

MAIB

MARINE ACCIDENT
INVESTIGATION BRANCH

SAFETY DIGEST

**Lessons from Marine
Accident Reports
2/2016**



SAFETY DIGEST
Lessons from Marine Accidents
No 2/2016

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October 2016

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.

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

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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.”

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Glossary of Terms and Abbreviations

| | | | |
|-----------------|--|----------|--|
| AB | - Able seaman | kg | - kilogram |
| AIS | - Automatic Identification System | m | - metre |
| ARPA | - Automatic Radar Plotting Aid | “Mayday” | - The international distress signal (spoken) |
| BA | - Breathing Apparatus | MCA | - Maritime and Coastguard Agency |
| BNWAS | - Bridge Navigational Watch Alarm System | MGN | - Marine Guidance Note |
| C | - Celsius | nm | - nautical mile |
| CO ₂ | - Carbon Dioxide | OOW | - Officer of the Watch |
| COLREGS | - International Regulations for the Prevention of Collisions at Sea, 1972 (as amended) | OS | - Ordinary Seaman |
| CPA | - Closest Point of Approach | PBA | - Personal Buoyancy Aid |
| DSC | - Digital Selective Calling | PFD | - Personal Flotation Device |
| ECS | - Electronic Chart System | PLB | - Personal Locator Beacon |
| EPIRB | - Emergency Position Indicating Radio Beacon | RA | - Risk Assessment |
| FRC | - Fast Rescue Craft | SAR | - Search and Rescue |
| GNSS | - Global Navigation Satellite System | SOG | - Speed Over The Ground |
| GRP | - Glass Reinforced Plastic | SOLAS | - International Convention for the Safety of Life at Sea |
| gt | - gross tonnage | VHF | - Very High Frequency |
| | | VTSS | - Vessel Traffic Services |
| | | VTSSO | - Vessel Traffic Services Officer |

Introduction



It is customary for the three sections of the MAIB Safety Digest to be introduced by respected members of our industry. This edition is no exception and I am very grateful for the wise comments provided by John Rose,

Keith MacRae and Duncan Wells respectively in their introductions to the merchant, fishing and recreational craft sections. However, I would like to particularly thank Bari Khan, currently an MCA surveyor, for his contribution (see Case 12). Bari was serving as an engineer on board a vessel when he was involved in an accident, which resulted in the tip of one of his fingers being severed. His candid account about the circumstances that caused the accident is a graphic reminder that accidents can (and do) happen to anyone if we allow our emotions to override our training.

The procedures and safe working systems that lie at the core of all safety management systems are there for a reason – invariably mariners have been hurt, ships and/or their cargoes have been damaged or lost, or the environment harmed. MAIB investigations into marine accidents consistently identify cases where mariners chose to ignore the instructions and guidance contained in companies' safety management systems. The root cause for this is often complex, but MAIB investigators regularly

identify a disconnect between the safety culture that shore-based managers believe (or perhaps hope) is in place within their fleet and what is really happening on board. Cases 1, 11 and 16 are good examples of this. A strong safety culture is not something that will appear by magic, it takes hard work and commitment – particularly from senior managers ashore and afloat. Similarly, safety management systems need to evolve over time if they are to remain credible. If the procedures on board your vessel are not working, don't just use convenient work arounds to get tasks done – flag up the problem and make sure they are changed or amended in a controlled way that ensures the system retains its credibility and continues to reflect the company's best practice requirements.

A depressing fact, taken from many investigations that the MAIB has conducted into accidents which have resulted in the crew going into the sea, is that PFDs are not being routinely worn by fishermen when working on the open deck (see Cases 18 and 22). This is despite a concerted campaign by many different stakeholders to encourage this. So here is another fact: if you fall, or are taken overboard from your fishing vessel, based on the typical year round temperatures in UK waters, MAIB statistics indicate you will most likely die from the effects of cold water shock within 15 minutes if you are not wearing a PFD. Think about how your loss will affect your family and loved ones.

In closing, I make a plea to all fishermen reading this Safety Digest: please, please, always ensure you wear a PFD when working on the open deck of your fishing vessel.

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 2016

Part 1 – Merchant Vessels



The MAIB has once again pulled together an excellent summary of incidents, some of which it has investigated. It is in a format that is both easy to read and to identify the

lessons learned. This is a most commendable effort by the MAIB, and I hope the readers of this latest digest of reports will put the lessons learnt into good practice.

As usual we can see that there are a wide range of contributory factors that result in maritime accidents and incidents. However the one contributory factor occurring consistently throughout the reports is the Human Element – people’s ability and capability to deal effectively and safely with the complexity, difficulty, pressures and workload of their daily tasks, not only in emergency situations, but also during routine operations.

Crewmembers and the ship’s superintendents should ask themselves, “What is normal on board our ships?” In one case it was to sail on a routine basis with inadequate stability! In others there appeared to be no risk assessments undertaken and an absence of a management of change process.

Seafarers now undertake mandatory training in resource management, leadership and team working skills at an operational level, then leadership and managerial skills at management levels. So why do we still read about Masters demonstrating rule breaking behaviours and equally, not being challenged by the Officers? The Master of a passenger ship that went aground had not amended the passage plan when a new destination for anchoring was required – subsequently without a plan to work with, the Bridge Team was unable to adequately assist the Master.

After the grounding the Master did not use the emergency checklist available to him and took the ship full of passengers to sea. A great deal of time and experience goes into preparing emergency checklists. Their use provides a ready-made strategy to ensure that mistakes and omissions in the heat of the moment do not make a bad situation worse.

Navigation and collision avoidance aside, the OOW also needs to be available to respond to emergencies such as fire, machinery breakdown and man overboard. In one case reported in this edition, the OOW was not on the bridge for 20 minutes – the OOW is required to maintain a continuous watch on the Bridge for good reasons!

The Maritime and Coastguard Agency (MCA) has recently issued Marine Guidance Note MGN 520(M)¹. It contains the “Deadly Dozen” which describes the most common people based factors in maritime safety, with suggested mitigating actions. Readers are recommended to read the MGN 520(M) in conjunction with the findings included in this digest.

CHIRP aims to seek out root causes for near misses, identify the lessons learned and to consider how best this information can be used to prevent reoccurrence elsewhere in the maritime industry, whilst not apportioning blame to any company or individual whatsoever. Near miss reports that have been received by CHIRP over the last 12 years were analysed using the “Deadly Dozen” human factors definitions and the top five failings were identified. These accounted for 75% of the causal factors in maritime incidents, namely failures in: situation awareness, alerting others, communication, complacency, and the safety culture onboard. All of these items can be seen to have surfaced in the full incident reports investigated by the MAIB. People need to learn more from near misses and hazardous occurrence reporting.

¹ MGN due to be published in November 2016.

Reading these reports from the comfort of an armchair or as a dedicated professional at your place of work, some of the casual factors in this digest of reports appear to be unbelievable in this modern age of advanced technology and training, but they did happen and unless the lessons learned are consistently applied, as advised in this and previous MAIB publications, we shall be reading similar reports in the future.

Ask yourself what safety margins you are working to and are these sufficient when taking into account the exposure to potential risks? Please remember the lessons learned here will not only apply to seafarers but also to people at all levels and positions within the overall wider maritime system. Let us all try harder to send all seafarers safely home to their family and loved ones at the end of each and every trip.



**CAPTAIN JOHN ROSE MNM, EXC, LLM, FNI
DIRECTOR (MARITIME): CHIRP (CONFIDENTIAL HAZARDOUS INCIDENT
REPORTING PROGRAMME)**

John's experience in the Shipping and Maritime industries spans over 45 years. His seagoing career was with Shell, he is qualified as an Extra Master Mariner and subsequently awarded the Royal Society of Arts Silver Medal for highest marks in the examinations.

His decision to work ashore started as Harbour Master/Chief Executive to the Harbour Commissioners for Yarmouth Isle of Wight, then later returning to Shell Shipping where he reached the position of General Manager for global shipping.

In the last three years as CHIRP's Director, the maritime programme has expanded to include involvement with seafarers from 46 countries and a following of 200,000 readers of their publications. In 2015 John was awarded the Merchant Navy Medal for his work in the detection of hazardous incidents at sea.

John is a Master of Laws (Southampton), Fellow of the Nautical Institute and a Younger Brother of Trinity House.

When Stability is Taken for Granted

Narrative

A 50,000gt vehicle carrier had completed loading and was proceeding to sea. As the ship turned to port to follow the navigable channel around a sandbank, it developed a significant starboard list. The list increased to in excess of 40°, causing the ship to lose steerage and propulsion and to drift onto the sandbank.

The list caused cargo to shift, resulting in breaches to the ship's hull and consequent flooding. However, all crew were safely evacuated and there was no resulting pollution.

The Lessons

1. The ship heeled heavily to starboard while turning as a result of having departed port with inadequate stability. The following factors contributed to its lack of stability:
 - The ship's normal operating cycle had been changed, but the cargo loading plan had not been adjusted. Consequently, the upper vehicle decks were full while the lower vehicle decks were lightly loaded.
 - The change in operating cycle meant that the ship was low on bunker fuel oil, which was stored low down in the ship.
 - The estimated weight of many items of loaded cargo used in stability calculations was less than their actual weight.
 - No allowance was made for the vertical centre of gravity of the loaded cargo being above deck level.
 - The distribution of ballast on board the ship was not accurately known and bore no resemblance to reality.
2. It would have been possible to increase stability by loading additional ballast low down in the ship, but the shortcoming in stability had not been identified prior to the ship's departure.

Assessing a ship has adequate stability for its intended voyage on completion of cargo operations and before it sails is a fundamental principle of seamanship that must not be neglected.
3. A loading computer is an effective and useful tool for calculating a ship's stability. However, its output can only be as accurate as the information entered into it.

The value of establishing before departure that a ship has a suitable margin of stability for the intended voyage had eroded over time such that unsafe practices relating to cargo loading and ballast monitoring had become the norm.

What is the norm on your ship?

A Clutch of Problems Leads to a Fire

Narrative

A cargo ship was proceeding on passage in a controlled traffic lane when the duty engineer noted that one of the main engine clutches was overheating and generating copious amounts of smoke. He contacted the bridge and requested an immediate shutdown of the affected engine. The engine was shut down, the fire alarm sounded and the ship's crew mustered at their emergency stations.

As there was a significant amount of smoke coming from the engine room, a fire-fighting team wearing BA was organised to investigate. While the BA team was investigating, the master prepared to deploy the anchor.

The BA team reported back that the clutch area was extremely hot, with electrical control wires melting, producing sparks and thick smoke. Local cooling was attempted. However, this proved ineffective, and a decision was taken to close down the engine room and to use the CO₂ fixed fire-extinguishing system.

The ship was immediately anchored and the starboard engine, which had not been affected, was stopped. Following operation of the CO₂ system, the boundary temperatures were monitored. After a number of hours, the engine room was vented of smoke and residual CO₂. The atmosphere within the space was then tested. Following confirmation that it was safe to enter, an inspection of the engine room and area around the clutch revealed that the cables were no longer sparking and that the heat had dissipated.

The engine room fans were started, the generators run up and electrical power restored. The starboard engine was then started, and the vessel commenced weighing anchor. However, before the anchor had been fully recovered, the chief engineer reported electrical short-circuiting from the clutch controls, and smoke emanating from the cables. The engine room was again shut down and monitored until it had sufficiently cooled and was clear of smoke. A request for assistance was made and the ship was later towed to a safe haven for repairs to be carried out.

A technical inspection of the port engine clutch found that an oil seal on the hydraulic clutch control unit had failed. This had allowed hydraulic oil to pass into the clutch housing, resulting in excessive pressure developing within the housing. The clutch housing relief valve had then operated, which reduced the over-pressure but allowed oil to spray onto the hot clutch casing. The atomised oil ignited on contact with the clutch casing. A fire then developed around the area of the clutch. This melted the insulating material on the electrical control cabling, resulting in thick smoke and electrical short-circuits within the clutch control system. It was noted that the clutch high temperature alarm had not activated before or during the fire.

The Lessons

1. Planned maintenance systems need to be reviewed to ensure that they continue to provide appropriate maintenance solutions. Maintenance activities should include an assessment of component condition, and maintenance intervals should be adjusted accordingly.
2. In this case, the correct operation of one safety device and the malfunction of another combined to turn a component failure into a hazardous situation:
 - The pressure relief valve worked correctly by preventing a dangerous over-pressurisation of the clutch housing. However, the resultant oil spray led to a fire. Designers, installers and operators have a responsibility to ensure that safety devices are fit for purpose and that their emergency operation does not lead to a hazardous situation.
 - The high temperature alarm, which should have given warning of a fault when the clutch mechanism temperature increased due to the pressure rise, failed to function. Critical alarms should be tested on a regular basis, alarm test results recorded and any defects rectified.
3. Following the initial fire, electrical power was restored before sufficient remedial work had been completed on the damaged cabling. A thorough post-fire risk assessment should have been carried out to identify potential hazards (collateral damage to equipment and systems) and deficiencies in emergency systems. The fire detection system might have been damaged and the fixed fire-extinguishing system was no longer available as it had been operated during the initial fire incident. If a sufficient risk assessment had been carried out, it is likely that the identified hazards would have highlighted the need for external assistance at an earlier stage.

'Normal' But No Longer Safe

Narrative

A 5,000gt container ship was inbound under river pilotage to a discharge port. It was dark with light winds and a calm sea. A deck cargo of containers had been secured using lashing rods of varying lengths.

Four crewmen had been assigned to start removing the lashing rods prior to the ship's arrival alongside. While disconnecting a

lashing rod located in the vicinity of the ship's side, one crewman lost his balance and fell overboard.

A lifebuoy with a light was immediately thrown into the water, and a search involving a number of assets was initiated. However, the crewman was not found and remains missing.

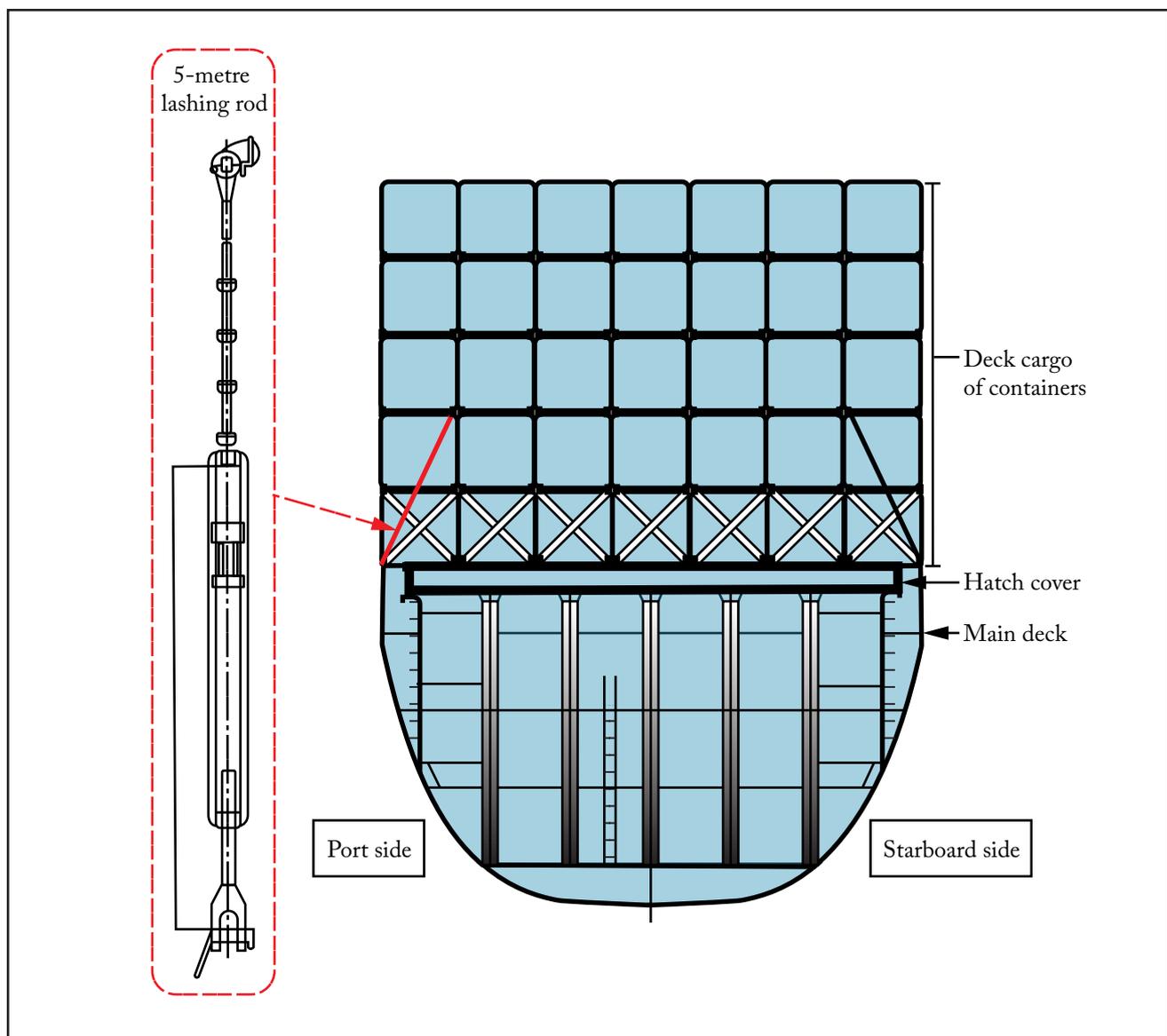


Figure: Diagram of ship viewed from aft to forward, indicating location of lashing rod

The Lessons

1. The crewman's fall overboard was a direct consequence of him disconnecting a lashing rod in the vicinity of the ship's side. The lashing rod was 5 metres in length and weighed 21kg (see figure). The crewman had disconnected the lashing rod without assistance. He had then lost his balance, causing him to drop the lashing rod into the water before falling overboard himself.
2. For reasons of efficiency, it had become a normal and accepted routine for the deck cargo's inner lashing rods to be disconnected prior to the ship's arrival in port. However, this extension to the normal working practice did not feature in the ship's safety management system, and had not been risk-assessed.

