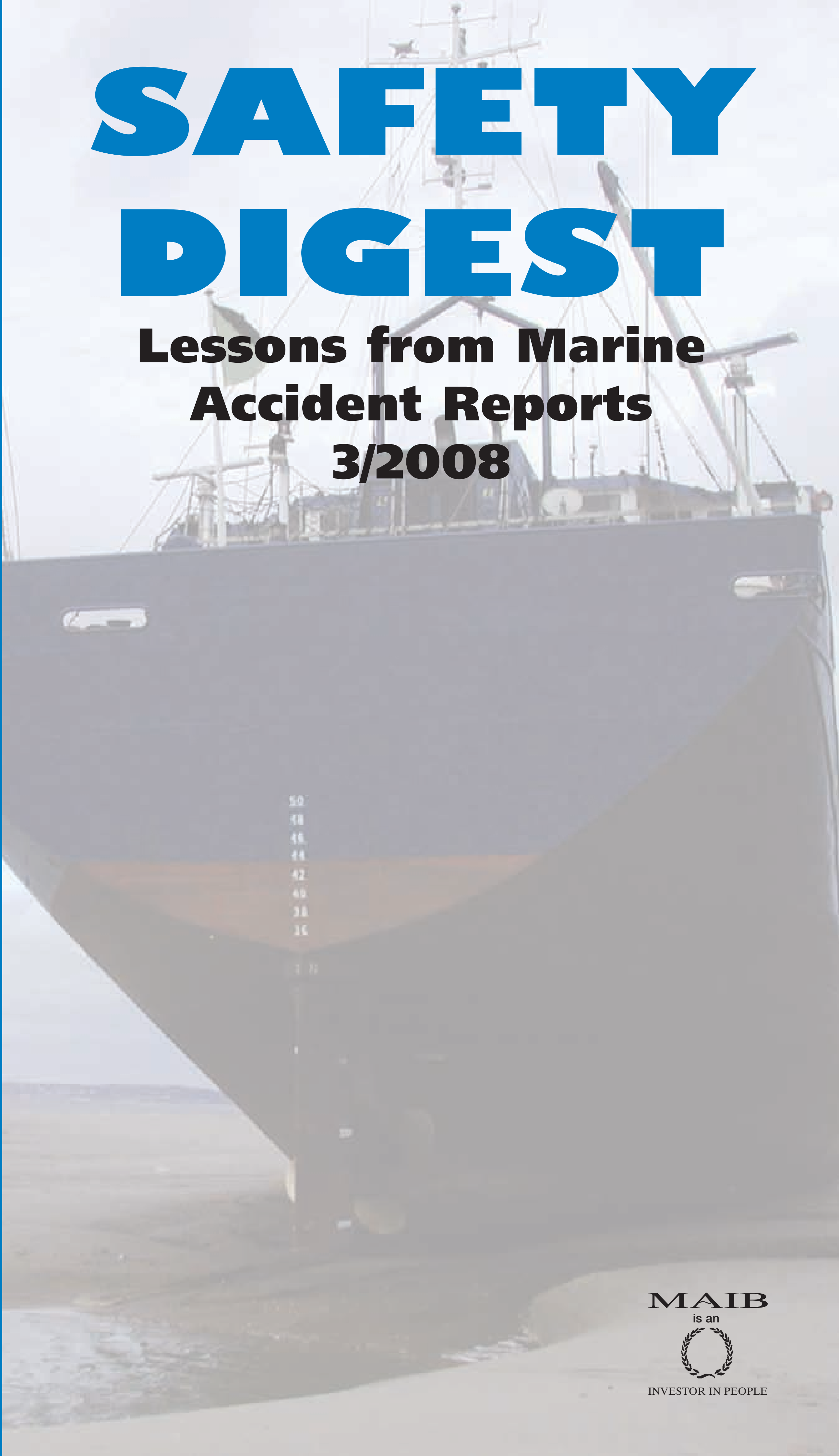

SAFETY DIGEST

Lessons from Marine Accident Reports 3/2008

MARINE ACCIDENT INVESTIGATION BRANCH

MAIB

MAIB is an INVESTOR IN PEOPLE

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December 2008

MARINE ACCIDENT
INVESTIGATION BRANCH

The Marine Accident Investigation Branch (MAIB) is an independent part of the Department for Transport, the Chief Inspector of Marine Accidents being responsible directly to the Secretary of State for Transport. The offices of the Branch are located at Carlton House, Carlton Place, Southampton, SO15 2DZ.

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 facts which have been determined up to the time of issue.

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

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

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

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MAIB

MARINE ACCIDENT INVESTIGATION BRANCH

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

Extract from
The Merchant Shipping
(Accident Reporting and Investigation)
Regulations 2005 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

INDEX

Glossary of Terms and Abbreviations

AB	–	Able seaman
CoSWP	–	Code of Safe Working Practices
CO_2	–	Carbon Dioxide
DSC	–	Digital Selective Calling
EEC	–	Electrical Engineering Cadet
EEO	–	Electrical Engineering Officer
EGE	–	Exhaust Gas Economiser
EPIRB	–	Emergency Position Indicating Radio Beacon
FRC	–	Fast Rescue Craft
GPS	–	Global Positioning System
GRP	–	Glass Reinforced Plastic
GT	–	Gross tonnes
HP	–	Horsepower
HSE	–	Health and Safety Executive
IMDG	–	International Maritime Dangerous Goods
IMO	–	International Maritime Organization
ISM	–	International Safety Management Code
kHz	–	kilohertz
m	–	metre
"Mayday"	–	The international distress signal (spoken)
MCA	–	Maritime and Coastguard Agency
MFO	–	Medium Fuel Oil
MGN	–	Marine Guidance Note
mm	–	millimetre
OOW	–	Officer of the Watch
PPE	–	Personal Protective Equipment
RAF	–	Royal Air Force
RNLI	–	Royal National Lifeboat Institution
rpm	–	revolutions per minute
SAR	–	Search and Rescue
VDR	–	Voyage Data Recorder
VHF	–	Very High Frequency
VTS	–	Vessel Traffic Services

Introduction

Tragically, in this edition of the Safety Digest, many of the incidents have ended with one or more fatalities. In nearly every case, the death(s) resulted from risks being taken unnecessarily and without recognition.

"Risk Assessments" have, to a certain extent, become mired in bureaucracy; they have become paperwork exercises, rather than life-saving assessments. Everything we do at sea is hazardous in one way or another – a few moments thought, to identify the risks of what we are about to do, would prevent most accidents. But familiarity breeds contempt; by the time we have done something a few times, we have lost the sense of danger. We rationalise subconsciously that, because we have always "got away with it", it must be safe. Have this thought in your mind when you read the articles in this digest, and I hope you will see what I mean. Alertness to the dangers would have prevented many of the accidents. Then consider whether you, or the people who work with you, have become complacent.

I put a "stop press" notice in my introduction to the last Safety Digest, on an enclosed space fatality. This fatality is currently under investigation by the MAIB; MAIB has also recently published reports into a triple fatality on board *Viking Islay* and a double fatality in *Sava Lake*. There continues to be serious concern by accident investigators around the world that there remains an unacceptably high death rate due to enclosed space entry. On the noticeboard at the back of this digest, there is a copy of the Safety Bulletin MAIB issued on the subject.

Finally, in Sections 2 and 3, fishing and leisure, we find yet again that the biggest killer is the lack of a lifejacket. Unless you are wearing your lifejacket, properly fitted and secured, it will not help you in an accident. Accidents normally happen without warning at sea, so there is rarely time to "put them on when they are needed". Do not make the assumption that you don't need one because you are a strong swimmer – look at the tragic consequences of Case 22. The tide is slowly starting to turn and more people are routinely wearing lifejackets – please join the club.

Stephen Meyer
Chief Inspector of Marine Accidents
December 2008

Part 1 – Merchant Vessels

The "Human Element" is a rather cold term that is sometimes used to refer to "they that go down to the sea in ships". I became aware of the specific terminology of the "Human Element" a few years ago when I attended an MCA hosted seminar on the very subject. The seed was sown, and since then I have tried to gain benefit from the learning opportunities that incidents have presented to me, with particular regard to the "Human Element". Logically, if we can identify the causal factors of an incident it allows us to develop safeguards to ensure, or at least minimise, the likelihood of a repetition of the incident. There is no doubt in my mind, that the most common causal factor within most incidents is the "Human Element".

I am sure that all masters will agree that even well found vessels backed by a robust Safety Management System, manned by a trained and professional crew are frequently presented with learning opportunities. However, and despite all the advice available to us in our Company Regulations, Safety Policies and Procedures, Safe Working Practices, Risk Assessments, Safe Systems of Work and the mountains of information available externally from professional bodies, we still suffer incidents, accidents and near misses which, after investigation, are generally found to be attributable to the "Human Element".

The Industry should recognise that the 'Human Element' extends beyond the crew to include shore administration, designers and management, who are just as liable to experience the effects of the "Human Element". For example I would suggest that the effectiveness of the ISM code is being diluted due to the inclusion of too many operational elements which can be loosely related to safety issues. The ISM code, which in essence is a fairly simple framework developed to ensure the safe operation of ships, has been allowed to expand exponentially as a result of the desire to produce a foolproof safety code, and to quote Douglas Adams "A common mistake that people make when trying to design something completely foolproof is to underestimate the ingenuity of complete fools". Not that I would suggest we are complete fools, far from it, but I'm sure every person who has ever written a policy or a procedure has experienced the same disappointment of discovering that when his perfect policy is implemented the "Human Element" manages to find the one loophole which renders the policy or procedure ineffective.

We are all human and therefore we all make mistakes, but the only real mistake we can make is the one from which we learn nothing. It must be considered best practice to learn from our own mistakes, but to my mind it is infinitely preferable to learn from someone else's mistakes. To enhance our ability to learn from each other we must communicate efficiently and effectively across the whole spectrum of our industry, this is a fundamental requirement and is of paramount importance to ensure the safety of all seafarers and the safe operation of our ships. The MAIB safety digest is at the forefront of this communication network and is well supported by marine guidance notes, safety bulletins & of course CHIRP reports. The prudent mariner will take note of the advice and guidance from all sectors of our industry, as often the only thing that separates or defines incidents into a particular sector is the matter of scale.

Captain Alastair McFadyen

Captain McFadyen commenced his sea-going career with Wm Thomson of Leith, working on Ben Line steamers as cadet and second officer between 1972 and 1979. He then took a year's sabbatical 'working' on sailing vessels in the Caribbean. In 1980 he joined Canadian Pacific, serving as second officer and chief officer. Between 1986 and 1992 he worked as executive officer for a prestigious government organisation in the Sultanate of Oman. Captain McFadyen joined P&O European Ferries in 1992 serving as second officer and chief officer before being appointed to the position of master and then senior master.

In 2008 Captain McFadyen was delighted to receive the award of Lloyds List Ship Master of the Year.

He is married with three children and lives in Sutton Coldfield. His hobbies include walking the dog and playing golf (though not necessarily in that order).

Shipped Waves Kill Two Seamen and Seriously Injure Another

Narrative

A Panamax crude oil tanker carried out a ship-to-ship transfer while at anchor in a deepwater bay, and loaded a full cargo of crude oil. After the loading operations were completed, she weighed anchor and proceeded seawards, her escort tug letting go and her two pilots disembarking near the entrance to the deepwater bay. She then followed a designated deepwater route in the relative lee of the land. The wind was near gale force, with waves of about 4 to 5m high. The ship's freeboard was about 6.6m and spray was being shipped on board.

After weighing anchor, the bosun and a seaman had secured the port anchor and had begun stowing three loose mooring lines down into the forward store room. During the transit, two other seamen, who were stowing loose mooring lines away aft, were sent to assist forward.

On clearing the confined waters of the deepwater route, the bosun instructed one seaman to place a securing wire through the starboard anchor cable, while the other two, on the starboard winch platform, were lashing canvas covers around the mooring wires. As the first seaman turned towards the anchor cable, a large wave was shipped over the bow. The ship pitched into the following trough and then a second, larger wave was shipped on board. The two seamen on the winch platform were swept aft, towards and under the flying bridge. The other seaman was swept aft and came into contact with a protection plate for the forward liferaft. The bosun had managed to cling onto the store room door when the first wave was shipped, and then onto the ladder rungs of the foremast as the second wave swept over the foredeck. He remained uninjured.

All three injured men were taken to the accommodation. The ship reported the accident to the coastguard and requested medical assistance. Later, the coastguard arranged a radio telephone link between the ship's master and a doctor at a hospital. Such was the severity of the injured men that a local doctor was transferred by helicopter to the ship. Once on board, the doctor determined that two of the seamen had died from their injuries and that the other should be taken to hospital. The helicopter airlifted the doctor and the injured seaman from the ship, which then returned to the deepwater bay.

Position of crew at the starboard winch platform

The Lessons

1. The two large waves that were shipped over the bow could not have been considered abnormal and should have been expected in the prevailing weather conditions. It is dangerous to assume that it is safe to work on deck in marginal conditions, even in the largest ships.

2. It would have been more wise for the master to have delayed the sailing so that the ship could be secured for sea in the sheltered waters of the deepwater bay.

3. The master's decision to leave the shelter of the deepwater bay before the foredecks were secured for sea should have prompted an effective plan of action. The plan could have concentrated the crew forward earlier, leaving the stowing of the after ropes until the fore part of the vessel had been secured.

4. The plan should also have prompted the need for precautionary measures, such as considering the option of turning the ship away from the weather, when safe and practicable to do so, to secure the anchor.

CASE 2

Fire Extinguishers – Are You Sure Yours Are Correctly Serviced?

Narrative

A large container ship was undergoing a routine dry docking in a Far Eastern shipyard. Progress was good and on schedule.

As part of the contract, all the ship's fire extinguishers were removed ashore for servicing by a certified contractor, and temporary extinguishers provided. In total, 59 × 9-litre foam extinguishers were serviced, which included renewal of the foam charge. The extinguishers were each provided with a servicing certificate as they were replaced on board.

An emergency exercise was carried out while the vessel was still in dry dock. As part of the exercise a practical demonstration was given on the correct use of the foam extinguisher. The chief officer was dismayed by the "watery" nature of the foam and its inability to provide an effective foam blanket. Suspecting that it was an isolated case, he discharged a second extinguisher, but with the same results.

To compare the foam quality, the chief officer arranged for the two expended extinguishers to be recharged using onboard spares. These produced the expected, thick foam blanket, which quickly smothered the fire.

The contractor quickly responded to the chief officer's concerns and recharged all the foam extinguishers to the correct standard within 6 hours of the incident.

The Lessons

It is unclear whether the contractor used the wrong foam compound or if the concentration was incorrect. Fortunately, the defective extinguishers were not used in a real incident. Had they been, it appears that the foam would have been incapable of providing the necessary blanket to extinguish a liquid fuel fire. This could have resulted in serious personal injury as well as the spread of fire.

MGN 276 (M+F) – Fire Protection – Maintenance of Portable Fire Extinguishers, provides general information and references relating to fire extinguisher servicing.

It is reasonable to expect that a certified fire extinguisher servicing contractor should be fully aware of the extinguishing materials specification. Nevertheless, the following lessons can be drawn from this hazardous incident:

1. **Where possible, check that the extinguisher servicing contracts clearly specify the type of foam and concentration to be used.**

2. **Consider carrying out a test, during live exercises, on a sample foam extinguisher following servicing, to ensure it is capable of laying an effective foam blanket.**

Full Astern! Not

Narrative

A feeder container vessel departed one of her routine ports of call in the early hours. It was a clear night with a light wind and good visibility. The master and second officer were on the bridge, and a harbour pilot was embarked for the departure. The master, who was new to the company, had joined the ship for the first time 2 weeks earlier. The previous master had left the ship due to ill health. The handover between them had taken around 3 hours.

As the vessel departed the lock and turned into the channel, the master transferred the steering and bow thrust controls from the port bridge wing to the centre console. He then selected autopilot steering, and the pilot selected the course. Control of the main engine and controllable pitch propeller was usually transferred to the centre at the same time, but on this occasion was left located at the bridge wing console.

A product tanker in the channel, approaching from the opposite direction, was expected to pass clear as both vessels kept to the starboard side of the channel.

A few minutes later, and unknown to the master and pilot, the port bridge wing engine control was set to zero pitch. Eighteen seconds later, the container vessel started to sheer to port into the path of the product tanker. The autopilot applied full starboard helm to correct the turn, and shortly afterwards the pilot ordered hard to starboard. The master changed to hand steering and confirmed the rudder was hard over to starboard. Concerned that the vessel was still turning, the pilot ordered 'full astern'. The master moved the centre console engine control to full astern (without effect as the port console was still in command), and set the bow thruster full to starboard.

