Fortunately, the sea was calm and, although the vessel was certified to carry up to 12 passengers, there were none on board at the time.

A study of similar workboats revealed the following common trends:

- A section of the air heater exhaust pipe passed through the plywood deck; this section was not insulated.
- There was little or no clearance between the bare exhaust pipe and the plywood; this led to charring of the under-deck area (Figure 2).
- Cans of diesel, cotton rags, paper and other flammable material were stored in the same compartment as the heater.
- The heater compartment was not fitted with fire detection or fire suppressant systems.



Figure 1: Burning workboat before it sank



Figure 2: Uninsulated exhaust pipe causing the wooden deck to char

The Lessons

Exhaust gas temperatures at the outlet of an air heater can exceed 450°C. When subjected to high temperatures, most solids undergo pyrolysis, which is an irreversible chemical process that releases flammable vapours from the solid. These vapours can ignite at 250°C without the need for a source of ignition such as a flame or a spark.

1. Check all the exhaust systems in your vessel to ensure that they are adequately lagged.
2. Do not store flammable material near items of machinery operating at high temperatures.
3. Install fire/smoke detectors in areas where there is a fire risk and test them regularly to ensure their reliability.

Blind Pilotage

Narrative

There was dense fog throughout the area when a pilot boarded a large bulk carrier which had discharged its cargo at a riverside berth. Port regulations dictated that the tug, required to assist the vessel's manoeuvre off the berth, could not operate in visibility of less than 2 cables² and so departure was delayed until the visibility improved.

The pilot remained on the vessel and a few hours later there was a slight improvement in visibility. Staff in the port's VTS centre contacted the master of the tug allocated to assist and asked if he would attend the bulk carrier, which he agreed to do.

VTS staff advised the pilot that the tug was willing to attend, and the pilot agreed that the vessel could depart. Visibility was about 4 cables and the pilot was aware that another vessel was waiting for the berth. The pilot asked the OOW to call the rest of the vessel's crew and to prepare for departure. The OOW tested the bridge gear but required the assistance of another officer to set up the vessel's one operational radar; the vessel's second radar set, fitted with ARPA, had been defective for several weeks.

While preparations for sailing were continuing the visibility reduced to less than 2 cables, but since the tug had already been secured at the vessel's stern, the decision was taken to continue with the departure. The master and pilot exchanged information about the planned manoeuvre off the berth but there was no discussion about the specific roles and responsibilities of the individuals on the bridge, who were the master, OOW and the pilot. The duty helmsman was not in the wheelhouse as he was assisting with unmooring operations.

When the manoeuvre began, the pilot instructed the tug to pull the vessel stern-first into the middle of the river and the vessel's engine was put astern. However, due to a combination of the tug's power and the vessel's light condition the vessel quickly gathered sternway, crossed the river and left the fairway, when VTS staff alerted the pilot to the vessel's position.

During the manoeuvre the OOW was at the helm and was also operating the engine telegraph; the master remained in the central area of the bridge and the pilot moved between the radar, on the port side, and the VHF radio set, on the starboard side. In the absence of any prominent speed or heading display on the bridge, and with no continuous radar watch being kept, the bridge team soon lost situational awareness.

On receiving the alert from VTS, the pilot ordered the engine to full ahead, helm hard-a-port and instructed the tug to pull on the vessel's port quarter, intending to manoeuvre the vessel back into the fairway. However, the tug's power caused the vessel to swing to starboard towards shallow water. The pilot assumed, incorrectly, that the vessel's engine was defective and reported this to VTS, and the vessel's master, hearing this report, increased engine power to maximum sea speed to demonstrate that the engine was operating normally.

The vessel's forward mooring party then contacted the bridge and warned that through the fog they could see moored barges close ahead of the vessel. However, no action was taken to reduce the vessel's increasing speed, with the result that the vessel made contact with the moored barges and grounded at full sea speed.

² 1 cable = one tenth of a nautical mile

CASE 3

As a result of the contact the vessel was holed above the waterline, but no damage was caused to the hull by the grounding, which occurred in an area of soft mud. The vessel was refloated

a few hours later on a rising tide, with the assistance of two tugs and was taken out of service for 2 weeks while hull repairs were carried out.



Tugs attempting to refloat the vessel

The Lessons

1. The OOW was unable to set up the one operational radar to the pilot's requirements despite the vessel being delayed for several hours. It is important that masters and watchkeeping officers are completely familiar with all navigational and communications equipment.
2. The master/pilot exchange did not consider the roles and responsibilities of the members of the bridge team during the manoeuvre. In restricted visibility it is particularly important that consideration is given as to how situational awareness will be maintained, and there should be a clear understanding of who will be responsible for the continuous monitoring of the vessel's position.
3. The decision to depart the berth was taken despite a further reduction in visibility. Another vessel was due onto the berth to discharge cargo, and the pilot was aware that a delay in departure may adversely affect commercial operations in the port. Decisions taken relating to safety of navigation should not be prejudiced by commercial considerations.
4. The bridge team's loss of situational awareness was compounded by poor internal communications. An effective bridge team is one which communicates well at all levels and where individuals are empowered to question decisions in the interest of navigational safety.
5. The power of the tug exceeded that of the vessel but, due to the loss of situational awareness and lack of position monitoring, this was not realised by the bridge team. The power of harbour tugs allocated to a vessel should be discussed in the master/pilot exchange to assist effective planning of the manoeuvre.

Changing the Plan Alters the Risk

Narrative

An emergency response and rescue vessel was operating offshore during a period of heavy weather. In the early hours of the morning, it was struck amidships on the port side by a large wave. The impact resulted in damage to the bulwark and shipside fittings, which included a redundant vent pipe. Banging was heard from outside the accommodation block, and water ingress, via the damaged vent pipe, was discovered in the engine room.

The chief engineer advised the master that the engine room bilge pumps would be able to contain the water ingress. The source of the banging could not be identified as access to the deck was restricted due to the bad weather.

The situation was reviewed later in the morning once there was sufficient daylight to see the external damage. After discussions with the crew, the master decided that, as the weather had improved, there would be an opportunity to repair the damaged bulwark.

The repair was to be carried out from the fo'c'sle deck and a tool box talk was conducted to confirm the plan and highlight identified hazards. The vessel was aligned to run before the wind with a lookout strategically positioned to give directions to the master in order that the vessel could be steered to provide the repair party with the maximum shelter.

The repair party, led by the mate, viewed the damage. They concluded that the repairs could not be conducted from the fo'c'sle. However, not conducting repairs risked sustaining significant damage to the vessel's side. Without consulting the master, the mate decided to take the party onto the main deck to attempt to secure the bulwark.

The working party had completed the temporary repair and had started their return to the bridge when the mate noticed that one of the bulwark securing ropes had come loose. He headed back to reattach the rope and, just as he was about to unclip his safety harness lanyard to negotiate an obstruction, he was hit by a wave. The weight of water knocked him off his feet and swept him into the stairs at the base of the accommodation. The mate was recovered to the vessel's treatment room and was found to have sustained a broken leg as well as a cut to his head.

The master informed the coastguard of the incident and requested a medical evacuation of the casualty. The casualty was transferred by rescue helicopter to hospital for treatment, while the vessel was released from its standby duties and made its way to port for repairs.

The Lessons

1. A repair plan had been decided, the hazards assessed and controls put in place to reduce the risk to the working party. One of these controls was to only work from the fo'c'sle. By changing the plan without making a formal reassessment of the hazards and controls, the additional hazards associated with working from the main deck had not been considered. This new plan exposed the working party to unassessed hazards. The risks associated with any change in the agreed plan should always be carefully assessed before the change is implemented. Once this has been done, all personnel included in the plan should be briefed accordingly.
2. Risk controls included the use of personal protective equipment. In this case, the use of a safety harness with a single lanyard was not suitable. If there is a requirement to unclip for transit around an obstacle, alternative arrangements, such as twin lanyards, should be used to ensure that individuals remain connected to the vessel's structure at all times.

Overlook, Overfill, Overflow, Overboard

Narrative

While waiting to return to service, the crew of a ferry were washing down the vessel's lower vehicle deck. Eventually, the wash water filled the bilge and the high level bilge alarm sounded. In response, the duty engineer pumped the oily water from the bilge into a collection tank in the engine room.

To transfer the water, the bilge system and the ballast system (Figure 1) were connected by remotely opening a cross-over valve. This was completed using the ship's electronic platform management system (PMS) (Figure 2).

To pump out the lower car hold bilge wells, the engineer selected each system in turn, opened the appropriate valves and started the bilge pump. When the vehicle deck bilge had been pumped dry, the bilge pump was shut down. However, the cross-over valve connecting the ballast and bilge systems was left open.

Later on the same day, the ferry's second officer needed to transfer 40 tonnes of ballast water from aft to forward. This was a routine operation that the second officer had carried out regularly and was familiar with. Before the second officer started the transfer, he called the engine room and informed the duty engineer of what he was about to do.

To configure the ballast system, the second officer accessed the ballast system screen on the PMS. This showed all the ballast pumps and ballast valves, but it did not show the cross-over valve connecting the ballast system with the bilge system. This valve was only shown on the bilge system screen, which was not selected for viewing. Using the PMS, the second officer opened the required ballast system valves and started a ballast pump. The transfer of ballast water commenced.



Figure 1: Bilge and ballast pumps and valves



Figure 2:
PMS control station

About 10 minutes later, the high level alarm on the bilge collection tank in the engine room sounded. The duty engineer immediately contacted the second officer and told him to stop the ballast pump and to close the ballast valves. Approximately 40 tonnes of ballast water had been transferred into the bilge collection tank instead of the forward ballast

tank as intended. This caused 600 litres of oily water already in the tank to discharge overboard through the tank's air vent (Figure 3).

However, it was only when the ferry left the berth that oil was seen and the vessel's oil spill response plan was initiated.

The Lessons

1. Platform management systems are designed to give the operator ease of control over a ship's systems and machinery, as well as enabling a high degree of monitoring. However, they do not eliminate human error. Therefore, operators must:
 - Have a thorough understanding of the PMS, including its potential pitfalls. In particular, where one system can be cross-connected to a second, both systems must be checked to ensure their integrity.
 - Check that what is intended is actually happening by monitoring tank levels where appropriate.
2. When tanks containing potential pollutants are over-filled, there is always a risk that the pollutant might not be contained on board. All routes of potential egress overboard must be quickly checked to enable an oil-spill response plan to be fully effective.
3. Where key ship systems can be cross-connected, a padlock or equivalent is a simple measure that goes a long way in preventing inadvertent operation and unintended consequences (Figure 4).



Figure 3: Oily water discharge on ship's side



Figure 4: Modified cross-over valve - actuator removed, locking device fitted

Unsupervised Mooring Operation Proves Fatal

Narrative

A small general cargo vessel was being shifted along the quay to an adjacent riverside loading berth after discharge of its cargo. The shore linesmen had discussed the planned move with a senior officer from the vessel, and the crew were at mooring stations to facilitate transfer of the mooring lines from bollard to bollard ashore as the vessel moved astern.

The forward mooring party, which initially consisted of an officer and two crewmen, was required to slack down the headlines and heave on the backsprings to assist the vessel's movement along the quay. It was dark and there was a strong offshore wind that pushed the vessel's bow off the quay as the headlines were slacked down. The master was on the bridge, attempting to manoeuvre the vessel back alongside using the main engine and bow thruster.

As the operation progressed the wind increased in strength and, as the vessel's bow movement became more difficult to control, another deck officer joined the forward

mooring party. As the vessel moved astern one of the crewmen was left tending the headlines on the port bow, while the remainder of the forward mooring party were heaving on the backsprings on the starboard side.

The crewman working alone on the port headline was suddenly heard to shout for help. His colleagues turned towards him and saw that his foot had become caught in a bight of rope which was being pulled over the bow as the vessel moved astern. There was no time to react before the crewman was pulled over the bow with his foot still caught in the rope.

The crewman was seen face-down in the water and lifebuoys were thrown to assist him.

Tragically, although the vessel's fast rescue boat was quickly launched, the crewman's body was taken by the tidal stream and he disappeared from sight beyond the vessel's stern. Despite an extensive search involving helicopters, coastguard teams and divers, the man's body was not found.

The Lessons

1. Prior to the vessel's shift of berth the shore linesmen had discussed the plan with a senior officer, but this exchange of information was not relayed to the master and no crew briefing was conducted. A crew briefing should always take place before each mooring operation, even if the planned manoeuvre may appear routine.
2. The crewman was unsupervised at the time of the accident and it is probable that his foot became trapped in a bight when he was controlling the slack rope with his foot as the headline paid out. Mooring operations should always be supervised by a competent person who can retain an effective overview of the operation, to ensure that appropriate safety standards are maintained.
3. The vessel was shifting berth without a representative of the port authority being on board. This was common practice when a vessel remained secured with at least one mooring line. However, given the strong offshore wind and tidal stream at the time of the accident, it might have been appropriate for the master to have had support from someone with knowledge of the local conditions. Following the accident the port authority introduced a requirement for vessels shifting berth at riverside quays to take a pilot. Port authorities should ensure their control measures for vessels shifting berths are such that residual risks are kept as low as reasonably practicable.



Reconstruction of accident scenario

Retain Control to Achieve Your Goal

Narrative

A small bunkering tanker was preparing to manoeuvre alongside a larger vessel in daylight when it failed to answer propulsion commands. The control failure resulted in a collision between the two vessels.

Owing to previous adverse weather conditions, the tanker had been at anchor outside the port. Once the weather had improved, it entered the port and prepared to manoeuvre alongside the first of its customer vessels.

The tanker's master had taken over the watch for departure from the anchorage and remained on the bridge for the passage to the port and the manoeuvring operation. Prior to weighing anchor, the master had completed the bridge equipment checklist in the deck logbook, with no defects noted.

Once the anchor had been stowed, the chief officer went to the bridge to ensure sufficient manpower was available in accordance with company procedures. These required that two deck officers and a helmsman were on the bridge when the vessel was in confined waters. The chief engineer was on stand-by in the machinery control room (MCR).

The manoeuvre required the tanker to cross ahead of the customer vessel prior to swinging parallel with it and backing down into a position alongside its bunkering point. The swinging manoeuvre was carried out using a combination of the controllable pitch propeller (CPP), bow thrust and rudder movements. The swing took place approximately half a ship's length ahead and to port of the customer vessel's bow.

Once the swing was complete, the master applied 50% astern pitch. He then prepared to transfer propulsion control to the remote starboard station (located within the wheelhouse). The control transfer procedure

required the centre console CPP control lever to be set at zero before control was passed to the starboard station.

The master pressed the 'accept control' button at the starboard station in preparation to continue the manoeuvre. The button on the remote station was backlit. It had been previously dimmed to prevent the light from affecting the bridge team's night vision, but had not been later reset for daylight operations. The illuminated button was designed to act both as a means of taking control and as an indication that control had been achieved or as an alarm to indicate a failure of the control transfer. The button showed a solid colour once control had been established or a flashing light to indicate a fault. Owing to the light having been dimmed, the master did not become aware of a system fault until it became obvious that the propulsion was not responding to his inputs. At this point, the master noted that the CPP pitch was set at 50% astern and was not responding to the starboard station control lever (Figure 1).

The master returned to the centre console, where he attempted to re-establish control of the propulsion; however his attempts were unsuccessful and the vessel continued to move astern. He ordered the chief officer to tell the AB on the fo'c'sle to deploy the port anchor, and contacted the MCR to instruct the chief engineer to stop the main engine.

The tanker's aft quarter struck the customer vessel and continued to travel down the vessel's side until it came to a stop as a result of the anchor taking hold. The two vessels then separated.

In the MCR, the chief engineer was unaware of the nature of the incident, but was concerned that stopping the engine had also

stopped the shaft alternator which was used to power the bow thrust. He decided to de-clutch the propulsion shaft and re-start the engine.

Once the damage had been assessed and it was confirmed that there were no openings below the waterline on either vessel, the tanker proceeded to an anchorage within the harbour. The incident was reported to the harbour authorities and to the company management.

Once at anchor, the master and chief engineer attempted to re-create the control failure. Although the master was convinced that he had followed the correct procedure for changing control stations, the only way in

which the fault could be replicated was to leave the centre console CPP control lever at a position other than zero when transferring to the remote station. Further trials indicated that it was possible that the control lever had been inadvertently knocked from its zero position to 50% astern when the master reached for the VHF handset (Figure 2).

The damage (Figure 3) to the shell plating on both vessels was significant and resulted in the two vessels being out of service for several days for repairs to be undertaken. Fortunately there was no injury to personnel or any pollution as a result of the collision.

The Lessons

A number of factors - predominantly relating to bridge manning and management - contributed to the incident.

1. There was no teamwork between the master and the chief officer – the chief officer came to the bridge, but only to fulfil mandated manning requirements. He took no active role in the manoeuvre to come alongside the customer vessel. Had he been involved in the planning and execution of the manoeuvre, it is likely that the anomaly with the control station transfer would have been avoided. The ICS Bridge Procedures Guide (Fourth Edition 2007) Chapter 1 paragraph 1.1 explains that *'effective bridge resource and team management should eliminate the risk that an error on the part of one person could result in a dangerous situation'*.
2. The master was unfamiliar with the reversionary mode to regain control of the CPP or of the effect on the bow thrust of stopping the main engine.
3. The changeover of control was carried out at an inappropriate point in the manoeuvre and no confidence check was carried out on completion of the change of control station. Again the ICS Bridge Procedures Guide paragraph 3.2.5 recommends operational checks of equipment are conducted before entering harbour, including checks to confirm that full engine and steering manoeuvrability is available.
4. The ability to dim the visual alarm with no audible back-up resulted in an unsafe condition.
5. Although not contributory to this accident, the chief engineer should not have re-started the main engine without ascertaining the nature of the emergency.

