Safety Digest 3/2003

Contents

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. 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.

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.

If you wish to report an accident or incident please call our 24 hour reporting line: 023 8023 2527

The telephone number for general use is 023 8039 5500.
The Branch fax number is 023 8023 2459.
The e-mail address is maib@dft.gov.uk

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 1999

The fundamental purpose of investigating an accident under these Regulations is to determine its circumstances and the causes with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame.

Glossary of Terms and Abbreviations

AB	Able Seaman
ARPA	Automatic Radar Plotting Aid
CPA	Closest Point of Approach
DSMB	Delayed Surface Marker Buoy
EPIRB	Emergency Position Indicating Radio Beacon
FRB	Fast Rescue Boat
GRP	Glass Reinforced Plastic
GT	Gross tons
IMO	International Maritime Organization
MARPOL	International Convention for the Prevention of Maritime Pollution
"Mayday"	Spoken distress signal
OOW	Officer of the Watch
RIB	Rigid Inflatable Boat
VHF	Very High Frequency
VTS	Vessel Traffic Services

Introduction

One of the saddest parts of my job is to see the number of deaths and serious injuries that result, not from exceptional or freak occurrences, but from absolutely routine business. It is in such work that seafarers are least alert, and when tired or busy mariners fail to recognize the risks.

I was thus fascinated to read an excellent publication from "*Step Change in Safety*", an umbrella safety organisation for the offshore industry. It attempts to draw out the lessons from deaths in the offshore sector; with permission, reproduce extracts from the report which are equally applicable to our industry:

"There are several common threads running through these fatalities. The most common is *that of mistaking 'routine' for 'safe'*. We manage complex operations effectively but at times exercise inadequate control over risks arising from routine operations. *Responsibility* for this lies with *personnel at all levels........* At times we also fail to plan, design and supervise such routine tasks adequately, to make them as tolerant to human error and variations in human behaviour as possible."

Common threads identified include:

1. "Routine tasks are consistently underestimated in terms of the risk they pose.

Re-examination of routine tasks is necessary across the industry to assess exposure.

2. Supervisors are not spending sufficient time at the work site. *Supervisors need to spend more time supervising and setting expectations and need to have sufficient administrative support to ensure that they achieve this.*

3. Workers are vulnerable because they do not perceive the risk - or deem it acceptable (i.e. part of the job). *Peoples' risk perception needs to be constantly challenged particularly in the area of routine tasks.*

4. The extent to which established procedures are ignored is significant. *The reason behind this needs to be an ongoing and active discussion on all installations.*

5. Procedural violations were often observed *but tolerated thus...*

a. The obligation to intervene must be embedded, but...

b. People don't like to get involved and need to practice, and in practicing...

c. People need to learn to be sensitive in offering challenge (criticism) and generous in receiving it.

6. The credibility and use of risk assessment is not at the required level. *The character of risk assessment must be changed - in particular the written form.* The starting point must be the question - What is useable, meaningful and useful to the workforce? Risk assessment should be live, should stimulate thinking, be an integral part of planning and be useful and useable i.e. well laid out - rather than driven by regulatory concern." Let us use the lessons from another sector to make our own industry safer.

Stephen Meyer
Chief Inspector of Marine Accidents
December 2003

Part 1 - Merchant Vessels

A safety officer, MAIB investigator, or anyone else involved with safety investigation, is not satisfied in finding out just "whodunnit". Accident investigation is about understanding why accidents happen, and realising the underlying problems that have to be addressed for future safety.

Even the most safety conscious of us will, occasionally, initiate unsafe acts such as those reported in this *Safety Digest*. Most of us do not commit these acts on purpose! The engineer did not mean to flood the engine room; the bridge watchkeeper did not intend a close quarter situation; the master did not want the ship to take a 25° list.

Complacency is a word often discussed at the MAIB. People do things without appreciating the dangers. Routine, but unsafe, practices that have continued for months, if not years, are assumed to be safe simply because they have been undertaken without incident. A mooring winch, reported in this issue, was unfit for use, yet the crew had continued to use it in this condition until it killed a shipmate. Nobody: crew, classification society surveyor, manager, questioned its fitness for purpose until the accident.

It is likely that readers will know what solutions are needed to prevent another dreadful accident such as this. But what is also important is the need for forethought and an awareness of what can be done to avoid hazards. We should ask ourselves if instructions and warning signs are understandable and easy to follow. An awareness of what might occur is often forgotten through habit and expectation.

Forgotten knowledge, are you ready for an update?

Case 1: 2a and not 2b - That is the answer!

Narrative

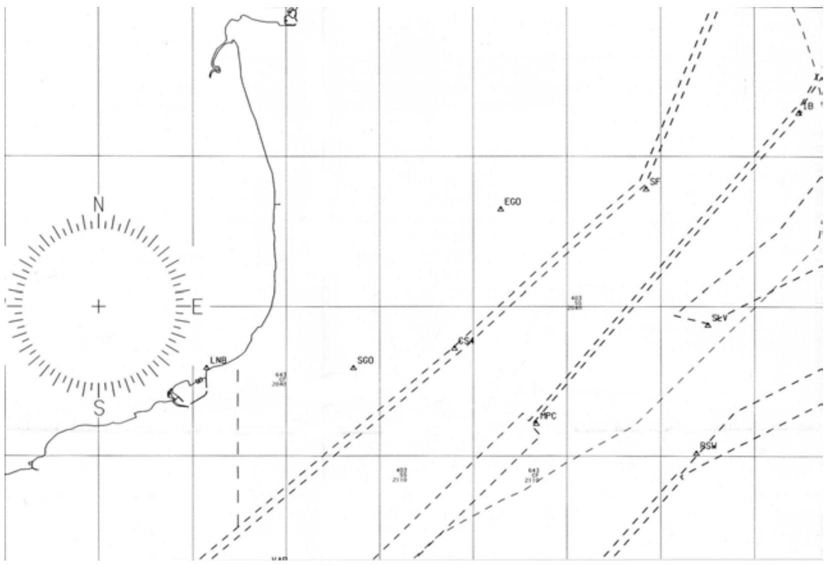
An oil tanker was on passage in good visibility in the south-west lane of the Dover Traffic

Separation Scheme. A ferry had departed Dover on an easterly course with the intention of crossing the south-west lane at right angles to the general direction of traffic flow.

At about 2050, the ferry altered course to approximately 120°. At this time, the tanker was at about 5 miles range, and the alteration resulted in a predicted clearance of about 0.25 mile ahead of the tanker at a predicted time of about 2100.

The tanker's OOW misinterpreted the predicted clearance, and was satisfied that a risk of collision did not exist. The ferry's OOW, however, interpreted that a risk of collision did exist and, at about 3 miles range, gave a series of flashes to prompt the tanker to take avoiding action. He then attempted to contact the tanker by VHF radio and gave another series of flashes before deciding to take avoiding action himself by altering course to port.

The tanker's OOW maintained course and speed, and the ferry passed down the tanker's starboard side at a range of about 0.25 mile.



Extract from CNIS Plot showing the respective tracks of the tanker and the ferry

The Lessons

The Collision Regulations make it clear that if there is any doubt as to whether a risk of collision exists, it shall be deemed to exist. In this case, however, the tanker's OOW had misinterpreted the predicted clearance and, consequently, was confident that a risk of collision did not exist. It is for this reason that the Collision Regulations provide stand-on vessels with an option to avoid collision by their action alone as soon as it becomes apparent that the give-way vessel is not taking appropriate action in compliance with the Rules.

The ferry's OOW indicated his doubt by giving a series of flashes. This was recognised by the tanker's OOW; however he chose to maintain course and speed as he had originally intended. In doing so, he unnecessarily placed a burden of responsibility on the ferry's OOW to consider what best action to take. Rule 2(a) requires an OOW to be alert to special circumstances and to take precautions in accordance with the ordinary practice of seamen. In this case, it would have been seaman-like to have heeded the ferry's doubt, assumed a risk of collision to exist, and altered course to starboard around the ferry's stern. By maintaining course and speed, the OOW merely prolonged a period of uncertainty and thereby reduced the safety margins available to both vessels in which to prevent a collision.

1. The ferry's OOW had an option of waiting for a suitable gap in the traffic before altering course to cross the traffic lane. He should have recognised that, by altering course at that time, at the edge of the traffic lane, he would create a risk of collision with the tanker, and that time would be limited for the tanker's OOW to assess the situation and take sufficiently early and substantial action. Such forethought derives from good seamanship, a quality required by Rule 2(a).

2. If circumstances permit, Rule 17(c) requires a power-driven vessel which opts to take action in a crossing situation, not to alter course to port for a vessel on her own port side. However, the ferry's OOW considered that an alteration of course to port could be executed safely in view of the vessel's high manoeuvrability and speed.

In requiring an OOW to be alert to special circumstances, including the limitations of the vessels involved, Rule 2(b) permits an OOW to depart from the Rules when necessary to avoid immediate danger. In this case, the ferry's OOW had alternative options, such as reducing speed or altering course to starboard to parallel the tanker's heading. An alteration of course to port was unnecessary in the circumstances and, therefore, contrary to Rule 2(b) as well as Rule 17(c).

Had the tanker's OOW altered course to starboard, albeit belatedly, in response to the ferry's signal, uncertainty would have prevailed and a collision might then have resulted despite the ferry's high manoeuvrability and speed.

Case 2: Communications...Communications ...Communications

Narrative

In preparation for going to sea, a hydraulically powered deck crane on a 70m vessel was being stowed. During this operation, the piston rod of the jib control cylinder failed. This allowed the cylinder to fall and the jib to swing out from the crane body.

There was no load on the crane at the time, and there were no injuries.

The crane was disabled and securely lashed to allow the vessel to go to sea.

The piston rod failed at the site of an earlier repair. This was a temporary welded repair, performed to allow the crane to be safely stowed while a new replacement piston rod was found. The material of the rod was unsuitable as a permanent welded repair, in a safety critical, load-bearing component. However, the crew had assumed the repair to be permanent and, quite naturally, were very concerned by this failure.

