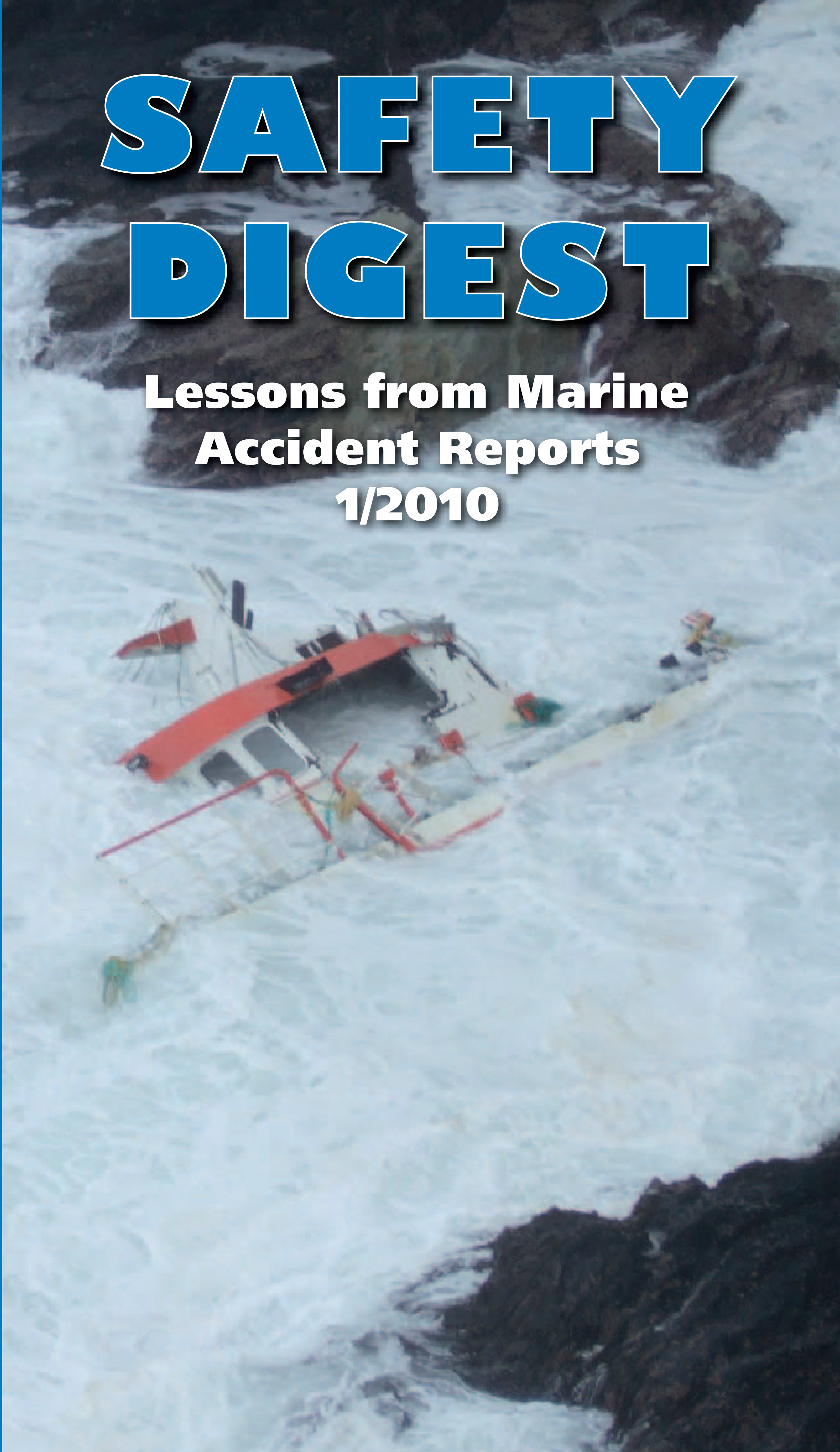
SAFETY DIGEST

Lessons from Marine Accident Reports 1/2010



MARINE ACCIDENT INVESTIGATION BRANCH

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SAFETY DIGEST

Lessons from Marine Accidents

No 1/2010

MAIB
is an
INVESTOR IN PEOPLE

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April 2010

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 Mountbatten House, Grosvenor Square, Southampton, SO15 2JU.

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

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

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

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MARINE ACCIDENT INVESTIGATION BRANCH

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

Extract from
The Merchant Shipping
(Accident Reporting and Investigation)
Regulations 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
ARPA - Automatic Radar Plotting Aid
BA - Breathing Apparatus
BT - Bow Thruster
Cable - 0.1 nautical mile
CO_2 - Carbon Dioxide
CPP - Controllable Pitch Propellers
CPR - Cardio Pulmonary Resuscitation
CST - Crude Sulphate Turpentine
DSC - Digital Selective Calling
ECDIS - Electronic Chart Display and Information System
ECR - Engine Control Room
ECS - Electronic Chart System
EPIRB - Emergency Position Indicating Radio Beacon
H_2S - Hydrogen Sulphide
MCA - Maritime and Coastguard Agency
MGN - Marine Guidance Note
MIRG - Maritime Incident Response Group
MSDS - Material Safety Data Sheet
OOW - Officer of the Watch
P&A - Procedures and Arrangements
PEC - Pilotage Exemption Certificate
RIB - Rigid Inflatable Boat
Ro-Ro - Roll on, Roll off
SMS - Safety Management System
SOSREP - Secretary of State Representative (for salvage)
StS - Ship to Ship (transfer)
TSS - Traffic Separation Scheme
UPS - Uninterruptible Power Supply
UV - ultraviolet
VHF - Very High Frequency
VTS - Vessel Traffic Services

Introduction

MAIB is currently investigating the death of a seafarer, during which we have discovered evidence of dereliction of one of the most fundamental duties of the mariner - the moral and legal obligation to go to the aid of those in peril on the sea. Even at the height of war, civilised combatants went to great lengths to save the lives of sailors from enemy vessels they had sunk. Yet here we are, in the 21st Century, finding ships failing to respond to Mayday messages.

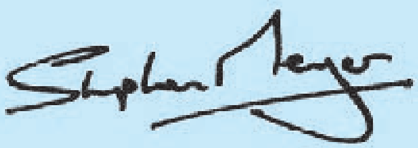
In the case we are investigating, poor visual lookout meant that most of the major vessels within 10 miles of the sinking vessel reportedly failed to see a series of distress flares. This in itself is disappointing, but even more alarmingly, most of the same ships also failed to respond to the Mayday Relay, issued several times by the Coastguard. Some claimed not to have heard the VHF (poor standard of watchkeeping again); some claimed not to have received the DSC distress alerts (!); and some masters claimed not to understand that they have a legal (and moral) duty to react.

SOLAS is quite clear on the subject:

> *"Regulation 33 - Distress Situations: Obligations and Procedures*
>
> *The master of a ship at sea which is in a position to be able to provide assistance, on receiving information from any source that persons are in distress at sea, is bound to proceed with all speed to their assistance, if possible informing them or the search and rescue service that the ship is doing so. This obligation to provide assistance applies regardless of the nationality or status of such persons or the circumstances in which they are found. If the ship receiving the distress alert is unable or, in the special circumstances of the case, considers it unreasonable or unnecessary to proceed to their assistance, the master must enter in the log-book the reason for failing to proceed to the assistance of the persons in distress, taking into account the recommendation of the Organization to inform the appropriate search and rescue service accordingly."*

I approached the senior management of each of the ships involved. I am pleased to report that all reacted with horror that their vessels had not responded, and took urgent action to instruct all their ships to respond properly to such situations in the future.

I would urge all companies and mariners to remember that this requirement is not optional. It is also not up to coastal stations to call ships with a request to assist; in such circumstances it is the duty of every "master of a ship at sea which is in a position to be able to provide assistance" to at least call the search and rescue service and then respond to their instructions.



Stephen Meyer
Chief Inspector of Marine Accidents
April 2010

Part 1 - Merchant Vessels

When I was asked to write the introduction to this edition of the "Safety Digest," I was very happy to volunteer. The reason for this is that prevention of incidents in the fleet I manage is something my team and I think about every day. Any organisation or report which helps in this endeavour is worthy of support.

Before beginning to write, I had the opportunity to review a number of the articles describing a wide range of incidents, and was immediately struck by how many were almost identical to accidents I have read about previously, or indeed experienced in some way through my career. Two that particularly resonated with me were: "Cargo Vapours - The Unseen Danger;" and "Machinery Commissioning - A Shocking Result." Luckily, there were no fatalities in either instance, but there so easily could have been.

When I read of such events, it is very disturbing on a number of counts. Not only are real people suffering real injuries, or in the worst case even death, but also our industry seems unwilling to really learn the lessons of the past.

While there are no excuses for this perceived inability to learn, there is little doubt that such a quest is not assisted by the fragmented nature of the shipping community, with many owners under many different national regimes. However, I am firmly of the view that if we all, as individuals, commit to learning and following safe practices, we can make a difference. In this respect, two areas we need to guard against are complacency; and the very nature of the "can do" attitude of a seafarer.

With regard to complacency, I came across the following statement recently: "If eternal vigilance is the price of liberty, then chronic unease is the price of safety." What I believe this means is that when operating in a hazardous environment it is essential each individual is constantly thinking of what can go wrong and acting accordingly. One could think of it as an ongoing mental risk assessment. I recognise that maintaining such a mental state for lengthy periods of time is challenging. However, I believe we need to look at this as the price of safety.

As to the seafarer's "can do" attitude, I see this as a much larger challenge. Seafarers have a reputation as proud individualists with a long history of simply getting the job done no matter what the circumstances. There is a very large degree of truth in this and it is something we should be proud of.

However, it's also true to say that shipping, because of its incident rates, has always ranked as a hazardous profession. From both a humane and societal perspective, this is not something we can and should accept. We need to overcome the scepticism around following "Risk Assessment" and "Permit to Work" procedures, and move away from the tick box mentality. These are tools to prevent injury to you and your fellow seafarer. These safety measures are not simply processes that need to be carried out. They need to be interwoven into the management of the task and adjusted if circumstances change.

Finally, let me finish on a positive note. Without shipping, trade would not exist and without trade, the world as we know it would not exist. Because we are largely unseen then we rarely get the recognition we deserve, but nevertheless, it is something we can all be proud of.

We also, in my opinion, have some of the most committed and talented people in any industry, working in what can be a very hostile environment. Because of all these things, we owe it to ourselves, our colleagues and our families to "get home safely."

Graham Westgarth

Graham Westgarth joined Teekay in February 1999, and as President of Teekay Marine Services is responsible for the day-to-day operations of the Teekay fleet that is in excess of 165 vessels, and close to 5,000 multi-disciplined sea and shore staff. Graham's mandate includes newbuildings, conversions, repair and maintenance, manning and training, procurement, marine, and last but by no means least, health, safety, environment, and quality. He has over 38 years of industry experience, 17 of which were at sea, including 5 years command experience. Prior to joining Teekay, Graham spent 12 years with the Maersk Company heading up its UK flag fleet. During this period, he established and was the general manager of AP Moller's FPSO operations in the UK sector of the North Sea. In 2006, Graham relocated to Norway for 8 months following the acquisition of Petrojarl ASA, and as interim CEO successfully led the company and integrated it into Teekay. In August 2007, he resumed his position in Vancouver. Graham has held a number of Board positions over the years, has completed the Columbia Business School Senior Executive Development Program, and is currently Chairman of INTERTANKO.

Cargo Vapours - the Unseen Danger

Narrative

Most of the officers and crew of a chemical tanker had served with the company for a number of years and had a wide range of chemical cargo experience. It therefore came as a bit of a surprise that when they were instructed to load a cargo of 2000 tonnes of MARPOL category "X", Crude Sulphate Turpentine (CST), for a Ship to Ship (StS) transfer at a cargo terminal, nobody on board had any previous experience of it, nor of its associated hazards.

The ship's Safety Management System, Procedures and Arrangements (P&A) manual, cargo checklists and ship's orders, provided detailed instructions of cargo briefing requirements, loading and discharging programmes and precautions. Supported by this detailed guidance, there was no reason for anything to go wrong – that is, providing the instructions were followed!

Prior to loading the cargo, the chief officer conducted the required pre-arrival conference, but he did not have the cargo Material Safety Data Sheet (MSDS) at the time, so the safety briefing did not properly cover the cargo hazards. Unbeknown to him, the cargo contained hydrogen sulphide (H_2S), organo-sulphides and mercaptans. Later, the shipper handed him a cargo-specific MSDS, but the hazards were not briefed to the crew. In the meantime, the ship manager obtained his own MSDS which was not cargo-specific, and which did not mention H_2S.

The MSDS obtained by the ship manager was passed, in good faith, to the discharging port agent, who in turn passed it to the receiving StS ship and to the terminal staff. It was not passed to the cargo surveyor who obtained a generic MSDS from the internet, which also did not mention H_2S. As a result, the surveyor equipped himself with the incorrect respirator filter to protect against H_2S vapours.

A pre-arrival conference was held in preparation for the StS transfer, but once again it was in general terms only, and did not highlight the need for any special precautions. The original location for the StS transfer was changed, and it was a week later that it took place, but the pre-arrival conference was not reconvened.

Terminal staff carried out cargo and safety checks with the chief officers of both ships. Emergency procedures were covered in detail, but no checks were made to identify the cargo dangers listed in the MSDS because everyone thought they had the correct data. The cargo surveyor carried out his checks while wearing his respirator. The accompanying AB, who opened the tank Butterworth hatches, was not protected and did not query why the surveyor was wearing a respirator and yet he was not.

While the StS transfer was completed without mishap, there was a very strong, pungent, "rotten egg" smell throughout, which drifted across the site as the atmosphere from the receiving ship's tanks was displaced. However, no one investigated this properly and no reference was made to the MSDS to check the cargo hazards.

Following the StS transfer, a mandatory MARPOL pre-wash was carried out. The P&A manual stated that the normal method of washing was to use the fixed systems, but as most of these were defective, the portable washers were used. These were passed through the open Butterworth hatches. As the washers agitated the tank's atmosphere

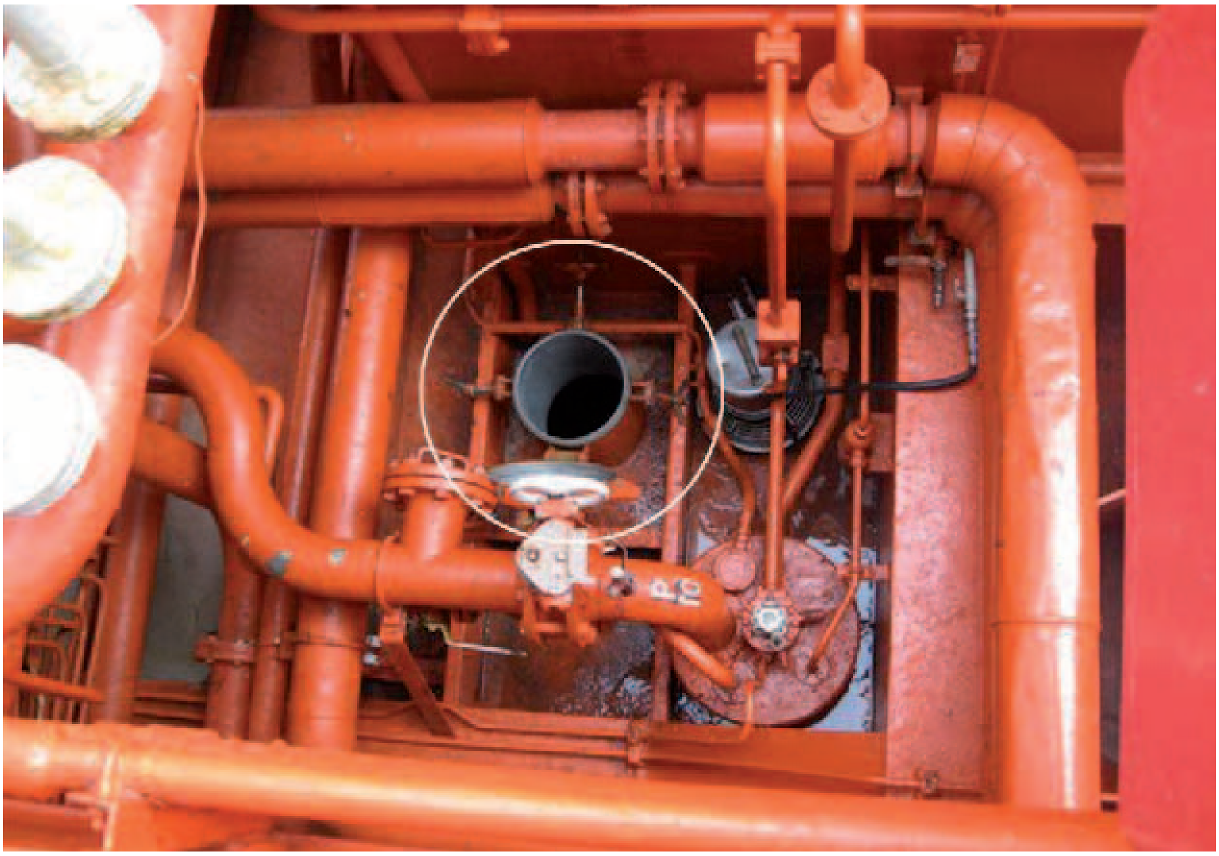


Figure 1: Butterworth hatch

the pungent, heavier than air cargo vapours were driven through the open hatch and accumulated in the vicinity of the hatch.

As the pre-wash completed, one of the duty ABs went down to the hatch (Figure 1) to remove the portable washer. As he descended the ladder he lost the pungent smell, began to shake uncontrollably, and collapsed across the open hatch. Very soon afterwards another crew member saw the casualty and alerted the chief officer. The chief officer informed the master, who went to the bridge to sound the general alarm. Instead of using the terminal's emergency procedures, he informed the agent of the problem. The agent, in turn, informed the harbourmaster, who contacted the emergency services.

Meanwhile the chief officer attempted to rescue the AB, but without testing the atmosphere and without wearing breathing apparatus (BA). The inevitable happened. As he approached the AB he lost his motor functions, could not speak, and slipped in and out of consciousness. Another AB attempted a further rescue from the walkway above the Butterworth hatch. He took large gulps of air before descending to the casualties. He was badly affected by the cargo vapours, but fortunately managed to struggle back to the walkway.

Soon afterwards, crew members wearing BA rescued the chief officer and AB. They were transferred to hospital, where they both made a full recovery. Had it not been for the prompt actions of the crew, the outcome could so easily have been different.