CASE 7



Figure 1: Starboard control station

Figure 2: Centre control console

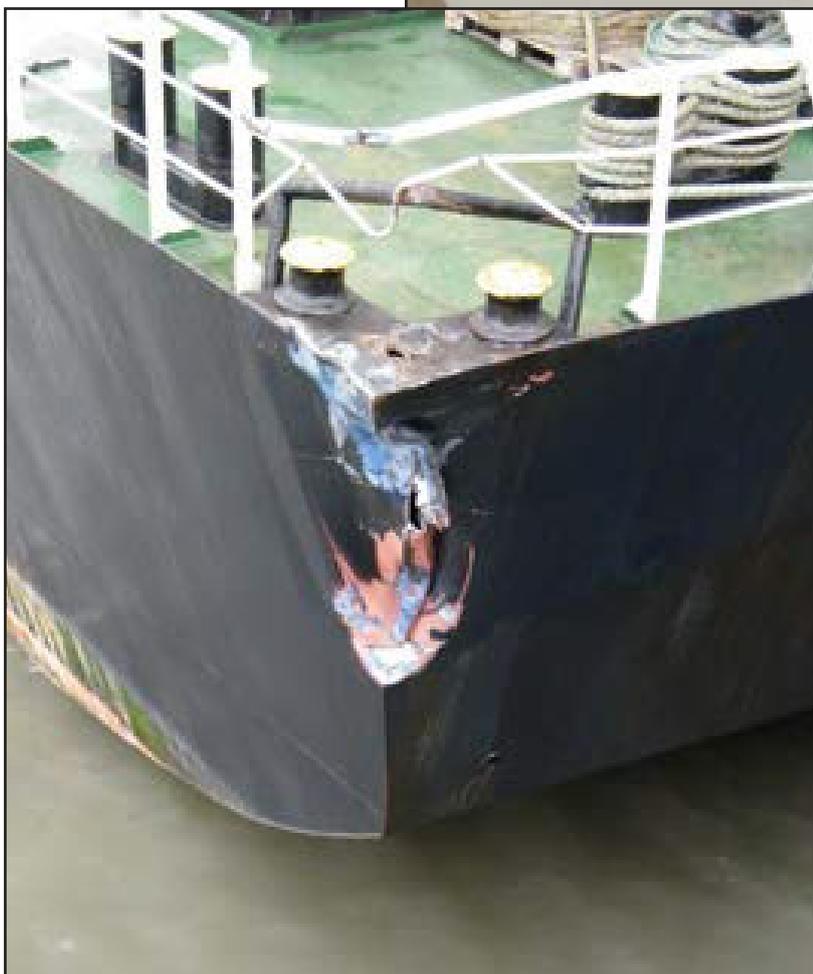


Figure 3: Damage to shell plating

Assess the Risk and Maintain the Controls

Narrative

A workboat was coming alongside a dredger to conduct a personnel transfer. This was a routine operation that had also been conducted earlier in the day.

The normal method of carrying out this operation required the workboat to go alongside the dredger with the workboat's port side to the dredger's starboard side. The workboat was manoeuvred to a position approximately 3 metres ahead of the transfer position. A line was then passed from the workboat and made fast on the dredger, the workboat then dropped back to align the two vessels' personnel transfer points.

A deckhand normally passed the line from the workboat to the dredger. The workboat skipper did not have a clear view of the operation due to the boat's crane being located in his sightline. The skipper therefore relied on hand signals from a deckhand on the dredger to adjust the relative position of the two vessels (Figures 1 and 2).

On the day of the accident, the workboat had taken position as planned and the line was passed to the dredger by the workboat's deckhand. The workboat dropped back and, under the direction of the deckhand on the dredger, had started to come ahead. At this point the skipper realised that something was not correct as the deckhand's signals became animated, and he indicated that the workboat should stop.

The deckhand on the workboat had passed the line as planned, but he had not noticed that he was standing with his foot in a bight of the rope. As the rope became tight it pulled the deckhand towards the edge of the vessel. In an attempt to prevent injury he jumped into the water as he was being pulled towards the deck edge, but his leg remained entangled in the rope.

The workboat's other deckhand reported the man overboard (MOB) to the skipper, who immediately put the engines into neutral and called the local harbour authorities to report the incident.

On the dredger, their end of the rope was released to prevent the casualty from being dragged underwater. The dredger's engines were stopped and a lifebuoy was thrown into the water.

The remaining deckhand on the workboat connected the rope to the crane and began to bring the rope back inboard. As the head of the crane was raised, the casualty could be seen with his leg still entangled in the rope. The deckhand and the workboat skipper then manually recovered the casualty onto the workboat's deck, where they immediately commenced CPR. A rescue vessel arrived shortly after the recovery, the casualty was transferred to the rescue vessel and transported ashore.

Once alongside, an automated external defibrillator (AED) was applied to the casualty. No shock was given but the AED was used to monitor the CPR, which was continued until the casualty was transferred into the care of the ambulance service.

The deckhand was taken to hospital, where he made a full recovery and was discharged the following day.

At the time of the incident, the deckhand had been wearing appropriate PPE, including a lifejacket. On entering the water, the automatic inflation device had operated and the manual inflation cord was also pulled, but the lifejacket failed to inflate. An independent examination of the lifejacket found that the gas inflation cylinder was loose, which had prevented the pin on both manual and automatic activators from piercing the inflation cylinder.

CASE 8

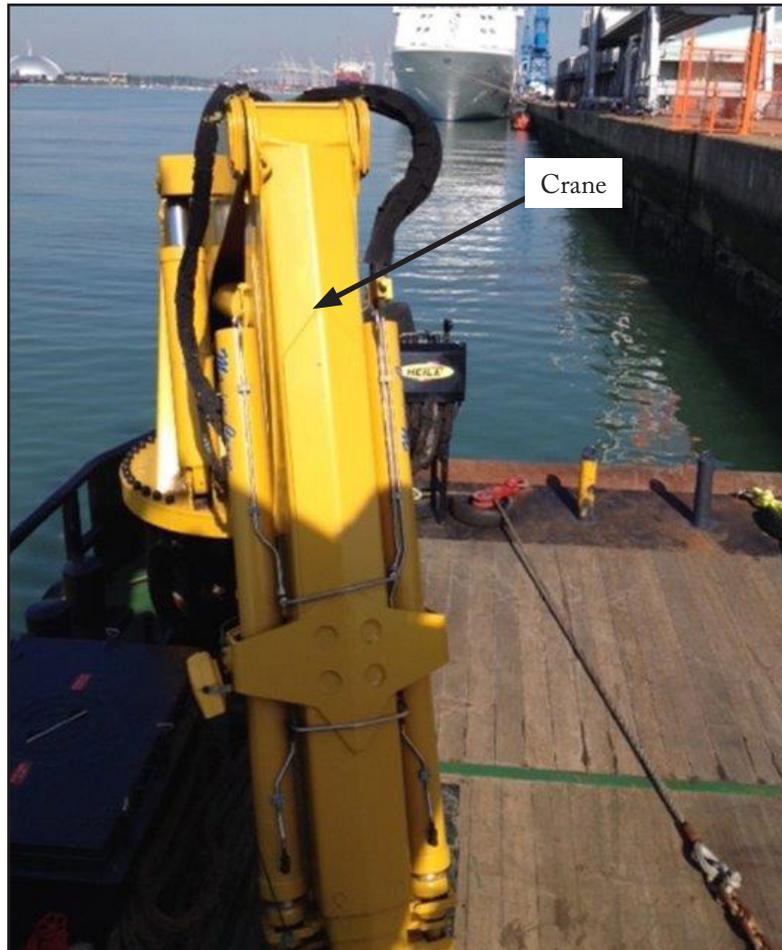


Figure 1: View forward

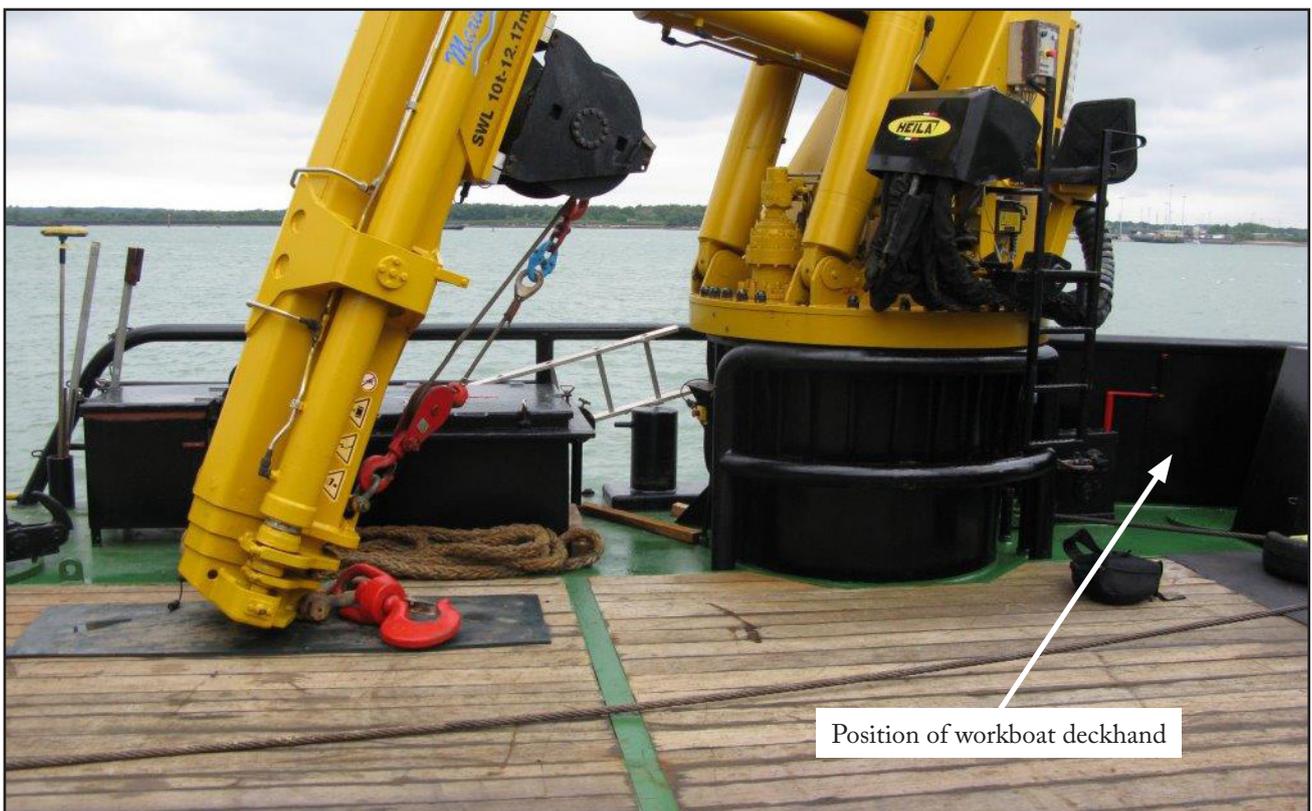


Figure 2: View towards port side

The Lessons

1. The workboat had a number of risk assessments (RA) that covered some aspects of the personnel transfer operation (one of which included hazards associated with working with wires and ropes, including control measures to highlight awareness of running wires on the deck). However, if there had been a specific RA for this operation the occluded sight lines and consequent need for alternative communication might have been identified and controls established.
2. One of the fundamentals of good seamanship is not to stand within the bight of a rope. In this case the deckhand had inadvertently placed one foot in the bight of rope. This highlights that it is vital to remain alert and retain good situational awareness during any shipboard operation no matter how routine it may appear.
3. First-aid medical training is essential, and in this case the prompt administration of CPR almost certainly saved the crewman's life. This incident also highlighted the additional benefit of an AED to support CPR efforts.
4. While routine maintenance of PPE may be carried out through contractor support, it is an individual's responsibility to ensure that their equipment is fit for use. The Code of Safe Working Practice for Merchant Seamen, Chapter 4 Personal Protective Equipment paragraph 4.3.2 refers to workers' duties in respect of PPE checks – when did you last check your lifejacket before use?

No Pitch = No Steering!

Narrative

A laden tanker, carrying 22,000 tonnes of gas oil, was entering a port via a long river passage during the hours of darkness. The vessel's bridge team was supplemented by two pilots who had been embarked to provide local advice for the passage into port.

On boarding the vessel the senior pilot advised the master that he would be conducting a practical examination of the second pilot, who would take the vessel's con for the inward passage. The senior pilot was authorised to pilot vessels of all classes and to conduct practical examinations of other pilots as they progressed through the port authority's pilot training programme. The master was not informed that the second pilot's examination was for the pilotage of vessels of a smaller size than the tanker itself.

The master/pilot exchange was conducted between the master and the second pilot, who explained his port pilotage plan and the use of tugs to assist the vessel's berthing. The master informed the pilot about the vessel's manoeuvring characteristics but neither pilot realised that the vessel was fitted with a CPP.

The master then left the bridge and went to his cabin to prepare paperwork for the vessel's arrival. He informed the OOW that he wished to be informed 10 minutes before the tugs were due to be made fast.

Over the next 3 hours the vessel's passage progressed in accordance with the agreed passage plan. The wind was light but there was a strong flood tide running at a rate exceeding 3kn; the vessel's arrival at its berth was planned to coincide with the period of slack water.

As the vessel approached a large bend in the river the pilot ordered the vessel's speed to be reduced and the helm to starboard 15°. The

vessel's rate of turn increased rapidly to 25° per minute and the pilot ordered port helm to slow the turn. After about a minute the rate of turn to starboard began to decrease.

The pilot then ordered the engine to be stopped, after which the rate of turn increased rapidly to 30° per minute to starboard. The pilot ordered the helm to hard-a port and the engine to full ahead just as the master entered the bridge and repeated the order.

However, the vessel had moved out of the fairway and was quickly approaching the quayside of a riverside container terminal. The pilot ordered full astern a few seconds before the vessel made contact with the quayside.

There were no injuries or pollution, but damage was caused to infrastructure on the quayside and the vessel's hull in way of empty ballast tanks. The contact occurred less than 6 minutes after the vessel had begun its turn around the bend in the river.

Following the contact, the vessel's anchors were let go and control was regained. Tugs attended the vessel, which was able to proceed to its berth, where its cargo was discharged. Following temporary repairs the vessel was permitted to make passage to a nearby port for permanent repairs, which took 3 weeks.

This was the fourth accident in 6 years in this area, involving loss of control of large vessels during times of strong tidal flow, resulting in contact damage to vessels and shore infrastructure.



Damage to the shell plating

The Lessons

1. The master/pilot exchange did not include reference to the vessel having a CPP and, when giving the order to stop the engine mid turn, both pilots had assumed that the vessel had a fixed pitch propeller. Reducing the pitch of the CPP to zero stopped the flow of water over the rudder, leading to the vessel taking a shear that could not be corrected in time to prevent the accident. It is important that a vessel's manoeuvring system is discussed during the master/pilot exchange.
2. The conduct of the practical examination on a vessel which was larger than that which the pilot would become qualified to assist, was inappropriate. Port authorities should avoid practical examinations taking place on vessels which are not representative of the vessels which the candidate will pilot at his next training level.
3. The master was not on the bridge when the order to stop the engine was given. If he or a senior officer had been present in the period leading up to the accident, he would have understood the consequences of ordering the engine to 'stop' and would have been able to intervene to prevent the accident.
4. The accident occurred in an area of complex and strong tidal flows where there had been other accidents resulting in damage to vessels and shore infrastructure. Port Authorities should review their safety management systems following accidents to ensure that control measures are sufficiently robust to make sure that the residual risk to navigation is kept as low as is reasonably practical.

The Weakest Link

Narrative

A high-sided ro-ro vessel was berthed in an exposed port, waiting to load cargo (Figure 1).

Due to the poor weather forecast, all the available shore moorings were used to moor the vessel. In this instance, these consisted of five shore mooring ropes in addition to four of the vessel's own ropes, and the stern ramp was on the linkspan. The shore mooring ropes were twice as strong as the vessel's own ropes, but were difficult to handle, so were wound on winch drums with brakes applied rather than being put onto bitts. In addition to the mooring lines, a tug was being used to hold the vessel's stern on the berth while its bow thrusters were being used forward.

As forecast, the wind was gusting up to 40 knots, and this was causing the vessel to surge up to 1.5m off the berth. The master called the crew to mooring stations and requested that the vessel's main engines be started. As the wind continued to increase, the stern lines, with the exception of the spring, began to

pay out as the winch brakes began to render. Despite the efforts of the tug, the stern moved off the quay, requiring the stern door to be lifted clear of the linkspan.

When the wind reached 47 knots, the stern spring parted and the vessel continued to move off the berth. The master used the engines and thrusters in an attempt to arrest the swing but, despite the efforts of the crew, the forward winch brakes also began to render. The master ordered the starboard anchor to be let go, but this did not slow the vessel's movement and so was recovered to reduce the risk to the hull by the trailing anchor and chain.

As the vessel was blown out of the dredged area of the port towards shallow water, a port pilot embarked to assist the master and they agreed that, due to the high winds, it was no longer possible to sail into open water. The master, helped by the pilot, spent the next 50 minutes trying to reduce the vessel's exposure to the wind and to keep the vessel in deep water. However, the vessel ultimately grounded on sand and mud 45 minutes after high tide (Figures 2a and b).

Following two unsuccessful attempts to refloat the vessel, the decision was made to wait and allow tides to build sufficiently. The vessel was successfully refloated 9 days later with no damage or pollution.

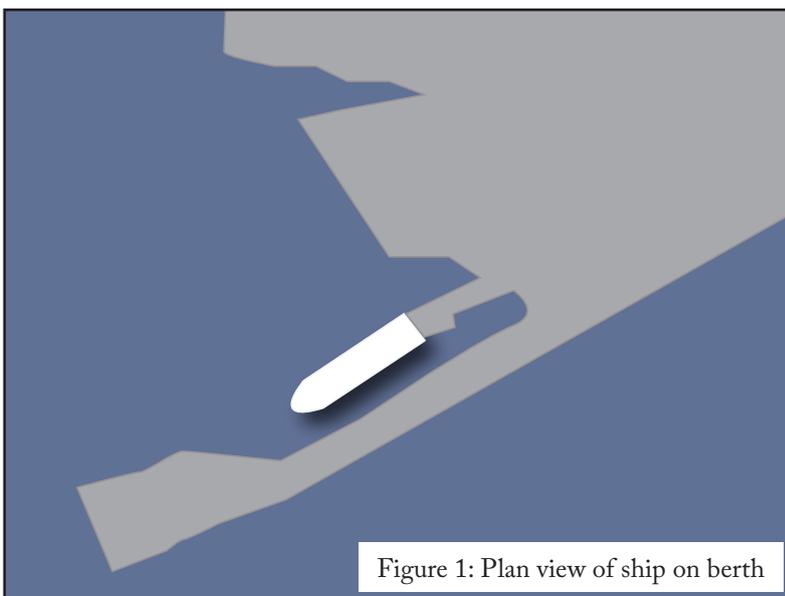


Figure 1: Plan view of ship on berth

The Lessons

1. When bad weather is forecast during a port call, it is important to ensure that it is safe to remain in port. This is especially true for high-sided vessels or vessels on exposed berths. Masters should consult with harbourmasters and pilots, and agree weather limits for remaining alongside together with contingency plans. Each vessel and port will have its own particular characteristics, and these should be taken into account.
2. Where a shore mooring is wound onto a drum and the brake applied, the weakest link will most likely be the rendering point of the winch's brake. It is reasonable to expect moorings provided from shore to be stronger than ships' lines. However, this does not guarantee that a vessel will be moored more securely when they are used. A vessel's winch brakes should be set to render before the vessel's own ropes part. Therefore, if stronger shore moorings are used to improve the security of a mooring they will need to be wound onto bitts on board in order to achieve the aim. It is appreciated that the size of these ropes and the large tidal range in some ports may make this difficult to achieve, but securing them onto the winches is not a suitable alternative.
3. Tugs are not available in every port, and all tugs are not equal. When planning to use a tug, whether for routine or emergency assistance, the tug's specification must be considered to ensure that it is up to the job. Differing propulsion arrangements, bollard pulls and availability all need to be considered. The availability of a suitable tug may well impact on the agreed weather limits for a vessel or a berth.