Precautions against falling should have included the assistance of another crewman in disconnecting the lashing rod, the wearing of a safety harness and lanyard, and appropriate supervision. Furthermore, in view of the risk of him falling into the water, the crewman should have worn a personal flotation device. Implementation of such measures could have been expected had a proper risk assessment been conducted for the task.

Although viewed as a small change to an already changed procedure, the decision to disconnect the outer lashing rods prior to the ship arriving alongside created a revised 'normality' for which there were inadequate safeguards.

Any change in procedure should prompt a review of its associated risk assessment to ensure that any previously identified risk control measures remain valid.

Hoping For The Best

Narrative

Early in the morning, having disembarked passengers and completed cargo discharge, the master of a passenger/ro-ro cargo ship decided to anchor in the approaches to a port for a scheduled layover period. The wind was south-west at 30 knots, and was forecast to increase throughout the day and to peak in excess of 40 knots during the evening.

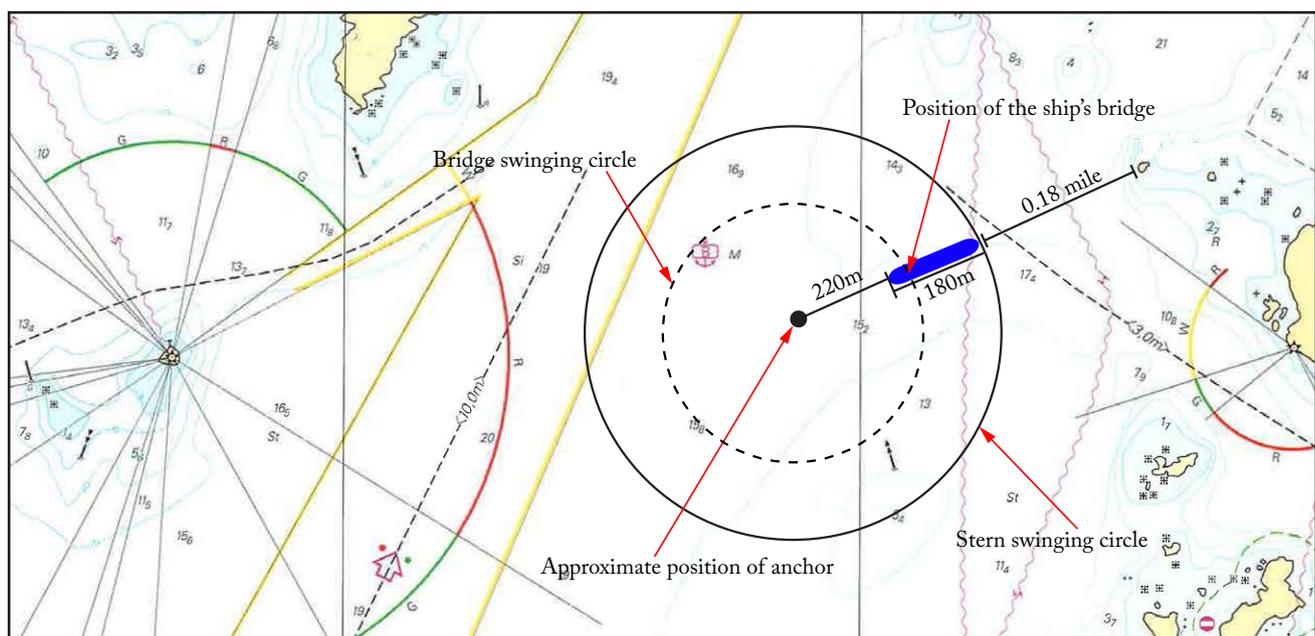
The ship was anchored with 8 shackles of cable close to the main channel and south-west of its normal position to gain better holding ground and to maximise its distance from a small island astern. The master ordered the four main engines to remain on 5 minutes' notice. One main engine, driving a shaft alternator, was left running and available to be clutched in immediately should it be required.

The master then handed over to the OOW, and left written instructions for him to instruct the engineer on watch to clutch in the main engine and to call both the master and the bosun should the OOW suspect that the anchor was dragging.

The master intermittently returned to the bridge throughout the day to monitor the wind speed and weather forecast. By early evening, the wind had increased to 50 knots, causing the ship to yaw up to 60° either side of the wind direction. The chief officer, who happened to be on the bridge with the OOW, heard noises emanating from the forecabin and decided to investigate with a duty seaman.

The master then returned to the bridge and, noting that the wind speed was now about 65 knots, looked at the electronic chart display and saw the ship's history trail start to move astern. He immediately instructed the OOW to call the engine room to start a second engine and to clutch in the first. The engineer on watch acknowledged the instruction. He then slowed down the running engine in preparation to engage the clutch, and then began to start the other three main engines.

Meanwhile, the ship continued to drag its anchor and to drift north-eastwards at about 3 knots. It grounded a few minutes later, shortly before the engineer on watch handed control of all four main engines to the bridge.



The Lessons

1. In deciding to anchor in the port approaches, the master considered there would be little protection from the wind and sea immediately outside the port and that the number of small islands within the port approaches would provide an adequate lee for the ship. He dismissed the option of proceeding to sea and then heaving to in more sheltered areas along the coast. However, such an option was feasible considering the length of the scheduled layover period.

The master's decision was influenced by his previous successful, albeit limited, experience of anchoring similar ships in wind speeds of up to 40 knots. The forecast wind speed was at the assumed maximum design limit of the anchoring equipment. However, the ship's tendency to yaw in such conditions, which the master was not familiar with, would have increased the loading to beyond that limit.

Are you familiar with your ship's anchoring capabilities and performance? Without first-hand experience to draw on, such information can be lost unless specifically covered during handover periods and, in particular, when a ship is sold on, or there is a change of manager.

2. Having decided to anchor the ship in the port approaches, the master then needed to appraise his intended anchorage, fully assess the consequent risks, plan the anchoring operation and implement appropriate safeguards to prevent the ship dragging anchor and/or running aground.

In view of the forecast wind speed and direction, the master wisely modified the ship's normal anchoring position and increased the amount of cable from that normally used. However, he did not construct a swinging circle either at the planning stage or after anchoring. Had he done so, he might have more acutely recognised the limited time that he would

have available in which to arrest the ship's drift should the anchor start to drag, and might have been encouraged to reconsider his decision to anchor (see figure). Do you construct an anchorage swinging circle as a matter of routine?

3. As the wind speed increased throughout the day, the anchor remained in position, which reaffirmed to the master that the amount of deployed cable was probably sufficient to prevent the anchor dragging in the forecast conditions. He also remained confident that, by clutching in the running engine, the ship's drift could be satisfactorily arrested to prevent it from grounding should the anchor begin to drag.

However, particularly once the wind speed had exceeded what had been forecast, the master could have taken more proactive measures, such as clutching in the running engine, starting the other main engines, and manoeuvring the ship ahead to reduce loading on the anchoring equipment. He could also have lowered a second anchor to the seabed to reduce the ship's yawing.

The master lacked an appreciation of the ship's likely rate of drift should it start to drag anchor in the prevailing wind conditions. His expectation for the running engine to be clutching in immediately if the ship dragged its anchor was not effectively communicated to the engineer on watch. However, even if it had been clutching in immediately, it is uncertain that its sole use would have prevented the ship from grounding.

4. The master did not consider the possibility of the ship experiencing stronger winds than those forecast. With no contingency plan developed to address this eventuality, the trigger point at which a response was executed became the point at which the ship started to drag its anchor. Hoping for the best should never be an option.

Chain Reaction

Narrative

A passenger/ro-ro cargo ship was inbound to a regular port of call. It was daylight with light winds and good visibility. The bridge was manned by the master, an OOW and a helmsman.

The port was situated in a large estuary and was entered on a north-westerly heading by means of a narrow channel that passed between two headlands. A strong ebb tidal stream was common through the entrance, as was the case at the time of the accident. A speed limit of 10 knots was imposed, and a sectored light was provided to assist navigation through the narrow entrance.

A chain ferry, which operated between the two headlands, was moored in its out-of-service position a few metres off the southern slipway.

After the ship had entered the approach channel, the master took the con and reduced the ship's speed over the ground (SOG) to 10 knots. He then altered course with the aim of turning onto the centre of the channel marked by the white sector of the leading light. As the

ship passed the chain ferry, the latter started to move laterally south-east. The ship's master then applied starboard helm to initiate a planned turn to starboard. As the ship passed over the chains of the chain ferry, the chain ferry stopped and then moved laterally north-west before coming to rest.

The ship's high speed and close proximity to the chain ferry had caused the vessels to interact, which had resulted in the chains of the chain ferry being lifted. The ship had, in fact, tracked south of the white leading light line. This, coupled with the low height of tide and the resulting squat effect on its draught, had led to the ship making contact with the seaward chain of the chain ferry.

The ship sustained some minor damage to both of its rudders (Figure 1), a propeller tip (Figure 2) and the underside of its skeg. The seaward chain of the chain ferry parted (Figure 3) as a result of the accident, requiring the chain and its associated hydraulic motor to be replaced.



Figure 1: Damage to port rudder



Figure 2: Damage to starboard propeller tip



Figure 3: Parted seaward chain

The Lessons

1. Given the bridge team's familiarity with the ship having previously entered the port without incident at various states of tide, traffic and weather, their main focus was on preventing the ship from grounding on a shallow sandbank located to the north of the leading light line. They achieved this by ensuring a minimum pre-determined radar range off the northern headland; the fact that this resulted in the ship tracking south of the leading light line generated little concern.

Navigational best practice would have been to turn the ship onto the leading light line as early as possible. Then, by visually monitoring the sectored light and by using radar parallel indexing, the ship's heading would have been adjusted to maintain a track that followed the leading light line until it was necessary to turn the ship to starboard, ensuring that it was clear of all identified dangers, including the shallow sandbank to the north.

In view of the variable nature of tide, traffic and weather, a key element missing from the ship's passage plan was information on the extent to which the ship could safely deviate from the intended track, given the prevailing conditions. What safety margins are you working to? Are there others you should be taking account of?

2. After handing the con to the master, the OOW had little further involvement in the ship's navigation into the port. The master did not inform the bridge team of his intended track, and assumed that the OOW would alert him should the ship

deviate from the normal track. Without a full understanding of the master's intentions and no proper consideration of the extent to which the ship could safely deviate from the normal track, the OOW was restricted in the practical assistance he could provide to the master.

3. A bridge team that is comprehensively briefed and has a clear understanding of the plan is better prepared to maintain good situational awareness, and to immediately address developing hazardous situations.
4. The imposed speed limit of 10 knots was intended to refer to speed through the water. Due to the prevailing strong ebb tidal stream, the ship's SOG of 10 knots corresponded to a speed through the water of 14-15 knots, which was needlessly high and caused unnecessary squat and interaction.

Interaction between two vessels passing in close proximity can occur in any depth of water, but it is intensified by the effect of shallow water as squat amplifies the pressure difference along the hull. Similar to squat, the extent of interaction is proportional to the square of the ship's speed through the water. Travelling at 10 knots rather than 14-15 knots would have halved the ship's interaction with the chain ferry.

Relevant guidance on the dangers of interaction can be found in MGN 199 (M).

Not The Way to Make a Splash

Narrative

A ship had berthed alongside and was now secure with all moorings in place. The engines were shut down, and the crew commenced deploying the gangway to provide a safe means of access to and from the ship.

During this operation, an AB was using a boat hook in an attempt to guide the gangway into the correct position. The AB was stretching at the limit of his reach when the hook became detached from the gangway. This caused the AB to lose his balance and stumble. Consequently, his left foot came into contact with the gangway turntable, causing him to trip and fall through the turntable opening and overboard from the ship.

The AB was a very lucky man; he fell free from the ship, and entered the water between the ship and the quay. The estimated height of the fall was 4.5 metres. Although not wearing a Personal Buoyancy Aid, the AB was able to remain afloat and make his way to a quay wall ladder, and then to climb up to the quay. He sustained only a minor injury (a scratch to his left hand).

Although it was considered a routine task, the deployment of the gangway was a controlled operation with a documented procedure, which was subject to a risk assessment (RA) and a lifting plan. Furthermore, there was a formal requirement for the OOW to have manoverboard procedures in place.

The gangway rigging procedure required three crew members, including a trained crane operator. The manoverboard procedures

required a lifebuoy and buoyant lifeline to be available at the gangway position. All of these requirements were met at the time of the incident.

The gangway was lifted into position using the ship's crane. A tag line was secured at each end of the gangway to be used to steady it until it had been slewed round and lowered into position.

At the start of the operation, it became apparent that the tag line at the far end of the gangway had become entangled and that the gangway was the wrong way round to be secured to the turntable. The AB was attempting to overcome this by use of a boathook to manoeuvre the gangway.

After the incident, a CCTV recording showed that the gangway was being slewed at speed; a factor which is likely to have contributed to the incident.

There was a requirement, highlighted in the RA, for personnel to wear buoyant work vests if they were less than 1 metre from the quay edge when manoeuvring the gangway. Buoyancy aids were not considered necessary on board the ship because the ship's side rails were deemed to be a suitable barrier to falling overboard. However, on this occasion, the ship's side gate had already been opened and the turntable lowered before the gangway was in a position to be secured.

The Lessons

1. Annex 1.2 of the Code of Safe Working Practices for Merchant Seamen highlights that RAs should be reviewed on a regular basis to ensure that they remain appropriate for the task being completed. If elements of the task change (in this case opening the ship side gate and lowering the turntable) additional controls may need to be introduced, i.e. the wearing of a PBA.
2. The provision and use of a PBA for any work carried out from an overside position or in an exposed position where there is a reasonably foreseeable risk of falling or being washed overboard, is required under The Merchant Shipping and Fishing Vessels Personal Protective Equipment Regulations 1999 (Merchant Shipping Notice 1731 (M+F)).
3. For a work procedure and its associated RA to be effective, they must be understood by all participants and all steps pertaining to the task must be followed. If something is not as it should be, stop and reassess the situation.

Lookout, By All Available Means

Narrative

It was a fine sunny day with excellent visibility when a dredger collided with a yacht. The yacht suffered catastrophic damage and sank with loss of life soon afterwards.

The dredger was employed on a major dredging and reclamation project in a port. It was a modern and well equipped ship with a range of navigation aids, including 3cm and 10cm ARPA radar, both of which were operational at the time of the accident. In common with many dredgers of its type, the ship was fitted with discharge equipment on its bow which, although complying with legal requirements, caused a blind sector directly ahead when viewed from the bridge conning position.

The chief officer and second officer were on watch on the bridge. The chief officer, who held a pilotage exemption certificate for the port, had the con, and the second officer was engaged in completing paperwork. The chief officer planned to follow his normal route out of the port, staying in the main channel up to a pre-determined point, then altering course to starboard to leave the channel, and setting a course for the designated dump site, for the vessel's cargo of dredge spoil.

Having arrived at the pre-determined point in the channel, the chief officer altered course to starboard towards the dump site without either he or the second officer noticing a yacht that was now about 1.5 miles dead ahead.



