MARINE ACCIDENT
INVESTIGATION BRANCH

MAIB

SAFETY DIGEST

Lessons from Marine Accident Reports 3/2006

Department for Transport

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Further copies of this report are available from:
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Southampton
SO15 2DZ

Printed in Great Britain. Text printed on material containing 100% post-consumer waste.
Cover printed on material containing 75% post-consumer waste and 25% ECF pulp.
December 2006

MARINE ACCIDENT INVESTIGATION BRANCH

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

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

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

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

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

The Safety Digest and other MAIB publications can be obtained by applying to the MAIB.

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The Branch fax number is 023 8023 2459.
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Summaries (pre 1997), and Safety Digests are available on the Internet:
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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."

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Glossary of Terms and Abbreviations

AB	–	Able Seaman
AIS	–	Automatic Identification System
ARPA	–	Automatic Radar Plotting Aid
CO_2	–	Carbon Dioxide
FRC	–	Fast Rescue Craft
GPS	–	Global Positioning System
GRT	–	Gross Registered Tonnes
HP	–	Horsepower
IMO	–	International Maritime Organization
ISM	–	International Safety Management Code
kg	–	kilogram
kW	–	kilowatt
"Mayday"	–	The international distress signal (spoken)
mm	–	millimetre
OOW	–	Officer of the Watch
"Pan Pan"	–	The international urgency signal (spoken)
PEC	–	Pilotage Exemption Certificate
PMS	–	Power Management System
RIB	–	Rigid Inflatable Boat
SOP	–	Standard Operating Procedure
STCW	–	Standards of Training, Certification and Watchkeeping for Seafarers
UTC	–	Universal Co-ordinated Time
VHF	–	Very High Frequency

Introduction

In the introduction to the MAIB Annual Report 2005, I wrote that one of our greatest concerns for safety at sea is complacency. This caused something of a stir, with a small number of people feeling that this was an affront to the professionalism of mariners, but with a much larger body of opinion agreeing that it was a serious issue that had yet to be addressed.

One of the first hurdles to overcome – before we can begin to address the issue – is the word itself. Complacency is seen to have derogatory connotations, to imply smugness or self satisfaction. That is not what is intended when used in terms of accident investigation. We are looking at the normal human response to a familiar situation. When we do something for the first time, we are intent on what we are doing and are painfully aware of the hazards or dangers; by the time we have done it a thousand times with no problems, we have lost that stimulation, we have become so familiar with the operation that we have largely forgotten the possible consequences of something going wrong, and our guard is lowered. So complacency, in this context, is not a criticism, but is an aspect of human nature – one that I believe every experienced mariner will recognize.

I would like to see this issue on everyone's agenda, because it is the business of everyone: masters and officers; owners and managers; professional bodies, unions, fishermen, leisure sailors. It is now starting to be considered, and I hope that useful actions will be taken as a result of this work. In the meantime, what can we, as ordinary seafarers do? A starting point would be for all of us – in merchant ships, fishing vessels or leisure craft – to remember the dangers in what we are doing. Please read the cases highlighted in this edition of the Safety Digest – could something similar happen to you?

Stephen Meyer
Chief Inspector of Marine Accidents
December 2006

Part 1 – Merchant Vessels

American Admiral Chester Nimitz said, *"No officer, regardless of rank should flatter himself that he is immune to the inexplicable lapses in judgement and slips of the tongue which had led many fine officers to disaster"*.

Another wise individual said, "*You must learn from others' experience as you may not live long enough to do all the mistakes yourself"*.

Reading the above, the connection and benefits from MAIB's reports contained in this issue of "Safety Digest" are obvious.

The 16 case studies that follow point to a range of lapses, including deficiencies in knowledge, seamanship, navigation and engineering practice, design, communication, understanding, risk assessment, supervision, improper use of available tools/information, poor organisation, resource management and one reckless and easily avoidable case of alcohol abuse.

By circulating such reports, MAIB provides the shipping industry in general and seafarers in particular, with valuable learning opportunities that ultimately benefit society at large.

Merchant shipping moves about 90% of international trade in volume terms. The dependence of the world economy on this vital transportation sector is seldom appreciated by the public at large. Furthermore, water transport is by far the most energy-efficient and environmentally friendly mode, and technical and regulatory steps are being taken to continuously improve performance in both these areas. Statistically too, shipping has a consistent record of very high safety, which means that the vast majority of voyages are successfully completed without any loss or damage.

However, despite this high safety record, every incident, however small, receives a great amount of publicity and attention, thus overshadowing all the positive/incident free operations. This leads us to safety and the need to prevent incidents, however minor.

Safety is more than a concept. Companies and mariners need to adopt it as a culture and support it as a way of life on board. Indeed, the International Management Code for the Safe Operation of Ships and Prevention of Pollution (ISM Code) has devised a remarkably effective method to 'simplify, standardise, specify, supervise and scrutinize' the effective implementation of safety and continual improvement in safety awareness, and emergency preparedness.

Under the Code, all ship operation and ship management activities may be broadly categorised under routine or emergency operations, with the common thread of safety running through both. Routine activities may include loading and discharge of cargoes, ballast and fuel, embarking and disembarking of passengers, planning and conduct of passage, operation and maintenance of machinery, inspection of external hull, internal spaces. Emergency-related activities may include personal safety familiarisation and training, planning and conduct of emergency drills, proper response to actual emergencies. Personnel on board and ashore are required to be able to perform all the above activities to a uniformly high standard. This is achieved by documenting written procedures in simple language, mandating training, and the widespread use of detailed checklists.

Safety of navigation, especially, has benefited tremendously from these management methods. If these systems are properly understood and used, an incident-free passage is virtually assured.

For cargo ships, the properties of cargoes that are permitted to be carried on each ship have an important bearing on safety. The varieties, quantities, methods of packaging and shipping of cargoes have increased enormously in keeping with global industrial progress, economic growth and trade volumes.

A number of codes of safe practice, most of them created under IMO auspices, exist to address the multiple risks and hazards associated with cargoes. These codes provide a system of risk assessment, risk control and safe carriage and handling.

An accident can be defined as an unexpected hazardous occurrence caused by unsafe practices that arise from inadequate knowledge, improper training, and failure to follow proper procedures, and usually resulting in loss of life or injury to personnel, damage to property and the environment.

Besides these, accidents also cause ‘intangible’ losses, such as loss of earnings, reputation and employment.

Unfortunately, a disturbingly large proportion of accidents are directly attributable to failure to follow procedures that are invariably clearly stated in the Company manuals. This certainly points to a ‘communication gap’, in the sense that the relevance and the value of following the (written) procedures have not clearly been fully appreciated by personnel.

It is natural that individual traits and cultural factors do condition human behaviour and responses. However, experience shows that modern training methods such as behaviour-based safety can be used to effectively overcome these barriers. This process has two main objectives – to identify barriers to working safely and to address the unsafe behaviours that lead to incidents. The barriers mentioned can be anything from incomplete procedures to the correct tools not being available, and are normally easily identified and remedied. Addressing at risk behaviour involves the use of positive reinforcement and constructive feedback, which requires training to manage properly. This demands a substantial commitment from company management whose role cannot be underestimated.

Above all, mariners must fully recognise and appreciate their unique work environment, the heavy burden of individual and joint responsibility and, most significantly, the terrible consequences that can result from even a momentary lapse of concentration.

Is “zero incident” attainable? Only when we believe and act towards it, can the answer be yes. Let’s do it.

Captain Nand Hiranandani

Capt. Nand Hiranandani is the Master of Company of Master Mariners of India and has over 4 decades in the maritime industry. He works for Chevron Shipping Co. San Ramon, California as HR Manning Manager for India and the Philippines. He is extensively involved with professional bodies, seafarer welfare activities and maritime education. He lives in Mumbai with his wife, Sarla, and daughter, Ambika, who is a budding lawyer.

CASE 1

Bulk Carrier Grounds in Fog

Figure 1

Narrative (all times UTC)

A bulk carrier laden with 47,000 tonnes of bulk mineral sand from Australia, with a draught of 11.8 metres, was navigating in the North Sea bound for a port on the east coast of England.

At about 0710 hours, the visibility was less than 500 metres in fog and the vessel was steering a course of 328° at full sea speed. The master, OOW and lookouts were on the bridge. Three radar targets were being tracked as they crossed from the port side. The master was aware that his vessel was hampered on her starboard side by a large sandbank with a charted depth over it of less than 8 metres. The echo sounder was not being used.

The master altered course to starboard to avoid a close-quarters situation with the first of the vessels while still keeping a safe distance from the sandbank. However, this now put him in a close-quarters situation with the other two vessels.

Not wishing to go closer to the shallows on his starboard side, he tried repeatedly to call the vessels, using VHF radio, but he received no reply. The two crossing vessels appeared to be taking no action.

The master decided to make a further alteration of course to starboard in the hope that he could cross ahead of the two vessels and clear the end of the sandbank, which was only about 2 miles ahead. However, as a result of the course alterations to starboard, and the strong effect of the local tidal stream, the vessel ran aground before the sandbank could be cleared.

The vessel's master called the local coastguard station and apprised them of the situation. Fortunately, the vessel had grounded very shortly after low water, and, as the tide rose, she refloated without tug assistance after about 3 hours.

The Lessons

1. The vessels were navigating in restricted visibility, and Rule 19 of the International Regulations for Preventing Collisions at Sea applied. Section (e) of the rule states: "*every vessel … which cannot avoid a close-quarters situation with another vessel forward of her beam, shall reduce her speed to the minimum at which she can be kept on her course. She shall if necessary take all her way off and in any event navigate with extreme caution until danger of collision is over*". Bearing in mind the lack of sea room on his starboard side, the master should have slowed down or stopped when the close-quarters situation was detected. In any case, the bulk carrier should not have carried on at full sea speed when the poor visibility had been encountered.

2. The master placed too much reliance on being able to call the other vessels on VHF radio, and lost valuable time in the process. He should have taken earlier avoiding action, as indicated in Lesson 1, above, instead of using his time attempting to call them by radio.

3. A vessel's passage plan should take into consideration the anticipated traffic density, especially crossing traffic and fishing vessels. Courses should be chosen to allow ample sea room for anti-collision purposes where possible.

4. Long range radar scanning, to give warning of close-quarters situations, is crucial, especially in fog, to give the OOW or the master time to take the appropriate action.

5. When deciding to take action to avoid a close-quarters situation, the person with the con should be fully aware of the impact the manoeuvre will have on other vessels. The trial manoeuvre facility, which is available on many types of radars, should be used.

6. When navigating close to shallow water, careful watch should be kept on the echo sounder, and the depth alarm should be set.

CASE 2

Fast Rescue Craft Launching – Faster Than Planned

Figure 1 – FRC davit

Narrative

A newly built, 165 metre long, specialist ro-ro vessel was alongside undertaking various commissioning exercises prior to entering service. One of the exercises undertaken was a manoverboard drill, which required the launch and recovery of the vessel's fast rescue craft (FRC) to simulate the rescue and recovery of a person from the water.

The FRC, a 7 metre long rigid hulled inflatable boat, was stowed in a dedicated davit and launched using a single wire arrangement (Figure 1). The boat was connected to the wire via a quick release hook (Figure 2), which operated in the "off-load" mode, such that when the boat was lowered into the water, the hook automatically released once the weight of the boat on the hook was reduced to below 12kgs.

Figure 2 – Quick release hook

Figure 3 – FRC davit controller

The davit itself was hydraulically operated and was controlled by a winch operator using a control unit on a wandering lead. This unit was fitted with push-buttons which controlled the position of the davit arm and the hoist and lower speed of the winch motor (Figure 3). The hoist/lower winch was controlled via a two speed motor, operated on single button controls such that the operator pushed the button partially in to obtain slow speed operation (0.6 m/s) and fully in to obtain the fastest speed (1.3m/s).

In accordance with the vessel's standard operating procedures (SOP) for the manoverboard routine, the FRC was initially lowered to the embarkation deck where the crew of two boarded. Once they were ready, the crew signalled to the winch operator that the boat could be lowered to a position 1 metre above the water level, in accordance with SOP, from where the boat would be prepared for lowering into the water and release of the hook. On this occasion, the boat was lowered to 1 metre above the waterline and the crew prepared for the final lowering.

Once ready, the crew indicated to the winch operator that the FRC could be lowered into the water. The boat then started to lower and almost immediately stopped, at which point the quick release hook opened and the boat fell just under a metre into the water. The crew were shaken but unharmed by this accident. Following an examination of the davit and the fitting of a replacement hook, as a precaution, the FRC was safely recovered.

Investigation into the cause of the accident revealed that, as the hook released the davit was observed to judder. Subsequent tests showed that when the winch motor was stopped (button released) from the fast lower (fully depressed) position, the davit assembly juddered considerably, and it is thought that this movement in the davit arm could have been sufficient to cause the off-load release hook to open, allowing the boat to drop into the water.

When the davit assembly was installed onto the vessel, it was supplied with a hook which operated on manual release. However, the vessel's operator used a standard "off-load" release hook throughout its fleet and accordingly changed the hook supplied to the fleet standard. No trials were undertaken to prove the compatibility of the hook with the davit system before the vessel entered service.

IMO circular 1094, dated 17 June 2003, states that all parts of the FRC stowage launch and recovery system should be proven to be compatible well before installation, preferably at the design stage, and that they are supplied and supported by a single source.

The Lessons

1. **Operators should ensure that all parts of the fast rescue craft installation are proven to be compatible well before installation onto their vessels. If the operator has a specific requirement to use a particular type of hook or other component, this should be considered at the design stage and not undertaken unless it has been fully assessed.**
2. **The single button, two speed operation of the winch had not been fully assessed prior to installation. It was relatively easy to inadvertently select the wrong motor speed, particularly if using gloved hands, and this should have been taken into account prior to installation.**

Sleeping With One Eye Open?

Narrative

A fully laden cargo vessel was on passage with the third officer and an AB on watch. It was dark, and the weather was calm with good visibility as the vessel proceeded at almost 11 knots just outside UK waters.

The OOW started to make chart corrections, relying on the AB to look out for other vessels in the vicinity. About an hour later, the AB obtained permission from the OOW to go and carry out fire rounds of the accommodation. The AB checked visually that there were no vessels in close proximity to the ship and, seeing nothing of concern, left the bridge. Fire rounds usually took no longer than 12 minutes, but on this occasion the AB was gone for longer.

The OOW continued to work on chart corrections after the AB left the bridge, rather than giving his full, undivided attention to keeping a lookout. He was still concentrating on the chart corrections when the cargo vessel collided with a fishing vessel.

The 17 metre UK registered trawler had been towing on a steady course for several hours, with a deckhand on watch. The vessel was well lit, with regulation lights and additional aft deck floodlights. The watchkeeper observed the cargo ship closing on them from astern, for several miles, but he was not unduly alarmed. The watchkeeper left the trawler's wheelhouse to call his relief, with the cargo ship approximately 1 mile distant. The changing of the watch woke the skipper, who had been in his bed for 2 hours. Now awake, the skipper decided to check that all was well, so as the watchkeeper and the relief made their way to the wheelhouse, their skipper was close behind them.

On reaching the wheelhouse, the watchkeeper immediately drew the skipper's attention to the approaching vessel 1 mile astern. The skipper made a quick assessment that the cargo vessel would pass clear by about 0.25 mile. However, on reassessing the situation after the other vessel had closed to within 0.5 mile, he became concerned that a collision situation now existed. He instructed one of the men to go below and rouse the remainder of the crew, and started taking evasive action by switching the steering from autopilot to manual, going hard to port and sounding the fog horn.