Figures 2a and b: Vessel aground



The Unaware Meets the Unqualified

Narrative

A 190t aggregates carrier was passing just to the south of a channel buoy heading 275° at 6.7kts. It was dark and the visibility was good. The navigational watchkeeper was an unqualified deckhand who was alone on the bridge. The vessel's master and mate were in bed. Ahead of the cargo ship at a range of 1.2nm was a trawler towing on a heading of 251° at 1.5kts along the 10m depth contour (Figure 1).

The local VTS operator called the cargo ship and warned its deckhand of the trawler ahead. The deckhand confirmed that he could see the trawler's stern and fishing lights.

When the vessels were 0.4nm apart, the cargo ship altered 10° to starboard in order to pass to the north of the trawler (Figure 2). However,

the trawler's skipper, who was on watch in the wheelhouse, had not seen the cargo ship. He was focused on the fishing operation and made a bold alteration of course to starboard.

The cargo ship was only 0.2nm away and the vessels were now heading for a collision (Figure 3). In response, the cargo ship's deckhand turned the cargo ship further to the north, reduced its speed and sounded the general alarm. However, the vessels collided soon after (Figure 4); the trawler's bow struck the cargo ship's port side. The cargo ship then ran aground in shallow water outside the channel.

Damage to the trawler's stem cost approximately £30,000 to repair. The cargo ship sustained only minor damage.

The Lessons

1. Fishing vessels operating in narrow channels or fairways, and traffic separation schemes, are required by the COLREGS not to impede the passage of other vessels. If wheelhouse watchkeepers don't maintain a good lookout and keep up to speed regarding which other vessels are around, this requirement cannot be met.
2. Seafarers' qualifications help to ensure that crew on board commercial vessels of all types and sizes possess minimum standards of competency. Leaving an unqualified watchkeeper alone on the bridge of a merchant ship, in a narrow channel, at night, not only contravenes international requirements but it is also very poor practice.
3. Navigating in confined waters can be challenging, particularly when balancing collision avoidance with staying in safe water; neither can be done without consideration of the other. In such circumstances, situational awareness is key. Think ahead and be ready for the unexpected. Overtaking on the outer edge of a narrow channel invariably limits the options available.

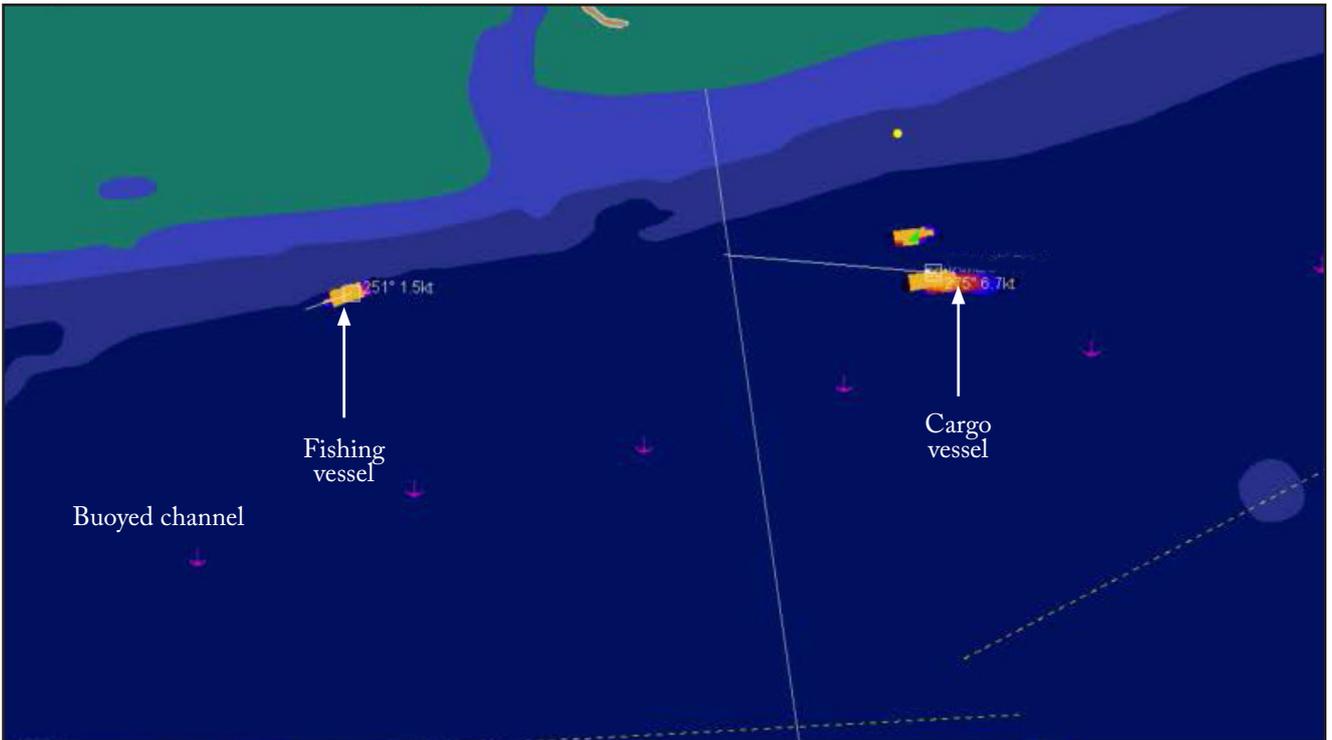


Figure 1: Snapshot 1

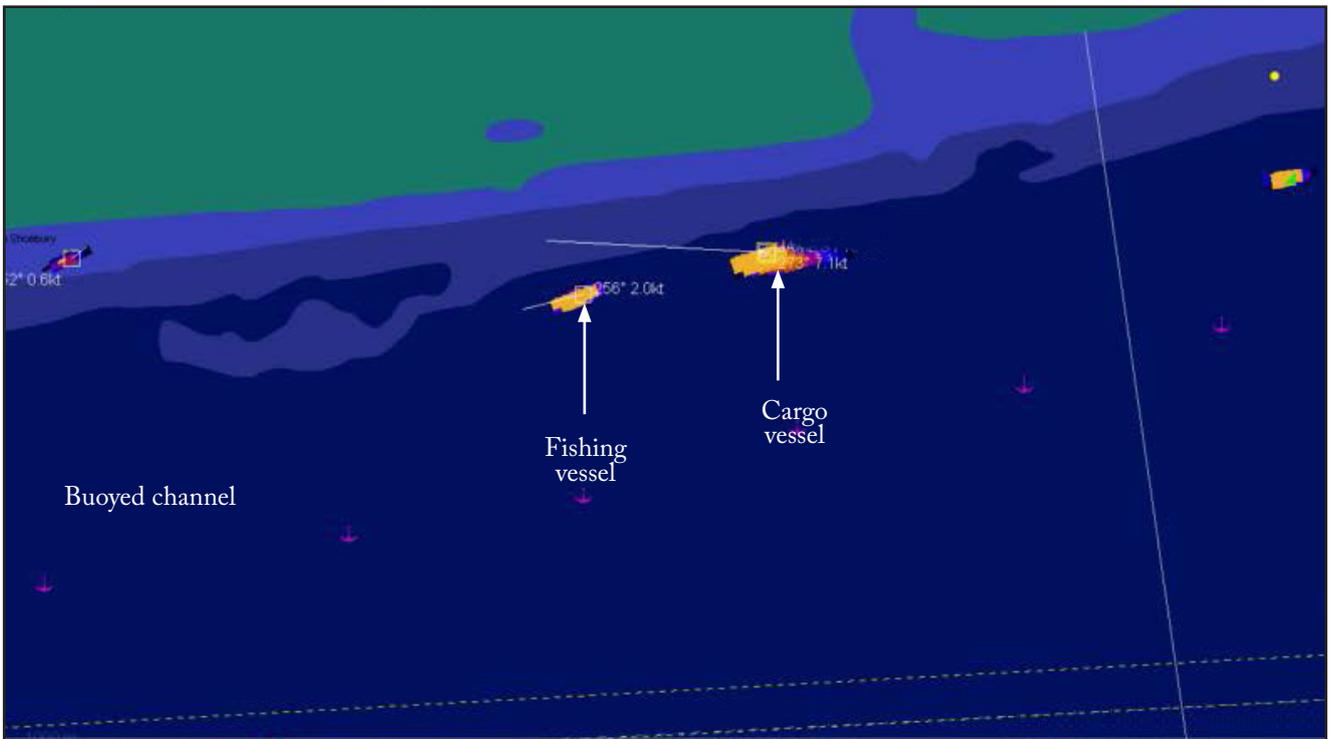


Figure 2: Snapshot 2

CASE 11

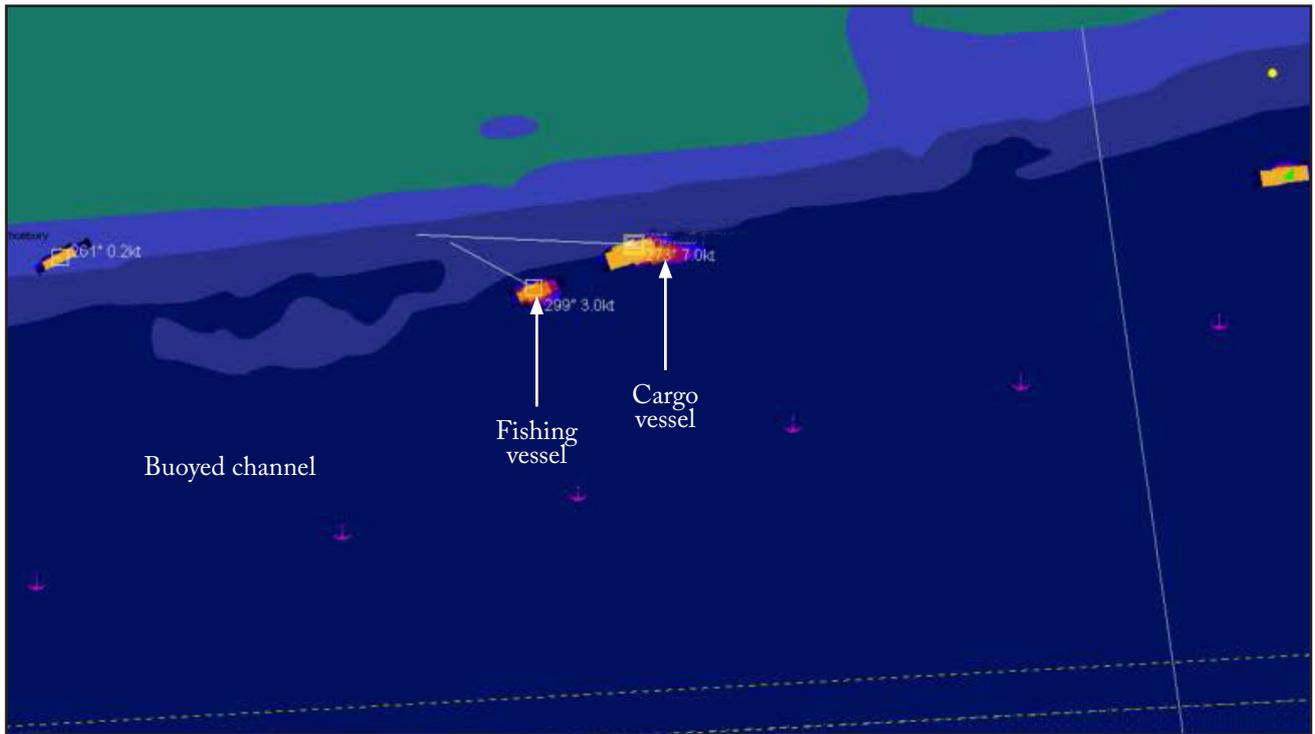


Figure 3: Snapshot 3

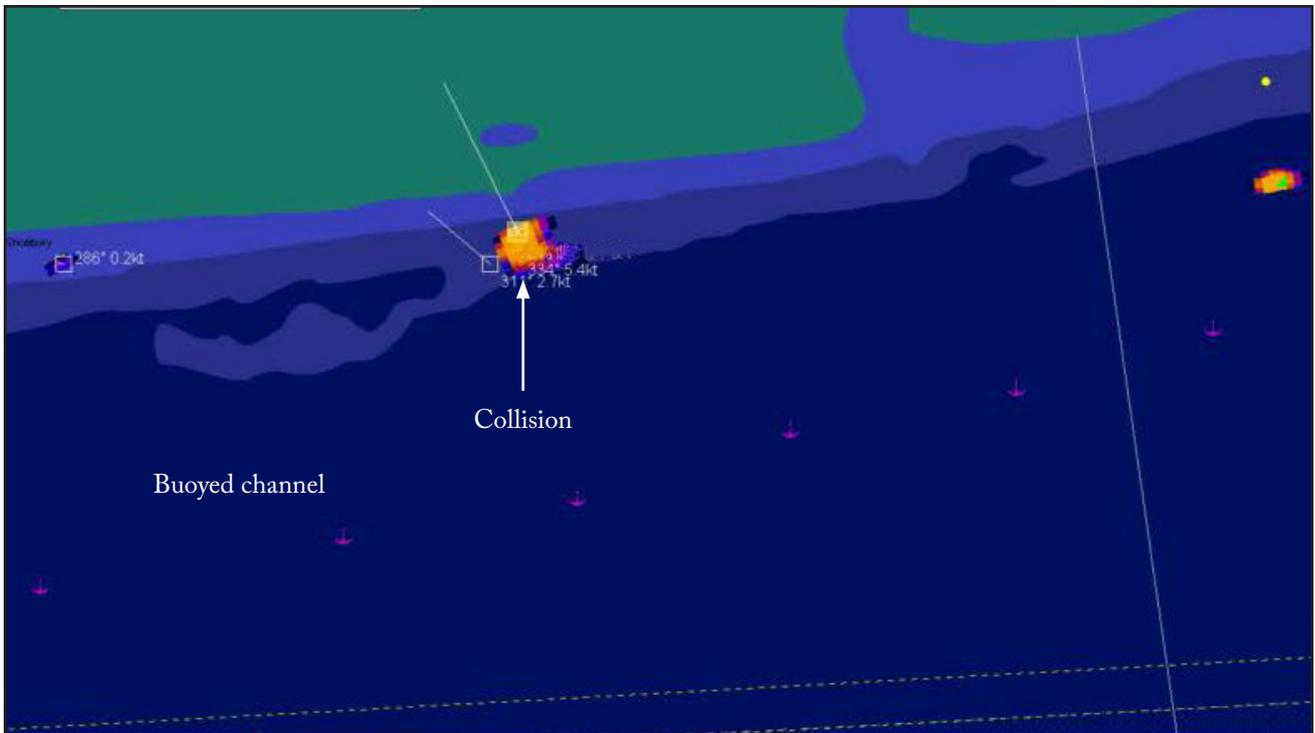


Figure 4: Snapshot 4

Lack of Maintenance Can Result in You Coming Unstuck

Narrative

A sail training vessel was at anchor with local divers in attendance to clear a fouled propeller. The divers had arrived in a small inflatable boat with an outboard engine. Once on site, the diving operations proceeded to plan and, on completion of the work, the divers prepared to return to their base. The vessel's master was concerned that with increasing onshore wind coming there was a risk to the divers' boat, and decided to prepare the vessel's rescue boat for immediate launch.

The divers' boat had only travelled about 20 metres from the vessel when its engine failed and could not be restarted. The rescue boat was launched and the divers and their boat recovered. The master then decided to secure the divers' boat and tow it to an alongside berth where the engine defect could be resolved.

The vessel proceeded to an alongside berth with the rescue boat providing berthing assistance. This was a standard operation during which the rescue boat was used to push the vessel's bow onto the berth.

Following the berthing manoeuvre, the rescue boat delivered the divers and their boat back to the local marina, returning to the vessel on completion. It was understood that the engine failure on the divers' boat was caused by water contamination of the fuel. During these operations, the rescue boat had shipped a quantity of water. Therefore, the coxswain requested permission to take the boat for a short run to drain the water via the transom drain tubes.

During berthing and departure manoeuvres, mooring station, bridge and rescue boat personnel normally communicated with each other via VHF radios. This had been the case during the berthing manoeuvre and when the boat had taken the divers back to the marina.

However, when the boat set out for its final run to drain water, although the coxswain had retained his radio, the other stations had stood down. The coxswain did not conduct a radio check before he commenced this run, and he was therefore unaware that he did not have communications with the vessel.

Shortly after commencing the run to empty the boat of water, the engine stalled. On restarting, it ran for a short time before stalling again. The boat then drifted, downwind without power, towards the far side of the bay. To arrest the drift, the coxswain decided to deploy the boat's anchor. The anchor was coupled to a short length of chain, which was intended to be attached to the boat's painter to form the anchor cable. However, with the large depth of water in the bay, the painter was too short. There was another rope in the boat, which could have been utilised, but the anchor chain did not have a shackle to which this larger rope could be tied. The coxswain was able to overcome this situation by tying a heaving line through the chain links on the anchor, which was sufficient to hold the boat and prevent further drift.

On board the vessel, a crew member working on deck noticed that the rescue boat appeared to be in difficulty, and alerted the master. Meanwhile, the rescue boat coxswain and assisting crew member continued to investigate the cause of the engine failure. It became apparent that the failure was related to the fuel system. They tried swapping the two fuel tanks and supply hoses, but this failed to rectify the fault. They then completely filled one tank from the other, which allowed the engine to start. They recovered the anchor and managed to get within paddling distance of the quay before the engine again failed. They were then able to paddle the boat to the quay and secure it alongside.

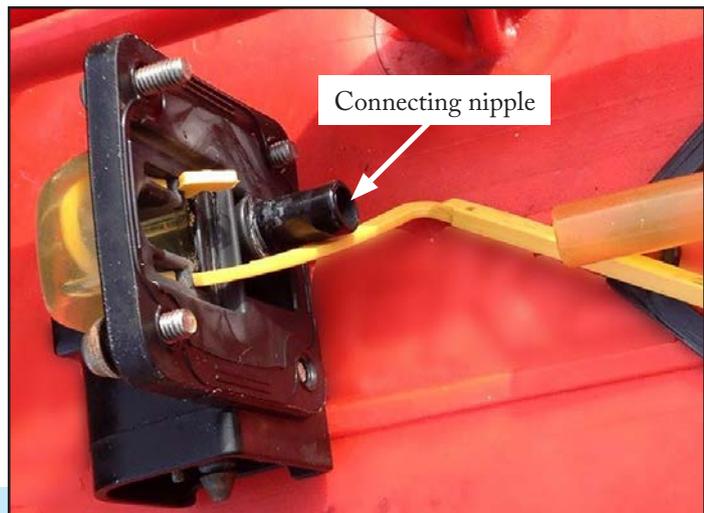
CASE 12

An investigation of the fuel tanks found that the fuel pick-up tubes within both tanks had become detached from the tank top fuel hose fittings. This left only the short connecting nipples, to which the tubes should have been attached, to pick up fuel. Each nipple was only long enough to suck fuel from a full tank, which would only last for a short period of engine running (see figure).

During the recovery of the divers, the berthing manoeuvre and the delivery of the divers to the marina, the engine had been running at high power settings for more than an hour. It is likely that during this period, one or both of the pick-up tubes had become detached from the connecting nipple.

While the rescue boat engine had been serviced on a regular basis, there was no documented evidence of when or if the fuel tanks had been inspected or serviced.