The Lessons

1. Ship's staff, who operated the crane when the piston rod failed, were unaware of the purpose of the temporary repair. Clear communication with the 'repairers' should have established the nature of the 'repair'.

2. Had the repair been a permanent one, the crane should have been examined and load tested according to regulation. Until such examination and tests were completed, the crane should have been clearly identified as being out of service and disabled.

3. Owing to crew changes, ship's staff were unaware of the purpose of the temporary repair to the piston rod. Communication at crew changes is vital on matters associated with safety critical systems such as lifting gear.

Case 3: A Nasty Surprise

Narrative

A steel workboat, capable of carrying 98 passengers, and operated in sheltered waters, had just been boarded and prepared for departure. Before she cleared the berth it was noticed that she was down by the head. The passengers were safely disembarked.

It was found that a void space forward was flooded.

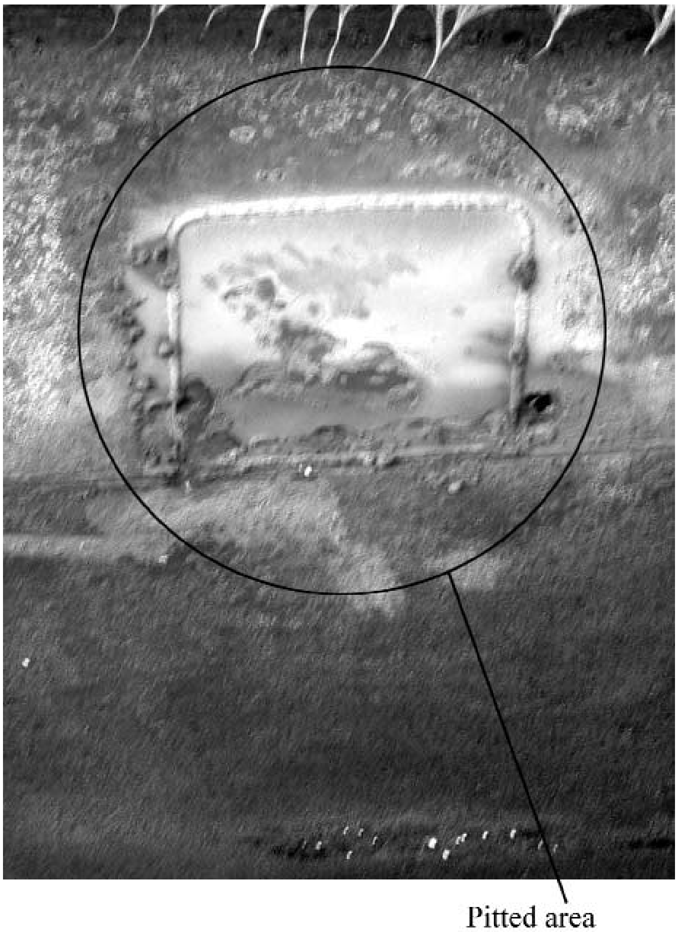
The vessel was taken to a nearby slipway and hauled from the water. A hole, about 4cm diameter, was found in the hull plating about 50cm below the normal waterline (see figure). This was the cause of the flooding.

Further areas of unexpectedly heavy pitting were found in other parts of the hull.

The vessel had been surveyed about 10 months previously, when the hull's anodes were found in good condition. Many years of operating history in the same area caused the owners to believe they would comfortably last until the next planned survey.

Further investigation established that the vessel had recently changed her duties. From being in use every day, she had been relegated to a standby role and, consequently, was used only once a week. She thus spent most of her time at a lay-up berth alongside a pier constructed of steel.

The owners concluded that stray electrical currents between the steel pier and the vessel's hull in the lay-up berth had contributed to accelerated wastage of the anodes. In turn, corrosion rates of the hull then became significant and resulted in the perforation and flooding.



Close up of pitted area on the hull of the vessel

The Lessons

1. Accelerated wastage of anodes can be caused by changes in operating conditions. Rapid hull corrosion can follow.

2. Damaging stray electric currents can also be the result of electric welding on board without proper earthing. Other electrical equipment, such as battery chargers supplied by shore power, can cause them too.

Case 4: Cargo Shift in Heavy Weather

Cargo vessel at sea

Narrative

A ship carrying just over 10,000m^3 of timber packages, of which about one third was stowed on deck, encountered a severe gale and high seas while on passage in the English Channel. Proceeding directly into the wind and sea caused her to pound, which made it unsafe for her crew to check and tighten the wire lashings securing the deck cargo. Although speed was reduced from about 12 knots to 8 knots through the water, large amounts of water were shipped on to the deck cargo.

About 2 hours after darkness had fallen, loud bangs were heard from the cargo deck as two of the wooden uprights used to help secure the stow were broken. The master realised the deck cargo had started to shift and altered course to port to close the French coast; the nearest place of safety. Speed was also increased to 12 knots. On the new course, the sea was now about 35° on the starboard bow, and the ship started to roll more heavily. About 20 minutes later, she rolled heavily to port. This caused the deck cargo to shift about 0.5m across the deck and to break all of the remaining uprights on the port side. The ship immediately listed to between 10° and 15° to port.

Speed was reduced to 8 knots, and course was altered very slowly to put the sea on the port side to try and shift the cargo back to starboard. As the ship's motion was more comfortable on this heading, speed was again increased to 12 knots to close the English coast. Two tanks on the starboard side were then ballasted but, although this reduced the ship's roll, her list continued to increase.

Several hours later, the ship experienced a total electrical failure, and the main engine stopped.

Soon after, an attempt was made to jettison some of the deck cargo but, although the crew managed to cut the after-most wire lashing, the cargo did not move. As the next lashing wire could only be reached by moving along the edge of the bulwark outside the cargo stow, the cutting of further wire lashings was considered to be too dangerous. The chief engineer then succeeded in restarting one of the ship's main generators, which ran for less than 2 hours. During this time, however, the main engine could not be restarted because its fuel boost pumps had been saturated by water from a damaged sea-chest pipe.

After being informed that there was little prospect of either electrical power or propulsion being restored, and as the list had increased to about 40°, the master requested assistance. The crew were evacuated by helicopter and taken to safety, and the abandoned ship grounded about 12 hours later. About 70% of her timber cargo was lost overboard and swept up on to nearby beaches.

The Lessons

1. It is not a coincidence that nearly all timber cargo shifts occur during bad weather. In such conditions, a deck cargo can be hit with great force by considerable amounts of water taken over the bow, large amounts of water can get under tarpaulin covers and among the cargo, and pounding and rolling can generate tremendous shock loading on the cargo and its lashings. Obviously, bad weather should be avoided if at all possible, even if this means deviating from the passage plan and sheltering for several hours. When this is not an option, however, each course and speed alteration must be carefully judged, bearing in mind the vulnerability of the deck cargo at all times. As the relevant IMO Code of Practice advises:

> *In cases where severe weather and sea conditions are unavoidable, masters should be conscious of the need to reduce speed and/or alter course at an early stage in order to minimise the forces imposed on the cargo, structure and lashings. The lashings are not designed to provide means of securing against imprudent ship handling in heavy weather.*

2. During the course of a voyage, vibration causes a timber deck cargo to settle, which results in its wire lashings loosening, and leaving little else but the timber's own weight to keep it in place. This problem is usually overcome by checking and tightening the lashings on at least a daily basis when at sea. It is sod's law, however, that when in rough seas and a cargo shift is most likely to occur, this is not always possible. It certainly cannot be done safely unless guard wires or lifelines are rigged to provide safe access to the turnbuckles.

3. The jettisoning of a timber deck cargo can be extremely dangerous, even when slip hooks are fitted on each wire lashing. Some brave soul is usually required to stand on the cargo which is to be jettisoned; akin to sawing off a branch while sitting on it. It would not be surprising, therefore, if volunteers to undertake this task were slow in coming forward. Cutting the lashings from a more accessible area is also just as precarious, as any subsequent movement of the cargo is at the mercy of the sea. Think twice before attempting to jettison a timber cargo, and always bear in mind the safety of the people involved.

4. The use of uprights by ships carrying packaged timber deck cargoes has decreased in recent years, and indeed many modern ships have no provision to have them fitted. When uprights are still used, however, the support they provide is considerably increased when hog wires are also rigged.

5.Remember, it is speed through the water, not speed over the ground, that is relevant when determining the speed at which steering can be maintained. Speed over the ground can be very misleading in this respect.

6. Ships' machinery is generally designed to operate up to an angle of heel of 22.5°.Don't rely on it thereafter.

Footnote

In August 2003, the MAIB published its *Timber Deck Cargo Study,* which contains accounts of eight accidents involving a transverse shift of cargo. Further information can be obtained by contacting us at the office, or the report can be viewed on our web site at www.maib.gov.uk.

Case 5: Modified Bilge Pipework Causes Flooding

Narrative

A high-level bilge alarm located in a storeroom sounded as a ro-ro ferry prepared to enter harbour. Her duty engineer operated the bilge valves and emergency bilge pump remotely from the machinery control room.

Minutes later, a second bilge alarm, that of the forward machinery space, sounded. Another engineer investigated and found the water level there to be rising. The bilge suctions were changed over to this space, which also contained the emergency bilge pump. However, the water level continued to rise.

Although additional crew members were called to assist, the water level continued to rise and, eventually, reached the starter for the emergency bilge pump, causing it to fail. A second pump was started, and this stabilised the water level.

Once the ferry was alongside, divers fitted a cover to the overboard discharge of the forward machinery space, and the water was pumped out using portable salvage pumps.

Investigations found that the recently installed test valve on the emergency bilge pump discharge line had been left open after a previous test, despite the posting of warning notices giving instructions in the correct procedures. They also revealed that the overboard discharge valve did not have a non-return capability, adding to the risk of flooding.

An overboard non-return valve has since been fitted to this ship. However, the crew must close the test valve when not being used for test purposes. Failure to do so will result in future flooding.