The bridge team continued to monitor the swing, expecting the vessel to turn to starboard

Figure 1

Figure 2: Bridge overview of the feeder container vessel

and, believing the engine to be running full astern, the speed of around 9 knots to reduce. The pilot on board the product tanker, seeing the approaching container vessel turn towards him, altered course to starboard and increased speed. When he realised collision was unavoidable, he altered course to port to swing the stern away and reduce the impact.

The two vessels collided 2 minutes and 22 seconds after the container vessel's engine control had been set to zero pitch. The container vessel then continued across the channel and grounded on the opposite bank. Astern power was finally achieved 12 minutes after the collision, when control was finally accepted at the centre console, and the vessel re-floated on the rising tide. Both vessels sustained only minor damage.

Immediately following the collision the master pushed the Voyage Data Recorder "save" button provided on the centre console. Due to the method of storing data, the last few minutes of the accident were not recorded and the events after the grounding were not saved.

The Lessons

1. Handover periods are essential to familiarize officers with the operation of their vessel. In this case, the master, new to the ship and company, was unaware of the correct method of operating the main engine control system, and relied on his experience from previous vessels. The second officer was unable to confirm the correct, or incorrect, actions of the master and therefore support him effectively. Appropriate handover periods should be provided, including passages where necessary, to ensure individual officers are familiar with the vessel and management system before they assume their duties.

2. The failure to transfer the engine control from the bridge wing to the centre console required the master to make two mistakes: to not transfer control from the wing, and then to not confirm control at the centre. Effective communication between the master and second officer could have ensured that the engine control had been transferred correctly. Attempts to analyse the developing situation could have been successful had there been a suitable rapport on the bridge and the engine pitch indicator reading been checked. Bridge Team Management requires leadership from the top. It also requires persistence.

3. Emergency situations, such as collisions and groundings, can be anticipated and plans made for reacting to them. Effective drills develop a team's response to foreseeable scenarios, and this response will develop over time. Company verification of a ship's emergency response exercises can determine how effective such a response will be. Further, emergency response plans should be instantly available, not buried in the ISM documentation.

4. The size and position of the pitch indication on the centre bridge console did not easily show the bridge team that the engine was at zero pitch, and it was also not immediately clear that the engine control lever was not active. The ergonomics of bridge equipment should be considered at the new build stage, or retrofitted with suitable indicators when necessary. This ship, which is one of a series, would have benefited from an additional pitch indicator adjacent to the deckhead rudder indicator which was clearly visible to the bridge team.

5. VDRs are an important tool in determining the causes of accidents. When VDRs are incorrectly set up, or data is not stored following an accident, their value is lost. Suitable instructions should be provided to ensure that VDR data is saved following an accident, and that the VDR is routinely checked for accurate operation.

Failing to Plan…

RAF SAR helicopter on scene

Narrative

It was a fine Monday morning in August when the crew of a 24m aircrew training launch boarded their craft for another week of training exercises with search and rescue (SAR) helicopters. The master was fairly new to this work, but had many years of experience at sea to draw upon; the mate had been doing this job for years and knew the launch and the local area like the back of his hand. The weather was good, the sea flat, and visibility was over 5 miles.

Once the master had received the day's orders, the launch sailed into the bay to rendezvous with the helicopter for another day of routine training. The rendezvous position was based upon the mate's experience of where the launch would be ideally positioned to begin the exercise. The bridge team did not plot their starting position as they expected to be changing course and re-positioning all day long, and they felt they knew their area well.

Once the helicopter arrived they agreed with the pilot that the launch would head in the direction of a prominent headland that was about 5 miles away. Once settled onto this course, they engaged the autopilot, as was their habit. The mate noted their course from the magnetic compass, but did not plot anything on the chart. Neither the height of tide nor tidal stream had been checked, despite the exercise being conducted in an area notorious for exceptionally strong tidal streams.

As the exercise commenced, the mate had the con, and the master and chief engineer were chatting together on the opposite side of the wheelhouse. Meanwhile, the crew worked the helicopter from the aft deck. Two winchmen were lowered to the craft, without any problems – the exercise was going well.

The launch had been on the same course, at about 14 knots, for 20 minutes when she grounded very violently on an isolated rock pinnacle and became impaled on the rock. The chief engineer went below to find the amidships accommodation had been holed and the launch was flooding rapidly. He checked the forward cabin, which was dry, and closed the watertight door tightly. He then went aft to the engine room to check there, but became distracted when he realised that one of the crew was in the lavatory, within the area that was flooding rapidly. He closed the engine room door, but did not secure it thoroughly before returning to the wheelhouse to report the seriousness of the situation to the master. By now, the launch was heeling over to about 30 degrees and moving unsteadily in the strong tidal stream. Fearing the launch might capsize, the master immediately made a "Mayday" call on VHF channel 16 and ordered the crew to prepare to abandon ship. By that time, the SAR training helicopter was ready to lift the crew off, and within a few minutes they had all been landed safely ashore on a small island nearby.

HM Coastguard raised the alarm and alerted the local RNLI lifeboat and the regular RAF SAR helicopter. Once on scene, both units put men and salvage pumps on board the launch, with the result that the launch was stabilised with about 150mm of freeboard. The lifeboat was eventually able to tow the launch back to port, where she was beached.

The launch suffered significant flooding damage to two main compartments – the lower amidships accommodation and the engine room – and her owners have had to provide a substitute craft in order that vital SAR training is not affected.

Luckily, there were no injuries and no pollution as a result of this incident.

The Lessons

1. **Even in the most familiar of tasks, it is essential that professional standards are maintained. In this case:**

   - **Bridge team management was non-existent; tasks fell to whoever happened to be at hand.**
   - **There was no passage plan, no courses to steer, and no allowance for the tidal stream. The launch was well equipped with navigational instruments, and up-to-date charts were available, but none were used.**
   - **The bridge team were dangerously overconfident in their ability to navigate the launch by eye alone. The rock pinnacle was accurately charted and known to both the master and the mate; complacency, as a result of familiarity with what they were doing, resulted in disaster.**

   Every passage should be planned in advance, the intended track plotted, and the course made good closely monitored and checked against the plan.

2. **The launch's operations were subject to frequent inspections and audits by her owner's superintendents, and less frequent audits by the charterer's representatives. However, all of these audits failed to reveal the systemic failures of the navigation team.**

   For an audit to be effective, it is essential to always find out what actually happens on board. If necessary, auditors should consider making sea passages in order to find out what is really happening. Be sure that your audit does not become just a "check of the checklists"!

3. **Initial damage control was not effective – had the engine room watertight door been closed and fully 'dogged down', the space would probably not have flooded to a dangerous extent.**

   Remember, emergency procedures and checklists have been developed to help ensure that <u>all</u> necessary actions are completed after an accident. Use them in your drills and use them on the day!

CASE 5

An Unfortunate Chain of Events

Narrative

A coastal tanker was on passage with a cargo of gas oil. The main engine lubrication oil cooler had been overhauled during a recent dry docking period, but while the vessel was on passage, it failed. The cooler was made up of many plates, each separating cooling water from the engine oil. Many of the seals had detached from the plates, allowing oil to spray out into the engine room. There were no other means to cool the oil, and the main engine was shut down to prevent possible damage. The shaft generator was designed to provide some emergency propulsion, but this was faulty and could not be used.

In favourable weather conditions, the vessel drifted, the master unwilling to anchor due to a large number of oil and gas pipelines on the seabed in the immediate area. The crew contacted their technical managers ashore, who advised the chief engineer to remove the damaged plates and rebuild the oil cooler, albeit with less capacity. This was not successful because too many seals had been damaged, so the managers arranged for a tow.

A powerful multi-purpose tug was the only towing vessel available; it proceeded to meet the tanker. The tug's crew were advised that the tanker had been involved in a collision a few days earlier and had suffered damage to the bow, so they prepared a towing bridle.

There was very little communication between the vessels about the details of how the tow would be connected. The tanker crew had no previous experience of being towed at sea and were surprised by the large size and weight of the towing gear. After a considerable struggle, the tanker's mooring lines were attached as messengers, and the mooring winches used to haul the bridle pennants inboard. They were connected to bitts on the forecastle and the tow got underway.

The intention was for the tanker to be towed to an anchorage near her discharge port, where repairs would be made to the oil cooler. The tanker would then sail under its own power into the discharge port. The passage on tow was uneventful and allowed key members of the crew to deal with matters arising from the earlier collision.

Towing gear

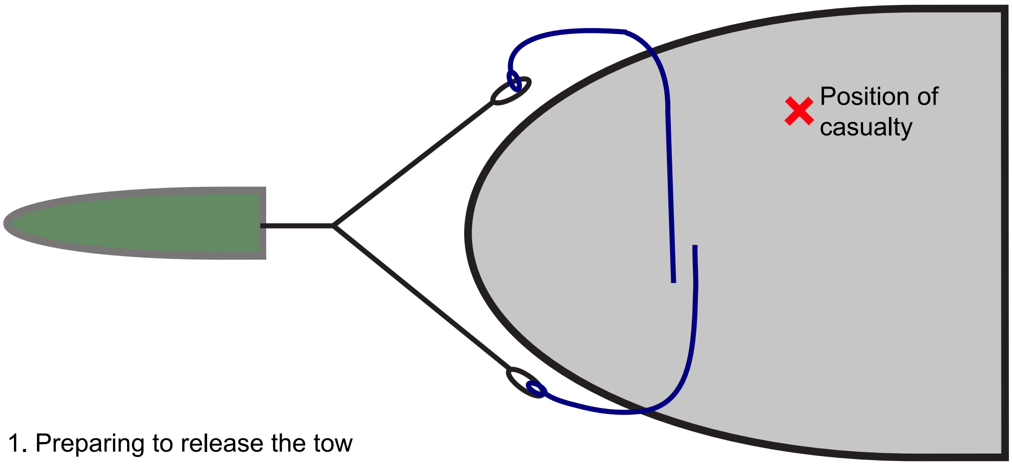
There was little discussion or planning on board the tanker about how the tow would be disconnected. Despite none of the crew having any relevant experience, the chief officer's arrangement of the watches meant that he would not be present to prepare, assist or supervise releasing the tow, deciding to leave the task to the master and more junior crew. The master, meanwhile, was preoccupied with events relating to the collision, so the arrangements for releasing the tow were left to the second officer.

On reaching their destination, the tug master asked the tanker's crew to cast off both pennants into the sea simultaneously, and expected to steam ahead and recover the tow. The tanker crew, however, were unable to manhandle the pennants clear of the bitts, so decided to connect the mooring lines as messengers once again, to bear the weight of the towing gear. The second officer intended to use shackles to make the connection between the messengers and bridle, however he was unable to find any large enough, and with time running short, had to settle for a length of chain and a smaller shackle instead. These were used to connect the eyes of the messenger and towing pennant on the starboard side. A short length of gantline was already attached to the port pennant and this was used to connect to the messenger on this side.

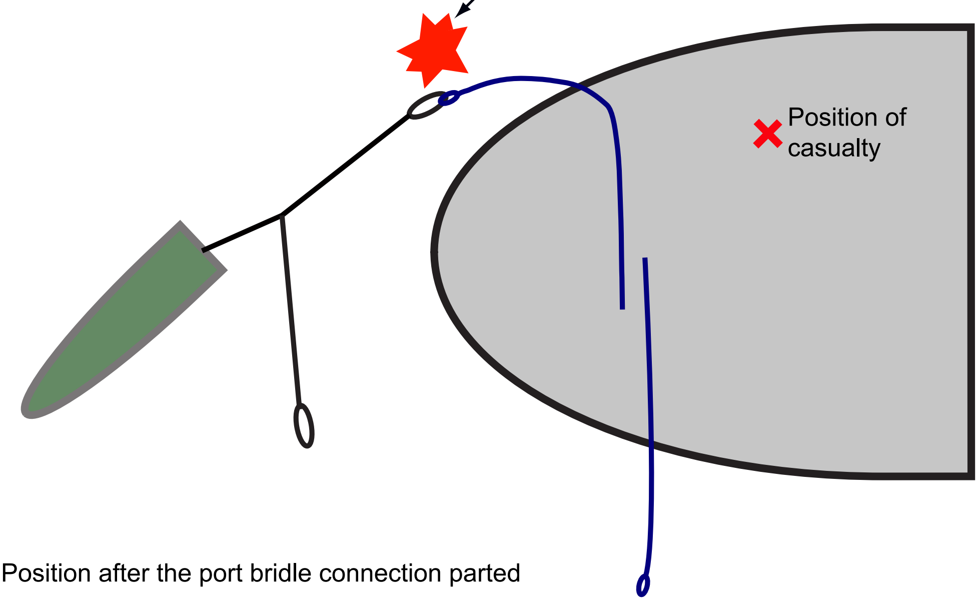
From his position on the bridge, the master could see the second officer and the AB struggling to move the towing pennants, and asked the chief engineer and cook to go to the forecastle to assist. As the starboard pennant was released and veered, the master of the tug became concerned that the large amount of slack in the starboard side of the bridle could foul his propellers, so moved his tug to the port bow of the tanker, both to avoid the slack lines and to ease the tension in the port leg of the bridle. The port pennant was released and both sides were payed out together.

The tug began to recover the slack in the tow and moved ahead to clear the propellers. The weight of the tow was significant, and the tension caused the mooring line to bury itself within the line on the winch drums. The lines became snagged on the drums, and tension in the port pennant caused the gantline to part. The port pennant fell slack in the water, the weight adding to the tension in the starboard pennant. This came up tight, but as the chain was more substantial, more force built up before it, too, parted with a bang.

The starboard mooring line recoiled inboard and struck the cook, who was standing on the starboard side of the forecastle. He received severe, multiple injuries and was evacuated to hospital, where he spent several days in the high dependency unit.



1. Preparing to release the tow



2. Position after the port bridle connection parted

The Lessons

1. Managers should recognise the potential for the concentration and performance of crew who have been involved in accidents to diminish and, if necessary, make early arrangements for them to be relieved without prejudice to blame or liability.

2. When unusual seamanship evolutions have to be undertaken, it is essential that they are properly planned and carefully supervised. The risks must be properly considered and mitigated. In particular, if non deck specialists are to be employed, they require even closer supervision.

3. Crew on board towing vessels should consider providing additional guidance and support to vessels which may not be regularly involved in towing operations and ensure that a safe system for connecting and executing the tow is agreed before commencing operations.

4. Effective communications must be established and maintained between vessels under tow and tugs.

More detailed practical advice and guidance for handling lines and on towing is contained in the MCA's Code of Safe Working Practices for Merchant Seamen.

Snagged Ropes Can Kill, Too

Towing arrangement – watch where you stand!

Narrative

A tug, with a crew of six on board, was completing the last tow of the day. It was towing four barges, three barges abreast with the last behind. The barges were secured to the tug using two tow ropes; one from each of the outer barge's towing bitts to the tug's tow hook.

As the tug conducted the usual approach to the barge mooring, the skipper backed up to the barges and three of the crew transferred to them to prepare for the mooring operation. The barge crews shortened the tow ropes and moved the port rope to the centre barge. Another crewman remained on the aft deck of the tug to tend the tow ropes. As the weight was taken on the tow ropes once again, everything appeared normal, with the tug and tow shaping a slow turn into the ebb tide. The tow lines both appeared straight and as expected.

Suddenly there was a loud noise and a shout from the crewman on the aft deck. The skipper ran out of his wheelhouse to look down on the aft deck and saw the crewman lying on his back.

A crewman on the barge shouted to the skipper to come astern, which he did, and two of the crew from the barges jumped across and attended to the injured crewman. The skipper made a quick call on the VHF radio, and the local lifeboat was launched shortly afterwards. A paramedic was also taken out to the tug. Sadly, despite all their efforts, the crewman died from his injuries.

The crewman had received a single fatal blow to his chest from one of the tow ropes. Neither of the tow ropes had parted. It is believed that the port tow rope became snagged on part of the mooring arrangements on the barge. When the snag cleared, it transmitted a wave, which travelled along the tow rope, striking the crewman as it passed. This snagging mechanism had occurred before, but had not previously been seen to generate travelling waves with this magnitude of force.

The Lessons

1. Unlike the hazards associated with parted lines, which are generally well understood, crews need also to be aware of the dangers posed by snagged lines and ensure they stand away from lines under tension, as recommended in CoSWP. As demonstrated by this accident, a relatively small deflection of a line under tension can result in significant forces, which must not be underestimated. Do not, on any account, lean or rest on lines which are under tension, even if the tow appears stable and steady.

2. During manoeuvres such as this, no matter how frequently they are carried out, it is vital that a single crewman is made responsible for monitoring the safety of the operation. They can issue warnings when people are standing into danger, and provide a communication link between the deck crew and skipper. Leaving individual crew members to manage their own safety leads to many assumptions having to be made, and the potential for injuries increases as a result.