Information from the engine and fuel tank supplier indicated that an annual inspection of the fuel tanks should form part of the boat's maintenance schedule. The pick-up tubes were secured to the tank top assembly by use of an adhesive. The vessel had a diverse operating schedule and, over a period of time, had purchased petrol from a number of different countries. There was a risk that fuel with a high ethanol content could cause the adhesive to deteriorate.



Fuel tank pick-up tube assembly

The Lessons

This incident involved the vessel's rescue boat, a key item of life-saving equipment which must be ready for deployment at any time (SOLAS Chapter III – Life Saving Appliances - Regulation 20 details operational readiness and maintenance requirements). To ensure that it is at immediate readiness, correct and thorough maintenance is vital. Maintenance must be completed in accordance with a planned schedule and comprehensive maintenance records maintained.

1. Manufacturers of fuel tanks and fuel systems should ensure that all components are compatible with available fuels or that sufficient warnings are displayed to highlight incompatibility with certain fuel types.
2. The initial task for the rescue boat was to recover the divers due to a fuel system failure on their boat. This demonstrates the susceptibility of exposed engines/fuel tanks in a harsh marine environment, highlighting the requirement for extra diligence by operators in respect of maintenance and inspection.
3. The vessel's SMS stated that the rescue boat coxswain must carry a radio, but it relied on common sense to ensure that there were reciprocal arrangements on the vessel. A communications check should form part of the documented deployment preparations.
4. The rescue boat's anchor was not suitably rigged for its intended purpose. The anchor rope should be an appropriate length to meet expected conditions of use.

Messenger Rope Kills Ship's Carpenter

Narrative

A 176,000 tonne bulk carrier was approaching a discharge port in the early hours of an autumn morning. Two river pilots were on board and four tugs met the vessel to assist in manoeuvring onto the berth. The aft mooring party comprised the second officer, the carpenter, a welder and two engine room ratings. Their first task was to receive the tow wire from the stern tug. The second officer was in charge of the operation; however, the carpenter was the most experienced member of the team and the *de facto* leader that morning. The mooring team did not discuss the task among themselves or with the tug's crew.

The vessel and the tug were positioned stern to stern and proceeded together at around 6.5 knots. The deck of the tug was approximately 13m below that of the bulk carrier. The carpenter lowered the messenger line to the tug and the tug's mate attached the eye of the steel tow wire to the messenger line. When the tug's mate saw that the vessel's mooring team were attempting to manually pull the tow wire up, he shouted up to them to stop and use the mooring winch instead.

Without discussing his intentions with the rest of the team, the carpenter then passed the messenger line through the aft centreline bitts, diagonally across the deck, inboard of the starboard winch, to a pedestal fairlead located forward of the winch. He then passed the messenger around the pedestal fairlead and onto the warping drum (see figure). This resulted in a poor lead for the messenger, which bunched up around the outer edge of the drum as it was hove in. It also caused

riding turns to develop on the warping drum, resulting in the free end of the messenger line being pulled back into the drum.

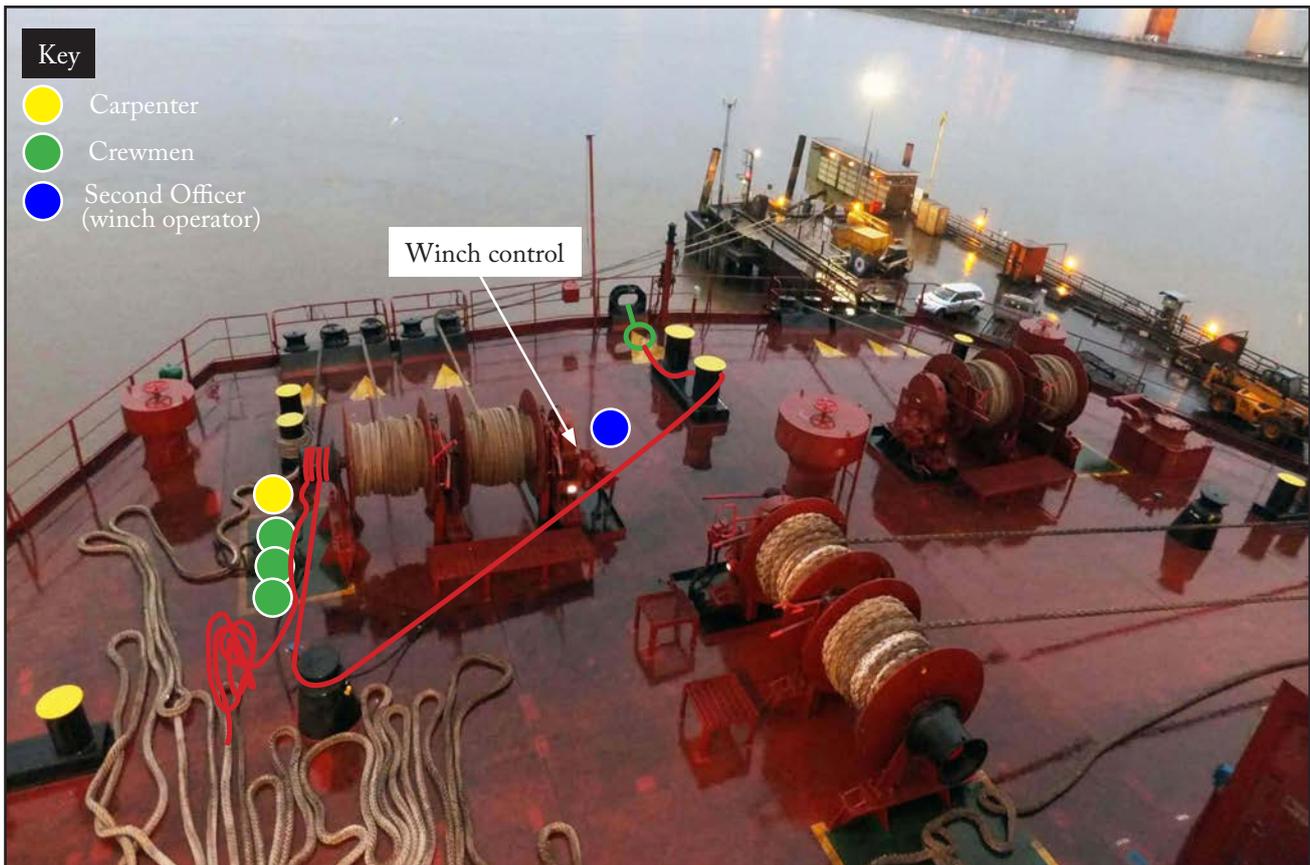
The welder was at the winch control while the carpenter stood close to the warping drum. The second officer looked down at the tow wire and gesticulated to the welder to heave up the messenger line. However, the messenger kept slipping off the warping drum, causing the tow wire to drop back onto the tug. The welder suggested that they redo the operation, but the carpenter did not listen to him.

The carpenter asked the second officer to operate the winch, and told the welder and the two ratings to help him push the messenger back onto the rotating drum. To achieve this, the carpenter stood close to the end of the warping drum with his head only a few centimetres away from it. The second officer did as he had been asked, gradually heaving up the tow wire until it was visible on the deck, despite his view of the rest of the team being obscured by the winch's rope guards.

Suddenly, the second officer heard a sharp cry. He stopped the winch and ran over to the carpenter who was slumped over the messenger line with a loop of it hanging loosely around his neck. By the time the emergency services arrived on board, the carpenter had succumbed to his injuries. The postmortem report established that he had died of a fractured neck.

It was established that a section of the tensioned messenger line slipped off the end of the warping drum and struck the carpenter on his neck.

CASE 13



Layout of mooring equipment and messenger line routing at the time of the accident

The Lessons

The mooring equipment on the aft mooring deck did not offer an obvious safe method for receiving the heavy towing wire from the tug and the crew had not received any training or guidance in the safe use of messenger lines or the warping drum.

The absence of control by the second officer over the mooring party, allowed the carpenter to attempt to receive the towing wire from the tug in an inappropriate and dangerous manner.

1. It is essential that mooring parties are appropriately supervised at all times. Regardless of how well intended, individuals should not be permitted to assume control of the party without the prior agreement of the supervisor.
2. The arrangements for rigging the safest leads for mooring and towing lines should be clearly displayed.
3. Stay well away from lines that are under tension; identify potential snap-back zones and mark them accordingly.
4. Mooring parties should be provided with onboard training and guidance for safe mooring and towing operations.
5. If the nature of the task changes part way through, or if the original plan is not working, stop the operation and consider alternative approaches. Discuss the issues with other team members and be prepared to listen to others who may identify hazards.
6. The highest priority on board a vessel must always be the safety of its crew. It is better to delay a task than to complete it in time at the risk of compromising safety.

Mirror, Signal, Manoeuvre

Narrative

A small cargo ship was following a traffic lane of a TSS. The vessel's OOW was the second officer and this was his first contract since qualifying. He was alone on the bridge.

The watch was relatively quiet. The vessel was on autopilot following its intended south-westerly track. The closest vessel was a bulk carrier, 2nm off the starboard quarter, which was slowly overtaking.

Soon after plotting the vessel's position on the paper chart, the OOW saw a group of lights 20° off the starboard bow. Through binoculars, he identified the masthead light and the port side light of what he assessed to be a power-driven vessel crossing the traffic lane. By radar, the vessel was at 3.9nm and its CPA was 0.1nm.

When the vessels were 2nm apart the OOW altered the cargo ship's heading 20° to starboard in order to give way. He had not recognised that the vessel ahead was a trawler towing its gear at slow speed. The trawler was showing the appropriate navigation lights and transmitting its status on AIS. Its skipper had seen the cargo ship and the bulk carrier and he had already started to manoeuvre the trawler to port in order to keep out of their

way. However, because the trawler was towing, this was being done in increments using small adjustments to the autopilot.

As the cargo ship settled onto its new heading, the OOW realised that the vessel ahead had altered course to port. The two vessels continued to close. The OOW was uncertain of what to do next and over the next few minutes he adjusted the cargo ship's heading to port and then to starboard.

The erratic movements of the cargo ship were seen by a shore-based VTS operator. The operator called the cargo ship on VHF channel 16 and during the subsequent discussion of the trawler the operator asked the OOW whether he intended "*to do a 360...*" After some hesitation the OOW confirmed that this was his intent. The OOW then switched the steering to manual and put the helm hard to starboard. He did not see the bulk carrier, which had maintained a steady course and speed and was only 0.25nm off the cargo ship's starboard beam. The OOW remained unaware of the bulk carrier's proximity until the two vessels collided less than 2 minutes later.

The general cargo vessel's port bridge wing was severely damaged (see figure) and the bulk carrier's port bow was holed. There were no injuries.

The Lessons

1. OOWs' competency depends primarily on their knowledge, training and experience. Although they might be qualified to be in charge of a navigational watch, the less experienced still require careful monitoring and close support, particularly in potentially challenging situations. Newly qualified OOWs should not be keeping watch alone at night in a TSS.
2. Checking that a new course is clear of hazards by looking out of the window and at the radar, and checking that the appropriate quarter is clear of other vessels, are fundamental safety precautions that must be taken before every alteration of course.
3. Keeping a good visual lookout is key to safe bridge watchkeeping. However, all available means should be used to detect, identify, monitor and assess other vessels. Radar, ARPA and, more recently, AIS can play a vital role in maintaining an OOW's situational awareness providing they are used and the advantages and disadvantages of each are taken into account.
4. When overtaking and the actions of vessels ahead are cause for concern, reducing speed allows more thinking time in which to make an accurate assessment and to decide the best course of action. Maintaining speed frequently limits the options available.
5. Calling the master 'when in doubt' is a ubiquitous requirement of masters' and night orders. All too frequently, this important 'catch all' is either ignored by OOWs - who see calling the master as a sign of failure - or by anxious OOWs concerned at the master's reaction. A good OOW will not hesitate to call the master and a good master will not criticise an OOW for being called.



Damage sustained to the general cargo vessel

A Bridge Too Near

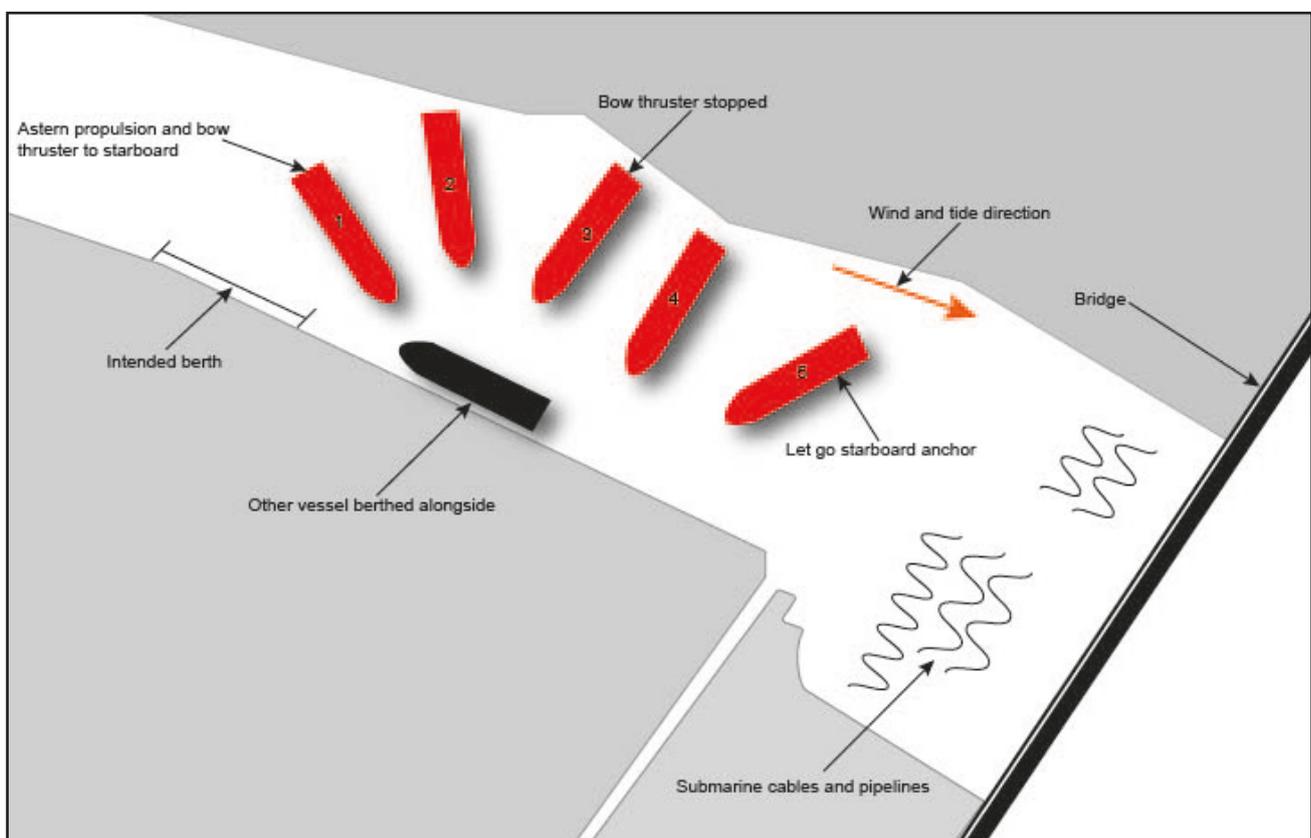
Narrative

A 4,000gt general cargo vessel was entering port at night with a pilot on board. The plan was for the vessel to berth starboard side alongside in readiness to load cargo. The pilot was giving engine and rudder orders, the master was at the controls, and the chief officer was manually steering the vessel. Crew members were at their forward and aft mooring stations.

As the vessel approached the berth (see figure), the pilot became aware that the following wind and tide were having a greater effect on its speed than he had expected, and there was a danger of it colliding with a vessel secured at an adjacent berth. He therefore decided to abort the approach, turn the vessel around and berth port side alongside.

The pilot ordered astern propulsion and bow thruster to starboard. Halfway into the turn, the bow thruster stopped. Aware that the vessel was being set towards a bridge that spanned the waterway, and that he would be unable to complete the turn using only helm and propulsion, the pilot ordered the starboard anchor, and then the port anchor, to be let go. Although this had the effect of assisting the turn, the vessel was too close to the bridge to prevent its stern impacting with it.

Following the accident, both anchors were weighed and the vessel was manoeuvred port side alongside its intended berth. Substantial damage had been caused to the vessel's port quarter and lifeboat davit. The bridge, which accommodated road and rail traffic, was subsequently closed to rail traffic until resulting damage to its tracks was repaired some days later.



Sequence of events leading up to the accident

The Lessons

1. The plan to berth the vessel starboard side alongside was decided following a request by the shipper as this would be more expedient for loading the intended cargo. The manoeuvre was therefore required to be conducted with a following wind and tide, contrary to good seamanship.
2. Such a manoeuvre had been regularly conducted in the port previously without incident. However, the confined nature of the area in which the vessel was to be berthed meant that an effective contingency plan was necessary should circumstances require the original plan to be aborted.
3. An effective contingency plan in this case relied on a fully functional bow thruster and an ability to effectively anchor the vessel without delay, particularly given the existence of submarine cables and pipelines in the vicinity of the bridge.
4. On departure from the vessel's previous port, the bow thruster had unexpectedly stopped after operating for about 30 minutes, the reason for which had been neither determined nor resolved prior to the accident.
5. Although crew members were stationed forward for the berthing manoeuvre, the anchors were not in a ready state to be deployed immediately. There was a consequent delay in letting them go, indicating that the crew members had not been sufficiently briefed on the probability of having to deploy the anchors, and on the importance of then having to do so without delay, should the need arise.
6. Had a conventional port side berthing been planned at the outset, the bow thruster and anchors could have been used to good effect in helping to turn the vessel to stem the wind and tide and so maximise control while manoeuvring the vessel alongside. The risks associated with any proposed deviation from good seamanlike practices need to be fully considered and effectively countered before acceptance.

From Rags to Riches

Narrative

A container ship departed its berth and was heading on the outward passage with a pilot on board. Before the ship left the pilotage area, a low level alarm for the main engine lub-oil drain tank sounded.

The engineer on watch alerted the bridge and the ship's speed was reduced while he went to investigate. The lub-oil tank's contents gauge indicated that the tank was empty; approximately 10000 litres of oil had apparently 'disappeared'. To prevent significant damage, the ship was immediately anchored and the engine was shut down.

About 30 minutes later, to the surprise of the ship's engineers the contents gauge showed the tank was full. Consequently, the main engine was re-started, but again the lub-oil tank appeared to empty. Not wishing to take any chances, the master shut down the engine and returned back alongside with tug assistance. Soon after, the contents gauge indicated that the lub-oil tank was full again.

A service engineer attended to help identify and rectify the problem. Once the engine had cooled, the contents of the lub-oil drain tank were transferred to a holding tank and the lub-oil drain tank was inspected. A number of items, such as rags, plastic tape and plastic end caps were found in the tank (Figure 1), caught on a steel mesh protecting the oil pump suction well.