The Lessons

Flooding can cause vessels to suffer contamination of fuel, loss of electrical power, loss of engine power and damage to cargo, as documented in MAIB records. In addition, it can result in the movement of cargo, loss of buoyancy and loss of stability. Serious listing can follow, which can sometimes lead to capsize and the total loss of the ship. Yet subsequent investigation by the MAIB suggests these dangers are rarely appreciated, or are underestimated by those on board, so are not always effectively guarded against.

1. In this incident, procedures for testing the emergency bilge pumps in the forward machinery space were not followed, and the test valve was left open. Consequently, when the overboard valve was opened from a remote position, backflooding occurred. Unless procedures for operating machinery and associated equipment are adhered to, they are of little use, and accidents are more likely to occur.

2. Warning notices, indicating the normal position of valves and other controls, may reduce the likelihood of similar mistakes. Such notices, however, can only be effective if they are clear and are posted in a language which the crew understands.

3. Does your ship have a similar arrangement that has an open-ended pipe connected to the bilge or ballast system, and with only single valve isolation? Is the risk of backflooding fully recognised, and are there adequate precautions to prevent it happening to you? Modifications to shipboard systems need to be thoroughly explored to lessen the risk to the safe operation of the ship.

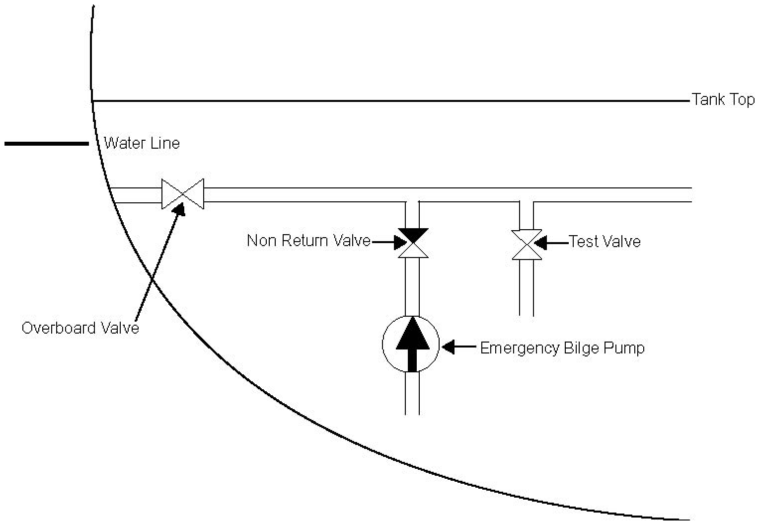


Diagram of valves

4. Use of emergency bilge pumps, which pump directly overboard, for normal bilge operations, may result in contravening MARPOL regulations in addition to company requirements.

5. Electrical equipment for emergency bilge pumps must be positioned above the vessel's bulkhead deck to prevent the emergency bilge pumps from being disabled by the very water they are meant to be removing. Does your system meet this criterion?

6. A flooding vessel is a frightening situation, one that you will not readily forget. Could it happen to the vessel you are on now? Find out - check your pipework.

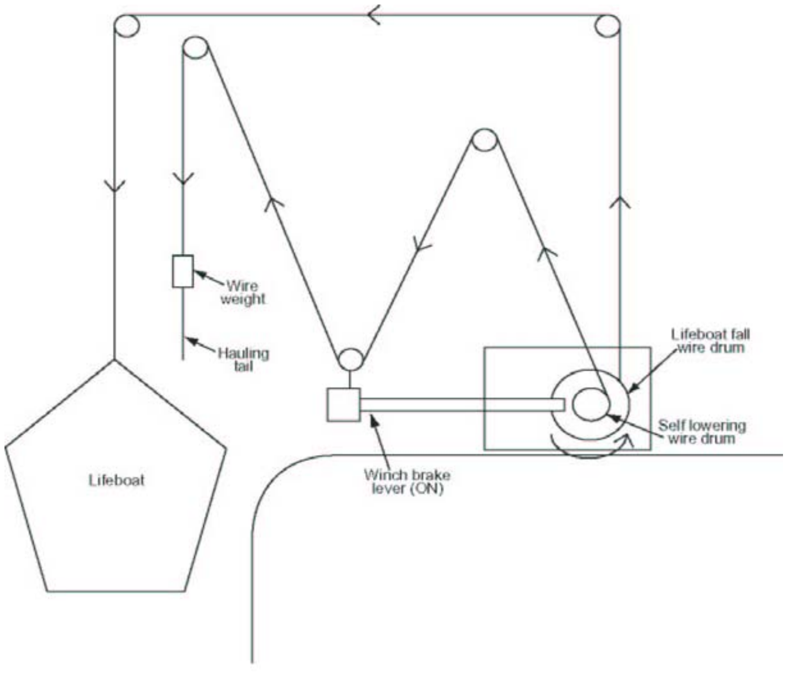
Case 6: Who is Lowering the Lifeboat?

Narrative

In recent years, many accidents have been reported in the marine industry involving the lowering of lifeboats.

One of the main causes of these accidents has been the "snagging" of self-lowering control wires while the boat is being lowered using another means. This has the effect of fully opening the winch brake, allowing the boat to run away on the centrifugal brake. This "uncontrolled" running away at maximum speed, checked only by the centrifugal brake, will only be arrested when either the remote lowering control wire parts, allowing the brake to return to the "on" position, or when the boat reaches the water. This has the potential to cause injury to any persons in the boat, a hazard to any other boats positioned under it, and has the added risk of causing serious damage to the boat and davit. One should also be aware that this type of accident can happen while underway at sea, with potentially a more serious outcome.

In this case, an officer on a passenger vessel was engaged in lowering the vessel's tenders, under power from the deck, to the sea, shortly after the vessel arrived at her anchorage. The boat crew were in the boat for the operation. When the boat had been lowered about halfway down to the sea, the paying-out self-lowering wire jumped from its drum and caught on the opposite side of the drum, so that it began hauling back in. This resulted in the weight attached to the wire rising. It then become fouled around the davit arm span wire, which resulted in the brake arm being lifted, releasing the brake.



Schematic - Lifeboat lowering system, showing the normal direction of wires when lowering

Figure 1: Schematic - Lifeboat lowering system, showing the normal direction of wires when lowering

The boat suddenly plummeted to the sea at the speed allowed by the centrifugal brake.

Although some minor damage was caused to the davit structure, the tender crew sustained no injuries.

The Lessons

1. Being observant, and understanding the equipment being used, will limit the opportunity for a minor hitch to develop into a time consuming and potentially life-threatening situation.

2. Great care must be taken when maintaining and adjusting the self-lowering control wires.

3. When lowering and hauling up lifeboats, it is good practice to visually check the free movement of all blocks and running gear during each and every operation.

4. It should be noted that the complicated rigging arrangements of some designs of lifeboat davits increases the risk of wires becoming snagged or jamming. All persons should therefore be alert to the possibility of a problem, and lowering should be stopped immediately if a fault is noticed.

5. Maintenance of davit winches should be carried out by competent authorised persons, to ensure correct operation of the braking systems.

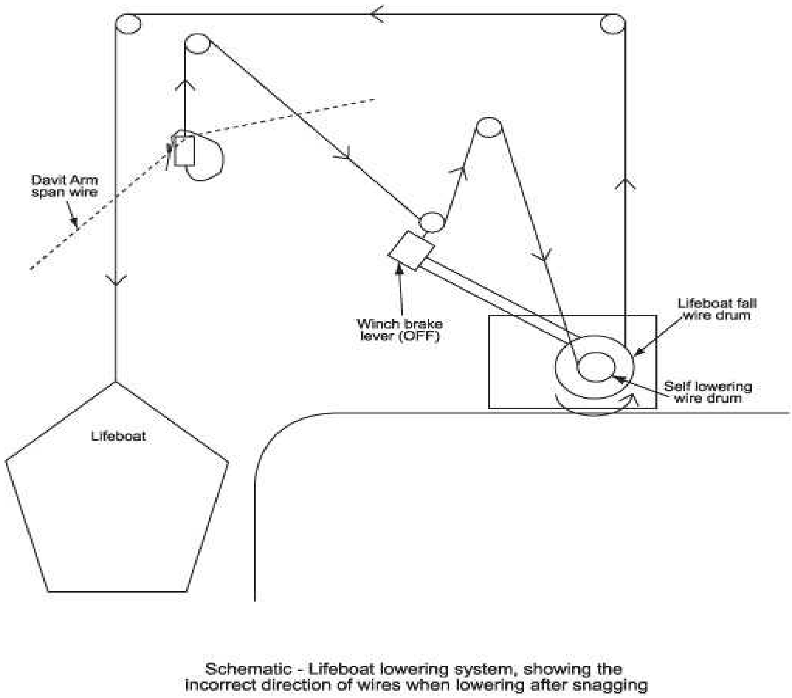


Figure 2: Schematic - Lifeboat lowering system, showing the incorrect direction of wires when lowering after snagging

Case 7: Delayed Action - Real Time Collision

Narrative

While on passage on a course of 075° at a speed of 13 knots, the OOW of a chemical tanker carrying almost 5000 tonnes of caustic soda, saw a vessel 5 miles on his port bow. By ARPA, the other vessel had a CPA of 0.5 mile to port. The OOW identified this vessel as a vessel engaged in fishing by her green and white lights at the masthead. At the same time, the skipper of the fishing vessel, which was a beam trawler, saw the masthead lights and port sidelight of the chemical tanker on his starboard bow, and estimated that she would pass close ahead.

When the vessels were about 1 mile apart, the tanker's OOW assessed the fishing vessel had altered course to port and was now on, or near, a steady bearing. Concerned about the close quarters situation that was developing, he flashed a hand-held signal lamp towards the fishing vessel. Meanwhile, the skipper of the beam trawler, who had not altered course, realised that the tanker would now pass very close ahead.

After trying without success to contact the tanker on VHF radio channel 16, he adjusted the autopilot 90° to starboard, and reduced speed to about 2 knots to increase the passing distance. Although the helm on the autopilot was set to 20°, the rate of turn was very slow because the fishing gear was being dragged along the seabed.