Figure 1: The dredger

CASE 7

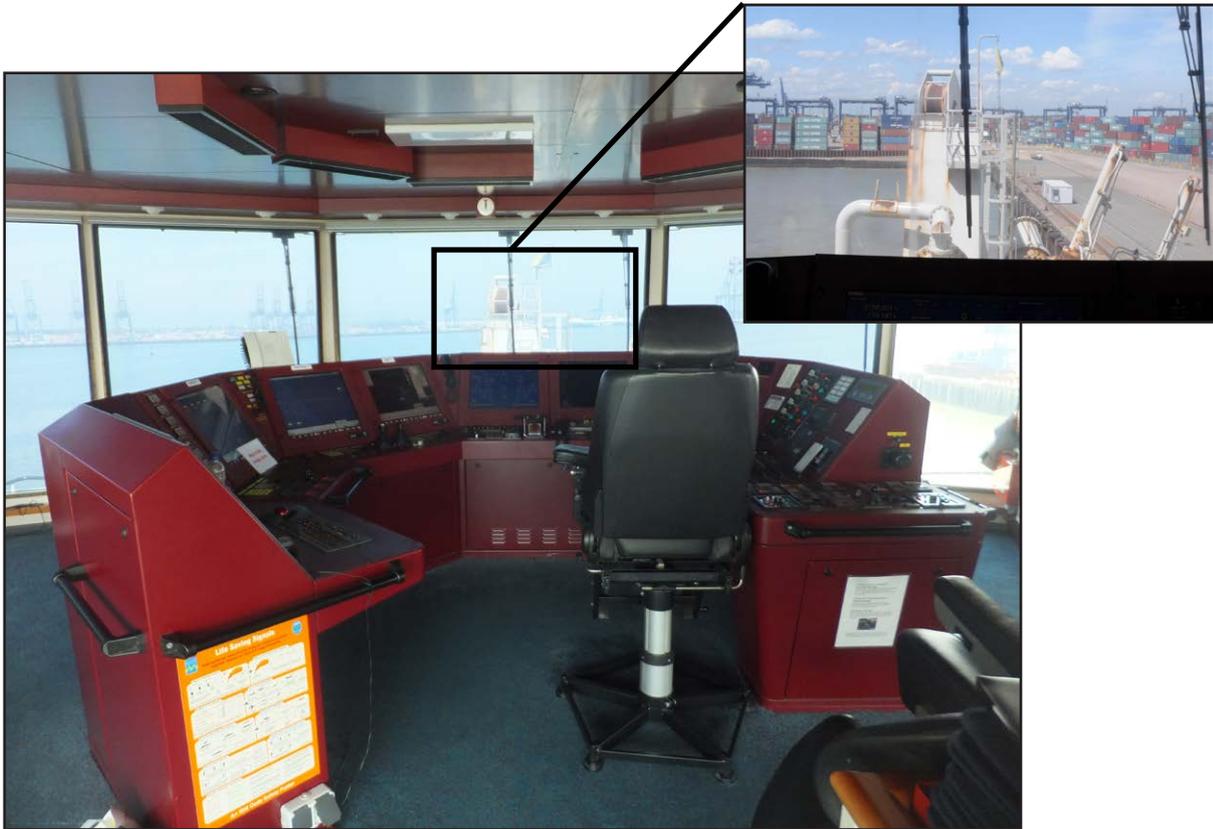


Figure 2: Bridge conning position (inset: obstruction)



Figure 3: Damage to starboard side of yacht

On completing his paperwork, the second officer requested permission to leave the bridge to conduct some safety routines on deck. The chief officer agreed to this request, and the second officer left the bridge with the yacht now at a range of about 0.4 mile and still dead ahead.

The chief officer saw the top of the yacht's mast very close and directly ahead of the bow seconds before the vessels collided. Following the collision, he raised the alarm and notified the harbour authority. The ship's rescue boat was launched shortly afterwards and recovered the yacht's skipper from the water. However, the second person on the yacht was unable to escape before the yacht sank soon after the collision.

The Lessons

1. Maintaining a proper lookout by all available means, in accordance with Rule 5 of the COLREGs, is essential. The dredger's OOWs were not doing so. Neither of them identified the yacht in sufficient time to be able to take avoiding action despite the fine weather, excellent visibility and operational radar. Recorded evidence has shown that the yacht was clearly visible on at least one of the dredger's radar displays for at least 12 minutes prior to the collision.
2. In this case, there was a blind sector directly ahead of the dredger's conning position. Watchkeepers need to take full account of known blind or shadow sectors caused by the design characteristics of their particular vessel, and adjust their watchkeeping practices accordingly. Resist the temptation to remain in one place on the bridge. Move around frequently.
3. Local harbour regulations required the dredger's bridge to be manned by two people. In this case, the second officer was engaged in other tasks and, while on the bridge, he was not keeping a lookout. It is all too easy in today's busy world to become distracted and to prioritise what can erroneously be perceived to be more important jobs. Despite alternative crew being available to keep a lookout, none was requested to relieve the second officer before he left the bridge. Neither the chief officer nor the second officer valued having two people on the bridge. Do you?
4. Prior to making any alteration of course, the prudent mariner should ensure that the intended course is clear by scanning ahead, both visually and by radar. In this case, the dredger was required to keep out of the way of the yacht. However, as a stand-on vessel, the yacht had an option of taking early avoiding action as soon as it became apparent to the yacht's skipper that the dredger was not keeping clear. In altering course to starboard out of the channel, the dredger's chief officer made a series of small alterations which, although not contributory to this accident, would have been difficult for other vessels to visually detect.

Uncontrolled Fire, Unexpected Fireball

Narrative

A passenger/ro-ro cargo ferry was approaching port when an uncontrolled fire broke out in the furnace of a thermal oil heater. Following an alarm on the ship's fire detection system, an engine room team proceeded to the port boiler room to investigate. Pulses of smoke were seen to emanate from the jointing surfaces at the top of the port thermal oil heater.

The boiler room ventilation was stopped from the bridge and fire-fighting teams were prepared. Meanwhile, the chief engineer gave instructions for the port thermal oil heater to be shut down, the burner fuel and air supplies to be isolated, the thermal oil supply by-pass valve to be opened, and the thermal oil heater coil inlet and outlet valves to be closed (Figure 1).

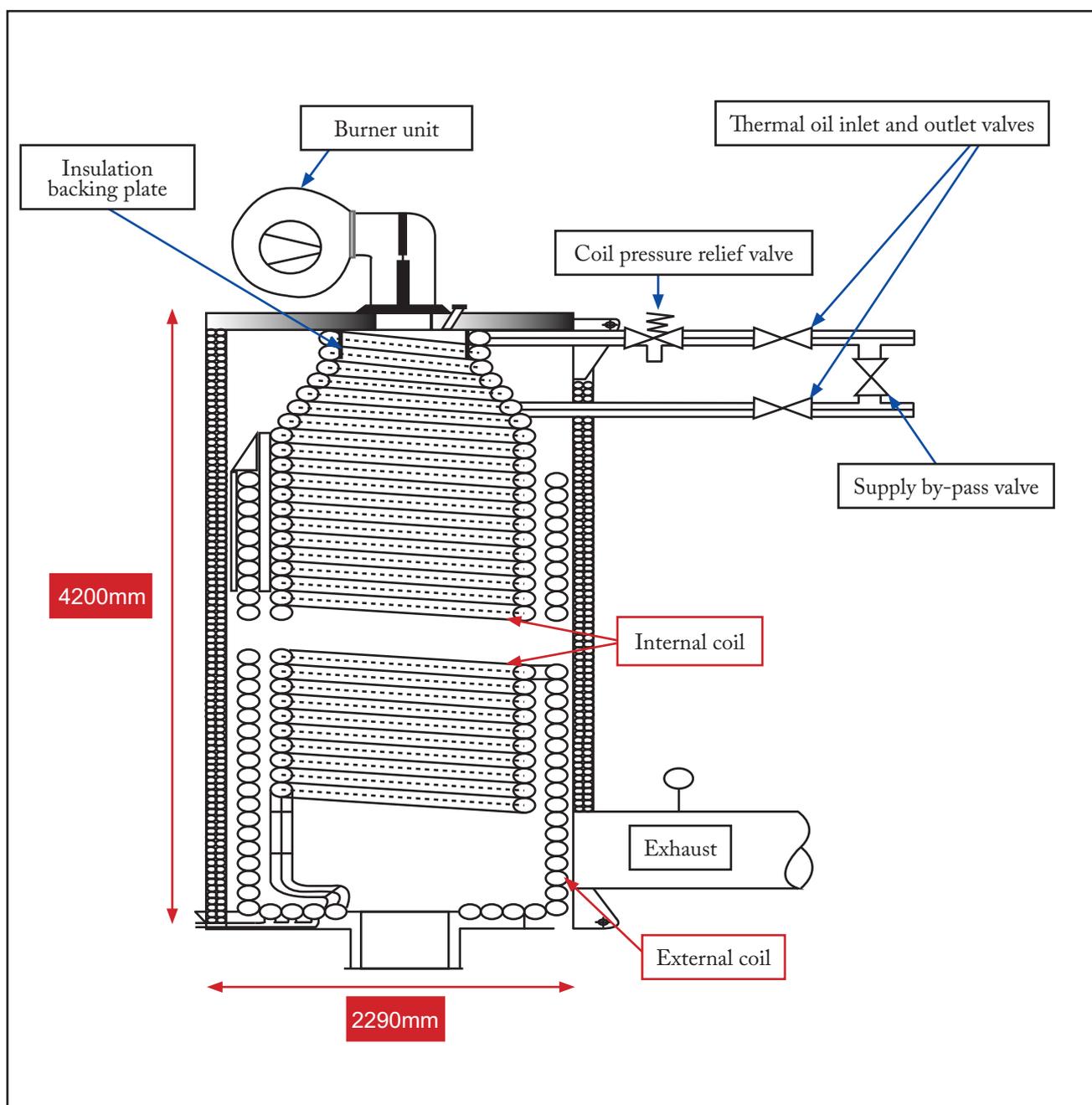


Figure 1: Diagram of the port thermal oil heater

The chief engineer considered that the fire had probably been caused by a coil failure that had allowed thermal oil to pass into the furnace. He advised the master accordingly, who informed the port authority and requested that the local fire and rescue service meet the ship on arrival.

On seeing the burner unit, located at the top of the thermal oil heater, lift and remain open, the chief engineer entered the port boiler room and closed it. However, owing to the presence of dense smoke he was unable to remain in the compartment long enough to properly secure the burner unit, which re-opened shortly afterwards. Concerned that the thermal oil pressure in the heater coil would rise to an unacceptable level, the chief engineer sent a fire team into the port boiler room to manually operate the heater coil pressure relief valve. However, conditions had worsened within the compartment and the team was unable to complete the task.

Shortly afterwards, the dry powder fixed fire-extinguishing system for the port thermal oil heater was activated on the chief engineer's

instruction. The ship was then berthed alongside and firefighters from the local fire and rescue service boarded. Following a discussion between the chief engineer and the shore firefighter in command, it was decided to make an entry of the port boiler room using a combined team of ship's crew and shore firefighters. The plan was for the ship's crew to operate the heater coil pressure relief valve and for the shore firefighters to inject dry powder directly into the heater furnace.

On opening the port boiler room entrance door, an unexpected fireball swept across the open deck, knocking over and injuring a number of personnel in the vicinity. The door was then closed, and the hi-fog water fixed fire-extinguishing system for the port thermal oil heater activated, while the ship's crew started boundary cooling around the port boiler room. The shore firefighters later deployed their own combined water-jet cutting and fog nozzle fire-fighting equipment to assist in cooling the compartment. The fire was finally declared extinguished some 12 hours after it had started.

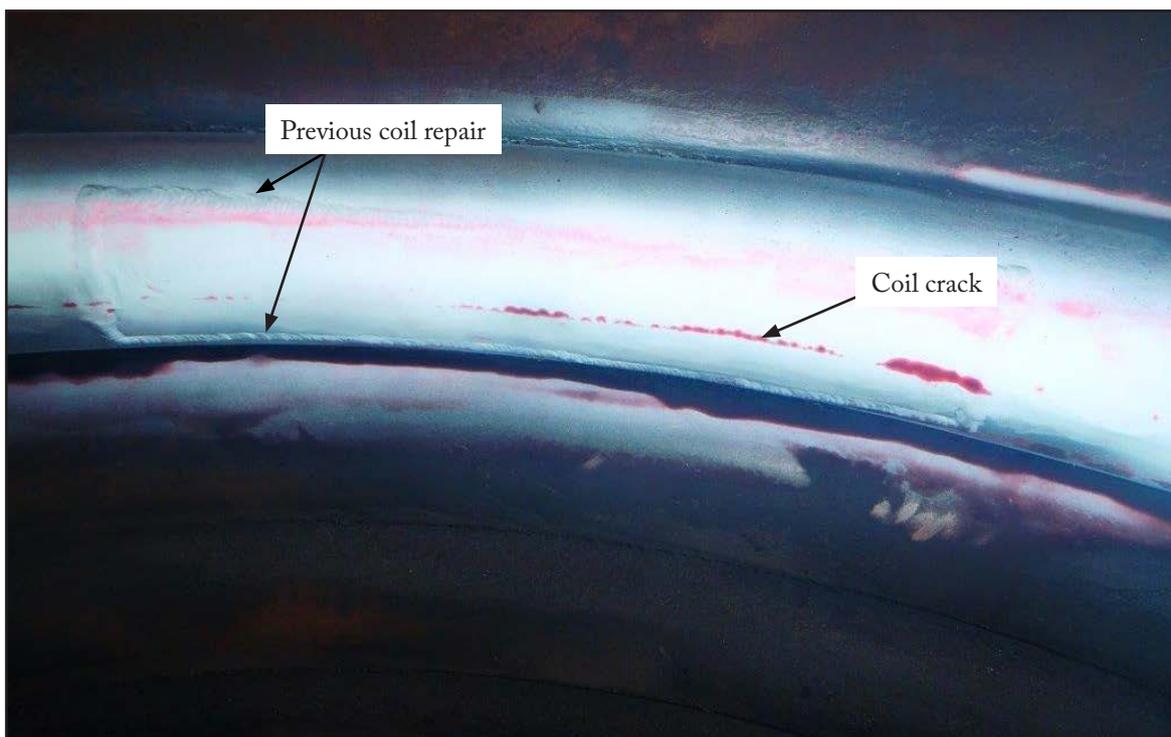


Figure 2: Port thermal oil heater coil fracture

The Lessons

1. The fire started because a fracture had developed in the coil carrying thermal oil through the furnace. This allowed the oil to enter the furnace and ignite. The fracture was situated along a circumferential weld securing the refractory insulation support plate at the top of the furnace, where a number of previous repairs were evident (Figure 2).

The section of coil that failed was particularly difficult to inspect visually due to the refractory insulation in the vicinity. There were no detailed maintenance records referring to the previous repairs. Had such records existed, the area could have received more attention during inspections, prompting hydraulic pressure testing where the coil was not accessible for visual external examination.

2. The port boiler room had three separate fixed fire-extinguishing systems:
 - A dry powder system designed to extinguish a fire on top of the thermal oil heater.
 - A hi-fog water system designed to extinguish a burner unit fire on top of the thermal oil heater.
 - A CO₂ system designed to provide fire-extinguishing capability for the whole compartment.

Dry powder will only remain effective while it is present in the atmosphere above the fuel; it has no cooling effect, resulting in a high risk of rapid re-ignition. The hi-fog water system would

have been a preferred option for use in extinguishing the fire at an early stage. However, heat from the open burner unit aperture disabled its automatic function and, despite a number of indications that the fire had spread into the port boiler room, its manual use was delayed. Instead, the ship's crew and shore firefighters remained focused on fighting a fire that they considered was contained within the thermal oil heater.

A comprehensive review of all available information, involving all key ship and shore personnel, would have allowed a fire-fighting plan, appropriate to the actual situation, to be developed and agreed. Furthermore, had a standard operating procedure for dealing with a thermal oil heater fire been developed and exercised as part of the training programme on board, the ship's crew would have been better prepared to deal with the emergency.

3. Limited ventilation can lead to a fire in a compartment producing gases containing partial combustion and unburnt pyrolysis products. If these accumulate, an admission of air when an opening is made to the compartment can cause a backdraught, resulting in a fireball moving through the compartment and out of the opening.

A thorough situational risk assessment would have allowed the risk of backdraught conditions within the port boiler room to be identified and a revised entry plan to be developed and agreed.

Proper Prior Planning Prevents Groundings

Narrative

A platform supply vessel grounded when it left the buoyed channel of an unfamiliar port. The vessel was aground for several hours while its crew checked for damage and then de-ballasted. Once re-floated, the vessel continued into port, where a divers' survey revealed that its hull was intact but that its propeller had been damaged.

The vessel had arrived off the port during the hours of darkness and the bridge team decided to wait for daylight before entering it. The master was not familiar with the port and contacted the master of another vessel that was already alongside to obtain advice about the arrival passage. The employment of a local pilot was not compulsory and had not been considered when the voyage was planned.

During the night the wind strength increased, and a gale force wind was blowing as daylight broke and the vessel commenced its entry into the port.

The approach channel was narrow and included several turns of more than 100° around potentially hazardous shoal areas, it was well marked with navigation buoys as well

as sectored shore lights. The passage through the channel was also described in detail in the local pilot book, but the bridge team had not consulted this when the voyage plan was prepared.

As the vessel approached an alteration of course position, with the gale force wind right astern, the vessel's turn was greater than expected, and it left the channel and grounded.

Soundings were taken and the vessel's ballast tanks were pumped out to reduce its draught. Three hours later, the vessel was re-floated and proceeded into the port without further incident.

The owner's investigation of the incident concluded that the vessel's speed over the ground on approach to the turn had been excessive, given the available depth of available water and the reduced width of the channel. It also concluded that the planning, execution and monitoring of the passage were not in line with best practice and the bridge team had lost situational awareness when the wheel over position for the course alteration was missed.

The Lessons

1. Effective voyage planning requires that the elements listed below are consistently followed by bridge teams:
 - *Appraisal* of all relevant information.
 - *Planning* the intended voyage from berth to berth.
 - *Executing* the plan, taking account of prevailing conditions.
 - *Monitoring* the vessel's progress against the plan continuously.
2. In this case several control measures, which should have been considered when the plan was prepared, were missing:
 - The arrival section of the plan did not include consideration of taking a local pilot. Even if a vessel is not subject to compulsory pilotage, when visiting an unfamiliar port with a potentially hazardous approach, it is prudent to obtain the services of a pilot.
 - The voyage plan did not include reference to the sectored lights in the approach channel, use of which might have enabled the bridge team to maintain situational awareness and prevented the grounding.
 - The local pilot book was not consulted when preparing the plan. The appraisal of all relevant information when preparing a voyage plan is essential.
 - The vessel's charts were not marked with "no-go" areas and parallel index lines had not been prepared for entry into the port. The identification of dangers and safe passing distances are essential elements of voyage planning and would have assisted the bridge team's ability to retain situational awareness.