The tank's contents sensor was located in the well and the debris had slowed the oil flow from the tank. Consequently, after the oil pump had drawn the lub-oil from the well, the contents gauge indicated that the tank was empty. Once the engine and lub-oil pump were stopped, the oil had seeped through the debris from the tank and filled the well.

After the lub-oil tank was thoroughly cleaned and the oil replaced, the vessel resumed its schedule without further problems.

The Lessons

1. Tanks and engine crankcases should not be left open after work has finished. Before being closed, they should also be thoroughly inspected to ensure that no detritus or tools are left behind. Ideally this should be done by someone not involved with the work being carried out.
2. Prompt and appropriate responses to machinery alarms are necessary if damage to equipment is to be prevented. This requires the on-watch engineers and the bridge team to have a good understanding
- of the propulsion system and to be well drilled in the event of an alarm or breakdown.
3. Anchoring and returning alongside following mechanical problems inevitably causes delays. However, it is better to be late than to not reach the intended destination through 'pressing on' until a problem is sorted. Tug assistance and engineering expertise are easier and less expensive to access in port than they are elsewhere.



Figure 1: Rags found in the drain tank



Figure 2: Sump grid

Part 2 - Fishing Vessels



It's good to see that many more fishermen are starting to wear some form of Personal Flotation Device (PFD) when at sea.

This was hammered into me at a very young age by my

father who was in the Royal Navy at this time. We built several sailing dinghies and were not allowed to go near them unless we were wearing a PFD; we just got used to this and on many occasions were glad of them. When we went out on our small creel boat before going to school each day we tended not to wear them, I couldn't really understand this, perhaps because 'real fishermen didn't wear lifejackets'. After a few close calls and reprimands from parents, we started to use them whenever we were at sea, but took them off before coming into harbour. This was because our parents could see us when we were at sea, but not when we were in the harbour. However, our friends and fishermen could see us in the harbour, the power of peer pressure!

Several years later when I started full-time commercial fishing, I realised that this peer pressure was still a big influence on fishing vessel health and safety. There was a definite attitude of invincibility among many in the industry. One of my first experiences of an improvement in safety awareness coming into the industry was when it was suggested that we took part in the new industry safety training courses that were being introduced by the Sea Fish Industry Authority at that time. This involved practical training in sea survival, firefighting and first aid. For many it was the first time that they had actually put a

lifejacket on, or seen a flare being fired, or used a fire extinguisher. For some it was actually the first time they'd seen a life raft inflated, never mind how to get in one. Over the next twenty years at sea, working as a commercial fisherman all around the Scottish coast, there were several occasions that the information covered during that training was put to good effect.

Since joining Seafish in 1997 as a gear technologist I have become more involved with the fisherman's safety training courses, organised by Seafish Training and Standards group. Seafish, and all of the other organisations involved in trying to make fishing safer, provide a lot of expert information, advice, guidance and training to fishermen, but it appears that this is not always being applied on board, and that needs to change.

At Seafish we have a policy that all seagoing staff should repeat their basic safety courses every three years. I have found this most beneficial in keeping me up to date with changing trends in safety at sea and the equipment. It's also interesting how I personally cope with the training as I get older. When I did my first sea survival course in the 1980's I was able to clamber into the inflated life raft with ease and then help others in. Nowadays I struggle to get in and often I'm the one who needs the help of others! I would recommend that any fisherman should refresh their basic safety courses, life rafts, PFDs and first aid advice as all have changed a lot since I first did my safety training.

Fishermen can currently apply for a grant of up to £1,500 towards the cost of approved courses, so there is no excuse for missing out. Just email training@seafish.co.uk with your enquiry and we'll do everything we can to help you.

A handwritten signature in blue ink, consisting of a stylized 'M' followed by a horizontal line extending to the right.

Mike Montgomerie
SEA FISH INDUSTRY AUTHORITY

Mike Montgomerie is a Gear Technologist with Sea Fish Industry Authority.

He started his fishing career as a summer job working with the local salmon fishery in beach seining in the estuary at Montrose. This was interspersed with working about 100 creels before and after school. A move to the Moray Firth created an interest in larger vessels in the seine net trawling fleet.

On leaving school Mike moved to Glasgow to study at Jordanhill College, now part of Caledonian University, to become a Physical Education teacher. After several years in this profession he moved back to NE Scotland and went back to his love of fishing.

Starting out on a 25metre trawler working all around the coast of Scotland changing between pelagic pair trawling, prawn trawling and white fish trawling on a seasonal basis. After about 3 years he progressed from this vessel to becoming part owner in a newer trawler working predominately the west coast of Scotland. Replacing this vessel in 1990 with a larger newer one, and then operating it with his business partner and co-skipper until 1997.

After more than twenty years at sea, Mike moved to Hull to take up a position as Gear Technologist at the Seafish Flume Tank. He was responsible for delivering the Seafish training and research in trawl gear technology. His role involved him in many of the Seafish gear and selectivity projects undertaken around the UK. He still has a similar job title today but the role has changed dramatically to meet the demands of the UK fishing industry.

Mike has been involved with many of the selectivity and discard reduction projects undertaken in Scotland, England and Northern Ireland in recent years, either for advice on gear design or managing the projects.

Mike has been in this role for eighteen years and is now one of the leading experts in trawl gear technology in the UK. Much of his role in recent years has been in supporting industry and government in finding gear based solutions to meet the demands of originally, the cod recovery plan and today the landing obligation.

Three Lives Lost When Angling Boat Capsizes

Narrative

Three men left harbour on a winter's morning in a small speedboat to go angling and to recover some long-line fishing gear they had laid the day before. None of the men were wearing lifejackets, they were not experienced in operating small craft at sea and they had informed nobody ashore about where they intended to fish or when they expected to return.

The weather forecast on the day of the accident was for the wind to increase and veer during the day to become onshore, leading to deteriorating local sea conditions. However, it is unlikely that the men were aware of this.

The boat had been purchased via the internet and was not equipped with a VHF radio or with any other means of raising the alarm in a distress situation. The boat was powered by a single outboard engine which was fitted in a central well at the stern. The freeboard at the

stern of the boat was 36cm, but a hole had been cut in the fibreglass hull only 26cm above the waterline to accommodate the engine controls and fuel pipe. This hole had been filled in with a plastic cover held in place with sealant, but this fell off during the trip.

The first indication that the trip had ended tragically came when a member of the public reported to the coastguard that there was flotsam close offshore. The coastguard organised a search with the use of lifeboats, rescue helicopters and shoreline teams. The crew of a lifeboat found the boat's upturned hull with the propeller fouled by fishing gear, and a short time later recovered the body of one of the men who had been wearing a buoyancy aid.

Despite an extensive search by multiple rescue units no trace of the two remaining men was found.

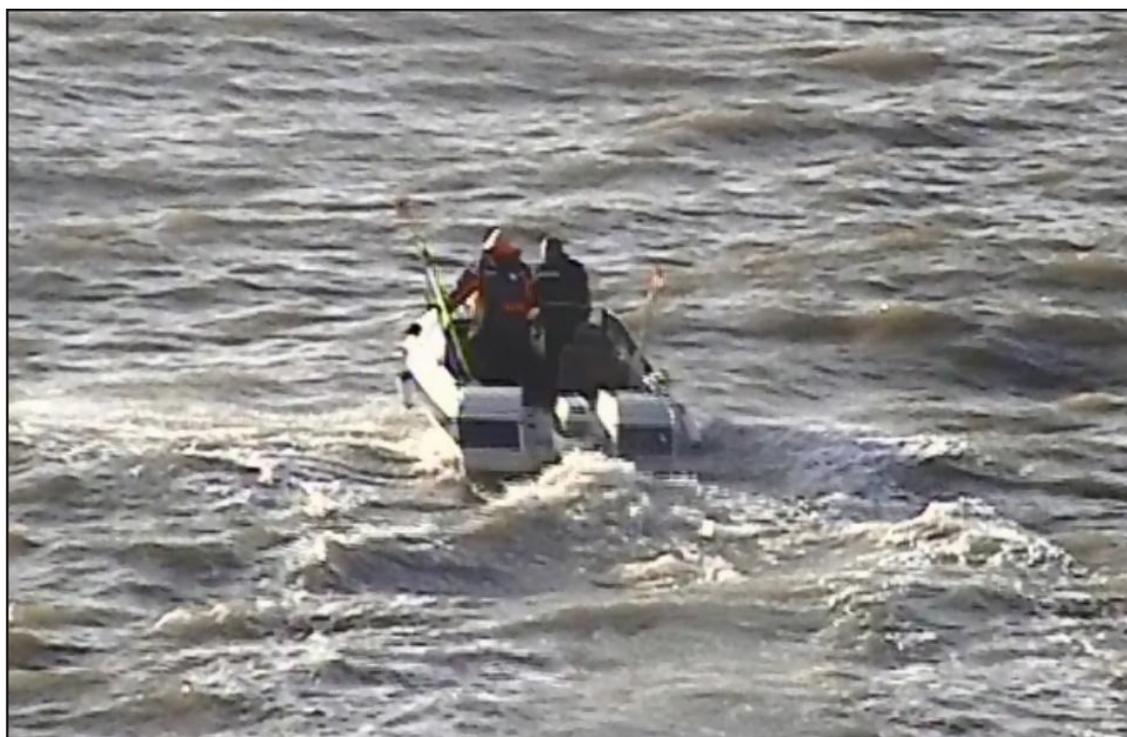


Figure 1: The men leaving harbour

The Lessons

1. The men were not experienced and were probably not expecting the weather conditions to deteriorate.
2. Before going out to sea in small craft always check the weather forecast to ensure you and your boat will be able to operate safely in the expected conditions.
3. The boat had a low freeboard at its stern, which was further reduced by a poorly fitted patch where the engine control cables passed through the transom. When the fishing gear fouled the propeller, the boat would have become anchored at its stern and vulnerable to being swamped and ultimately capsizing.
4. Know your boat and its limits.
5. The boat carried no means of raising the alarm and, although mobile phones were found on the recovered body, there was no record of them having been used. This suggests that the capsizing was rapid.
6. Ensure you and your boat are properly equipped to be able to raise the alarm if the need arises.
7. The recovered body was found wearing a buoyancy aid. Buoyancy aids are not designed to keep the wearer's face clear of the water and are not suitable for use in cold or open water. The chances of survival for a person in the water are significantly improved if a lifejacket and thermal immersion suit are worn.
8. Always wear appropriate clothing – it could save your life.

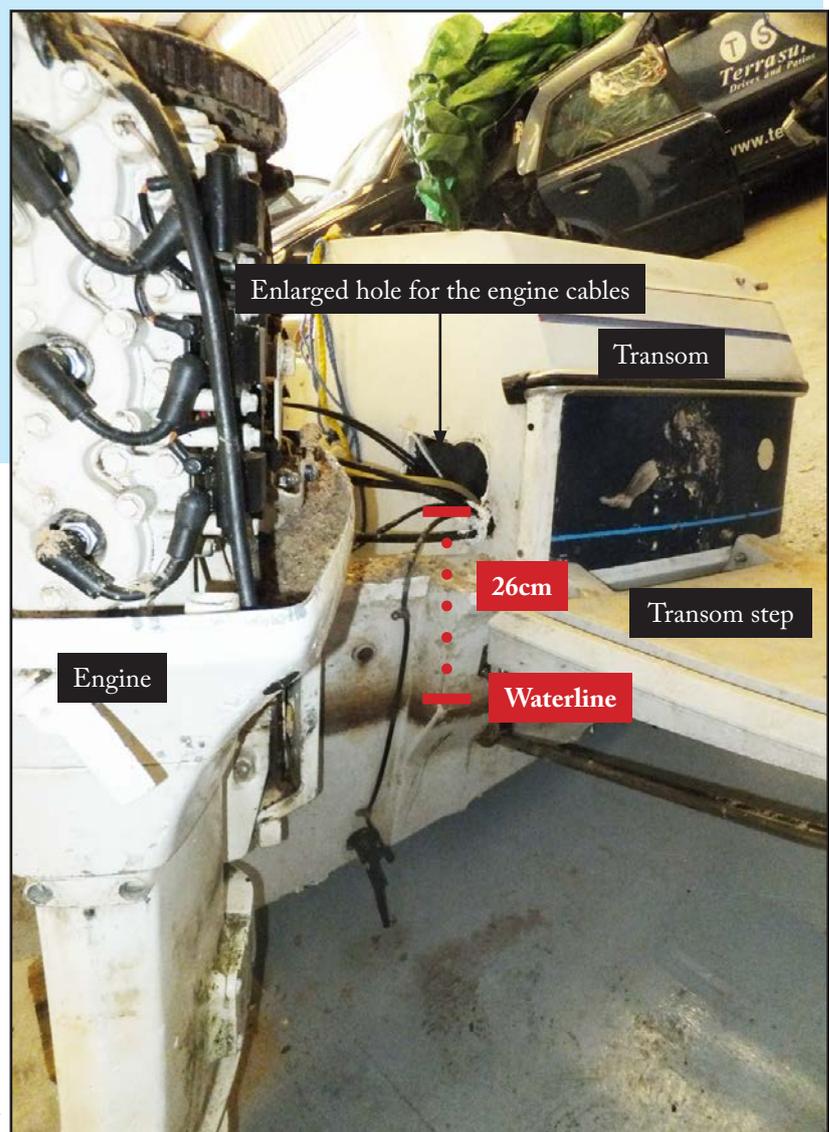


Figure 2: Stern view showing enlarged hole cut in transom for engine cables

Carbon Monoxide – the Silent Killer

Narrative

Tragedy struck the crew of a 9.95m scallop dredger during a break from fishing. The skipper and crewman, who were both in their early 20s, died from CO poisoning as they slept on the boat after an arduous period at sea dredging for scallops.

The dredger secured alongside shortly after midnight following a period of 36 hours at sea. The men then off-loaded the catch of 26 bags of scallops. At about 0300, the skipper and the remaining crewman shut down the dredger's engine and went to bed.

About 5½ hours later, the skipper of an adjacent vessel went on board the dredger to rouse its crew. The wheelhouse door and windows were locked shut. The skipper realised that something was wrong so he forced open the wheelhouse door. The wheelhouse was extremely warm and the cooker grill was lit.

As the skipper turned off the grill, he looked down into the sleeping area and saw the dredger's skipper and crewman lying in their bunks, fully clothed.

The fishermen did not respond to the skipper's attempts to wake them, so he called the emergency services. Paramedics arrived on the scene within minutes and quickly determined that the boat's occupants were dead. They had died from CO poisoning.

The deceased had left the grill lit overnight to heat the wheelhouse and the accommodation. The grill was corroded (see figure) and emitted high levels of CO. Another crewman, who had recently left the dredger, had shown the symptoms of CO poisoning a few days earlier. A CO detector was not fitted.



Corroded grill

The Lessons

1. CO is an odourless and colourless lethal gas that is a by-product of the incomplete combustion of fuel. It is produced by all fossil fuel-burning appliances. LPG cookers, heaters, barbeques and internal combustion engines are all potential killers. Therefore, it is essential that these appliances are fitted and maintained by suitably qualified technicians in accordance with manufacturers' instructions.
2. Never leave LPG appliances on overnight unless they are designed for such use, and use only fossil-fuelled appliances for their intended purpose. A cooker is a cooker, not a heater.
3. Good ventilation reduces CO emissions from fossil-fuelled appliances by promoting combustion. It also prevents CO from accumulating in enclosed spaces. Check to ensure that all ventilation ducts are free from obstruction, and always maintain a good air-flow in habitable spaces when CO producing appliances are in use.
4. Early symptoms of CO poisoning include headaches, vomiting, tiredness and confusion, stomach pain, shortness of breath and difficulty breathing. Unfortunately, these symptoms can be masked by other ailments such as flu, food poisoning, a hangover or general tiredness.
5. CO detectors are available for as little as £25. All boats with enclosed accommodation spaces and fitted with combustion engines and fossil-fuelled appliances should have at least one fitted. Detectors meeting the EN50291-2 standard are intended for use in the marine environment. However, they must be properly sited, regularly tested and be 'in date' if they are to be effective.
6. Comprehensive and practical advice on CO and its dangers can be found in 'Carbon Monoxide Safety On Boats' - a leaflet published by the Boat Safety Scheme in partnership with the Council of Gas Detection and Environmental Monitoring. This includes advice on the symptoms of CO poisoning and on the purchasing and siting of an alarm. The leaflet can be found at:

<http://www.boatsafetyscheme.org/media/180329/co-safety-on-boats-2013-web-hkj.pdf>

Got a Screw Loose?

Narrative

It was a quiet, pleasant evening when the skipper and three crew of a wooden stern trawler called into the small harbour to land the catch. The skipper was pleased with the fishing and he was planning on a quick turn-around and then heading back to sea as soon as possible.

After the catch had been put ashore, the crew got ready to move to an adjacent berth astern to load empty boxes on board for the next trip. Once the lines had been let go, the skipper, who was alone in the wheelhouse, moved the engine control lever “astern” and the trawler moved towards the intended berth as planned.

As the trawler neared the berth, the skipper put the engine control lever “ahead” to check the vessel’s way. Nothing happened - the vessel continued to power astern. The skipper shouted to the engineer to stop the main engine and moved the engine control further ‘ahead’, but the trawler soon reversed into an adjacent quay wall.

The trawler’s stern was severely damaged (Figure 1) and the vessel rapidly took on water. Although the engineer started the bilge pump, it couldn’t cope with the rate of ingress. The trawler, which didn’t have watertight bulkheads due to its age, listed to port. The speed of flooding left the crew with little choice but to evacuate to the quay. Shortly after they scrambled ashore, the trawler foundered. Only 30 minutes had elapsed from the vessel striking the quay wall to it sinking.

The trawler was eventually re-floated (Figure 2) and an investigation discovered that the loss of control was due to a clamp, used to secure the Morse cable between the control lever in the wheelhouse and the engine and gearbox, detaching from supporting framework (Figure 3). The clamp had been secured with one rather than two screws as intended (Figure 3 inset) and the lone screw had worked loose and had fallen out.



Figure 1:
Stern damage

The Lessons

1. The loss of control of the main engine is a potential nightmare for the skippers of all boats manoeuvring at close quarters with other vessels or in harbours. Fortunately, many control systems are relatively simple and are usually trouble-free. However, no matter how straightforward such equipment might be, its reliability cannot be taken for granted. Vibration, wear, and corrosion are among the factors that make the routine inspection and maintenance of these safety-critical systems a 'must do', regardless of how well they appear to be working or how difficult they are to access.
2. When a vessel starts to flood, a prompt response is essential to stop the situation getting out of hand. In some cases, however, the rate of flooding can be so rapid that little can be done from the outset, regardless of a crew's training and competence. When this happens, the decision to evacuate or abandon is critical. Such a decision is
3. never easy but, as shown in this case, when it is made in good time injury or worse is usually prevented.
3. Over the years the construction standards of fishing vessels have been raised considerably in many areas. Consequently, newer vessels have more safety features than older ones. That does not mean that older vessels are unsafe, but the absence of these safety features does reduce their survivability. Therefore it is best to incorporate such safety features in older vessels wherever possible, even though they might not be required by regulation. For instance, the retro-fitting of watertight bulkheads might be difficult and expensive, but the installation of a main engine emergency stop in the wheelhouse could possibly be achieved relatively easily.