The tanker's OOW became increasingly worried and tried to call the fishing vessel on VHF radio, and alert her by further use of the signal lamp. He felt unable to safely alter to starboard because of the proximity of another ship on his starboard quarter. By that time, the two vessels were extremely close, and in the absence of any apparent action by the fishing vessel, the OOW ordered the helmsman to put the helm hard to port; he also put the engine telegraph to stop, and alerted the master. Moments later, the fishing vessel skipper saw the tanker turning towards him and switched to hand steering. He then put the helm hard to port, and released the brake on the starboard winch to allow the fishing gear to run free and enable the ship to turn more quickly.

Within seconds, the ships collided, with the tanker's starboard bow hitting the end of the trawler's starboard derrick. This momentarily pushed the trawler sideways through the water until the derrick folded in half under the strain. Fortunately, nobody was injured, there was no pollution, and the fishing vessel was able to return to port under her own power.

The Lessons

1. Vessels engaged in fishing are not very manoeuvrable. It is, therefore, sensible that the collision regulations place the onus on power-driven vessels to keep out of their way. Gauging the distance at which it is safe to pass such vessels, however, is not easy and depends on a host of factors including vessel manoeuvrability, navigational constraints, environmental conditions and bridge manning. An OOW can control the movement of his own ship, but can do absolutely nothing about the movement of others. Application of the 'what if?' question, along with taking nothing for granted regarding the movement of other vessels, are very useful tools to help an OOW stay in charge of his own destiny.

2. The aspect of fishing vessels can frequently change because of their relatively small size and slow speed, particularly in bad weather. This increases the difficulty in determining their courses, speeds, and expected CPAs, with OOWs regularly asking themselves questions such as: 'Where is she going?' 'What is she doing?' and 'Is she altering course or not?' In such circumstances, the vessels must be monitored continuously, the information gleaned from radar and ARPA must be checked for consistency, and any uncertainty in a vessel's course and speed should be taken into account when deciding on the distance at which to pass.

3. Fishermen seem to believe that when a merchant ship is the give way vessel, she will not alter course until the last possible moment; merchant OOWs appear to hold a similar view of fisherman. Consequently, a game of 'chicken' frequently results with action not being taken by the stand-on vessel, or vessel engaged in fishing, in the belief that the give way vessel, or the vessel required to keep clear, will do so albeit late. Such an assumption is a very dangerous one to make: not all watchkeepers are equally conscientious and competent. Be right, but not dead right!

4. When vessels are in close proximity and closing, an OOW cannot afford to be tied up talking on the radio or flashing a light. For instance, given a vessel on the bow at a range of 1 mile with a relative closing speed of 20 knots, the ships are closing at a rate of 18 seconds per cable, which gives an OOW only 3 minutes to have taken avoiding action. The longer positive action is delayed, the less chance it has of being successful.

5. The imprudence of using VHF radio as an aid to collision avoidance, particularly when ships' identities are unknown, and language difficulties can be expected, has been well documented. Even if a response is received, which is frequently not the case, there is no guarantee that the ship replying is the ship in close proximity. This can lead to time-wasting and meaningless conversations along the lines of 'who's that there saying who's that there?' At the risk of playing an old record, everyone should be aware of the limitations of VHF radio; its use might not be the best course of action.

6. When other shipping prevents an alteration of course required to avoid a collision or increase the CPA of another vessel, there is sometimes no option but to slow right down or stop. Don't be reluctant to do so.

7. It is better for a master to be called whenever an OOW has the slightest doubt, than to be called too late or not at all.

Case 8: Hidden Corrosion Causes Ingress of Seawater

Narrative

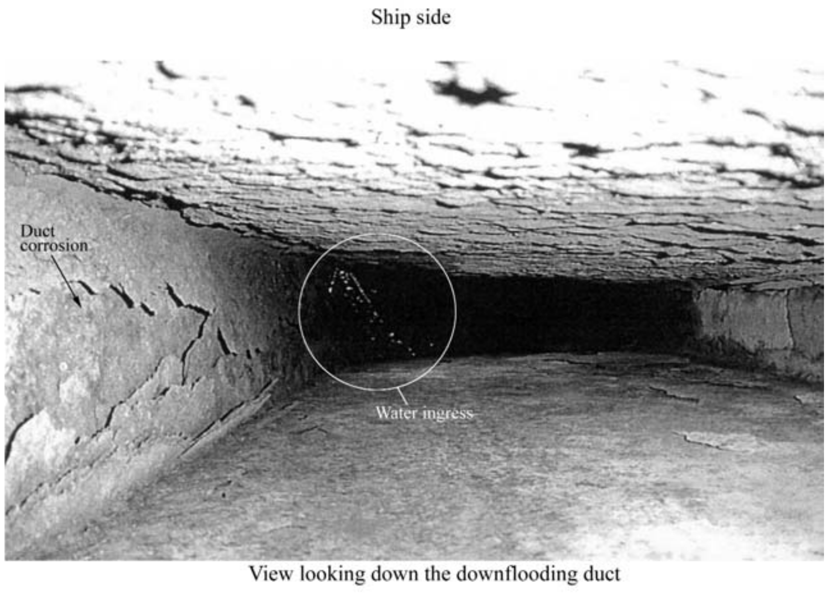
While sailing with about 2000 people embarked on a 9-day cruise, a routine inspection of all tanks and void spaces on a 20-year-old passenger ship revealed a slow ingress of water.

The ship's crew's initial examination did not reveal the reason for the water ingress. It was not until she made port that divers found one vertical crack and two small holes in the ship's starboard side. The crack could not be seen from within the ship as it was in the vicinity of a vertical downflooding duct or trunk. When the duct was opened up, serious corrosion to the ship's side was exposed.

The ship was fitted with ten pairs of similar ducts for damage stability purposes: if an upper space became damaged and flooded, seawater would downflood through the ducts to the lower void/ double bottom tanks and add extra bottom weight, re-establishing a level of stability.

Inspection of all the ducts on board revealed that four of the ten ducts were badly corroded (see photograph) in the vicinity of the crew's galley. The corroded ducts passed through the high temperature compartments of the galley and bakery and, owing to the temperature difference between the hull and the inboard duct plate, the water vapour in the air condensed on to the colder ship's side plate, which caused the corrosion.

To make the ship operational, it was necessary to replace two 8 metre vertical lengths of shall plating in way of the corroded ducts.



View looking down the downflooding duct

The Lessons

1. A proper protective paint coating system on the inside of the duct would have withstood the condensation better.

2. Had the duct been covered with thermal insulation, the temperature difference and, hence, the condensation, would have been reduced.

The insides of the downflooding ducts have now been included in the ship's inspection programme.

Case 9: Two Unplanned Trips

Narrative 1

During a ferry crossing, an assistant steward was returning from the crew mess to his workplace. This involved him descending a steep stairwell between decks.

He either slipped or tripped on the stairwell, tumbled to the bottom and crashed into a fire door.

He suffered a twisted ankle and needed time off work.

Narrative 2

After completion of a dry docking, a north sea supply vessel was on a lay-by berth while work in her engine room was carried out.

The chief engineer and a fitter needed to gain access to the main engine lube oil filters. To do this, they removed a section of the engine room deck grating. This left a gaping hole.

When the chief engineer returned to the engine room he fell down the hole left by the missing grating. He sustained lacerations to one of his legs and required time off work.

The Lessons

1. The above cases clearly illustrate the hidden - and sometimes not so hidden dangers lurking on board every ship:

- **Stairwells are hazardous.**
- **Steep stairwells are very hazardous.**
- **During rough weather, stairwells are subjected to unexpected and sudden movement, which makes them extremely hazardous.**
- **Poorly maintained, steep stairwells, during rough weather, are positively dangerous.**

2. Always remember that your movement around a ship is fraught with danger:

- **Use the handrails**
- **Take care**
- **Pay attention.**

3. Narrative 2 demonstrates how gaping holes act like magnets. If there is a hole in which to fall, the odds are that someone will! Question the wisdom of leaving exposed holes, and take precautions to safeguard you and your fellow workers, particularly if you feel under time pressure.

4. Tiredness towards the end of a long shift can reduce your perception of hazards. Taking a little extra time to carry out a job will limit the opportunity for that accident to bite you when you least expect it.

Case 10: Suspended Weight and Unsecured Cargo Lead to Severe List in Port

Narrative

A 4600gt ro-ro vessel on passage from Norway to England called into a Scottish port enroute to discharge some containers and piping.

During discharge, the vessel was being unloaded in three different areas: via the stern doors, using a tug-master; through the side door, using a forklift truck; and the ship's crane was being used to unload deck cargo. Before the discharge operation began, the crew had undone the lashings and twist locks on the containers that were due to be unloaded.

Halfway through the operation, a 28 tonne container was lifted clear of the deck, ready for discharge on to the quay. As the crane driver moved the container, which was suspended in the air towards the quayside, the vessel suddenly heeled over to starboard, towards the quay, by an estimated 25°.

The container came crashing into the quay and was badly damaged, spilling part of its contents, Class 9 dangerous goods, into the harbour. In addition to this, two other deck containers were severely damaged. On the vessel's lower deck, there was a major shift of lashed bundles of piping, and the stern door became wedged against the link-span. This reduced the freeboard to 300mm on the vehicle deck level.

After all but three of the crew had been evacuated ashore, the master began transferring ballast from starboard to port, and slowly offloading the remaining deck cargo on the starboard side to return the vessel to upright.

No injuries were sustained and, although the spillage from the container resulted in slight pollution, this was contained by the emergency services.

The Lessons

1. The cause of the accident was deemed to be operator error. Loading and discharging cargo needs to be carefully planned, particularly taking into consideration the effect it will have on the vessel's stability. Unless you are absolutely sure what is being discharged, and in what order, it is important to load or discharge one area at a time in accordance with a loading/ unloading plan. Weights being added or removed randomly, especially when suspended in the air by a shipboard crane, will have an adverse effect on stability.