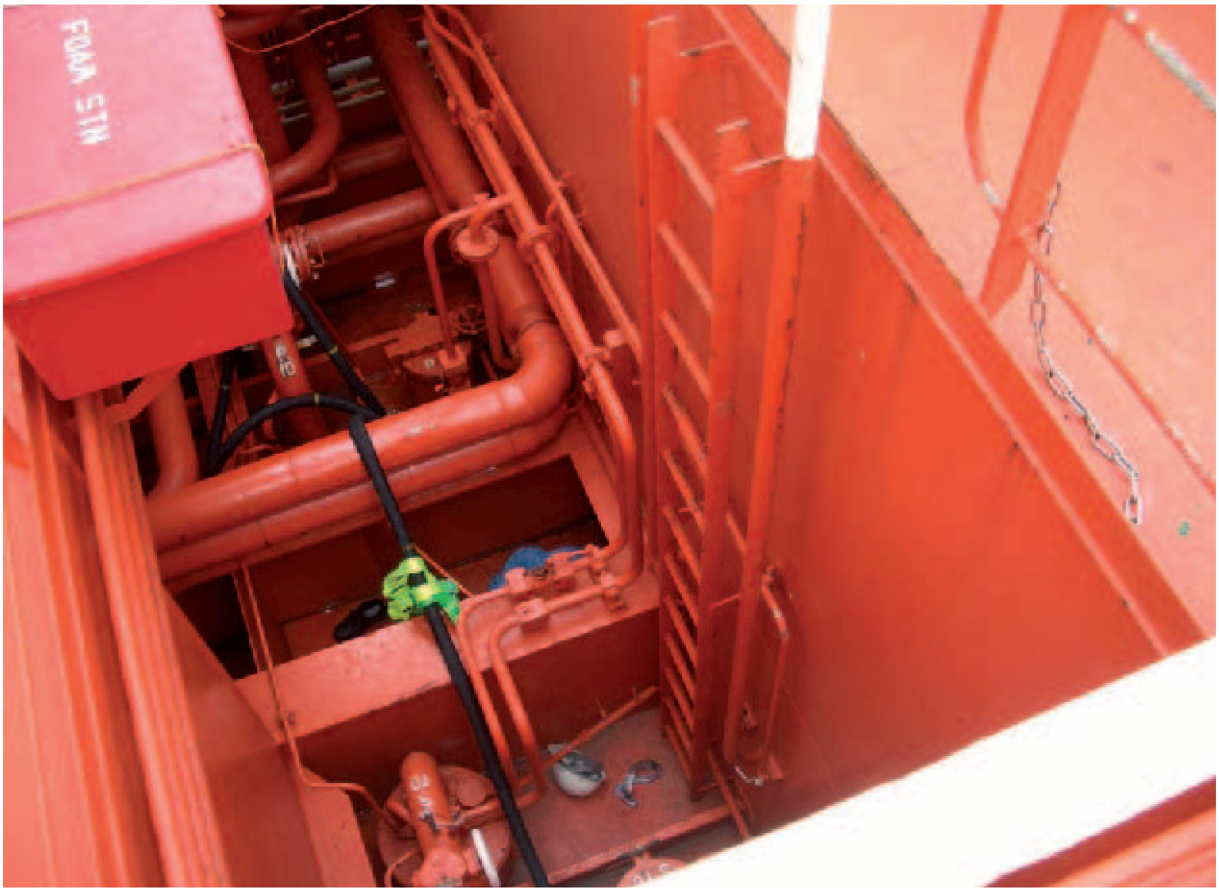


Figure 2

Figure 3: Port bulwark flair

The Lessons

Although part of the upper deck, the area around the hatch fell into the International Maritime Organization's definition of an enclosed space: there were limited openings, unfavourable natural ventilation and the area was not designed for continuous worker occupancy (Figure 2). The surrounding construction and the flair of the port bulwark (Figure 3) impeded air flows from dissipating cargo vapours. However, the crew did not recognize this, so there were no warning signs. Despite the strong pungent smell of the released vapours, the hazards were not investigated, so there was no direction on the use of BA. It is notable that the casualties exhibited the classic signs of H_2S/mercaptan inhalation.

The following issues were identified:

1. Complacency leading to lapses in procedures – in this case there were inadequate safety briefings, non use of BA, an acceptance of chemical smells, and fixed washing systems' defects. These points were adequately covered in the SMS: *for their own safety, officers and crew must take ownership of the SMS and properly implement the instructions. Managers are encouraged to audit the procedures during ship visits and address cargo equipment defects promptly.*

2. Potentially dangerous spaces not being identified – the Butterworth hatch was effectively in an enclosed space. There are many such areas on board ships, which do not fall under the traditional interpretation of an enclosed space such as a tank, cable locker etc. Managers and ship's staff should identify these areas, and risk assessments should be carried out to determine the appropriate risk control measures.

3. Would-be rescuers acting on impulse and emotion rather than knowledge and training – the initial rescue was attempted without BA and without testing the atmosphere. Realistic drills should be regularly carried out and critically assessed so that equipment and manpower resources are used to best effect and safe reactions become instinctive. In this case, the chief officer impulsively went to help the casualty without the aid of respiratory protection or assistance; he would have been more effective in an "on-scene commander's" role.

4. Terminal emergency procedures not followed – the terminal emergency procedures were briefed to only the chief officer, so the master was not aware of the correct procedure to expedite assistance. The convoluted communications route resulted in delays which could have affected the survivability of the casualties. Emergency procedures should be clearly promulgated and followed.

5. Use of different MSDSs – there were two different MSDSs in use. The one passed by the manager did not specify all the cargo's components, so safety measures were based on inaccurate information. Ship managers should take action to ensure that the cargo-specific MSDS is promulgated to receivers (whether that be terminals or transshipment vessels/barges) either directly or via the ship operator or agent.

Note: The International Chamber of Shipping's publications Tanker Safety Guide Chemical (Third edition 2002) and the International Safety Guide for Oil Tankers and Terminals (Fifth edition 2006) provide greater detail and advice on the safety lessons identified in this article.

CASE 2

Dream Becomes a Nightmare

Figure 1: Vessel aground

Narrative

A 2,500 tonne cargo vessel, trading in near coastal waters, sailed from a port on the west coast of Scotland and was heading south towards the Irish Sea when the chief officer relieved the master for the 0000-0600 watch. Shortly afterwards the chief officer sat in one of the wheelhouse chairs, looked at the radar and electronic chart and then fell asleep. He did not wake up until the vessel grounded, some 3 hours later.

The master and chief officer were the vessel's only bridge watchkeeping officers and both had been on board, working 6 hours on, 6 hours off for $3^1/_2$ months at the time of the accident. The vessel carried three ABs, but no lookout had been posted from sunset the previous evening. The bridge watch alarm, installed to alert the off duty crew if a lone watchkeeper became indisposed for any reason, was turned off at the time of the accident.

The vessel made frequent port calls and had called at 21 ports in the preceding 2 months. When in port, the master and chief officer were required to complete statutory paperwork, plan and supervise cargo operations, be available for planned and ad-hoc vessel and cargo inspections, and deal with the day to day requirements of managing a vessel and her crew. In some ports, as was the case in the Scottish port, the master was expected to undertake his own pilotage, and the opportunities for both bridge watchkeeping officers to be able to keep to a strict 6 hours on, 6 hours off watch pattern were rare.

Analysis of accidents indicates that the cumulative effects of watchkeeping officers working long hours, in disrupted shift patterns, for periods in excess of 3 months leads to them becoming fatigued, complacent and likely to make errors of judgment. In this case, as well as falling asleep, they resulted in errors including the failure to post a lookout, and the watch alarm not being activated so as to avoid disturbing off duty personnel. The vessel was refloated a few hours after grounding, on a rising tide, under her own power. Fortunately, nobody was injured and there was no pollution. However, the vessel's hull suffered indentation damage over 70% of her length, and she underwent 4 weeks of repairs which required 25 tonnes of new steelwork to be fitted before she was approved to resume service.

The Lessons

1. The chief officer probably fell asleep due to the cumulative effects of fatigue. Working 6 hours on, 6 hours off for months at a time on a vessel making frequent port calls will inevitably lead to watchkeeping officers becoming fatigued. This, in turn, can lead to complacency and poor decision making.

2. The requirement to post a lookout in addition to the watchkeeping officer, during the hours of darkness and as necessary at all other times, is widely promulgated. All too frequently, the MAIB finds that the lookout is not being consistently posted, often because ABs are instead being required to work long hours, either in port or on general maintenance duties.

3. When considering the minimum manning level required to operate a vessel safely, it is essential that owners and flag state administrations take into account the intensity of the vessel's trading pattern and the length of the tour of duty, particularly when deciding on the number of watchkeeping officers and crew required.

Figure 2: Vessel aground

Keep a Proper Lookout or Look Out!

Narrative

In the early hours of a dark, calm and clear morning a 2,500gt general cargo vessel was crossing the Dover Strait Traffic Separation Scheme (TSS) heading towards a Belgian port from a major UK estuary. As she began crossing the traffic lanes, the watchkeeping officer allowed the lookout to leave the bridge to undertake safety rounds.

At about the same time, in the NE traffic lane a 23,000gt bulk carrier was on passage in the deep water route when her watchkeeping officer allowed the lookout to leave the bridge. Both vessels were equipped with operational radars, fitted with Automatic Radar Plotting Aid (ARPA), but neither watchkeeping officer used the ARPA to plot any radar targets.

The two vessels were on a collision course:

However, neither watchkeeping officer saw the other vessel until moments before the impact, when the officer on the larger vessel saw the masthead lights and green sidelight of the other vessel very close on the port bow. He then put the wheel hard to starboard and stopped the engine.

The larger vessel had just begun to swing to starboard when the collision occurred. She struck the smaller vessel amidships, breaching her hull and rupturing a fuel tank.

The larger vessel was also holed by the collision. However, she was in ballast, with a draught of 6 metres, and her watertight integrity was not compromised.

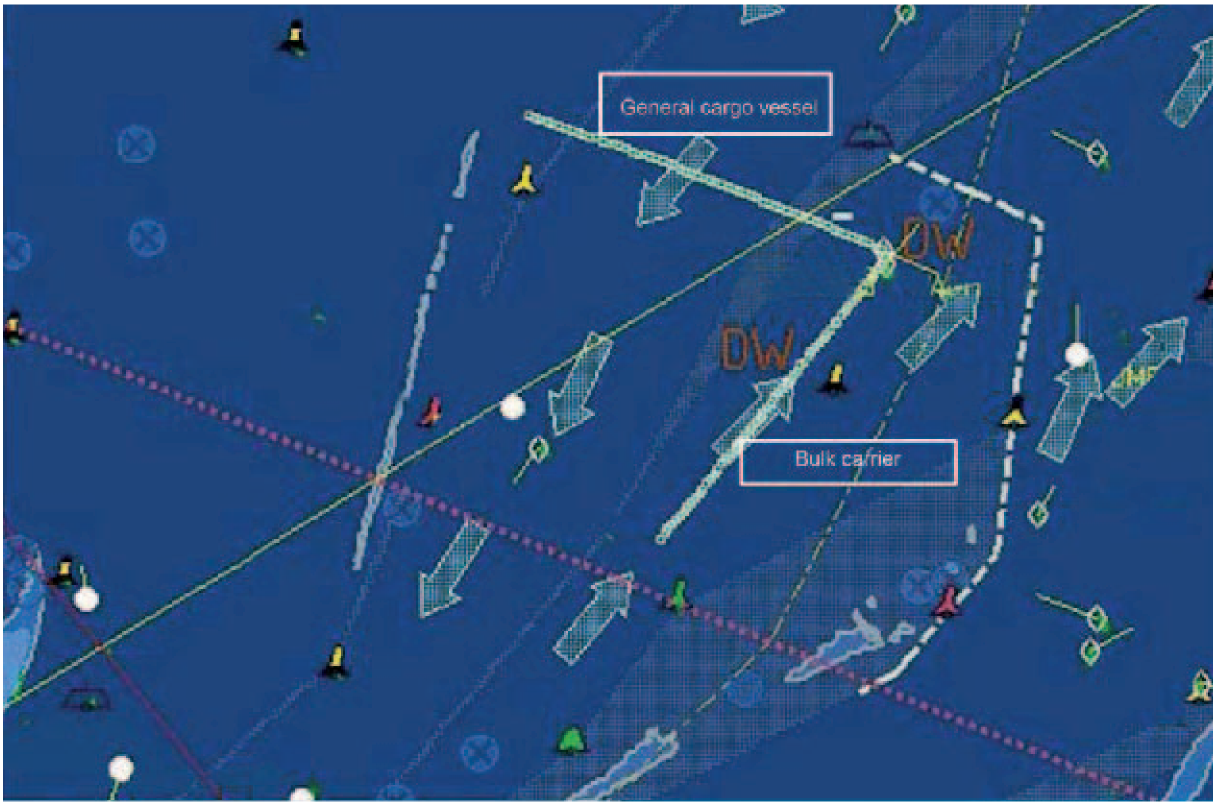


Figure 1: CNIS track showing the courses taken by the two vessels involved

Figure 2: Damage sustained to starboard side of general cargo vessel

After the collision the vessels exchanged details and verified that neither required immediate assistance. The larger vessel then resumed her passage to her next port, where repairs were undertaken, resulting in her being out of service for a week.

The full extent of the damage to the smaller vessel was not realised until some time after the collision. The hole in her hull was first seen when illuminated by a rescue helicopter. The crew had not undertaken a comprehensive, post-collision check of the entire vessel. They had assumed, erroneously, that the only damage sustained was to the vessel's starboard bridge wing, which had been struck when the two vessels briefly came together after the main collision.

Once the nearest Coastal State was aware of the full extent of the damage, the vessel was directed into port for survey, investigation and repairs. These resulted in her being out of service for several weeks.

The Lessons

1. The bridge watchkeeping officers on both vessels demonstrated a complacent attitude to maintaining a safe navigational watch.

2. Neither vessel maintained a proper lookout as required by the COLREGS. In a very busy shipping lane both lookouts were permitted to leave the bridge. This was inappropriate: lookouts are essential in maintaining a safe navigational watch. Some vessels continue to regard posting a lookout as a low priority.

3. Neither watchkeeping officer took additional actions when the lookouts left the respective wheelhouses. They did not increase their vigilance or begin to use ARPA to plot the targets showing on their radars.

4. Neither master was on the bridge at the time of the collision. The master of the smaller vessel had not left night orders. The night orders left by the master of the larger vessel did not reflect the increased risks, from additional traffic, facing the vessel on her passage through the Dover Strait.

5. The larger vessel was in a deep water route, recommended for vessels with a draught of 16m or more, but her draught was only 6m. This reflected poor passage planning practice and, by electing to use this route, the master set a poor example to his bridge watchkeeping officers.

CASE 4

Hot Surface+Fuel = Fire

Narrative

In the early hours of the morning, a 2,000 tonne general cargo vessel was approaching an east coast estuary when a fire broke out in her engine room.

The vessel was within port limits. The local VTS station and the coastguard were immediately notified of the emergency, and the crew were mustered. A prompt decision was made to close the engine room ventilation, shut the fuel isolating valves and flood the space with CO_2.

The vessel was drifting, without power, in the approaches to the estuary. VTS continued to monitor the vessel's position and made radio broadcasts to other vessels in the area to ensure they gave her a wide berth. The local lifeboat arrived on scene within 20 minutes. About 30 minutes after CO_2 flooding began, the master commenced venting the engine room and requested the assistance of shore-based firefighters. A rescue helicopter arrived on scene about 20 minutes later. After a further 30 minutes, the master allowed the chief officer and the chief engineer to enter the engine room wearing breathing apparatus and carrying an oxygen meter.

The officers confirmed that the fire had been extinguished and that the atmosphere was safe. The chief engineer identified that the fire had been caused by a fracture in a low pressure fuel sensor pipe coupling, which had resulted in oil spraying onto the unshielded, main engine exhaust drain cock. The drain cock's normal operating temperature of about 350°C was sufficient to cause the oil to auto ignite when it came into contact with the hot surface.

A shore-based fire-fighting team were later winched onto the vessel from the rescue helicopter, and confirmed that the fire had been extinguished. The vessel was then towed into the port, where she remained out of service for a considerable period of time while repairs were undertaken.

The Lessons

1. **The master's decision making in the early stages of this crisis demonstrated the benefits of having good procedures for responding to emergency situations:**
   - **He advised the coastal state at an early stage, which ensured rescue resources were quickly on scene, and he continued to liaise with them throughout the incident.**
   - **He closed down the engine room ventilation and flooded the space with CO_2 as soon as it was confirmed that all the crew were accounted for.**
2. **Ventilation of the engine room was resumed just 30 minutes after flooding the space with CO_2. Established best practice is that ventilation of a space, after it has been flooded with CO_2, should not be resumed until it has been definitely established that the fire has been extinguished. This is likely to take several hours. Additionally, professional firefighters were en route to the vessel when the crew entered the engine room wearing breathing apparatus. Entry could have been delayed until the experts were on board.**
3. **Protection of surfaces with temperatures above 220°C is a requirement of SOLAS, Chapter 2 Regulation 4 2.2.6. In this case a regularly used drain cock was not protected as it should have been, and the fuel pipe below the cock was not adequately supported. Any fire on board is a potentially serious incident, and precautions must be taken to prevent fuel impinging on hot surfaces.**

Detail showing diesel oil filter, pressure alarm and unshielded drain cock

CASE 5

Surf's Up

Narrative

A specialised workboat was working with a survey team in a river estuary on the West African coast. The workboat had a large open deck area, with low freeboard aft to allow the surveying equipment to be deployed easily. The superstructure was two decks high, and consisted of the bridge above a mess room and galley.

In common with many of the rivers on the West African coast, the entrance to the estuary was obstructed by shifting sandbanks. Heavy swell prevented the planned survey, so the survey team decided to relocate to a more sheltered location at the mouth of the river to enable work to continue. The skipper agreed to approach the mouth of the river, taking advice from a hydrographic surveyor on board regarding the best approach through the sandbanks.

Photograph of the workboat involved in the accident

With dead slow ahead set on the engines, the skipper steered for a gap in the breakers to position the boat inshore, but as the boat approached the surf, she touched bottom and stopped. The skipper engaged the engines astern, and the boat started to gather sternway. At that point, a series of waves rolled over the stern of the boat and struck the aft facing deckhouse bulkhead. Water flooded through an open watertight door and into the accommodation. A crewman who was working in the mess room attempted to pass through an internal door in order to close the external watertight door. As he reached the internal door, he supported himself by grabbing the door frame and, as he did so, the internal door swung shut under the pressure of water, trapping his hand and damaging his fingers. A second crewman managed to close the external door as the skipper turned the boat and headed away from the breakers.