3. Positive communications are essential to ensure safety is not compromised during operations such as featured in this accident. Reliance on crew experience and familiarity is not sufficient, as even a small mistake can result in disastrous consequences. It is essential that actions which put lines under load are not undertaken until a signal has been provided, by a crewman monitoring the operation, that it is safe to do so.

Know your GPS Track Plotter Limitations – Over-Reliance Causes Grounding

Figure 1

Narrative

The population of a group of islands was heavily reliant on the tourist trade, so the decision to upgrade a number of quays used by the visitors was warmly welcomed by the local boat owners. One particular company owned a single fast jet workboat (Figure 1), which was contracted to transfer a team of civil engineers the 2 miles from the island on which they were accommodated to another island where the quay work was being undertaken. Although the contractors had used the company previously, none could recall a safety brief being given.

The skipper of the boat had 33 years' experience of operating around the islands, although night trips were infrequent. He held the MCA's Boatmaster's Tier 1, Level 2 Licence as well as the local authority's Boatman's Licence. This was issued following a local knowledge pilotage assessment which was carried out in daylight only. The assessment also satisfied the Local Knowledge Endorsement requirement to the Boatmaster's licence.

The workboat left the quay at 0520 with the skipper and six contractors on board. The radar was set on the 0.5 mile range scale, and a track for the destination was selected from the GPS track plotter. The skipper opted not to take a second crew member because he felt the conditions did not warrant it despite it being a condition of the Workboat Certificate.

The weather was fine but overcast, and it was very dark, there was a force 3-4 wind and it was low water. Although the skipper had made this trip many times during daylight, he had not previously encountered the very dark conditions present at the time. Nevertheless he wasn't worried – he had the selected track from the GPS plotter memory to follow, in which he was totally confident. As usual, the skipper used the leading lights for leaving the quay and then headed to pass a nearby buoy and beacon. At 0524 he increased speed to about 24 knots. At 0525, the boat passed the buoy and beacon lights. The skipper then picked up the quick flashing green light at the end of the destination's quay.

He then relied on the perceived accuracy of the GPS track plotter as his only source of navigation to guide him through the 50 metre wide channel between a charted rock, which was drying at about 2.5 metres, and another small island (Figure 2). He made no reference to the radar. Because of the level of darkness, the skipper was unable to pick out any prominent features against the destination island, nevertheless he continued at 24 knots along the selected track. As the boat approached the rock, the skipper felt uneasy about his position and reduced the boat's speed to about 15–18 knots. Almost immediately, at about 0528, the boat grounded on the rock and was left hanging off it at an angle of about 70 degrees.

The skipper was thrown forward, cutting his head on the window wiper motor. Two contractors were thrown into the seats and suffered bruising. One of the contractors attended to the skipper, who was concussed, and another contacted the coastguard and alerted them to the problem. In the meantime other contractors, two of whom were non-swimmers, shouted to the skipper for the location of the lifejackets because they were not in their expected positions under the seats. However, the skipper was confused and could only point to the starboard forward corner of the wheelhouse. Unbeknown to the contractors, the lifejackets were stowed in the compartment below the wheelhouse to prevent them from becoming soiled.

The skipper managed to compose himself, and at 0530 he, too, alerted the coastguard by VHF radio. Soon afterwards, the boat came free from the rock due to a combination of wave motion and limited manoeuvring by the skipper. He and the injured contractors were later transferred to hospital, where they made a full recovery.

Fortunately the damage did not significantly affect the boat's watertight integrity. It suffered a puncture to the forward section of the hypalon tube, a 1 metre long split to the starboard side of the hull, and distortion to longitudinals and to hull plates near to the port side of the keel – Figure 3.

Figure 2

Figure 3: Damage to the vessel

The Lessons

The skipper and his passengers were extremely fortunate that they did not suffer serious injury. The boat was very close to capsizing when it was suspended on the rock, and could easily have trapped those on board; good fortune threw it clear of the rock and in an upright position, which allowed the situation to stabilize.

The accident was caused because the skipper's speed of approach was far too fast for the very dark conditions, and he chose to use the GPS track plotter as his only source of navigation because of its perceived accuracy. A GPS error of up to 33 metres is commonplace. Furthermore, close examination of the selected track showed that it did not in fact pass between the rock and the island, but to the other side of the rock and over other obstructions.

The following lessons can be drawn from this accident:

1. Make use of all available navigation aids and do not simply rely on the perceived accuracy of a GPS track plotter as the single source of navigation. MGN 63 (M+F) Use of Electronic Aids to Navigation highlights additional precautions.
2. Man your vessel appropriately. Had a second crew member been carried it is possible that he might have been able to alert the skipper to the dangers.
3. Consider your speed of approach. When in doubt, reduce speed early or come to a stop to allow time to safely assess the situation.
4. Carefully consider the prevailing conditions when selecting your track. In this case an alternative, far safer route could have been taken, which would have added only a couple of minutes to the transit time.
5. Ensure a safety briefing is given and that lifejackets are readily available; they are your very best friend in this type of situation.
6. Where local authorities require boatman licensing, consideration should be given to assessing pilotage local knowledge during darkness.

CASE 8

The Hardest Way to Learn

Narrative

The passenger lift fitted in the accommodation of a container vessel had a number of recurring defects with the cabin door closing and safety interlock systems. The electrical engineering officer (EEO) and electrical engineering cadet (EEC) were repairing the latest of these problems after another crew member had become stuck in the lift earlier in the day.

The EEO had turned on the "inspection switch" on top of the lift cabin to position "1", to prevent the lift from responding to normal commands. The EEC was assisting the EEO by moving the lift upwards, standing on the roof of the cabin, operating the maintenance controls to move the lift to between decks 5 and 6 so that the EEO could repair the lower part of the doors. The lift initially moved as expected, but it stopped prematurely at Deck 5. The EEC moved away from the controls to investigate the problem.

The lift was called by the second engineer from deck 9, to travel from his cabin deck to the engine control room for his afternoon watch. The second engineer had been asleep in his cabin and did not know that the lift was being repaired, and there were no warning signs to indicate that it was out of use. The second engineer saw the lift call button light up and heard the lift begin to move as normal. Shortly afterwards, he heard a scream and immediately ran down to the engine control room to report what had happened.

The EEO opened the lift doors in the engine control room and saw that the lift had stopped. The EEO, chief engineer, second engineer and motor man ran up to Deck 5 and then again to Deck 6 to gain access to the top of the lift cabin. They saw that the cadet had been trapped between the side of the lift cabin and the lift shaft. He was not breathing and had no pulse.

The lift was lowered, and the cadet was released and taken to the ship's hospital. Despite the best efforts of the crew to revive him, he died from his injuries.

After the accident, the EEO found that the "inspection switch" had been turned to the "0" position, allowing the control system to respond to normal commands. It was evident that the lift had stopped prematurely at Deck 5 and that the EEC had moved away from the controls, probably to investigate why the lift had stopped. The position where his body was found was such that it would have allowed him to put his foot on the cable that closed the cabin doors, and it is most likely that he was attempting to move the doors to complete the interlock circuit that had been a problem in many of the recent breakdowns.

It cannot be determined why the "inspection switch" had been moved, but because the controls were not properly shrouded or labelled, it is likely that the cadet either misunderstood the operation of the switch, or caught the controls accidentally.

Although the vessel's management company had clear procedures to conduct *risk assessments* and complete *permits to work* for potentially hazardous and non routine maintenance, the crew had not applied them on this occasion. They had interpreted the rescue of the crewman earlier in the morning as an emergency, and considered they could not justify the delay caused by working through these procedures.

The company did not allow cadets to operate machinery without supervision. In this case, the EEC was reported to be very capable and keen to help the EEO. Despite this, it is likely that he lacked the experience to fully appreciate the risks of working on top of the lift cabin.

The Lessons

1. Ensure that all personnel working on lift machinery understand the operation of the safety interlocks and inspection controls.

2. Check that inspection controls are clearly marked and properly shrouded or covered to prevent them being operated unintentionally.

3. Managers, and those responsible for procedures on board, should ensure that it becomes habit for crews to assess risk and put in place control measures to ensure their safety while undertaking potentially hazardous tasks.

4. Managers should thoroughly review shipboard procedures and instructions relating to the maintenance and survey of lifts, taking into consideration existing industry guidance, including:

   – *Code of Safe Working Practices for Merchant Seamen*

   – *The Merchant Shipping and Fishing Vessels (Lifting Operations and Lifting Equipment) Regulations SI 2006:2184*

   – *HSE Guidance for Thorough Examination and Testing of Lifts*

   – *Code of Practice for Safe Working on Lifts, BS 7255:2001*

   – *Maintenance for lifts and escalators – rules for maintenance instructions BS EN 13015:2001*

   – *Classification Society guidance*.

Although accidents involving lift maintenance on board vessels have been infrequent, this is not an isolated incident, and shows graphically the horrific consequences which may result from such accidents. Owners/managers of vessels with lifts installed are strongly advised to review their maintenance procedures in light of this incident, and take into consideration the industry guidance when working on lifts.

CASE 9

Steaming Towards Disaster

Narrative

The duty engineer on a container vessel sailing from a port on the east coast of the USA noticed that pressure in the steam system was dropping. He called for assistance and went to investigate the auxiliary boiler. Steam was escaping from the air inlet, so the burner was shut down and the furnace door opened. More steam escaped, but when it cleared, it was possible to see that the furnace was severely distorted and had cracked, allowing steam to leak through.

There was some delay before the chief engineer was informed about the breakdown, and further delay before the problem was reported to the master, who was on the bridge. Although the vessel could have anchored safely in order to allow the problem to be investigated, it was agreed that the main engine could continue to run at low power, and the vessel proceeded to sea.

An Exhaust Gas Economiser (EGE) was fitted in the funnel uptakes to generate steam from the waste heat contained in the main engine exhaust gases. The auxiliary boiler and EGE were linked, with water being taken from the auxiliary boiler to circulate through the EGE. The steam generated in the EGE then passed back down to the auxiliary boiler before being distributed around the vessel.

Ineffective liaison between the chief engineer and master led to the master not fully understanding the implications of the auxiliary boiler failure. No power limitations had been agreed and, shortly afterwards, the bridge increased to the maximum manoeuvring speed available.

A rapid rise in the temperature of the EGE was noticed, and the chief engineer realised there was a fire inside the EGE casing. The bridge and nearby crew were alerted and the emergency alarm was activated. Radiant heat

Heat damage

from the EGE ignited light fittings, cables, and paint on bulkheads in the funnel uptakes, and crew attempted to fight the fire with a water hose and a fire extinguisher. They were beaten back by the heat and smoke and the engine room was evacuated.

Personnel were mustered, and firefighters re-entered the funnel uptakes and began to cool the EGE casing. However, they were withdrawn when their team leader grew concerned that the structure might collapse. The CO_2 gas smothering system in the main engine room was activated, but this had little effect on the fire because by that time it was hot enough for hydrogen and iron fires to develop and so, had become self-sustaining.

The fire was contained by employing water hoses to cool its boundaries, and was finally extinguished by drenching the internals of the EGE with water from the top of the funnel and, later on, through doors in the EGE casing.

The most likely cause of the auxiliary boiler overheating was a malfunction of the control system, which allowed the water level to drop too low without shutting down the burner. Feed water was then lost from the auxiliary boiler and this caused circulation through the EGE to fail. With the main engine still running, heat built up, causing soot deposits that had been allowed to accumulate in the EGE to ignite.

A new fire tube was fitted to the auxiliary boiler, but the EGE was damaged beyond repair. Repairs delayed the vessel by 2 weeks, spoiling perishable cargo and incurring further penalties.

Heat damage

The Lessons

1. Report problems and seek assistance early on – before a situation deteriorates further.

2. Trying to carry on after a machinery breakdown can make matters worse, unless proper action is taken to prevent more damage.

3. Check that other departments on board understand the implications of machinery problems so that they do not inadvertently exacerbate the situation.

4. Ensure personnel understand as much as possible about the circumstances of a fire to enable them to use the most appropriate fire-fighting techniques from the onset.

Caught in a Jam

Narrative

A safety standby vessel was carrying out a regular drill to launch the Fast Rescue Craft. The ship was fitted with a "Caley" type davit, consisting of a single fall running through a docking head to a single release hook in the boat. A cruciform arrangement fitted around the hook mated with the docking head of the davit, and was designed to hold the boat in the correct fore-and-aft attitude as the davit was extended or recovered. During previous drills, the crew had noticed that the steel ring at the end of the fall was at the same height as the coxswain's head when the hook was released, and there was a danger of the ring hitting a crewman or becoming snagged on equipment in the boat. To avoid this danger, the crew had attached a tripping line to the ring so that once the boat was released, the ring and fall could be hauled clear and secured on deck. With the boat hauled up to the docking head, there was no purpose-built lead for the tripping line. The line then passed between the docking head and cruciform arrangement wherever space allowed.

When the boat was launched on this occasion the standard routine was followed. Permission to launch was given by the master, on the bridge, and the boat was swung out. Once the davit was fully extended, the coxswain cocked the off-load quick release hook, and once all were ready in the boat gave the "thumbs up" to the davit operator, indicating that the boat was ready for lowering. As the davit operator pushed the control to lower the boat, the hook opened and the boat fell approximately 9 metres to the water.

Post-accident investigation showed that the tripping line had jammed between the cruciform and the jaws of the docking head. With the hook cocked for release, the davit

Fast Rescue Craft securing arrangement

operator had started to lower the boat, and the jam momentarily held the boat's descent sufficiently for the hook to sense no tension, and release. Gravity then took charge and the weight of the boat almost instantaneously overcame the friction of the jam, and the boat fell. Two of the boat's crew suffered minor injuries, but the third man broke bones in both feet and was incapacitated for a prolonged period.

The Lessons

1. **Adding the tripping line to the system was designed to make the operation safer. However, the further dangers caused by permanently attaching the tripping line to the lifting ring were not assessed. An addition designed to improve the safe operation of one part of the system, was responsible for an unsafe condition elsewhere in the system. Careful observation of the entire operation should have highlighted the possibility of the rope snagging in the docking head. Had this been seen, alternative arrangements could have been made to ensure that the ring was kept clear of the boat.**

2. **Cocking the release hook with the boat still in the docking head and approximately 9 metres above the water was the procedure passed to the crew by the commissioning engineer when the ship was on sea trials. Had the hook not been cocked for release at the docking head, it is unlikely that the boat would have fallen when the tripping line jammed.**

Off-load quick release hooks should not be cocked until the boat is close to the water. Following the incident, the shipping company issued a safety alert to this effect, and the hook manufacturer made an appropriate change to its procedures.

Poor Protection – Rash Outcome!

Narrative

To maintain large, main engine turbocharger efficiency there is a need for routine daily cleaning to remove engine exhaust deposits from the turbine blades. In this case, crushed nut shells were injected into the turbocharger under 7 bar air pressure.

A schematic of the injection system is at Figure 1 and the key components are shown at Figure 2. Of particular note is the long section of unsupported pipework from the reservoir to the turbocharger (the white angle steel bracket was fitted after the accident). Although Personal Protective Equipment (PPE) such as goggles, gloves and hard hats was readily available about the ship, there was none dedicated to the cleaning task.

Just before the accident, the "on watch" fourth engineer had completed a set of machinery rounds. The main engine was running well and he had no cause for concern. It was hot in the engine room and, as was his custom, he rolled up the sleeves of his overalls as he prepared to carry out the familiar task of daily cleaning the main engine's three turbochargers.