A (not so) Funny Turn

Narrative

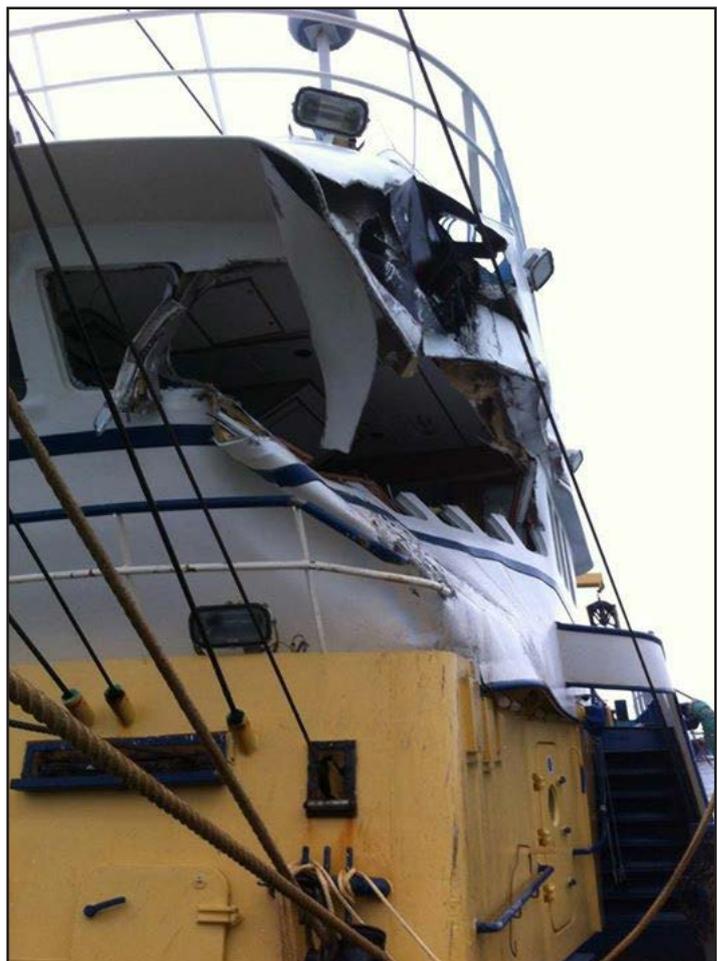
The early morning watch for a tanker's OOW and OS lookout was uneventful. The vessel traffic was light despite navigating through an area in which several traffic lanes converged. The only radar target of interest was a fishing vessel several miles ahead that the tanker was slowly overtaking. Both the tanker and the fishing vessel were on south-westerly headings and the OOW estimated that the tanker would not overtake the fishing vessel for over 1 hour. The OOW decided that it was a good opportunity to repair a defective dimmer switch on the chart table light. However, the repair required spare parts, so the OOW left the bridge to find them.

At about the same time, the fishing vessel, which was towing its nets, altered course towards the north-west. The distance between the tanker and the fishing vessel now started to decrease much more quickly. This did not alarm the OS who, although alone on the bridge, was able to use the radar to determine that there was no immediate risk of collision. The CPA of the fishing vessel was 9 cables.

Everything appeared to be under control until, several minutes later, the fishing vessel altered course to the north and its CPA reduced to 5 cables. This caused the ARPA collision alarm to sound. The fishing vessel was only 2.5nm ahead so the OS adjusted the autopilot 5° to port in order to increase the passing distance between the two vessels. However, when the distance between the vessels was about 1nm, the fishing vessel continued to turn to starboard, across the tanker's bow. The fishing vessel's wheelhouse watchkeeper had not seen the tanker and was turning

to join a route pre-set on a track plotter. The tanker's OS immediately recognised the danger and attempted to contact the OOW, who by that time had been away from the bridge for over 20 minutes. He was unsuccessful.

The tanker's bow collided with the fishing vessel's port side, causing extensive damage below the waterline in way of a wing fuel tank between the fish hold and the engine room (see figures). There were no injuries, but the crew of the fishing vessel were very fortunate. Had the damage been either side of the fuel tank, the resulting flooding of either the fish room or the engine room would probably have caused the fishing vessel to quickly founder.





The Lessons

1. An OOW is required to keep his/her watch on the bridge for good reasons. Navigation and collision avoidance aside, the OOW also needs to be available to respond to emergencies such as fire, machinery breakdown and man overboard. Delegation and keeping lookouts involved during a watch are signs of good management, but there is a limit. If there is an urgent need to leave the bridge when on watch, play safe and call another qualified OOW for assistance, no matter how quiet a watch might seem. Failing that, get someone else to sort the problem or leave it until the watch is over.
2. Assumptions are great contributors to accidents. To assume that another vessel will maintain its heading or will keep clear or take a certain course of action (even if it is obliged to do so) is asking for trouble. Keeping a good lookout, closely monitoring the movements of nearby vessels and checking that an intended heading is clear before altering are the only ways to help to prevent nasty surprises.

There is No 'I' in Team, But There is in 'Grounding'

Narrative

A passenger ship was on a short cruise in north-west Europe and had already missed a port due to technical difficulties. When the master received a forecast of bad weather, he decided to proceed at the best possible speed to the next port of call – a small island harbour – so as to arrive ahead of the weather and complete the intended stop.

Unbeknown to the master, there were two smaller ships already anchored in the bay outside the harbour and there was no room for a third. Consequently, when the master contacted the harbour's marine manager, he was advised that his ship would have to wait for the smaller ships to leave before there was room for it to anchor. Frustrated by the delay, the master examined the chart and chose a bay to the north of the harbour in which to drift and await clearance to proceed. The passage plan was not amended and the master did not discuss his intentions with the bridge team as he diverted the ship to his chosen drift area.

The wind had now increased to south-westerly force 6/7, gusting up to 40 knots at times. On the bridge of the passenger ship the bridge team consisted of the master, the OOW, helmsman and cadet. The ship drifted in the same area for almost 2 hours before the OOW saw on the radar that the remaining small ship in the bay was underway; the first had departed earlier.

The master, who had the con, set the engine controls to half ahead and ordered the helmsman to steer a course of 200°. Although the passenger ship's speed over the ground slowly increased to approximately 3 knots, the wind was causing it to be set down by as much as 17° at times. The OOW had assumed responsibility for position fixing, a task that was also being carried out by the cadet without reference to the OOW. Both were plotting the ship's position infrequently and with varying

degrees of accuracy, and neither of them was providing the master with any information regarding the ship's proximity to the charted rocky shoal at the entrance to the channel, which led to the harbour.

As a result of the earlier drifting position, the passenger ship was now approaching the channel from the north-east rather than the original north-west approach set out in the approved passage plan. The green channel buoy marking the rocky shoal could be clearly seen off the port bow. The small ship departing the anchorage sailed north and agreed a starboard to starboard pass with the inbound passenger ship.

As the passenger ship continued towards the channel, the bridge team became aware of a large bulk carrier travelling from the north-west and a large motor yacht approaching from the south-east. Both vessels hailed the passenger ship on the VHF radio and, during a confused conversation, the OOW agreed to give way to both, without discussing the situation with the master.

With the outbound small ship, the bulk carrier and the yacht all converging towards the passenger ship, the master reduced speed to allow enough room for the other three vessels to safely pass ahead. As the passenger ship continued towards the channel, its port quarter grounded on the rocky shoal, damaging the port rudder, propeller, propeller shaft and shell plating. The port rudder and propeller were damaged sufficiently to render them unserviceable.

Although the master and bridge team were immediately aware of the grounding and that they had lost use of the port propeller, no crew muster was sounded. Despite the unknown extent of the damage to the ship, the master decided to continue into the confined bay.



Figure 1: The damaged port propeller



Figure 2: Hull damage

However, he then chose to divert from the passage plan once again and attempted to anchor the vessel in the entrance to the bay and not at the planned location further within the bay. Due to a number of factors, including poor holding ground, wind strength and the amount of anchor cable used, the anchoring operation was unsuccessful and the passenger ship dragged its anchor. The master narrowly avoided the ship going aground a second time before aborting the attempt and heading back out to open water.

After the ship had cleared the bay, the master eventually informed the owners of the grounding. The shore authorities were informed of the accident only when they received an enquiry from a third party.

The passenger ship proceeded to dry dock, where the extent of the damage became apparent (Figures 1 and 2). The cruise was abandoned and the ship remained out of service for 3 months.

The Lessons

This passenger ship had a full complement of qualified, experienced deck officers and a safety management system that provided good guidance for expected bridge operations and emergencies. Despite this, the ship grounded as a direct consequence of poor bridge team management, which continued following the grounding, exacerbating an already dangerous situation. In particular, the following basic areas were lacking:

1. Communication and briefings

- There was no flow of information within the bridge team and there had been no briefing before the ship approached the harbour. Good communication is essential to a cohesive bridge team.

2. Shared mental model

- When the berthing prospects changed, the passage plan was not reviewed and consequently the new approach direction to the channel, and the rocky shoal, went unrecognised. Without a plan to work with, the bridge team was unable to adequately assist the master.

3. Situational awareness

- No roles had been defined, so no-one recognised their responsibility to ensure that the master was aware of the vessel's proximity to the shoal.

4. Challenge and response

- No-one challenged the angle of approach to the channel or the decision to give way to all other traffic.
- The master's decision to proceed to open sea with unknown damage was not questioned. Had the damage been more severe, this decision could have resulted in significant pollution or the loss of the ship and life.

5. Short-term strategy

- Following a significant grounding that had led to obvious damage, the master chose not to follow the emergency checklists available to him. Had he done so, they would have prompted him to ensure that the ship was safe to proceed and to inform, and seek advice from, owners and shore authorities. A great deal of time and experience goes into preparing emergency checklists. Their use provides a ready-made strategy to ensure that mistakes and omissions in the heat of the moment do not make a bad situation worse.

First-Hand Experience – Literally

I qualified from my marine engineering cadetship in 2009 at Warsash Maritime Academy (WMA), sponsored by an oil majors shipping arm. After sailing and gaining some excellent experience, including refit and time in dry-dock, I returned to WMA to further my academic qualifications at degree level in 2013. I was accepted on the Maritime and Coastguard Agency's graduate trainee surveyor programme where I rotate between survey and policy roles. I have been fortunate to be sponsored by the MCA and have successfully passed my second engineers unlimited ticket in 2016. I am progressing to work as a main grade surveyor and will hopefully return to sea in the near future to advance through the ranks to Chief Engineer.

Bari Khan

Narrative

I had been on board a vessel for 3 months and was preparing to leave when I suffered a serious accident. I had joined the vessel part way through a major docking, in which significant work was being done on all systems. It had been a hectic but enjoyable time and my confidence in the job was on the up.

On the morning of my accident I was tasked to renew the drive belts of the general service rotary air compressor. Cracks in the drive belts had been noticed during previous maintenance. The job was completed with no issues and the compressor was back online.

During the evening, I had finished packing and wandered down to the combined cargo control room to see the other engineers. As was my habit, while there I checked the integrated automated system and noticed that there was a problem with the general service air compressor. The system pressure was low, but not low enough for the low pressure alarm to cut in. I was really frustrated that this had occurred just before I was about to pay off. I was desperate to repair the compressor, so without uttering a word to the other engineers I collected my safety gear and went to the

engine room, cursing and slamming doors along the way. All I could think about was fixing the compressor so that I could hand it over in excellent order.

In the engine room, I ripped off the compressor's covers and threw them onto the deck plates – something that was quite out of character. I then stood on the compressor's case and leant over the compressor. I knew it was rotating and could hear the suction valve trying to open as the air rushed past, but I couldn't see if the drive belts were moving. I picked up my torch but, as I did so, I slipped and my right hand moved onto the drive belts that were rotating at high speed. I was then pulled down into the master pulley. As I pulled my hand back I was relieved to see just two cuts to my main and ring fingers. However, the realisation that the tip of my index finger was missing and that the bone was protruding hit me. It became clear that what had just flown past my head must have been either my finger tip or part of the drive belt.

Looking back, I was fortunate to have only suffered the loss of the tip of my index finger and not all of my fingers. I was off work for 6 months and underwent three operations.



The Lessons

1. Frustration and anger can create an uncomfortable and intimidating atmosphere in which to work. They are also emotions that can result in accidents. Engineers need to be alert and aware, but they must also remain calm and objective.

If they are not, even the usually positive attributes of pride in work and keenness to please can lead to rushed decision-making, inadequate diagnostics and departures from safety procedures.

Knot a Good Time for Teaching

Narrative

The master and mate were on the bridge of a high-speed river tour vessel, operating on a very busy waterway. There were no passengers on board, and the vessel was proceeding towards a lay-by berth for a scheduled break in its daily service.

The master had the con and was seated in the wheelhouse central conning chair. He and the mate were discussing how to tie a particular type of knot. Having used his mobile phone to google instructions, the master left the conning chair and walked to the rear of the wheelhouse

to demonstrate to the mate, who was waiting with a rope, how to tie the knot. In leaving the chair, he inadvertently knocked the helm, altering the vessel's course to starboard.

While the knot-tying demonstration was ongoing, the master looked up and noticed that the vessel had taken a sharp turn to starboard. He immediately returned to the conning position, applying full astern on the engines and hard-to-port on the helm. However, his actions were in vain, and the vessel collided with a moored barge.

The Lessons

1. While the practice of teaching seamanship skills to other crew members is admirable, the master's timing was inappropriate on this occasion. With the vessel underway, he should have been focused solely on safe navigation. In leaving the helm unattended and with no one keeping a lookout, the master failed to meet his fundamental responsibility of ensuring the safety of the vessel and its crew. The vessel was about to stop for a scheduled break, during which there would have been ample time to conduct the knot-tying demonstration.
2. While not entirely contributory to the accident, the use of mobile phones on the bridge of a vessel can be an unwelcome and unnecessary distraction. MGN 299 (M+F) warns of the danger of inappropriately using mobile phones, and recommends that consideration should be given to prohibiting their use when navigational requirements demand the individual attention of all those responsible for the safe conduct of the vessel.

Be Careful Where You Step

Narrative

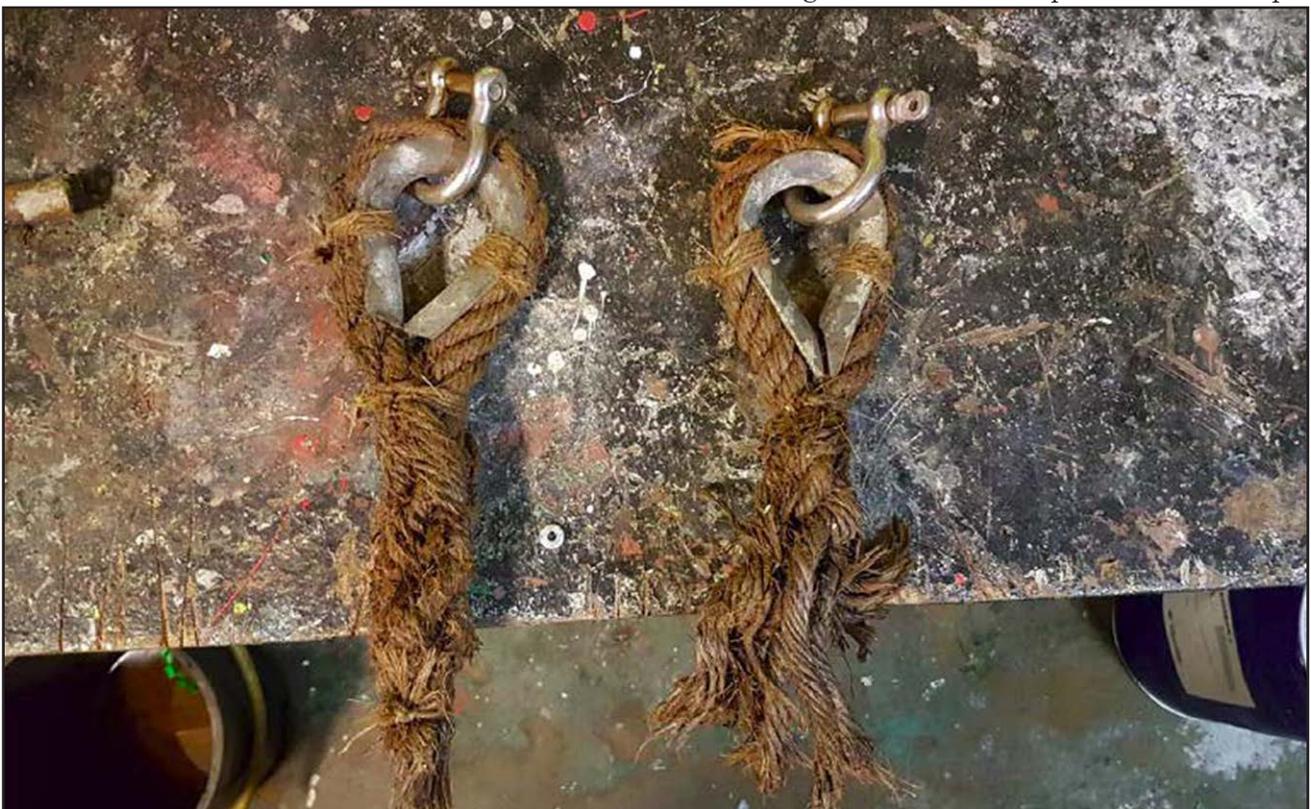
A pilot ladder failed on board a large roll-on roll-off passenger vessel during a routine harbour pilot transfer evolution in sheltered calm seas. A pilot was on the ladder at the time but was uninjured.