As the second crewman started to administer first-aid to the injured man's finger, he realised they were both receiving electric shocks through the water. He therefore had to cease first-aid while he isolated the electrical power in the mess room.

The injured man was landed ashore later in the day to the care of a charity hospital ship, where the medical team were unable to save his little finger.

The Lessons

1. **The watertight door at the aft end of the superstructure carried the label "to be kept closed at sea". The importance of such an instruction is all too clearly demonstrated by this accident. The ingress of a large amount of water into the mess room could have adversely affected the boat's stability and caused it to capsize. As it was, had the door been closed, the water would not have entered the accommodation and a crewman would not have lost his finger.**

2. **The standard to which electrical equipment is waterproofed on board depends on its location. Thus, domestic electrical equipment would not normally be protected from immersion in sea water. When a large amount of water entered the mess room, the electrical equipment shorted, and the crewmen felt electric shocks as they waded in the water. The second crewman's good system knowledge and quick thinking in isolating power to the mess room probably saved both men from further injury.**

"Let Go Forward, Let Go Aft" – Are You Sure You Are Ready?

Narrative

A self-unloading bulk carrier had been on charter for many years on a regular 6-7 hour passage schedule. Loading – and especially discharging – the cargo was a complicated affair that required a sound knowledge of the conveyor system. Hence, the chief officer was dedicated to cargo operations. This left the master, who was the sole PEC holder, and the second mate, to cover the bridge watchkeeping requirements.

After loading a cargo the ship laid over for 2 days. At 0330 the master, who was alone on the bridge, and the chief engineer started their pre-departure checks in readiness for slipping at about 0400. It was to be yet another routine departure and passage.

Because of the poor communications system between the bridge and engine room it had become practice to pass orders via the telegraph only (Figure 1). Although the chief engineer had a VHF radio in the Engine Control Room (ECR) for emergency communications, the reception was very poor and the volume was normally turned down. At about 0347 the master selected "start engine" on the telegraph, and soon afterwards he instructed the forward and after mooring parties to let go of the head and stern lines. However, this was done before he had control of the propulsion at the bridge position.

In the meantime, the chief engineer connected the bow thruster electrical supplies, but during this period he inadvertently applied pitch from the ECR. From this point on the results were anything but routine.

Using his VHF radio, the second mate, who was at the after mooring station, shouted to the master that the ship was moving up the jetty. At the same time the chief engineer selected bridge control for the propulsion system. However, the master was unable to take control because the ECR and bridge pitch control levers were mismatched. But this was not recognised. The master quickly became overloaded as he repeatedly tried to take propulsion control while the ship was gathering speed along the jetty.

The second mate let go of the after springs and the load came on to the forward springs, which parted. The master then tried to tell the chief engineer via the telephone system to go full astern, but this was not understood because of the poor audio quality, so the master attempted to manoeuvre the ship using the bow thruster. This was unsuccessful, and a short time later the ship made contact, at over 3 knots, with a concrete dolphin which was about 70 metres forward of the ship's berth. Propulsion control was eventually passed to the bridge and the ship managed to make her own way back to the berth.

Fortunately there were no casualties. However, the ship suffered extensive structural damage to the bow area (Figure 2).

Figure 1: Telegraph and telephone system

Figure 2: Bow damage

The Lessons

The root cause of this accident was the chief engineer's inadvertent application of propeller pitch. However, the master decided to remove the head and stern lines before he had proven that he had the propulsion control at the bridge position. While the forward and after springs were connected, he still had the option of avoiding the contact had he considered using the engine emergency stop. The situation was further exacerbated because of the extremely poor communications link between the bridge and engine room, which prevented the chief engineer from understanding the master's urgent orders to go astern.

The master was alone on the bridge. As the situation developed he became overwhelmed as he remained focused on attempting to gain propulsion control at the bridge position.

The following lessons can be drawn from this accident:

1. Ensure that checklists include the requirement to prove propulsion controls before arrival and before letting go mooring lines on departure.

2. Leaving a berth is a period of high activity. Single person bridge manning at this time increases the risk of overload, which can lead to accidents - as this case demonstrates. Although manning levels may at times be stretched, the full implications of lone bridge manning should always be considered carefully.

3. The inability to take propulsion control at the bridge because the mismatch of levers was not recognised. All too often the method of transfer of controllable pitch propellers between the various control positions is not understood. Do think about including this in the drill schedule.

4. Even with the poor communications, the master had the option of using the telegraph to indicate to the ECR to go astern or, indeed, of attempting to use the emergency VHF radio link.

5. Where the positioning of propeller control levers can lead to inadvertent operation, consider the need for a gag to be fitted as a safeguard.

More detailed safety guidance on bridge manning and resource management can be found in:

- Marine Guidance Note 315(M) – Keeping a Safe Navigation Watch on Merchant Vessels.

- International Chamber of Shipping's Bridge Procedures Guide Fourth Edition 2007.

- The Nautical Institute's Bridge Team Management – A Practical Guide Second Edition, 2004.

Wrong Side of the Buoy

Narrative

An inter-island ro-ro passenger ferry sailed for passage following a 30 minute turnaround. The ferry was not operating on her regular route and the crew's ability to sleep during the previous 2 days had been adversely affected by poor sea conditions.

On the bridge were the master, who was on the port wing and had the con, the OOW and a quartermaster. The chief officer and a cadet were also on the bridge but had no specific navigation duties. The master manoeuvred the vessel clear of the berth and then headed on a north westerly course at a speed of 4 knots towards a reef, 5 cables away and marked by north and south cardinal marks (Figure 1). He then moved inside and to the front of the bridge, from where he intended to navigate the vessel.

However, the master found it difficult to see directly ahead because the centre bridge window was dirty (Figure 2) and the vessel was heading directly towards the low, bright sun. As the window washer was not working, the master instructed the cadet to clean the window; he also increased speed to 8 knots. Unfortunately, the cadet was not familiar with the whereabouts of the cleaning equipment or access to the outside of the bridge windows, and his questions regarding these matters briefly required the master's attention.

Figure 1: The north and south cardinals

Figure 2: The windows on the bridge of the vessel

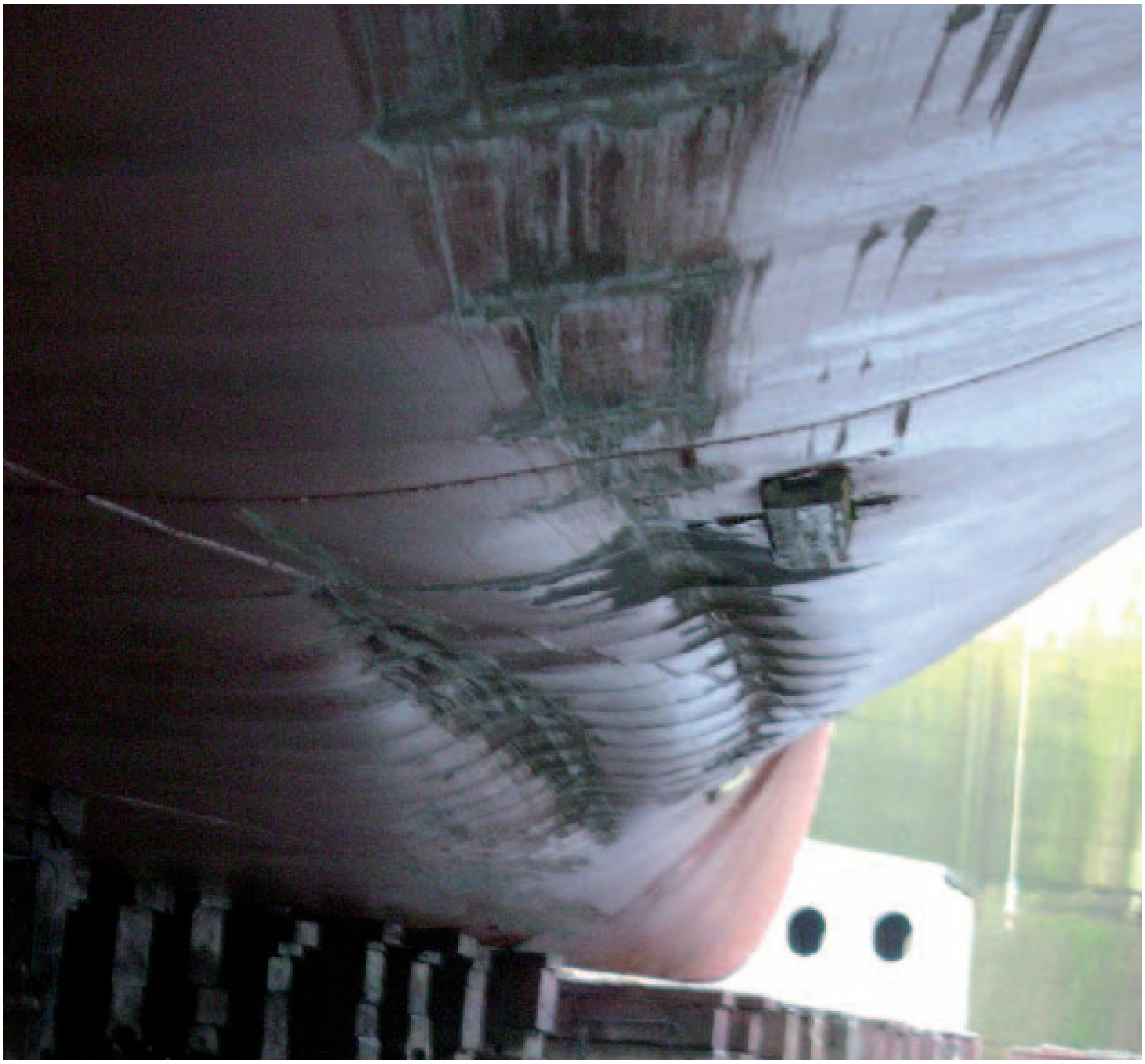


Figure 3: Hull damage

Although the visibility through the bridge window was impaired, the master saw the cardinal marks, and applied port helm to put the southern mark on his starboard bow in accordance with the passage plan drawn on the paper chart. Inexplicably, the turn was stopped with the buoy still on the port bow. Although the bridge team had not been briefed of the intended plan before departure, and the initial part of the passage plan had not been entered into the vessel's ECS, the OOW realised that the ferry was heading into danger, and alerted the master.

The master immediately applied full astern pitch and full port thrust. However, this did not prevent the vessel from momentarily grounding on the reef just 6 minutes after slipping. The ferry suffered substantial hull damage (Figure 3), but was able to return alongside without assistance.

The Lessons

1. Everyone makes mistakes, no matter how well qualified or how long they have been at sea. However, most mistakes or errors of judgment need not result in an accident providing everyone involved in the navigation of a vessel is aware of the intended passage plan, and work as a team. Although departure and arrival briefs might occasionally seem repetitive and unnecessary, they do help to ensure that everyone is aware of where the vessel should be going, and therefore enable them to quickly recognise when things start to go wrong.

2. In restricted waters, it goes without saying that a vessel's position needs to be closely monitored. This can only accurately be achieved by the use of real-time methods such as visual head marks, radar parallel indexing or ECS/ECDIS. Looking out of the window is a key element of successful navigation, but navigation by eye alone is an unnecessary risk.

3. ECS and ECDIS are only as good as their input data. Where this does not include the passage plan, their usefulness is seriously compromised.

4. Manoeuvring in close proximity to dangers requires a master's undivided attention. Distractions at critical times, caused by the failure to meet basic requirements such as clean bridge windows, are totally avoidable by the use of detailed pre-departure and pre-arrival checklists.

5. Fatigue isn't just brought on by working long hours. It can also be the result of poor quality sleep caused by a number of factors, including bad weather and stress. The signs of fatigue are not always obvious, but it can and does affect performance.

CASE 8

When Pre-Arrival Safety Checks = Danger

Narrative

A large container ship was nearing her pilot station when the master decided to carry out the standard pre-arrival checks in accordance with the ship's Safety Management System (SMS) procedures. The anchors were put in gear in readiness to lower them to a predetermined level above the water, where they were then to be taken out of gear and readied to let go in an emergency (Figure 1).

At about the same time, the main engine was stopped before restarting in astern mode so that astern manoeuvring control could be checked before starting the estuary passage.

A propulsion failure while in the estuary would be very unfortunate – but what of one while still in open water? Well that should not be too much of a problem, and it was not one in the forefront of the master's mind; not just yet anyway!

Attempts were made to restart the engine a number of times, but it failed on each occasion. The cause of failure was identified as a faulty engine air distribution start valve. The engineers attempted to address the defect as the master contacted the coastguard to advise them of the situation.

Despite the engineers' best efforts, they could not start the engine. By this time, the ship was drifting towards a wind farm construction site, so the master decided to start the bow thruster to gain some control of the ship's movement. However, the engine control room was not informed, so the switchboard was not reconfigured with an additional generator to cater for the additional load. At the same time, the master decided to drop his anchors.

As the anchor windlasses were being prepared, the bow thruster was started, which overloaded the generator, the preferential breakers opened, and power was lost to the anchor windlass. This now prevented the weight being taken off the anchor cable to allow the windlass to be taken out of gear so that the anchors could be let go under gravity.

The situation was now rapidly changing as the ship continued to drift at 1.8 knots towards the wind farm boundary. To make matters worse a manned jack up barge was also nearby with its legs jacked down, unable to move.

The master was now faced with the dilemma of having no main propulsion power, unable to drop the anchors, and the ship now 2.5 cables from the wind farm. The bow thruster helped to stem the drift and fortunately, there were two tugs attending the barge that were able to put lines on board and tow the ship clear into a deep anchorage.

The ship remained at the anchorage as the main engine manufacturers were arranged to attend the vessel to repair the air start valve. However, because of the worsening wind conditions and the lack of main propulsion power, the Secretary of State's Representative for Maritime Salvage and Intervention (SOSREP) required the ship to be taken into port under tow, where her systems were later repaired.

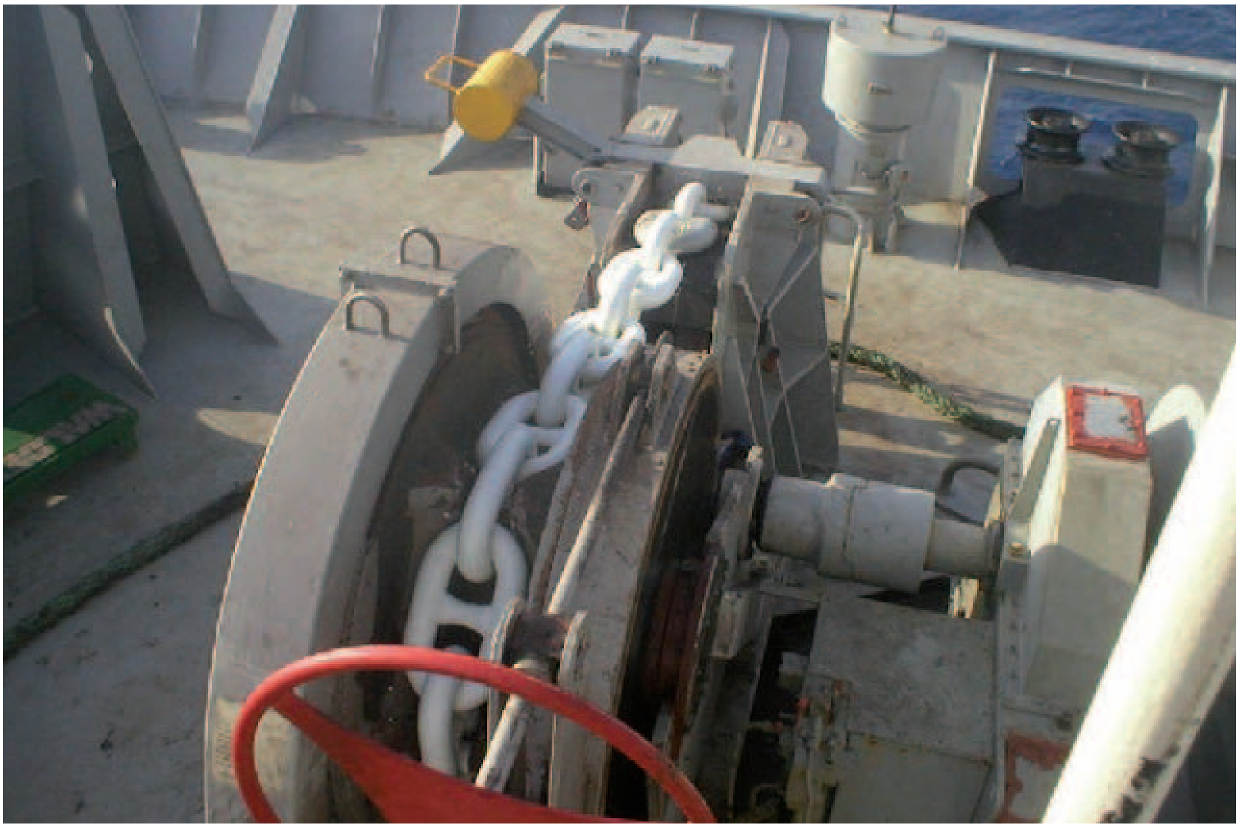


Figure 1: Anchor windlass

The Lessons

The master adhered to the pre-arrival requirements as detailed in the ship's SMS. However, he did not take sufficiently into account the proximity of the wind farm construction site because he believed that he would immediately have ahead power available once the engine astern manoeuvring had been proven.

It would have been prudent to have fully prepared the anchors before carrying out the propulsion checks. Having made the decision to test engines first, and once it was clear that the engineers were having problems, the anchors should have been immediately prepared for letting go instead of hoping that propulsion power would be restored.

The master's actions placed the ship and the crew of the jack up barge in danger as well as potentially risking a pollution problem had the ship entered the wind farm site.

The following lessons can be drawn from this accident:

1. Anchors should be made capable of being let go before engine checks are carried out.

2. Before deciding when to carry out pre-arrival checks, due account should be taken of the weather, current, and the proximity of danger areas. This may appear obvious but, as this case shows, complacency can lead to hidden dangers emerging.

3. As the propulsion system repairs were unsuccessful, the master would have improved his options had he re-directed the engineers' efforts into restoring electrical supplies to the winches so that the vessel could anchor.

4. Never assume that routine activities such as engine checks will always be successful; always expect - and be prepared to deal with - the unexpected, and consider the "what ifs".

Modern Technology – Same Old Problem

Narrative

A large catamaran was fitted with four gas turbine engines, two in each of the hulls. The engines themselves were located in separate gas tight modules and each module was fitted with a camera, ultraviolet (UV) sensors to detect fire, and a CO_2 fire extinguishing system. The modules were also fitted with a drainage system and acoustic lagging linings. Access to the modules was through a water and gas tight door which incorporated a viewing port.