The aft and centre turbochargers were cleaned successfully. The engineer prepared the system for cleaning the forward turbocharger by

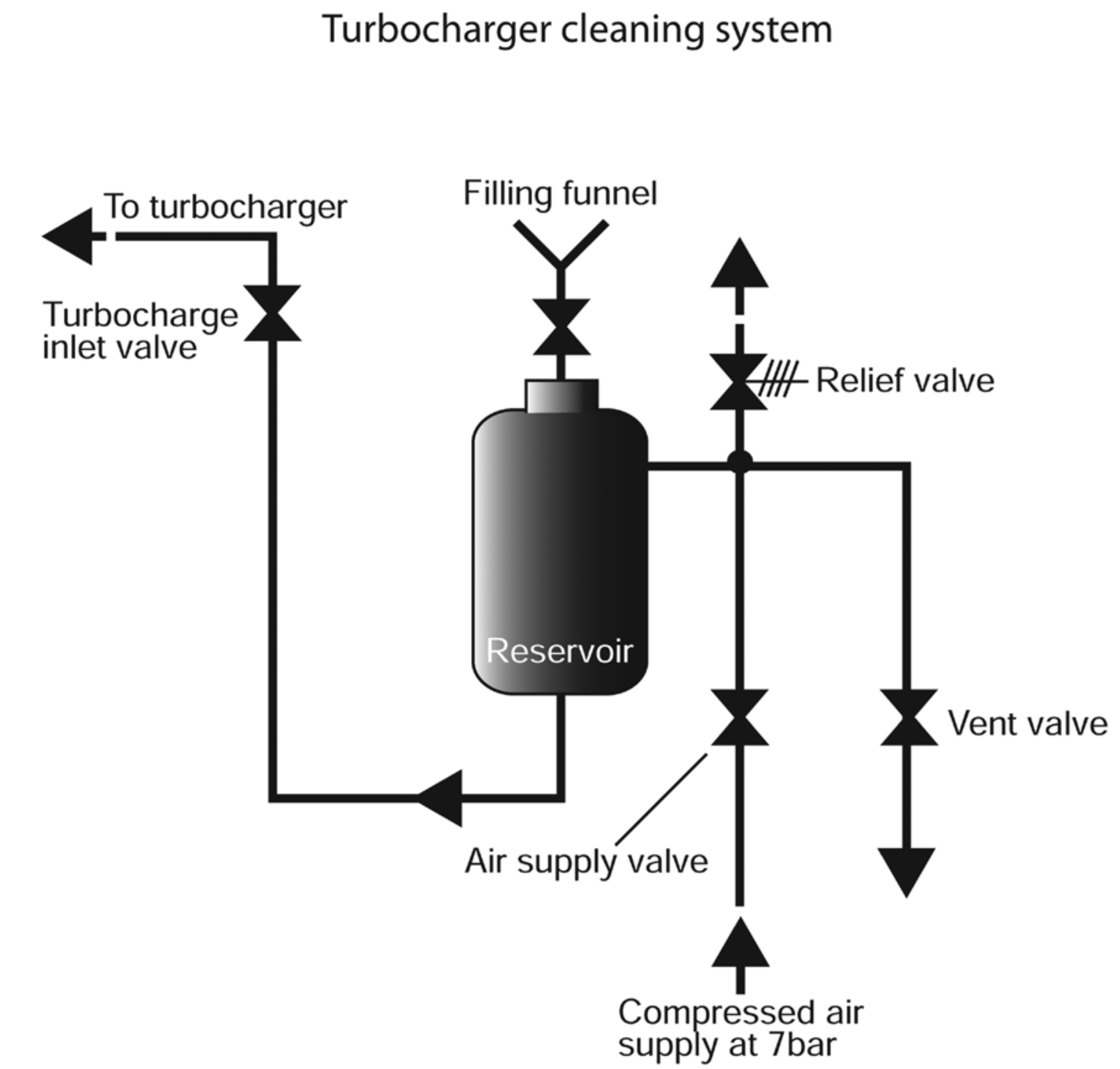


Figure 1: Schematic of the injection system

Figure 2: Key components

blowing it through with compressed air to ensure there were no blockages. He then closed the air supply and discharge to the turbocharger valves. The drain on the reservoir was opened to relieve any built up air pressure, and then closed. He removed the reservoir funnel cap and filled the reservoir to the correct level with crushed nut shells. The engineer then opened the air supply valve to pressurise the reservoir. As he prepared to open the discharge valve to the turbocharger, the long unsupported pipe blew out from the reservoir compression connection fitting – Figure 3.

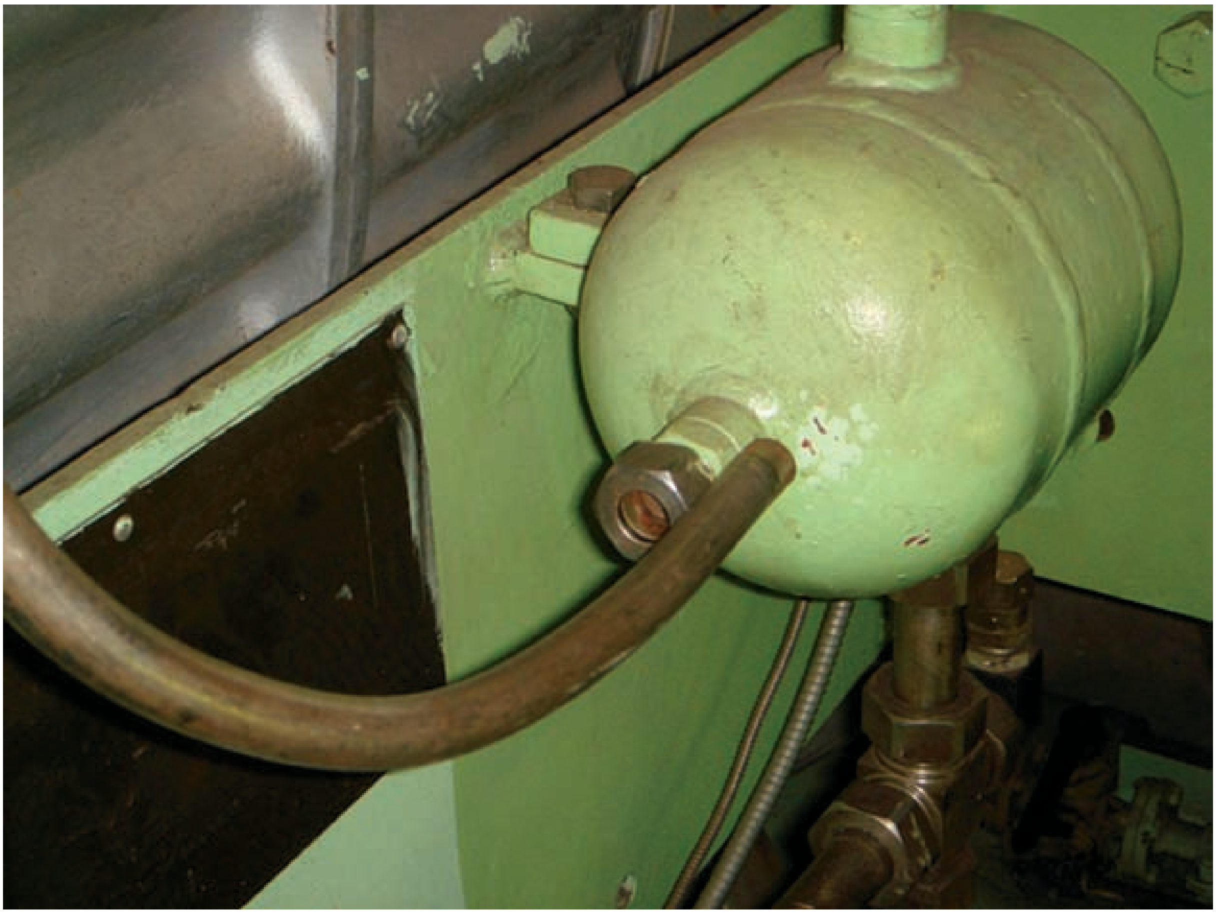


Figure 3: Pipe disconnected from reservoir connection fitting

Figure 4: Abrasion injury to crewman's right arm

The engineer raised both his arms to protect himself from the crushed shells which were being sprayed from the failed connection at 7 bar pressure. He suffered severe abrasion wounds (Figure 4) before staggering away from the engine and raising the alarm.

After receiving first-aid treatment on board, the engineer was transferred to a shore-side hospital after the ship diverted from her planned passage.

The Lessons

Luckily, the fourth engineer made a full recovery after spending several days in hospital. However, had the crushed shells been sprayed onto his face then it is likely that he would have suffered far more severe injuries, and possibly blindness.

On investigation, it was found that the backing nut on the pipe compression joint had vibrated loose, and there were corrosion deposits around the compression olive allowing the pipe to become detached from the connection when under pressure.

The following basic safety measures and good engineering practice could easily have prevented this accident:

1. **Long lengths of unsupported pipework, whether they are large or small bore, should be avoided. The result is an increased risk of the pipe suffering from the effects of vibration, which can result in fire or personal injury. In the case of copper pipework, the vibrations cause brittleness through "work hardening", which also leads to failure. Pipe systems should be adequately supported using clips, brackets or pipe hangers.**

2. **Overalls are designed to provide personal safety protection as well as cosmetic protection for dirty tasks. Sleeves are often cut off or rolled up for misguided comfort reasons, but this only increases the risk of burns or abrasion injuries, as this accident so clearly illustrates. Encourage your officers and crew to use the full protection that overalls provide.**

3. **The use of PPE, including goggles, gloves and hard hats should be identified by task risk assessments. In this case, PPE stowages have been retro-fitted in the vicinity of the turbocharger. Goggles and gloves are now routinely worn when carrying out the cleaning task. Ship's officers and crew should always be minded to raise the issue of PPE where it is seen to be deficient.**

Beware of Fumigated Cargoes

Narrative

An 81m general cargo vessel loaded feed wheat into her two holds. Once loading was complete, the cargo was fumigated by applying aluminium phosphide tablets loose into the cargo. To fumigate the cargo during the 4-5 day voyage, the tablets would decompose and produce phosphine gas. Before departing the ship, the fumigator-in-charge briefed the chief officer, and issued him with two gas masks and some phosphine gas detection equipment.

The voyage was uneventful, but the weather deteriorated after 2-3 days, with the ship encountering force 7-8 wind on the port bow. On the day of the accident, the able seaman was last seen at lunchtime, although he left most of his meal. During the same day, another crewman, whose cabin was on the same deck, had noticed a smell in the corridor outside his cabin, but put it down to some vomit in the laundry sink.

At 0800 the following morning, the able seaman was found dead in his cabin, lying on the floor next to his day bed. He appeared to have been dead for some time.

When the vessel arrived at the port, the fumigator appointed to meet the vessel found a very high concentration of phosphine gas in the deceased crewman's cabin and in the compartment next door. Both these spaces were adjacent to the aft bulkhead of the hold, and the cabin deck overlapped into the hold by 0.5m. No obvious leakage path for the fumigant gas was located, even after smoke testing the hold and stripping back the bulkhead linings. However, following de-scaling of the area, some pin holes were discovered in the underside of the cabin deck that overhung the cargo hold.

Following the postmortem, all indications were that the crewman had died from phosphine poisoning.

Figure 1: Cargo hold

Figure 2: Cabin deck overhanging the cargo hold

The Lessons

The procedures to be followed when carrying a fumigated cargo are detailed clearly in IMO's recommendations on the 'Safe Use of Pesticides on Ships', (which is now included as an Annex in the 2004 edition of the IMDG Code). Make sure your ship has a copy and you know where it is.

In particular, ensure:

1. The fumigator-in-charge carries out a thorough pre-fumigation check to ensure your ship is safe to transport a fumigated cargo.

2. The master is aware that the cargo is to be fumigated, and has given his permission for it to be loaded and fumigated.

3. The crew have been briefed about the dangers the fumigated cargo may pose; the test regime for leaking gas; and, anything else that might indicate the gas has leaked.

Ship or Tug's Line?

Narrative 1

An outbound vessel secured a tug forward to assist in her passage through a lock towards the open sea. Although the vessel was equipped with a designated towing line, a mooring line was used to secure the tug.

As the vessel cleared the lock, the tug took up the weight on the line to turn the vessel towards the open sea. However, the line suddenly tightened on the bitts and began to surge and to smoke. The crew in the vicinity recognised the danger and started to move clear, but the rope parted and hit two of the crew on the head as it recoiled. Both crew were injured; one was evacuated to hospital by helicopter. Subsequent investigation found that the mooring rope was in a poor condition and that none of the crew on the forecastle were wearing PPE.

Narrative 2

A passenger cruise ship, which was not equipped with a bow thrust, secured a tug through her bow to help turn the vessel in an inner harbour prior to departure. The tug was secured using a ship's mooring line at the request of the tug's master, as was the usual practice within the port.

As the vessel approached the inner harbour entrance, the pilot realised that she was getting close to the southerly pier head, which was on the vessel's port bow. Consequently, he ordered the vessel engine to be put astern and for the tug to move to the starboard bow and pull towards the north. The tug was not kept informed of the vessel's engine movements and during this manoeuvre the tow line suddenly tensioned and parted. The ship came to rest on the southerly pier head. Fortunately, there were no injuries and, although material damage was caused to the pier head (figure), the vessel sustained only superficial scratches to her paintwork.

Contact with the pier head

The Lessons

1. The strength of mooring lines is usually much less than lines specifically manufactured for towing. Towing lines are also often designed to allow sudden increases in tension to be absorbed. Therefore, when ships' lines are used for this purpose, their limitations and vulnerability should always be considered.

2. When a tug is required to change position or direction of pull in confined waters, maintaining constant tension in the tow line and avoiding 'snatching' can be very difficult. Pilots and masters can assist by maintaining good communication with the tug during such a manoeuvre to ensure the movements of both vessels are co-ordinated.

3. When under tow during mooring operations, the tension on a tow line is likely to increase without warning. It is therefore imperative that all crew in the vicinity are aware of the potential for such changes and constantly monitor the positions of themselves (and others) with regard to 'snap-back zones'.

4. The usefulness of PPE is demonstrated only when it serves its purpose or when it is not worn and injury results. The former is undoubtedly the preferred method of recognising its benefits.

Pilot Vessel – You're Fired

Narrative

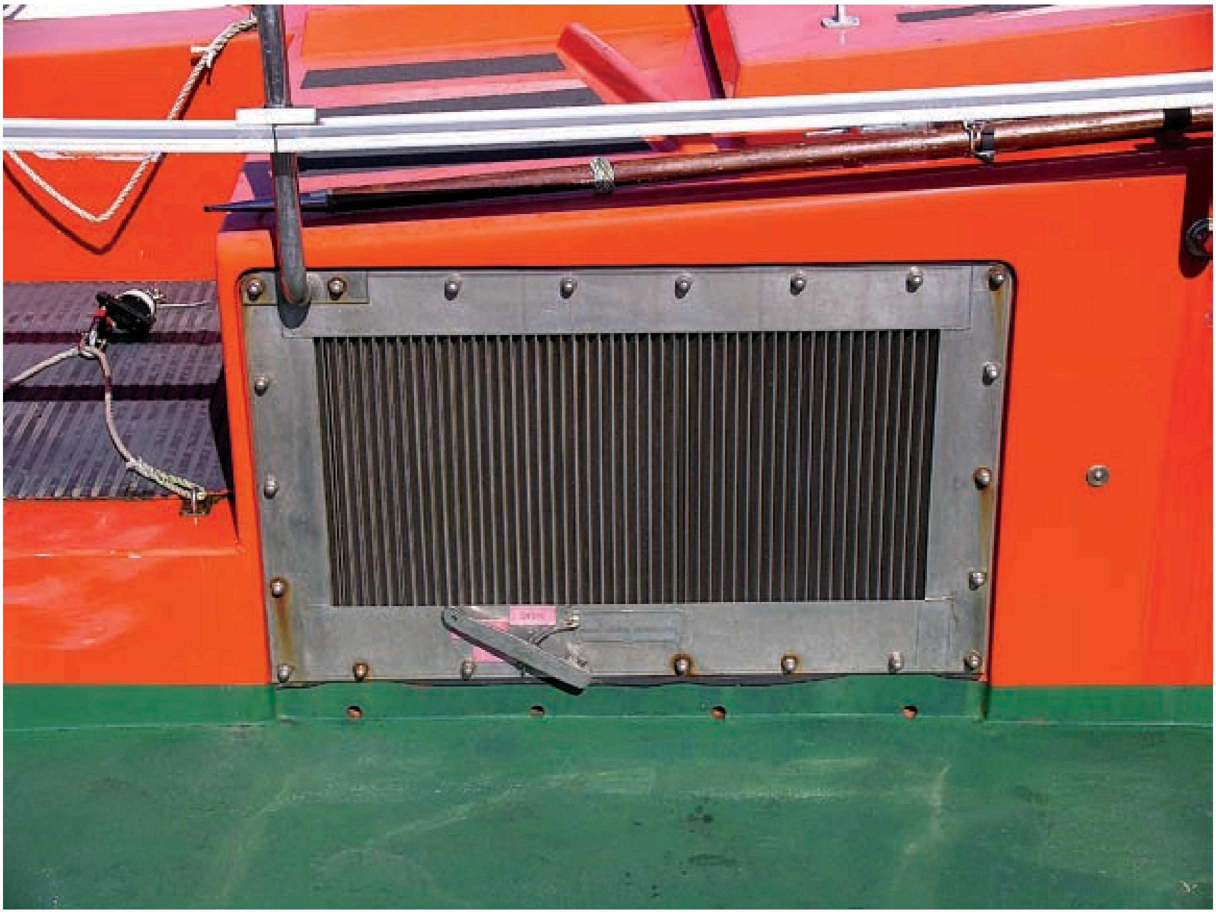
A pilot boat was rounding the stern of a large vessel to board the pilot. As the pilot boat crossed the vessel's wake, both engines suddenly stopped and large amounts of thick black smoke started to emit from the engine room ventilators. The coxswain went below to investigate the problem, and looking through the observation port in the engine room door could see nothing but black smoke.