2. Never undo lashings or twist locks on containers or any other cargo until just before discharge. Loose cargo only compounds the problem of an unexpected list, whether at sea or in port.

Case 11: If in Doubt - Get Out!

Narrative

A large dry cargo ship was on ocean passage. It was daylight and the weather was fine with clear visibility. The OOW saw a crossing vessel on his port bow and interpreted his to be a stand-on vessel within the meaning of the Collision Regulations. As such, he maintained course and speed.

The other vessel was, in fact, a research vessel, displaying the appropriate signal for a vessel restricted in her ability to manoeuvre. Her OOW interpreted the cargo ship to be overtaking and so maintained his course and speed.

When the cargo ship approached to within 0.2 mile, her OOW sounded one blast on the whistle but took no avoiding action. The research vessel's OOW responded by altering course hard to port, resulting in the cargo ship passing clear at a distance of about 0.1 mile.

The Lessons

1. The cargo ship's OOW interpreted it to be a crossing situation, and saw no reason to take avoiding action. However, the research vessel was restricted in her ability to manoeuvre and her OOW interpreted that he was being overtaken which, in either circumstance, would have placed the obligation of keeping out of the way on the cargo ship.

2. As a stand-on vessel, the cargo ship's OOW would have had the option of taking action in accordance with Rule 17(a)(ii) of the Collision Regulations, which would have prevented a close quarters situation developing. As a give-way vessel, he was required to take early and substantial action in accordance with Rule 8. Such situations require a sensible approach. Whether yours is the give-way vessel or not, the Collision Regulations provide a means by which close quarters situations can be avoided. A selective and inflexible interpretation of the Collision Regulations is unnecessary and dangerous.

3. The cargo ship's OOW later suggested that useful lessons to be learned from this incident were to use the radar at all times and to call the master at once. While such action is no doubt wise in certain circumstances, this was a close quarters situation in clear weather and open waters, which could have been avoided simply by observing good seamanship, keeping a proper lookout and taking appropriate action in accordance with the Collision Regulations.

Case 12: Painter Away!

Narrative

A ro-ro passenger ferry with no passengers on board was undertaking a training exercise to launch her 6m fast rescue boat (FRB) while underway.

The FRB was crewed by three personnel: a second officer and two seamen. All were wearing self-inflatable lifejackets and waterproof trousers.
None was wearing a survival suit.

The FRB was launched, cleared away and recovered successfully. However, the master observed that the davit wave compensator had not been used correctly, so he ordered a repeat of the exercise.

The second officer remained in charge of the FRB, while another two - similarly dressed -seamen took the place of the first two.

The FRB, towed by the painter, was lowered into the water, with the suspension hook still attached. The seaman at the bow waited for the instruction to release the painter.

With the suspension hook located behind him, the second officer gave the signal to release the painter; he was assuming the seaman behind him had released the hook. He had not. Realising the error, the seaman in charge of the suspension hook immediately attempted to release it, but his efforts were unsuccessful. The pull of the fall wire caused the FRB to broach.

Although the ship's engines were quickly put astern, one of the seamen was thrown into the sea, into water estimated to be about 8C. He remained in the water for almost 20 minutes, before the second FRB was launched successfully and was able to recover him. Minutes later, the crew from the broached FRB were also recovered.

Damage to the FRB and davit head required the FRB to be towed into harbour for repairs.

The Lessons

1. The significant factor in this accident was the second officer's decision to release the painter. He did so without first receiving confirmation that the suspension hook had been released. Put differently, he made assumptions instead of following procedures.

2. A pre-exercise briefing for all concerned of the hazards involved in such an exercise will reduce the risk of a similar incident happening to you.

3. Has your management provided clear written instructions on the proper operation of launching and recovery systems for rescue craft? If the answer to this question is "No", then perhaps it is time to raise the issue.

4. A survival suit should be worn when exercising fast rescue craft in northern European waters - at any time of the year. It can give someone in the water those extra few precious minutes while help is on its way.

5. This incident illustrates how even a regular training exercise can, without warning, go wrong. It exposed a weakness in the system so that measures could be implemented to thwart a repeat performance.

Case 13: Severe Weather and Defective Equipment = Fatality

Narrative

A 40-year-old, 412gt general cargo vessel entered harbour to shelter from the severe weather conditions that were predicted. She berthed in a southerly heading, and the crew put out four mooring lines: a head line, stern line and two springs.

The following day, the vessel began to range along the berth owing to the south-east gale force conditions. To limit this movement, the crew added another head line.

During the night, the weather conditions reached their peak and the chief officer, on watch, saw that the stern line was slack. This allowed the vessel to surge along the berth.

The chief officer woke the two ABs and sought assistance from them in taking in the slack of the stern line. While the chief officer kept watch on the mooring lines, one AB operated the manual capstan, and the other AB coiled the slack on to bollards.

The capstan was a basic design: the operating handle was removable and was attached to drive shafts on the capstan. An internal gear ratio of 13:1 enabled one person to tension the mooring line adequately. To prevent reverse rotation, external ratchet pawls at the base of the capstan fitted into slots at the circumference. Three pawls were in use, the fourth having failed some time in the past.

Base of capstan

Base of capstan showing location of missing ratchet pawl

Because the vessel was surging along the berth, an additional load had been placed on the aft mooring line. The combined load caused the ratchet pawls to fail simultaneously, resulting in the capstan drum rotating in the opposite direction. The internal gearing spun the capstan handle out of the AB's hands and struck him on the head. The blow was fatal.

The Lessons

1. The regular crew knew and accepted that the fourth ratchet pawl was missing, yet made no attempt to repair the capstan. Ignoring a fault on board your vessel effectively makes it dangerously acceptable. It is the crew's responsibility to highlight to management all defects

which cannot be rectified on board. The owners are ultimately responsible for ensuring a vessel is maintained in a safe condition.

Have you accepted faulty equipment on board your ship?

2. A contributory factor in the accident was the generally poor condition of the capstan. Had the vessel operated a planned maintenance system, the missing ratchet pawl might have been highlighted, so that measures to repair it could have been employed. An effective planned maintenance system is more likely to limit the opportunity for accidents than a system of breakdown maintenance.

3. Mooring operations in severe weather conditions impose additional forces on equipment. Shock loading will find the weakest link in a system when you least expect it. The following mooring guidelines will limit the opportunity for a vessel to surge along a berth in bad weather:

- **Mooring lines should be arranged as symmetrically as possible about the midship point of the vessel, to adequately spread the load.**
- **Breast lines should be set as perpendicular as possible to the longitudinal centre line of the vessel. They should be as far forward and aft as possible.**
- **Spring lines should be set as parallel as possible to the longitudinal centre line of the vessel.**
- **Breast and spring lines are more efficient at holding a vessel than head and stern lines, unless mooring dolphins are available. Even so, owing to their longer length, head and stern lines will have a higher elasticity.**
- **The vertical angle of mooring lines should be kept to a minimum, to maximise their horizontal effect.**
- **The same size and type of mooring lines should be used. Alternatively, lines used for the same operation (e.g. breast lines) should be the same, and be of similar length.**
- **Slack lines will allow excessive movement of the vessel, and should be hauled in first.**
- **As a mooring line is tensioned it will affect the tension on the other lines, therefore only one line should be tensioned at a time.**
- **When a spring line is altered, the opposite spring should also be adjusted to prevent unintentional movement of the vessel along the berth.**

Case 14: Fatal Accident Involving Hatch Cover Operations

Narrative

While at anchor in the southern North Sea, the hatch covers of a 6700gt general cargo/feeder container vessel were being removed to enable her holds to be cleaned. The aim was to facilitate the loading of a cargo of grain. It is not certain whether commercial pressure was a factor in this operation.

The design of the vessel incorporated slab-type hatch covers to aid the loading and discharging of containers. The deck crew were using the vessel's cranes to remove and replace the hatch covers.

The practice of removing and replacing hatch covers while at anchor in this vessel had been carried out for some time, having been inherited when she traded in South American waters.

On the day in question, the weather conditions were force 5 with a 2m swell. The deck crew, which included the chief officer, were in the process of removing tween-deck hatch covers and stowing them in a specially adapted position on deck, just forward of the accommodation.

While manoeuvring one of the hatch covers into its position on deck, the chief officer placed himself between it and the accommodation bulkhead. As he did so, the hatch cover developed a swing and, despite his efforts to restrain it, it struck him, crushing his pelvis against the bulkhead.

The emergency services were contacted immediately, and the crew attempted to sustain the chief officer. Owing to the severity of his injuries, he died an hour later.

The Lessons

1. One of the main reasons why this accident happened is that the chief officer placed himself in immediate danger by working in a restricted space between the bulkhead and a suspended hatch cover. Whenever handling hatch covers, or any heavy object, never work in an area where space is restricted. And always ensure you can exit the area safely, just in case things don't go according to plan.

2. A contributing factor was the practice of removing and replacing hatch covers while at anchor. At such time, a vessel is still subject to the forces of the sea and, as such, a degree of rolling and pitching can be expected.

Carrying out hatch cover operations in a force 5 wind and a 2-metre swell was dangerous. The dangers of suspended weights in those conditions should have been obvious. Irrespective of commercial pressures, the best and safest option is to wait until the vessel is alongside before beginning this type of work.

3. Complacency also had a bearing on the accident. Because the removal and replacement of hatch covers had been carried out numerous times before while at anchor, the crew had become complacent. This led to a belief that the operation was safe. An operation that has been done several times before is not necessarily a safe one. The best option is to carry out a risk assessment and look at the operation in practical terms to find out what can go wrong - before it actually does!

Part 2 - Fishing Vessels

When the subject of bilge alarms is raised there can be few who do not roll their eyes and mutter 'not that again'. In recent editions of this Digest we have been concerned at the apparent indifference of seafarers to the lessons to be learned from previous incidents with regard to this equipment.

It is with a sense of relief that this edition shows that, when properly installed, they can save the vessel and, more importantly, the crew. The message may be getting through!