The vessel had been at a lay-by berth for a couple of days. During this time, the power turbine of No 1 engine was changed by the engine manufacturers as part of the planned component change schedule. Changing the power turbine required the gas generator to be removed and then replaced. The gas generator combustion gases were prevented from entering the module by a metal seal known as a "plenum seal". The seal ensured that the combustion gases from the gas generator passed through to the power turbine which, in turn, rotated the output shaft to the gearbox.

The day after the power turbine change the vessel commenced her regular passenger schedule. When she was about 30 minutes into her second passage the fire alarm sounded in No 1 gas turbine engine module located in the port hull. The chief engineer was on the bridge, and he immediately selected No 1 module on the display screen and confirmed that there was a small but discernible flash, indicating a fire.

The enclosure UV sensors picked up the fire, and the automatic shut down and fire extinguishing process activated. The engine was shut down, and the fuel, ventilation, air intake and exhaust systems were isolated. The CO_2 system was discharged into the enclosure and the fire was seen to die down and extinguish. In the meantime the master alerted the passengers, and as a precaution they were issued with lifejackets. The fire team confirmed that the fire was out; the entire fire incident had lasted less than 3 minutes.

It was decided to return to the departure port using only the starboard hull engines. The passengers were stood down from emergency stations a short time later.

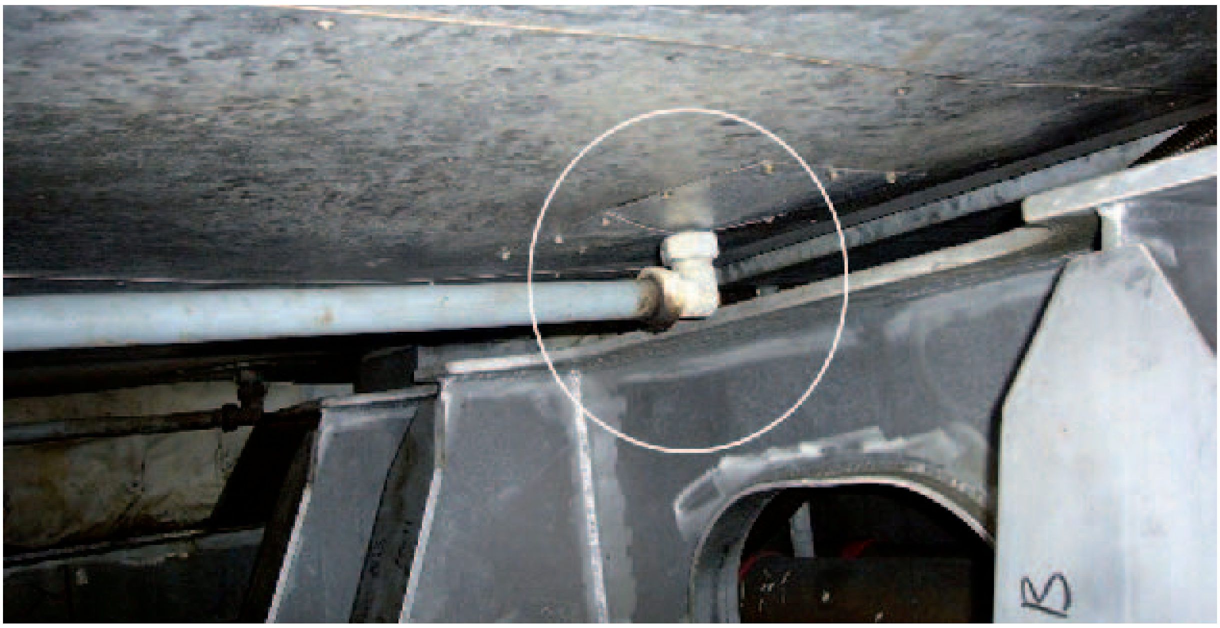


Figure 1: Module drain

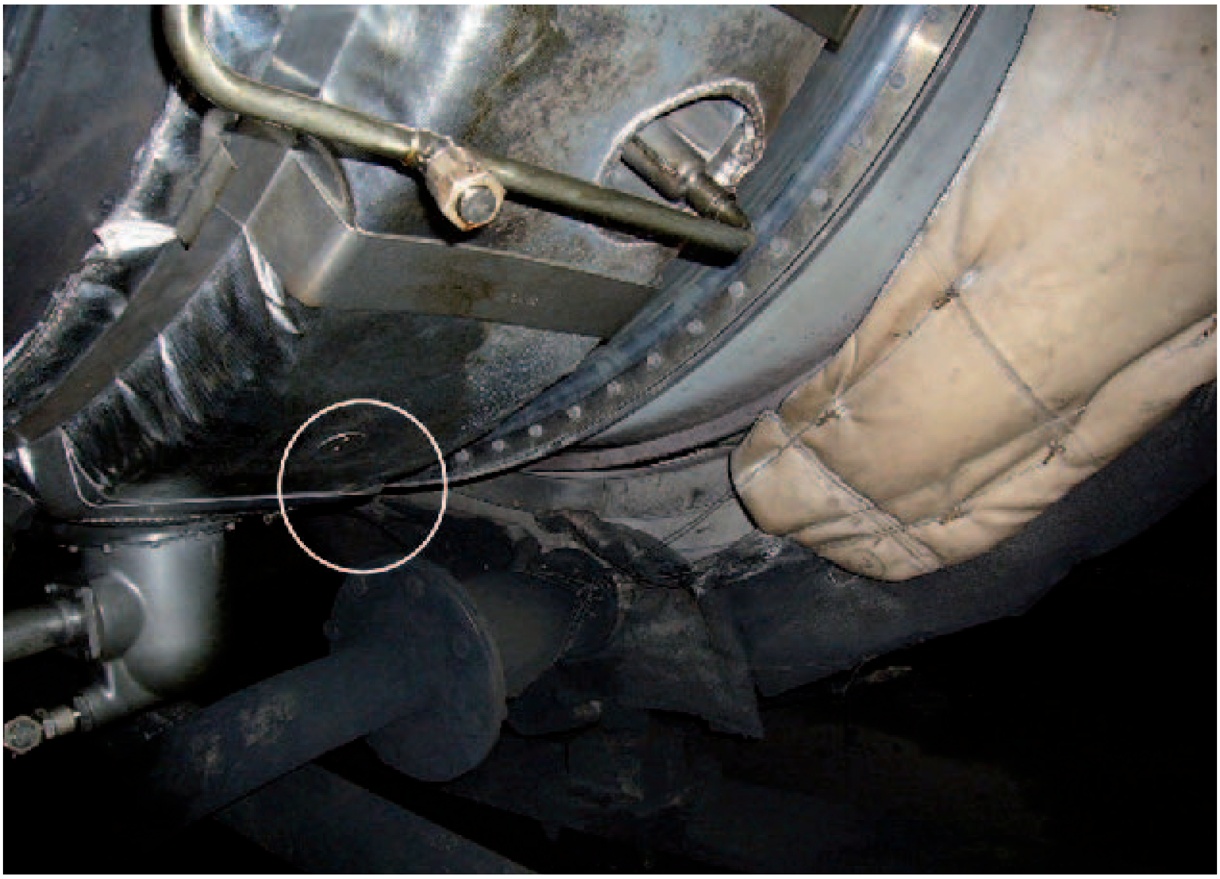


Figure 2: Position of plenum seal leak

Figure 3: Scorch damage

The Lessons

On investigation it was found that the module power turbine channel plate recess had some oil residue in it because the module drain had been partially blocked by debris (Figure 1). A small amount of oil had been soaked up by the acoustic lining and turbine exhaust lagging, and had ignited. The ignition heat source was a hot gas leak from around the "plenum seal" (Figure 2). There was no damage except for a small scorch mark identifying the source of the gas leak, and some minor lagging damage (Figure 3).

It also transpired that the contractors were aware that the "plenum seal" had become worn. However, some of them were inexperienced in maintaining this particular type of power turbine and had not realised the potential danger, so they had not advised the chief engineer of the problem.

In this case, a serious incident did not escalate into a crisis. The ship's team had regularly practised fire drills and were confident that they could manage the problem. They reacted well to the fire situation and dealt with it in a safe and competent manner.

The following lessons can be learned:

1. Residues of oil can easily be soaked up by lagging and become a fire hazard. It is good engineering practice to clean up oil spills and build up. More importantly, investigate where they originate and take prompt action to rectify leaks.

2. Gas turbine modules can reach very high temperatures, so it is doubly important that any debris that represents a fire risk is removed.

3. Drain systems tend to attract secondary consideration. They nevertheless form an important element in reducing fire risks – ensure your drains are free of debris and corrosion.

4. This case firmly illustrates the importance of emergency drills. The crew were confident in dealing with an engine module fire situation because they were well practised. The lesson is practice, practice and practice again!

A Fatal Attraction

Narrative

A laden tanker anchored outside the entrance of a traffic separation scheme (TSS) in a designated anchorage to await the next rising tide in order to proceed upriver to discharge her cargo. The master discussed the passage plan with the second officer, and left orders for the vessel to be ready in order to be at the pilot boarding ground on time.

The master returned to the bridge 30 minutes before the vessel was to weigh anchor, and found that the second officer had amended the passage plan to take into account a change to the entrance of the TSS, which previously had not been plotted on the chart. This now required the vessel to steam an additional 2.7 miles to the pilot station (Figure 1). The master brought forward the preparations and weighed anchor. Initially the vessel steered 324º, and a few minutes later altered to 335º. The tidal stream was setting south-south-east.

The master reduced speed to 6 knots and ordered the wheel to hard-a-port with the aim of conducting a stepped turn and then entering the inbound traffic lane earlier than planned. As the vessel was swinging to port, he reduced the helm order to port 10º and then engaged in a VHF radio conversation to arrange passing with an outbound vessel, while the second officer plotted a position on the chart. Having completed the conversation, the master realised that he had overshot his next planned course of 290º. He ordered hard-a-starboard and increased engine speed, but reduced both as soon as the bow started to swing to starboard. Under the influence of the strong tidal stream, and without the master fully appreciating the situation, the vessel continued to be set down onto the North Cardinal buoy marking the channel (Figure 1).

Although a late order to increase engine speed and helm was given, the vessel made contact with the buoy. Subsequently, the rudder horn snagged the buoy's anchor cable, and it required the assistance of divers to free the vessel.

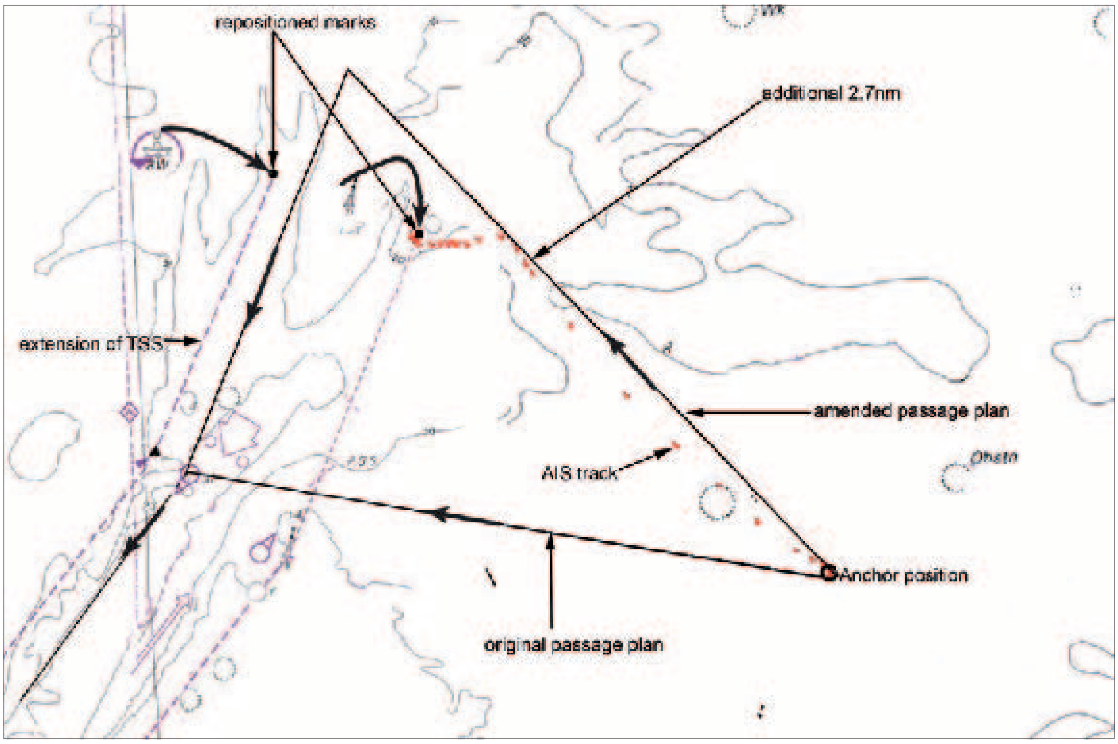


Figure 1: Passage plan showing amended route of vessel

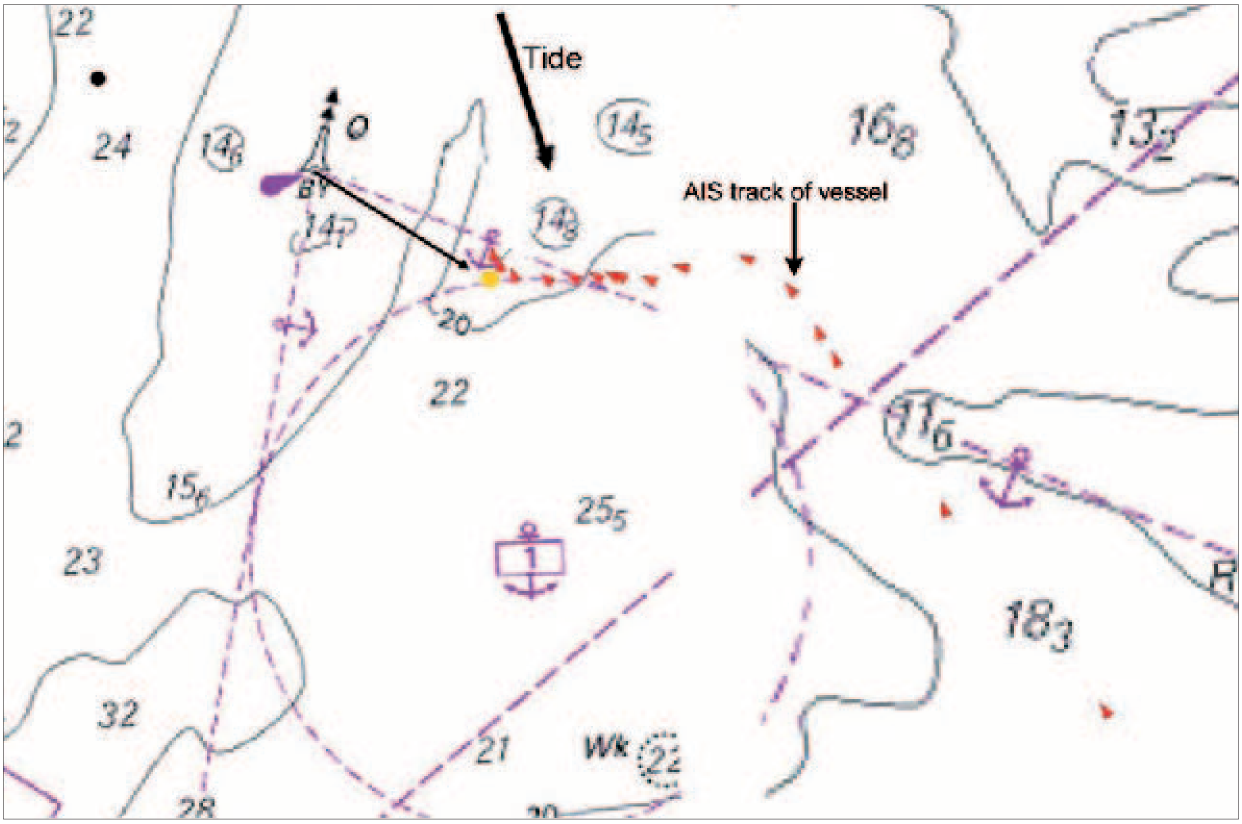


Figure 2: AIS track of vessel's route

The Lessons

1. The revised plan should have been communicated to the master when it became apparent to the second officer that a significant change in the plan was required. This would have allowed the bridge team to assess the new plan without the unnecessary time pressure that was created to get to the pilot station at the scheduled time.

2. Although the passage plan had been discussed with the second officer, the master did not engage him by assigning specific duties or encouraging positive reporting. The second officer in this case was inexperienced; had the duties been clearly assigned, there would have been a better understanding of expectations within the team.

3. The master became distracted by a VHF conversation at a vital moment when he was executing a large turn, and he forgot to take into account the influence of the flood tide on his next course. He could have easily delegated this task to the second officer, or instructed him to execute the turn while he established communications with the outbound vessel. Working in isolation when carrying out a critical operation carries the increased risk of an error being made and then going undetected.

4. Passage plans do often change; sometimes at short notice. In this case, the master opted to initiate an early stepped turn to port instead of a later, much sharper turn (Figure 2). However, he did not communicate his intention to the second officer. Effective communications and continual engagement will create good situational awareness and allow the bridge team to anticipate and prevent dangerous situations arising.

Failed Seal Causes Engine Room Fire

Narrative

A 30 metre tug had just completed a dry docking during which the two propulsion units had been overhauled and the vessel surveyed.

The master and three crew joined the vessel a few days before sea trials to familiarise themselves with the tug's layout and equipment. On completion of the rigorous 2-day sea trials, the tug returned to her refitting port. The master was pleased with the way the tug handled, and at the end of the trials period there were no outstanding defects.

The tug was prepared for the 10 hour passage to her northern home port which was planned for the next day. The complement for the passage was a master, chief engineer and two deckhands. Unfortunately one of the deck-hands did not attend the tug when she sailed at 0415. While the master and chief engineer had wide ranging sea experience, the remaining deckhand had been with the company for only 4 months and had completed no formal safety training courses. However, he had received induction training on the company's emergency procedures, and the master had ensured that he knew where the emergency equipment was stowed and the actions he was to take in the event of a man overboard, fire or flood.

Despite the manpower shortage, the master decided to sail. He considered that the three persons on board would be able to deal with any emergency that occurred. They were soon to be tested.

During the passage, the chief engineer checked the engine room a number of times. The engines were running well, there were no obvious fluid leaks and the space looked spic and span following the refit. But not for long.

At about 0730 the deckhand was in the galley preparing breakfast, the master was in the wheelhouse, and the chief engineer was in the mess room having just left the engine room.