Hampered by trawl gear, the fishing vessel responded slowly and, despite the evasive action, the cargo ship collided with her starboard gantry and scraped down her starboard side. The impact pushed the trawl gantry down through the deck, and the sea, forced up between the vessel's hull, flooded down into the cabin, soaking two crewmen who were below deck.

Fortunately, the trawler righted herself after the impact and no further flooding occurred.

The trawler's crew donned lifejackets and prepared the liferaft, while the skipper called the coastguard by VHF and informed them of the collision. The skipper was unable to identify the other vessel. Once establishing that their vessel, although badly damaged, was not in danger of sinking, the trawler's crew jettisoned the trawl gear and started making slowly for the shore.

Meanwhile, on board the cargo ship, the OOW felt the collision with the fishing vessel and, after his initial shock, called the master to the bridge. No general alarm was sounded on the ship to alert the crew that their vessel had been in a collision; instead, the mate was called to check the ship for damage as she continued through the sea with her speed unabated. Soon after the collision, the cargo ship's signal disappeared from the Automatic Identification System (AIS) as she carried on for several miles. However, her AIS signal was logged and recorded onshore, allowing the coastguard to identify the vessel; after about 30 minutes they succeeded in contacting her on VHF, whereupon she turned and went back

Photograph highlighting initial contact point, and showing scrape marks to starboard side

Damage to cargo vessel

to assist the fishing vessel. Soon after this, her AIS signal came back on again.

Another trawler skipper in the area heard the communications between the damaged trawler and the coastguard, and immediately went to assist. An all weather lifeboat was summoned by the coastguard, which met the vessels about 15 miles off the coast and escorted the damaged fishing vessel safely back to port.

The Lessons

1. Leaving the scene of a collision and not stopping to assist is totally unacceptable. Any vessel in a collision with another is required to: stop; check for damage; communicate with the other vessel involved and with the authorities; and, provided it does not endanger their own vessel, render assistance to the other vessel until it is no longer required. To not do so is callous and shows little regard for other seafarers. In the above case, the sleeping crew of the cargo ship were not alerted to the collision; they, too, were endangered as their ship might also have been damaged and taking water.

2. Carrying out chart corrections while on watch is inappropriate. In this case, the OOW had ample time, when off watch, to carry out these corrections; they could also have been made while the vessel was loading or discharging cargo. Particularly after the AB left the bridge, the OOW should have given his undivided attention to his lookout duties.

3. It is also unacceptable for the lookout to leave the bridge for over 20 minutes. There is no good reason for fire rounds on a vessel of this size to take more than about 5 minutes to accomplish. Any longer than this indicates a failing in the vessel's Safety Management System.

4. The trawler skipper's vigilance is commendable. Had he not risen when disturbed from his sleep, it is highly probable that the accident would have had a tragic ending. Although no one likes having their sleep disturbed, this accident emphasises how capable skippers can turn such disturbances to advantage.

5. The watchkeeper on the trawler observed the larger ship closing for almost 30 minutes, and made no attempt to notify his skipper, despite having standing orders to do so in such circumstances. Watchkeepers must be aware that skippers would rather be called 10 minutes too early, than 1 minute too late – *"If in doubt, call him out"*.

6. Following their investigation of the incident, the cargo ship flag state authority revoked both the captain and the third officer's certificates of competency, and issued the captain a substantial fine.

CASE 4

Hot Stuff

Narrative

A 10 year old cable laying vessel was heading for dry dock with a pilot on board. The passage thus far had been uneventful. While approaching the dry dock turning, a fire alarm sounded, indicating a fire in the auxiliary engine room. A quick, visual inspection by the second engineer confirmed that one of the auxiliary engines was on fire. Details were reported to the navigating bridge, and the chief engineer advised that the fixed CO_2 system needed to be used. All fire parties were mustered at their fire stations and the vent party instructed to close all vents to the affected zones.

Closing of the vents (Figure 1) proved labour intensive, however on completion of closure and a successful headcount the CO_2 was released. Throughout this period, fire parties stood by for boundary cooling, but no significant hot spots were detected.

Shortly after the original fire alarm sounded, the vessel blacked out and lost all propulsion and thruster power. One of the vessel's two rudders lost power, although the other remained in operation under power from the emergency generator.

The vessel continued upriver under her own momentum and current flow until the starboard anchor was let go to slow the vessel and aid berthing on an adjacent jetty. At this time, a tug arrived, with a second shortly after, and the vessel was safely berthed alongside. The fire brigade, having been alerted earlier, were waiting on the quayside, and with assistance from ship staff verified that the fire was extinguished.

The vessel was shifted to another berth and subsequently to dry dock, as originally planned.

Subsequent examination revealed the cause of the fire to be a fractured fuel gauge pipe

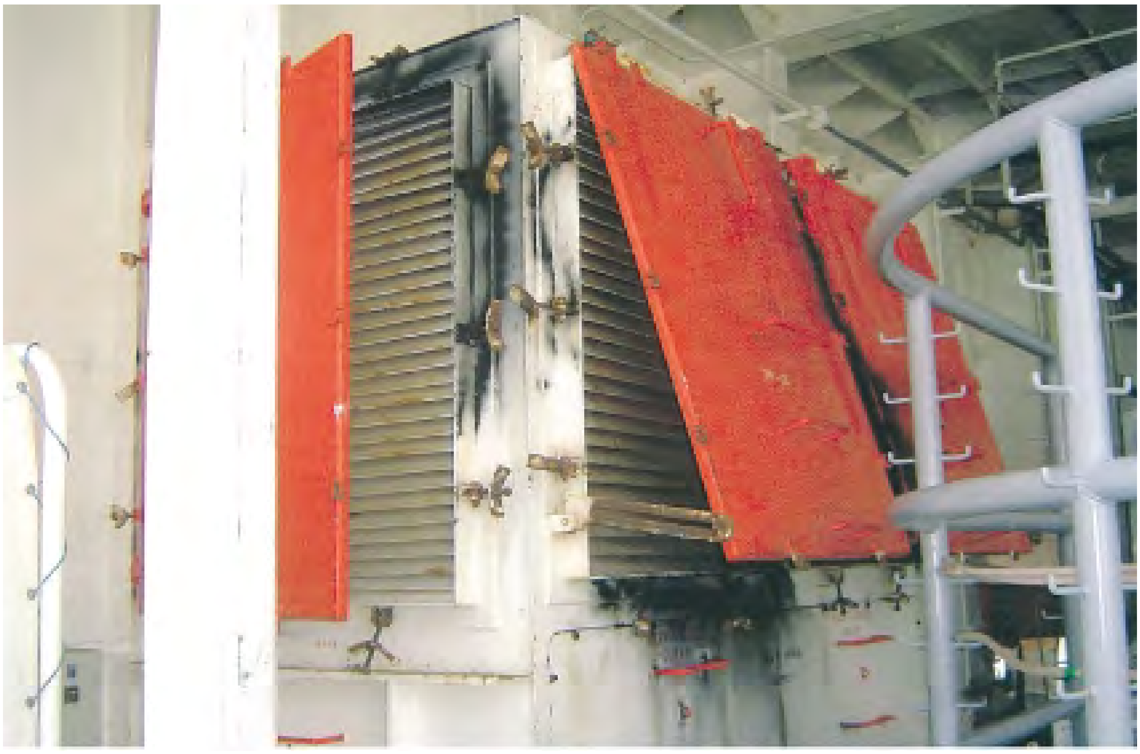


Figure 1 – Engine room vents

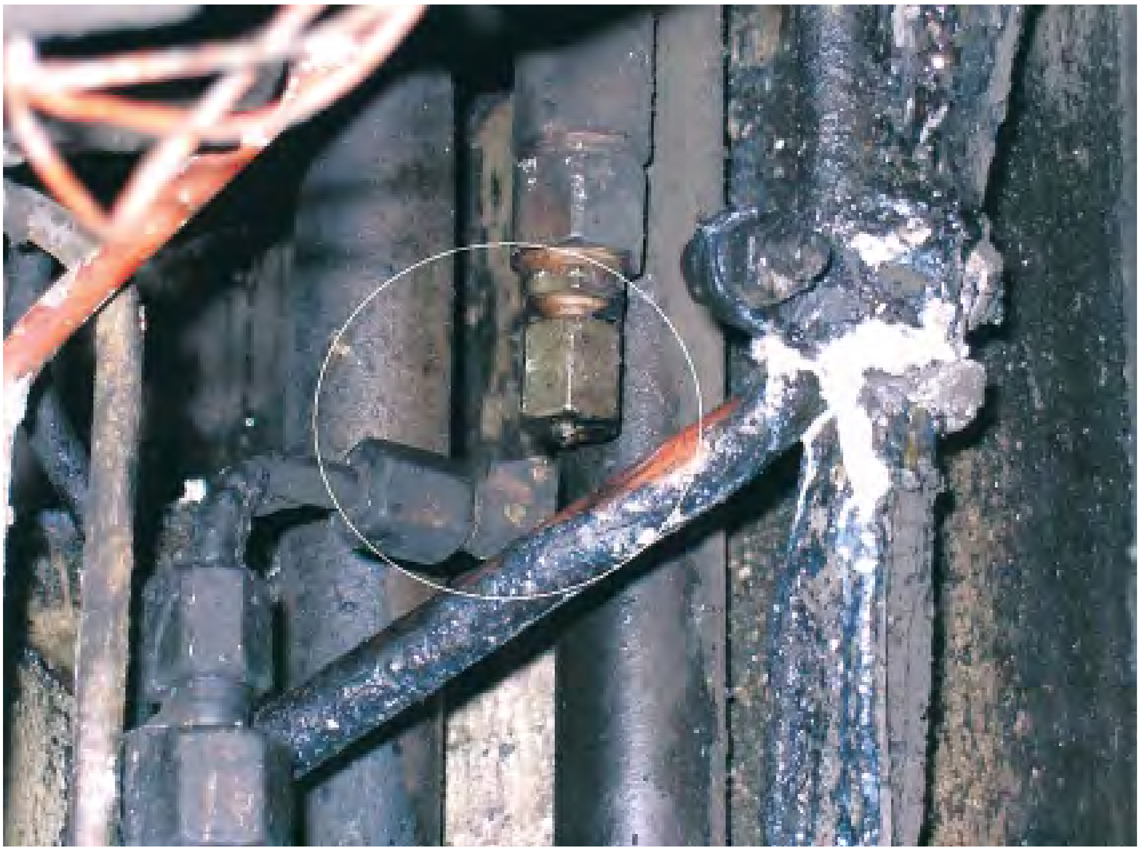


Figure 2 – Fractured fuel pipe

Figure 3 – Burnt out cabling

(Figure 2) on the low pressure fuel line to the engine, which allowed fuel to spray onto the turbocharger and be drawn into it, thereby igniting. Examination of the other, similar, auxiliary engines revealed that a support bracket for the gauge line was missing on the engine in question and, indeed, appeared never to have been fitted from new.

The fact that the vessel lost all main electrical power shortly after the fire started, was found to have resulted from damage to critical cabling passing over the burning engine. As a result of the heat generated, the cabling was burnt (Figure 3) and fused, damaging the 24volt control to the vessel's Power Management System (PMS), causing it to fail. Although the emergency generator started correctly, on sensing loss of main power, failure of the PMS, early in the series of events, prevented use of the vessel's other generators located outside the auxiliary engine room. The PMS control panel was located in the auxiliary engine room, seat of the fire, and was therefore inaccessible for manual operation.

The Lessons

1. **Pipework support brackets must be examined regularly to ensure they are well designed, secure and adequate for their intended purpose.**

2. **Capillary gauge pipeworks are always vulnerable to breakage or leakages, particularly over a period of time. Alternative monitoring systems do exist, in the form of electrical transducer systems which remove the need for the use of susceptible capillary pipework. Use of such monitoring equipment should be considered, particularly for older, more vulnerable designs of engines on systems carrying flammable fluids such as fuel and lubricating oils. Alternatively, if such electrical monitoring is deemed inappropriate, for local monitoring, consideration should be given to fitting isolation cocks or valves in the capillary pipework at, or close to, the entablature (or pump casing) which can be kept closed under normal operation and opened only for sufficient time to read the gauges, when required.**

3. **The existence of *single points of failure* is critical to the safe operation of any vessel and should be evaluated through a risk assessment approach. Where such possibilities are identified, efforts should be made to remove, or reduce, the possibility of such failures endangering the vessel's safe operation. In this instance, had the critical cabling been run through a safer route, it might not have been damaged as a result of the fire, and the ship's staff might have been able to utilise the vessel's other stand-by generators, thereby averting a total blackout situation which clearly endangered the vessel in a busy seaway. Such cable routings are ideally considered at a vessel's new building stage. However, for existing vessels, cable routings may be changed, or protection provided in vulnerable areas.**

4. **Emergency drills are critical in shaping the crew's response to a variety of emergency situations. During this incident, the crew had difficulty in accessing and closing some of the vents before releasing the CO_2 system into the auxiliary engine room. Emergency drills should be designed so that crews become familiar with all that they may be required to do. In this case, it would have been beneficial had drills required the crew to physically close the vents from time to time, rather than simply identify their locations. This would have made them familiar with any tools or access requirements needed to close the vents and would save valuable time during a real incident.**

"Flying" Cylinder Causes Blackout

Narrative

The Halon fire-fighting system on board a North Sea supply vessel had been decommissioned to comply with new legislation. The contractors who were renewing the fire-fighting system had agreed to remove the four redundant Halon cylinders from the machinery spaces. However, the contractors were unable to carry out the task on the agreed day. They asked the vessel operator to organise the removal of the cylinders ashore to be stored until they could be collected. The vessel was contacted and told to carry out this work.

Five crew members were involved in removing the pressurised cylinders, which each weighed 123.2kg. By early afternoon, the two cylinders in the engine room had been lifted out through the engine room escape hatch using the vessel's crane. The remaining two, which had been located in the generator room forward of the machinery control room, were being carried through the control room to the point where they could be lifted out of the engine room.

Figure 1

Figure 2 – Photograph showing cylinder with no transportation cap in place

To gain access to the control room from the generator room, the crew had to negotiate two steps and a doorway with a raised cill before stepping down into the room (Figure 1). Two crew members were lifting the last cylinder, base first, over the cill when the unprotected release valve (Figure 2) was knocked against a step, causing the valve to open.

The rapid escape of gas caused the cylinder to "fly" into the control room, where it hit the switchboard and tripped a breaker, causing a blackout. Two crew members were injured; one was detained in hospital with bone fractures.

The Lessons

1. Manual handling of large gas cylinders is hazardous in a number of ways:

   - They are heavy: lifting 123kg in an awkward space is likely to cause physical injury, either by over straining or by dropping the cylinder. Consider using a correct cylinder trolley which has wheels and lifting points, and can make the task of moving a heavy cylinder in a restricted space considerably less arduous.

   - Pressurised cylinders are very dangerous. Correct transportation plugs or caps should be in place prior to moving the cylinder.

   - The gas might be flammable and/or toxic: a sudden unexpected gas release in an enclosed space, or near hot surfaces creates a dangerous risk, especially if the lights go out at the same time.

2. The Code of Safe Working Practices for Merchant Seamen provides guidance on manual handling and appropriate control measures based on the findings of a risk assessment. This assessment should include not only the specifics of the load and the task, but also the working environment. The employer should consider, among other things, controls such as an alternative means to carry out the task before instructing personnel to do it by manual lifting.