A number of actions were then taken in quick succession. The fixed fire-fighting system was activated, the fuel shut-off to both main engines was operated, the ventilation flaps were closed, the engine ignition circuits were turned off, and the fire hose was rigged to commence boundary cooling. Smoke was filtering through the engine room bulkhead and filling the wheelhouse, making it impossible to use the main VHF radio set.

Fortunately, both the pilot and coxswain had portable VHF radio sets with them, and the pilot also had his mobile telephone.

The pilot telephoned the VTS operation centre to raise the alarm, since his hand-held VHF radio set did not have sufficient range. The VTS operator contacted the local coastguard station and arranged for the RNLI lifeboat to be launched. An RAF rescue helicopter, which was exercising nearby, was on scene in 15 minutes. Once the helicopter winchman was on deck, he discussed the situation with the crew. Since the boat had recently been refuelled, and it was not known whether or not the fire was still alight, it was decided to evacuate the vessel. The pilot and the two crew members were then winched into the helicopter and taken ashore.

Thirty minutes later, the RNLI lifeboat arrived and, having assessed the situation, the



Engine room ventilator

Damage inside the water tank

coxswain put two of his crew members on board to fight the fire. The engine room hatch was opened, and a hose was discharged into the engine room. With the hatch open, the remaining smoke quickly dispersed, and it was clear that the fire was out. The lifeboat then towed the pilot boat back to port.

Once alongside, an investigation was started into the cause of the fire. It was discovered that a lubricating oil pipe on the port engine had fractured, spraying oil over the turbo-charger. This ignited, producing large amounts of thick black smoke which choked the engine air supply, stopping both engines. The port engine stopped before all of the oil was pumped from the sump, and the engine remained functional. An investigation of the fixed fire-fighting system showed that the paint lining the inside of the water storage tank had delaminated, leaving large flakes of paint in the bottom of the tank.

The Lessons

1. Lubricating oil supply pipes are vulnerable to fatigue failure unless adequately clamped to reduce the effects of vibration. In the event of a failure of a pipe near a turbo charger, the risk of a resulting fire can be significantly reduced if the turbo charger has been effectively shielded to prevent oil spray contact.

2. The crew correctly followed their fire drill: they closed down the engine room and activated the fixed water sprinkler system. An efficient routine, allied to practice drills meant that when the emergency happened, the crew knew what to do and the fire was effectively dealt with.

3. The ventilation flaps to the engine room were free to operate, and closed effectively. However, the position of the operating lever meant that a crew member had to put himself into the smoke zone to move the lever from the open to the closed position. This could have been avoided by having a remote operating position for these flaps.

4. The fixed fire-fighting system operated as it was designed to. However, the post-accident inspection showed serious flaws in the paint system used to line the water tank. Large flakes of the paint had delaminated, and corrosion of the tank structure had started where the paint had come away. The standard for the fixed installation, BS5306 indicates that, where the internal paint has come away, or corrosion is evident, the extinguisher should be condemned. The extinguisher had recently had its annual test and maintenance, and this paint failure had been missed. The manufacturer of the extinguisher has alerted surveyors and maintainers to this possible problem. Had the paint flakes blocked the siphon tube, the system would not have operated.

CASE 15

Bollards!

Damaged bollard

Narrative

While securing alongside, a ferry's bow thrusters became fouled by her own mooring lines. A tug was quickly arranged to assist with the berthing, and it helped to keep the ferry alongside in the strong winds which were blowing off the quay. Divers then attended the vessel to free the mooring lines from the thrusters. Warning signs stating that the main engines and bow thrusters were not to be started were placed at the appropriate control positions, but no formal checklist was completed by the divers or the ship's crew.

Over the next 2 hours, the weather conditions improved sufficiently to allow the tug to be released. However, shortly afterwards, the wind increased to more than 40 knots. This caused the vessel's mooring lines, which comprised polyamide lines running from dedicated mooring drums, and polypropylene lines stored on loose reels, to stretch. The loading on the mooring lines became concentrated on the forward breast rope, and the shore bollard used to secure rope was pulled from its concrete foundations (see figure).

The remaining forward mooring ropes then parted as the vessel's bow started to swing away from the quay. A diver in the water, clearing the bow thrusters, was signalled to return to the shore by his supervisor who had heard the bollard fail. The diver surfaced, but was momentarily entangled in trailing mooring ropes. To try and check the vessel's movement, the starboard anchor was let go and the main engines were started. The diver heard the anchor splash into the water nearby as he swam to the quay. The vessel's swing to port could not be checked and the aft mooring lines also parted. The port anchor was also let go, but the vessel continued to be blown by the wind towards another vessel moored on the quay opposite, and contact could not be avoided.

The ferry was eventually assisted to an adjacent berth by two harbour tugs and was out of service for 10 days while repairs were undertaken.

The Lessons

1. Having ropes in the water at some point during mooring operations is frequently unavoidable. When this happens, there is always the danger of thrusters or a propeller becoming fouled unless good communication and co-ordination is maintained between the bridge, the mooring parties and the berthing party ashore.

2. The various types of mooring ropes in use have differing properties. This can – and does – cause problems if they are used alongside each other for the same purpose. Rope management is an important aspect of mooring operations, and careful consideration should be given to the rope types and strengths used.

3. The security of shore bollards is probably something everyone takes for granted. This is not surprising as they are usually extremely reliable. However, failure can, and does, happen and usually at very awkward times. Spreading the load across several bollards is one way of reducing this possibility.

4. When a ship is alongside and hazardous operations such as diving on the hull are taking place, it is essential that measures are taken which ensure the safety of the people involved. This inevitably requires the ship to have appropriate procedures in place, and for one person on board to be responsible for the oversight and co-ordination of the operations, be it the OOW or the duty officer depending on the circumstances.

5. Before letting go an anchor near a berth or congested waters, looking over the bow to check it is clear is not as foolish as it sounds. There is at least one case where an anchor has been dropped on to an assisting tug. In this case it could have killed a diver!

In the Tank – *Not* Over the Side

Narrative

The agents for an 18000gt general cargo vessel arranged for her to bunker about 300 tonnes of medium fuel oil (MFO 180) as well as 45 tonnes of marine gas oil while at a designated anchorage.

It was intended to bring Nos 2 and 3 port and starboard double bottom tanks to 90% capacity by bunkering 85 tonnes in each of the tanks. About 130 tonnes of fuel were to be taken into No 2 deep tank, which had a 360 tonnes capacity. All three tanks were confirmed to be empty before bunkering commenced. Each of the pneumatically operated tank filling valves could be remotely operated from the fuel control room, and there were also open/closed colour coded indicators showing the valve positions. There were no remote tank level indications, so levels were determined by manual tank soundings.

The fuel barge arrived alongside and was secured to the ship. The Bunker Operations Safety Checklist was signed by the bunkering contractor and the ship's chief engineer. Specifically, the completed checklist confirmed that the ship's scuppers were effectively plugged, savealls had been placed under the tank vents and there was a ready supply of oil spill equipment available to deal with any fuel spillage. A pumping rate of 150 tonnes/hour was agreed, with 5 minutes' notice to stop pumping.

The filling valves to Nos 2 and 3 double bottom tanks were remotely opened and the indicators in the fuel control room confirmed this. Pumping started, and the soundings confirmed that the tanks were filling. As the levels approached 85 tonnes in the tanks, the fuel control room operator operated the lever to open No 2 deep tank filling valve. However, the valve indicator was defective, and had been for a long period. With no means of confirming the status of the valve, the operator counted 20 seconds to allow time for the valve to open before closing Nos 2 and 3 port and starboard double bottom fuel tank filling valves.

This ad hoc sequence did not go entirely to plan!

Before the valves were closed there was a shout from the main deck that fuel had spilled from Nos 2 and 3 double bottom fuel tank vents. The savealls then overflowed and fuel rapidly spread over the deck. The fuel contractor heard the shout at the same time as receiving a message on VHF radio to "stop pumping".

Pumping was immediately stopped, and the ship's crew attempted to absorb the fuel with the oil spill equipment. However, about 100 litres of fuel flowed from the scuppers into the sea. The local port's oil spillage plan was activated, booms were laid (Figures 1 and 2), chemicals were sprayed onto the fuel, and over the next 2 hours the fuel dispersed.

Figure 1

Figure 2

The Lessons

Despite the operator in the fuel control room giving 20 seconds for No 2 deep tank filling valve to open, it was found to be still in the closed position because of an air pipe leak on the valve actuator. The tank was also found to be empty. The operator had assumed that the valve was open, so was content that Nos 2 and 3 double bottom tanks would not, themselves, become overfilled. The risk associated with this procedure was not recognised.

Despite the engineers and deck crew knowing that No 2 deep tank valve indicator was defective, they had made no attempt to rectify the defect. Having been aware of this problem, arrangements should have been made to visually check the valve's true position well ahead of the other tanks nearing the 90% level.

The control measure in place to deal with the spill was to ensure the scuppers were tight. The checklist was signed to say they were but, in fact, they were not; this led to the fuel spilling into the water. While the spill was relatively small and easily dealt with, the potential for significant pollution was all too apparent because of a failure to take the appropriate precautions.

The following lessons can be drawn from this accident:

1. Where remote valve indicators are defective, ensure that a visual check on the actual valve is made to determine its true position.

2. Rectify remote indication defects promptly, and prove actual valve positions against those indicated at the remote position.

3. Scupper blanking arrangements should be regularly checked to ensure that they are tight. Their integrity can be proven by a simple water test.

4. It is useful to include oil spillage exercises as part of the emergency drill schedule.

Part 2 – Fishing Vessels

The fishing industry continues to be recognised as one of the most hazardous industries in existence. It requires a special person to command and operate a commercial vessel safely. When considering the often difficult working conditions due to uncertain weather and complex vessels, with an array of modern machinery and gear, the job of the commercial fisherman is very demanding.

Working in some of the harshest environments known to man, fishermen of the modern era are required to perform skilful tasks onboard an ever moving platform that demands an ability and professionalism rarely seen in other labour intensive industries. There must be awareness that if there is a problem at sea, the skipper and crew must be competent in their reaction to critical situations as in many instances they are on their own.

Safety at sea for the fishing industry has to be a prime concern, and having worked in and with the industry for more than 35 years, I have to commend the progress made by the industry in improving safety in recent times, but there is still much work to do as the loss/accident history remains a concern.

The business pressures endured by owners today are far greater than any experienced in the past, but despite these challenges the industry continues to survive and press forward in key areas.

In many respects, my Company and the MAIB have a common goal in our respective businesses in attempting to establish why accidents at sea occur.

The intervention of the MAIB in accident investigation, greatly assists in determining cause, and then by feeding the critical information back to the industry, as to the reasons why the problems occurred, safety is advanced to a greater degree.

The prime objective of the MAIB is to learn from the accidents of the past and evaluate cause to improve safety at sea in the future.

Whilst there are numerous areas of increased safety that can be highlighted, to be constructive and to give increased focus, perhaps one of the most significant changes to the UK industry has been the continued introduction of foreign crewmembers.

In recent years, the migration of non-English speaking crewmen from Eastern Bloc countries and the Far East has presented new challenges. It is imperative that risk assessments are clearly understood with regular drills and emergency practices undertaken as part of the accepted routine. The relatively recent dilemma of working with crew whose first language is not English has presented new problems, and this is an area where greater education of crew is essential.

From a global standpoint, having worked with fishing industries from more than 50 countries around the world, I can confirm that the lack of a common language in the event of an emergency is a serious risk to crew and vessel safety. Specific drills and repeated training for key tasks with non-English speaking crew can result in lives or a vessel being saved when the inevitable problems associated with fishing occur.

Being diligent to ensure that the basic sea survival courses are undertaken is a first step. It still remains a concern when accidents occur that, when interviewed, some crewmembers have not completed this fundamental course.

In addition, as legislation increases, owners must ensure that safe practices when working onboard, and in the navigation of the vessel, must be adhered to rigorously. Even though the fishing activities are carried out in confined surroundings in the hostile environment of the sea, the safety obligations of an owner are no different to a land based industry. Indeed, if anything, such obligations are even more onerous as immediate assistance is not always directly at hand when a problem is encountered.

Included in this edition of the MAIB Digest are reviews of incidents of concern, and it is apparent that, with greater care, increased diligence and better working practices, they could and should have been easily prevented.

Whilst commercial pressures continue to mount, navigating with no one in the wheelhouse is the classic "*accident looking for a place to happen*". There is a duty of care to crewmen and other seagoing craft to respect and abide by the laws of the sea and safety regulations. A vessel underway without anyone at the wheel is heading for trouble, and over the years of investigating many losses, I have to say this act carries some of the most devastating consequences.

Greater financial stress has been seen in recent times due to diminishing returns from fishing, but this should not compromise essential maintenance. The reports in this edition clearly demonstrate how inadequate maintenance has resulted in increased danger where the consequences of omissions have been disastrous.

The work of the MAIB Inspectors is invaluable in ensuring safety at sea is understood and complied with by all. It serves as an unquantifiable protection as it is difficult to measure what has been saved, prevented or improved by having an increased regard for safety, but I am convinced that the work of the MAIB has a positive impact.

In this instance, when considering the fishing industry, "*we are all on the same side*" where the positive work of the MAIB is designed to make the fishing industry a better and safer place to work for all.

This respected Safety Digest is an essential element of gaining increased understanding as to how accidents happen. Please read it in detail and consider the short time necessary to put into practice the prevention recommendations to move safety at sea to an improved level.

Geoff C. Parkinson

Geoff Parkinson joined Sunderland Marine in 1972 as a junior claims assistant. The company allowed the development of a proactive claims approach encouraging the close association with the fishing industry in the UK and Ireland. Within a few years, he was asked to undertake risk assessment and loss prevention field trips to various parts of the world to encourage the development of business. He was promoted several times between 1979 and 1993, and in 1996 was appointed to the position of Chief Executive.

Geoff is married with two children, and is a keen sports enthusiast with a particular interest in Newcastle United Football Club.

CASE 17

Double Tragedy

Narrative

After the last haul of the trip, the skipper of a 20m trawler set the autopilot to return to port at a speed of about 7 knots. During the 18 mile passage, he assisted the boat's two deckhands in the shelter deck to help prepare the catch for market, but returned to the wheelhouse periodically to check the boat's position and adjust the autopilot. Several minutes after the skipper's last visit to the wheelhouse, when he had estimated by eye that the boat was about 1nm from the port entrance, the boat struck the rocky shore further south.

The skipper ran straight to the wheelhouse and put the engine full astern. Once clear of the rocks, he put the engine ahead and turned towards the port, which was only 3 cables away. By now, the low-level bilge alarm was sounding, so the skipper told one of the deckhands to steer while he went below to the engine room to start the auxiliary engine and the secondary bilge pump. This took only a few seconds, during which time the skipper saw water entering the engine room bilge through gaps around pipework penetrating its forward bulkhead.

When the skipper returned to the wheelhouse, the high-level bilge alarm was also sounding, and the boat had stopped answering the helm. The skipper was then informed that the forepeak was almost full of water and the fish room was half full. The deckhands were instructed to take off their oilskins and prepare the liferaft on the galley roof while the skipper fetched the lifejackets from the accommodation. However, he was unable to get into the accommodation because its access was flooded and the accommodation lighting had gone out, so he joined the deckhands on the galley roof. The boat was now trimmed considerably by her head, and as soon as the skipper released the slip holding the liferaft in its cradle, she sank.

The three men initially clung on to the liferaft canister until the skipper managed to inflate the liferaft by pulling on its painter. Unfortunately, it inflated upside down, and by the time the skipper managed to right it, the deckhands had disappeared. The local lifeboat was activated after the coastguard had been alerted by the boat's EPIRB, and spotted the liferaft about 5 cables from the port entrance. The skipper was rescued about 1½ hours after the boat sank. The body of one of the deckhands was later recovered from the seabed close to the wreck, but the body of the second deckhand was not found.

An underwater survey of the wreck showed that the vessel was badly holed below the waterline on her bow.

The Lessons

1. Leaving a wheelhouse unattended is risky at the best of times. To do so when approaching the shore at night, and not keeping any form of lookout, is asking for trouble. Balancing the various demands of a fishing vessel crew can be difficult, and keeping the wheelhouse manned when there's plenty to do on deck is not always popular. However, whereas such unpopularity will usually be short-lived, the grief following a fatal accident will potentially last a lifetime.

2. Deciding on the right course of action to take following a grounding is not always easy, and requires a skipper to think on his feet to quickly consider a number of factors. Although moving into safe water as quickly as possible is an instinctive response, it might not be the best action to take without first obtaining a quick assessment of the damage sustained. In any event, driving ahead when holed below the waterline forward not only increases the rate of flooding, but it also increases the chances of making the damage worse.