The peace was shattered when, at 0800, the fire alarm sounded. The chief engineer immediately went to the engine room to investigate. On opening the engine room door he saw smoke and flames around the port main engine turbo charger and exhaust. He shut the engine room door, informed the master of the fire and recommended that both main engines be shut down. The emergency routine for an engine room fire was initiated. Fuel supplies were quickly isolated and the compartment fully closed down before the fixed fire-fighting system was activated. The vessel then anchored as the master contacted the coastguard and the owners.

A lifeboat arrived soon afterwards and set up boundary cooling. The indications were that the fire had been extinguished by the time the local authority's Maritime Incident Response Group (MIRG) fire response team arrived on board at 1100. As a precaution, the fire brigade officer requested a second breathing apparatus team; this arrived at 1220. The MIRG monitored the engine room temperatures, which indicated the fire was out. The tug was taken under tow back to the refitting port, where the MIRG made a re-entry and confirmed that the fire was out.

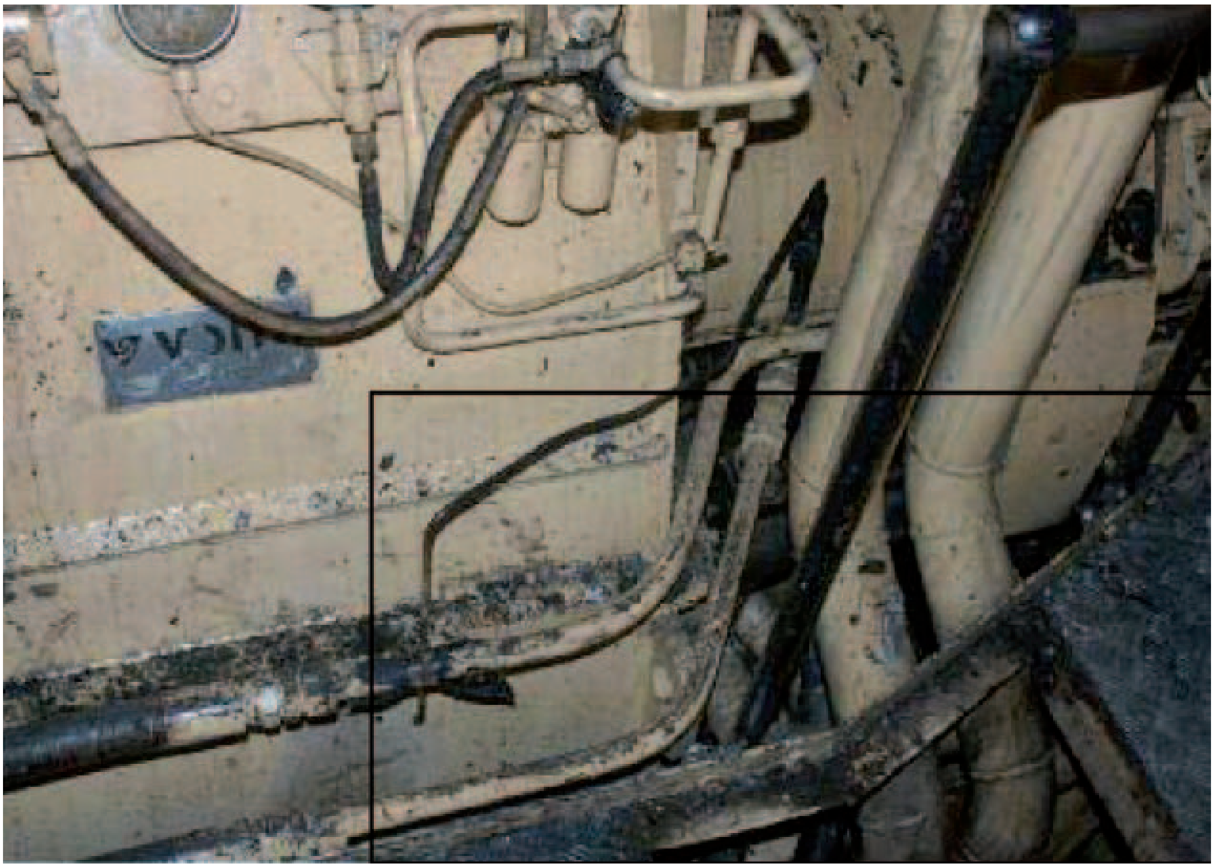


Figure 1: Burnt area

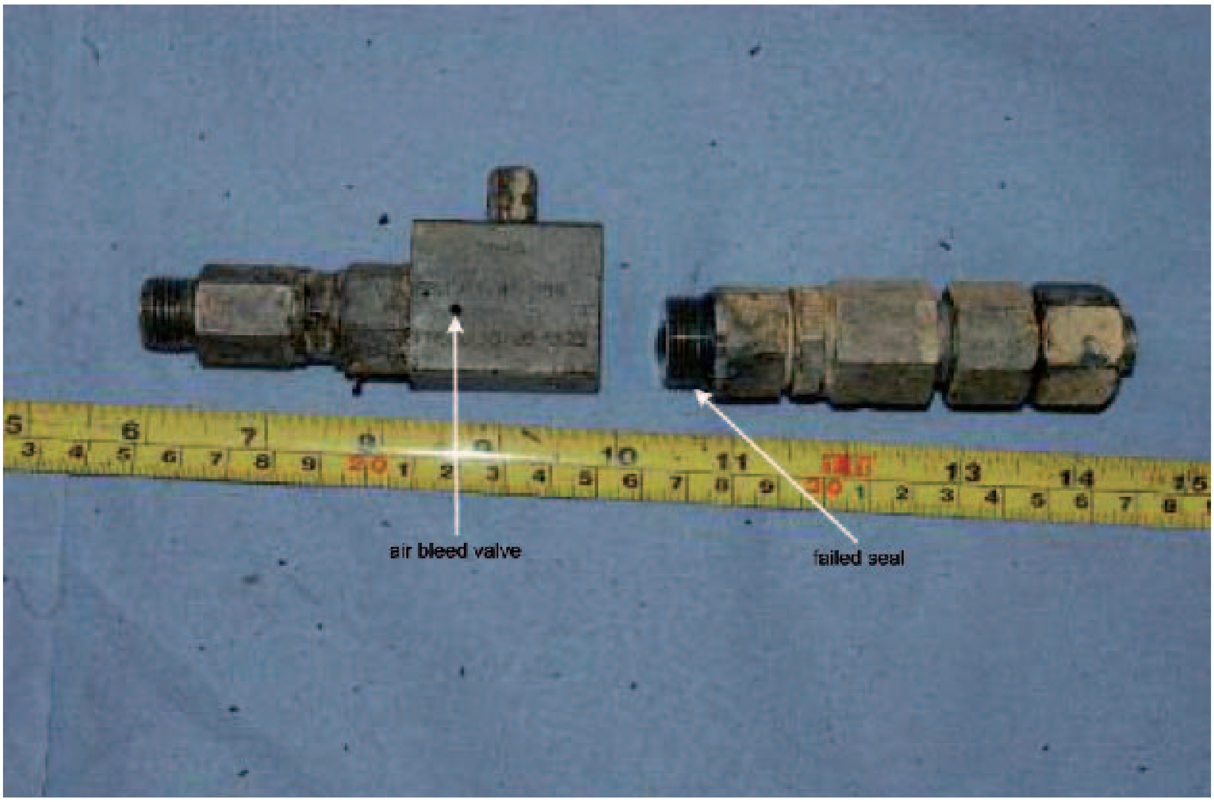


Figure 2: Air bleed valve and pipe connection

The Lessons

The engine room sustained smoke damage throughout. The fire damage was centred around the port main engine in the vicinity of the turbo charger. Widespread spatter deposits on several components had also burned, indicating there had been a release of high pressure fuel or oil.

Closer examination revealed that the port propulsion unit air bleed valve was not fitted with a blanking cap, and there was evidence of burning in the area (Figure 1). The valve was dismantled, and it was found that the "O" seal, captured in a steel washer (commonly known as a "dowty seal"), which connected the valve to the pipework, had failed (Figure 2).

The fire was caused by hydraulic oil, at about 100 bar, being sprayed from the defective seal. The fine droplets combined with the air, and on reaching the mixture's lower flammable limit were ignited by the hot, port main engine turbo charger. The flame front then "flashed back" to the fuel source, igniting the larger droplets. The crew's prompt action in closing down the engine room and activating the fire extinguishing system prevented an escalation of the fire.

The following lessons can be drawn from this accident:

1. Crews should be properly trained and exercised to deal with emergencies. In this case the inexperienced deckhand was scheduled to undertake a number of formal safety courses. The master, recognising his inexperience, had briefed him on the actions to be taken in an emergency, and he undertook these in a competent manner.

2. It was unclear when the air bleed valve to the pipework sealing washer was last removed. It is good engineering practice to replace sealing washers whenever components are dismantled.

3. Had the air bleed valve failed, far more high pressure hydraulic oil would have been sprayed around the engine room. This would have had the potential to cause greater damage because blanking caps were not fitted. Always fit blanking caps tightly to open ended pipework, and ensure that bleed valves are pinned in the closed position when not in use.

CASE 12

Ghost in the Machine?

Narrative

A ro-ro passenger ferry was on a regular run between two ports, completing several round trips each day. Weather conditions were benign and it was slack tide – in short it was another routine operation.

As the vessel was leaving port, she suffered a partial power failure. The bridge team were presented with an unfamiliar situation and were unable to control the vessel, which gathered headway and made contact with the link span on an adjacent berth.

The ferry had four main engines arranged in two pairs powering each of the controllable pitch propellers (CPP). Two of the main engines also powered the bow thrusters (BT) via shaft alternators. The other two main engines also drove shaft alternators, which were being used to supply all of the vessel's electrical requirements, the main switchboard being split in half by opening the bus coupling breaker. Each of the CPP shaft lines had its own independent control system. The ferry was also provided with an Uninterruptible Power Supply (UPS) and an emergency diesel alternator; both were ready to operate automatically when needed.

As the ferry left the berth, stern first, the master was at the bridge wing console, manoeuvring her using the combinator controls. Once clear of the berth, he started to turn her. Without warning, one of the two bow thrusters stopped, the air conditioning went off and the lights momentarily dimmed as the ferry experienced a partial loss of electrical power. A cacophony of visual and audible alarms was triggered, and the bridge control system briefly failed before being automatically restored as the emergency power supplies took over. The bridge team set all the manoeuvring controls to zero while they waited for the situation to stabilise. There was no traffic and the vessel was making little way; they felt lucky to be in a relatively safe situation, and were confident that normality would soon return.

The vessel then began to move ahead. The master was unsure why this was happening, but realised something was wrong and that the ferry was standing into danger. Unable to regain control of the CPP system at the bridge wing, he ordered the chief officer to do so at the centre console. However, he too was unsuccessful. The master therefore ordered the port anchor to be let go. The ferry continued to gather headway. Still unable to regain control, the master ordered the starboard anchor to be dropped as well. Realising that heavy contact with the berth was now unavoidable, the master pushed the main engine emergency stops and shouted to his team to brace for impact.

The vessel hit the quay, and then the link span, causing significant damage to both the ferry (Figure 1) and the port facilities (Figure 2). Fortunately there were no injuries and no pollution as a result of the accident.

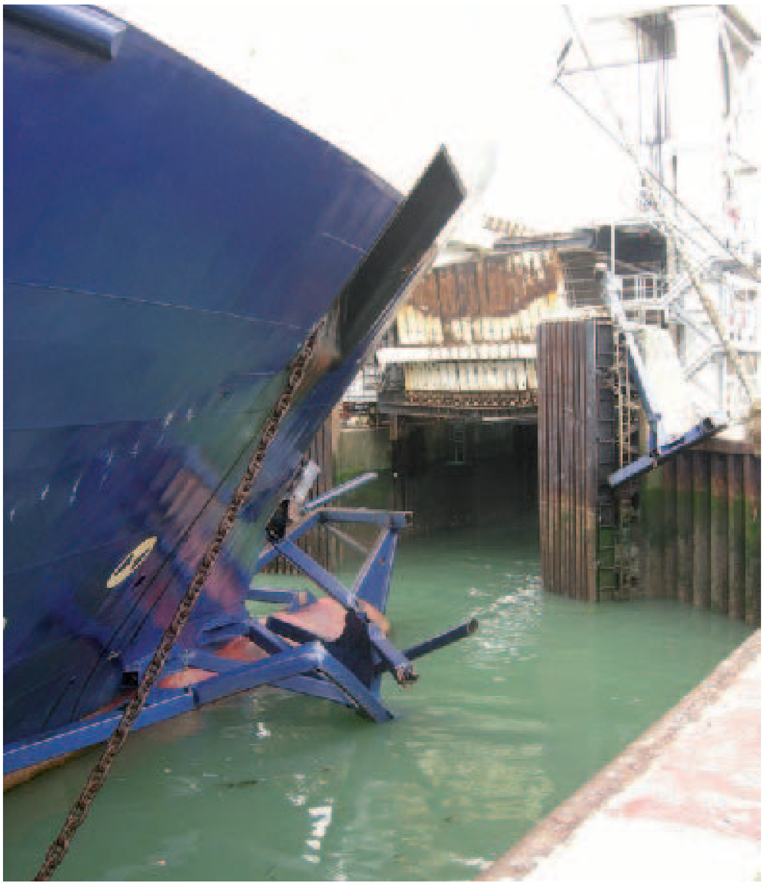


Figure 1: Damage sustained to ro-ro passenger ferry

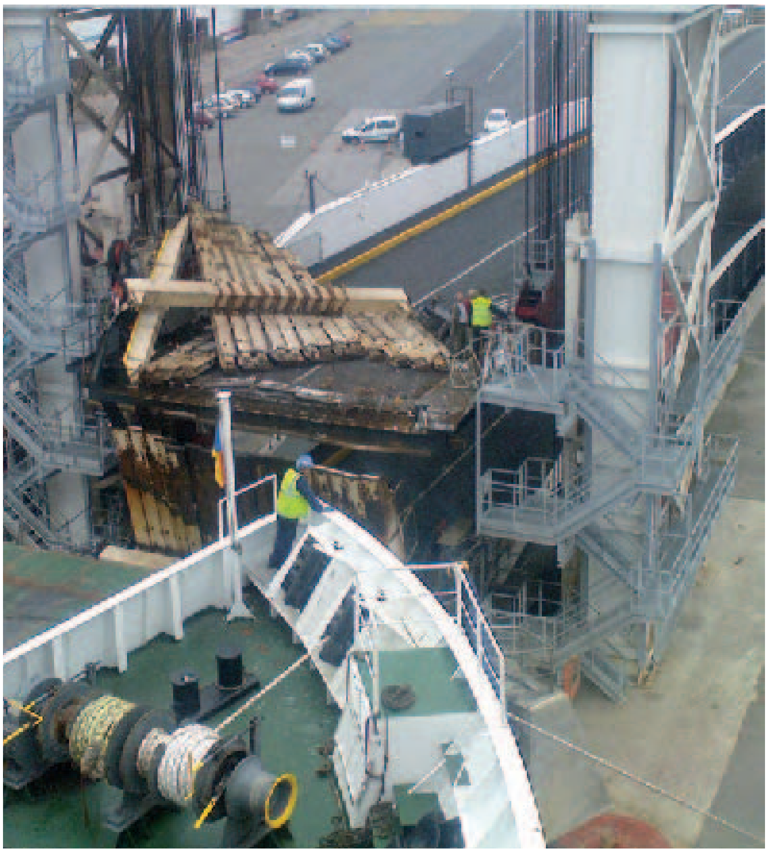


Figure 2: Damage to the port facilities

The Lessons

Investigations concluded that both starboard engines stopped for reasons unknown. This resulted in a failure of power supply to the starboard half of the main switchboard. Both engines on the port shaft line were unaffected, and so continued to run. Until power was restored, each CPP control system had been powered by its own UPS system. The starboard control system operated correctly and bridge control was maintained as normal, however the shaft was not rotating. The port control system UPS failed to supply the power demanded and, as a result, the control system operated as designed and automatically switched to back-up control mode. The pitch on the CPPs failed to "last setting", in this case approximately 50% ahead on the port shaft and zero on the starboard.

The bridge team had set all of the bridge control combinators to zero. However, they were unaware that the port control system was now applying a pitch command via the back-up control system, requiring them to control the port shaft using the back-up control joysticks as the port shaft combinators had been automatically disconnected by the control system. The alarm to indicate the changeover was probably sounding, but was lost in the noise created by all the other alarms.

This scenario was not covered in the manuals available on board, so the emergency pitch drills that were regularly conducted were, unbeknown to the crew, less than realistic and resulted in an ineffective response to a critical situation.

The following are quotations from MAIB investigation report 24/2007, MT *Prospero*, which can equally apply to this accident:

- *A good SMS system will require deck officers and engineers periodically to practise and drill reversionary modes of operation. As well as fully understanding the emergency functions of the system under their command, operators must have both the confidence and the competence to switch back and forth between the primary method of propulsion and steering control, and the back-up systems.*

- *The MAIB is becoming increasingly aware of accidents that have been caused because ship's staff have either failed to recognise that a system had automatically selected a reversionary mode of control, or who are so inexperienced in the use of reversionary modes that they have been unable to effectively control their vessel.*

Get to know your control systems – before they get you!

Machinery Commissioning - A Shocking Result!

Narrative

A ship was in dry dock undergoing an extensive refit which included the overhaul of the main engine, main shaft alternator and its integral cooling fan. Before the fan was removed, one of the engineers electrically isolated the unit. Because the fan was not fitted with an isolating switch or dedicated breaker, the fan's 3 x 160 amp supply fuses were removed (Figure 1).

The engineer placed a conspicuous sign on the switchboard fan cubicle stating that the fuses had been removed. He also logged "fuses removed" in the Padlock Electrical Isolation Sheet.

The refit progressed well and to schedule. The chief engineer, keen to push on with the machinery re-commissioning, issued a blanket Permit to Work for himself and a contractor to cover the equipment overhauled during the refit. The chief engineer was very experienced and had been through this type of procedure many times before – this time was to prove very different indeed.

Trials on the main engine in the "no load" condition went well, and there followed a need to load up the engine by connecting the shaft generator to the switchboard. The third engineer tried to close the breaker, but was unable to do so. The chief engineer, knowing that the alternator cooling fan had been worked on, suspected that it was not running. He also incorrectly thought that the fan was interlocked with the breaker and was required to be running to close the breaker.

The chief engineer inspected the fan which was sited on top of the alternator enclosure (Figure 2) and found that, indeed, it was not running. He then went to the switchboard and noticed the "fuses removed" sign on the front of the switchboard fan cubicle. As the alternator breaker was open, the chief engineer wrongly assumed that the supply to the fan was on the "outgoing" side of the breaker, so thought that the circuit was dead. Significantly he neither referred to the system drawings to confirm his hypothesis nor did he carry out any electrical checks to confirm that the circuit was dead, as required by the SMS.