The vessel, operating on a regular route, departed port with two pilots on board: a senior pilot and a pilot under training. As the vessel approached the pilotage departure point, the two pilots made their way to the port pilot door, where the crew had already rigged a pilot ladder. The master had informed the harbour authority that the pilot ladder had been rigged in compliance with SOLAS¹ requirements and the pilots had used it the previous day.

When the pilots arrived at the pilot door their launch manoeuvred into position and the senior pilot climbed onto the ladder. Once on the ladder, the senior pilot descended it, and transferred to the pilot launch 3.5m below, without incident. The trainee pilot then followed the senior pilot, but as he descended the ladder, the launch's rubber fender made light contact with its bottom rungs. This caused the side ropes at the top of the ladder to part. The trainee pilot fell a short distance to the deck of the launch and was grabbed by a crewman who prevented him falling overboard. The ladder fell into the sea.

¹ The International Chamber of Shipping and International Maritime Pilots Association have published: *Shipping Industry Guidance on Pilot Transfer Arrangements for ensuring compliance with SOLAS*. It can be found at: <http://www.ics-shipping.org/docs/default-source/resources/safety-security-and-operations/shipping-industry-guidance-on-pilot-transfer-arrangements.pdf?sfvrsn=6>

Figure 1: Remnants of pilot ladder side ropes



The Lessons

The pilot ladder was 18 months old and was permanently connected by shackles to the deck within a small pilot boarding well. When the remnants of side ropes (Figure 1) were inspected after the accident, the ladder was found to have failed at the point the side ropes passed over the lip of the pilot door frame, and the core of the manila rope was found to have suffered severe degradation. The port pilot ladder was not used as often as the starboard ladder and, unlike the starboard pilot station, the ropes had not been protected from the door frame's sharp edges (Figure 2).



Figure 2: Pilot door frame

The trainee pilot was very lucky not to have been injured or to have fallen into the sea. The use of pilot ladders during pilot transfers is a hazardous activity, and there have been many similar incidents to this in the past. The key safety lessons identified in this and other cases include:

1. Ship's crew must make every effort to ensure that pilot ladders and other boarding arrangements are well maintained and rigged safely; this is particularly important as pilots boarding a vessel cannot check this before stepping onto a ladder.
2. It is important to note that manila rope tends to wear from the inside through self-abrasion, therefore a rotten rope might appear to be in good condition externally.
3. Ship's crew should also ensure that pilot ladders are rigged in accordance with SOLAS requirements and make every effort to protect the ladders' load bearing side ropes from tight bends and sharp edges.
4. Pilots should always closely inspect pilot ladders and their securing arrangements before using them to disembark a vessel.

Assume at Your Peril

Narrative

An inbound tanker loaded with condensate was waiting at the entrance of a buoyed channel for a harbour pilot to embark. The pilot was on board an outbound container ship. It was a calm, clear night with good visibility.

As the tanker waited, the skipper of a tug with a tow 1.3nm to the west of the entrance to the buoyed channel (Figure 1) called the port control by VHF radio and requested permission to cross the pilot embarkation area. The VTSO asked the tug's skipper "can you see the big tanker waiting?" The tug's skipper advised that he could, and the VTSO instructed him to "cross 1nm astern of the tanker." The tanker's master heard part of this radio exchange and assumed that the VTSO was talking to the container ship. He assessed that in order to pass astern of his vessel, the container ship would alter course to port on clearing the channel. The tanker's engine was put to 'dead slow ahead'.

As the container ship neared the end of the buoyed channel, the pilot advised the vessel's master that it was time for him to get off. He also advised the master that the tanker would wait clear of the channel. The container ship's speed was reduced and the pilot disembarked onto a launch. At the time, the tanker was visible and on radar 2.9nm off the container ship's port bow. However, the radar target was not selected as an ARPA target and the tanker was not transmitting on AIS. Once the pilot launch was clear, the container ship's

master increased the vessel's speed. By eye, he estimated that the tanker would pass about 1.5 cables off the container ship's port side.

The tanker's master saw the container ship pass between the last of the channel buoys (Figure 2) and became concerned when it did not alter course to port as he had expected. He called the port control and the following exchanges ensued in rapid succession:

| | |
|-------------------------|--|
| VTSO | <i>Container ship this is port control</i> |
| Container ship (OOW) | <i>Port control this is container ship. Good morning</i> |
| VTSO | <i>Are you clearing to starboard please? We have the tanker there coming to enter the channel...</i> |
| Pilot (on pilot launch) | <i>Container ship, Hard to starboard! Hard to starboard! Hard to starboard!</i> |
| Tanker (master) | <i>Hard to ***** starboard Hard to starboard.</i> |

Twelve seconds later, the container ship's master ordered "OK hard to starboard." He then exclaimed "what's that?" Three seconds later, the container ship and the tanker collided bow to bow (Figure 3), resulting in severe damage (Figure 3 inset) to both vessels.

CASE 15



Figure 1: Radar display on board outbound container ship

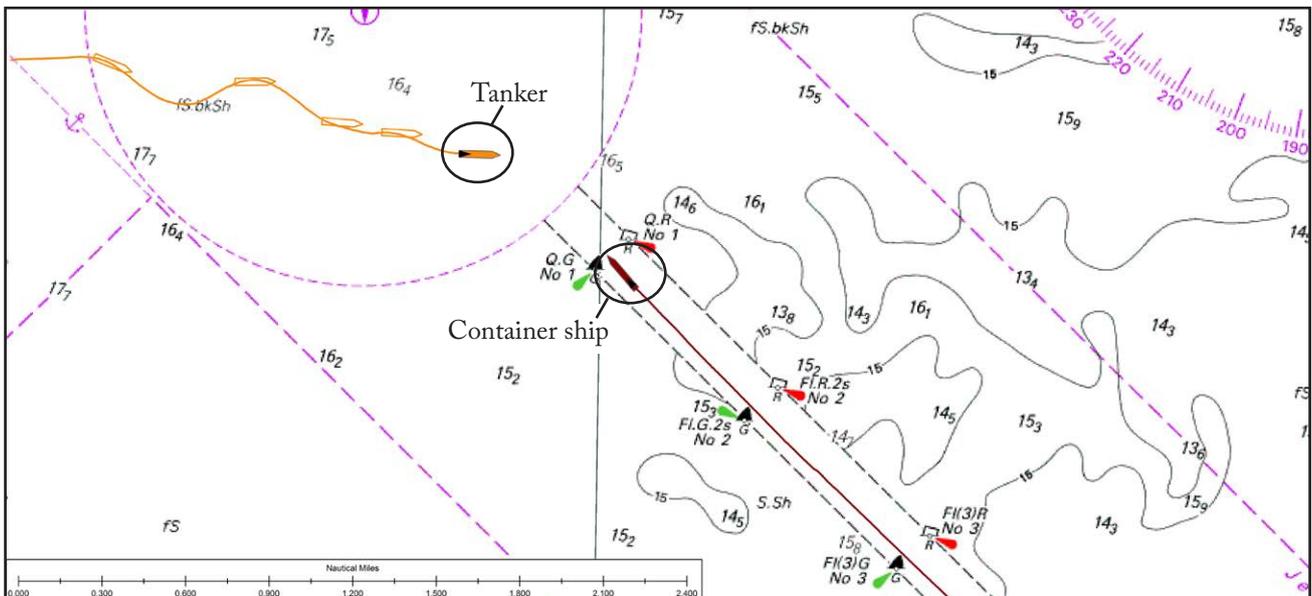


Figure 2: Reconstruction from AIS and VDR data

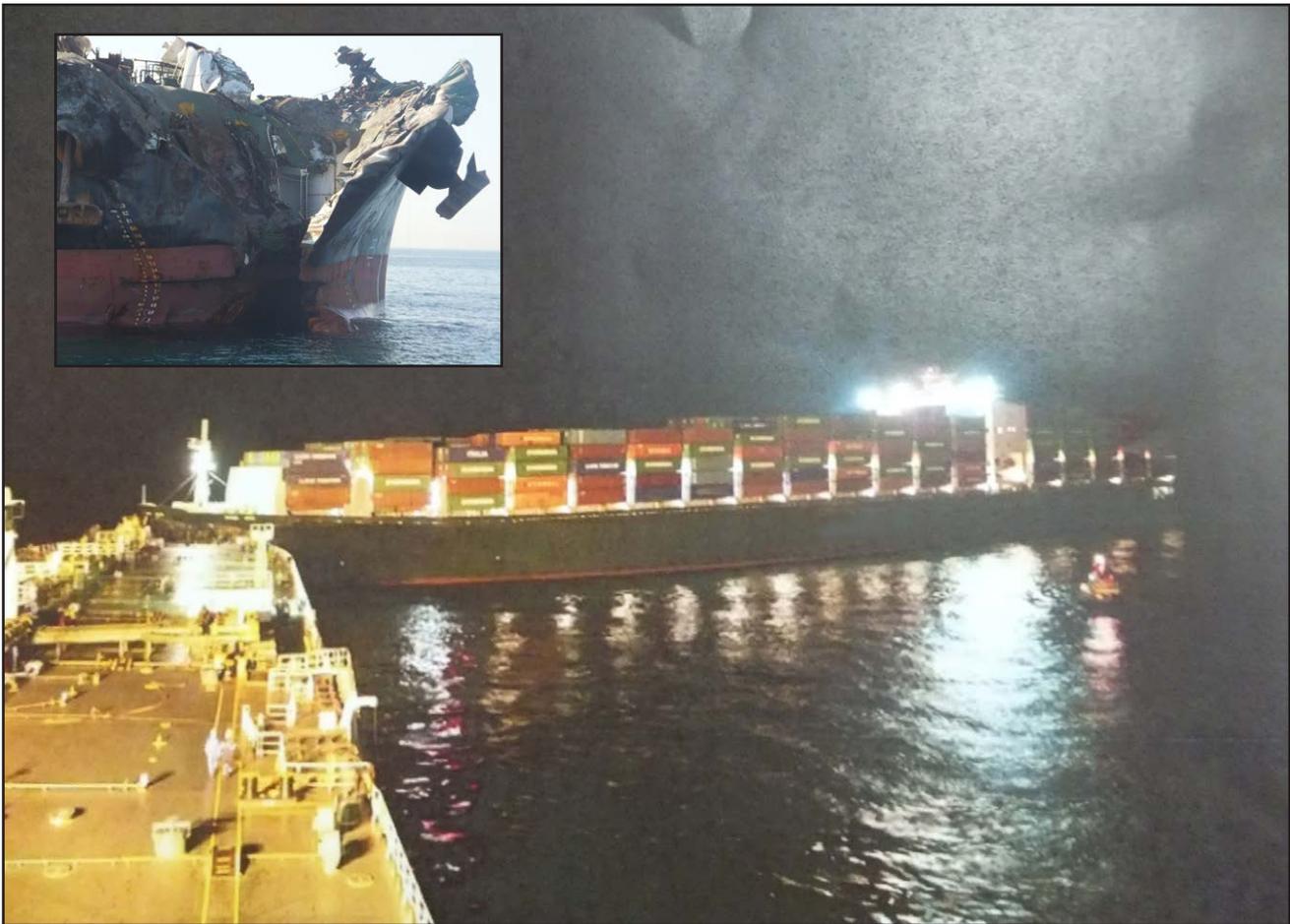


Figure 3: The moment of impact (inset: damage to the tanker)

The Lessons

1. Manoeuvring safely in or near port areas relies to a large extent on good communications between masters, pilots and VTSOs. Discussing intentions resolves ambiguities and ensures that everyone concerned shares the same 'mental model', whereas taking something for granted is fraught with danger. Tell if you know and ask if you don't; assumptions make fools of even the most capable and experienced.
2. A pilot's disembarkation and the ordering of 'full ahead sea speed' are frequently accompanied by a sigh of relief and anticipation of the next port of call. However, although a more relaxed focus is a natural reaction, it can never be justified while other vessels or navigational dangers are in close proximity. Regardless of how straightforward a situation might appear, the need for careful monitoring and a proper lookout is never-ending.
3. Frustration and irritation inevitably result from delays in pilot embarkation and vessel entry. However, slowly creeping closer towards congested or confined areas does little to improve the situation. Very little time is saved, there is every chance of getting in the way and escape options are usually reduced.
4. AIS has certain advantages over ARPA and, except for security reasons or specific exemptions, the system should always be operated on board ships on which it is required to be carried. Otherwise, valuable information – such as vessel names and status, heading and speed – is denied to others.

Total Constructive Loss was Totally Unnecessary

Narrative

Due to an adverse weather forecast, the master of a 129m general cargo vessel that traded between regular ports of call decided to follow the inshore, sheltered route.

Passage planning for the voyage consisted of uploading electronic files from previous voyages onto the vessel's ECS, drawing course lines onto paper charts and checking the tidal information.

The inshore route included several transits of narrow channels between islands and, in some areas, the vessel's course line had been plotted to pass within 0.2nm of the shore. The cross-track limit of deviation on the ECS was set at 0.2nm, but its alarm had been silenced.

When the voyage began the bridge navigational watch alarm system (BNWAS) was not switched on and, as darkness fell, no lookouts were posted by either of the OOWs.

During the evening, the master joined the OOW on the bridge for the transit of the first of the narrow channels, but left before the watch changeover at midnight and went to bed. No night orders were left in relation to the conduct of the vessel through the narrow channels or the use of lookouts.

Before taking his watch, the OOW coming on duty at midnight informed the duty seaman that no bridge lookout was required. Following a brief handover at midnight with the OOW coming off watch, he then settled into the starboard wheelhouse chair close to the radar set (Figure 1). The only noise in the enclosed wheelhouse was the regular sound of the radar watch alarm, which had been set to activate at low volume every 6 minutes. The OOW was able to reset this alarm without leaving his chair.

The OOW had a lot on his mind; the previous evening's phone call home had been emotional and challenging and, as a result, he had consumed a significant quantity of alcohol while in his cabin. Despite the no-alcohol policy in place on board, the vessel had a bonded store, the contents of which were regularly consumed on board by the crew.

At about 0100 a planned alteration of course was missed, but the radar watch alarm sounded a short time later and the OOW brought the vessel back on track towards the entrance to another narrow channel. Over the course of the next hour the OOW made several course alterations to keep the vessel on track using the autopilot, the controls for which could also be reached from his chair.

Just after 0200 a planned alteration of course was missed and the vessel passed the wrong side of a lighted navigation buoy, narrowly avoiding missing the rocks that the buoy was marking (Figure 2). After this, the radar watch alarm sounded and was reset a number of times, but the vessel continued off-course and headed towards land.

At about 0230 the vessel was in close proximity to land when the radar watch alarm sounded again. This time the OOW silenced the alarm, then engaged manual steering and put the helm hard-a-port. The vessel began to swing to port, but grounded on the rocky foreshore with its engine still set to full ahead (Figure 3 and 4).

The master, awoken by the noise of the grounding, soon arrived on the bridge and stopped the engine. The emergency checklist for grounding was not consulted, the general alarm was not sounded and the crew were not mustered.

The coastal state authorities were not informed of the grounding for a further 20 minutes, during which time the master phoned the vessel's owners to discuss the emergency.

The vessel remained aground for the next 2 days, during which time serious damage was caused to its double bottom structure as its

hull pounded on the foreshore in moderate seas, and 25 tonnes of gas oil were spilled into the water.

A major salvage and pollution control operation was undertaken and the vessel was subsequently towed to a local dry dock where, following survey, it was declared a constructive total loss.