Proper Planning Will Prevent a Pretty Poor Performance

Scrape marks on cliff face caused by bulbous bow

Narrative

A general cargo vessel of 2999grt was on a ballast passage to load a cargo of china clay. The voyage had been planned to take a little over 28 hours, and weather conditions had been generally good throughout. However, variable visibility overnight had delayed the vessel's arrival time by 30 minutes to 0930. At approximately 0920, visibility reduced to 150 metres, the master became disorientated and shortly afterwards the one operational radar failed. The vessel ran aground minutes later when the bulbous bow struck the cliff face 182 metres south-east of the harbour entrance. The fore peak was damaged, causing ballast water to drain to sea, but no pollution was caused.

The passage plan consisted of a series of GPS waypoints which terminated in the vicinity of the pilot station. Corresponding course lines were drawn on the relevant charts, including the harbour chart up to the intended berth. However, little thought had been given to establishing limiting danger lines, clearing bearings, minimum expected depths, or the preparation of a blind pilotage plan.

As the vessel approached the harbour limits, the master estimated the visibility to be about 1 mile. He was alone on the bridge, steering by autopilot. One radar was operational, with the other set to stand-by, and fog signals were not being sounded. Although the master clearly recalled reducing speed incrementally from 0900, the speed derived from his GPS fixing and confirmed by AIS data showed the vessel maintained her maximum speed of 12 knots until shortly before the grounding.

The master placed great importance on sighting a navigation mark, 1.5 miles south-

Damage to stern plate

west of the harbour entrance, which he succeeded in doing shortly after 0920 at a range of about 150 metres. The master reported feeling uncomfortable entering dense fog so close to shore, and he altered course to the east of the harbour entrance in an attempt to gain more sea room. His intention was to alter north-west when about 4 cables from the coast, to head back to the harbour entrance and to embark the pilot.

No fixing was achieved between the GPS fix at 0920 and the grounding at 0930. As the vessel approached 4 cables from land, the starboard radar power supply failed. The master switched the port radar from 'stand-by', to 'operate', but by the time he finally saw the radar picture a minute later, the vessel was 2 cables closer to land. When the master realised he was too close to the shore and proceeding too fast, he immediately applied maximum astern pitch and put the rudder hard to port. At about the same time, the outbound pilot boat identified the vessel on radar, realised that she was in imminent danger of grounding, and called on VHF to warn the master.

Seconds later, the master saw the cliffs emerge through the fog and, realising he was about to ground, put the wheel amidships to take the impact on the bow and so minimise the chances of serious damage and pollution.

At the time of grounding, the master was still alone on the bridge, he had encountered problems with the one operational radar, steering was still in automatic, and no fog signal was being sounded. The vessel's speed was recorded at between 7 and 9 knots minutes before the incident, and poor pre-arrival procedure checks meant the bow thrust had not been started.

The pilot boarded shortly afterwards and, after communicating with the harbourmaster, the port's harbour Emergency Plan was activated and tugs brought to immediate readiness to assist in berthing.

The Lessons

1. Detailed passage planning greatly assists the OOW when it becomes necessary to adapt or change the plan. Marking of 'no go' areas allows the OOW to see at a glance the possible safe options for an alteration of course and/or speed, and preparation of a blind pilotage plan allows the passage to continue safely when entering an area of restricted visibility.

2. The company's ISM procedures clearly laid down the actions to be taken when entering an area of restricted visibility, the majority of which had been ignored. Had the master employed a lookout and helmsman, this would have removed some of the pressure on him, allowing him to focus on the priority issues – safe navigation and safe speed. Similarly, had the second radar been operating instead of on stand-by, the master would not have been denied a radar picture when the vessel was so close to land. This alone would probably have avoided the grounding.

3. The onboard check-off lists could have been better designed, but were quite adequate in assisting the OOW or master to ensure that all necessary arrival procedures were in place. Failure to follow the checklist, compounded by a lack of positive reporting by other crew members, meant the vessel was not materially prepared to enter pilotage waters. Never assume – always assure!

Messenger Line Message?

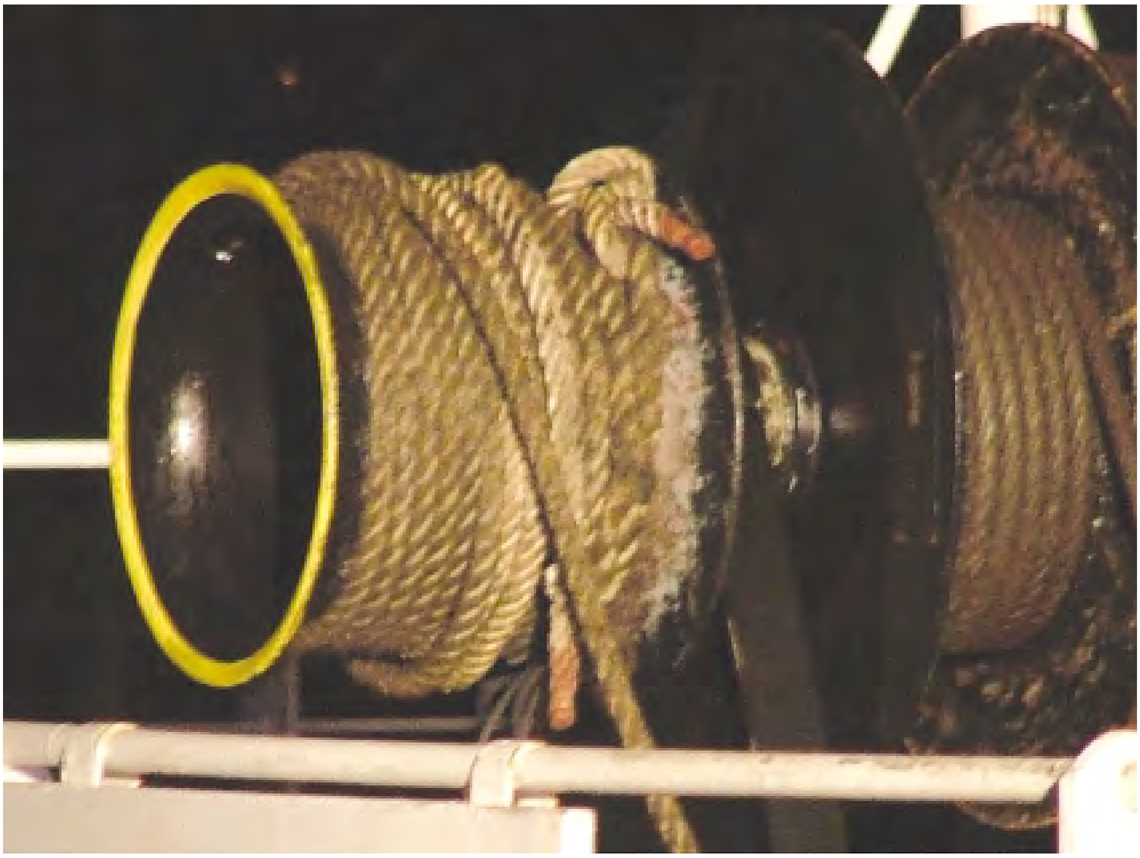
Narrative

This accident, while carrying out the common task of securing a tug, nearly cost a man his life.

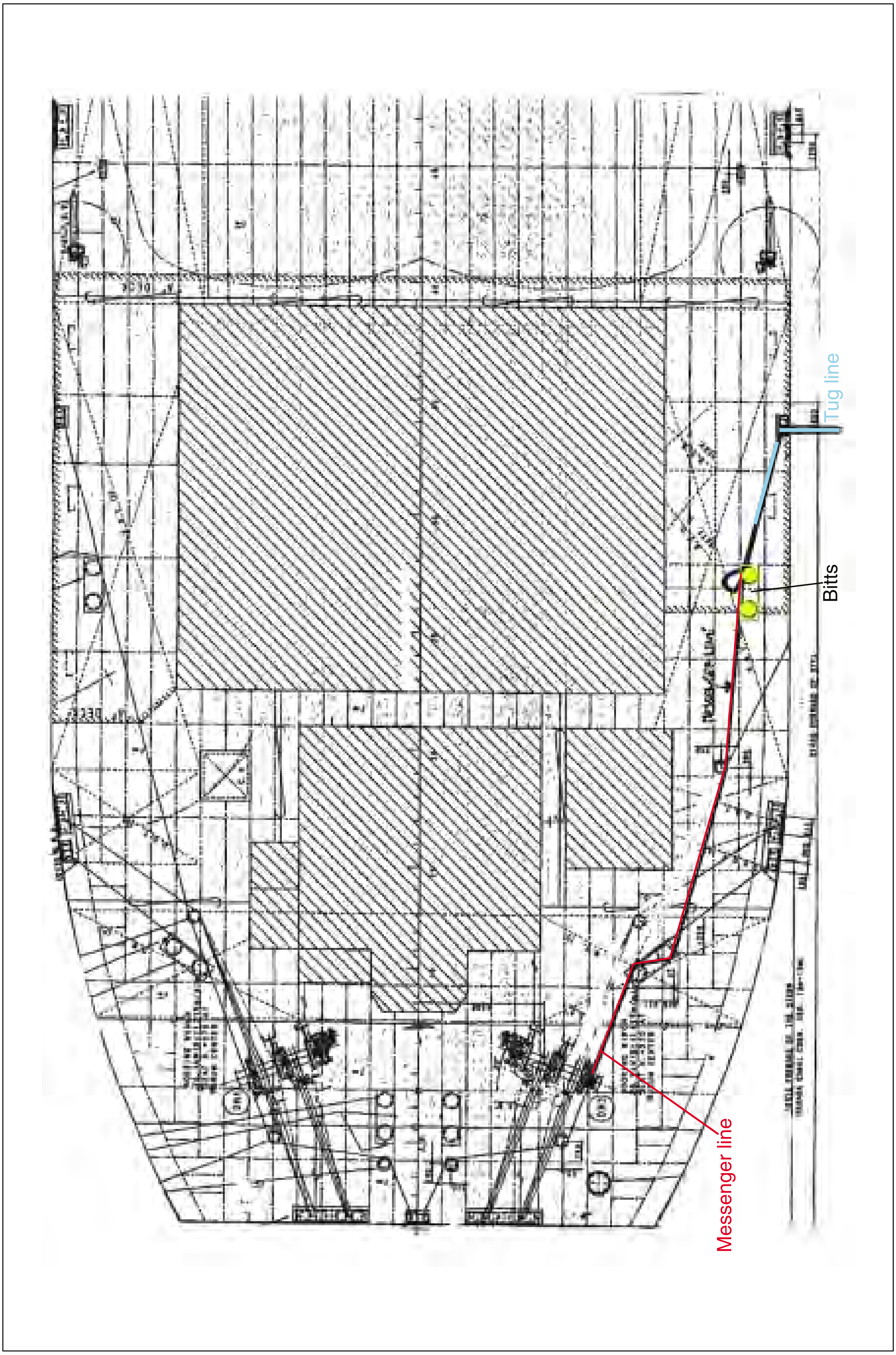
A tanker was preparing to depart from her berth. The aft deck mooring team closed up as the pilot boarded, 15 minutes before the scheduled departure time, and a short time later, the officer-in-charge received the order from the bridge to make fast a tug on the starboard quarter.

The tug master approached the ship and placed his bow gently on the ship's side in line with the panama eye he considered most suitable. As the tug touched, the crewman threw the messenger line up to a mooring team on the tanker's deck.

Seeing the tug's position, the officer-in-charge on the tanker's aft deck instructed his team to remove the 'fire-wire' from the bitts adjacent to the panama eye so it could be used by the tug's tow rope. Meanwhile, he and another crewman led the messenger line inboard of the bitts holding the 'fire-wire', round a standing roller bollard and between another set of bitts, to the mooring winch. The officer sent the crewman to the winch controls and secured the messenger line on the drum end. He then stood to one side to see along the starboard deck and instructed the winch controller to start heaving.



16 turns on drum end


Tug line
Bits
Messenger line

The tug master could not see the officer-in-charge on the tanker's deck and had no direct communication with him. On the tug's bridge, the chief engineer was controlling the towing winch and he started to pay out the tow rope as he saw the tanker take up the slack in the messenger line. As the eye of the tow rope approached the panama eye, the tug master noticed the crew on the tanker had stopped removing the 'fire-wire' from the bitts intended for the tow rope. He was unable to see that this was because the messenger line had become taut on the inboard side of the bitts. Concerned that his tow rope would be damaged if placed on the same bitts as a wire, he told the chief engineer not to give out too much line. He then used his loud hailer to tell the tanker's crew to remove the 'fire-wire' and, at about the same time, the chief engineer stopped veering the tow rope.

Nobody on board the tanker heard the tug's loud hailer. The crew immediately near the bitts saw the messenger line become very tight, and stepped back. Shortly after, the messenger line parted between the panama eye and the bitts. The officer-in-charge, standing in the line of recoil further aft, was hit across the legs by the parting messenger line. He suffered fractures to both legs, his collar-bone and his wrist, and needed immediate blood transfusion on arrival in hospital. Fortunately, operations on his legs were successful and both were saved.

The Lessons

1. **This accident was a consequence of some very poor seamanship practices. No matter how concerned you are about damage to your tow rope, you must never stop paying out the line without warning. In this case, putting the tow rope on top of the 'fire-wire' would not have caused any immediate damage, and the tug master could have instructed, via the tanker's bridge, that the 'fire-wire' be removed from the bitts before he took the strain.**

2. **It was discovered after the accident that there were 16 turns on the drum end; far too many. Three or four turns are all that are recommended, and the line must be tended so that it can be allowed to surge if load suddenly comes on the line. Using a drum end as a winch, and expecting the controller to react quickly enough to stop heaving or pay out the line, is highly dangerous.**

3. **It is very poor practice to place a rope and wire on the same bitts. The loads exerted by modern tugs through their tow ropes can be enormous, and the towing eye must therefore be as low down the bitts as possible. Do not be lazy if a 'fire-wire' or other wire is normally stored on the bitts, and try to leave half of the turns on.**

4. **Consider the line of recoil when deciding where to stand. Thinking about the problem beforehand will enable dangerous positions to be highlighted, and hopefully avoided.**

5. **Good communication is key to safe operations on board ship. In this accident, there was no communication between the tug and the aft deck of the tanker. It is essential the officer-in-charge on deck establishes basic communications with the tug, via hand signals if necessary, to keep control of operations.**

6. **The officer-in-charge on deck must monitor and manage his mooring team effectively. Becoming physically involved in operations detracts from overseeing them and ensuring the safety of all personnel, including the supervisor.**

Whoops!

Narrative

A stand-by safety vessel was being prepared for sea trials following a period undergoing dry dock and survey. The starboard main engine was started, then immediately stopped to attend to a fuel leak. On restarting, the engine immediately ran into overspeed, accompanied by a loud bang as one of the connecting rods came through the crankcase door. Attempts to stop the engine by pushing the fuel racks failed as the racks were seized solid.

Following a build up of dense smoke, the engine room was evacuated and the remote fuel trips were operated to starve the engine of fuel. Despite this, the engine continued to run at high speed for a period of time until all fuel within the lines was exhausted. Following a “headcount” and shutting down of the ventilation, the CO_2 system was released into the main engine room. The fire brigade attended and assisted with boundary cooling around the engine room. When it was safe to do so, the engine room was re-entered and the fire confirmed out. Inspection revealed little damage in the engine room other than heat and smoke damage in the immediate vicinity of the starboard engine.

Examination of the engine, after the incident, revealed that the fuel rack was still jammed in the full “on” position, and only released and returned to the zero position when the governor was removed. The engine crankshaft was damaged and the entablature probably distorted due to the excessive heat generated as a result of the overspeed.