Safety equipment such as this will not stop a vessel sinking, especially if you are not in a position to hear or see the alarms. The early warning of flooding that this alarm allows, may give the crew sufficient time to be able to save the vessel, or at least contact outside assistance. All alarms must be continuously monitored and acted on to be effective.

Monitoring alarms is an important part of watchkeeping. The idea that the alarm never goes off, so can be ignored, is bound to lead to problems. As often happens, the person monitoring alarms can become involved in tasks that take them away from the alarms, and on their return they discover one going off. How long the alarm has been sounding is impossible to tell.

To put figures on this problem, a 51mm (2 inch)diameter hole, 1 metre below the waterline, will allow approximately 1/3 tonne of water per minute into the vessel. Leaving the wheelhouse for 10 minutes, and being unaware of a bilge alarm for this period, will mean 3 tonnes of water in the boat. Could your vessel survive 3 tonnes of water placed on board?

NB Readers who have skipped Part 1 of this *Digest* may wish to glance back at Case 7 as it involves a fishing vessel collision.

Case 15: NUC or Not?

Narrative

A fishing vessel was towing on an easterly course. It was daylight with moderate visibility and a force 4 southerly wind. A chemical tanker, which had been steaming north, stopped her engine and started to drift, awaiting clearance to enter port.

The fishing vessel skipper considered that his vessel was on a collision course with the tanker, and called her repeatedly on VHF radio in an attempt to ascertain her intentions. In response, the tanker finally worked her engines ahead and the fishing vessel, which was restricted in her ability to deviate from her course owing to a number of seabed obstructions in her immediate vicinity, was then able to pass clear of her stern.

The Lessons

1. It is common for tankers to drift at sea while awaiting berthing instructions. However, before stopping, an assessment needs to be made of the surrounding traffic situation so as to ensure other vessels are not embarrassed by the change in circumstances. In this case, the fishing vessel skipper was unexpectedly faced with a risk of collision, which he was restricted in his ability to avoid. Indeed, it was not his obligation to keep out of the way since the tanker remained a "power-driven vessel" within the meaning of the Collision Regulations. The tanker was, therefore, required to take action to ensure that the fishing vessel passed at a safe distance. Having already stopped, this was difficult since the close proximity of the fishing vessel to the tanker's stern prohibited continued use of the main engine. In the event, the fishing vessel assisted the situation by altering course to starboard at the risk of fouling her nets.

2. The reluctance of the tanker's master to respond immediately to calls from the fishing vessel skipper, indicates an assumption that his was now a privileged vessel, and that other vessels would endeavour to keep clear. This was not so. An obligation for a drifting power-driven vessel to keep out of the way would only change if she was "not under command" and was displaying the corresponding signals. However, such a vessel would have to be unable to keep out of the way through some exceptional circumstance, awaiting port clearance is not one such circumstance.

Case 16: Near Miss Leads to Grounding

Narrative

A 35m Belgian beam trawler was inward-bound for a UK port after the completion of a fishing trip. At the same time, a 12000gt Swedish laden products carrier was outbound. It was dark in the early hours of the morning.

On turning from a northerly heading into the east channel, the skipper of the fishing vessel applied only 15° of helm. This took her to the north side of the channel, the incorrect side for entering. The tanker that was also on the north side of the channel, the correct side for departing, was approaching the vicinity of the turn. The tanker did not have a pilot embarked as the master was a PEC holder.

The fishing vessel skipper had not identified the close proximity of the tanker as he was navigating from buoy to buoy by eye, standing at the front of the wheelhouse, and not using the navigational equipment that was available.

Before executing the turn, the fishing vessel skipper did inform VTS that he would navigate to the south side of the channel. It was his intention to return to the south side of the channel once the turn had been completed. However, the tanker's master, who overheard the VHF radio conversation between the fishing vessel and VTS, was mistakenly under the assumption that the fishing vessel would remain on the north side. When the fishing vessel began to alter course to starboard to return to the correct side of the channel, her course put her on a potential collision course with the tanker.

Realising this to be the case, the tanker's master altered course to port to avoid a collision. When the skipper of the fishing vessel detected the alteration of course, he came full astern on the main engine. The result of both vessels' manoeuvres was that the fishing vessel passed down the tanker's starboard side at a distance of approximately 10 metres.

Both vessels were being monitored by Port Control, but they failed to intervene to prevent the near miss.

When the fishing vessel was approximately amidships of the tanker, the master of the tanker ordered full astern on the main engine. However, his action was insufficient to prevent the tanker from leaving the channel and running aground.

Fortunately there were no injuries, damage to either vessel, or pollution. However, the potential for a much more serious accident was evident.

The Lessons

1. Always make full use of the navigational equipment available. Had the fishing vessel's skipper done so, he would have detected the tanker a lot earlier than he did.

2. When entering or leaving port, always remain on the correct side of the channel in accordance with Rule 9 of the Collision Regulations. If you do intend to alter course, for whatever reason, use the sound signals prescribed in Rule 34(d) to make your intentions clear to other vessels.

3. Never assume another vessel's intentions, especially from an overheard VHF radio call. In this instance it would have been a simple matter for the master of the tanker to confirm with VTS the fishing vessel's intentions.

4. Had Port Control intervened in a timely manner, the near miss could have been prevented. In this context, there is a need for Port Controls to adopt policies with more emphasis on the direction of traffic in clear procedural ways.

5. Training in emergency response procedures is vital. Reconstruction shows that, had the tanker's master elected to come hard to starboard and full ahead when the fishing vessel was clear, instead of full astern on the main engine, he would have prevented the vessel from running aground. However, he wasn't to know, as no training in emergency response procedures had been carried out.

Case 17: Loss of Fisherman Within Harbour Breakwater

Narrative

A 24m beam trawler was returning to her south coast port earlier than intended because of bad weather. The wind and sea conditions as the vessel entered the harbour breakwater at sunrise were south-south-west gale force 8, with a rough sea and heavy swell. The ebb tide had also begun.

The crew comprised the skipper, mate and three deckhands. The skipper and mate, on the bridge, used the vessel's tannoy system to call the deckhands to mooring stations. The deckhands were wearing oilskins but no lifejackets.

Two deckhands proceeded forward and started raising the derricks; the third went aft. When the derricks had been raised, one of the forward deckhands threw a line to the deckhand aft, who then tied it to a cleat attached to a stanchion on the starboard quarter.

Stanchion on the starboard side

Stanchion on the starboard side

A short while later, as the vessel lined up for the harbour lock, the skipper looked out of the starboard aft bridge window to look for the third deckhand, whose usual mooring position was also forward. The skipper saw him at the starboard quarter tying up ropes. Using the tannoy system, the skipper requested another deckhand to go forward.

The trawler moored in the lock, the derricks were lowered for greasing, and the crew, apart from the third deckhand, carried out their usual tasks.

The skipper, concerned that he couldn't locate the third deckhand, asked the rest of the crew to help him search the vessel for their missing colleague. He wasn't found. The skipper alerted the rescue services and the harbourmaster.

A major air and sea search was unsuccessful and, the following day, the deckhand's body was found washed up on a beach further along the coast.

The cause of death was drowning.

View of harbour entrance from lock

View of harbour entrance from the lock

The Lessons

1. Since there were no witnesses to this tragic accident, the reasons for the deckhand falling overboard must be speculative. A contributory factor to his death, however, was his failure to wear a lifejacket. This vital piece of safety equipment just might have afforded him those extra few minutes to enable the rescue services to reach him.

Sadly, a popular opinion among fishermen is that a lifejacket worn during fishing operations is cumbersome because it can become caught on the fishing net, which can then drag the wearer overboard. Mooring operations don't involve the use of fish netting, but they do usually involve leaning over the side of a vessel or standing on the bulwark. It takes mere seconds to don a lifejacket before going out on deck. If you unexpectedly get a ducking, you'll be glad you made good use of those few seconds.

2. Don't assume that your crew mates will see you, or will hear your call for help, if you fall overboard. Rough seas and a howling wind could mean that your survival is entirely down to you. Don't you deserve the best chance possible? Why not try that lifejacket that is normally kept in your locker; you might get used to it.

Case 18: Can You See/Hear Your Bilge Alarm?

Narrative

A 32-year-old 14 metre wooden fishing vessel left her moorings one morning to continue creeling off the coast of Scotland. The wind was from the south-west force 4 to 5 with a light southwesterly swell. The crew had been waiting for favourable weather for 2 days, and there were already 3 tons of crabs in the vivier tank on board.

Later that morning, the three crew, including the skipper, were engaged on deck hauling a string of pots. The skipper was away from the aft wheelhouse for about 45 minutes as it was a large haul. After they had hauled and were preparing to shoot the pots, the skipper noticed the bilge alarm sounding as he walked towards the stern.

He rushed down to the engine room, where floodwater was well over the deck plates. The main engine then stopped. This was probably because water was getting into the air intake as the vessel rolled. Poor access prevented the skipper from investigating the flooding forward.

He was impeded by fishing gear, ropes and other equipment. The skipper shut off the seacocks in the compartment, but this did not stem the flooding. The small electric bilge pump fitted was no match for the amount of floodwater.

On the way back to the upper deck, the skipper retrieved the lifejackets from the accommodation and gave them to the crew. The two crew readied the liferaft while the skipper tried to make a "Mayday" call. The radio signal was poor, so he raised a nearby fishing vessel and asked them to stand by. The liferaft was launched successfully.

Everyone transferred from the sinking vessel to the rescue fishing vessel without difficulty. Roughly 6 minutes later, the casualty plunged bow-first and sank in 80 fathoms of water. The liferaft broke its tether easily and was retrieved. The EPIRB rose to the surface about 3 minutes later, and immediately started transmitting. This, too, was retrieved and was switched off.

The cause of the flooding was probably a failure of pipework, seacocks or other fittings associated with the vivier tank. The tank was fitted 12 years before the accident, and it is not known if any surveys had taken place since then.