After the chief engineer removed the plastic guard from the fuse carrier, he inserted the first fan fuse. Just two more to go and the fan could be started, breaker closed, and the load trial could begin. However, things were about to quickly change.

As the second fuse was replaced, there was an explosion, which destroyed the fuse carrier (Figure 3). The chief engineer staggered backwards and suffered burns to his right forearm, face and chest (Figure 4). He remained conscious throughout and was given immediate medical treatment and taken to hospital where - luckily - he made a full recovery.

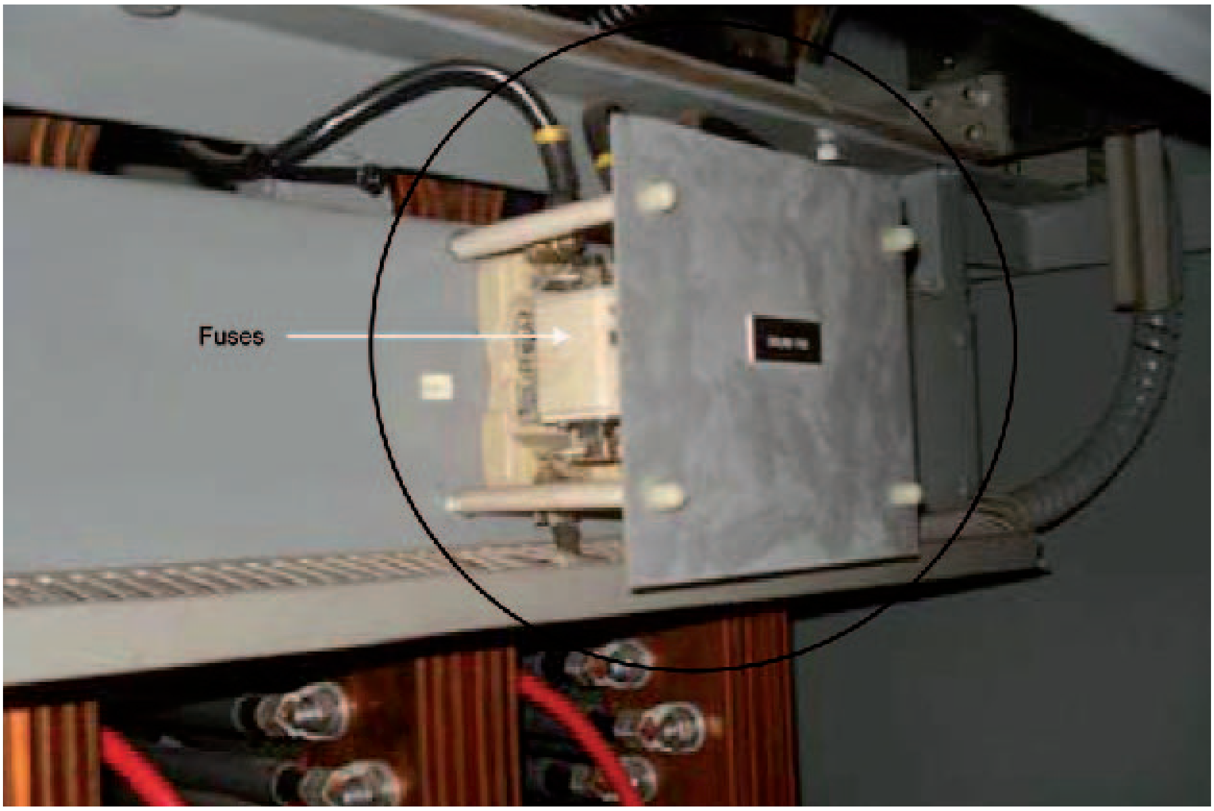


Figure 1: Supply fuse enclosure

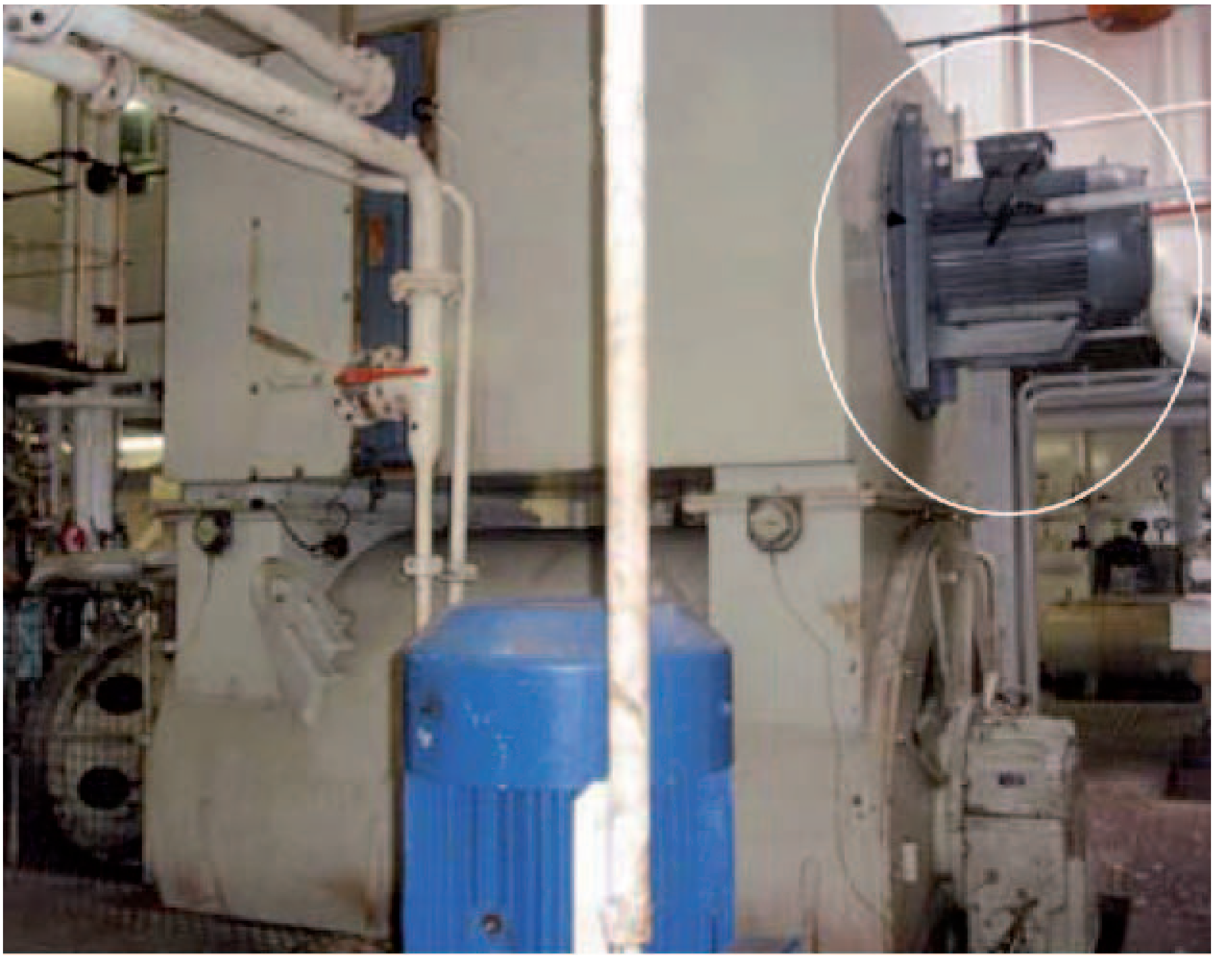


Figure 2: Alternator cooling unit

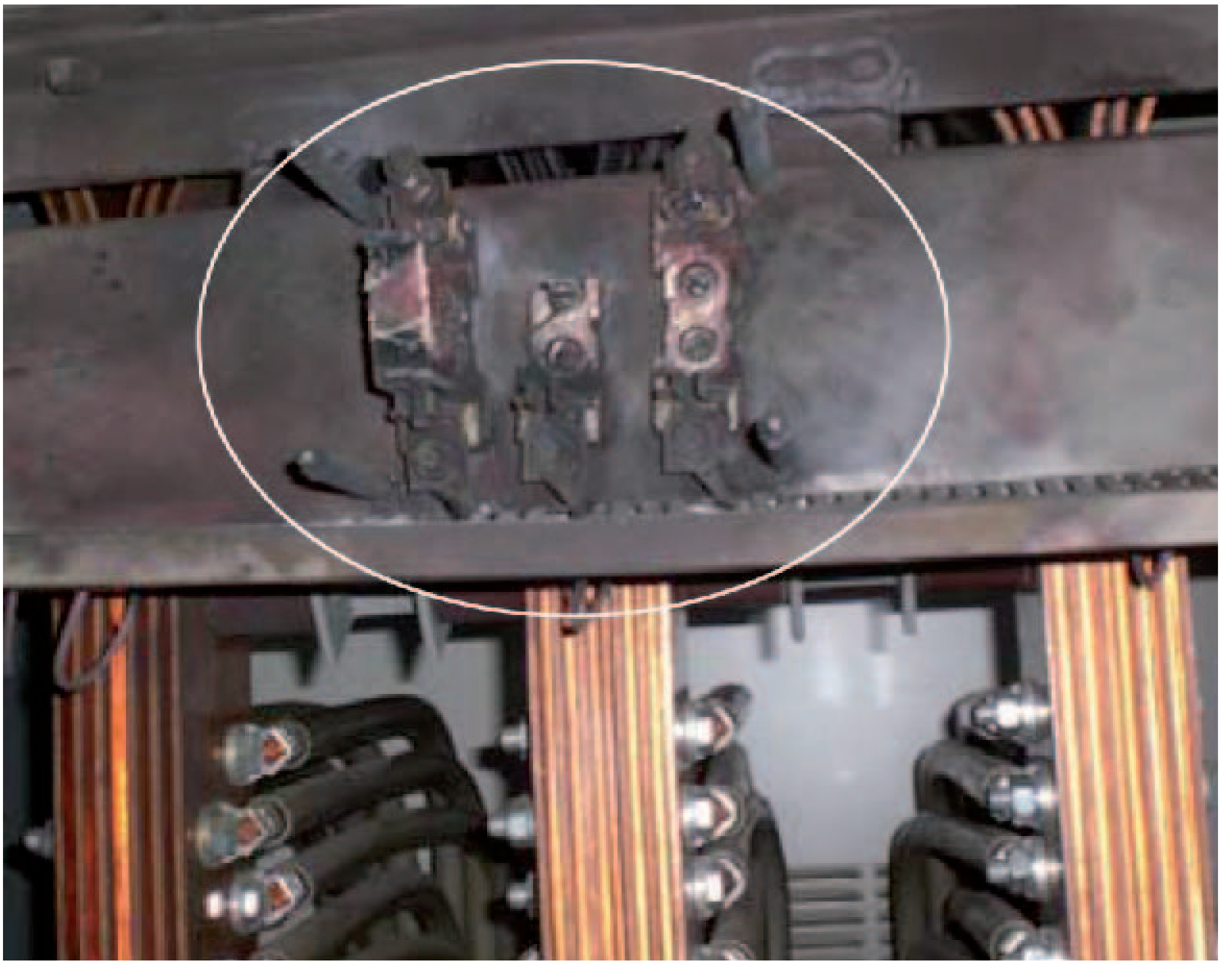


Figure 3: Destroyed fuse carriers

Figure 4: Chief Engineer's injuries

The Lessons

The chief engineer was wearing overalls, a hard hat and protective glasses. Had he not done so, his injuries could have been far more serious.

In this case, the fuses also provided voltage not only to the alternator fan but also to a 660/220V transformer which was used for the alternator instrumentation and control voltage to the main breaker tripping devices via another transformer. With the fuses removed, there was no breaker control circuit, so the breaker would not close and the fan would not run.

As the second fuse was replaced, there was a high inrush of current on the primary side of the control and instrumentation transformers, and a fault condition now existed as only two out of three fuses were now in place – effectively producing a single phasing situation.

The following lessons can be drawn from this accident:

1. Never assume that an electrical circuit is dead. Checks, using electrical test equipment, should always be carried out to ensure that circuits are safe to work on; this includes replacing fuses.

2. Always comply with the Permit to Work procedures - they will have been developed to ensure your safety. In this case the hazards were specified, and highlighted that parts of the system may remain live even though switched off. Do take note of advice such as this.

3. All too often, people believe that their experience will see them through. In this case, the warning signs were there: the chief engineer should have consulted the drawings which were readily available so that he could understand why the alternator fan was not working and to properly understand the origins of the power supplies.

4. There is often an urge to press on with trials due to commercial and time imperatives. This must not be an excuse for taking shortcuts – they can cause injury to you and others.

5. Remember, those working for you are likely to follow your example, so do ensure you adopt safe working practices.

Leaving Buoyed Channel Leads to Grounding

Narrative

Leaving port, a modern 27,000 tonne ro-ro vessel was in a buoyed channel when the bridge team decided to depart from the channel in order to pass clear of a vessel they were overtaking. As she passed a navigation buoy, marking a shoal area, on the wrong hand, the vessel made contact with the bottom. This resulted in minor damage to one of her rudders, the blades of a propeller and loss of paint from a 30m area of her bottom.

The bridge team consisted of the master, officer of the watch (OOW), helmsman and a pilot. The pilot, who had the con, was standing at the bridge window and was navigating by eye with the master standing beside him. The OOW was monitoring the vessel's position on the Electronic Chart Display (ECDIS) but was not plotting the position on the paper chart.

The decision to pass the navigation buoy on the wrong hand was taken by the pilot, with the master's agreement, when the vessel being overtaken moved across the channel to keep clear of inbound vessels using it.

As the vessel passed the buoy her speed, which had been in excess of 20 knots, suddenly reduced. The master realised that they had touched bottom and immediately reduced the propeller pitch to zero, before increasing speed again to allow the vessel to be safely brought back into the channel.

Thorough checks were then made of the vessel's tanks and spaces; these confirmed that her watertight integrity had not been compromised, and she was able to remain in service until a convenient time was found to effect repairs.

The Lessons

1. **The fundamental requirements of planning and executing a safe navigational passage must be clearly and fully understood and implemented by all bridge officers. SOLAS Chapter V, Regulation 34 and Annexes 24 & 25 clearly define the requirements for the planning and conduct of a safe navigational passage, the key elements of which are:**

    - **Appraising, Planning, Executing and Monitoring**

2. **The vessel was overtaking another when the decision was made to alter course and leave a buoyed channel. Consideration should have been given to reducing speed and delaying the overtaking manoeuvre in such circumstances.**

3. **The pilot was not monitoring a radar or ECDIS and lost situational awareness when the vessel left the channel. He considered that the vessel would pass sufficiently close to the buoy to avoid the shoal, but he did not appreciate her position in relation to the shoal.**

4. **The OOW did not monitor the vessel's position by plotting. Had he done so, he might have been able to alert the master and pilot to the fact that she was further off track than they realised.**

5. **Pilots are trained to know, in extremis, which buoys in their area can, subject to draught, be safely passed on the wrong hand. However, departure from a buoyed channel should always be an exceptional, carefully planned and monitored, manoeuvre.**

6. **The vessel's squat, at 20 knots, was in the region of 0.5m. However, this information was not available to the bridge team at the time because the builders had not supplied it. Companies should ensure that such information is provided to vessels before they enter service.**

Part 2 - Fishing Vessels

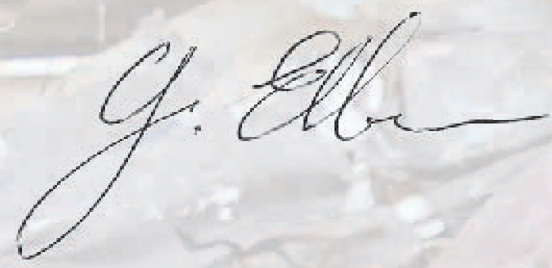
Fishing for me is not only a living but also a way of life, never having wanted to do anything else for a job. On the 22nd May the real impact of mistakes one can make were brought home to me very firmly.

On a fine calm day I was out with my close friend and colleague Brian, who was crewing for me. All the fish sorted, boxed and stowed away we decided to call it quits. While Brian cleared off the stern deck I started to get the gear aboard with the hydraulic winch, which was turning in order to use the warping drum, a job which I must have done thousands of times without any mishaps. That was about to change very quickly!

As I walked down the deck past the winch the long fishing smock I had on, caught under a rope which was round the warping drum and started to drag me in as it wound up like a rope. Calling out to my mate Brian, "Stop winch"! Acting quickly he stopped it by the emergency lever. Unfortunately I had been pulled right around the drum, underneath it and thrown out on to the deck. At first on regaining consciousness I thought I had broken my back, the pain was excruciating. Feeling down my leg I realised I had broken it in several places. Brian made me as comfortable as possible as I lay on deck unable to move. He put out a radio call and in due course the emergency services arrived and airlifted me to hospital.

After four days in hospital and an operation on my right leg, two metal rods and bolts being used to patch me up I was discharged spending the next two months convalescing at home.

On reflection after making a full recovery and going back to sea fishing, I realise familiarity breeds complacency. This accident could have been avoided by a little more attention.



John Elbra

John Elbra is 56 years old and is skipper and owner of a 15 metre boat *WIN LO 87*. He left school at 16 and worked in a boat builders. John has fished for 40 years and been a skipper of numerous fishing vessels. He has been involved in oyster farming for 20 years. John passed all mandatory training courses in 2004 and spent most of his fishing career in the Thames Estuary.

CASE 15

Tragedy Close to Home

Narrative

An under 10m steel fishing vessel sank while heading back to its mooring in rough seas and poor weather conditions. The owner, who was the only person on board, tragically lost his life.

The owner had checked the weather before he departed, and the forecast indicated that the wind would decrease to Force 3 for a time before increasing to Force 5 to 6. As the local conditions at the time appeared to be corresponding with this lull, he decided to spend the morning operating close to shore before the weather picked up. However, by lunchtime the weather had seriously deteriorated, and the owner made a call ashore using his mobile phone to say that he was heading back in to his mooring as the weather was 'horrendous'. Nothing else was heard from the vessel, and no distress signal was received. It was later established that she had disappeared off a local radar system a short while later. The radar also indicated that the vessel was making around 4 knots when she disappeared, with a local weather data confirming that there would have been winds gusting up to Force 8 on her port bow at the time of the loss.

A couple of hours later the vessel was reported as overdue to the coastguard, which initiated an extensive search. Sadly, only minor items of debris from the vessel were found. The vessel was located on the seabed the following day and was consequently recovered, but with no trace of the owner.