The overspeed protection on the engine had been tested and proven satisfactory earlier on the day in question. However, subsequent investigation revealed that one of the ship’s engineers had disconnected and reconnected the governor linkage while working on the engine later that day. It was thought that the linkage might not have been replaced correctly. Correct fitting of the governor linkage is critical to the control of the engine, and incorrect fitment, on this occasion, is the likely cause of the engine failure.

The Lessons

1. **Persons designated to work on critical machinery should be familiar with the equipment, and be provided with all the necessary information to complete the task in hand competently.**
2. **Prior to starting any diesel-powered machinery after a period of overhaul, it should be positively confirmed that all auxiliary systems are functioning correctly, and protection devices activated. Fuel racks should be set to minimum, and a controlled increase in engine speed and loading ensured by control of the engine fuel rack positions until correct operation is confirmed and fully automated operation engaged.**

CASE 9

Bridge Organisation – Use Your Experts

Narrative

A passenger vessel capable of carrying 784 passengers, grounded shortly before entering its next port of call.

The onset of bad weather the previous day had required the vessel to anchor overnight and await a suitable opportunity for passage to its next port of call, where it was intended to take on stores and be suitably pre-positioned for a planned sailing the following day with passengers embarked.

A weather forecast obtained by the master on the day of the accident indicated that the strong westerly winds were decreasing and that sea conditions would have subsided enough to meet the company's ISM requirements for passage making. Passage planning had identified that one of the year's strongest spring ebb tides was running and the estimated time of arrival was at low water, but that sufficient safe water still existed in the dredged channel for a safe entry to be made.

With assistance from the ebb tide, a fast passage was made, and the vessel arrived off the fairway buoy shortly before low water. The vessel's size, and that she was not carrying passengers, meant there was no requirement for the master to employ a pilot for this entry. However, due to the frequency of visits to the port, one officer did have a pilotage exemption certificate. He was on the bridge for the entry, but had not been incorporated into the bridge organisation.

With an ebb tide setting to the left, the master decided to keep as close as possible to the

Note: Plate cut out in ship repair yard

right side of the channel, and directed the helmsman to 'keep her up to buoys' on the starboard side. The helmsman achieved the aim, the electronic chart display data showing him steering between 10 and 15 degrees to starboard of the approach course to counteract the effect of the tide. The master reduced speed half way up the channel by stopping one engine just as the tidal stream was losing its strength. This allowed the westerly wind, blowing across the channel from the left, to have a greater effect on leeway. Consequently the vessel was steered, and set, further to starboard, resulting in a gradual drift outside of the designated channel.

As the vessel closed the harbour entrance it became apparent to the master that the aspect of the breakwater was incorrect and that he was too far to starboard. He attempted to regain ground to port, narrowly missing the final starboard hand mark to starboard. Seconds later the vessel momentarily grounded.

A damage assessment confirmed the vessel was taking water into a void space. Basic damage control measures were taken, but the vessel's pumps only just managed to contain the flooding.

The vessel berthed minutes later, when assistance was provided by the emergency services and contractors appointed by the company. Inspection showed that, had the damage been sustained 1 metre further aft, the main engine room would have been breached, possibly resulting in a substantially different outcome.

CASE 9

The Lessons

1. Although the final starboard hand mark was passed on the correct side, close inspection of the chart showed that the mark was positioned outside of the main channel boundaries in a shallow water area. By aiming for the buoy, the master had taken the vessel outside of the channel and into an area of shallow water.

   Passage planning should include careful inspection of the charts, giving close attention to detail when operating within minimum safety margins. Helm orders should be specific and not leave interpretation to the helmsman who may be unaware of many of the external factors affecting ship movement.

2. The master had decided to bias his approach to starboard in the belief that should the vessel be set to port he would then be in the centre of the channel. Had he planned on maintaining the centreline (the vessel had steered and maintained track well), the incident could have been avoided.

   When transiting narrow channels or fairways, ensure you have a means of measuring leeway, and have sufficient room to take action to correct any unexpected sets.

3. Bridge team organisation was sadly lacking. Had the master incorporated the PEC holder, who was aware of the buoy's offset, into the bridge team, and had the officer monitoring the electronic chart display alerted the master when he saw the vessel leaving the channel, once again the incident might have been avoided.

   Make use of the expertise available, and organise the bridge team in a way that will provide the best advisory service.

Needless Death

Narrative

A third engineer and an electrician were carrying out routine maintenance on an auxiliary boiler burner of a 15000gt, Lithuanian crewed, bulk carrier while the ship was at anchor. The maintenance was considered necessary because the burner unit was emitting excessive black smoke – a sure sign of inefficient combustion. The work required was agreed with the chief engineer and should have been routine, well within the capability of a third engineer and electrician.

The third engineer shut down the boiler burner and carried out the work required to solve the problem. After doing this he tried to start the system up again, but it refused to ignite; after several attempts he decided that there must be an electrical problem, so called for the assistance of the ship's electrician.

The electrician duly arrived in the engine room and the two men discussed the problem, consulted the boiler instruction manual, which was written in English, and went about resolving the problem. It was thought that the cause of the unit's failure to ignite could have been due to inadequate sparking of the diesel fuelled pilot burner electrodes. The element holding the electrodes, pilot burner, and main heavy fuel line was withdrawn from the boiler and taken to the workbench where the electrodes were cleaned and checked for gap etc. Once the ignition system was reassembled, it was tried again; but still to no avail. It was then decided to test for a spark at the end of the electrodes. On many systems this can be seen through a viewing port in the boiler front, but on this unit it was not possible. The men closed the valves in the lines supplying fuel to the burner, disconnected the fuel pipes and, leaving the

high tension leads attached to the electrodes, partially withdrew the electrode/burner element from its housing. This left a gap into the burner housing through which the third engineer hoped to look to establish if there was a spark, while the electrician switched on the ignition manually.

After again checking that the fuel valves were closed, the ignition was switched to "on". Immediately, diesel fuel issued from the open ended pilot burner fuel line. This resulted from a failure to isolate the fuel pump which, situated downstream of the isolating valve, discharged all the fuel lying within the line (enough for about 6 seconds combustion of the pilot burner).

As the fuel issued from the open ended pipe, the third engineer automatically put his hand over the end of the pipe, creating a spray of fuel, which drenched him and splashed onto the electrician standing nearby.

Unnoticed by the two men, the high tension lead terminals, connected to the spark igniter for the pilot burner, had cracked and damaged terminal covers, thus allowing arcing to take place on the outside of the burner front.

As the ignition was activated and the fuel sprayed from the open ended pipe, a fire erupted, engulfing the third engineer and also setting fuel alight on the electrician. The electrician succeeded in beating out the flames on himself. He then threw a tarpaulin over his burning colleague and doused the last of the fire with a powder fire extinguisher, but not before the third engineer was badly burned. The injured engineer was able to walk, with assistance, from the engine room and he and the electrician were airlifted by helicopter to hospital.

In hospital, it was found that the third engineer had sustained 70% burns to his arms and upper body. He was given several skin graft operations but, sadly, after 6 days in intensive care he died as a result of his injuries. The electrician, who had sustained 3% burns to his hands, scalp and ears was expected to make a full recovery.

The MAIB enquiry following this accident revealed that the third engineer had not been wearing a protective overall, and that the electrician's understanding of English might not have been sufficient for him to understand the boiler instruction manual.

The Lessons

1. **Risk assessment: a suitable risk assessment, carried out before starting the work, would have highlighted the danger areas involved and identified control measures to be taken before commencing this work.**

2. **Risk control: isolation of danger sources is the cornerstone of risk control. In this case, the electrical supply to the discharge pump should have been disconnected as well as fuel lines being drained. Better still, the electrodes should have been bench tested away from all sources of ignition.**

3. **Personal Protective Equipment: the final control measure. Cotton overalls (ideally flame retardant) should always be used in engine rooms. They will not only keep your clothes clean, but will also provide an element of protection from fire risks. Had the engineer been wearing these at the time of his accident, he would have had a much greater chance of survival.**

4. **Instruction manuals: the manuals were written in English, and those involved probably had insufficient command of the language to utilise the manuals properly. Ideally, manuals should be written in the crew's working language (in this case Russian), or the crew involved should have a proficiency of English to enable them to follow the technical content of the manuals adequately. The manuals did point out, that when switching on the ignition, the electric pump would also start.**

CASE 11

Fire in a Cargo of Coal

Figure 1

Narrative

A 225m long bulk carrier (Figure 1) was discharging coal in a UK port when cargo in some of the holds was found to be smouldering. The fire service was called and a plan was formulated to deal with the situation. A hold which was unaffected by fire was emptied, and smouldering coal from the three affected holds was put into it. This was then hosed down by the fire service. It took all night to deal with the problem, but by morning all the smouldering coal was extinguished and the fire service departed. The damage to the ship amounted to only some scorching of the paintwork in the holds (Figure 2), although the incident was potentially very serious.

The 70,000 tonnes of coal had been loaded in Indonesia, and the shipper did not supply information on the characteristics of the cargo as required by IMO's Code of Safe Practice for Solid Bulk Cargoes (BC Code).

A coal cargo should be ventilated for the first 24 hours, to dissipate the methane. The hatches should then be sealed. The atmosphere on top of the hold should be monitored daily to check, in particular, the level of Carbon Monoxide (CO), because a rise indicates that the cargo is self-heating and that there is a risk of fire.

The crew did not follow the requirements for handling a cargo of coal, as specified in the BC Code, because the holds were kept ventilated for the entire passage. When the ship arrived in the UK, she anchored until the discharge berth became free. The weather deteriorated while at the anchorage, and the ventilators were closed as a result. The daily gas measurements showed a substantial rise in CO, but the master and mate did not appreciate the significance of this and the port authorities were not told.

Figure 2

The Lessons

1. It is important that shippers provide relevant safety information concerning coal cargoes. The crew might have been more alert to the potential problem of self-heating had this been the case.

2. Senior officers on bulk carriers must be aware of the dangers associated with coal cargoes, and be aware of the correct loading, stowage, monitoring and carriage procedures contained in the BC Code. Masters and mates should read the section on coal in Appendix B of the BC Code before the cargo is loaded (only 6 pages). Appendix G of the BC Code, which contains information on gas monitoring of coal cargoes (4 pages), should also be checked.

3. The requirements in the BC Code should be followed on passage, and in particular the gas measurements for CO should be carefully taken and closely checked. If the daily records show that CO levels are rising, this indicates that the coal is self-heating. If the CO levels rise above 50ppm, the owner or ship manager should be contacted for their expert advice.

CASE 12

Closer Than You Thought

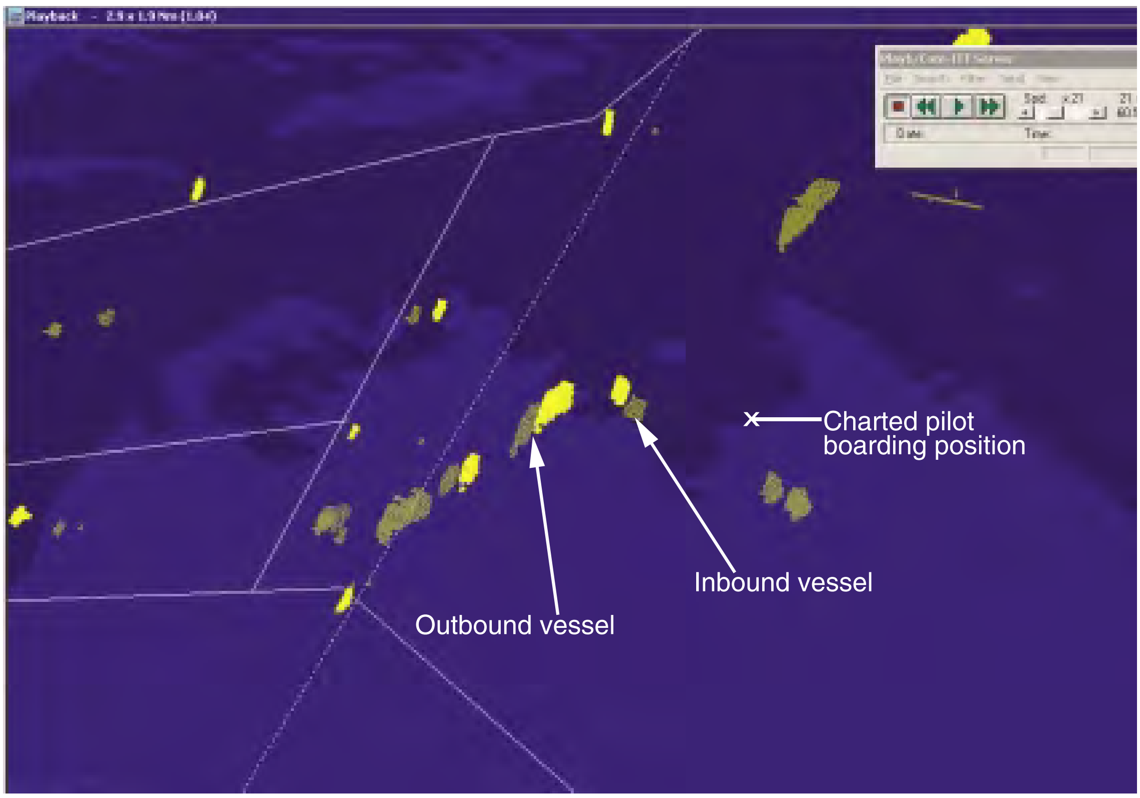
Narrative

A chemical tanker was leaving a port on the east coast of the UK. The ship had slowed to drop the pilot. Before disembarking, the pilot pointed out an inbound ship to starboard, making for the pilot boarding station. His advice to the master was to go around the stern of this inbound ship before altering to port for his destination. The pilot also reminded the master to change his VHF set back to the VTS working channel once the pilot boat was clear and he no longer needed to talk to it. The master acknowledged this advice and the pilot left.

The master checked his ARPA and decided that because this indicated the inbound ship to be passing clear on his starboard side, it would be safe for him to alter to port and increase speed, and then cross ahead of the inbound vessel. He ordered the course change and full ahead, forgetting that he had just slowed down, altered course, and then increased speed, making the information displayed by his ARPA unreliable.

The inbound ship was a small gas tanker. Noting the outbound vessel, the master maintained course and speed making for the pilot boarding position. He noticed that the outbound vessel on his port bow was altering course across his bows, so called him on the VTS working channel to ask his intentions. The VTS operator also called the outbound vessel, but did not receive a reply. The two ships were now very close, and the master of the inbound ship then took action to avoid collision by turning his vessel hard to starboard and reversing his course.

Again the VTS operator tried to contact the outbound vessel, with no success, until he tried the VHF channel used by the pilot boat. He was successful, and reminded the master of his requirement to keep a listening watch on



the VTS working channel. He then pointed out the near collision, which the outbound master denied, saying that the passing distance had been at least 2 cables.

The incident was recorded on the VTS radar, and measurements taken from this show that the clearance between the two vessels was in fact less than 100m.

The Lessons

1. For ARPA to display reliable target information, the observer's ship must maintain a steady course and speed for at least 3 minutes. The ARPA will then give results which meet the ARPA performance standards. In this case, the observer's ship had not maintained the steady course and speed, and the ARPA information on which the master based his collision avoidance manoeuvre was therefore unreliable.

2. A check of the visual aspect of the inbound vessel should have raised concerns over the accuracy of the information being provided to the master by the ARPA.

3. The pilot could have stayed on board the outbound ship until the danger of collision was over. However, he had advised the master of the inbound vessel and had no reason to doubt that the master would take his advice.

4. The outbound ship's failure to switch back to the VTS working channel meant that it was not contactable for some minutes following the incident.