Figure 1

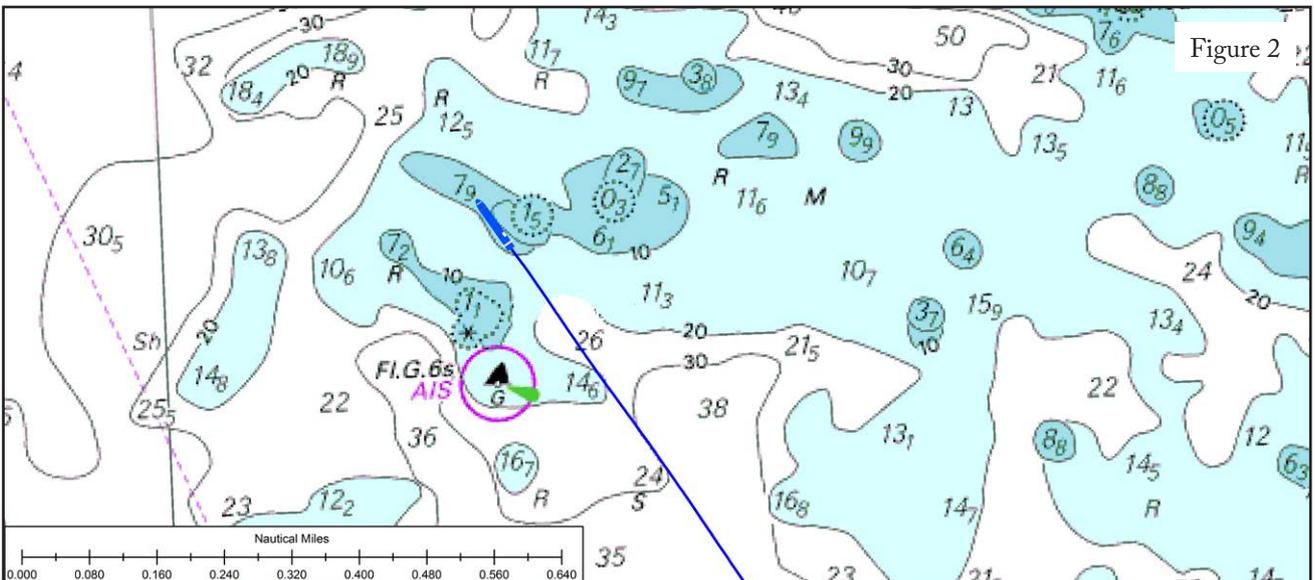
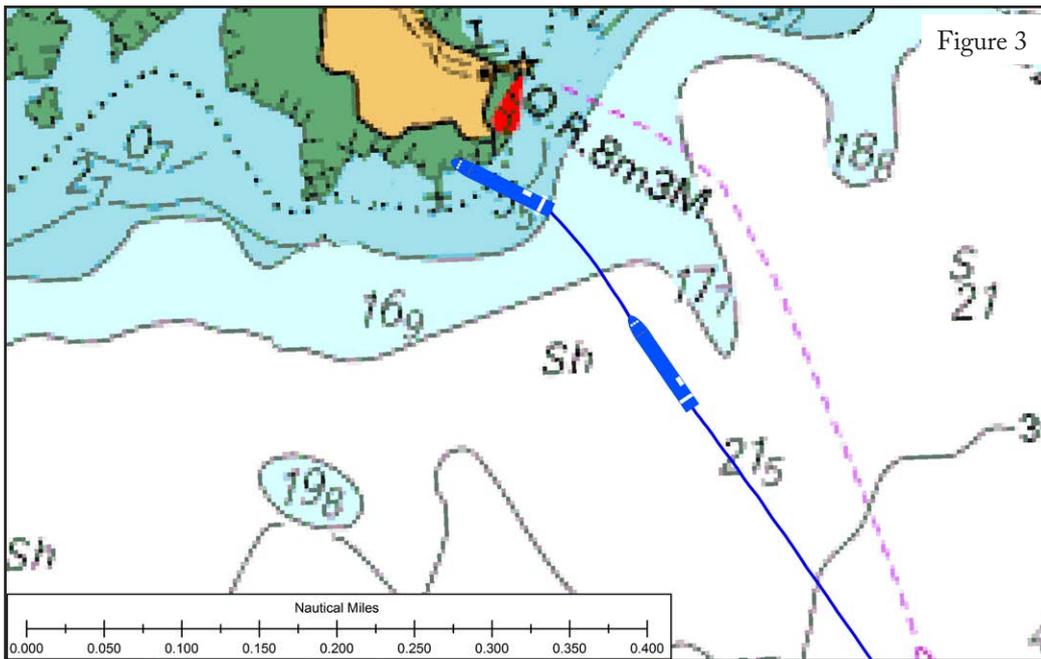


Figure 2



The Lessons

1. Planning a safe passage involves more than simply drawing lines on a chart or uploading files to an electronic chart system. All potential risks should be assessed, and critical areas, which may require special control measures, identified.
2. In order to be effective, alcohol policies need to be backed by audit and testing regimes. In this case a simple audit of the vessel's bonded store would have identified that the no-alcohol policy was not being complied with.
3. This vessel grounded during the hours of darkness and no lookout was posted. Had a lookout been on the bridge, he would have been well placed to prevent the accident and save the ship.
4. Alarms can only be effective when they are properly set up and turned on. The BNWAS was not switched on; had it been operational it is probable that when leaving his chair to reset the alarm, the OOW would have been alerted to the vessel's predicament, which on this occasion might have saved the ship.

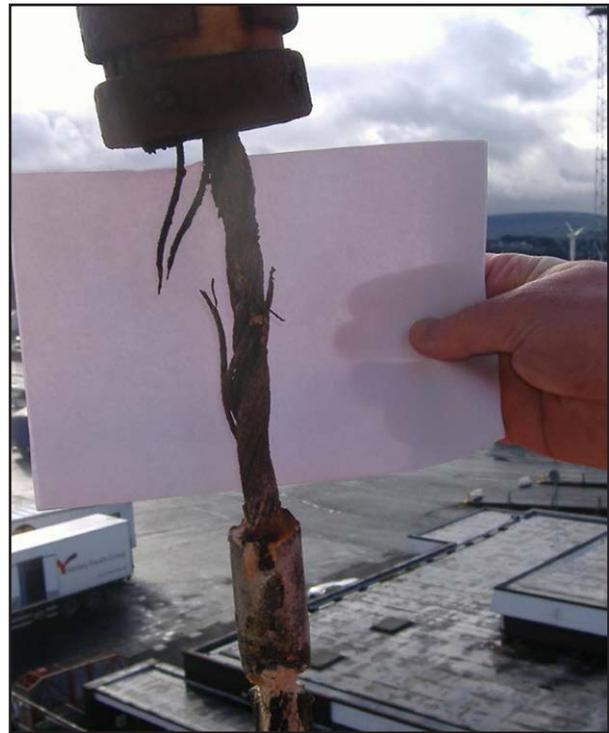
Don't be a Fall Guy

Narrative

During a routine drill alongside, a ferry's starboard FRC was lowered with a coxswain and a crewman on board. As soon as the FRC was in the water, the coxswain attempted to start both outboard engines, leaving the FRC connected to the slackened fall wire as he did so. The starboard engine started but, despite several attempts, the coxswain was unable to start the port engine. As a result, the drill was cut short.

The FRC coxswain checked the fall wire. He then instructed the deck crew to hoist. The FRC was lifted slowly up the ship's side but, as it came level with its stowage, the fall wire started to part. The coxswain immediately shouted to the deck crew to stop the hoisting and for the other crewman in the FRC to get off the boat. As soon as the coxswain and the crewman were clear, the FRC was slewed in to its stowage.

An inspection of the fall wire identified a 15cm section of corrosion at its bottom end. Also, three wire strands had parted (see figure), tearing a thin, black plastic tape that had covered the corroded section. Similar black plastic tape was found wrapped around the bottom 15cm of the port FRC's fall wire. When the tape around the port wire was removed, the wire was discoloured but there was no corrosion.



The fall wires had been fitted on board the ferry for almost 4 years and had been maintained, greased and inspected in accordance with company and onboard instructions throughout. The grease used was black. No issues relating to the condition of the wires had been recorded.

The black tape had probably been on the fall wires since their installation and would have been difficult to see under the black grease. It is evident that, over time, moisture and salt had slowly penetrated under the tape on the starboard fall wire, which caused the wire to corrode, degrade and eventually fail. The discolouration of the port wire indicated a lack of lubrication.

The Lesson

1. Most wire ropes are shipped with their ends seized, often with heavy tape. However, once a wire's end has been terminated to a fitting such as a release hook mechanism, the seizing tape must be removed. Otherwise, the tape will prevent lubrication reaching the wire and hide

any resulting discolouration, corrosion and degradation. Bear in mind that, over time, tape used for seizing tends to mould around a wire and is difficult to see. Therefore, it's worth looking really closely at a wire's ends during inspection.

Part 2 – Fishing Vessels



As a lawyer with Mackinnons in Aberdeen it has been my privilege throughout a career of over 35 years to have acted for many of those involved in the Scottish fishing industry. Our clients are vessel owners, managers, fish salesmen, fishermen and insurers and I have seen first-hand the effort, invention and courage that the fishing industry displays on a daily basis. I often feel that shipping is the Cinderella of all the UK's industries, and that description also applies to the fishing sector. Too often regarded with a sideways glance, the UK fishing industry is a multi-million pound enterprise and with a fleet ranging from single-handed creel boats up to state of the art pelagic trawlers.

My job frequently involves advising on and dealing with the consequences of serious accidents and I have worked alongside the MAIB in investigations since the Branch's inception in 1989. In that time there have been significant steps forward in health and safety, both in theory and in practice, with a much more structured approach now being taken, particularly after the Merchant Shipping & Fishing Vessels (Health & Safety at Work) Regulations 1997 and the regulations which followed it. These regulations formed for the first time a statutory health and safety code setting out what is required by way of risk assessment and other steps to ensure safety.

Accidents, however, keep happening, and often the same kind of accidents. The first major case I was involved with after the MAIB was set up

involved the capsizing of a pair trawler after its gear had snagged. Five men lost their lives, two survived. In this edition of the Digest we read of the capsizing and sinking of a 17 metre stern trawler where three fishermen lost their lives and two were rescued. Both these cases raise issues of fishing vessel stability, issues which, despite the best endeavours of the MAIB in a series of reports over the years, have not been fully resolved in fishing vessel operation.

It does not seem to be for the want of trying, at least on the MAIB's part, but this, and other issues, require more resources and more interest and attention from the relevant regulatory bodies if progress is to be maintained.

Other reports in the Digest have a sadly familiar ring about them. Two involve the hazards of working with moving ropes on deck, one reports the failure to wear a personal flotation device (PFD) while another highlights the importance of ensuring a proper look-out and maintaining a safe navigational watch.

None of these things are novel or unusual hazards and yet accidents continue to occur. I took part in a seminar on health and safety in the offshore wind industry recently and the accident statistics in that sector are quite enlightening. The majority of incidents arose from well-known areas of risk – marine operations, lifting operations, working at heights and operating plant and machinery. The majority of incidents occurred either onshore or on vessels, not on wind turbines themselves.

This suggests to me that the majority of hazards are not unfamiliar and indeed many occur routinely in every day operations.

So why do accidents keep happening?

I do not believe that the marine industries are over-regulated, nor that health and safety has

become over-complicated. Risk assessment, involving the whole crew of a vessel, is a useful and effective exercise if it is carried out in a straightforward and practical way as part of a dynamic process. It is right that proper duties are imposed on those responsible for operating vessels or other enterprises which create hazards to those working in them.

I do think, however, that we have reached a watershed between health and safety on paper and health and safety in practice. The majority of accidents still involve hazards which are either known or foreseeable and often are a result of actions taken by experienced crew with adequate competence and training. We need to reinforce the role of the individual in safe working and the need for awareness of the risks in practice. Risk assessment is an important part of this process and a combination system-based approach and the raising of awareness of individual responsibility should be the way forward.

I started this introduction by commending fishermen and those involved in the fishing industry. I conclude it with a word of praise for the MAIB. Under-resourced at its inception, the Branch has produced much good work and many important reports since it was set up. We may not always see eye to eye, and have to agree to differ on occasions, but there is no denying the Branch's commitment to improving safety. It must be a source of frustration to all in the industry that accidents continue to recur in similar circumstances but that simply highlights the importance of good investigation and the effective communication of the relevant lessons learned. While the fishing industry remains too productive of incidents for the MAIB to investigate and report, things have improved and the work of the MAIB has contributed to that improvement.



KEITH MACRAE
PARTNER, MACKINNON'S, SOLICITORS, ABERDEEN

I am a lawyer specialising in shipping litigation and major casualties and a partner in Mackinnons in Aberdeen. I have been with the firm since 1980 and a Partner since 1983. Most of my work is for vessel owners, managers and insurers and it covers the fishing, offshore support and mobile drilling sectors and general shipping. Over the years I have dealt with most of the major fishing vessel accidents in Scottish waters or involving Scottish vessels. I deal with these cases from the incident itself until the resolution of any legal issues arising. I carry out on site post-accident investigations and deal with any litigation (civil and criminal) and inquiries (Fatal Accident Inquiries, Merchant Shipping Act, etc.) which arise.

Think What's Different – Think What If?

Narrative

A small creel fishing vessel, with a regular crew of two, set out early in the morning to fish for crabs. It was a routine that had been followed for many years. A self-shooting arrangement was used on the vessel to deploy its creels. Normally, one fleet was worked on deck at a time. However, two fleets were worked when moving grounds, as was to be the case on this particular day.

After separately hauling and re-shooting two fleets of creels, two further fleets were then hauled and stowed on deck in preparation for shooting in a new position. After deploying the first of the two fleets and manoeuvring the vessel into position for deploying the second fleet, the skipper instructed the crewman to release the fleet's first weight.

As the creels deployed, the crewman lifted down the upper two tiers of creels from the rows that were stacked four-high. This required him to step across the back rope. The skipper remained in the wheelhouse and monitored progress by glancing aft through the wheelhouse door.

The skipper became temporarily distracted, after which he looked aft and could no longer see the crewman on deck. He immediately left the wheelhouse to check the area aft of the wheelhouse. He noticed that weight was coming onto the buoy line and that the deck was otherwise clear. He then put the buoy line onto the hauler and started to turn the vessel around when he saw the crewman face-down in the water about 50 metres from the vessel.

The skipper quickly manoeuvred the vessel alongside the crewman and recovered him on board through the shooting doorway. Noting that the crewman was not breathing, the skipper transmitted a "Mayday" on VHF radio channel 16, which was acknowledged by the coastguard. He then began cardiopulmonary resuscitation and, after a short while, was assisted by the crews of other fishing vessels who had responded to the emergency. The crewman was then transported by helicopter to a local hospital where, sadly, he was pronounced deceased.