Subsequent examination of the vessel found that the hull was intact, with both of the deck hatches in place and with no obvious source of initial downflooding that might have contributed to the loss. The wheelhouse door was, however, missing and the displacement of some of the wheelhouse windows from their frames, along with the movement of other items on board, suggested that the vessel had most likely been overcome by the seas, and had capsized suddenly.

Figure 1: The fishing vessel being recovered

The Lessons

1. Although the owner was expecting the weather to deteriorate, he was almost certainly not expecting it to be as bad as it turned out. Had he anticipated such a deterioration in the weather, he would have headed back in earlier as Force 8 was in excess of his normal operational limit. Forecasts are just that, only a prediction of what is likely to happen; they don't always get it spot on. They also tend to differ depending on the data used and the calculation methods employed. It does no harm to consult a second or third forecast before deciding how long to put to sea for.

2. Various modifications had been made to the vessel over the years, including the fitting of a substantial gantry. Such changes would have reduced the stability and freeboard, and possibly contributed to this loss. Although there are no statutory stability requirements for under 15m fishing vessels, it is advisable to be aware of your vessel's stability, and to consider how this will be affected by any proposed structural alterations. One way of doing this is to consult a qualified naval architect; another is to attend the well-received Seafish Stability Awareness course.

3. Although there is no regulatory requirement for a vessel of this size to carry an EPIRB, liferaft or Digital Selective Calling (DSC) capable VHF radio, all are recommended. None were on board this vessel (there was a VHF, but not DSC), and it is not inconceivable that any or all of these items might have helped identify that she was in difficulty and, indeed perhaps have saved the owner's life.

4. The skipper had previously been in the habit of using a personal locator beacon while he was operating single-handedly. He had, however, recently stopped using this. Again, particularly when operating alone, the use of a locator beacon such as this might have ensured his survival. No one pretends that equipment such as EPIRBs and liferafts are cheap, but what value do you place on your life?

CASE 16

Fatigue and Defects Lead to Grounding and Contact

Narrative

An under 12 metre scallop dredger set out for her usual 4/5 day fishing trip with just the skipper and one crew member on board. The vessel had had mixed success, and in order to make a reasonable profit the manning level had been cut to the bare bones. To make matters worse, commercial pressure drove almost "round the clock" fishing, with the skipper and crew managing to get only about 3 hours of intermittent sleep each day.

To add to the problems, the material condition of the vessel was poor. There was a large hole in the fish hold hatch coaming, which clearly compromised the watertight integrity. The fish hold bilge alarm had been disconnected, the wheelhouse main engine monitoring panel, together with its engine start and emergency stop, was also defective. Worst of all, the port derrick winch auto-tensioner had frequently failed, causing the port derrick to suddenly drop directly in the area where the crew member was positioned during shooting and hauling.

A couple of days after sailing, the weather deteriorated. With the dredges inboard, the skipper turned out both derricks to improve the vessel's stability as he sought shelter. His intention was to use the port dredges as an anchor until the weather improved. At about 0600, as the vessel entered the shelter of a small bay, the skipper topped the starboard derrick. As he attempted to raise the port derrick to pick up the dredges, and then lower them, the port winch auto-tensioner failed (Figure 1), so the derrick dropped back to the horizontal position. Instead of waking the crew member to take the con, the skipper put the gearbox into neutral and left the wheelhouse unattended as he went to investigate the winch problems. A couple of minutes later the vessel grounded. Fortunately, there was no structural damage, and a short time afterwards the skipper managed to manoeuvre the vessel off the bottom on the rising tide. The vessel was then taken to anchor. The time at anchor should have given the skipper a chance to catch up on his rest; instead it was spent repairing the winch, with the result that he became even more tired.

The following day the weather abated, and the skipper fished in a northerly direction while on his way to the offloading port. During the passage he decided to fish in an area which he knew was reasonably abundant but which was subject to a navigation warning. The warning advised vessels to give the area a wide berth because a jack up barge was carrying out survey work in support of a wind farm project.

The vessel passed within 60 metres of the barge and, despite hearing radio warnings from the barge master to keep clear, the skipper chose to ignore them. Just after midnight the dredges were shot away once more, and afterwards the crew member went to the mess room to rest.

At about 0110 the main engine lubricating oil pressure gauge sited in the wheelhouse started to fluctuate violently. Knowing there were problems with the engine panel, the skipper was unsure of the situation and decided to investigate the problem. The vessel was in auto-steering, towing at 2.5 knots, with the jack up barge about 2-3 points off the port bow about 0.8 mile away when the skipper left the wheelhouse and went to the engine room.

Once again he did not wake the crew member to take the con. While the skipper was in the engine room, the inevitable happened. The tidal stream set the vessel on a course directly towards the barge, and at 0128 she made contact with the barge's hull while the wheelhouse was still unmanned.

Fortunately it was almost high tide, and this prevented the vessel from being driven under the barge's hull, which received superficial damage to its lower edge. The scallop dredger suffered minor impact damage to the stem adjacent to the whaleback and to guardrails (Figures 2 and 3) – the damage could so easily have been far greater, and resulted in the loss of the vessel and possibly the lives of those on board.

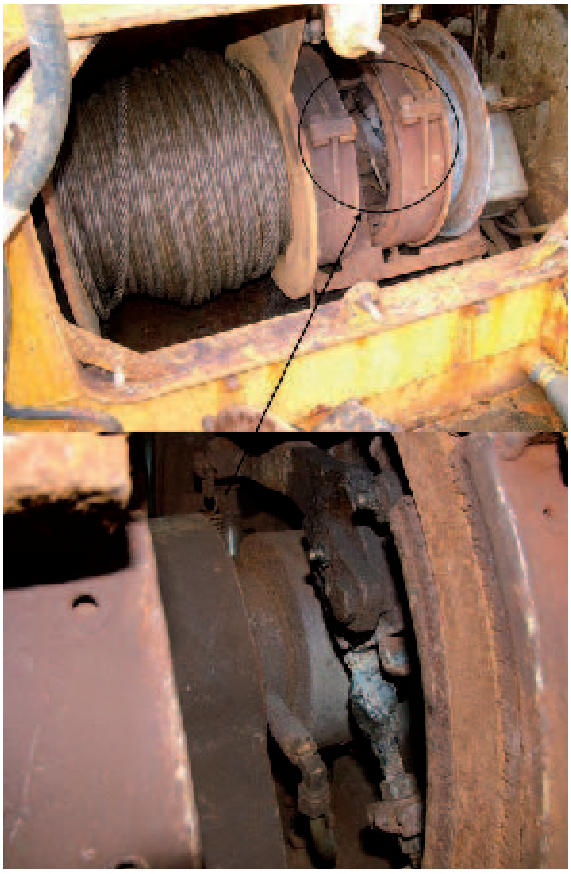


Figure 1: Close-up of auto tensioner

Figure 2: Jack up barge - point of impact

Figure 3: Damage to the stern of the fishing vessel

The Lessons

The skipper allowed commercial pressure to compromise the safety of the crew and the vessel. In order to make reasonable returns, fishing was carried out almost "round the clock". The vessel's manager was under the impression that the skipper frequently went to anchor to achieve some rest, but this was not the case. The ice stock lasted for about 5 days, and financially it was impracticable to reduce the fishing time by one third to get the required rest while there were only two persons on board.

Any potential time for rest was often taken up attending to repairs, so the fatigue levels built up. The cumulative effect of fatigue can easily impact on rational decision making. In this case, the skipper took no account of the tidal set or the close proximity of the barge when he opted to leave the wheelhouse unmanned, despite having the option of rousing the crew member to take the con.

The following lessons can be drawn from these accidents:

1. Do not ignore the potential cumulative effects of fatigue caused by under manning. The responsible manager and owner should keep manning levels continuously under review.

2. Recognise that fatigue can affect rational decision making.

3. When there is a need to leave the wheelhouse, use other crew members to keep the lookout.

4. Promptly attend to deficiencies which compromise the safety of the crew and vessel. In both the grounding and contact accidents the root reason for the skipper leaving the wheelhouse unmanned was to attend to long-standing defects.

5. Respect navigation warnings - they are broadcast for your safety. Unknown to the skipper, the barge was held in position using anchors; the dredges could easily have become snagged. There are far too many cases of capsize and loss of life due to snagged fishing gear, and in this case the risk was avoidable.

More detailed safety advice on fitness for duty and navigational responsibilities can be found in the following Marine Guidance Notes (MGNs) which are available, free of charge, from the MCA's website:

- MGN 313(F) – Keeping a Safe Navigation Watch on Fishing vessels.

- MGN 137 (M+F) Look-out During Periods of Darkness and Restricted Visibility.

Fatal Chain of Events

Narrative

A crew member was lost overboard from a twin rig trawler during shooting operations, in darkness and moderate to rough sea conditions. Unfortunately, despite the best efforts of his crew mates, including one who jumped into the sea to assist, he could not be rescued.

The vessel had shot her gear and the crew were attaching the three towing chains to the trawl wires. After attaching the port and starboard towing chains, two crewmen were in the process of attaching the centre chain. Once attached, the load on the trawl wires was transferred onto the chains. During this time, one crewman became caught between the chains and the vessel's bulwark rail, and was carried overboard as the load came onto the chains.

The man overboard managed to grab hold of the trawl wire, which was quickly hauled up in an attempt to recover him. However, unfortunately he was unable to hold on long enough to be pulled on board and was swept away from the boat and into the darkness.

Recognising the boat's lack of manoeuvrability with the trawl gear deployed, the skipper immediately ordered the wires to be cut using a petrol-powered angle grinder. The boat was quickly turned around and the crew located their colleague in the darkness by listening for his calls for help. Life-rings were thrown to him, but he was unable to hold on, and once again he drifted away from the boat. The skipper again manoeuvred the boat alongside and life-rings were thrown to the man overboard. Seeing that the casualty was unable to help himself, probably due to cold

Demonstration of where the crewman was standing at the time of the incident and water ingestion, the vessel's skipper jumped into the sea, without protective clothing, in an attempt to help his colleague. Unfortunately he was unsuccessful and the skipper, too, began to succumb to the effects of the cold water.

Luckily, but with difficulty, the remaining crew were able to recover their skipper from the water. However, despite a concentrated search and rescue operation, the casualty was not recovered even though he was wearing a flotation jacket.

The trawler's skipper was airlifted to hospital suffering from hypothermia after an estimated 10 to 15 minutes in the sea.

The Lessons

1. The two crewmen attaching the towing chains secured the port and starboard sides before attaching the centre chain. This placed them in an area of danger because a winch brake band could have rendered while they were attaching the centre chain. Attaching the centre chain first would have allowed the port and starboard sides to be secured from a position of relative safety - while standing on the fore side of the chains.

2. Transferring tension from the winch onto the towing chains should be monitored continually and in direct communication with the winch operator. Thereafter, slack wire from the winch should be pulled off only when the load has been fully transferred, and again carried out in a position of safety so that if a chain or connecting piece renders, the risk to crew members is minimised.

3. The casualty was wearing a 50 Newton flotation jacket. Although these do provide a degree of thermal protection, they are classified for "swimmers in sheltered waters use and where help is close at hand"; they are not lifejackets, and will not keep the wearer's face and mouth clear of the sea if they become unconscious. An inflatable lifejacket, on the other hand, gives no thermal protection. If not too cumbersome, both a lifejacket and thermal protection should be worn when on exposed open decks; this will maximise the chances of recovery in the event of going overboard.

4. The skipper's valiant attempt to rescue his crewmate almost cost him his own life. Wherever possible, thermal protective clothing and a lifejacket should be donned before entering the sea, and a lifeline attached for recovery.

5. This skipper's quick action in ordering the wires to be cut maximised the chances of gaining manoeuvrability of the vessel. Angle grinders, such as the one used in this instance, are now readily available. These enable the gear to be cut away if necessary and do not need to be plugged in to a boat's electric supply. Survival times of a man overboard can be counted in minutes and seconds, so no time should be wasted hauling gear which could be jettisoned and recovered later.

Snagging Can Lead to Loss of Vessel and Lives

Narrative

A 13m, twin-rig trawler had been fishing for prawns in a deep-water estuary when her fishing gear became snagged on an underwater obstruction. The crew made a number of unsuccessful attempts to free the gear by shortening in and then shooting away. When the gear was finally shot away and the winch brakes had been applied, the vessel swung to port and water came over the port quarter bulwark. The vessel then rapidly capsized to port. While she was heeling, the crew scrambled over the starboard side and entered the water. They were not wearing lifejackets.

People ashore alerted the coastguard, which issued a "Mayday Relay" and began to allocate resources. A nearby trawler saw the capsized vessel, hauled in her gear, proceeded to the scene, and requested another vessel to inform the coastguard of her actions.

Meanwhile, the capsized vessel foundered by the stern and her liferaft released automatically. The three crew members managed to reach the liferaft and await rescue. Soon afterwards, the nearby trawler picked them up and took them into harbour, from where they were conveyed to the local hospital and treated for hypothermia.

The Lessons

1. Although snagging in some areas is a daily occurrence, it can normally be quickly overcome. However, on this occasion, the snag did not readily release the gear; this should have alerted the crew to take extra precautions. They should have battened down the hatches and vents, and donned lifejackets in case the vessel capsized.

2. If a snag does not readily clear, thought should be given to releasing and buoying off the gear, which could be picked up by other means at a later date. Better to be safe than to place the vessel and crew in jeopardy.

3. The MCA's MGN 265(F) gives advice on the recovery of snagged gear, and strongly warns that winches should not be braked and used in conjunction with a vessel's motions in an attempt to free it. Think before taking extreme measures.

4. Vessels that witness an accident and are in a position to be quickly on-scene should make their intentions immediately and directly known to the coastguard. This will enable the coastguard to effectively co-ordinate search and rescue operations and quickly direct appropriate resources to the scene.

A Hard Day's Night

Narrative

In the early hours of the morning, a Vivier crabber ran aground as she returned to port to land her catch after a 6-day trip.

The weather conditions during the trip had been exceptionally good for the time of the year, and the crew had worked long hours while hauling about 1500 pots each day in order to catch sufficient crab to make the trip profitable in challenging commercial conditions.

The skipper took over the bridge watch as the vessel approached land. He checked the vessel was on heading for the next alteration of course position, which was indicated by an electronic bearing line on the plotter. It was a very dark night, with a calm sea and no other vessels in the area. The skipper looked around, sat in the wheelhouse chair, reset the bridge watch alarm and then fell asleep; the vessel passed through her planned alter course position with no alarm sounding.

The skipper awoke to the sickening sound of the vessel striking rocks. He immediately ensured that the crew, who had been asleep down below, were safe and mustered in the wheelhouse, and that they were wearing life-jackets and warm clothing. He sent a "Mayday", which was quickly answered by the coastguard, and lifeboats, a helicopter and a cliff rescue team were tasked to proceed to the vessel's assistance.

The crew demonstrated considerable fortitude during the rescue, particularly when the helicopter arrived - and then departed - because the vessel's precarious position meant that it was considered unsafe to winch the men at night. The crew had to wait a further 3 hours before being rescued at first light.

Throughout the rescue, the skipper's conduct was most professional: he maintained excellent communications with the rescue services and ensured the crew remained calm during challenging circumstances.

The vessel was subsequently declared a constructive total loss.

Figure 1: Vessel aground on the rocks

Figure 2: The crew being winched from the vessel by the coastguard

The Lessons

1. The skipper fell asleep near the end of a trip during which he and the rest of the crew had been hauling pots for 16 to 18 hours each day and then sharing the night watches on the bridge. In difficult commercial conditions the crew were working very long hours so that they remained profitable. Owners should recognise the dangers of fatigue in their crews, and they should take appropriate measures to ensure their crews are adequately rested to prevent such accidents recurring.

2. The watch alarm was located beside the wheelhouse chair, and the skipper was able to cancel it without the need to become fully alert. Owners should review the position of watch alarms to ensure that it is necessary for watchkeepers to stand up and move in order to cancel the alarm.

3. The vessel passed through a planned alteration of course position without any alarms sounding. Although she was equipped with an Electronic Navigation System, which would have provided waypoint alarms, this was not in use because the crew were not sufficiently trained in its use. Owners should ensure that crews receive training for the navigation equipment carried, so as to be able to optimise the use of the equipment.

A Stark Reminder of the Dangers of Drinking

Narrative

A scallop dredger returned to her home port and landed her catch. The vessel then went alongside her normal quayside berth overnight with a provisional plan of sailing the next day. A deckhand remained on board that evening as he did not live locally; the rest of the crew stayed ashore. In the event, the next day's sailing was postponed, and during that day another of the company's fishing vessels moored outboard of the scallop dredger.

During the spare day in port, the crew had attended to various maintenance tasks, and later in the afternoon the deckhand who had stayed on board the previous night, went ashore to the local pub. Late in the evening he returned on board, and at 2330 the mate from the fishing vessel moored alongside saw him standing on the deck. The mate spoke to the deckhand and ascertained that he was all right, before he then spent a few hours in the nearby pub.

The mate returned from the pub at 0230, and as he crossed the deck of the first boat to reach his own, he found the deckhand asleep on the deck next to the starboard accommodation door. He tried to rouse him, but the deckhand did not want to move. Judging the night was not too cold, and considering the clothing the deckhand was wearing, the mate decided to leave him there and head for his own bunk.

The next morning the crew arrived to start work and found the first boat's accommodation door still padlocked shut, but the door was not dogged. The keys were in the usual place. It was not until 1030 that someone on the quay noticed a body in the water between the boat and the quay wall. The deckhand's body was recovered from the water, with no signs of life or significant injuries. It was determined he had drowned.

The position where the crewman was found lying on the accommodation deck

The Lessons

1. Boats and significant quantities of alcohol do not mix. Simply climbing down the quay ladder could have been very dangerous when under the influence of alcohol, and once on deck there was the risk of falling overboard. Stay ashore or remain sober if you want to avoid a needless death, as here.

2. Think about the possible consequences of leaving a crewman asleep on deck when you believe them to be drunk. Even if this crewman had not fallen overboard, he could have succumbed to hypothermia. Seek assistance from other crew and try and make the person safe.

3. As an owner/skipper, consider whether your crew need to stay on board while in port. If everyone is staying on board, then it may be reasonable and probably safe to do so. However, when a lone crewman is living on board, the potential risk to that crewman is much greater. Make sure that if crew do need to stay on board, you have fully considered this in your risk assessment process and have included suitable control measures to make it safe.

Tender by Name – Tender by Nature

Narrative

At dusk, on a winter's evening, three fishermen were using a borrowed tender to get ashore from their vessel, which was moored on a mid stream pontoon. The tender was 3 metres long, it had a low freeboard, was unlit and had no engine.