5. The port has been asked to review its pilot boarding position to try and prevent another incident of this sort.

CASE 13

Previous Maintenance History is so Important

Narrative

A small general cargo vessel, which was operating under new ownership, was en route from a UK port to the continent. She was maintaining a steady 12 knots in force 7 winds and rough seas.

Just before midnight, the second engineer was on watch and sitting in the engine control room when he heard a loud bang from the engine room. He saw oil being sprayed from the port (scavenge) side of the single, eight cylinder, main engine, accompanied by smoke and flames. He immediately stopped the engine.

A crew muster took place, the engine room ventilation was shut down and CO_2 was released into the space.

A request for assistance was made and the vessel was towed into port.

An inspection of the damage revealed that number 7 crankcase explosion relief door portside had been torn from its mounting bolts and had ricocheted off other engine room machinery (Figure 1). The ensuing fire had engulfed and destroyed an engine control box situated above units six and eight, and had caused light damage to the scavenge trunking and exhaust cover above. The vessel was disabled and had to be towed to port.

Seven of the eight pistons and liners, and two main bearings, were removed for further inspection to determine the cause of the explosion. Number seven liner was found to be badly scored and the piston was also found in a poor condition, with badly worn rings and heavy carbon deposits (Figure 2). In addition, the butt, or end to end, clearance of the rings was excessively large and the rings were poorly spaced around the piston.

The other units inspected were also in poor condition, with number six piston firing (top) ring having broken 3cm from one end. The fuel injection system was also found to be set incorrectly and the oil mist detector was not working.

Figure 1 – Number 7 crankcase explosion relief door showing damaged mounting points

Figure 2 – Number 7 cylinder with heavy carbon deposits

The Lessons

1. The badly worn piston rings and the grooved cylinder of number seven unit probably provided the 'hot spot' on which lubricating oil, from the crankcase, or fuel oil escaping past the worn rings, could vaporise. It was only a matter of time before ignition of this flammable vapour occurred. Although the engineer heard only one explosion, it is possible that it was a secondary explosion, which was larger and more powerful than the initial one. This would indicate that the explosion relief door did not immediately operate and close effectively during the initial explosion, to prevent ingress of air. The resulting secondary explosion was large enough to tear the crankcase door from its mounting points. Operating a medium or large speed diesel engine without a working oil mist detector is folly. A detector provides warning of oil mist concentrations before they reach dangerous proportions. Fortunately, no crew members were standing in the vicinity of the explosion.

2. The previous owner of the vessel had provided very little service history when the vessel was sold. This is like buying a second-hand car with no historic information. However, the consequences on board a ship can be considerably worse when something goes wrong. Unfortunately, there is no requirement for a shipping company to provide this information when it sells a ship, and the buyer is reliant on an effective survey to reveal any faults. A ship's crew should be proactive, by highlighting to the new owner equipment which is not working or is in poor condition, and possibly pre-empt an unwelcome accident. The combination of an ineffective oil mist detector, poorly adjusted fuel injection equipment and an unknown maintenance history meant that this was an accident waiting to happen.

CASE 14

Hot Oil And Water *Will Not* Mix

Narrative

A crewman is recovering from severe scalding burns to his face, chest, shoulder and arm after an accident while draining the used cooking oil from a deep-fat fryer in the galley of a large passenger vessel.

The crewman had switched off the unit's heater in preparation for draining the oil. A container and funnel arrangement were then placed under the drain valve to collect the oil. He was wearing thick gloves and safety shoes as well as his chef's tunic, which had the sleeves rolled up to the elbow. The area was well lit and clean. The crewman was working alone.

The normal working temperature for the cooking oil was approximately 170°C.

It is not known exactly how long the oil was allowed to cool before the drain valve was opened, but it is certain its temperature was still well in excess of 100oC and that the collecting container held some residual water. When the crewman opened the valve, and hot oil began to drain into the container, this water flashed into steam and the resulting back pressure caused the hot oil in the funnel to be blown back onto his face and upper body.

The Lessons

1. **Before attempting to drain oil from deep fat fryers, ensure it has cooled sufficiently to be safe: i.e. well below 100°C.**

2. **Be aware of the effects of trying to mix water and hot oil, and ensure that the two are kept separate.**

3. **Ensure that, whatever the operation, the personal protective clothing worn offers adequate protection against the likely hazards.**

Another Low Pressure Fuel Line Fire

Fractured fuel pipe

Narrative

Two tugs were assisting a container vessel onto her berth on a wide river. Most of the vessel's lines had been secured when the skipper of one tug noticed an unusual smell of diesel. The tug's engineer went to investigate. On opening the engine room door he was faced with black smoke and flames over the starboard engine. The automatic fire alarm began to sound.

After ensuring that the container vessel was secure, the tug's skipper called his partner tug for assistance, shut down his engines and began to close down the engine room.

The second tug was quickly alongside the casualty and passed across three charged fire hoses. This allowed boundary cooling of the engine casing to be started. Once all machinery had been stopped and ventilation flaps closed, the CO_2 smothering system was activated.

Meanwhile, the skipper of the assisting tug made contact with port authorities so that they could alert shore firefighters and arrange a berth where the fire could be tackled safely.

The casualty was towed to the selected berth, and an external examination of her engine casing by the fire brigade, using a thermal imaging camera, indicated that the fire was probably extinguished. The fire officer advised that the engine room should remain closed for several hours, boundary cooling continued, the space monitored externally and allowed to cool.

Several hours later, following a final check with the thermal imaging camera, it was clear that the fire had been extinguished. The engine room was opened, ventilated and entered.

A copper pipe connected between a pressure gauge and the starboard engine's fuel line was found fractured just below the olive used at its connection to the pressure gauge (see figure). This had allowed gas oil, at a pressure of about 1 bar, to spray over the engine and hot exhaust lines where it ignited. Substantial quantities of unburnt gas oil were found around the engine room, showing the fire had been smothered by the CO_2.

The Lessons

1. **Prompt action by the tug's crew prevented this fire from spreading throughout the engine room. The amount of unburnt fuel remaining in the engine room was an indicator of the speed of their response.**

2. **The use of compression fittings on copper pipes, particularly on low pressure fuel lines, is poor practice on applications where vibration is present. Numerous fires have resulted from failures of these pipes, or from pipes pulling from olives, particularly where the pipes have not been adequately supported.**

High But Not Dry!

Narrative

A 1680gt general cargo ship in ballast was on passage to Sweden, course was 132° in autopilot and speed was 10 knots. On the bridge was the chief officer, accompanied by an AB lookout. The master was asleep in his cabin.

At 0300, the ship neared the narrow approach channel of the destination port, and the AB lookout was sent below to wake the two other able seamen on board and prepare the ship for mooring. Eight minutes later, the chief officer 'buzzed' the master in his cabin using an intercom system to wake him, in accordance with his orders. The chief officer then briefly left the bridge to wake the chief engineer in his cabin below. On his return to the bridge, the chief officer 'buzzed' the master again and reduced speed to about 6 knots. He then altered course to 022° in autopilot to head directly towards a cardinal buoy at the start of the approach channel, the outer limits of which were marked by leading lights. By that time, the deck ratings had prepared the mooring lines and were having a coffee in the mess room.

On reaching some 2 cables off the cardinal buoy, the chief officer became concerned that the master had not arrived on the bridge, and went to the master's cabin. On arrival, he saw that the master was dressing, and immediately returned to the bridge. The chief officer then adjusted the engine control lever to dead slow ahead, and changed the steering control from auto to manual steering. He then adjusted the ship's heading to aim toward the centre of the channel and the bright harbour lights ahead. The visibility was good, the wind was south-west at between 7 and 10 knots, and the tidal stream was negligible.

The master arrived on the bridge at about 0344, when the ship was in the vicinity of the cardinal buoy and in the centre of the approach channel. During a brief handover with the chief

officer, the master was informed that manual steering was selected. After the master relieved the chief officer, he increased speed to 10 knots. About 1 minute later, the ship's heading started to drift to the north, away from the lights of the harbour and into darkness.

By 0347, the ship had left the channel, and was noticed by a pilot on board a nearby vessel. At 0349, he called on VHF radio to advise that the ship was to the north of the channel. The master acknowledged this call and, although starboard rudder was applied, the ship grounded at 0350 when about 0.75nm from the harbour entrance.

Soon after the grounding, the master and chief officer were tested for alcohol on their breath: the master was found to be positive. At 1257, the alcohol content in his blood was 0.34 promille (=34mg/100ml). The master was later dismissed by the ship owner for breaching its alcohol policy, he also faced criminal prosecution.

The Lessons

1. Given the amount of alcohol in the master, when tested at 1257, it is probable that his alcohol level was between 4 and 5 times this amount when the ship grounded some 9 hours earlier. This was equivalent to at least 5 pints of beer. Regardless of a person's ability and experience, alcohol impairs judgment, concentration, awareness, and perception of risk, and therefore considerably increases the risk of accidents occurring. In this case, the master did not adjust course in manual steering to keep the ship in the buoyed channel, and was not aware of her slow change of heading towards the north. The adverse effect of alcohol on performances is becoming increasingly recognised by national enforcement authorities and ship owners, and alcohol testing following an accident is becoming common practice. Don't be caught out.

2. Although it was dark and the ship was in restricted waters, the master was alone on the bridge. He need not have been. Any of the three able seamen could have been ordered to report to the bridge to act as lookout as soon as the preparations for mooring had been completed. The chief officer was also available until the ship arrived off her intended berth. Had another person been on the bridge, the ship's change in heading, from the bright lights of the harbour to the darkness north of the channel, would have been readily apparent, and action might have been prompted in sufficient time for corrective action to be effective. No OOW is infallible, and every OOW runs the risk of becoming incapacitated for a variety of reasons. In such situations, a second person on the bridge can be the difference between embarrassment and disaster.

3. Not too many people would feel comfortable with all of the flight crew of an airliner leaving the cockpit to talk to the passengers. Leaving the bridge unattended when underway, however briefly, is not dissimilar. It is a contravention of STCW but, more importantly, it is unsafe, and should not be necessary if all available resources and communications equipment are used effectively.

Part 2 – Fishing Vessels

Being a fisherman is by far the most dangerous occupation, and the industry is often condemned for this. Having seen fishing operations on all types of vessel, it is apparent to me that it is not because fishermen are foolhardy – although there are exceptions – but simply because the work is taking place on the sea. 'Things going wrong' in the factory ashore results in lost production, whereas on a fishing boat it can mean loss of life. Looking at the fluctuating statistics and trying to draw sensible conclusions is unlikely to provide answers, but reading the lessons drawn from MAIB reports does give a true picture of the 'things that go wrong' and the consequences!

Having been at Seafish for many years, and being involved with safety, I eventually found myself attending meetings of the Fishing Industry Safety Group, where I tried hard to follow the discussions about such things as Codes of Practice, cut off points, LSA, fire regulations and crewing regulations.

"Is the accident record for small vessels worse than the bigger vessels?" The industry said no, and pointed to the statistics. *"Ah, but small vessels are not at sea for as long as bigger ones and hence, the accidents per time period at sea is greater"* responded the MCA.

It was difficult to get a clear understanding of the true picture. One can argue about statistics and trends, but it has always concerned me that one incident can totally change the statistics. So, whilst not dismissing statistics totally, it is far better to look carefully at each incident that occurs.

All incidents have one thing in common: the persons involved did not expect them to happen! We all make assumptions that everything will be all right, because our experience is that it usually is. However, as the lessons in this Safety Digest show, circumstances can conspire, setting in motion a chain of events that result in the unexpected. The gear comes fast; there is a strong tide and a heavy swell; the watertight door is left open; or the freeing ports are inadequate. Suddenly, these are the factors that result in the loss of the vessel as you attempt to free the gear.

Wearing a lifejacket when it is rough makes sense, but most fishermen drown in calm conditions when they least expect to find themselves in the water. Fishermen are starting to wear lifejackets all the time – Seafish can help you identify the most suitable one for your type of fishing.

Carrying the mussels in cubic metre bags seems like an excellent idea, and it can work extremely well. However, if there is sudden bad weather and the engine fails, these bags can become the factor which causes the vessel to be lost by filling with seawater as it breaks over them. I can recall a similar incident happening with net bins some years ago. We don't appreciate that this can happen, until it actually does.

Hindsight is a wonderful thing: we are always right after the event. Everyone makes mistakes, and we usually get away with it, hopefully learning a lesson or two. The accidents featured in this Digest relate to fishermen who did not get away with it, and who have suffered severe consequences. It is up to all fishermen to take advantage of these hard lessons.

A major part of my work at Seafish in recent years has been risk assessment, as required by Health and Safety legislation. We have tried hard to find a sensible means for fishermen to do this easily and to meet the accepted standards. The Seafish Safety Folder has been acclaimed by health and safety experts to be very good, but not all the fishermen who had to complete it thought the same! Many fishermen did fill it in, and stated that it worked well. However, many others felt it was too bulky and complicated and, hence, simply did not carry out any risk assessment. Improvements have been made to the folder, and it is now a reasonably slim book that fishermen, in general, are able to complete successfully.

Health and safety has grown into a big industry, with consultants all too willing to help – for a fee. However, risk assessment should be 'simple common sense', just weighing the job up and thinking about the possible problems. The current Safety Folder does comply with accepted risk assessment practice, and does satisfy all the requirements for the 'work activity' (slips, trips and falls), but it deliberately does not address the question of whether the vessel is fit for the purpose for which it is being used.

In the past, when most fishing was performed with vessels over 15m, regulations ensured that vessels were 'fit for purpose'. However, today, many vessels are under 10m, doing the work of much bigger vessels, and the regulations that apply are minimal. New vessels are built to Seafish Construction Rules, but existing vessels, under 15m, may be modified without any control whatsoever. MAIB reports are continually highlighting concern about the incidents involving modified small vessels; often having occurred as a result of flooding or a lack of stability. In response, the MCA has set up a working group to consider a new Small Vessel Code, which could result in more regulation with more costs to fishermen for inspections. Alternatively, a sensible assessment of the risks that apply in the particular circumstances of each vessel could enable fishermen to operate their vessel safely, and without the unnecessary expense that all-embracing regulations may require.

Seafish is currently preparing very simple 'safety assessments' for under 15m vessels, each designed for a particular fishing method. They are not long, fewer than 10 pages, and they consider all aspects of operating the vessel, and its condition. They are simply a series of questions which are answered with a tick or cross. This new approach is being considered by industry and the MCA and, if approved, will be made widely available. I hope and believe that an assessment or safety checklist, which fishermen consider to be sensible, and easily and honestly completed, will provide a way of improving safety – without unnecessary cost.

Perhaps in the future, MAIB reports will have fewer fishing incidents but, as always, the reports will be very valuable, as they do provide the true picture.

Alan Dean

Alan Dean

Alan joined the White Fish Authority in 1969 for a temporary job to produce the drawings for a gutting machine. Since then, he has been involved in many of the projects that WFA and, subsequently, Seafish has undertaken. During the past 15 years, much of the work has been aimed at improving safety, and various safety related projects and studies have been undertaken. Alan has participated on the Fishing Industry Safety Group and its sub groups and through this became involved in the development of risk assessment for fishing vessels. As part of the Seafish re-structuring exercise, Alan took early retirement from Seafish at the end of September 2006.

CASE 17

Delay Structural Repairs at Your Peril

Figure 1

Narrative

An experienced skipper of an 11 metre prawn trawler was well known around the many landing ports he used, as a "colourful" character, enjoying life to the full.