Figure 2: Salvage

CASE 19

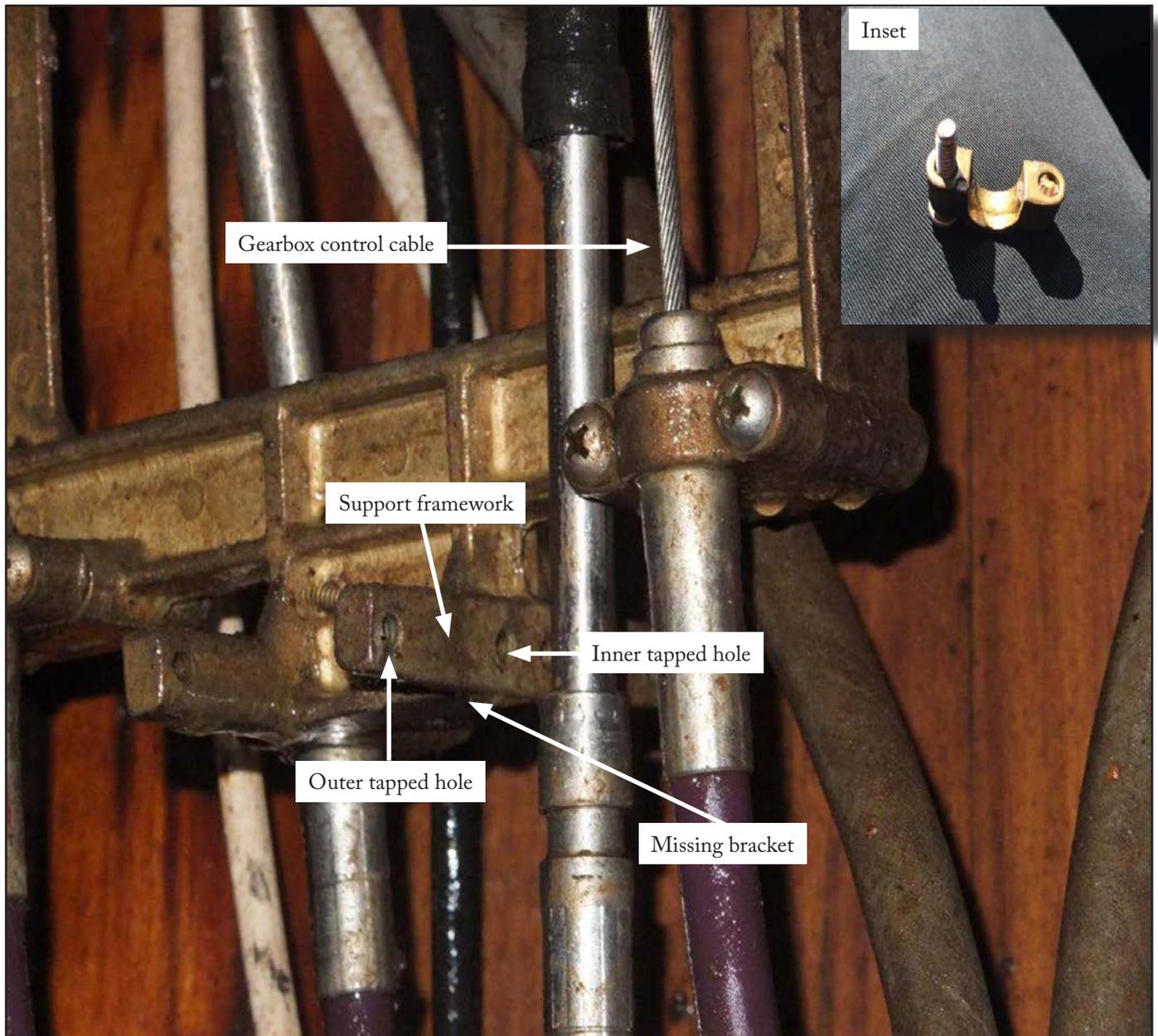


Figure 3: Support framework and detached securing bracket (inset shows clamp secured with one screw)

Flood, Flood, Flood

Narrative

On completion of an annual maintenance period on a slipway, a 22m wooden stern trawler was put back into the water. Shortly afterwards, the vessel sailed to pick up its fishing gear from another port. Three crew were on board for the 75nm passage.

The trip was largely uneventful until the engine room bilge alarm sounded 3nm from the trawler's destination. The crew investigated and saw that the engine room was flooding with water coming through gaps in the fish room bulkhead. They immediately tried to reduce the water level using an electric and an engine-driven bilge pump. However, the electric pump soon stopped when it was submerged under water. Shortly afterwards, the engine-driven pump also failed as water

sprayed onto its electro-mechanical clutch. A petrol-driven salvage pump was taken to the fish room, but it was not used.

The skipper made a distress call via VHF radio. In response, the coastguard tasked an all-weather lifeboat (ALB), which went to assist. Portable pumps were transferred from the lifeboat to the trawler and the flooding was brought under control. The trawler then made its way into port under its own power, escorted by the ALB.

When the trawler had been on the slipway, the sun had dried out the caulking around its stem. The caulking eventually fell out, leaving gaps of approximately 6mm between the planking, which allowed seawater to penetrate into the forepeak and beyond (see figure).



Water ingress between the planks

The Lessons

1. Caulking is a time-proven method of sealing wooden vessels. However, whenever a wooden boat is taken out of the water, all seams should be thoroughly checked to ensure they are intact and in good condition. The hull's watertight integrity should also be closely monitored on re-launch to ensure that the planks and caulking have swollen sufficiently to make a seal. Even if there has been no work on the hull, the caulking might not be as effective when a boat is put back in the water as it was when it was taken out.
2. Petrol-driven pumps should not be used between decks or other enclosed spaces because they emit carbon monoxide, which is lethal. In recent years, too many UK fishermen have succumbed to this silent killer. In this case, the crew made the right decision to raise the alarm and seek assistance rather than run the petrol-driven pump in the fish room.
3. Sending a distress call by digital selective calling or by VHF channel 16 when an emergency arises is the right action to take. The sooner it is done, the more likely assistance can be provided and therefore a greater chance of success.

Bilge Alarms: Disconnect at Your Peril

Narrative

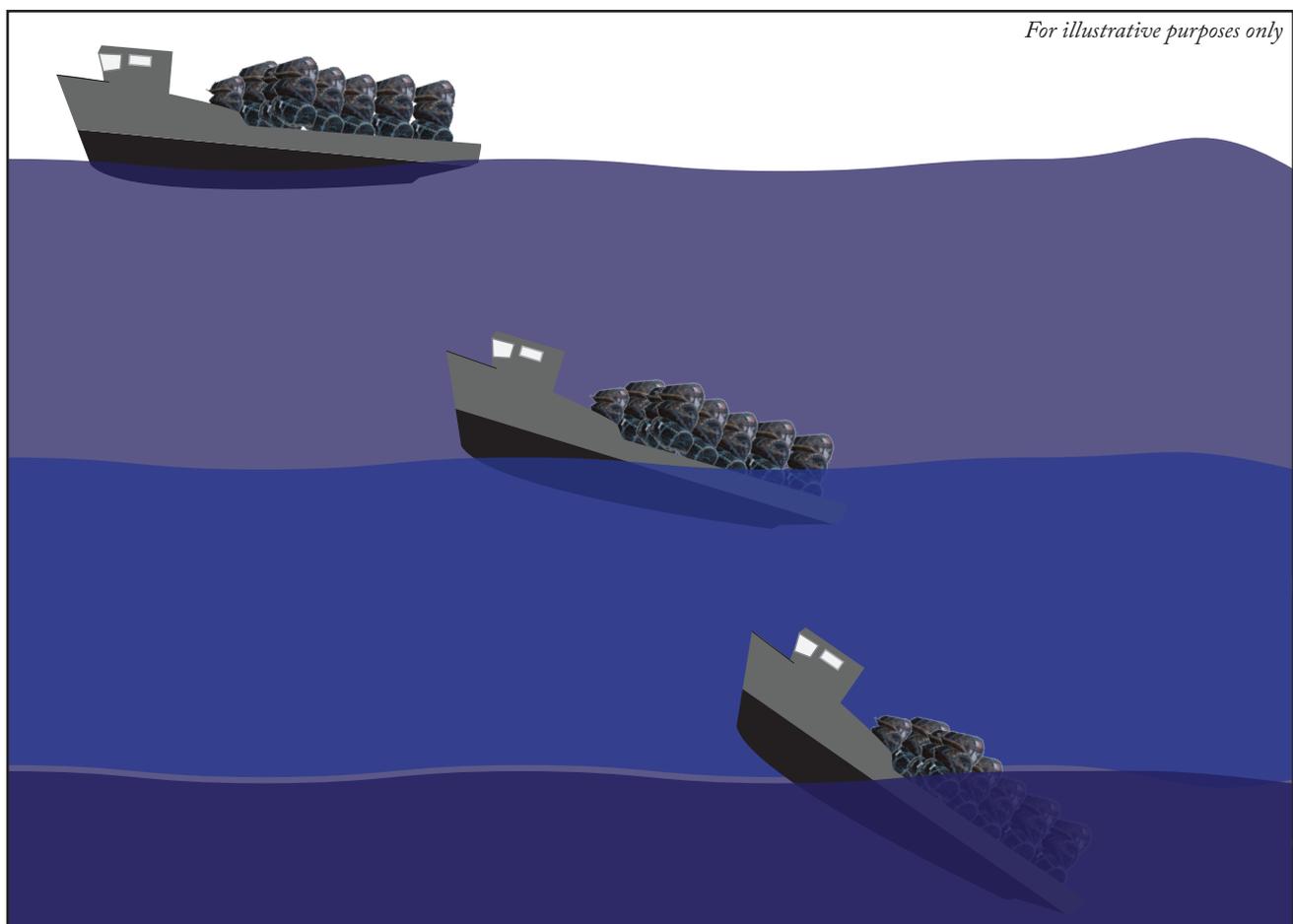
On a February morning, the skipper and two crewmen of a fishing vessel set out to retrieve some fleets of creels they had left out at sea during the winter period. A few hours later they had completed their mission and headed back to port. The vessel was heavily trimmed by the stern due to the weight of the creels and also had a slight starboard list. As they crossed a patch of turbulent sea, the vessel suffered a heavy slam. However, there was no apparent damage and the crew soon forgot about the incident.

About an hour later the older of the two crewmen was resting in his bunk and the skipper was at the wheel, drinking a cup of tea with the other crewman. Noticing that the vessel had gone down further by the stern, they tried to correct the trim by shifting the creels forward. However, this had no effect

and soon the sea was starting to wash over the deck. The skipper concluded that the fish hold, which was located aft of the engine room, was flooding, but he was unable to inspect the space as the only access was covered with several layers of creels on the deck.

The skipper had previously disconnected the fish hold bilge alarm, relying solely on the engine room bilge alarm, which had been tested a week before the accident.

Calling out to his crew to get ready to abandon the vessel, the skipper ran down to the engine room and started the deck wash pump in an attempt to empty the aft fish hold. He noticed that the engine room bilge was dry although the pump was discharging a full flow of water from the fish hold. He then came up to the wheelhouse and transmitted an incomplete



Behaviour of fishing vessel with heavy stern trim during flooding

CASE 21

“Mayday” call using channel 16 on the VHF radio. The coastguard misheard the name of the vessel and did not receive the position of the “Mayday” call.

The vessel was going down rapidly, but the skipper managed to launch the liferaft and board it along with one of his crewmen. The older crewman, who was wearing a lifejacket, jumped into the sea as the vessel listed dangerously to starboard. However, he drifted nearly 150m upwind from the liferaft. Working hard against the wind and tide, it took the skipper and his crewman around 20

minutes to retrieve the older crewman into the liferaft. Although he was conscious, he was suffering from the effects of cold water shock.

The coastguard was eventually able to establish the correct name of the vessel and its approximate location; however, valuable rescue time had been lost and 1 hour and 40 minutes elapsed between the “Mayday” call and the crew being rescued by helicopter.

The crew were flown to the nearest hospital. However, the older crewman suffered a cardiac arrest and died later that day. The postmortem report concluded that the cause of death was hypothermia.

The Lessons

1. A working bilge alarm could save your boat. Although the exact cause of this flooding could not be determined, the most likely reason was a partially sprung plank caused by the heavy slam experienced by the vessel that morning. As the vessel already had a heavy stern trim, the water accumulation continued aft while the engine room remained dry. Had the fish hold bilge alarm been connected, the crew would have had sufficient time to save their vessel.
 - There was a reason for the vessel having two bilge alarms. Always make sure that all bilge alarms on board your vessel are fully functional by testing them before every voyage.
2. On a small fishing vessel carrying a full load of creels it is sometimes unavoidable for the access to spaces to become blocked. Some vessel owners fit CCTV cameras to monitor these spaces.
 - CCTV systems are not expensive these days. If you regularly operate with a blocked access hatch, consider investing in this technology; it may one day save your vessel.
3. The vessel involved in this accident was fitted with a digital selective calling (DSC) VHF radio. Pressing the DSC distress button for 3 seconds would have transmitted an automated distress message, which would have included the identity and position of the vessel. This is a far more efficient method of raising a “Mayday” than using channel 16.
 - Always use the DSC to raise a distress call. Increasingly the coastguard is monitoring DSC more closely than VHF channel 16.

Singled-Handed Fishing Needs Proper Planning

Narrative

A leisure fisherman decided to go out fishing with a friend in their 13 foot long open boat. With the competitive angling season coming to an end the fisherman was keen to get out onto the water. Unfortunately the friend had to cancel on the morning of the trip because of work commitments so the fisherman decided to go fishing alone.

On a cold December morning the fisherman and his friend took the boat down to the waterline at a local cove. His friend, once assured that everything was set up, left him in the boat awaiting the tide to lift it from the beach. The fisherman was wearing warm clothing and a lifejacket and he had with him food and a hot drink.

Later that day, 5½ hours after leaving the fisherman at the waterline, the friend became worried after the fisherman's wife telephoned him to say that he had not yet returned. The friend had understood that the fisherman was to return before dark; it was now 1½ hours after sunset. A slow dawn of realisation caused both the friend and the fisherman's wife to be concerned that something could be wrong. After several telephone calls between family and friends they decided to call the coastguard. By that time it was nearly 6½ hours after the fisherman had last been seen.

The coastguard received the emergency call from the friend and immediately tasked the local lifeboat and coastal rescue team to commence a search for the lone fisherman. The coastguard also broadcast an urgent message on VHF channel 16 to which a survey ship responded. The ship was asked to assist in the search, and one hour later its crew found the missing fisherman in the darkness. He was afloat, semi-conscious and with his lifejacket inflated. The lifejacket's light was not activated and only its retro-reflective tape, illuminated by the ship's searchlight, had indicated his location.

The fisherman was recovered to the survey ship's deck and transferred to the lifeboat for medical treatment. About 30 minutes later a search and rescue helicopter winched him from the deck of the lifeboat and he was immediately flown to a hospital, where he succumbed to his ordeal and died.

Four days later, two sections of the boat were found close together 35 miles east of the fisherman's location (Figure 1). It was concluded that he had not been wearing his kill cord (Figure 2) when he fell overboard and the boat's engine had continued to run with the propeller in gear. His boat was probably struck by a ship several days later.

CASE 22



Figure 1: Fishing vessel recovered sections



Figure 2: Kill cord and throttle

The Lessons

1. The fisherman was wearing a lifejacket and the correct clothing for a cold winter day fishing in a local bay. However, no safety equipment was carried in the boat, such as a VHF radio or personal locator beacon, that might have been used to alert shore authorities in the event of an emergency. Mobile phones are not substitutes for such equipment, signal strength can be unpredictable in coastal areas and they may not work if they become immersed in water.
2. Before setting off, it is vital that you tell loved ones or friends ashore where you are going and the latest time you will return.
3. It is essential that the engine's kill cord is attached correctly so that the boat's engine will stop if you fall overboard. This will allow you to swim back to the boat and perhaps reach the radio or flares to raise the alarm. It will also eliminate the risk that you are struck by the boat when you are in the water.
4. Do not rely on being able to get back in the boat. This is notoriously difficult, and generally requires a ladder or assistance.

Part 3 - Small Craft



We are fortunate in the UK to be an island nation, and few of us fail to have some relationship with the sea. Even for the most land-locked, the sight of the Channel, North or Celtic seas as the plane passes overhead are clear signs of the start of a journey.

Readers of this publication will have a rather closer link, and in a society where safety restrictions are increasingly imposed rather than recommended, many will see the sea as an escape route where survival depends on common sense and good seamanship.

Those two values are essential to enjoying the freedom the sea has to offer. The first case in this edition illustrates my point. The people involved in the incident had undergone basic training and knew what they needed to do to keep safe, but did not apply their knowledge. The result was a tragedy. The MAIB's recommendations that the driver should have been wearing a kill cord and that the children should have been sitting down are good, common sense. Their suggestion that further training would have helped the crew handle their powerful craft is good seamanship: a crew should only operate a boat within their own ability.

The second case has a similar set of lessons. The report describes the dinghy skipper's decision to sail as 'questionable' given the conditions. A forecast is a useful tool, but not a replacement for your own judgement on the day. In leisure boating, more than with some of the commercial cases discussed in this digest, there is no reason to depart in poor conditions. We sail for fun, and fun it should remain, for both skipper and crew.

As a skipper, your responsibility is to your crew, and as such you should keep yourself

safe. Although the dinghy crew were sensibly attired, the skipper had inadequate clothing for immersion in these conditions, and capsize is always a possibility when dinghy sailing. It's also possible that the fastenings or seals of the watertight hatch on the aft buoyancy tank may have been at fault: keeping your boat in good condition is part and parcel of the need to keep yourself safe.

The third case demonstrates how a tiny error of understanding can have potentially disastrous consequences. The training session described had everything in place: risk assessments, well-trained instructors, suitable boats and correct clothing. But a classic novice's misinterpretation of a helm order deposited the entire crew into a fast-flowing tidal stream in close proximity to rocks.

The errors here are small: the coastguard should have been advised of the training and of the accident, the instructor should have been clearer, and the trainee was not yet ready for the conditions experienced. In the organiser's favour, as two boats were involved, another boat was on hand to effect a speedy rescue.

None of the cases in this section of the digest resulted from serious errors. The MAIB's recommendations do not suggest that sweeping changes and regulation are necessary for us to go on enjoying our chosen sport. But what we should all glean from this is that anyone who goes afloat should constantly question their own decisions. It's very easy to take small risks, and most of the time we get away with them. But once in every 100 times we won't, and will end up putting ourselves, our crews and our rescue services at risk for no very good reason.

It's said that one of the unique aspects of being human is that we can learn from our own and others' mistakes. Thank you, MAIB, for distilling these into a readable and cogent form: from reading these reports I'm going to increase my efforts to question my decisions as skipper in the light of common sense and seamanship, and I encourage you all to do the same.

Enjoy your boating.

D.P.A.