The men were not wearing lifejackets, carried no lights and had not informed anyone of their intention to moor on the mid stream pontoon.

As they made their way across the water, in fading light, the tender was rocked by the wash of another craft and it capsized, throwing all three men into the water. Two of the men managed to swim back to the pontoon and call out for assistance, while the third, older man clung to the tender's upturned hull.

Fortunately, the men's pleas for help were heard by staff from the harbour office, who had been about to finish work for the day. They raised the alarm and quickly launched a boat to rescue all three men.

The men had been in the water for only about 6 minutes, but the older man was already showing signs of hypothermia when he was rescued. The harbour staff, who had called an ambulance, provided the men with warm drinks and dry clothing and the paramedics kept them under observation until satisfied they had made a full recovery from their ordeal.

Photograph of the tender

The Lessons

1. This incident demonstrates that, even on a short trip, in a sheltered harbour, things can go wrong. Be prepared – always wear a lifejacket.

2. The men did not consider the risks of making the short passage in such a small vessel. Tenders invariably have low freeboard, especially with three men embarked; they should have made two trips so as not to overload the vessel.

3. If the accident had occurred a short time later, the harbour office would have been closed and the men's cries for help might not have been heard. This would have placed the men - particularly the older one - at great risk. Always ensure that someone ashore is advised of your intentions, especially when entering unfamiliar ports.

Part 3 - Small Craft

Whether being on the receiving end of a rescue during the 1979 Fastnet coloured my judgement for the next 30 years, or whether I would have developed an awareness for safety issues anyway remains unclear to me. But there is no doubt that being involved in the worst yacht racing disaster in history was a frightening experience and one that will forever leave its mark. Yet, it is what I've seen since that has worried me more.

* Owners who pay scant regard to safety regulations or the serviceability of the safety equipment aboard their boats.

* Skippers who seem oblivious to the need to brief their crew before setting off.

* Boats that have undergone major structural alterations with little or no proper calculations or structural assessments.

* So-called macho crews who avoid even sizing up a harness or lifejacket before a long offshore race, let alone wearing one when the going gets tough.

* Worst of all, those who believe some of the major disasters are unlikely to happen again.

When it comes to heavy weather survival, safety, in my book, is a state of mind. There is no definitive check-list of items and procedures, because safety afloat is a personal thing. It will depend on your experience, capabilities, type of boat and where you wish to sail. Safety is not a yellow box with a set of batteries and a panic button and it's certainly not relying on the Coastguard. Safety is thinking about the possible problems you might encounter and ensuring you've considered your options.

Dangers below deck are frequently ignored. One of the biggest problems aboard our own boat during the height of the 1979 storm was the ability of objects to break loose. Tins of food and other heavy objects were flying around the saloon each time we suffered a knockdown. After our storm-damaged boat was recovered some weeks later, one of the lead acid batteries which had been secured under the companionway steps was found wedged in the yacht's bow. This deadly 'missile' had taken away part of the main bulkhead during one of our pitchpoles.

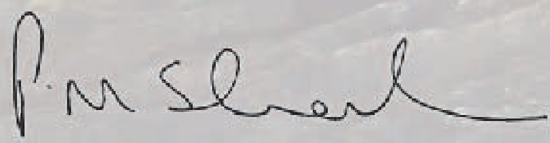
As a crew we believed we had prepared well for the 600 nautical mile race. Everything was labelled, panic bags were clearly marked and every crew member briefed on the location of safety gear. And yet, despite this organisation, in the space of less than 24-hours, I witnessed a competent boat and crew become overwhelmed by a series of events that ended in tragedy.

Our story was not about an instant crisis. We were not holed or run down. We did not lose our keel or rig (until the end) and there was no fire or explosion aboard the boat.

Instead, we were faced with a series of events that escalated beyond our control. With the benefit of hindsight, I appreciate more than ever the importance of keeping your boat under control. Never let conditions overwhelm you. Safety is anticipating events both before and during your voyage.

Safety also starts with striking a balance between having an appreciation of what could lie around the corner and not becoming frozen with the fear of anticipation. Learning from other people's experiences is a valuable starting point and here the MAIB's Safety Digests have become essential reading for anybody who takes to the water.

Safety begins well before you put on your lifejacket.



Matthew Sheahan

Matthew Sheahan is racing and technical editor for Yachting World magazine. A keen racer himself, Matthew both competes and reports on many of the world's top regattas. He has watched, commentated and reported on most major racing series including the America's Cup, Olympics and around the world races.

For 16 years he was also responsible for Yachting World's boat test programme and has tested and written about hundreds of popular sailing yachts from dinghies to superyachts.

Having raced dinghies and yachts since childhood, he studied yacht design at Southampton before working for a leading mast making company. He also served as a member of the Royal Ocean Racing Club's Main Committee as well as the Technical and Special Regulations Committees.

Taking a Turn for the Worse

Narrative

A sail training vessel was proceeding under sail on a northerly heading at a speed of about 5 knots. The OOW was accompanied by three trainees: two were keeping a visual lookout and the other was steering. It was shortly after sunrise, the visibility was good and the wind was south-westerly force 3 to 4.

The helmsman saw a tug at about 55º on the starboard bow and reported it to the lookout trainees. One of them then reported it to the OOW, who took a visual bearing. The tug was proceeding under power on a west-south-westerly course at a speed of about 12 knots. The OOW went inside with one of the trainees to monitor the radar. After a short while, he stepped back outside and observed the tug again.

Noting that the tug was not taking avoiding action, the OOW told the helmsman to tack, expecting him to alter course to port. However, the helmsman applied starboard helm. Realising that the vessel was now swinging quickly to starboard, and assessing that there was insufficient time to stop the swing and then turn the vessel to port without risk of collision, the OOW instructed the helmsman to continue with the starboard turn. He then sounded one continuous blast on the whistle.

Meanwhile, the tug's OOW had sighted the sail training vessel at about 15º on the port bow at a range of between 2 and 3 cables. On hearing the continuous blast, he altered course to starboard. However, this action was insufficient to prevent a collision.

The tug sustained negligible damage. However, the impact breached the sail training vessel's hull and there was some resulting ingress of water. Two trainees suffered impact injuries. Communication was then established between the vessels and the local coastguard, and the tug later escorted the sail training vessel to her intended destination.

The Lessons

1. In view of the relative difficulty of manoeuvring a vessel under sail, the COLREGS require a power-driven vessel to keep out of the way when vessels are in sight of one another. By failing to maintain a proper lookout, the tug's OOW denied the sail training vessel her right of maintaining course and speed. Instead it caused her OOW to become unnecessarily concerned, prompting him to make a large alteration of course while under sail to avoid a collision.

2. Effective communications and monitoring are essential when margins of safety are reduced. The sail training vessel's helmsman misunderstood the OOW's instruction and was able to initiate and continue an incorrect turn to a point beyond which control of the situation was lost. The ICS Bridge Procedures Guide states: "Effective bridge resource and team management should eliminate the risk that an error on the part of one person could result in a dangerous situation". Instructions need to be clearly understood by all members of the bridge team, and well established monitoring procedures need to be in place to ensure that incorrect actions are immediately identified and countered.

3. The COLREGS require specific sound signals to be made in certain situations. As soon as the sail training vessel's OOW became concerned that the tug was taking insufficient action, he should have sounded at least five short and rapid blasts. Firstly, this would have drawn the attention of the tug's OOW to the developing risk of collision and, secondly, it would have given him time to successfully take avoiding action. On altering course to starboard, the sail training vessel's OOW should have sounded one short blast. Although the sounding of one continuous blast alerted the tug's OOW to an imminent risk of collision, it gave no immediate indication of what action the sail training vessel was taking.

Beware of Tractor Rides While Riding in a RIB

Although outside MAIB regulations as a reportable accident, it was thought worthwhile to highlight this cautionary tale of boat launching.

Narrative

A dive club had decided to try a new venue for its weekend diving, and its RIB was taken along as the dive boat. The RIB was towed to a car park at the launch site and the seven divers prepared their equipment and the boat for diving. There were several other boats also in the car park preparing to launch into the sea.

The necessary fee having been paid at a local shop, a tractor then towed the fully loaded craft, with divers on board, out of the car park, through the dunes and on to the beach. There, the craft was reversed and launched into the sea. This manoeuvre was carried out without any incident or cause for concern on the Saturday.

Dive RIB inverted on the beach

On the Sunday, the divers arrived again and prepared as before. They all boarded the RIB, and the tractor set off towards the beach at what was probably a slightly faster pace than the previous day. Once on the beach, the tractor and trailer were turned parallel to the sea, with the water's edge on the right-hand side, in preparation for reversing the trailer and RIB into the sea.

As the tractor reversed and turned, the right-hand trailer wheel buried itself in the sand and the left-hand wheel lifted into the air, tipping the RIB off the right-hand side of the trailer. The divers were trapped under the boat as it landed on the beach in an almost inverted position. The divers received various injuries, including one back injury that required an air ambulance evacuation to hospital.

The Lessons

1. **Using a tractor to tow the RIB and trailer across a sandy beach was probably a sensible thing to do. However, by also using the RIB to transport the divers, it is highly likely that the trailer would have been overloaded, and the centre of gravity of the combined unit would have been much too high for safe towing, especially on a soft and uneven surface.**

2. **When considering where and how to launch your boat from its trailer, make sure you have fully considered the potential risks and any options that will ensure the launch is completed safely. Putting your trust in the hands of an operator to launch your boat should not be undertaken lightly.**

3. **The launching of boats - especially into surf - can be a dangerous process. Keep the number of crew on board to the minimum required to launch safely.**

Fatal Entrapment

Narrative

A sailing dinghy with a crew of two was taking part in a club race along with a dozen other dinghies. The wind was force 3 to 4, but quite gusty and shifting 10-15 degrees either side of the mean direction.

The dinghy was completing its second lap of the fourth race that day, and was beating upwind close by the committee boat when it was hit by a particularly strong gust of wind which caused it to capsize to leeward. The helmsman ended up in the water near the stern of the boat, and the crew appeared to land on the dinghy's mainsail. The race officer on the committee boat heard a shout for help from the capsized boat's crew and immediately used his radio to alert the crew of the safety boat, which had just completed assisting with another incident.

By the time the safety boat arrived on scene, the dinghy had inverted, the centreboard had dropped into its slot and there was no sign of either of the crew. The safety boat crew could not right the capsized dinghy, so collected the race officer from the committee boat and, with his help, brought the dinghy back to the horizontal with the mainsail near the water surface.

The helmsman's body was found immediately and he was taken on board the safety boat. The crew was also on the surface, but her ankle was found entangled in the port trapeze wire some way up the mast near the spreaders. Another race competitor passing the scene jumped into the water to assist and he released the crew's ankle from the trapeze wire so that she could be lifted on board the safety boat. CPR was conducted on both helmsman and crew, on board the safety boat, and on the sailing club jetty until the emergency services arrived and took over. Sadly neither of them survived. Postmortems revealed they had both drowned.

Photograph of the dinghy in the capsize position

The Lessons

1. The dinghy's crew were well prepared and had put some thought into the dangers of entrapment: the crew was wearing a quick release trapeze hook, and both were carrying knives. However, in this case these precautions were of little use. Although it is natural to go to the aid of an entangled crew member if circumstances allow, the person in difficulty can often best be helped by the other crew member stopping the boat from inverting. This action ensures the entrapped crew has time to sort themselves out or be assisted by the safety boat. Remember, nearly all dinghies will invert given the right circumstances.

2. When faced with an inverted dinghy and no sign of the crew in the water, it is important to right the boat as quickly as possible to give the entrapped crew every chance of survival. Ensuring that safety boat crews are well trained and practised in such activities will maximise their effectiveness and potentially save lives. Sailing clubs often provide safety boat training, and there is no better experience than practising dinghy inversion recovery to prepare people for the real thing.

3. The crew of the safety boat, who were highly trained in first-aid, and other rescuers made a valiant effort to keep the two casualties alive. Having at least one first-aid trained crew member in the safety boat will greatly assist in casualty survival. Make sure you have fully considered how you would recover an unconscious casualty on board your safety boat, and also the best way of carrying out CPR in the boat. Preparations for such events will lead to more effective action in an emergency.

Hands-Free Mode Required When Mooring

Narrative

On the first day of his holiday on a hired canal boat a man was preparing to moor up. He was at the helm, and as the boat drew close to the bank he picked up the mooring rope, a mooring spike, and the mallet and attempted to step across the gap between the stern and the canal bank.

As he stepped onto the bank, with both hands full of equipment, he slipped and fell. He landed heavily on his chest and then entered the water. As a result of the fall he fractured his pelvis, left foot and three ribs and had to be airlifted to hospital.

There was nobody on board to assist him but, fortunately, a passerby saw him fall, helped him from the water and raised the alarm.

The Lessons

1. The hirer was attempting to do too much in jumping across the gap between the boat and the bank while carrying all the equipment required to moor a canal boat. This incident demonstrates that, even on the sheltered waters of a canal the traditional cautionary saying of "one hand for yourself and one for the ship" holds true.

2. There was nobody on board who could assist the hirer to moor the boat; when undertaking such tasks on your own, take extra time to manoeuvre the boat into a position such that you can safely step ashore.

The stern of the canal boat

APPENDIX A

Preliminary examinations started in the period 01/11/09 – 28/02/10

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 (gt)	Type of Accident
03/11/09	*Husky Racer*	Dry cargo	UK	9991	Cargo handling failure
06/11/09	*Korenbloem*	Fish catching/ processing	UK	139	Person overboard
03/12/09	*Goole Star*	Dry cargo	UK	233	Accident to person (1 fatality)
09/12/09	*Ocean Spray*	Fish catching/	UK	26	Person overboard
19/01/10	*Fast Ann*	Dry cargo		1740	Contact
27/01/10	*Spes Bona V*	Fish catching/ processing	UK	36	Collision
	Leeswig	Dry cargo	Antigua & Barbuda	2901	
01/02/10	*Celtic Star*	Dry cargo	Cyprus	11086	Contact
02/02/10	*Oscar Wilde*	Passenger	Bahamas	31914	Fire/explosion
19/02/10	*Bro Arthur*	Tanker/ combination carrier	UK	28226	Accident to Person (1 fatality)
20/02/10	*Kerloch*	Fish catching/ Processing	Channel Islands	50	Flooding/ Foundering
24/02/10	*Ronja Skye*	Live fish carrier	Norway	497	Grounding

Investigations started in the period 01/11/09 – 28/02/10

Date of Accident	Name of Vessel	Type of Vessel	Flag	Size (gt)	Type of Accident
11/11/09	*Osprey III*	Fish catching/ processing	UK	17	Person overboard (1 fatality)
18/11/09	*Optik*	Fish catching/ processing	UK	6.44	Person overboard (1 fatality)
20/12/09	*Etoile des Ondes*	Fishing vessel	UK	40	Collision (1 fatality)
	Alam Pintar	Cargo	Singapore	46982	
29/01/10	*Sand Falcon*	Dredger	UK	6534	Cargo handling failure
06/02/10	*Isle of Arran*	Passenger	UK	3296	Contact

Reports issued in 2009

Abigail H – flooding and foundering of the grab hopper dredger in the port of Heysham on 2 November 2008
Published 1 July

Antari – grounding near Larne, Northern Ireland on 29 June 2008
Published 19 February

Astral – grounding on Princessa Shoal, east of Isle of Wight on 10 March 2008
Published 29 January

Celtic Pioneer – injury to a passenger on board the RIB, Bristol Channel on 26 August 2008
Published 21 May

Eurovoyager – entrapment of an engine room fitter in a watertight door on board the ro-ro passenger ship while approaching Ramsgate, UK on 3 November 2008
Published 7 July

HMS Westminster/Princess Rose – person overboard during a passenger transfer on the River Thames on 24 November 2008
Published 2 July

Hurlingham – loss of a passenger overboard, Westminster Pier on the River Thames, on 17 August 2008
Published 9 June

Jo Eik – release of cargo vapours, resulting in two casualties on board the chemical tanker at the Vopak Terminal, Teesport on 6 May 2009
Published 26 November

Maersk Kithira – fatal injury of a crew member, and the serious injury of a second crew member in heavy weather, South China Sea on 23 September 2008
Published 28 April

Maersk Newport – heavy weather damage on board the container ship, 50 miles west of Guernsey on 10 November 2008, and fire alongside at the container berth in Algeciras, Spain on 15 November 2008
Published 17 June

Maggie Ann – man overboard accident in Cardigan Bay on 12 February 2009, resulting in one fatality
Published 8 September

Moondance – electrical blackout and subsequent grounding in Warrenpoint Harbour, Northern Ireland on 29 June 2008
Published 10 February

MV Norma – hazardous diving incident, Dover Strait on 21 June 2008
Published 21 January

Pacific Sun – heavy weather encountered by the cruise ship, 200 miles north north-east of North Cape, New Zealand on 30 July 2008, resulting in injuries to 77 passengers and crew
Published 24 June

Plas Menai RIB 6 – capsize of the RIB 6 while undertaking unauthorised RIB riding activity near Caernarfon, Wales on 1 July 2008, resulting in one injured student
Published 18 February

Pride of Canterbury – grounding in "The Downs" – off Deal, Kent on 31 January 2008
Published 14 January

Riverdance – grounding, and subsequent loss, of the ro-ro cargo vessel on Shell Flats, Cleveleys Beach, Lancashire, on 31 January 2008
Published 3 September

Saga Rose – fatality on board the passenger cruise ship in Southampton, England on 11 June 2008
Published 6 January 2009

APPENDIX B

Scot Isles/Wadi Halfa – collision in the Dover Strait on 29 October 2008
Published 14 May

Sooty – grounding at high speed of the RIB, Calve Island, Isle of Mull on 18 May 2009, resulting in one fatality
Published 22 October

Stellar Voyager – catastrophic failure of a windlass hydraulic motor, off Tees Bay, resulting in a major injury on 23 March 2009
Published 9 December

Stena Voyager – shift of an articulated road tanker in Loch Ryan on 28 January 2009
Published 1 October

TS Royalist – grounding of the sail training vessel, near Chapman's Pool off the south coast of the UK, on 5 April 2009
Published 11 December

Vallermosa – contact made by the tanker, with the tankers Navion Fennia and BW Orinoco at the Fawley Marine Terminal on 25 February 2009
Published 12 November

Ville de Mars – fatality of a chief officer in a ballast tank on board the container ship in the Gulf of Oman on 28 January 2009
Published 10 September

Vision II – fire on board the fishing vessel alongside at Fraserburgh on 1 August 2008, resulting in three fatalities
Published 25 March

APPENDIX C

Reports issued in 2010

Wellservicer – fatal accident on the diving support vessel 3 miles south east of Aberdeen, Scotland on 1 April 2009
Published 20 January

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