The skipper had mixed success at fishing, so money was fairly tight. This might help to explain the extremely poor condition of the vessel (Figure 1). On many occasions, harbour authorities and other skippers had advised him to attend to the poor – and in their view, dangerous – structural condition of his vessel. There were holes and splits in the weather and forecastle deck and bulwarks. The fish hold did not have a watertight cover or even a tarpaulin to cover the hatch boards, and there was virtually no paint protection to prevent hull corrosion (Figure 2).

Over the years, some attempts had been made to carry out patch repairs to the deck. But these had to be frequently abandoned because of the lack of parent metal to weld to and could be considered as only temporary measures. Perhaps this was because permanent repairs would have been too costly and burdensome for a commercial venture that was, at best, marginal. Although regarded as a capable skipper, those who knew him, found it extremely difficult to balance this with his ambivalent attitude towards the condition of his vessel.

On the final day of sailing, the wind was force 3-4 and sea state 2-3. It was a fairly pleasant day. The skipper took his vessel to a well known, fertile fishing ground, which bordered on a steep contour. Throughout the day, the weather deteriorated and other vessels in the

Figure 2

vicinity returned to port, their skippers fully expecting the prawn trawler to follow them in. It did not. The last positive sighting of the vessel was as she was still trawling in deep water near the contour.

The skipper's operational pattern varied, so his acquaintances were not surprised that he did not return to his departure port. However, 9 days after the last sighting of the trawler, his now concerned family and friends contacted the coastguard to report that the vessel had not been seen for some while. Despite a radio and widespread harbour search, the trawler could not be located.

A further 9 days passed before a fishing vessel picked up a sonar contact and nets in the vicinity where the trawler was last seen.

Subsequent remotely operating vehicle surveys identified the contact as the missing vessel. Her trawl gear was deployed and it appeared that one trawl door was buried under the seabed.

Sadly, 9 more days passed before the skipper's body was found on a remote stretch of the coastline.

It is likely that the vessel's trawl gear came "fast" during the evening of the last sighting. In attempting to free the gear, or during the process of coming "fast", it is probable that the deck edge became submerged, rapid downflooding occurred through holes in the weather deck and the non-watertight fish hold hatch, causing the vessel to founder. As there was no "Mayday" alert, the foundering is likely to have happened very quickly.

The Lessons

It is very difficult to understand why the skipper did not heed the advice of his peers, harbour authorities and contractors, and deal with the severe hull and bulwark plate wastage. It must have been abundantly clear to him that the vessel was in a poor material state and was at severe risk of flooding, but he was happy to risk his life and take it to sea. Sadly, in this case it was once too often.

Steelwork repairs and plate replacement is never cheap. But the potential consequences for not doing so are far mostly costly, and traumatic.

The following lessons can be drawn from this accident:

1. Skippers and owners of fishing vessels must ensure their vessels are safe to proceed to sea. This means that watertight hatches and doors should, indeed, be watertight and the structure should be in a seaworthy condition. Do not delay repairs – the situation will only get worse.

2. The condition of a ship's hull will inevitably deteriorate over time. However, ensuring that the paint preservation is intact and regularly touched up, is one, relatively cheap and effective way of protecting structure against corrosion. In this particular vessel, it was difficult to find evidence of any external paint coatings.

3. Regularly examine upper deck, non-watertight hatch arrangements. The risk of downflooding through fish hold hatches that are fitted with boards can be much reduced by fitting tarpaulin covers over them.

Mobile Phone Causes Grounding

Narrative

A 23m long fishing vessel grounded at night close to a light beacon. She had been returning to her home port after 18 days on guard duty near a North Sea pipeline. The experienced skipper was on watch when she grounded only a few miles from a harbour entrance.

The crew of five comprised the skipper, three deckhands and a cook. The crew were suitably qualified, with the skipper holding a Class 2 (Fishing Vessel) certificate.

The vessel had been at sea twice as long as her normal fishing trips, but the guard ship work was considered relaxing by comparison. The skipper usually carried out the day watch between 0730 and 2230, and two crew members split the night watch.

At the beginning of the trip, the vessel had been well equipped for navigation, with two radars (one of which was an ARPA), three electronic chart plotters (one of which plotted continuously) and two GPS. However, on the second day of the duty period, the radar which was not fitted with ARPA failed and could not be repaired on board.

The final return passage to port was carried out late at night, and recent strong winds had left a large swell. During the 5 hour passage, the skipper was at the helm and was, mostly, alone in the wheelhouse. He made several course corrections to avoid other vessels.

Two hours into the passage, the ARPA radar also failed. The skipper replaced the fuses but was unable to re-start the radar. He usually relied heavily on the radar for navigational guidance when making a landfall. However, he allowed the vessel to continue on the same heading, expecting to make fine course adjustments when he could see the lights of the port. To aid his night vision, he dimmed all the bridge equipment lights, effectively making them unusable.

The skipper noticed the lights of the port gradually appearing as he neared the coast. He

allowed the vessel to continue on the same heading toward a light beacon, which was situated on rocks about 2 cables from the shore and which marked the southern entrance to a wide bay. The skipper intended to pass quite close to the north of the beacon in order to line up for the harbour entrance. The characteristic of the beacon was a white flash once every 10 seconds, and the direction from which the fishing vessel was approaching could be lost easily among the background lights of the port.

As the vessel approached the light beacon and the bay, the skipper's mobile telephone rang. His wife wanted to know what time he would be home. During the ensuing conversation, the vessel grounded less than 100m from the light beacon.

The skipper contacted the harbour office, which immediately contacted the Coastguard. Lifeboats and a helicopter were tasked and the vessel crew were winched to safety a short while later.

Due to difficulties in salvaging the vessel, which had been holed in various compartments, and the sea conditions preventing easy access, she became a constructive total loss.

The Lessons

1. The skipper received no help from his crew during this late night passage, despite having no radars and despite having been in the wheelhouse alone for most of the previous day. The crew were available, and had not been working long hours. A crew member posted to look out would have been sufficient to alert him that the ship was about to hit a light beacon.

2. As well as not using his human resources, the skipper failed to use the available equipment to assist him navigate the vessel safely. He had an electronic chart plotter which was switched on and running but, because it was not supposed to be used for navigation, he left its lights turned down and did not refer to it. In the absence of any radars, it would have been prudent to refer to the chart plotter, at least for warning purposes and general guidance.

3. The skipper had made the approach to his home port many times before, and in all weathers. Although the lack of any radar was a concern, it was not sufficient to overcome the complacency that this familiarity engendered. He thought he knew exactly where he was – but he was wrong. It is very difficult to judge direction and distances at night, irrespective of how well you know the area.

4. To make matters worse, the skipper allowed himself to become distracted at a critical moment, by a mobile telephone call. Mobile phones have a role to play in modern communications, but their use in the wheelhouse should be very carefully controlled.

CASE 19

Loss of "Rulebeater" With Poor Freeboard

Narrative

A 9.8m long fishing vessel (photograph) with two people on board was swamped by a wave which came over her stern while her trawl was snagged on a seabed obstruction. Floodwater was trapped in the shelter, and the vessel capsized before the water could escape through the freeing ports.

When he realised that the net was snagged, the skipper reduced power to dead slow ahead. The autopilot was then set to keep the vessel steering in the same direction (downwind) while the skipper heaved the vessel back towards the trawl. The trawl warps and trawl doors were hauled on board, and some of the bridles were wound on the winch. The length of the gear to the fastener was then about 210m and the depth of water was about 55m when the skipper used a substantial burst of engine power to try to break free. A wave broke over the stern at this time and swamped the shelter. The vessel did not have enough freeboard and buoyancy aft to resist the downforce on the stern caused by the use of the engine and the tension in the bridle wires. The engine was put into neutral, but the freeboard had reduced, and this resulted in more waves coming on board. It became clear to the crew that the boat was about to founder.

The deckhand was aft and was able to jump overboard as the vessel started listing to port. The skipper was at the forward end of the shelter and he made his escape through a hatch on the starboard side just as the vessel capsized. There was no time to make a distress call or retrieve the lifejackets that were stowed in the wheelhouse.

The crew found themselves in the water and were lucky to find two lifebuoys that floated up as the vessel sank. Shortly afterwards, the vessel's liferaft appeared and began inflating. The crew boarded it and, after spending a worrying 5 hours afloat, were eventually seen and rescued by a passing vessel.

The fishing vessel had been fairly new and, like many modern vessels, the build philosophy had been to maximise the fishing capacity while keeping the length under 10m so that the owner would not have to purchase a fishing quota. Heavy equipment was installed including: a main engine capable of providing 265kW (but de-rated to 228kW); a trawl winch with a core pull of 5.3 tonne; two net drums each with a core pull of 2.1 tonne; heavy nets; a shelter; and an extensive suite of bridge equipment.

There was no minimum freeboard requirement for a fishing vessel of this size, but there was for an equivalent sized workboat. If the workboat standard had been applied to this vessel, she would have been about 5 tonnes too heavy. She was overloaded with equipment and fittings, and her freeboard and buoyancy were inadequate as a result.

The Lessons

1. **The commercial advantages to be gained by "*rulebeaters*" like this one must be weighed against any resultant reductions in safety-critical areas like freeboard. The builders and first owners of this vessel had no idea that she was dangerous under certain conditions. Research is currently being carried out which will probably lead to new regulations on minimum freeboard. In the meantime, owners of "*rulebeaters*" similar to this one should carefully consider whether the amount of freeboard on their vessel is appropriate and safe.**

2. **The standard for workboats provides useful guidance. A fishing vessel with a continuous watertight weather deck and a length of 9.8m would require a minimum freeboard of 415mm when fully loaded. If your vessel meets this description, but with reduced freeboard, you need to be aware that she suffers from a lack of buoyancy which may substantially reduce her capability to survive in certain circumstances.**

3. **The area of freeing ports on this vessel did not meet the basic minimum guidance. When the effect of the shelter was taken into account, her freeing ports were woefully inadequate. Trapped water on a vessel can easily cause capsize, and adequate means for water to quickly escape should be provided. If your vessel has a shelter which could trap water on the after deck, try to avoid operating while stationary and stern-to the sea waves.**

CASE 20

Aggregate Bags Sink Mussel Dredger

Narrative

Over the years, fishermen have thought of many ideas to reduce time spent alongside and unloading the catch. Recently, some fishermen have taken to loading their shellfish catch into 1 cubic metre aggregate bags, which are more commonly used in the building industry by builders' merchants. These bags are stowed on the open deck and unloaded quickly by crane.

This practice had been adopted by the owner and skipper of a 9 metre mussel dredger fishing out of a port in southern England.

The vessel, with a crew of three, had a successful day's fishing, and was heading back to port with a good catch when the weather deteriorated unexpectedly and she experienced strong winds and large seas. As the vessel closed her home port, her engine failed and she began rolling heavily and shipping seas which started to fill the bags on deck.

The vessel began to list, or possibly loll, to one side and the skipper, realising the danger the vessel was in, broadcast a "Mayday" on VHF channel 16. The local lifeboat was launched and a nearby yacht headed for their position. The vessel's movement began to be of grave concern to the skipper as she laboured in the heavy seas, so he ordered the crew to launch the liferaft and to prepare to abandon ship. As the crew carried out his instructions, the vessel rolled onto her side, throwing them into the sea. She sank a few minutes later.

The liferaft had been launched, but it was taken down to the seabed, trapped in the rigging. Not all the crew were wearing lifejackets, despite some warning of the impending capsize.

Fortunately, the men were in the water only a short time before the yacht was on scene, and they were able to clamber on board to safety. The fishermen were later transferred to the lifeboat and returned to shore. No one suffered lasting injuries.

The Lessons

1. Both the owner and skipper failed to notice the serious stability implications of the bags having no means of drainage. Using these bags had the same effect as blocking the vessel's freeing ports, because water could not escape. Be aware of the dangers of water trapped on deck. It can happen quickly and unexpectedly. Always ensure that freeing ports are kept clear, and that containers on deck have adequate drainage holes.

2. Fishermen on small vessels should consider wearing constant wear buoyancy aids all the time at sea. The MAIB frequently comes across accidents where vessels capsize suddenly, with little or no warning. In such a circumstance, it is *too late* to scrabble around to find the lifejackets which are often stowed in the most inaccessible location.

CASE 21

Are Lifejackets Really Too Much Trouble?

Narrative

A skipper and his deckhand were hauling a string of pots on an 11 metre fishing vessel.

The skipper was guiding the line over a snatch block hanging from gallows extending beyond the side of the vessel. He was also controlling the vessel's heading, speed and hauler using local controls. The deckhand was further inboard, removing catch from the pots, re-baiting and stacking them. He had his back towards the skipper.

The skipper screamed and the deckhand turned to find him hanging from the snatch block with his legs in the water. Before the deckhand could take any action, the skipper slipped into the water.

After cutting free the string of pots, the deckhand went to the wheelhouse, turned the vessel and came alongside the skipper. He also called for help on Channel 16 VHF.

He first attempted to bring the skipper close alongside by using a boathook. The skipper


Snatch block


Engine controls
Snatch block
Position of skipper
Crewman

was able to grab one end, but the boathook slipped from the grasp of both men and fell into the sea. The boat was still moving through the water and the skipper fell astern.

The deckhand again manoeuvred the boat alongside the skipper, from the wheelhouse, but by this stage the skipper was face-down in the water.

Using a grapple, the deckhand was able to get a line on the skipper and, passing this line over the block and hauler sheave, lifted the skipper's head and torso clear of the water. Unable to lift the unconscious man inboard, on his own, he waited a few minutes until the skipper of a nearby boat came alongside to assist. Together they dragged the skipper inboard and began attempts to resuscitate him.

A lifeboat came alongside a few minutes later, with a doctor among its crew. In spite of the doctor's help, and being airlifted to hospital, the skipper lost his life.

The Lessons

1. **Had he been wearing a lifejacket, the skipper would have significantly increased his chances of being recovered alive. The small extra degree of discomfort from wearing a lifejacket on deck – and it is only small with modern self-inflating types – is surely worth the greatly increased chance of surviving going over the side.**
2. **The skipper had been very conscientious in carrying out a full written risk assessment. From this, he had identified that there was a risk from going overboard when shooting and hauling. His control measure, to reduce the risk from that hazard, was to wear a lifejacket. It is unfortunate he did not follow his own judgment.**

Part 3 – Leisure Craft

I have been a keen reader of the MAIB Safety Digest for a number of years. Its impartial appraisal of marine incidents provides valuable lessons for us all. The addition of the leisure section highlights areas which those of us whose work has significant overlaps with the leisure sailing world need to be aware of and can learn from.

Whilst I am a full-time professional seafarer, the only other permanent staff member on board Ocean Youth Trust South's 22-metre sail training vessel, *John Laing*, is a 21-year old bosun. Otherwise, I sail each week with an ever-changing cast of volunteer watchleaders plus a dozen crew members aged between 12 and 25. Most of our watchleaders come from a leisure sailing background – apart from those who have been promoted from amongst our young crew members and may have never sailed any other vessel. The young crew themselves are frequently completely new to sailing in any form; yet the ethos of the Ocean Youth Trust demands that we involve them in every aspect of sailing the vessel.

This means that I have to provide the training and support to enable every single person on board, right down to the smallest 12 year old, to take an appropriate share of responsibility for the safety of vessel and crew. The first mate must be able to get the vessel to a safe haven if I am ill or injured; but little Sam, who set foot on board for the first time only yesterday, must know how to fit and use a lifejacket and harness, and how to keep a good lookout and clearly report anything seen to a watchleader.

Establishing safe operating procedures and ensuring that correct routines are followed, preparing for emergencies, practising and briefing and training, and communicating with each other so that everyone is clear about what is happening and their role in it, are all essential to safety – as the case studies in this digest illustrate.