The Lessons

1. It is one thing to have a working bilge alarm, it is quite another to be able to see or hear the alarm when it goes off. External visible or audible means of highlighting flooding alarms should be provided for just this situation. There are many examples where bilge alarms have provided vital early warning so that effective corrective action can be taken.

2. The advantage of watertight bulkheads is demonstrated clearly in this accident. Had they been fitted, the vessel might well have not been lost. Bilge alarms in the different watertight spaces will also greatly assist in pinpointing the problem, thus saving vital time if a vessel is to be saved.

3. The risk of vessel pipework failure must be considered fully in your fishing vessel risk assessments. Having a vivier tank system installed in a fishing vessel requires particular care, and regular surveys should be conducted to ensure vessel watertight integrity is maintained.

4. Keeping sea valves and critical pipework clear is essential if problems are to be located and solved quickly. In this instance, even if the skipper had been warned earlier, he might have been unable to do much to stem the flooding because all the relevant valves and pipework associated with the vivier tank were obstructed.

It is encouraging to see lifesaving procedures and equipment working well. Even if another fishing vessel had not been close at hand, the liferaft operated correctly and was ready to be boarded. The EPIRB also functioned correctly.

Case 19: Bilge Alarm Success Stories

Narrative 1

A 16m wooden creeler, off the coast of Scotland, finished fishing for the day and was heading home with her six crew. There was a light swell and the wind was south-easterly force 3 to 4. Only 8 miles from home, the bilge alarm sounded, so the skipper made straight for the engine room where he discovered water in the bilge. As a precaution, he called the coastguard to request pump assistance. Meanwhile, three pumps on board were brought into action to pump out the floodwater. The floodwater was effectively contained within the engine room by the bulkheads forward and aft, and the pumps had the flooding under control shortly after.

The lifeboat arrived alongside and, having assessed the situation, escorted the vessel back to port.

On investigation, it was found that the seals and bearings of a seawater pump on the main engine had failed, causing the leak. It was a reconditioned pump and had been fitted only 4 months previously.

Narrative 2

A 22m wooden twin trawler, manned by four crew, set out after having landed her catch the previous night. The weather was overcast, with heavy drizzle and a north-westerly force 4 to 5 wind.

After arriving at the fishing grounds some 5 hours later, the gear was shot away. Suddenly the bilge alarm in the fish hold sounded. On investigation, a significant ingress of water was found in the forward end of the fish hold, but the extent of flooding was restricted by the two fish hold bulkheads. The crew quickly hauled the fishing gear and the vessel's two bilge pumps were started.

As the vessel headed for home, the crew monitored the flooding closely and called the coastguard.

A coastguard helicopter delivered a salvage pump, which emptied the fish hold and stemmed the ingress of water. The local lifeboat escorted the vessel back to port where she was slipped.

The source of the leak was found to be some dislodged caulking between the keel and one of the hull planks.

Narrative 3

A small GRP fishing vessel was fishing for mackerel off the south coast of England. She was stationary in the water, rolling heavily with a force 5 wind blowing. The skipper and crew were suddenly alerted by the sounding of the bilge alarm in the engine room. Shortly afterwards, the engine stopped.

The skipper entered the engine room and located the source of the floodwater. A stainless steel jubilee clip on the deck wash inlet pipe had broken, allowing water to leak in slowly. The alternator belt had flicked some of the floodwater up on to the engine relays, causing the engine to cut out. The vessel had a manual bilge pump as well as an engine-driven one. The latter was obviously useless with the engine dead. The coastguard was called and a lifeboat towed the vessel back to port.

The skipper has since doubled-up all jubilee clips and has fitted another bilge pump, which is driven by the main engine and is operated by a float switch.

The Lessons

It is good to have positive lessons from cases that have gone well:

1. Here we have three examples of where bilge alarms have saved vessels and - more importantly - possibly 12 lives. Properly functioning bilge alarms enabled appropriate action to be taken in sufficient time to stem the flooding and to avert disaster.

2. It is vital to ensure your bilge alarm is working before every trip. It is also important to check that it has been reset correctly after testing. Failing to do so might result in it not sounding during an actual emergency.

3. It is also essential to position the bilge alarm sensor as low as is practicable. An early warning will maximise the chance of floodwater not reaching vital systems like the main machinery, so that pumps will be kept running.

4. Keeping your bulkheads as watertight as possible will also greatly improve your chances of containing floodwater and maintaining buoyancy.

5. Don't let your pride put your vessel and crew in unnecessary grave danger. Call the coastguard earlier, rather than later.

6. Sources of flooding are numerous and varied. Make sure your seawater systems are watertight and that sea valves are accessible and turn freely. Always doubleup clips on flexible hoses and ensure pipes are aligned correctly. In particular, check the condition of any flexible pipework and fittings regularly.[1]

[1] For further guidance on preventing flooding see Marine Guidance Note (MGN) 165 (F).

Case 20: Back Rope Bights Back

Narrative

A 12m GRP fishing vessel was creel fishing with a crew of three. The vessel had approximately 100 creels on board and had started shooting them with the skipper posted at the helm, one crewman at the shooting position and the other passing the creels.

After ten creels had been deployed, the crewman at the shooting position stepped into a bight of the back rope. The other crew member shouted to the skipper, who immediately put the vessel astern to stop her. The trapped crewman by that time had stepped on to the gunwale and was desperately trying to hang on. The second crewman reached for a knife to cut free his entangled colleague but, as he did so, the trapped crewman was pulled over the side. As he fell into the water he came free.

The second crewman cut the back rope and then passed a line to the man in the water. The skipper and crewman heaved him on board and then called the coastguard. The coastguard helicopter evacuated the injured man to hospital, where it was found that he had dislocated his right knee.

Although a relatively experienced fisherman, the injured crewman had joined the vessel just a week before the accident.

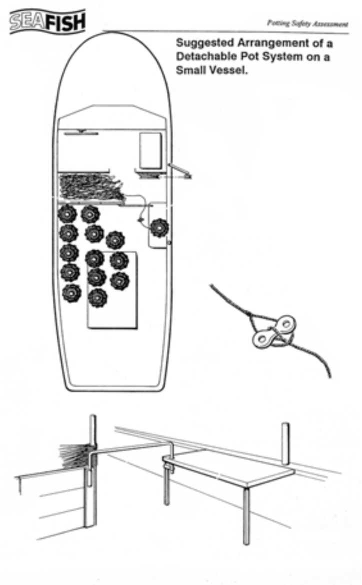
The Lessons

1. The crewman in this accident had a very lucky escape indeed. The back rope could so easily have dragged him to his death, as has been so tragically demonstrated by at least seven accidents reported to the MAIB during the last decade. Don't rely on your luck to stay alive!

2. Ensure you have conducted a thorough risk assessment of the fishing operations on board your fishing vessel. Involve all the crew, so that hazards can be identified and measures taken to minimise their risk as far as possible. Establish the training needs of each crew member and take nothing for granted. Making assumptions about the competence of a newcomer - albeit experienced newcomer - is risky. And ensure that each crew member knows exactly what to do in the event of an emergency.

3. The swift actions taken by the skipper and the other crewman, to rescue their entangled fellow worker, prevented a potential fatality. Having two crew left to deal with the situation undoubtedly helped to avert a disaster. Think carefully before you decide how many crew you require.

4. It is essential to arrange your working deck so as to keep the back rope away from the crew. This could be achieved by simply carrying fewer creels, providing more clear deck space, and/or by adopting the arrangement suggested by the Sea Fish Industry Authority, shown in the attached figure.



Potting safety assessment

Part 3 - Leisure Craft

Boating and diving are two leisure activities enjoyed by increasing numbers of the general public, particularly during the summer months. Each poses its own risks and is monitored by a number of authorities intent on maintaining adequate levels of safety. As individual activities, accidents are relatively rare. However, with an increasing use of suitable sea areas around the UK, and a growing reliance on chartered craft to support diving operations, the number of accidents is increasing.

Two of the articles in this section focus on the need for divers to ensure that the vessel they hire is correctly certified. However, certification will generally only relate to the seaworthiness of the vessel itself, and not necessarily to its suitability for the diving operation for which it has been chartered. The associated requirements of diving therefore need to be considered, and additional measures, such as carrying emergency oxygen, need to be agreed and taken to ensure that the vessel is properly prepared before departure.

The remaining article concerns the potential conflict between those involved in diving operations and other vessels that may be in the vicinity. Each needs to consider carefully the limitations of the other, and good communication is essential to ensure that both activities can be conducted safely and with mutual enjoyment.

Case 21: Vessel Sinks Beneath Party of Divers


The transom doors

The transom doors

Narrative

Twenty divers embarked on a weekend of diving off the south coast of England. It was a glorious summer's day.

The size of the dive party meant that the company providing the trip had to charter a second vessel and the divers were split into two groups of ten. The chartered vessel had been used on previous dive trips, and had recently had her out of water survey carried out, in preparation for recertification against the Code of Practice for the Safety of Small Commercial Motor Vessels (Yellow Code). However, the certification had expired, so the vessel should not have been in operation until the recertification process was complete. Strangely, she had been assigned a freeboard mark that was above the level of the bottom of her transom doors, which opened outwards from the aft deck. There was no internal watertight subdivision.

The vessel prepared for departure, with her aft deck loaded with dive gear. As she was manoeuvred from the mooring, one of the divers noticed water coming in at the transom. The skipper was not unduly concerned, however, and they headed for the dive site.

On arrival about an hour later, water was clearly visible in the aft deck area; one of the divers joked that perhaps they were sinking! The skipper was now not quite so amused, knowing this meant that the bilge underneath the aft deck must also have been full for the water to have reached that level. He turned on all bilge pumps, including a salvage pump attached to the port engine, and quickly headed home. He also alerted the coastguard.

The vessel continued to fill with water. Both the port engine and, shortly afterwards, the starboard engine, stopped. The primary dive boat took the stricken vessel in tow to try and keep her afloat as long as possible.

By the time the lifeboat arrived, it was too late for emergency pumps to be effective. Confusion had arisen over the casualty's position, and this had delayed its arrival.