3. Watertight bulkheads save boats and save lives. Where penetrations in these bulkheads cannot be avoided, they can still be kept reasonably watertight providing the gaps around pipes and conduits are adequately packed.

4. In an emergency, it takes seconds to press the DSC button or to send a "Mayday" call. Not only does this alert the coastguard, but it also alerts all other vessels in the area, including nearby vessels alongside if their equipment is switched on. The sooner this action is taken, the sooner help will be at hand.

5. There are two main types of EPIRB, both of which are extremely useful in alerting the coastguard. However, the first transmits a vessel's GPS position when activated; the second relies on Doppler techniques to establish the beacon's location, which takes time and is not as accurate. Although the GPS version might be a little more expensive, it is potentially a sound investment.

6. Many older vessels pre-date the requirements for generators, batteries and switchboards to be protected against water ingress and a separate, emergency power source. Where this occurs, the provision of additional torches and portable VHF radios, which would be of benefit in an emergency situation, should be considered.

7. Storing lifejackets and other equipment such as flares, in the accommodation, when alongside, keeps them secure. Keeping them there at sea might result in them being inaccessible when they are needed.

8. Ideally a liferaft will have been inflated either manually before an evacuation, or automatically as a vessel sinks. However, if a liferaft has to be inflated by persons already in the water, great care needs to be exercised as the forces generated during inflation are potentially hazardous to those near its canister.

CASE 18

Water in Fuel – A Recipe for Expensive Problems

Narrative

A skipper and his five crew sailed from a south coast port to deliver his recently purchased 23 metre trawler to its new Scottish home port. Before sailing, 13000 litres of marine gas oil were bunkered. As the weather was fine the skipper decided to familiarise himself with the trawling equipment, so he spent a couple of days fishing before resuming his passage to Scotland.

The wind was west-south-west force 4. The trawler handled well in the seaway and the skipper was satisfied with the boat. The fishing was successful and life seemed, on the whole, to be pretty good.

Over the next 30 hours the weather and the sea state slowly deteriorated and the boat started to regularly ship heavy green seas. At about 2300, the engineer reported to the skipper that he had transferred fuel from the port and starboard service tanks to the day tank from which both the main engine and the two generators took their fuel supplies. About 10 minutes afterwards, the main engine revolutions dropped from 1400 rpm to about 1100 rpm. After a short period of stability the revolutions continued to fall. At the same time, the skipper noticed white smoke coming from the main engine exhaust, and soon afterwards the engine stopped. Because the electrical power was being generated from the "on engine" alternator, all electrical power was also lost.

Unable to restart the engine the skipper instructed that the electrical generators be started. Almost immediately after starting,

Figure 1

Figure 2

these also stopped and could not be restarted. The engineer was unable to identify the cause of the failures so the skipper had no option but to notify the coastguard of his problems.

They, in turn, arranged for the vessel to be towed into port by the local RNLI lifeboat. The tow was connected at about 0230 but parted twice before final arrival at 1125.

The Lessons

On investigation, it was found that after bunkering the vessel, the fuel deck filling caps had not been properly tightened. This allowed water to pass into the fuel service tanks during the rough weather. The water was subsequently transferred to the day tank from which both the engine and generators took their fuel supplies. The water-contaminated fuel caused the engine and generator failures.

The failure to observe the most basic of procedures – the tightening of the filling caps to prevent the ingress of water – led to the contamination of the complete fuel system. This resulted in considerable expense for cleaning/changing of fuel tanks, pipe work, pumps, strainers and filters.

1. Ensure that deck fuel filling connections are properly marked (Figure 1) to prevent inexperienced crew putting water or other fluids into the system – it has happened!

2. Threads and caps should be in good condition, and cap seals intact. If leather seals are used, they can become brittle, and should be regularly inspected and changed if damaged or if they become hardened.

3. Make sure that fuel deck cap tightening keys match the cap recess or stub and are in good condition so that the cap can be fully tightened.

4. Some types of filling caps are arranged so that a lock can be fitted to prevent intentional contamination. A lock or other device, a plastic cable tie in the case of Figure 2, can be fitted to prevent the cap from rotating through vibration which can easily lead to potential sea water contamination of the fuel system.

5. It is good practice, where possible, to check fuel quality before transferring between tanks so that contaminated fuel is not passed around the system.

6. Where fitted, always use fuel purifying systems to "polish" the fuel to remove impurities, including water.

7. Remember – fuel hygiene discipline is part and parcel of good engineering practice; look after your fuel and it shouldn't let you down.

Between a Rock and a Hard Place

Narrative

A deep sea fishing vessel's main engine stopped at a critical moment after she had been sheltering from severe weather for almost 2 days in the lee of an island. Initial close proximity to the shore, tidal effects, and violent unpredictable changes in wind direction caused the vessel to drift towards rocks after losing power. Repeated attempts to restart the engine failed, and the vessel grounded.

The skipper transmitted a distress call on VHF radio, which was answered by other vessels also sheltering in the bay. Unfortunately, due to shallow water and over 6m swell, these other vessels were unable to get close enough to pass tow lines.

DSC alerts transmitted by the stricken vessel before she lost electrical power were picked up by the coastguard, who immediately put in place a full scale search and rescue mission involving helicopters and a lifeboat.

Due to the weather conditions and distance from the rescue facilities, the crew sheltered for over 2 ½ hours in the vessel's wheelhouse as she lay crashing against a cliff face in darkness. During this time, waves stove open a wheelhouse door, soaking the occupants, who were wearing little more than normal clothing and lifejackets. The skipper realised any attempt to abandon by liferaft or scale the nearby cliffs would be futile, so motivated his crew and ensured they remained in the relative safety of the wheelhouse until help arrived.

The rescue helicopter had to abort an early attempt at rescue due to the darkness and extreme weather conditions. However, on a subsequent attempt, a winchman was successfully lowered to the vessel and all the crew were airlifted to safety.

On arrival ashore, several survivors were suffering from the effects of hypothermia and required treatment in hospital.

The Lessons

1. It is not known why the vessel's engine stopped. However, it had been idling for a prolonged period, which could have led to poor combustion and inefficient running. It is not unusual in such conditions for an engine to stop when load, such as engaging gear, is applied. Diesel engines need to be "worked" to maintain optimum performance and reduce coking. Even occasional revving up out of gear during periods of prolonged idling will help "clear" an engine and reduce the chances of it stalling.

2. Anchoring was not attempted to slow the vessel's drift; had it been, it might not have been effective in the sharp, steep swell anyway. Nevertheless, in close to shore situations anchors should always be prepared and be ready for use; if nothing else this can buy time.

3. The vessel was not equipped with immersion suits, and there is no statutory obligation for vessels of less than 45m in length to do so. The absence of regulation should not prevent responsible owners from ensuring some means of thermal protective clothing is available to crew members. If all else fails, oilskins secured around cuffs, waist and ankles can reduce heat loss in immersion situations, and reduce the early onset of hypothermia.

4. The skipper recognised the dangers of abandoning by liferaft on the wave-battered rocks, and also the dangers of attempting to scale the cliff face. The vessel was not breaking up beneath them and he knew that remaining on board provided their best means of survival. This reinforces the old adage, "Don't leave the ship until the ship leaves you!" The skipper motivated his crew and kept morale high for several hours while awaiting rescue, emphasising the benefit of strong leadership in such arduous circumstances.

When Making a Cup of Tea Wrecks a Crabber

Narrative

During the evening, a 15m crabber sailed for her fishing grounds. At about 0200, one of the deckhands was woken to take over the navigational watch. At this time the vessel was dodging inside a wide and deep sea loch, waiting for the weather to abate.

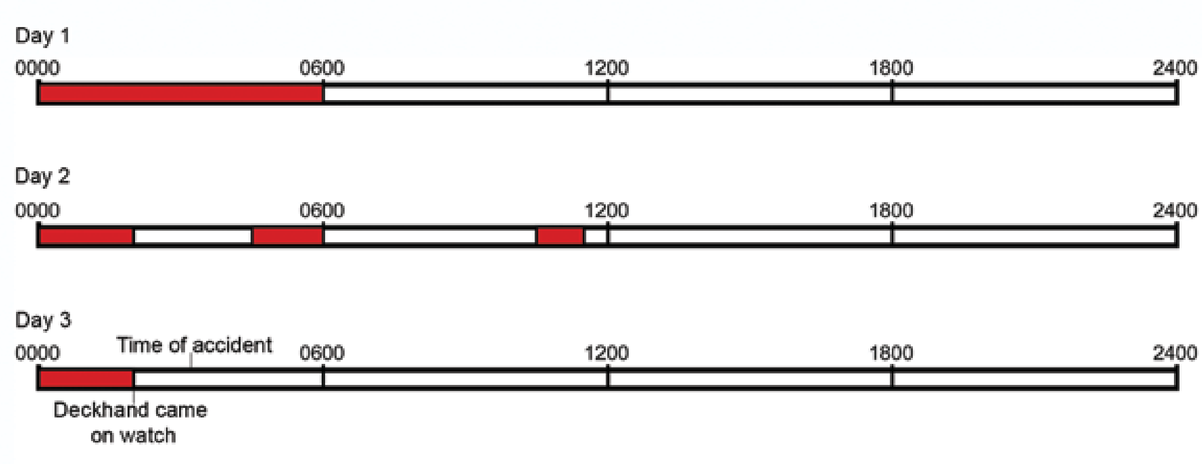
The deckhand had transferred from a sister vessel that evening and had only had sporadic and short periods of sleep over the previous 48 hours (see diagram below).

The engine was ticking over, giving a speed of about 4 knots, and the vessel was dodging north/south in a box that the skipper had drawn on the electronic chart. The watch alarm was in operation. As the vessel reached the southern end of the box, the deckhand selected a new course from the electronic chart and is reported to have dialled it into the automatic helm, expecting the vessel to turn onto a northerly heading. He then left the wheelhouse unattended and went to the galley to make a cup of tea and a sandwich, returning briefly to cancel the watch alarm.

During his absence, the vessel ran aground in a deep cove to the south of the box drawn on the electronic chart. The skipper awoke, and broadcast a "Mayday", which was received by the coastguard. Two lifeboats and a rescue helicopter were then tasked to the scene.

The crew prepared the liferaft, but before launching it they threw a lifebuoy into the water to see where it drifted. The swell drove the lifebuoy further into the cove, so the skipper decided it would be safer to remain on board the vessel. When the lifeboats arrived, they were unable to approach the stricken vessel to evacuate the crew because of rocks located astern and the swell waves breaking over them.

When the rescue helicopter arrived, the winchman was lowered down by the side of the cliff and onto the vessel. The 7-man crew were then airlifted to hospital and treated for hypothermia and shock.



Deckhand's sleep patterns prior to the accident

The Lessons

1. The vessel did not turn as expected. This might have been as a result of environmental influences and the vessel's slow speed. Alternatively, it is likely that the deckhand's performance was affected by fatigue, and he might have either not altered course at all, or dialled an incorrect course into the automatic helm.

2. Never leave the wheelhouse unattended, and always monitor alterations of course to ensure the vessel turns as expected. Sensible advice on keeping a safe navigational watch can be found in the Maritime and Coastguard Agency's Marine Guidance Note MGN 313(F).

3. It is essential that skippers take full account of a deckhand's work and rest pattern before allocating him to a navigational watch. This will ensure that he can perform his duties safely.

4. The skipper was wise to use a lifebuoy to test where the liferaft would drift before launching it. It is often safer to stay on board a vessel than to rashly abandon it at the first opportunity.

Wooden You know

Narrative

After a couple of weeks' layover during the Christmas period, a 20m fishing vessel sailed to the next port along the coast to pick up ice and to have a minor repair carried out to the fish-finder display in the wheelhouse. She sailed at 2035. As she was leaving the port, she made contact with the breakwater. However, she continued the voyage with no attempt having been made to check for damage to the vessel.

Overnight the passage progressed without further incident, but at about 0330 the watchkeeper called the skipper, having noticed that the engine revolutions were dropping and that the engine was making a strange noise. The skipper decided this needed further investigation, so turned back to port.

At about 0700, the fish hold bilge alarm sounded. This was set to sound once the well was full. Again the skipper was called, and he started the main bilge pump which was driven by the auxiliary engine. The suction for this pump ran along the port side of the keel into the well, and was fitted with a coarse strainer in the well, and a finer strainer at the valve chest in the engine room.

After about 10 minutes, the skipper checked to see that the pump was still discharging; it was not. He therefore went to the engine room and dismantled the valve and strainer. Removing a small amount of debris, he reassembled the valve, but could still not gain suction. He then started the bilge pump driven from the main engine. This suction ran up the starboard side of the keel, and was fitted with similar strainers to the port side suction. Again this ran for about 10 minutes before the discharge stopped. It was at this point that the skipper went to the fish hold. The water was now about 10cm above the level of the well, and could be seen running from forward through a redundant cable gland opening in the forward bulkhead.

Image from RAF rescue helicopter footage

Checking the forecastle space, the skipper noticed that the water level there was higher than that in the fish hold, but he could not see the source of the water ingress. He returned to the wheelhouse and called the rest of the crew, telling them the boat was filling with water and that they should don lifejackets, prepare the liferaft, and retrieve the emergency pump from the cabin and rig it to pump out the fish hold. He tried to raise the alarm, firstly by VHF radio channel 16, then on MF 2182 kHz, and finally by pressing the DSC alert button on his radio. The coastguard replied, and started to organise a rescue attempt. By this time, the crew had used the power block to lift the liferaft from the roof of the wheelhouse and put it on the poop, and had put on their lifejackets. However, they had failed to start the emergency pump because the engine was found to be seized. It was at about this time that one of the crew members, who was making his way forward, slipped and fell against the fish hatch coaming, breaking his ribs.

An RAF helicopter was launched to assist, and a number of oil rig supply vessels responded to the "Mayday Relay" broadcast by the coastguard. Approximately 40 minutes later, the first oil rig supply vessel was on scene, and the master gave orders for the FRC to be launched. In discussion with the fishing boat skipper, he decided to take three of the crew off, including the injured man, and take them on board his own vessel, which remained close to the sinking fishing boat as the RAF rescue helicopter arrived. Two salvage pumps were lowered onto the fishing boat, and one was started without problem. The second initially failed to prime, and was moved to a position on the main deck, where it operated effectively.

By now, the water level in the fish hold was such that a number of holes in the bulkhead between the fish hold and the engine room used for cable runs were submerged, and the engine room had also started to fill. The pumps were not keeping pace with the water ingress, so it was decided to take them back on board the aircraft and have the FRC take the remaining two crew members off.

The fishing boat sank at 1108. The injured crew member was transferred to the helicopter, and then on to hospital, and the remaining crew members returned to port on board the oil rig supply vessel. Before leaving the scene, the FRC was launched again to pick up floating debris and the fishing boat's EPIRB.

It is not possible to be certain about where the water was entering the hull. There were three possible sources: the first – and most likely – source was as a result of damage sustained when the boat contacted the breakwater when she left the port, and possibly holing her. The second was as a result of a fractured pipe supplying water to the freezer plant condenser in the forecastle. However, the pipes were fairly high in the space, and it is likely that the skipper would have seen water being pumped into the space through a pipe fracture. The third possible source was from a redundant skin fitting which had not been maintained.

The Lessons

1. MGN 165(F) Fishing Vessels: the Risk of Flooding, provides guidance on bilge systems and their construction and operation, as well as recommending the consideration of additional pumping arrangements to reduce the risk of catastrophic flooding.

   In particular, it includes advice on the need to keep bilge suction strainers and the fish hold bilge free of rubbish, and to position bilge alarms low enough to provide early warning of flooding. Further advice is given concerning the need to maintain bulkhead watertight integrity, the carriage of portable pumps and their regular testing, and ensuring that crew members are familiar with the bilge system.

   Much of this advice was not followed.

2. Only the skipper was familiar with the bilge pumping arrangements. None of the rest of the crew was able to assist him during this emergency.

3. The bilge alarm was set to sound when the fish hold bilge well was full. This meant that the end of the suction pipe was under approximately 80cm of water when it first activated. Had the bilge alarm been adjusted to sound at a lower level (as recommended by the MGN), it would have given an earlier warning of the problem, and allowed ready access to the strainer at that time.

4. It was not until the second pump suction strainer had become choked that the skipper entered the fish hold. By then, the water level rendered the strainer difficult to access. No attempt was made to stop water flowing into the fish hold from the forecastle through the redundant cable gland opening. Doing so, might have allowed the skipper enough time to clear the strainer and start to pump out the hold.