Keeping anchor watches and making certain that all those involved understand exactly what they are watching for is straightforward to organise. As a commercial vessel, alcohol use by anyone on board *John Laing* is restricted by the law, with possible criminal penalties; but even in purely leisure boating, mixing alcohol with any situation where the lives of yourself and others may depend upon your actions seems simply foolhardy. Correct use of all equipment, including killcords and lifejackets, can be taught, regularly reinforced, and enforced. And when the safety of vessel or persons is dependent on other people knowing where you are and what you are doing, it is not enough simply to communicate that information: you need to ensure that it has been received and understood by the people who need to know – whether this involves divers working in harbour or simply proper communication between a yacht's helmsman and the crew member preparing to take the bow line ashore. "I thought he knew what I meant!" is not much use once something has gone wrong. And very simple precautions, reliably followed, can prevent serious accidents: *John Laing*'s sea staff know they must check with the skipper before starting the engine – and the bosun is required to remove the engine key before starting any work in the engine room.

Time spent on training, drills and reviews is never wasted, and the lessons learned can echo down the years. The RYA provides some excellent courses: for example, though my coastal skipper course was many years ago, the skills I learned then all contributed to making me a safer sailor today, and I find myself passing on those tips and techniques to others.

The incidents reported in this edition reveal some salutary lessons. I recall when I first started skippering that I seemed to be learning about fourteen lessons a day; but I think the key at this stage is to be aware of your own capabilities and, while trying to stretch yourself and improve, always take the time to think through what could go wrong – or right – and consider various ways of dealing with different scenarios. Then, as you get more experienced, make sure you don't fall victim to complacency – there are always more lessons to be learned.

Reports like these encourage all of us who have ever had incidents or near accidents on board to evaluate and discuss them, debrief all those involved, and use the experience to improve our systems, procedures and training so that safety lessons are understood, remembered and acted upon – not just by the skipper, but by everyone on board.

Mark Todd, Staff Skipper, Ocean Youth Trust South

Mark Todd started dinghy sailing at the age of 22 while working as a solicitor, and went on to crew in friends' yachts before obtaining an RYA Day Skipper practical certificate. Eventually, tired of working with the aim of being able to buy a yacht on retirement, he resigned, left the law and got a job as a bosun with the Ocean Youth Club (now Ocean Youth Trust). This led to a season as first mate with the OYT in the north west, and eventually he took command of OYT South's 22-metre steel ketch, *John Laing*, at the start of the 2001 season. Now approaching the end of his sixth season skippering on the south coast and in Tall Ships races, he is an RYA Yachtmaster Instructor, and with the aid of a Trinity House bursary, he obtained Master (Yachts 200gt) and Officer of the Watch (Yachts 3,000gt) certificates of competence. He is now studying for Master (Yachts 3,000gt). He welcomes anyone who sees *John Laing* to come on board and say hello!

CASE 22

Secure Anchorage Proves to be Anything But

Narrative

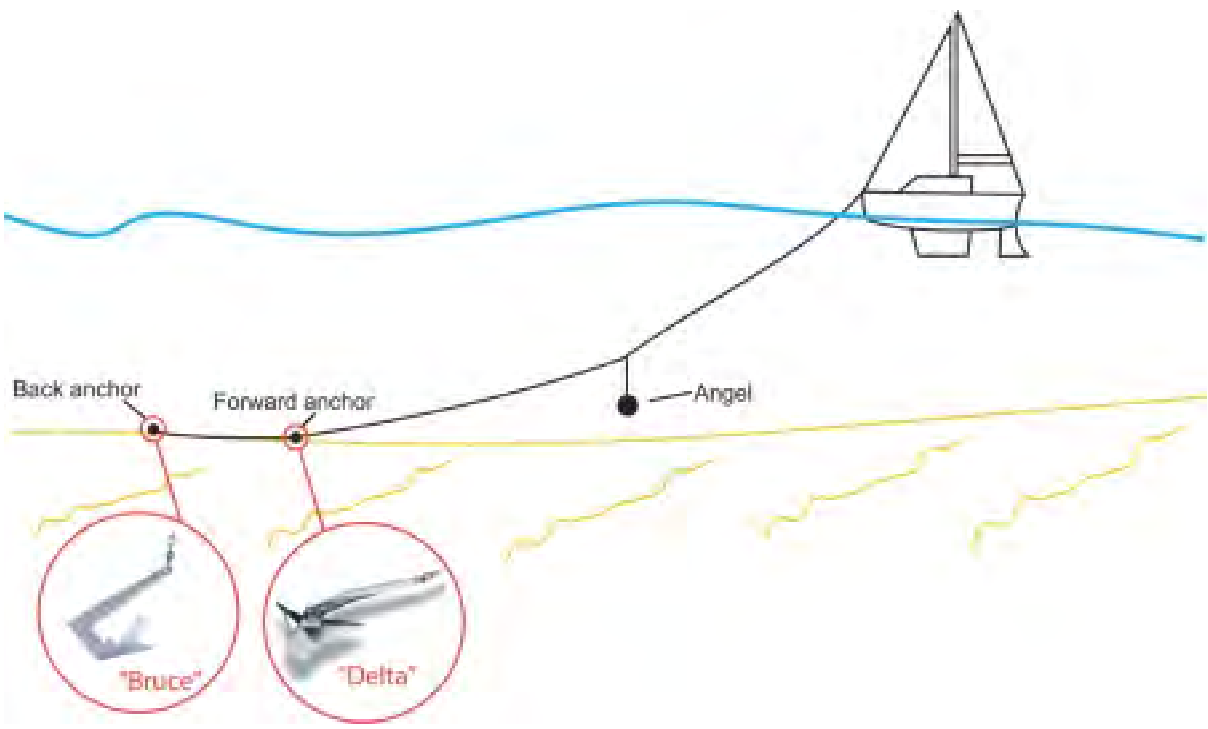
A 10.7m steel-hulled sailing yacht was being used for a 5-day training course on the west coast of Scotland. Strong winds were being forecast for the coming night so it was decided to find a sheltered anchorage.

A bay was chosen that the skipper had used several times before and the yacht was anchored in 2.7m charted depth. A 16kg "Delta" anchor was prepared with chain and warp, and a 7.5kg "Bruce" type anchor was attached to the trip line eye of the "Delta" with 4 metres length and a trip line and float attached. These were deployed as one unit, smaller first. This is a technique known as 'tandem' anchoring. In addition, a 5kg 'angel' was rigged at 20m length of chain, and nylon warp increased the overall scope to 36m. The nature of the bottom was fine sand with some weed.

The anchors were set for a SW wind and were tested with the engine running astern while transits were observed. Everything appeared to be secure and the GPS alarm was set to 0.03 mile (about 55m). The barometer had been falling steadily all afternoon and, as the skipper and crew were turning in, was observed to be falling more rapidly. At this point the wind was observed to be SW force 6.

Just before midnight the GPS alarm woke the skipper. He jumped out of his berth and saw that they were 0.04 mile out of position. He started the engine and donned a lifejacket, telling his crew of four to do likewise. By the time he was on deck, the depth sounder was showing minimal depth, and almost immediately the keel touched the bottom. Attempts to motor off failed and the yacht soon listed by 20° to starboard, with the wind and sea on the port bow. A "Pan Pan" was sent and acknowledged by the local coastguard. The local lifeboat was dispatched to the scene but had some distance to travel.

It was soon established that the yacht was on a reef and was being driven on by the weather. The angle of heel increased to 30°. The crew managed to recover the anchors during this time so that they could be deployed again when necessary.



By the time the lifeboat arrived, the skipper had established that the tide was on the rise and that the depth would be sufficient for them to float off. After more movement and pounding, they eventually came clear and were able to motor north to safely re-anchor. The yacht was lifted out to inspect for damage, but was found to be unscathed.

The Lessons

1. On the night of the accident, a vigorous depression was passing across the north of the British Isles. The inshore waters forecast, issued by the Met Office at 1700, gave south force 5 to 7, increasing force 7 to 9, then veering west force 5 to 6. Weather records from the nearest weather station confirm that this forecast was accurate, with southerly wind speeds peaking between midnight and 0300 at force 7 with gusts of force 9. By 0400, the wind had veered west and had moderated. Setting the tandem anchors for a south-westerly made sense earlier in the afternoon when that wind-direction was observed. However, the veering loads produced when the wind backed and freshened, might have reduced the effectiveness of this anchoring arrangement.

2. However unappealing the setting of an anchor watch might be, a forecast giving high winds and changes of wind direction through 90° overnight might have given pause for thought in what was a relatively tight anchorage. GPS alarms are a useful aid, but in this case did not give the skipper enough time to react. Alarms have to be set to a range sufficient for them not to trigger every time the boat veers normally, but to sound when 'serious' movement has taken place.

3. Tandem anchoring is a recognised technique for improving holding power on a single chain. However, there is a risk that when veering loads are applied, the forward anchor is at risk of rolling out of its set.

4. It was fortunate that the yacht grounded on a reef with safe water to leeward. If they had been driven onto a rocky lee shore, the outcome would most likely have been different.

CASE 23

Divers at Work in Port – Ensure Everyone is Fully Aware Before Signing the Permit

Narrative

A team of divers was working in a Scottish port, inspecting steel pile facings. They had already been engaged on the contract, in various areas of the port, for 4 weeks when an incident occurred.

On the morning of the incident, the harbourmaster met with the dive supervisor to discuss the planned operation. It was agreed that the divers would undertake inspections of the main fish quay and that the harbourmaster would inform the vessels using the quayside accordingly.

Two fishing vessels were alongside the quay at the time. The harbourmaster boarded one of them and advised the skipper of the planned diving operations. The skipper then elected to move his vessel to another berth. The harbourmaster notified the agent of the second vessel, a 46m stern trawler, of the diving operations and asked her to inform the skipper.

Unfortunately, when the agent boarded the vessel, she was unable to locate anyone, and decided to leave a note advising of the diving operation on the chart table. She then departed the vessel.

Later, the divers began their inspections and entered the water ahead of the vessel, unaware that no-one onboard had been advised of the operation.

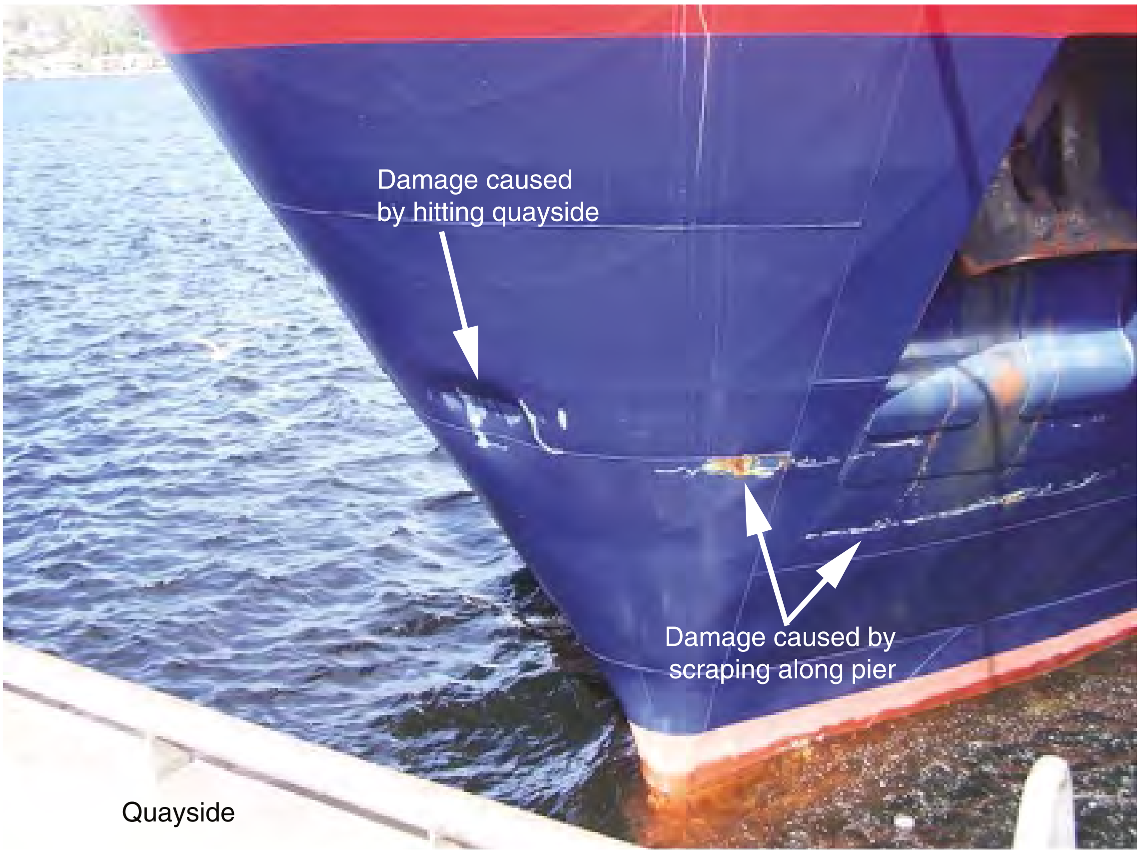


Figure 1

Figure 2

On board the vessel, the engineers began preparations for sailing: they started the main engine and clutched in the drive shaft, even though the bridge was not manned. The vessel was fitted with a controllable pitch propeller, and pitch control was normally transferred to the bridge once the shaft was at full operating revolutions. However, on this occasion, due to a mechanical fault, pitch was applied and the vessel moved slowly ahead. The engineers were unaware of this until they felt the vessel make contact with the quayside. At this time, the skipper had rushed to the bridge, but he was unable to stop the propeller because the control was still in the engine room.

As the vessel moved ahead, she passed through the area in which the divers were working and severed the air supply of one of them. Fortunately, the divers were unharmed because the vessel came off the quayside as it moved ahead, and this provided the divers with a relatively safe area close to the quay wall.

The vessel was subsequently brought under control and a fault was identified in her propeller pitch control system. It was also noted that the vessel had not been properly secured because some of the mooring lines had paid out when she moved ahead.

The Lessons

1. It is essential that a positive reporting process is in place when divers are working in a port area and that everyone is fully aware of the operation. The harbour authority and the dive supervisor must ensure this before signing the permit to work. Notwithstanding the shortcomings on the vessel, no-one on board was aware that diving operations were taking place close ahead.

2. A ship's engineer should never permit the propeller shaft to be turned without the express permission of a responsible person on the bridge.

Kill Cords Save Lives, When Used Properly

Narrative

It was a lovely sunny, calm day in spring, just right for taking a boat out for a spin. This boat was a rigid-hulled inflatable boat (RIB) with a 225hp outboard engine. The owner and a friend planned to take it out for an hour or so and then stop off for a meal before returning to a local boatyard where they could leave the RIB for the night.

In the early afternoon, they stopped off at a marina, and after a lengthy meal with wine started the return journey. The boat was well maintained. As they set off, both occupants were wearing flotation devices and the driver had looped the engine kill cord around his wrist. The boat left the harbour and initially steered a straight course, but the RIB unexpectedly swerved to port, throwing the two people into the water.