David Pugh
PRACTICAL BOAT OWNER MAGAZINE

David Pugh is the editor of Practical Boat Owner, Britain's biggest-selling boating magazine. He started sailing as a teenager with his uncle in Poole, later spending a year working as a boatbuilder on the Norfolk Broads and qualifying as an RYA Senior Instructor on keelboats.

He began his magazine career as a trainee for Yachting Monthly and Practical Boat Owner, before taking a job writing technical articles and testing boats for Yachting World. He moved back to Poole and to PBO as deputy editor in 2008, becoming editor in 2013. David and the team at PBO have recently finished restoring a 1964 Snapdragon 23, Hantu Biru.

He sails a Contessa 26, Red Dragon, co-owned with his brother and sister.

Family Boating Trip Ends in Tragedy When Engine Kill Cord Was Not Used

Narrative

A family of six – two adults and their four young children – were enjoying the excitement of the first trip of the year in their high powered RIB when disaster struck.

The family, who had purchased the 8.0m RIB the previous summer, set out from harbour on a fine early summer's day to operate the RIB in the local estuary. The RIB was powered by a single 300hp³ outboard engine, which was controlled by the driver at the main console. In addition to the controls and navigational equipment, the engine kill cord⁴ was also located on the console.

The adults had both attended a training course that covered the safety aspects of powerboat operation, including the correct use of a kill cord, and had received familiarisation training in operating their boat for routine family trips.

The family had spent several hours on the water, operating the boat at speed on runs up and down the estuary, when a decision was taken to return it to its mooring. The adults changed over as driver and, since the boat was not far from its mooring, the new driver decided not to attach the kill cord for

the relatively short journey back to harbour. However, on the way back to the mooring it was decided to turn the boat back into the estuary for one more run.

The boat was close to shore and the driver was not sure if there was sufficient room in which to turn the boat. The other adult reached across and put the helm hard over to starboard, while also applying full power on the engine throttle control, probably intending to perform a tighter turn to keep the boat clear of the shoreline.

The boat immediately accelerated and heeled into the turn before it suddenly and violently 'hooked', rolling back to port and ejecting all six family members out over the port side and into the water. The boat then continued to circle under full power with no-one on board.

The family were on the surface of the water, supported by their lifejackets and buoyancy aids, and the boat circled back, striking several of them. Two of the family were fatally injured, another two received very serious, life-changing injuries and the remaining two received minor injuries.

³ hp = horsepower is a unit of power. 300hp is equivalent to 228 kilowatts

⁴ A kill cord is a device for stopping a boat's engine if the driver moves away from the controls

The Lessons

1. When the accident occurred the driver was not wearing a kill cord. Regardless of how short the planned journey may be, a powerboat driver should always attach the kill cord around his/her leg before the engine is started.
2. The adults did not have a good understanding of how the boat would perform in a high powered turn and were not prepared for the forces exerted when the boat 'hooked'. Entry level powerboat training courses may not be sufficient preparation for the safe operation of boats with powerful engines. Always ensure you are sufficiently well trained to safely handle your boat.
3. At the time the family were ejected from the boat, the children were all in the bow area and some of them were standing. The adults were not aware that the magnitude of impact and movement on small high speed craft is greater at the bow and reduces towards the stern. Drivers should consider the potential effect of these forces on those on board when deciding where each passenger will sit.

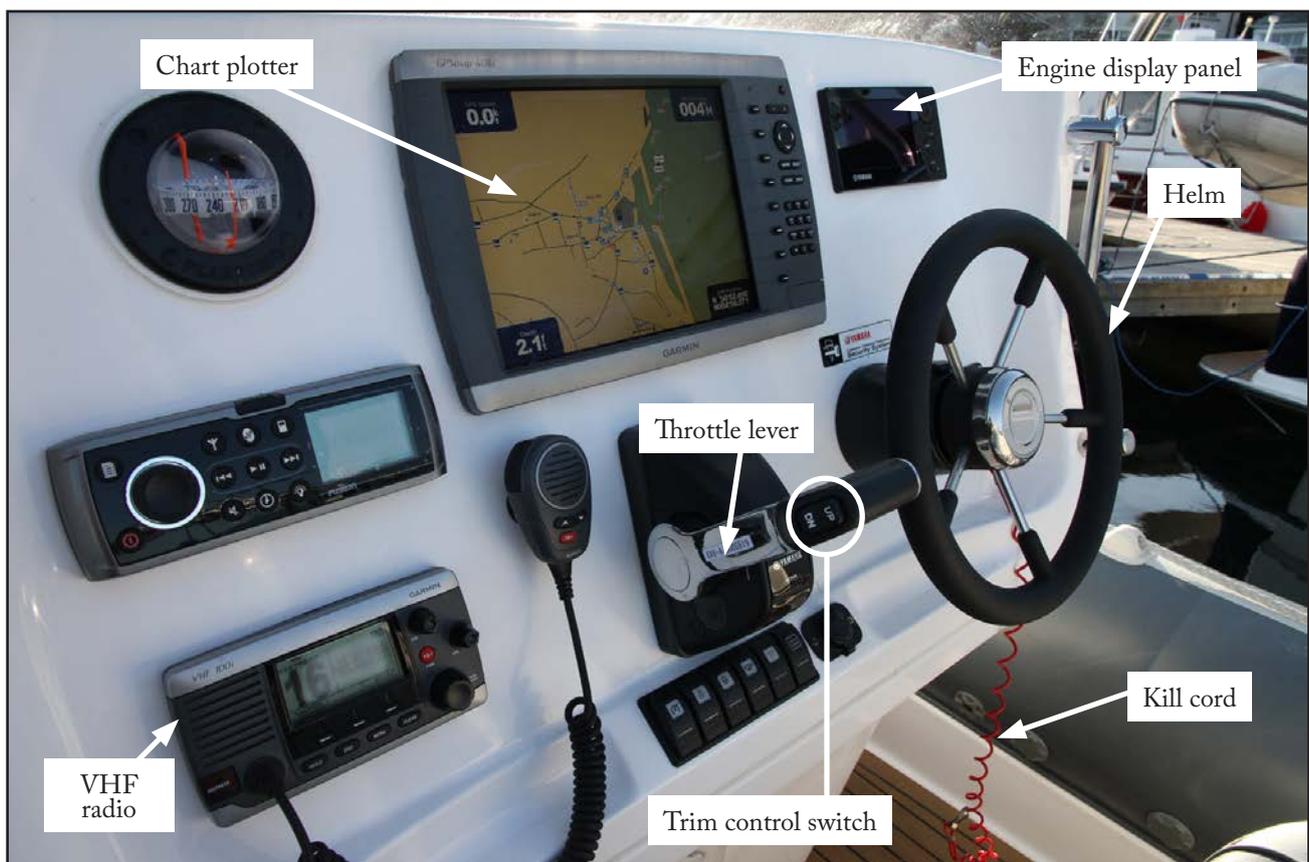


Figure 1: Steering console

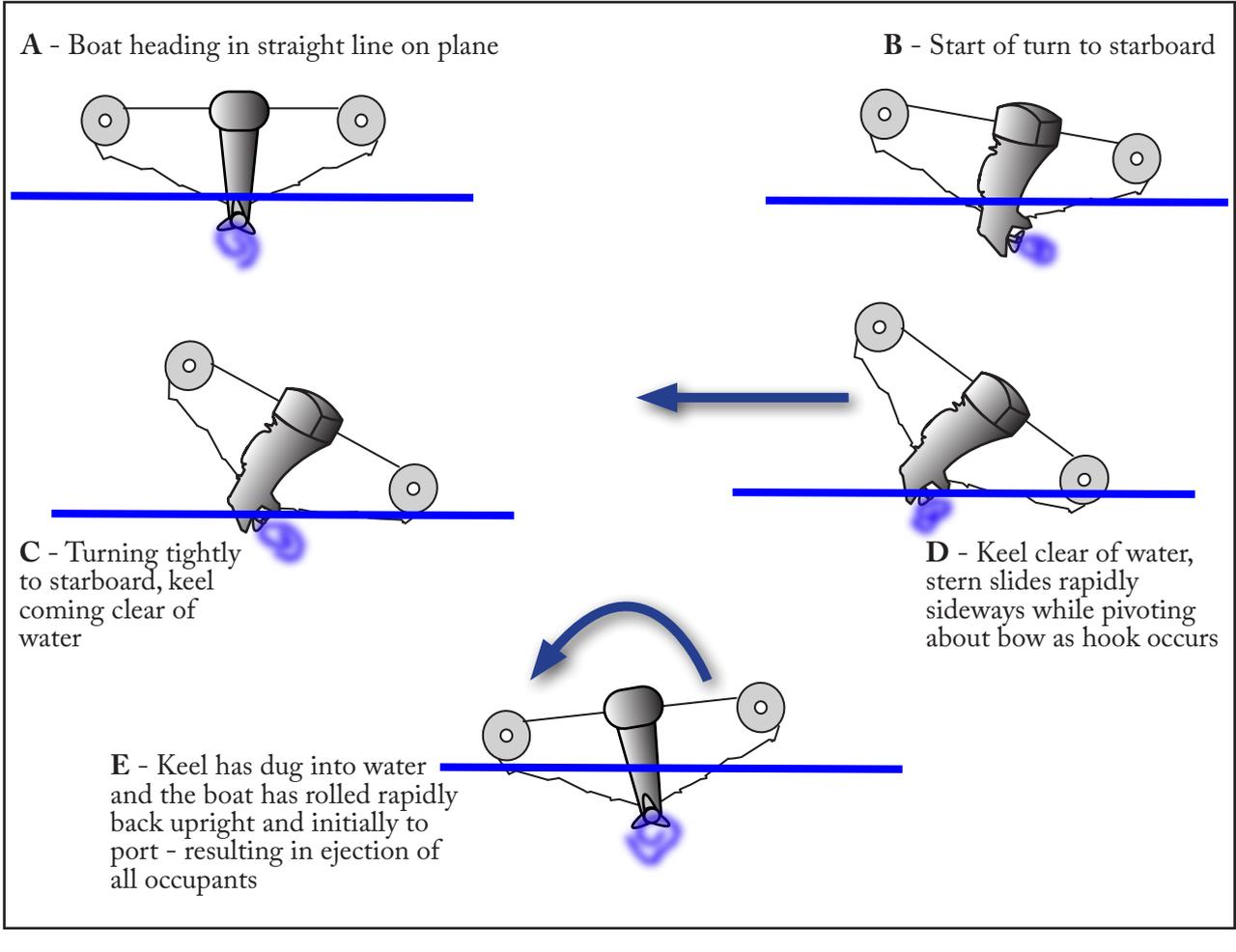
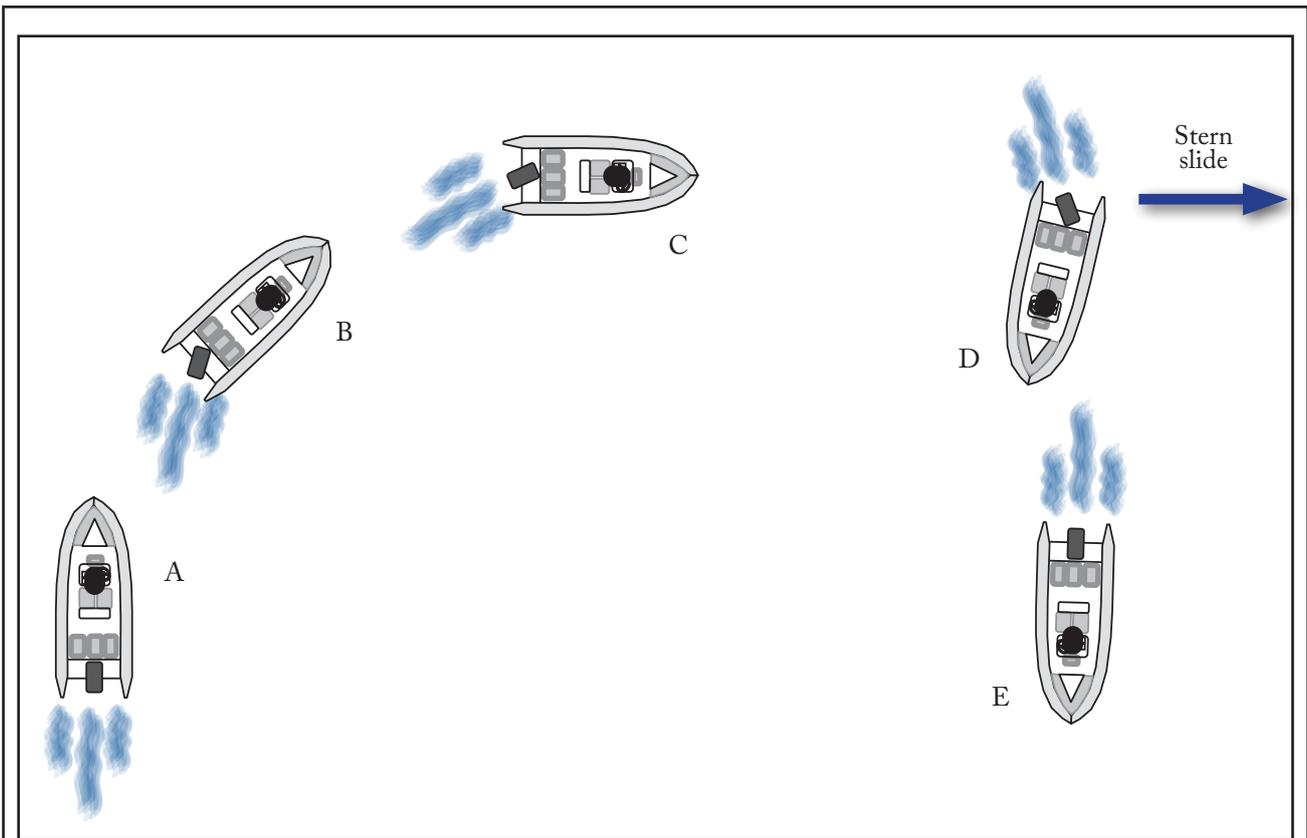


Figure 2: Diagram showing a hook during a turn

Wayfarer Capsize in January

Narrative

A man, his young daughter and another adult had to be rescued following the capsize of their Wayfarer Mk2 GRP dinghy in an estuary close to a port area. It was January, the sea temperature was around 6°C, and the wind was W-NW force 5-6. The child and the other crew member were dressed in winter wetsuits, neoprene socks, boots and gloves, salopettes, waterproof tops and woolly hats. The skipper was not wearing a wetsuit, having opted for fleece-type salopettes, a jumper and a spray top. All were wearing buoyancy aids.

The skipper had an RYA level 2 dinghy certificate, an RYA Day Skipper practical certificate and an RYA Yachtmaster Theory qualification. His daughter was qualified to RYA level 3 for dinghies. The other adult had done some sailing in the preceding year but held no qualifications.

Although the original plan had been to sail to a destination several miles distant for lunch, the conditions observed on arrival at the sailing club had caused the skipper to restrict their sailing to the local area. The boat was rigged with full mainsail and jib. No reefs were taken in on the mainsail.

After about 30 minutes' sailing, during which several tacks were undertaken, the decision was taken to return to the point of departure. During a tack, the jib was backed and remained aback as the dinghy came onto port tack. This, together with a gust and a large wave, conspired to capsize the dinghy to starboard.

The skipper tried to right the dinghy using the "scoop" method whereby the crew remained in the water close to the inside of the boat so that they would be automatically re-boarded once it was brought upright. However, the skipper was unable to right the dinghy, probably because the mainsheet had remained or become cleated, or in some way jammed, keeping the boom and therefore the sail, amidships, and not allowing the water to drain away from it as it started to come clear of the water.

The alarm was raised to the coastguard by a passing boat, which stopped. A passing ferry also stopped and launched its fast rescue craft to provide assistance. A local inshore lifeboat arrived as well as a launch from the harbour authority. At about this time some bags of clothing that had been stowed in the stern locker/buoyancy compartment were seen to be floating close by, indicating that the stern hatch had become detached and the compartment flooded. The skipper was still unable to right the dinghy. All three swam to the launch and were then transferred to the inshore lifeboat and taken ashore.

Once there, they were met by paramedics and assessed for hypothermia and any other injuries, but did not require any other medical attention. The Wayfarer was towed to shore where it was eventually drained and recovered on its trolley.

The Lessons

1. The skipper's decision to sail was questionable given the experience and ability of his crew. He had based his decision to sail that day on Meteorological Office and online weather forecasts. Forecasts aside, the actual conditions that could be observed while they were preparing to sail might have given pause for thought.
2. The skipper's choice of clothing was personal to him. Although his two crew were properly attired, the skipper was wearing 'fleece' type salopettes, a sweater and a spray top, as well as his buoyancy aid. Although the skipper was of heavy build and was used to being in the water in cold conditions, with a water temperature of 6°C and a significant wind-chill factor there was a risk of him starting to develop the symptoms of hypothermia. It was fortunate that help was at hand. If the capsize had taken place away from the busy shipping channel, the outcome might have been different.
3. Wayfarer dinghies are relatively heavy, but should be able to be righted by one adult. The fact that the mainsail was sheeted in (or snagged) while attempts to right the boat were being made, greatly hindered the skipper's chances of success. It is always important to ensure that sheets are running free before righting so as to allow the sails to drain, and to lessen the chance of the boat capsizing again through the sails filling as soon as it comes upright.
4. The detachment of the large hatch cover on the stern buoyancy tank and the consequent flooding would have significantly reduced their chances of recovering the situation had they managed to right the dinghy. It is important to realise that both the stern and bow buoyancy tanks must be kept watertight. Hatch fastenings and seals can become worn, and if there is any danger that they might work loose while sailing, should be replaced.

The Case for Clear Communications

Narrative

A local authority organisation was required to provide a waterborne rescue service in addition to its usual land-based responsibilities.

To fulfil the requirement a comprehensive 4-day waterborne training programme was established.

Training was carried out using RIBs in an area that was well known for its 4-5kt tidal streams and numerous natural navigational hazards.

It was a potentially dangerous area, especially as the trainees had virtually no marine experience. Recognising this, the organisation supported the training with wide-ranging and comprehensive risk assessments. It was also identified that it was better to avoid using the terms “port” and “starboard” in favour of “left” and “right”.

The four trainees, supervised by two Advanced Powerboat qualified instructors, were looking forward to putting into practice their theory-based training. They offloaded two RIBs from their transportation trailers for the first day of waterborne training. Although overcast, the wind was force 1-2 and the water was smooth. All in all an ideal training day.

Before the engines were fitted, the trainees, who were wearing thermal underclothes, dry suits, protective helmets and buoyancy aids carried out capsize drills close to the launching slipway. Confident that they were able to deal with a capsize situation the outboard engines, which were equipped with a common combined tiller and throttle control, were fitted to the boats and two trainees and an instructor got into each of the RIBs. The lead instructor advised his own organisation - which was based about 50 miles away - and also the office at the slipway, that the group was about to go

onto the water. However, he did not advise the coastguard as required by the organisation’s Standard Operating Procedures (SOPs).

Training progressed well, and after the morning’s syllabus had been completed the instructor of one of the RIBs decided to close on a cardinal mark post, where the water was confused, so that the trainees could experience the influence of rougher water. As he did so, the other RIB acted as a safety boat.