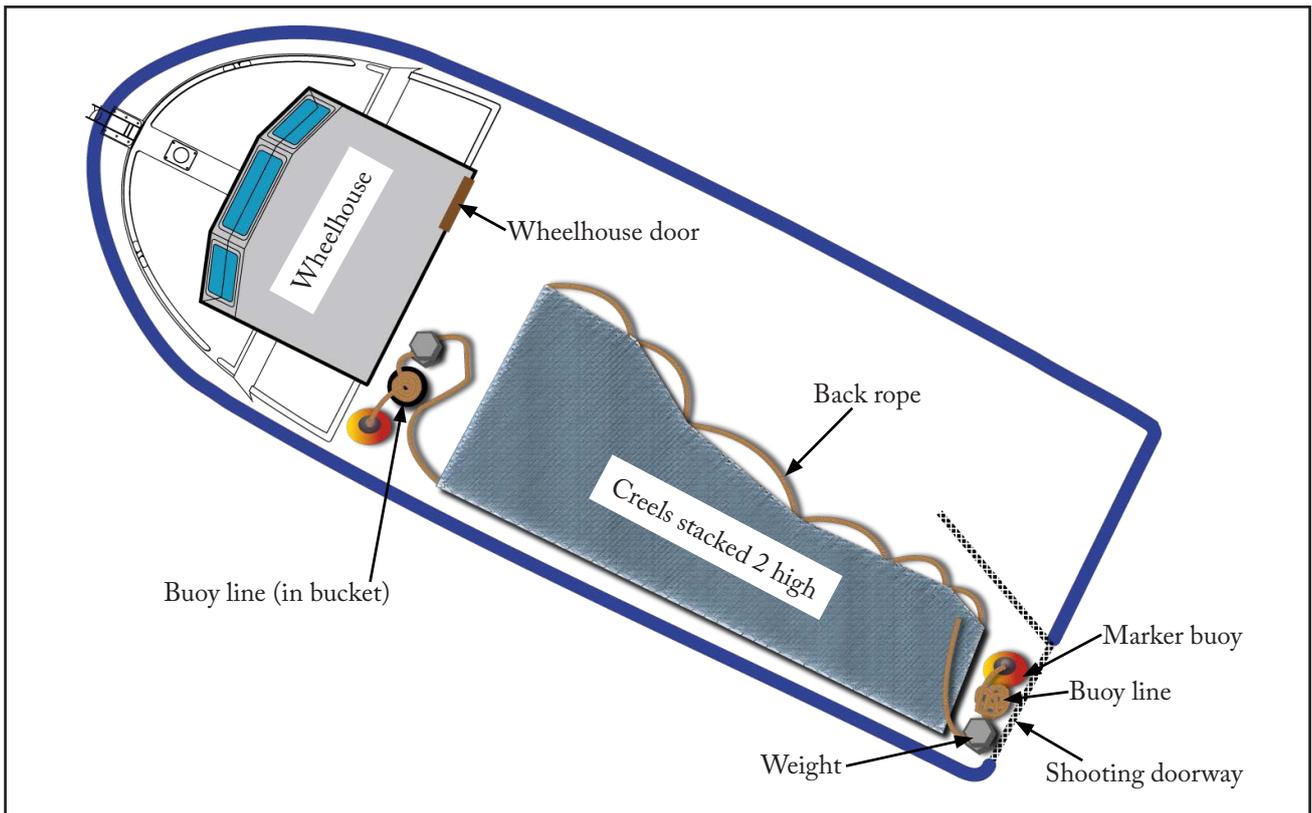


Figure 1: Single fleet storage of creels on deck of fishing vessel

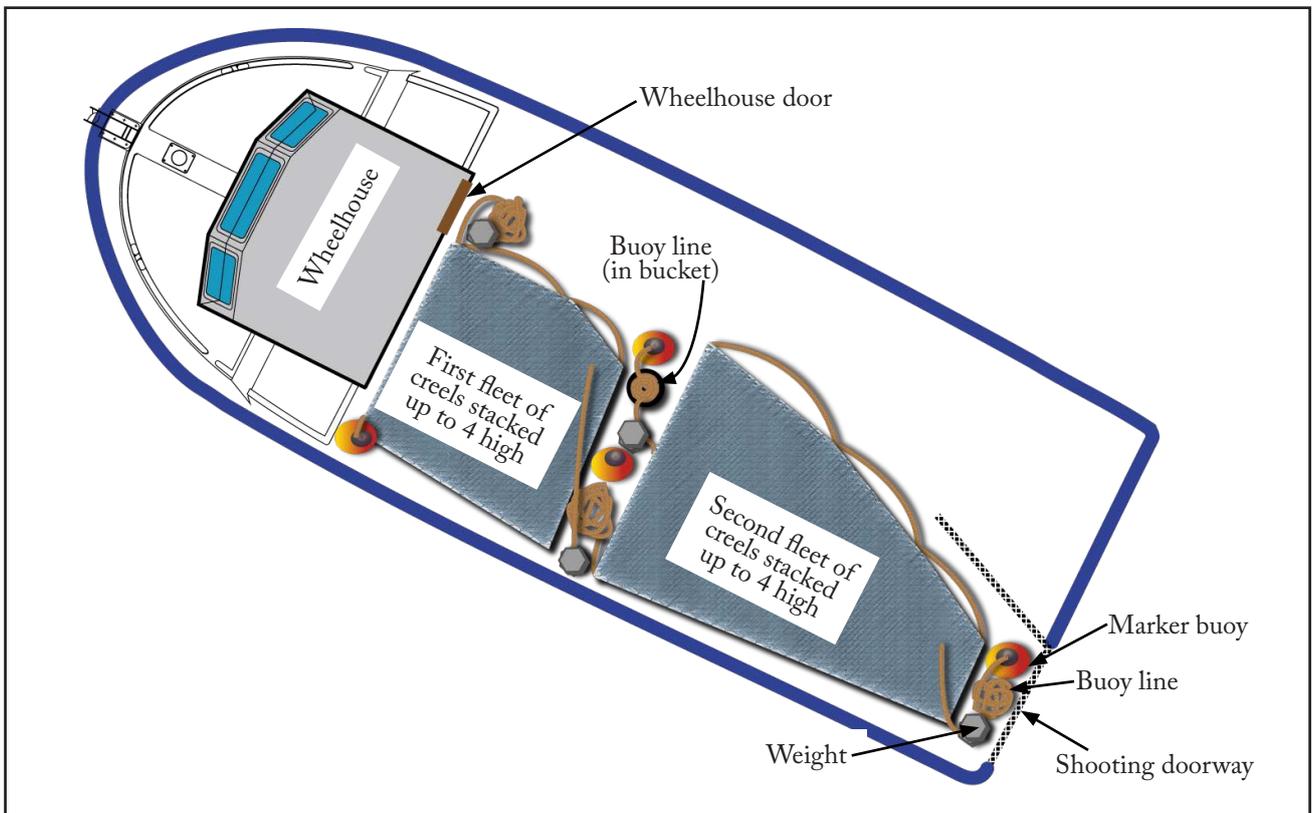


Figure 2: Storage of two fleets of creels on deck of fishing vessel (as on the day of the accident)

The Lessons

1. It was concluded that the crewman's right leg probably became caught in the buoy line at a time when the skipper was distracted in the wheelhouse, and that he was then dragged overboard.

The main safety benefit of a self-shooting arrangement is that it keeps the crew clear of the back rope and therefore reduces the risk of them becoming caught in the running gear. With only one fleet of creels stowed on deck, the creels deployed without need for manual intervention so it was possible for the crewman to stand in a position where he did not have to step across the back rope, or the buoy line, at any stage of the operation (Figure 1).

However, to enable stowage and working of two fleets on deck, creels had to be stacked higher and immediately aft of the wheelhouse. This reduced the amount of free deck space and removed the separation between the crewman and the running gear. Importantly, it also required the crewman to repeatedly step across the back rope to lift down the upper tiers of creels to prevent the stack collapsing and becoming entangled, and to step across the buoy line to release the second marker buoy (Figure 2).

While changes had been made to the system of work to enable the stowage of a second fleet of creels on deck, insufficient changes had been made to the shooting operation to adequately control the consequent additional risks of the crewman becoming entangled in the running gear.

2. The skipper had completed a risk assessment. However, it had neither been written down, nor had it identified adequate control measures to address the additional risks posed when working two fleets of creels. Had a more formal process of risk assessment and review been carried out, the additional risks to the crewman might have been given greater priority and a safer system of work identified.
3. Although PFDs were provided on board, the crewman never wore one, and the skipper only wore one when working the vessel single-handedly. While working on board together, neither of them considered the risk of falling overboard while on deck at sea to be sufficiently high to warrant their wearing a PFD.

While a PFD would not have prevented the crewman from falling overboard, it might well have reduced the time that he was under water, and turned him into an upright position with his airway clear of the water once he had surfaced.

4. The potential need for immediate assistance is particularly important when a lone crew member is left to recover a man overboard from the sea. At the risk of delaying the skipper's immediate rescue effort by a few seconds, it would have been possible for him to transmit a DSC alert while manoeuvring the vessel towards the crewman. This would have notified the coastguard to the emergency and the vessel's position, enabling search and rescue assets to be mobilised immediately.

Catch Fish – Not Waves

Narrative

A 17m stern trawler (Figure 1) broached, capsized and sank about 100 miles off the north-east coast of England while on passage to its fishing grounds in heavy following seas. Two of the crew were rescued about 3 hours later when the body of the skipper was also recovered; the other two crew have not been found.

The vessel, which had a non-watertight shelter aft of the wheelhouse, had left its home port the previous evening. At about 1100 the skipper, who was in the wheelhouse, suddenly shouted down to the crew of four, who were all in their bunks, that they should get up and get out as the vessel was going down.

Two of the crew, wearing only tee shirts and shorts, escaped out of the accommodation and over the side rails as the vessel capsized. They then managed to climb onto the upturned hull from where they saw the skipper and another crewman, unresponsive, in the water.

The vessel's EPIRB floated free and transmitted a distress signal, which was received at the UK's search and rescue satellite receiving centre. However, the EPIRB was not fitted with an integral positioning capability and so the distress signal only gave the vessel's name, but not its position. The correct position could not be confirmed until a number of satellites had passed within range of the beacon and triangulated its transmission. This took about 50 minutes.

The two crewmen remained on the upturned hull for about 30 minutes until the vessel sank under them. Two lifebuoys floated to the surface and the men used these to keep themselves afloat; neither of the vessel's two liferafts surfaced.



The coastguard, having received information about the EPIRB distress, issued a "Mayday Relay" broadcast and, once they had obtained an accurate position, tasked a rescue helicopter, which arrived on scene 3 hours after the capsizing.

The two crewmen were rescued and, although suffering from hypothermia, made a full recovery. The skipper was also located and winched into the helicopter, but despite being given extended lifesaving treatment he was pronounced dead on arrival at hospital. The bodies of the remaining two crewmen have not been found.

Wreck survey

An underwater survey of the wreck found that the vessel was upright on the seabed and intact with no visible signs of hull damage. Some of its freeing ports were found jammed and others were observed to have been modified and reduced in size.

The survey also found that the hydrostatic releases on both liferaft canisters had activated correctly, but their painters led into the shelter deck (Figure 2). It was concluded that once released from their cradles, the liferaft canisters had been pulled, by in-rushing water, into the vessel's shelter deck area during the capsizing, from where they were unable to float free.



Conclusions

It is probable that the vessel broached and capsized in high following seas. Its stability, which would have reduced while the vessel was surf riding in these seas, was probably further reduced by entrapped water on deck. During the investigation it was calculated that the vessel would have become unstable when a foot of water covered its deck.

The vessel was 40 years old and was reported to have had good seakeeping qualities, yet its records showed a history of marginal stability compliance, and no inclining test had been completed in the previous 10 years.

The Lessons

1. Had the EPIRB been fitted with an integral GNSS receiver the rescue services would have arrived sooner.
2. The water trapped on deck had an adverse effect on stability. Had the freeing ports been of the correct size and functioning as designed this water would have been able to drain more quickly.
3. Had the shelter been made watertight the amount of water trapped on deck would have been significantly reduced.
4. Quartering seas create a broaching risk for well-found vessels, and can be exceptionally hazardous to vessels with marginal stability.

A Nasty Bight

Narrative

A fine day for catching crabs almost ended in tragedy for the five man crew of an under 15m potter. During the morning, the skipper had decided to lift his pots and shoot them again in a different area. As the pots were hauled, the back rope connecting them dropped below the slave hauler (Figure 1), making it difficult for the crewman working the hauler to find a clear area of deck on which to stand.

While the crew were hauling the third string of pots, one of the pots became caught on an obstruction on the seabed. To try and free the snagged pot, the skipper told the crewman working the slave hauler to haul hard on the back rope. The crewman did so, but the back rope suddenly and unexpectedly popped out of the slave hauler and quickly ran out through a block suspended on a davit over the side.

The hauler operator was standing on the back rope and a bight of the rope quickly tightened around his ankle. The crewman was then pulled off his feet towards the davit block. His movement was stopped only by his ankle coming hard against the davit block, which prevented the rope from running out any further. The crewman was upside down with the full weight of the string of pots pulling his ankle against the davit block, inflicting excruciating pain.

After the crewman was cut free, the skipper decided that the ankle injury warranted urgent medical attention. The crewman was landed in the nearest port and was taken to hospital by taxi. The fisherman's leg wasn't broken but it had suffered severe soft tissue damage (Figure 2) and took several weeks to heal. Neither the vessel's skipper nor its owner reported the accident to the MAIB.

The Lessons

1. Each year, a number of fishermen are injured or even killed as a result of their feet or legs becoming trapped in bights of rope. Most of these accidents could have been avoided through good husbandry and safe working practices. In this case, having to stand on or very close to the back rope while it was being worked was an obvious hazard that could have easily been mitigated by the use of 'bins' or a similar arrangement to separate the rope from the crewmen.
2. The likelihood of back ropes jumping out of pot haulers has been reduced on board many vessels through technical fixes. One such fix is to use a roller on the rail instead of a swinging davit and to position the hauler horizontally. More information on potting haulers and rollers can be found at: <http://nffo.org.uk/uploads/attachment/101/review-of-pot-rollers-and-haulers-findings.pdf>
3. The reporting of accidents and near misses is not only a mandatory requirement for commercially operated vessels, but it is also essential if lessons are to be learned and similar accidents are to be prevented in the future. Reporting accidents is not an administrative burden that will get you into trouble, it is a means of helping to improve safety at sea.

CASE 20



Figure 1



Figure 2

Who's Catching Who?

Narrative

Four kayakers were out angling one evening within 0.5nm of the coast. The weather was good with a gentle breeze, calm sea and good visibility. But it was dark. The kayaks were anchored and were each fitted with an all-round white light on a 1m pole at the stern. The kayakers were also each wearing a head torch, a drysuit, and a buoyancy aid and were each carrying a VHF radio in a waterproof pouch.

A small fishing vessel was trawling for sole on the same evening. The singled-handed skipper was aware of a group of kayakers, which he presumed were angling, and he passed them on

two occasions. The kayaks did not appear on his radar, but he did maintain a listening watch on VHF channels 16 and 12, the latter being the local VTS channel.

One of the kayakers became aware of a fishing vessel heading towards him. It appeared to alter course and passed close by. Suddenly, his anchor became snagged by the fishing vessel's trawl gear, and he and his kayak were dragged along. Fortunately, he was able to slip his anchor and to then paddle back to his colleagues. The whole party then returned to the shore.

The Lessons

1. Single-handed fishing, especially at night, poses increased risks to the fisherman as well as other water users. While hauling or processing catch the fisherman will inevitably be distracted from keeping a continuous visual lookout. Radar will not warn of kayaks or other small objects floating in the water. Additional caution is therefore required to ensure that a proper lookout and a safe navigational watch are maintained. Don't take unnecessary risks.
2. Sea angling from a kayak at night has become more popular in recent years, but it does require extra precautions and care for it to be conducted safely. Fortunately, these kayakers were well equipped, travelling in a group, carrying VHF radios and wearing the right clothing.
3. Although wearing head torches and having each of their kayaks fitted with an all-round white light on a pole, they were still difficult to see against the background lights of the shore. Keeping a good lookout and being able to move at short notice are sensible precautions given the difficulty of being seen.
4. Being able to slip the anchor from the kayak quickly was an important aspect in ensuring this accident did not have much worse consequences. Although you may be able to avoid a collision with a fishing vessel itself, its towed gear presents a significant hazard and must also be taken into account.

Unplanned Winter Swims – Are You Prepared?

Narrative

Early one morning, a skipper and his deckhand left harbour in their small potter (see figure) and motored along the shoreline towards their creels. It was winter, the weather was fine and the sea state was calm. About 30 minutes later, the boat developed a sudden list to port and then started sinking rapidly by the stern. Both crewmen quickly scrambled onto the front of the boat's cuddy as it turned vertical with the stern submerged. Neither of them was wearing a PFD and they had no time to collect one from the lifejacket stowage in the cuddy or make a "Mayday" call on the VHF radio. However, the skipper was carrying a PLB and he was able to activate this before the boat sank. Both men managed to remove their oil skins and boots before they entered the water.

The fishermen immediately felt the effects of the cold water, but managed to swim to a nearby marker buoy and cling onto it. The skipper, who was a strong swimmer, estimated that the shore was within reach and decided to try and swim there to get help. Before setting off he gave the PLB to his crewman.

The distress signal from the PLB had been received by the coastguard ashore and the location of the crewman was quickly established. In response, the coastguard tasked

four local lifeboats, a coast rescue team and a helicopter to search the area. In the meantime, the crew of another small fishing boat that was working in the area saw what they considered to be an unusual object in the water, and decided to investigate. As the boat approached, its crew quickly realised that the object was in fact a very cold and distressed fisherman desperately clinging onto a marking buoy.

Having been recovered from the water, the distressed crewman told his rescuers that his skipper had attempted to swim for the shore. The fishing boat's skipper alerted the coastguard to the situation by VHF radio before landing the casualty ashore. Having transferred the casualty to a waiting ambulance the fishing boat returned to sea and joined the search for the missing skipper.

Fortunately, the skipper had managed to reach the shore but, without any means of raising the alarm, he had taken shelter in a disused lighthouse. When he was eventually found by the crew of one of the lifeboats that was searching for him, he was perilously cold and was subsequently airlifted to hospital. Both men were treated for hypothermia and released from hospital soon after the accident.

Figure: Photograph of the potter taken prior to the accident



The Lessons

1. Both fishermen were extremely fortunate not to have drowned after entering the water; the skipper only just made it ashore and the crewman holding onto the buoy was close to giving up. The potter was equipped with three PFDs, two of which were compact, auto-inflation lifejackets specifically designed for use while working on deck. Had they been worn, the lifejackets would have provided the crew with vital additional buoyancy as they waited for help in the cold water.
2. This case clearly demonstrates the need to expect the unexpected and to be properly prepared for every eventuality. This means always wearing a PFD when working on deck at sea; no matter how accessible the lifejacket might appear, there simply might not be time to grab one in an emergency.
3. Carrying a PLB could save your life. The activation of one will alert the coastguard to a distress situation, identify the casualty and provide a location. The PLB carried by the skipper in this case had not been registered and therefore the amount of information available to the coastguard was limited. It is vital that electronic safety beacons, such as PLBs, are registered with the coastguard as this will ensure that the emergency service has quick and easy access to crucial information and key points of contact. This is very important as the coastguard can contact family and friends to establish how many people are on board, working routines etc.

Part 2 – Recreational Craft



There are always lessons to be learned from the MAIB reports. And one lesson that I pick up from them is that time spent in preparation will pay dividends. Or rather if we prepare properly we reduce the chance of anything untoward happening.

Certainly when things go wrong for me it is when I haven't prepared properly.

And part of preparation is checking. Checking everything.

Take lifejackets – lifejackets and man overboard retrieval feature highly in my talks to sailing clubs, as many will know – have you ever taken the time to discover exactly what's inside, to understand it fully? I often look at people's lifejackets and every time no matter how experienced and responsible the owner, I find something amiss. No, that's not true, once, just once I found a jacket that was absolutely spot on. Bladder in good condition, harness and straps perfect, no chafe or wear, retro-reflective strips in place, sprayhood fine, light in date and working, cylinder clean, no hole in the end and screwed in tight, UML firing head in date. I pronounced it excellent. The owner said, "It should be, I only bought it this morning!" The key of course is to remember to service one's lifejacket every year.

DUNCAN WELLS

Duncan Wells is an RYA instructor, Principal of Westview Sailing, Author of Stress-Free Sailing and the soon to be published Stress-Free Motorboating, creator of MOB Lifesavers and writes for the yachting magazines.

That way it is likely to deploy correctly if we ever need it. Look after your safety equipment and it will look after you, is what I say.

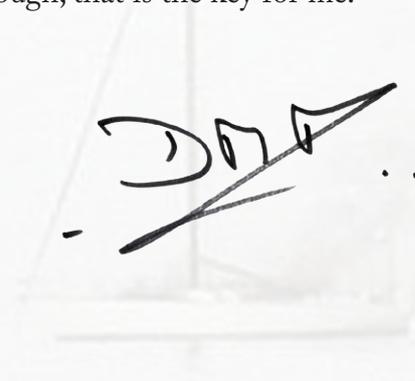
You see, a lifejacket is very important to me. I tried breathing under water, once, and it didn't work. Added to which I am of a certain age and I have lived very well and there is every chance that some organ vital to life or thought, may go on the blink for a moment and I might find myself in the drink. I will need the support of a lifejacket if I am unconscious.

Then there is the question of retrieving the man back onboard – me possibly – do we have a plan?