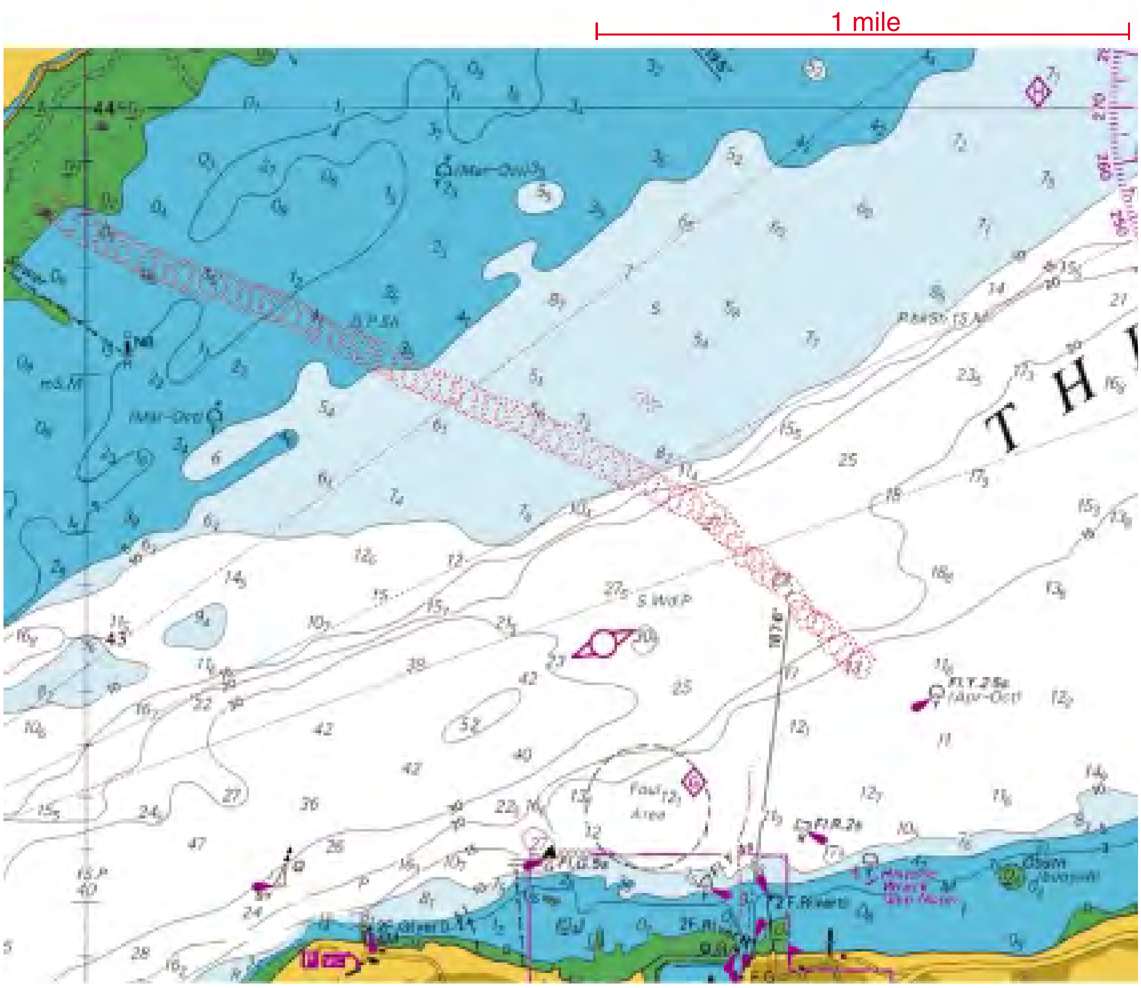
It is thought likely that the driver had seen an object in the water close in front of the boat, and his instinctive reaction had been to turn to avoid it. This had occurred at high speed and at a time when the passenger had momentarily released his grip on the steadying grab handles to retrieve an object from the floor of the boat. While the boat heeled in the sudden turn, the driver reached across the controls to try to steady his friend. This left neither the driver nor the passenger holding on tightly, and resulted in both men being tipped from the boat. In reaching to steady his friend, the kill cord had become entangled with the throttle controls, and despite the cord being stretched as the driver entered the water, it slipped off his wrist before it acted to stop the engine.

The RIB continued at high speed, constantly turning in a spiral and, fortunately, moving away from the people in the water. It grounded at speed and climbed to eventually come to rest on a footpath on top of a sea wall (see photograph).

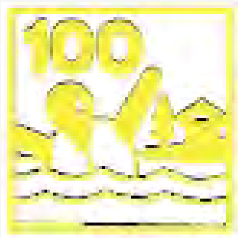
RIB photographed after accident

At first, the two friends spoke to each other in the water, but soon, the driver stopped talking and the two drifted apart. The passenger was not a strong swimmer and only had a 50N buoyancy aid on. The driver had been wearing a manually inflatable 150N lifejacket which, for some unknown reason, he did not inflate. After about 30 minutes, they were seen from a passing ferry, which used its rescue boat to pull them from the water. The passenger was unhurt, but suffering from the cold. Unfortunately, it was not possible to revive the driver.

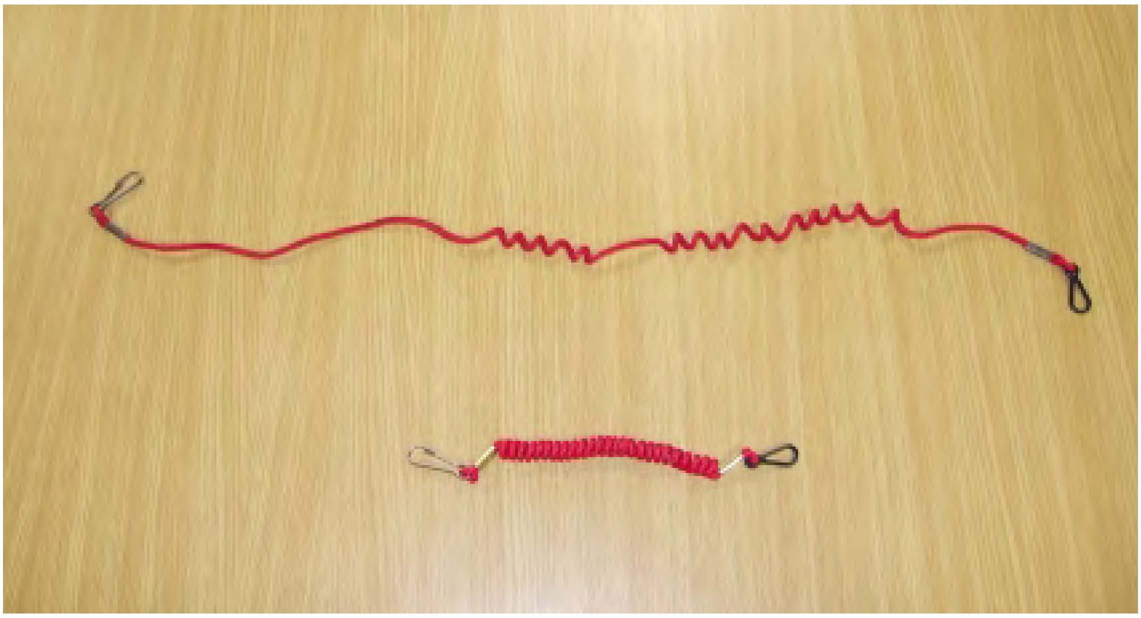
The postmortem report on the driver confirmed that, at the time of the accident, he had been almost twice the legal alcohol limit for driving cars on British roads.



Vessel's actual GPS track after incident

	**Buoyancy aid 50** Standard Application Swimmers only, sheltered waters Help at hand Warning: This is not a lifejacket Relevant European Standard EN393:1993
	**Lifejacket 100** Standard Application Sheltered waters Children under 40kg Relevant European Standard EN395:1993
	**Lifejacket 150** Standard Application Offshore Foul weather clothing Relevant European Standard EN396:1993
	**Lifejacket 275** Standard Application Offshore, extreme conditions Heavy protective clothing Relevant European Standard EN399:1993

Information derived from European Standards for lifejackets and personal buoyancy aids



Stretched kill cord in comparison with new item

The Lessons

A number of factors to this accident have also been contributory in other recent leisure craft accidents. Most are obvious, and they include:

1. Don't drink alcohol and then take a high speed boat onto the water. You never know when you may need quick reactions and all your wits to save your own or someone else's life. Furthermore, if you do end up in the water for any reason, your survival time will be significantly reduced if you have alcohol in your blood stream.

2. The engine kill cord should be connected to the driver's leg or lifejacket harness. Had the kill cord operated correctly in this case, the boat would have remained in the immediate vicinity to provide a possible lifesaving platform. If neither man had been hurt, they might even have been able to reboard the boat and restart the engine. It is also worth noting that the consequences in this case could have been even worse had the boat circled, as a number have done in the past, and then run over the people in the water.

3. A boat should be equipped with safety equipment that is appropriate for the area of intended operation. In this case, the use of buoyancy aids during an offshore passage is not advised; they are only designed for use "by those who can swim and are close to help". When you purchase any flotation device, check it is up to the task you are going to use it for and that it is approved to CE standards. There should always be a picture or written information which identifies its intended use (see figure). If in doubt, discuss what you are going to use it for with the vendor.

4. It is so easy to underestimate the reaction this type of performance vessel will have to a high speed turn. Get to know the limitations and capabilities of your craft, preferably through an approved familiarisation course.

APPENDIX A

Preliminary examinations started in the period 01/07/06 – 31/10/06

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

Date of Accident	Name of Vessel	Type of Vessel	Flag	Size (gt)	Type of Accident
13/07/06	*Marie Claire*	Fishing vessel	UK	157	Flooding
18/07/06	*Corona* *Walzberg*	Fishing vessel General cargo	UK Antigua & Barbuda	8.36 1961	Collision
21/07/06	*Philipp*	General cargo	Antigua & Barbuda	2567	Grounding
24/07/06	Dartmouth speedboat *Seraphica*	Pleasure craft Pleasure craft	UK UK	Unknown Unknown	Collision
01/08/06	*Olesea*	Hire canal boat	UK	14	Fatal acc to person
07/08/06	*Waverley*	Passenger vessel	UK	693	Grounding
10/08/06	*Midland 2*	General cargo	St Vincent & the Grenadines	4966	Grounding
12/08/06	*Mollie Louise*	Pleasure craft	UK	6	Fatal acc to person
12/08/06	*Natalie* *Bay Protector*	Fishing vessel Tug	UK UK	15.71 114	Collision
16/10/06	*Twaite*	Liquid Gas Carrier	Netherlands	1997	Hazardous incident
	Saint Pierre	Fishing vessel	France	103	
17/10/06	*Ennerdale*	Liquid Gas Carrier	Hong Kong	4227	Escape of harmful substance
26/10/06	*Lady Matilda* *Bro Gratitude*	Fishing vessel Tanker	UK Netherlands	5.67 4107	Collision
26/10/06	*Meridian*	Fishing vessel	UK	117	Missing vessel
26/10/06	*Clarity*	General cargo	St Vincent & the Grenadines	986	Grounding
27/10/06	*Kocatepe S*	General cargo	Turkey	2549	Fire/Explosion
31/10/06	*Harvest Caroline*	General cargo	St Vincent	712	Grounding

Investigations started in the period 01/07/06 – 31/10/06

Date of Accident	Name of Vessel	Type of Vessel	Flag	Size (gt)	Type of Accident
01/06/06	*Brothers*	Fishing vessel	UK	1509	Grounding (multiple fatalities)
?/08/2006	*Ouzo*	Pleasure craft	UK	Unknown	Missing vessel (multiple fatalities)
10/08/06	*Thunder*	General cargo	Antigua & Barbuda	1559	Grounding
08/09/06	*Harald* *Octopus*	Tug Barge	UK Belgium	411 Unknown	Grounding
14/09/06	*Sian Elizabeth*	Fishing vessel	UK	13.69	Accident to person
26/09/06	*Thomson Celebration*	Cruise ship	Netherlands, Antiles & Aruba	33933	Fatal acc to person
02/10/06	*Maersk Doha*	Container	UK	51931	Fire/Explosion
17/10/06	*Maersk Dover*	Ro-ro vessel	UK	35923	Hazardous Incident
	Apollonia	Tanker	Greece	160904	
	Maersk Vancouver	Container	Gibraltar	17189	

APPENDIX B

Reports issued in 2006

Abersoch RIB – a serious injury sustained when falling overboard on 7 August 2005
Published 3 February

Anglian Sovereign **–** grounding of UK registered emergency towing vessel near the island of Oxna in the Shetland Islands, 3 September 2005
Published 30 June

Auriga – loss of fishing vessel off Portavogie, Northern Ireland on 30 June 2005
Published 3 February

Berit **–** grounding, Trindelen Bank, near Gedser, Denmark on 5 January 2006
Published 6 July

Big Yellow – hull failure of RIB, Porthmeor Beach, St Ives Bay, Cornwall on 26 August 2005
Published 24 March

Blue Sinata – foundering in Weymouth Bay on 8 September 2005, with the loss of one life
Published 2 March

Border Heather – explosion and fire in Grangemouth, Firth of Forth, Scotland on 31 October 2004
Published 16 February

Bounty – capsize and loss 4 miles off Berry Head, South Devon on 23 May 2005
Published 2 February

Carrie Kate/Kets **–** collision near Castle Point, St Mawes, Cornwall resulting in one fatality on 16 July 2005
Published 24 February

CP Valour **–** grounding in Baia da Praia do Norte, Faial, Azores on 9 December 2005
Published 17 August

Dieppe **–** grounding of ro-ro passenger ferry on the approaches to Newhaven on 5 December 2005
Published 17 July

Emerald Star **–** investigation of vessel making contact with Chevron Texaco Number 6 berth at Milford Haven on the evening of 18 January 2006
Published 24 August

Greenhill **–** grounding and subsequent foundering off Ardglass, Northern Ireland on 19 January 2006
Published 8 August

Harvest Hope **–** capsize and founding of fishing vessel, 40 miles north-east of Peterhead on 28 August 2005
Published 15 August

Harvester/Strilmoy **–** collision in the North Sea on 4 November 2005
Published 14 June

Kathrin **–** grounding of merchant vessel, Goodwin Sands, Dover Strait on 12 February 2006
Published 1 September

Lerrix **–** grounding off the Darss peninsular, Baltic Sea, Germany on 10 October 2006
Published 11 April

Lykes Voyager/Washington Senator – collision in Taiwan Strait on 8 April 2005
Published 10 February

Mollyanna – capsize of sailing dinghy, off Puffin Island, North Wales, resulting in two fatalities on 2 July 2005
Published 15 March

P&O Nedlloyd Genoa **–** investigation of the loss of cargo containers overboard, north Atlantic Ocean on 27 January 2006
Published 11 August

Pastime **–** loss of one man overboard from sailing yacht, in the English Channel on 17 March 2006
Published 8 September

Portland Powerboats – collision during a junior racing event at Portland Harbour, 1 serious injury, on 19 June 2005
Published 31 March

Red Falcon – contact with the linkspan at Town Quay, Southampton on 10 March 2006
Published 3 October

Savannah Express – engine failure and subsequent contact with a linkspan at Southampton Docks on 19 July 2005
Published 7 March

Seasnake – grounding at high speed of leisure powerboat near the entrance to Tarbert harbour, Loch Fyne on 10 July 2005, with the loss of three lives
Published 20 March

Solway Harvester – capsize and sinking of fishing vessel 11 miles east of the Isle of Man on 11 January 2000 with the loss of 7 lives
Published 20 January

***Spruce* –** serious injury to member of crew of the LASH vessel, at Victoria Docks, Hartlepool on 6 March 2006
Published 18 October

***Star Princess* –** fire on board *Star Princess,* off Jamaica on 23 March 2006
Published 23 October

Annual Report 2005 Published May 2006

Recommendations Annual Report 2005
Published June 2006

Safety Digest 1/2006 Published April 2006

Safety Digest 2/2006 Published August 2006