5. Although the owners had followed the advice in the MGN concerning the provision of emergency pumps, they had not ensured that the pump was ready for use. No routine had been established to start and maintain the engine, and when it was required in an emergency it could not be started. Make emergency pump testing part of your pre-sailing checks.

6. Following contact with the breakwater, no check was carried out to see if any damage had been caused to the vessel. While it is unlikely that the water ingress would have been immediately apparent, since it was almost 11 hours until the bilge alarm sounded, any damage with the potential to cause flooding would have been noted, and the vessel returned to port for repairs.

7. The hull fittings in the forecastle included a redundant sea water suction valve, and a disused echo-sounder transducer. Both of these were situated underneath the water tank, which filled the lower part of the forecastle. It was not possible to see these fittings from inside the boat, and they were not maintained when the boat was slipped. The condition of these fittings was therefore unknown.

8. Attempts to raise the alarm by VHF and MF radio were initially unsuccessful because the frequencies used are no longer allocated for distress alerting. It was only when the correct procedure was followed, by using the DSC alert button, that a response was obtained. Are your emergency calling procedures up to date?

Part 3 – Leisure Craft

In today's health and safety environment, especially for those people involved in hazardous activities, it may seem perverse in the extreme that there should have ever been any debate as to whether leisure sailors should be equipped with and use basic first line safety equipment. In that category I include safety harnesses and tethers for people of larger sailing craft going offshore and lifejackets for anyone who ventures out on the water in small craft of all types.

But debates there have been. In the 1960s and 70s when, it should be added, sailing boats travelled much more slowly than they do today, top level ocean racing sailors often refused to wear harnesses as they were an encumbrance when they needed to act quickly, which was in many ways quite understandable but there was a macho element to it as well. Likewise, in the same decades lifejackets were large, heavy, cumbersome and uncomfortable to wear. They were not always particularly effective and I recall testing one only to find it waterlogged and giving as much buoyancy as a soggy rag. On board rules for wearing them also varied hugely from boat to boat but more recently, following initiatives from organisations such as the Royal Ocean Racing Club and Royal Yachting Association guidelines have been issued which broadly recommend that if it is windy enough to reef it is windy enough to put on a harness. And they should be worn at all times at night or in poor visibility.

Fortunately the design and construction of both have improved beyond recognition and the modern lifejacket is light and comfortable to wear and harnesses resemble climbing harnesses and are far less cumbersome than those a few decades ago. But still, as three of the following incidents sadly demonstrate, the best equipment in the world is of no use unless it's worn. And it is here, I believe, that the RNLI is starting to turn the corner with its campaign 'don't ask if it's time to put it on. Ask instead if it's safe to take it off'.

In the aeronautical industry pilots and aircrew who make mistakes that could endanger the safety of their aircraft or other aircraft are actively encouraged to report these incidents, anonymously if preferred, for publication so that others can learn from those mistakes and be less likely to do the same.

I see the MAIB's Safety Digests, 'Lessons from Marine Accident Reports', as performing very much the same role and would encourage all seafarers, whether professionals or leisure sailors, to read these, whether the printed version or online. They can be obtained from www.maib.gov.uk

Andrew Bray, EDITOR Yachting World

Andrew Bray has been an active sailor for nearly 50 years and has sailed in many parts of the world, including several Atlantic crossings, some shorthanded long distance races and has cruised much of Europe, the Mediterranean and Caribbean and also in Australia and in the Pacific and Indian Oceans. He has owned a succession of sailing boats from dinghies up to his present 43 foot fast blue water cruiser.

He became professionally involved with sailing when he started working as a yachting journalist in 1972 and went on to be Editor of Yachting Monthly in 1985 and later Yachting World in 1992

CASE 22

They Normally Wore Lifejackets

Similar aluminium angling boat

Narrative

The owner of a recently purchased 5m long aluminium angling boat was making repairs to his mooring when he met a friend on the bank of a lake. The two men had always lived locally, and had taken boats out onto the lake since their youth.

Although they had probably not previously planned to do so, the two men decided to take the boat out onto the lake. The weather was cloudy with good visibility, and the wind was west-south-westerly Force 3 which was raising wavelets about 0.3m high; well within the boat's Category D capabilities.

The two men did not wear lifejackets on this occasion as the owner had left them at home in his shed.

The owner had taken the boat out several times since he purchased it from a local supplier 3 months earlier. The planing hull, powered by a 30 HP engine, was capable of carrying 5 people and of achieving around 30 knots in good conditions. The new boat replaced the owner's previous slower boat, which was fitted with a forward cuddy and integral steering position.

The boat left the mooring late that morning and made its way out to the unrestricted waters of the lake. Around 15 minutes later, it was travelling at almost full speed when it made a sudden turn to starboard, followed by a similar turn to port. Both men were thrown from the boat and it stopped immediately because the kill-cord worn by the owner pulled free.

The accident was seen by one of the two crew of an approaching motor cruiser which was heading in the opposite direction. The cruiser headed at full speed directly to the men in the water, and the crew contacted the coastguard as they approached the scene. The motor cruiser's crew did not see either of the two men move from the time they were thrown into the water, and as they arrived at the scene, both men disappeared below the surface.

Tragically, despite an extensive search of the area by the emergency services, both men drowned.

The Lessons

1. **Both men were known to routinely wear their lifejackets; however, on this occasion, they decided to go out in the boat without them. This simple omission might well have made the difference between life and death. On a summer's day, even relatively warm water can trigger a gasp reflex in someone who is suddenly immersed. Without the buoyancy provided by a lifejacket or buoyancy aid it is very difficult to cough out any ingested water in order to breathe freely. Remember that the exception may well be the one time you need your lifejacket, and it will work only if worn and fitted correctly.**

2. **Build your confidence in an unfamiliar boat over time. Be sure that you understand the settings of steering and throttle control and how these affect the boat's handling at various speeds, in differing weather conditions and with various loads on board.**

3. **Don't misjudge the power of your boat and your ability to handle it. Consider whether a fitted steering console or an outboard engine tiller is the most suitable option for you.**

Clipped On?

Narrative

A 9m sailing yacht was making a passage along the south coast of the UK. The owner had recently bought the boat and a delivery skipper had been hired to assist in taking it to its new home port. The boat had been launched that morning after being laid-up ashore for 6 months.

The owner, who had not sailed for 15 years, was on board with the delivery skipper, and was using the trip to re-learn his sailing skills before taking the boat out for the first time on his own. The delivery skipper was delivering a yacht for the first time. The wind was blowing from the north east at force 6 and was forecast to increase.

On getting underway, they had hoisted a jib on a self-tacking system, uncovered but not hoisted the mainsail, and were also using the engine. This gave them a speed of about 9 knots, sufficient to get through the Needles Channel before the tide turned against them. At 1830, they passed the Needles fairway buoy and settled down for the long downwind leg towards Start Point. The delivery skipper made sure that the owner was wearing his lifeline and that he was clipped to a strong point, but for some reason did not put his own lifeline and harness on.

About half an hour later, an engine overheat alarm sounded and the engine was stopped. It was now dark, and the yacht continued to make fair progress, although the wind strength was increasing. Over the next 2 hours, some small incidents occurred. The pin locking the bar carrying the mainsail traveller in place worked loose, and the bar came free, allowing the boom to move wildly. As there was no mainsail set, this was easily controlled and the pin re-inserted. The combined bow lantern then went out, possibly due to water ingress to the unit. Then all electrical power switched off due to a low voltage trip activating. By over-riding this trip the skipper was able to restore power to the navigation lights and instruments. This lasted for about another hour, until all power finally failed. The yacht was now in darkness.

The voyage continued, and by that time the owner was becoming tired, having been at the helm for most of the voyage. He asked the skipper to take over the steering, and settled down to doze in the port aft corner of the cockpit. Sometime later he was alerted by a shout, and was then hit on the head by the skipper's body going overboard, and was knocked out for a few seconds. When he came to, he realised that he was alone on the yacht, and that he could see a light astern about 20 metres away. He threw the horseshoe lifebelt mounted on the poop rail towards the light, and tried to turn the boat back towards the skipper. Due to the direction of the wind and sea, and the sails carried, this proved impossible, so he tried to start the engine. Because of the lack of electrical power, the engine could not be started, and it proved impossible to return to his colleague in the water.

Realising that he needed help, the owner returned to the cabin and found there was enough power left in the batteries to make a distress call using the VHF radio. This was received by the coastguard, and a search and rescue operation was initiated. The owner had not been navigating, and there was no light available to read the chart, nor was there power for the GPS system. The position he was able to provide the coastguard was approximate, however they were able to triangulate his position using VHF direction finding apparatus before the power finally failed on the yacht's VHF set. The owner then started to set off flares, at intervals, but had some trouble igniting the hand-held flares because of the low light conditions and the fact that he could not find his glasses.

The yacht and the man overboard were both located some 3 hours later. However, the skipper had drowned before he could be rescued.

The Lessons

1. **The skipper was not wearing a lifeline and a harness. Had he clipped himself on he would have remained attached to the boat.**

2. **The cause of the electrical problems was found to be two fold. Firstly, the poor state of the batteries meant that they did not retain their charge; secondly, the crossover switch between the engine and domestic batteries was badly installed and of poor manufacture. This meant that the two batteries were permanently connected, and the power was drained from both at the same time. While this did not cause the accident, it meant that the engine could not be started and the man overboard could not be recovered.**

3. **It is important to know how to use all safety equipment. It is too late to start reading the instructions when the equipment is needed in an emergency.**

CASE 24

Tragic End to a Day's Fishing

Narrative 1

A 6m open angling boat (Figure 1) fitted with a 4 HP outboard engine, was returning to shore following a fishing trip on an inland loch. Some alcohol had been consumed during the day. The weather conditions were poor, and the boat started taking water over her low gunwale. An automatic bilge pump cut in, but was unable to cope with the volume of water coming over the sides. Consequently, the five crew started to bail out the water using empty cans. A large wave then swamped the boat and engine power was lost. The boat turned broadside to the waves and capsized.

All five of its occupants were thrown into the water and were initially able to cling onto the upturned hull. One of the anglers managed to contact the coastguard on his mobile phone and requested assistance. The local lifeboat and a rescue helicopter were launched, but when the boat was located two of the anglers were missing. One of the missing men was found shortly afterwards, but was pronounced dead on arrival at hospital. The body of the other man was found 12 days later.

The surviving anglers wore flotation suits over their clothing; the deceased only wore flotation trousers. No lifejackets were worn or carried on board.

Narrative 2

The owner of a 14 foot sports fishing dory launched his boat from the beach into his local river to go fishing for sea bass – as he had done many times over the last 20 years. He was accompanied by his nephew and a friend. The weather was forecast to be dry with sunny spells, with a maximum wind of between force 3 and 4. Lifejackets and buoyancy aids were carried in the boat, but were not worn.

Figure 1: Recovered dory

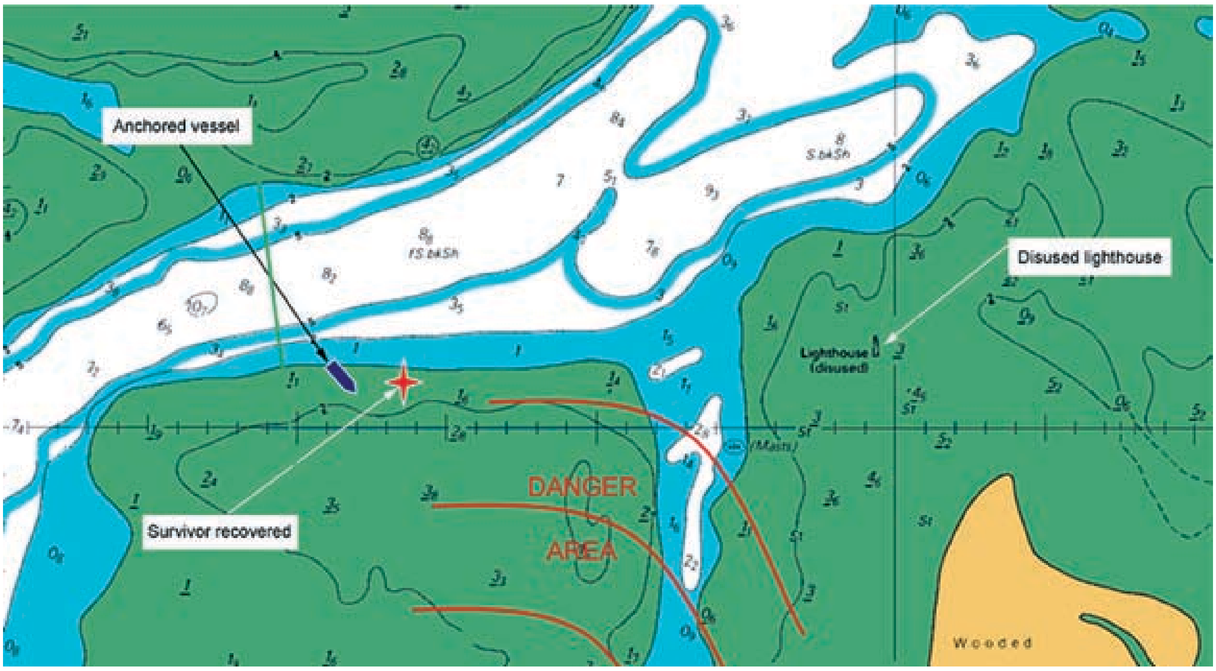


Figure 2: Chartlet of the area

After fishing in the estuary, the men made their way along the coast. By mid afternoon they had caught several fish, and anchored for a cup of tea and to watch seals on a nearby beach. The sea was calm, although there was a 2m swell from the south west. The men then continued fishing, and by early evening were drifting back into the estuary on the flood tide as the sun set.

At about 2000 the owner of the dory ordered "lines up" and they began heading upriver at about 6 knots to await the rise of tide. The predicted time of high water was 2309, and they knew they would have to wait a little longer before they could recover the boat on the beach. The evening was very still and clear and, although dark, the owner assessed the boat's position by eye. The vessel's GPS was switched on, but was not used.

As the boat closed a local disused lighthouse (Figure 2), a large swell wave passed under the vessel from astern. Seconds later, another larger wave broke over the stern. The owner immediately realised he was further south than he thought and was in an area known for large breaking waves at certain stages of the tide. However, it was too late to take any action because the boat was swamped and quickly sank by the stern. Although the anglers were initially able to cling on to the bow, which remained above the water for a brief period, this also sank. The men were left stranded in the water, at night, with no lifejackets and no means of raising the alarm.

Having made the decision to try and swim to safety, the men set off towards the northern shore, which they thought to be the closest. Within minutes, the friend of the owner disappeared. The owner and his nephew continued to swim and, after several minutes, they saw lights on the water ahead so began shouting for help. The light was from another angling boat anchored nearby. Her crew immediately alerted the coastguard when they heard the calls for help. They then weighed anchor and quickly recovered the owner of the dory, but there was no sign of his nephew. A life ring and light were thrown into the sea to use as a search datum, and a "Mayday" message was broadcast by the coastguard, which also tasked local lifeboats and search helicopters to the scene.

Tragically, the bodies of the two missing men were recovered from the water later that evening. The boat was found 2 days later. She

Figure 3: Boat found at sea

was still partially buoyant and was towed back to port (Figure 3).

Narrative 3

Two friends set off for a fishing trip in their recently purchased 18 foot open boat. They were unaware of the weather forecast other than that rain was expected. Shortly after 0800, they stopped the engine and began drift fishing for mackerel. The sea conditions were good.

Just before 0930, the wind increased and the sea became choppy. As neither of the anglers had caught any fish, they decided to call it a day, and started the engine in order to head back to port. Soon after setting off towards the harbour entrance, the boat started to take in water over its sides and stern. One of the men, who was steering and was positioned towards the rear of the craft, began pumping the water out using the manual bilge pump. However, because the water level in the boat continued to rise, he soon changed to bailing the water using a bucket. While bailing, the angler dropped his mobile phone into the bilge, rendering it inoperable. A large wave then came over the boat's stern and, as the other angler moved aft to assist with the bailing, the boat sank stern-first.

The two men remained afloat, but they were not wearing lifejackets and had no means of raising the alarm. One of them could not swim but, assisted by his colleague, managed to hold on to a creel marker buoy. The second angler found another creel marker buoy nearby to hold onto, but as the sea conditions had increased to moderate, and he could not see his companion due to the waves, he decided to try and get help. After untying the marker float, he swam towards the shore, which was about 0.75 mile away, clutching the buoy to his chest for additional buoyancy. He arrived in the shallows off the beach after spending 3 hours in the water. Although extremely tired, he was able to wade ashore and raise the alarm using a passer-by's mobile phone.

The coastguard immediately initiated a large-scale search, during which the second angler was located. He was winched from the sea by an RAF rescue helicopter and taken to a nearby hospital, but was confirmed deceased shortly after arrival.