As the RIB neared the mark the instructor ordered the trainee on the tiller to “come right”. Instead of bringing the boat to the right the trainee put the tiller to starboard and, as the RIB veered rapidly to port towards the post, the trainee inadvertently twisted the throttle and increased the engine power. The situation worsened as the RIB was powered into the post. The fast ebbing tide then forced the RIB onto its starboard buoyancy tube (see figure) and the occupants jumped into the fast flowing water.

The instructor in the second RIB saw what had happened and made his way towards those in the water, but he did not alert the coastguard to the changing situation. Fortunately, the instructor and crew were picked up by the safety boat within 2-3 minutes, but not before they had been swept well away from the post and close to a number of rocks.

The incident was also seen by a member of the public, who contacted the coastguard. The local inshore lifeboat was launched and was on scene within 13 minutes. The crew of a local training centre recovered the RIB and towed it safely to the launching position, where the rest of the group had assembled.

The Lessons

Luckily the instructor and two trainees escaped injury because the second RIB was immediately at hand to carry out the rescue. However, there were a number of communications issues and non-compliance with the organisation's own procedures.

1. Risk assessments and SOPs are developed to reduce the likelihood of an accident occurring and to ensure proper and safe procedures are adopted. In this case the additional training in the dangerous turbulent area, on the first day of waterborne training, close to the cardinal mark post had not been risk assessed and was outside the capability of the trainee helmsman.
2. There was a communication breakdown with the coastguard because they were not advised that the group were carrying out training, and later that the instructor and trainees were in the water. Had the emergency resources been required, this could have resulted in rescue delays.
3. Instructors should be acutely aware of the limitations of trainees. In this case the instructor ordered the helmsman to "come right", but this was misinterpreted by the helmsman to mean "put the tiller to the right". This simple misunderstanding led to the contact with the cardinal mark post and could easily have led to a far more serious situation developing.
4. While the weather conditions were benign, the speed of the tidal stream was high and its effect on the manoeuvrability of the RIB in the inexperienced hands of the trainee was not properly appreciated.



INVESTIGATIONS STARTED IN THE PERIOD 01/03/15 TO 31/08/15

Date of Occurrence	Name of Vessel	Type of Vessel	Flag	Size	Type of Occurrence
02/03/15	<i>Zarga</i>	Cargo ship Liquid cargo Liquefied gas tanker LNG	Marshall Islands	163,922 gt	Occupational accident (1 injury)
30/03/15	<i>Asterix</i> <i>Donizetti</i>	Service ship Tug (Towing/Pushing) Cargo ship Liquid cargo Chemical tanker	United Kingdom Luxembourg	25.4 gt 2,335 gt	Capsizing
15/04/15	<i>Karen</i>	Fishing vessel Trawler Stern	United Kingdom	50 gt	Loss of control
30/04/15	<i>Carol Anne</i>	Service ship Special purpose ship	United Kingdom	32.28 gt	Occupational accident (1 fatality)
02/05/15	Unnamed speedboat	Recreational craft Motorboat	United Kingdom	1 gt	Capsizing
11/05/15	<i>Hamburg</i>	Passenger ship Only passenger	Bahamas	15,067 gt	Grounding
13/05/15	Vector V40R	Recreational craft Motorboat	United Kingdom	7 gt	Contact Fixed object (1 injury)
18/05/15	<i>Kairos</i>	Fishing vessel Trawler Stern	United Kingdom	163 gt	Foundering
09/07/15	<i>Enterprise</i>	Fishing vessel Trawler Stern	United Kingdom	748 gt	Occupational accident (1 fatality)
09/07/15	<i>JMT</i>	Fishing vessel Dredger	United Kingdom	15.16 gt	Foundering (1 fatality, 1 missing)
29/07/15	<i>Silver Dee</i> <i>Good Intent</i>	Fishing vessel Trawler Stern Fishing vessel Trawler Stern	United Kingdom United Kingdom	63 gt 86 gt	Collision
03/08/15	<i>Oldenburg</i>	Passenger ship Passenger and general cargo	United Kingdom	294 gt	Occupational accident (1 fatality)
17/08/15	<i>Aquarius</i>	Fishing vessel Trawler Stern	United Kingdom	189 gt	Occupational accident (1 fatality)
18/08/15	<i>Arco Avon</i>	Service ship Dredger	United Kingdom	3,474 gt	Fire (1 fatality)
24/08/15	<i>St Apollo</i>	Fishing vessel Dredger	United Kingdom	51 gt	Grounding

Reports issued in 2015

Arniston

Two fatalities due to carbon monoxide poisoning on board the Bayliner 285 motor cruiser on Windermere on 1 April 2013

[Report 2/2015](#) Published 16 January

Barfleur/Bramble Bush Bay

Passenger ferry *Barfleur's* contact with the chain from chain ferry *Bramble Bush Bay* in Poole on 16 July 2014

[Report 11/2015](#) Published 21 May

Barnacle III

Fatal manoverboard from the creel fishing vessel, west of Tanera Beg on 13 May 2014

[Report 1/2015](#) Published 8 January

Cheeki Rafiki

Loss of the yacht and its four crew in the Atlantic Ocean, approximately 720 miles east-south-east of Nova Scotia, Canada on 16 May 2014

[Report 8/2015](#) Published 29 April

Commodore Clipper

Grounding and flooding of the ro-ro ferry in the approaches to St Peter Port, Guernsey on 14 July 2014

[Report 18/2015](#) Published 29 April

Diamond

Foundering of the fishing vessel, resulting in the death of a crew member, West Burra Firth, Shetland on 25 March 2014

[Report 5/2015](#) Published 11 February

ECC Topaz

Fire and subsequent foundering of the passenger transfer catamaran while conducting engine trials off the east coast of England on 14 January 2014

[Report 4/2015](#) Published 11 February

GPS Battler

Two fatalities connected with the operation of the workboat off Almeria, Spain on 13 August 2014 and in Marin, Spain on 6 January 2015

[Report 17/2015](#) Published 29 July

Millennium Diamond

Passenger vessel's contact with Tower Bridge, River Thames, London on 4 June 2014

[Report 7/2015](#) Published 5 March

Millennium Time/Redoubt

Collision between the passenger vessel and the motor tug with three barges in tow on the King's Reach, River Thames, London on 17 July 2014

[Report 13/2015](#) Published 17 June

Nagato Reefer

Accidental release of a lifeboat from the refrigerated cargo vessel in Southampton on 9 April 2014

[Report 9/2015](#) Published 7 May

Orakai/Margriet

Collision between the chemical tanker *Orakai* and the beam trawler *Margriet* North Hinder Junction, North Sea on 21 December 2014

[Report 16/2015](#) Published 9 July

Ronan Orla

Fatal accident to the skipper of the scallop dredger, 3 miles north-east of Porth Dinllaen on 30 March 2014

[Report 12/2015](#) Published 5 June

Sapphire Princess

Drowning of a passenger in swimming pool on the cruise ship, East China Sea on 6 August 2014

[Report 19/2015](#) 7 August 2014

Sea Breeze

Flooding and abandonment of the general cargo ship, 11.6nm off Lizard Point, Cornwall on 9 March 2014

[Report 14/2015](#) Published 24 June

Shoreway/Orca

Collision between the dredger *Shoreway* and the yacht *Orca* 7 miles off the coast of Felixstowe resulting in one fatality on 8 June 2014

[Report 10/2015](#) Published 20 May

Vectis Eagle

Grounding of the general cargo ship in Gijon, Spain on 30 November 2014

[Report 15/2015](#) Published 9 July

Wanderer II

Serious injury to a crew member, 1 mile south-east of Wiay Island, Outer Hebrides on 19 November 2013

[Report 6/2015](#) Published 12 February

Water-rail

Disappearance and rescue of the small fishing vessel in the North Sea on 20-22 May 2014

[Report 3/2015](#) Published 29 January

Safety Bulletins issued during the period 01/03/15 to 31/08/15

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY BULLETIN

SB1/2015

July 2015

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

Regulation 5:

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

Regulation 16(1):

"The Chief Inspector may at any time make recommendations as to how future accidents may be prevented."

Press Enquiries:

020 7944 4312/3176

Out of hours:

020 7944 4292

Public Enquiries:

0300 330 3000

NOTE

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

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All bulletins can be found on our website:
<https://www.gov.uk/government/organisations/marine-accident-investigation-branch>

For all enquiries:

Email: maib@dfi.gsi.gov.uk
Tel: 023 8039 5500
Fax: 023 8023 2459

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



Figure 1: Zarga alongside South Hook LNG terminal

MAIB SAFETY BULLETIN 1/2015

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

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

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

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



Steve Clinch

Chief Inspector of Marine Accidents

NOTE

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.gov.uk/maib

Press Enquiries: 020 7944 4312/3176; Out of hours: 020 7944 4292

Public Enquiries: 0300 330 3000

BACKGROUND

On 2 March 2015, a deck officer on board the LNG tanker, *Zarga* (**Figure 1**), suffered severe head injuries when he was struck by a mooring line that parted during a berthing operation at the South Hook LNG terminal, Milford Haven. The officer, who was in charge of the vessel's forward mooring party, was airlifted to a specialist head injuries trauma unit for emergency surgery.

Zarga was declared *all fast* alongside about 40 minutes prior to the accident and the attending tugs were let go. The vessel subsequently moved out of position in the gusty wind conditions during which time the mooring teams were fitting chafing guards to the lines (**Figure 2**). As the tugs had already been released, the master instructed the officer in charge (OIC) of the forward mooring party to tension the forward spring lines to warp *Zarga* back into the correct position.

The OIC positioned himself aft of the forward springs' port-shoulder roller fairlead (**Figures 2 and 3**), and positioned a second crewman forward of him in order to relay his orders to the winch operator. As the winch operator attempted to heave in on the springs, the winch repeatedly stalled and rendered¹. After about 10 minutes, one of the spring lines began to rattle and creak, and then suddenly parted (**Figure 4**). The section of the line between the break and the port-shoulder roller fairlead struck the OIC on his head as it whipped back before going overboard through the fairlead.

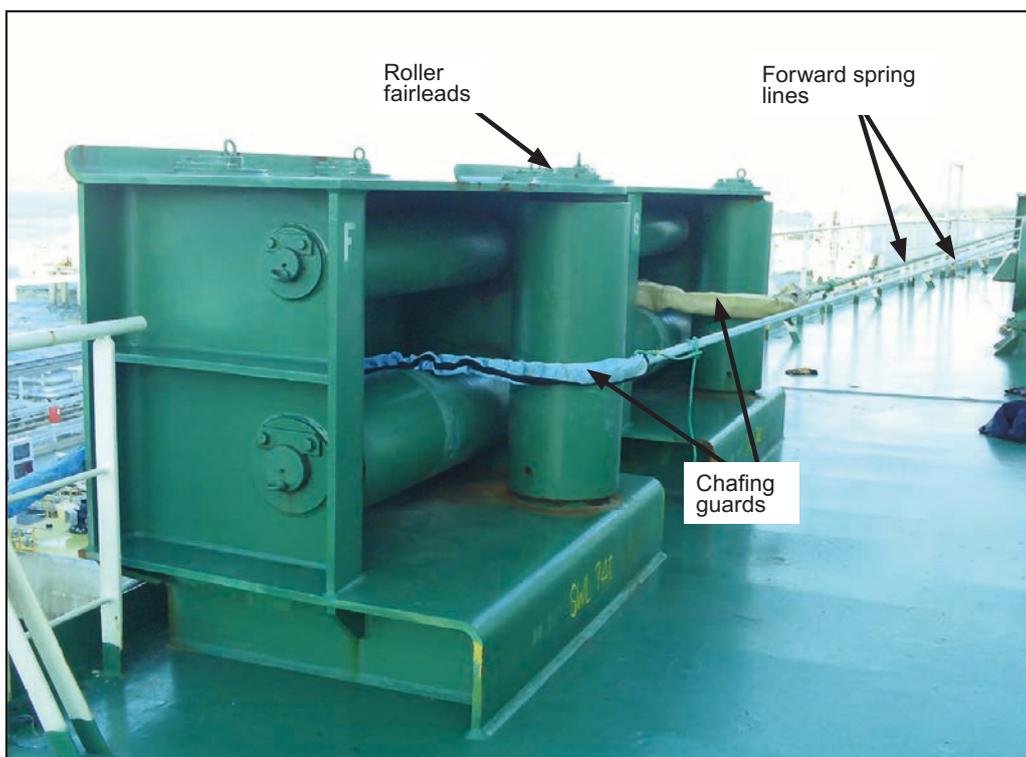


Figure 2: Port-shoulder roller fairlead

¹ Slipping under load

MOORING LINES AND WINCHES

The 5-year old mooring lines fitted to the vessel were 44mm diameter sheathed ultra-high modulus polyethylene (UHMPE) with a length of 275m and a minimum breaking load (MBL) when new of 137t. The outboard ends of the UHMPE spring lines were fitted with 22m long Euroflex (polyester/polyolefin) tails, which had an MBL of 190t. The section of the UHMPE spring line in use between the winch and the connection with the Euroflex tail was about 68m long. The split drum type mooring winch had a 30.6 tonne-force (tf) winding pull, rendered at a load of 34tf and operated at 15m/minute.

INITIAL FINDINGS

Elongation and snap-back

The amount a mooring line stretches depends on the elasticity of the material(s) used in its manufacture and the length under load. Elongation of the line introduces stored energy that, if suddenly released under load when the line parts, can cause the failed ends to recoil back towards their anchor points at high speed; this is referred to as snap-back.

Both wire and high modulus synthetic mooring lines have low elasticity and, consequently, are considered to have very little snap-back when they fail, and this is often considered to be an advantage over other types of synthetic line. However, although capable of handling high dynamic loads, low elasticity can make high modulus synthetic mooring lines prone to failure under peak dynamic loading.

On board *Zarga*, 11m tails were originally fitted to reduce peak dynamic loading, but these were replaced with 22m tails after peak dynamic loads were experienced that had led to a series of line failures. However, the 22m tails had much greater elasticity and this, and the routing of the line, introduced a significant snap-back hazard to the outer section of the failed UHMPE mooring line. The danger of snap-back was identified in the vessel's risk assessments, but snap-back zones had not been marked on *Zarga's* mooring decks. Because UHMPE mooring lines were fitted, the perception among members of the crew was that, in the event of a mooring line failure under load, the ends of a parted line would simply fall to the deck. In this case, the inboard section of the failed line recoiled a short distance towards the base of the winch.

Post-accident tests

Following the accident, the MAIB commissioned a series of tests and trials designed to measure the elongation and snap-back characteristics of the mooring lines used on board *Zarga*. When sections of the UHMPE rope were loaded to the point of failure the average maximum elongation was about 2% and minimal snap-back was observed. When the trial was repeated with the Euroflex tail² attached the elongation was significantly increased. Similar to the accident, it was the UHMPE section of the line that parted, and the failed end that was attached to the tail snapped back over 15m in less than 1 second. The other end of the UHMPE rope did not snap back.

Short video clips of these trials can be found on the MAIB website at <https://www.gov.uk/maib-reports/safety-warning-issued-after-mooring-line-failure-on-board-Ing-tanker-zarga-resulted-in-serious-injury-to-a-deck-officer>.

The causes and contributing factors of *Zarga's* mooring line failure are subject to an ongoing investigation and will be discussed in a full investigation report.

² The 22m tail was shortened to 15m to allow it to be accommodated within the test machine

Figure 3: Forward mooring party OIC at port-shoulder roller fairlead



OIC forward mooring party

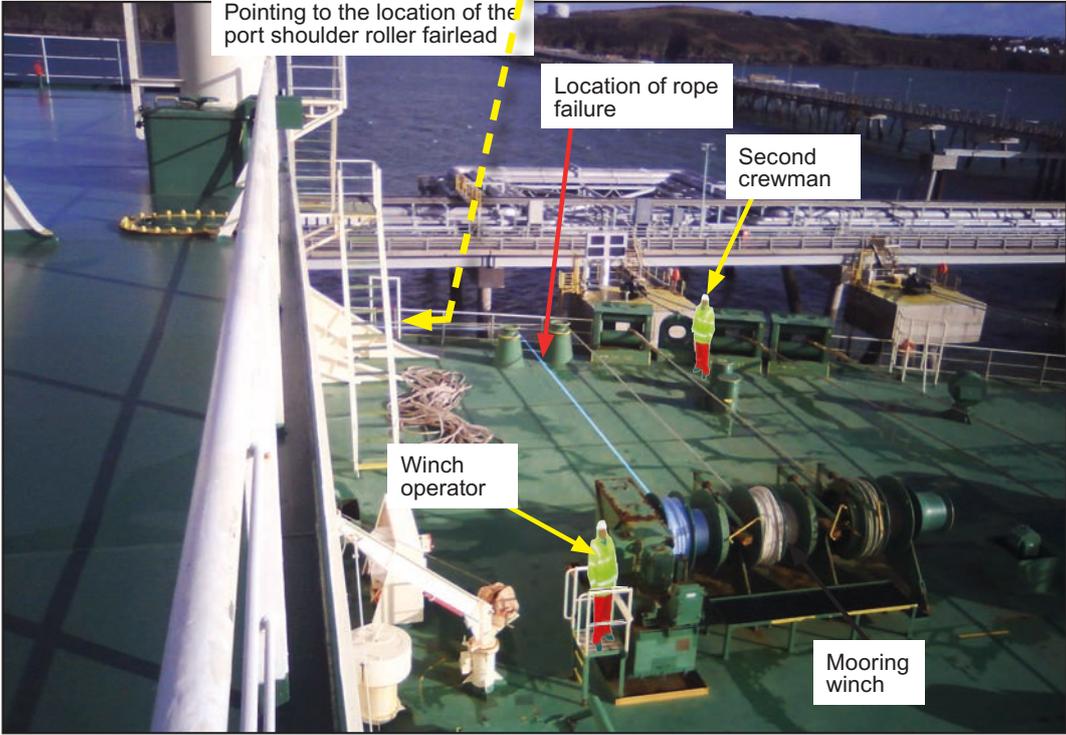


Figure 4: Port side forward mooring deck

SAFETY LESSONS

- When connecting synthetic tails to UHMPE, HMPE and wire mooring lines, the energy introduced due to the elasticity of the tails can significantly increase the snap-back hazard.
- Elongation is proportional to the length of tail. Increasing the length of the tail will increase the amount of elongation and hence the amount of energy that can be stored in the line when under load.
- Ship owners/operators should ensure that the type of lines and tails used for mooring lines are suitable for the task and that the dangers of snap-back are fully considered.
- Mooring teams should be aware of the potential for snap-back in all types of mooring line, and the probable areas on the mooring deck that are not safe when lines are under load.
- Mooring lines led around roller pedestals and fairleads can lead to potentially complex snap-back zones. Ship operators and masters should conduct their own risk assessments to ensure potential snap-back zones are identified, and are reviewed at regular intervals.
- Notwithstanding the ongoing investigation into the nature of the failure of *Zarga's* spring line, where doubt exists on the continued use of a mooring line, the vessel operator should obtain guidance from the rope manufacturer on the conduct of detailed line inspections.

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