I have spent a great deal of time working out how to get an incapacitated man back on board a yacht, a motorboat, a barge and I have an answer. There are many answers of course and each boat will present us with a different set of obstacles to overcome when retrieving a man. Have you worked out a strategy for how you would do it on your boat? Have you prepared?

By the way we should not be lulled into a false sense of security by the fact that we are wearing a lifejacket or a lifeline, we need to be aware of what the boat is doing. A lifejacket is no substitute for hanging on, tight. Well, I don't need to tell you that, you know that.

Preparation, though, that is the key for me.





Ocean Passage – Ready or Not?

Narrative

A 12-metre yacht with a crew of four flooded and then capsized in adverse weather while on ocean passage. An alert transmitted from the skipper's personal locator beacon triggered a major search for the yacht, the upturned hull of which was eventually located with its keel

detached and its liferaft still on board. With no persons found, the search was terminated. The yacht was not recovered.

The causes of the accident remain a matter of some speculation. However, it was concluded that the yacht had capsized and inverted following a detachment of its keel.

The Lessons

1. A possible cause of the keel detachment was a weakening of the yacht's structure where the keel was attached to the hull, through a combined effect of previous groundings and subsequent repairs. Detachment of a hull from its inner lining, which may not be visually apparent, is possible in yachts where a GRP hull and lining are bonded together. There is therefore a need for regular and routine structural inspection by a suitably competent person, particularly with longer and harder yacht usage, following any grounding, and prior to embarking on an ocean passage.
2. An ocean passage requires comprehensive risk assessment and contingency planning. A compromise needs to be made between planning a route to pick up favourable winds for a speedier passage, and a route to avoid particularly adverse weather at the expense of a slower passage requiring additional port calls. Weather routing, vessel tracking and frequent communications from a shore-based support cell can significantly reduce the risks.
3. Operators and crews need to be aware of the danger of keel detachment, and have preventive measures in place to reduce the risk. Such measures should include regular inspection of the keel attachment area and checking of keel bolts, and practised documented actions to take in the event of flooding, including reducing the load on the keel and preparing for the yacht capsizing and inverting.
4. Search and rescue (SAR) mid-ocean is hampered both by the time it takes fixed-wing search aircraft to arrive and their ability to assist when on scene. Consideration therefore needs to be given as to how the alarm will be raised, both by the quickest means and with an accurate position. The wearing of a PLB provides additional assurance that the alarm can be raised if it has not been possible to deploy a yacht's EPIRB.
5. In view of the time that is likely to pass before SAR assets arrive on scene, an ability to board a liferaft will be key to survival. In small craft, a compromise needs to be made between positioning a liferaft so that it can deploy automatically in the event of an emergency, and the risk of it deploying accidentally in heavy weather. As demonstrated in this accident, a further consideration should be to ensure its availability in the event of a sudden capsize.

Tragic Speedboat Ride

Narrative

A 5m speedboat was launched at a public slipway with the intention of taking a short trip in the bay. The experienced speedboat driver had three children with him. The weather was overcast and the wind was forecast to be force 4-5 with 1m high significant waves, but at the time of launching there were no white horses visible outside the harbour. The four occupants were wearing wetsuits and buoyancy aids.

The speedboat was motored slowly out of the harbour and was travelling in convoy with two jet skis. Once clear of the harbour, all three craft increased speed, the driver of the speedboat applying almost full throttle to get the boat up onto the plane.

Shortly afterwards, the speedboat hit a large unexpected wave and the boat capsized, initially settling upside down. Three of the occupants managed to get clear, but the boat's

stern then sank under the weight of the outboard engine, leaving the bow protruding out of the water. It was apparent that one of the children was somehow caught on the boat under water.

The jet ski riders, who had quickly arrived on scene, and the others in the water tried repeatedly to swim down and release the trapped child, but they were unsuccessful. The emergency services were alerted by a member of the public and the local lifeboat was paged.

Just as one of the jet ski riders arrived back ashore to raise the alarm, the lifeboat was launched. Once on scene, it lifted the speedboat by the bow, enabling the trapped child to be released. First-aid was commenced immediately, and the child was transferred quickly to a waiting ambulance ashore, but sadly never recovered consciousness.



The Lessons

1. One of the straps of the buoyancy aid worn by the casualty was found to have become caught on an aft mooring cleat of the speedboat (see figure). The buoyancy aid was too big for the child and this increased the risk of it becoming snagged. Buoyancy aids and lifejackets are important items of safety equipment, but they must be a close fit to ensure that they are able to function correctly and minimise an opportunity to become caught.
2. The speedboat was constructed prior to the introduction of the Recreational Craft Directive in 1996. Leisure craft since then have had to meet more stringent safety standards, one of which is that an open boat under 6m in length will remain afloat when swamped. This requirement would necessitate sealed buoyancy in the hull to support the weight of the outboard engine, preventing the boat sinking in the manner that occurred in this accident. When buying older or second-hand leisure craft, make sure you are aware of any shortcomings or seek professional advice if not.
3. It was fortunate that the accident occurred close to a harbour and was seen by somebody ashore so that the lifeboat could be alerted quickly. If a waterproof VHF radio had been carried by one of the party, it would have enabled the coastguard to be contacted immediately. It would also have made clarification of what had happened and how many persons were involved, easier.
4. Before going to sea, make sure you have properly assessed the weather, tides and likely sea conditions so that you can take the necessary precautions. Maritime forecasts are readily available on the internet and often, as was the case here, posted by slipways or on harbourmasters' noticeboards. Beware of placing too much reliance on what the sea conditions look like from ashore as this can be deceptive.

A Case of Bad Gas

Narrative

A family group comprising four adults and two children boarded a motor cruiser for a summer's day on the river. Before setting off, the boat needed petrol, so it was moved to a fuelling pontoon where one of the adults put the fuelling nozzle into one of two flush deck fittings on the boat's starboard side (Figure 1). After a few minutes of pumping, the adult, who had not been on the boat before, realised that he had been filling the wrong tank. About 75 litres of fuel was now in the waste water tank. A member of the marina staff who saw what had happened advised that the boat be moved to a nearby waste reception point where the waste tank could be emptied. He also suggested that the waste tank be filled with detergent and water.

The marina staff's advice was ignored and the family group set off on their journey. The boat left the marina and motored along the river. The boat's owner was at the helm, with the rest of the group either sitting or standing in the stern cockpit. As the boat's speed was reduced on approaching a lock, both of its engines stalled. When the driver attempted to restart the engines there was a loud explosion, the force of which threw one of the adults into the



water. Flames also engulfed the vessel's stern, but these were quickly suppressed following the automatic operation of a fire extinguishing system in the engine bay. All bar one of the boat's remaining occupants jumped into the water. The family group were taken to hospital, where they were treated for burns of varying degrees and broken bones. The motor cruiser was badly damaged beyond economical repair (Figure 2).

The explosion was probably caused by petrol vapour from the waste tank that vented directly in to the engine bay (Figure 3) instead of outside of the boat. The vapour was sucked into the engines' air intakes, causing the engines to stall. The vapour was then ignited by the activation of the electrical starter system when the driver tried to restart the engines.





Figure 3

The Lessons

1. Petrol is a volatile liquid that quickly evaporates in temperate conditions. Its vapour, when mixed with air, forms a highly explosive mixture that is easily ignited. If petrol is stowed anywhere other than in properly vented, purpose made tanks, or in approved containers, it is potentially a killer that can strike at any time.
2. On a boat, most people like to chip in and lend a hand. For 99% of the time this is helpful, and they can be left to their own devices. However, there are some tasks that require familiarity with a boat and its equipment. These should not be undertaken by others without thorough instruction and oversight.
3. It's natural to look forward to a day on the water. However, if something is not as it should be, opting to err on the side of caution and taking time to sort things out might not be a popular decision, but it's possibly the only sensible one.
4. Waste water tanks are designed to take only waste water. Nonetheless, the vapours produced can be unpleasant, or even toxic. Therefore, they should vent outboard, not into the engine bay or anywhere else inside a hull.
5. Hopefully, fixed fire extinguishing systems are never needed. When they are, they are lifesavers, so it's always worth ensuring they are properly maintained so that they will work when you need them.

INVESTIGATIONS STARTED IN THE PERIOD 1/03/16 TO 31/08/16

| Date of Occurrence | Name of Vessel | Type of Vessel | Flag | Size | Type of Occurrence |
|--------------------|--|--|---------------------------------|-----------------------|--|
| 09/03/2016 | <i>Saint Christophe 1</i> | Fishing vessel Trawler Other | France | 141 gt | Grounding |
| 01/04/2016 | <i>CV21</i> | Recreational craft Sailing boat (aux engine) | UK | 49.6 gt | Occupational accident (1 fatality) |
| 06/04/2016 | <i>Fredwood</i> | Fishing vessel Dredger | UK | 45.2 gt | Foundering |
| 09/04/2016 | <i>Louisa</i> | Fishing vessel Potter | UK | 32 gt | Foundering (3 fatalities) |
| 18/04/2016 | <i>Apollo</i> | Fishing vessel Trawler Stern | UK | 246 gt | Occupational accident (1 fatality) |
| 28/04/2016 | <i>Harvester</i> | Fishing vessel Potter | UK | 20.7 gt | Grounding (2 fatalities) |
| 11/05/2016 | <i>Johanna C</i> | Cargo vessel Solid cargo General cargo | UK | 9,530 gt | Occupational accident (1 fatality) |
| 13/05/2016 | <i>Uriah Heep</i> | Passenger ship Only passenger Port or internal waters | UK | 13.6 gt | Contact with fixed object |
| 15/05/2016 | <i>Surprise</i> | Passenger ship Only passenger Port or internal waters | | 75 gt | Grounding |
| 19/05/2016 | <i>Peggotty / Petunia Seaways</i> | Recreational craft Motorboat Passenger ship Passenger and ro-ro cargo | UK Denmark | 23 gt 32,523 gt | Collision |
| 09/06/2016 | <i>Love for Lydia</i> | Recreational craft Motorboat | UK | 1 gt | Loss of containment (2 fatalities) |
| 09/09/2016 | <i>Our Sarah Jane</i> | Fishing vessel Multipurpose | UK | 5.2 gt | Occupational accident (1 fatality) |
| 23/06/2016 | <i>King Challenger</i> | Fishing vessel Trawler Beam | UK | 192 gt | Occupational accident (1 fatality) |
| 10/07/2016 | <i>Royal Iris</i> | Passenger ship Only passenger Port or internal waters | UK | 464 gt | Grounding |
| 19/07/2016 | <i>Osprey / Osprey II</i> | Recreational craft Motorboat Recreational craft Motorboat | UK UK | 0.5 gt 0.5 gt | Collision |
| 03/08/2016 | <i>Sea Harvester</i> | Fishing vessel Multipurpose | UK | 73 gt | Occupational accident |
| 08/08/2016 | <i>Transocean Winner / Alp Forward</i> | Service ship Floating platform Service ship Tug (Towing/Pushing) | Marshall Islands Netherlands | 17,580 gt 2,789 gt | Loss of containment Loss of containment |
| 16/08/2016 | <i>Ardent II</i> | Fishing vessel Trawler Stern | UK | 251 gt | Fire |

Reports issued in 2016

St Helen

Collapse of a mezzanine deck on board a ro-ro passenger ferry at Fishbourne Ferry Terminal, Isle of Wight on 18 July 2014

[Report 1/2016](#)

Published 4 February

Vector 40R

Contact by a powerboat with a navigation buoy in Southampton Water on 13 May 2015

[Report 2/2016](#)

Published 24 February

Oldenburg

Fatality of shore worker while disembarking from a passenger vessel in Ilfracombe Harbour on 3 August 2015

[Report 3/2016](#)

Published 25 February

Good Intent/Silver Dee

Collision between fishing vessels resulting in the foundering of *Silver Dee* in the Irish Sea on 29 July 2015

[Report 4/2016](#)

Published 9 March

Kairos

Foundering of a fishing vessel while 70 nautical miles west of the Isles of Scilly on 18 May 2015

[Report 5/2016](#)

Published 9 March

Hoegh Osaka

Listing, flooding and grounding of a pure car and truck carrier on Bramble Bank, The Solent on 3 January 2015

[Report 6/2016](#)

Published 17 March

Karinya

Fire and foundering of a fishing vessel in the Moray Firth, 4 October 2015

[Report 7/2016](#)

Published 14 April

Cemfjord

Capsize and sinking of a cement carrier in the Pentland Firth with the loss of all eight crew on 2 and 3 January 2015

[Report 8/2016](#)

Published 21 April

Pacific Dawn

Drowning of a passenger in a swimming pool on board a cruise ship, while crossing the Coral Sea, South Pacific Ocean on 9 November 2015

[Report 9/2016](#)

Published 5 May

Asterix

Girting and capsize of a mooring launch at Fawley Marine Terminal, Southampton on 30 March 2015

[Report 10/2016](#)

Published 12 May

Carol Anne

Collapse of a crane on board a workboat, resulting in one fatality on Loch Spelve, Isle of Mull on 30 April 2015

[Report 11/2016](#)

Published 9 June

Hamburg

Grounding of a cruise ship in the Sound of Mull on 11 May 2015

[Report 12/2016](#)

Published 16 June

Enterprise

Fatal man overboard from a fishing trawler, north of Dogger Bank in the North Sea on 9 July 2015

[Report 13/2016](#)

Published 23 June

St Apollo

Grounding and flooding of fishing vessel in Inninmore Bay, Sound of Mull on 24 August 2015

[Report 14/2016](#)

Published 30 June

JMT

Capsize and foundering of a fishing vessel, resulting in two fatalities, 3.8nm off Rame Head, English Channel on 9 July 2015

[Report 15/2016](#)

Published 7 July

Majestic (LK678)

Foundering of a fishing vessel, 5 nautical miles off Yell, Shetland on 21 January 2015

[Report 16/2016](#)

Published 27 July

Arco Avon

Fire in the engine room on the suction dredger *Arco Avon* off Great Yarmouth resulting in one fatality on 18 August 2015

[Report 17/2016](#)

Published 1 September

Safety Bulletins issued during the period 01/03/16 to 31/08/16

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY BULLETIN

SB2/2016

August 2016

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

Regulation 5:

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

Regulation 16(1):

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

Press Enquiries:

01932 440015

Out of hours:

020 7944 4292

Public Enquiries:

0300 330 3000

NOTE

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

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**Carbon monoxide poisoning on board the
Doral 250 SE motor cruiser
Love for Lydia
at Wroxham on the Norfolk Broads
resulting in two fatalities
between 6 and 9 June 2016**



Figure 1: Boat alongside a marina following the accident (canopy as found)

MAIB SAFETY BULLETIN 2/2016

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.

The Marine Accident Investigation Branch is carrying out an investigation into an accident that occurred on board a Doral 250 SE motor cruiser. Two people and their dog died when they suffered carbon monoxide poisoning.

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: 01932 440015; Out of hours: 020 7944 4292

Public Enquiries: 0300 330 3000

BACKGROUND

A summer holiday on the Norfolk Broads on board a 15-year-old Doral 250 SE ended tragically when a couple and their dog were killed by carbon monoxide. At the time of the accident the boat was moored at a quiet river island location.

INITIAL FINDINGS

The motor cruiser's 5.7 litre petrol-driven inboard engine had been left running at 3000rpm while it was moored alongside, probably to charge the batteries. A slight wind blowing from the stern caused exhaust gas emitting from below the aft transom to enter the canopy covering the aft deck (**Figure 1**) from where it spread down into the accommodation area forward. During in-situ tests with the engine running the concentration of carbon monoxide from the wet exhaust (**Figure 2**), reached high levels in the accommodation in less than 3 minutes. The accommodation area was not ventilated and the couple and their dog were overcome. No carbon monoxide alarms were fitted.



Figure 2: Wet exhaust at boat's stern

SAFETY LESSONS

1. Carbon monoxide is a by-product of combustion appliances fuelled by oils, solid fuel or gas. It has no smell, no taste, is colourless and is extremely difficult for human senses to detect. Therefore, it is essential that carbon monoxide alarms are fitted in areas where carbon monoxide could accumulate and pose a risk to health (such as the accommodation areas of motor cruisers). When selecting a carbon monoxide alarm, preference should be given to those marked as meeting safety standard EN 50291-2:2010, which are intended for use in a marine environment. It is essential to fit alarms following the manufacturer's guidance, to test them routinely using the test button and not to ignore them.
2. The use of canopies can potentially increase the risk of poisoning, even when a boat is making way. Although external engine exhaust outlets discharge exhaust fumes into the open, the wind, aerodynamic effects and the proximity of nearby structures frequently result in the fumes entering the boat. Ensure that all spaces, including those under a canopy or an awning are always well ventilated. Never ignore the smell of exhaust fumes in any enclosed space.
3. Carbon monoxide is a silent killer. Its symptoms can be similar to colds, flu or hangovers; headaches, dizziness, nausea, vomiting, tiredness, confusion, stomach pain and shortness of breath are warning signs of its presence. If carbon monoxide poisoning is suspected, stop the source, get to the open air and seek medical attention.



Further advice on how to avoid carbon monoxide poisoning on boats, and more detail about carbon monoxide alarms, produced by the Boat Safety Scheme (BSS) and the Council of Gas Detection and Environmental Monitoring (CoGDEM), can be found at:

[http://www.boatsafetyscheme.org/stay-safe/carbon-monoxide-\(co\)](http://www.boatsafetyscheme.org/stay-safe/carbon-monoxide-(co))

Issued August 2016



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