The Lessons

1. Navigation by eye is instinctive, and is generally successful when in a familiar area during daylight, where there are a number of conspicuous features to assist. Navigation by eye at night is far more difficult. Distances are harder to judge and, in the absence of navigational features, it is very easy to unknowingly become disoriented. In such circumstances, it is essential that a vessel's position is also checked by other means such as GPS and radar, particularly when navigating close to dangers. The pitfalls of not doing so can be far worse than just a short-term grounding.

2. No matter how much safety and survival equipment a boat carries, it is of no use if it is lost with the vessel. Having lifejackets available is an extremely wise precaution, but the only way of maximising their success as lifesavers is to expect the unexpected and wear them at all times when on the water. They not only provide buoyancy, but they also provide a whistle with which to raise the alarm and a light to assist location and rescue.

3. There may be only a slim chance of achieving success by shouting for help when stranded in the water, in a remote area. However, it may be the only chance. Sound can travel long distances over water, particularly in still conditions or downwind.

4. Boating, whether at sea or on an inland lake or loch is potentially dangerous, regardless of how close to the shore a boat might be. Checking the weather forecast before setting off on a day's fishing is often a sound investment of time, and knowing the limitations of the craft involved is essential.

5. Flotation suits are ideal for boat anglers. They provide buoyancy, protection against hypothermia and are highly visible. However, if worn incorrectly, they will be more of a hindrance than a help. Wearing only flotation suit trousers provides buoyancy to the lower half of the body, making it very difficult to remain upright. When this happens, it is very tiring for even the strongest of swimmers to keep their heads out of the water for a long period, particularly in rough conditions.

6. When on the water, emergencies usually occur without warning. In such situations, requesting assistance is not normally a problem providing a VHF radio or a mobile telephone is carried. However, such equipment is prone to becoming unusable in wet conditions, or following capsize, unless it is carried in a weatherproof pouch.

7. The mixing of alcohol and water is best kept inside a glass. Even a moderate quantity can lead to over-confidence and risk-taking. It also increases susceptibility to hypothermia and reduces the chances of survival in cold water.

8. There are a number of organisations which produce information to assist people wishing to take up sea angling as a hobby, including the MCA and RNLI. An extremely useful publication is *Safety Guidelines for Sea Anglers*, which contains a great deal of useful information concerning boat purchase, training, what to do before setting off and what action to take in an emergency. Copies can be obtained from the internet at: http://www.mcga.gov.uk/c4mca/safety_guidelines_for_sea_anglers.pdf

CASE 25

Myriad of Fire Risks Ends in the Inevitable

Narrative

A heavy smoking, 66 year old male, with mobility problems, was well known locally as a "colourful" character. A keen fisherman, he often walked the towpaths of his local northern canal. During one of his walks, he became aware that a small motor cruiser was going to be scrapped, so he approached the owner and persuaded him to sell the boat to him for use as a fishing platform.

The boat had been issued with a 4 year Boat Safety Scheme Certificate 2 years previously, confirming that it met the required safety standards at that time. The boat had not been used since then, and its British Waterways Certificate permitting it to navigate had not been renewed. While the outboard engine and partially filled fuel tank were still fitted, there were no toilet or cooking facilities on board and the boat's general condition had rapidly deteriorated by the time the new owner took possession (see Figure 1).

The new owner moved the boat from its berth and secured it to mooring stakes at an unauthorised mooring alongside a towpath. A short time later he enclosed the after end of the deck, which included the outboard engine fuel tank, with a mix of plywood and canvas before placing a mattress in the enclosure in preparation for moving permanently on board.

The enclosure was lit by small candles and a number of paraffin fuelled "tilley" lamps, which also provided a degree of heat in the draughty enclosed deck. There was no evidence of smoke alarms being fitted, nor were there any fire extinguishers on board.

It became common knowledge that the owner slept on board, and local residents living near the towpath would occasionally check on his wellbeing. At about 0010 on the day of the accident, the owner was seen lying on the mattress, with the candles and paraffin lamps alight. About an hour later, residents were woken by the sound of burning as the

Figure 1: Showing the poor condition of the boat

Figure 2: Vessel after the fire

branches of trees above the boat caught fire. By the time they reached the boat, the area behind the small wheelhouse was engulfed in fierce flames and there was no sign of the owner.

The local Fire and Rescue Service attended the scene. Luckily the boat was moored fairly close to access points, so the firefighters were able to get their equipment to the boat and extinguish the fire.

The remains of the owner were found in the fire debris. The postmortem confirmed that he died from the effects of the fire, and not from smoke inhalation, suggesting that he died in the early stages of the fire. A number of paraffin lamps were found in the debris (Figure 2), together with a 5kg gas canister, remains of the outboard petrol tank and a number of cigarette ends. The outboard engine had dropped into the canal as the transom area had been badly burnt.

The Lessons

From the evidence, it is likely that the fire was started either by a discarded, lighted cigarette end, a fallen candle, or from the heat from one of the paraffin lamps. The owner died during the early stages of the fire, possibly as his mattress caught fire, and his immobility would have reduced his chances of escaping. The canvas and plywood coverings, GRP deck, and hull and outboard motor petrol tank contents would all have provided the fuel for this intense and fatal fire.

Boat fires are, fortunately, still rare. However, this accident clearly illustrates the potential for things to go wrong if the basic principles of fire prevention are not followed.

1. When considering modifications, think about the implications of fire – wherever possible plan to have two escape routes.

2. Avoid the use of open flame items such as candles. If you have to use paraffin or gas lamps, remember the metal and glass surfaces can produce very high temperatures – place them in a stable, out of the way position, well clear of any flammable materials.

3. Do fit smoke alarms, replace batteries and test the alarms in accordance with the manufacturer's recommendations. Remember, early warning will provide a good chance of escape.

4. Avoid placing petrol canisters in between decks or in enclosed spaces. The vapours given off are highly flammable and easily ignited.

5. Make sure that gas appliances are tested, that connections are tight and that gas canister valves are shut when not in use. Remember – bottled gas is heavier than air, and any leakage can easily migrate throughout the boat and is easily ignited.

6. When planning a mooring position, especially a temporary mooring, consider how the emergency services can gain access should you need their help. Mooring close to roads or tracks, where this is possible, will significantly improve the speed of response.

More detailed information on boat safety is contained in the British Waterways and Environment Agency sponsored publication – The Boater's Handbook (www.waterscape.com). The Boat Safety Scheme Guide established in 1997 by the British Waterways and Environment Agency also details wide ranging safety standards. Details of the Guide are available at www.britishwaterways.co.uk.

Safety Bulletin No. 2/2008, published July 2008

Fatalities in Enclosed Spaces

BACKGROUND

Since September 2007 the MAIB has started three investigations into accidents in which a total of six seafarers have died in enclosed/confined spaces:

- On 23 September 2007, three experienced seamen died inside the chain locker on board the emergency response and rescue vessel *Viking Islay*. The first two were overcome while tying off an anchor chain to prevent it from rattling in the spurling pipe. The third to die was the first rescuer who entered the chain locker wearing an Emergency Escape Breathing Device (EEBD). He was soon constrained by the device and removed its hood. All three men died as a result of the lack of oxygen inside the chain locker caused by the on-going corrosion of its steel structure and anchor chain.

- On 18 January 2008, two seamen collapsed in a store on board the general cargo ship *Sava Lake*. The chief officer entered the store to try and rescue the men but was soon forced to leave when he became short of breath and his vision narrowed. The two seamen had been asphyxiated. The store was adjacent to the vessel's forward cargo hold containing 'steel turnings'. To allow for the drainage of sea water and the removal of cargo residue, the bellows pieces on the cargo vent trunk either side of the cargo ventilation fan motor, located in the store, had been cut. This allowed a path for the air from the self-heating cargo, to enter the store. When tested, the air in the cargo hold contained only 6% oxygen.

- On 11 June 2008, an experienced seaman died on board the passenger cruise ship *Saga Rose* after he entered an almost empty ballast tank. The tank's manhole cover, which was inside a small cofferdam accessed from within the engine room, had been removed and the seaman had been instructed to confirm the tank's contents. As it was not intended for the seaman to enter the tank, no permit to work was issued. When the seaman was found to be missing, an experienced motorman was sent into the cofferdam to check on his wellbeing. He found the seaman lying at the bottom of the empty tank and raised the alarm. The motorman then entered the tank but collapsed when trying to recover the seaman. After the ship's emergency response team provided air to the stricken crew via in-line breathing apparatus, the motorman recovered and was able to leave the tank. However, the seaman never regained consciousness. He had been asphyxiated in the oxygen depleted atmosphere of the tank, which had not been inspected for several years and was heavily corroded. It is not certain why the seaman entered the tank but it is likely it was to determine whether a small amount of water in the tank bottom was salt or fresh water.

The MAIB report of its investigation of the fatalities on board *Viking Islay* was published on 9 July 2008. The MAIB will publish reports on the fatalities on board *Saga Rose* and *Sava Lake* on completion of its investigations.

Co-incident with the MAIB investigations, the Marine Accident Investigators International Forum (MAIIF) identified the large number of fatalities in the shipping industry worldwide which were related to work in confined or enclosed spaces and considered that the occurrence of such accidents was increasing. Accordingly, in October 2007, MAIIF tasked its representative from Vanuatu to research the incidence of this type of accident with a view to the submission of a paper to the International Maritime Organization (IMO). To date, responses from 18 administrations identify 120 fatalities and 123 injuries resulting from entry into confined spaces since 1991. These statistics do not include the fatalities from Sava Lake or Saga Rose.

SAFETY LESSONS

There can be few aspects of personal safety on board ships that have received more attention than the importance of following the correct procedures before entering a dangerous enclosed/confined space. Tragically, it is clear that the measures which have been put into place have failed to prevent the death of many seafarers. Indeed, the data collected on behalf of MAIIF indicates that accidents in enclosed/confined spaces continues to be one of the most common causes of work-related fatalities on board ships today. This is due to:

- Complacency leading to lapses in procedure;
- Lack of knowledge;
- Potentially dangerous spaces not being identified; and,
- Would-be rescuers acting on instinct and emotion rather than knowledge and training.

It is essential that the IMO recognises the unacceptably large fatality rate in this area and takes the lead in identifying initiatives to improve this very poor safety record. It is also vital that all shipping industry bodies raise the awareness of the continuing and increasing number of deaths in enclosed spaces to show that no-one is immune to the physical effects of the lack of oxygen or harmful gases. While the holding of breath might seem a logical step to a person entering a tank 'for a few seconds' or to a would-be rescuer, it is all too frequently the last life sustaining breath he or she ever takes.

RECOMMENDATIONS

Ship owners and managers, and industry bodies and organisations are recommended to:

- **Identify and implement measures aimed at improving the identification of all dangerous and potentially dangerous spaces and increasing compliance with the safe working practices required when working in such compartments.**
- **Individually and collectively raise the awareness of the continuing high incidence of fatalities of seafarers working in enclosed spaces.**

The Maritime and Coastguard Agency is recommended to:

Co-sponsor with the Maritime Administration of Vanuatu and other concerned administrations a submission to the IMO aimed at raising the awareness of the number of fatalities on ships which have occurred in enclosed spaces, and highlighting the need for measures to be identified which will reduce this unnecessary loss of life, such as the identification and marking of all potentially dangerous spaces.

Preliminary examinations started in the period 01/07/08 – 31/10/08

A preliminary examination identifies the causes and circumstances of an accident to see if it meets the criteria required to warrant a full investigation, which will culminate in a publicly available report.

Date of Accident	Name of Vessel	Type of Vessel	Flag	Size	Type of Accident
03/07/08	*Svitzer Waterston*	Tug	UK	686	Grounding
08/07/08	*West Express*	Ro-ro/lo-lo	Jamaica	9368	Contact
10/07/08	*Barbara* *Maersk Borneo*	Bulk Carrier Dry Cargo	Bahamas Singapore	22147 19758	Hazardous Incident
23/07/08	*Levan Mor of Looe*	Fishing vessel	UK	11.58	Foundering
30/07/08	*Isle of Inishmore*	Ro-ro vehicle/ passenger ferry	Cyprus	34031	Fire
09/08/08	*18ft dory*	Angling vessel	UK	Unknown	Foundering (1 fatality)
09/08/08	*Ark Forwarder*	Ro-ro/lo-lo	UK	21104	Accident to person (1 fatality)
13/08/08	*New Dawn*	Fishing vessel	UK	36.14	Accident to person(s)
23/08/08	*Monsoon*	Liquid Gas Carrier	Cyprus	3219	Contact
29/08/08	*European Endeavour*	Ro-ro vehicle/ passenger ferry	UK	22152	Contact
10/09/08	*Caledonian Victory*	Offshore supply vessel	Cayman Islands	5729	Contact
13/09/08	*Scot Venture* *Golden Promise*	General cargo Fishing vessel	UK UK	2594 22.80	Collision
18/09/08	*Nantewas* *Herm*	Fishing vessel Dry cargo	UK Antigua & Barbuda	9.68 7660	Collision
29/10/08	*Scot Isles* *Wadi Halfa*	General cargo Bulk carrier	UK Egypt	2594 22895	Collision
29/10/08	*Pau Casals*	Ro-ro vehicle/ passenger vessel	UK	22152	Hull failure

Investigations started in the period 01/07/08 – 31/10/08

Date of Accident	Name of Vessel	Type of Vessel	Flag	Size	Type of Accident
01/07/08	*Plas Menai*	Pleasure craft	Unknown	Unknown	Capsize/ listing
30/07/08	*Pacific Sun*	Cruise ship	UK	47546	Heavy weather damage
01/08/08	*Vision II*	Fishing vessel	UK	163	Fire (3 fatalities)
17/08/08	*Hurlingham*	Passenger vessel	UK	113.99	Accident to person (1 fatality)
26/08/08	*Celtic Pioneer*	Pleasure craft	Unknown	Unknown	Accident to person
23/09/08	*Maersk Kithira*	Container	UK	80654	Accident to person (1 fatality)

Reports issued in 2008

Audacity/Leonis – collision at the entrance to the River Humber on 14 April 2007
Published 25 January

Dublin Viking – parting of a mooring line alongside at Berth 52 in the Port of Dublin, Ireland, resulting in one fatality on 7 August 2007
Published 31 March

Figaro – inadvertent release of carbon dioxide and the disabling of the vessel off Wolf Rock on 6 December 2007
Published 14 August

Flying Phantom – loss of the tug while towing *Red Jasmine* on the River Clyde on 19 December 2007 resulting in 3 fatalities and 1 injury
Published 30 September

Lady Candida – fire and subsequent sinking off Corsica on 28 July 2007
Published 18 February

Lady Hamilton/Blithe Spirit – collision between fishing vessels in Falmouth Bay, Cornwall on 3 October 2007
Published 15 April

Last Call – foundering of the motor cruiser at Whitby on 23 November 2007 with the loss of three lives
Published 30 June

Logos II – two accidents during berthing and unberthing, St Helier, Jersey on 20 and 26 June 2007
Published 22 January

MSC Napoli – structural failure in the English Channel on 18 January 2007
Published 22 April

Pacific Star – heavy weather damage sustained by passenger cruise ship while on passage in the South Pacific Ocean on 10 July 2007
Published 29 February

Partner 1 – console detachment of the rigid inflatable boat, Studland Bay, Poole on 20 April 2008
Published 30 October

***Rigid Raider* (Army Cadet Force Rigid Raiding Landing Craft)** – capsize of craft in Loch Carnan, South Uist in the Western Isles of Scotland on 3 August 2007, resulting in one fatality
Published 18 March

Sava Lake – dual investigation of the deaths by asphyxiation of two crewmen while the vessel was approaching the Dover Strait on 18 January 2008
Published 23 September

Sea Mithril – grounding of the cargo vessel on the River Trent on 18 February 2008
Published 26 September 2008

Shark/Royalist – dual investigation report into fire on board *Shark* on 19 January 2008 and foundering of *Royalist* on 23 January 2008
Published 12 August

Sichem Melbourne – product carrier making heavy contact with mooring structures at Coryton Oil Refinery Terminal on 25 February 2008
Published 17 October

Ursine & Pride of Bruges – contact between two vessels, King George Dock, Hull on 13 November 2007
Published 30 May

APPENDIX B

Viking Islay – loss of three lives, 25 miles off the East Yorkshire coast on 23 September 2007
Published 9 July

Young Lady – vessel dragging anchor 5 miles east of Teesport and snagging the CATS pipeline, resulting in material damage to the pipe on 25 June 2007
Published 1 February

Annual Report 2007 Published July 2008

Safety Digest 1/2008 Published 1 April

Safety Digest 2/2008 Published 1 August

Leisure Safety Digest (2nd edition)
Published March