Just minutes before the vessel sank by the stern, the divers and crew were rescued. The liferaft, still in its canister, floated off the wheelhouse top and was retrieved. As the vessel sank, a towline was attached to the bow. Once she had sunk to the bottom, the lifeboat slowly towed the casualty along, and she rose to the surface and was able to be beached and salvaged on the next tide.

Under tow after sinking

Vessel under tow after sinking

The Lessons

1. When conducting commercial operations, never put to sea without valid certification: it is against the law. Prudent dive parties will ask for evidence of vessel certification before embarking.

2. Skippers must investigate any suspected flooding sooner rather than later. Deck coverings, and access hatches that are covered in diving gear, do not excuse a skipper from checking for leaks immediately.

3. The merits of having a working bilge alarm are clearly demonstrated by this accident. Had one been fitted to this vessel, and been maintained properly, it would have offered ample early warning and would have prevented the incident from escalating. The vessel had more than adequate pump capacity to handle an initial flood.

4. When alerting the coastguard, ensure you provide an accurate position, especially while in busy waters. Failing to do so will mean that vital time may be wasted.

5. Ensure your liferaft is stowed correctly. Fortunately, in this instance, good weather, and a number of vessels close at hand, meant the liferaft wasn't needed.

6. When faced with serious flooding, consideration should have been given to beaching the vessel in shallow water sooner, rather than aiming to make it all the way back to port.

Case 22: I Have Divers Down - Get My Drift?

Narrative

A charter boat was engaged in diving operations off the west coast of Scotland. It was daylight and, in accordance with the Collision Regulations, she was exhibiting a rigid replica of the International Code flag "A" to indicate that she had divers down and was therefore restricted in her ability to manoeuvre. The weather was calm with clear visibility, and a southerly tidal stream of about 0.3 knot was running.

Four pairs of divers and one group of three had dived on to a wreck by means of a shotline, which was marked with a buoy displaying Code flag "A".

The first pair of divers to surface was picked up at the shotline. Two delayed surface marker buoys (DSMBs) then broke the surface and started to drift in a southerly direction with the tide. These buoys indicated that two groups of divers were in the process of surfacing. The charter boat initially maintained position between the shotline buoy and the DSMBs, and then moved to the shotline as a second pair of divers surfaced. Having picked up the second pair, the boat returned to a position midway between the shotline buoy and the DSMBs.

At this time, the skipper noted a ferry approaching from the north and a yacht approaching from the south. One of the two DSMBs was used by the group of three divers, who then surfaced and were picked up, informing the skipper that the pair using the remaining DSMB still had approximately 10 minutes of decompression stops to perform. The skipper called the ferry on VHF radio to draw her attention to the shotline marker buoy, but received no reply.

The penultimate pair of divers then surfaced at the shotline buoy. Having estimated that the yacht would pass well clear of the DSMB on her current heading, and uncertain as to the ferry's intentions, the skipper decided to return to the shotline buoy. At this point, the final pair of divers surfaced and, using hand signals, acknowledged the skipper's intention of proceeding to the shotline before returning to pick them up.

Having picked up the penultimate pair of divers at the shotline buoy, the charter boat headed towards the last pair. The approaching yacht's skipper, having not yet sighted the DSMB, and interpreting that a risk of collision now existed with the charter boat, altered course to starboard towards the DSMB. However, on sighting the DSMB ahead, he altered course to port and passed about 100 metres from the divers, as they were being picked up from the water.

The Lessons

1. Both the ferry and the yacht were required under the Collision Regulations to keep out of the way of the charter boat. It was a clear day and the boat was exhibiting a rigid replica of the International Code flag "A", which served to indicate two things:

- **she was a vessel restricted in her ability to manoeuvre; and**
- **she had divers down, requiring approaching vessels to keep clear at slow speed.**

In the event, both the ferry and the yacht kept clear of the charter boat. However, the yacht's skipper did not appreciate that divers were located some distance from the charter boat. Hence, in altering course to avoid what he considered was a risk of collision with the charter boat, he unwittingly headed towards the remaining pair of divers. In the event, he sighted the DSMB and the divers in sufficient time to be able to pass well clear.

This incident highlights the importance of those engaged in diving operations ensuring they exhibit clear signals, and those who are likely to be affected by them ensuring they interpret those signals broadly. In other words, as with all operations that effectively restrict a vessel in

her ability to manoeuvre, they need to consider the likely extent of those operations, particularly in view of the prevailing weather and tidal conditions.

Keep well clear means just that!

2. In this case, the charter boat's skipper at no time considered that the approaching yacht posed a danger to those in the water. However, in situations where safety margins are significantly reduced, consideration needs to be given to the fact that those in charge of approaching vessels may not appreciate the extent to which divers might be operating remotely from the charter boat. In such circumstances, greater attention should be paid to ensuring that the scope of operation is clearly identified and broadcast either on VHF Channel 13 or following an all stations VHF DSC safety alert. Similarly, those who approach an area in which diving operations are known to be taking place, and are unsure of the likely extent of those operations, should not hesitate to contact the charter vessel or the local coastguard station for more information.

If you want others to know what you're doing - tell them.

If you want to know what others are doing - ask them!

Case 23: Mind That Propeller

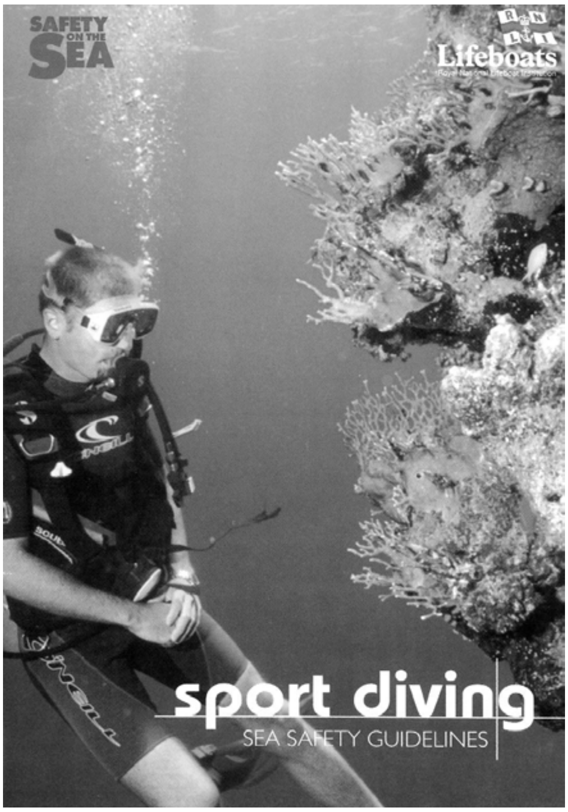
Narrative

A party of divers of wide-ranging experience was looking forward to a weekend of diving off the coast of Scotland. On arrival at the marina, the skipper of the dive vessel informed them that the diving rigid inflatable boat had problems with its clutch but that they could instead go out in his own private motor vessel, which they did.

They left the marina and headed out for the morning dive. The vessel was fairly small, which made preparation for diving a little difficult. The morning dive was completed without too many problems and the party returned to the marina for lunch and to recharge their air tanks.

In the afternoon, they headed out for the second site; one used regularly by the skipper. Everyone was readying themselves for the dive and carrying out buddy checks. The exit point from the vessel was on the starboard side near the stern. As the vessel arrived at the dive site the skipper asked whether anyone was ready to dive. One pair had completed their buddy checks, so exchanged places with those divers already sitting at the exit point. The vessel's engine was taken out of gear and, on the signal from the skipper, the first diver, the least experienced of the two, rolled backwards into the sea. The skipper then engaged the engine astern to hold the vessel's position in the tidal current. Before the dive buddy could enter the water, there was a loud bump on the hull, the vessel's engine stopped and the diver surfaced, screaming in agony.

At first it was thought that perhaps he had cramp, but it soon became clear that the vessel's propeller had struck his leg. The injured diver was recovered on board with some difficulty, as it had not been possible to quickly remove any of his dive gear beforehand. He was losing a lot of blood, so the dive party raised his leg and applied a tourniquet. Although the vessel carried a basic first-aid kit, there was no emergency oxygen available. The skipper radioed for help, and the local lifeboat, which was engaged in an exercise in the area, was quickly on scene.



RNLI safety guideline brochure

The Lessons

1. The private motor vessel was not the certified dive vessel. Although some people might have travelled some distance to go diving, the skipper should not have taken anyone out unless he could use a craft that was fit for purpose and complied with the regulations.

2. Dive skippers, and divers themselves, should ensure that the dive vessel's propellers are not rotating when deploying or recovering divers. It is highly dangerous to do otherwise. Make sure propellers are stopped before giving dive instructions and preferably turn the engine off as well to make absolutely sure that propellers are not rotating. Leisure diving is a very enjoyable pastime, but a sensible approach to the risks involved is required if it is to be safe.

3. The clutch problem with the dive RIB should either have been avoided by preventative maintenance, or should have been fixed well in advance of any diving expedition. Alternatively, the skipper should have sought approval for the use of his own motor vessel as a dive boat sometime earlier, so that he had a spare, certified and equipped reliable vessel.

4. Ensure that your dive boat carries an appropriate first-aid kit: one which includes oxygen. You never know when you might need it!

The RNLI publication 'Sport Diving - Sea Safety Guidelines' provides a useful reminder of the safety issues when embarking on a diving trip. Visit www.lifeboats.org.uk **to request a copy.**

MAIB Noticeboard

Deputy Chief Inspector of Marine Accidents

Captain Simon Harwood, MAIB's Deputy Chief Inspector of Marine Accidents, is to retire in March 2004. Simon has a wealth of experience and knowledge of maritime matters which, together with his compassionate approach to sensitive issues, he has used in making a huge contribution to the successful running of the Branch during the last nine years. We all wish him well on his retirement.

Captain Harwood will be succeeded by Captain Steve Clinch. Steve has been the Deputy Director (Technical) of the Bahamas Maritime Authority in London for the past two years. Prior to this, he enjoyed a highly successful career with P&O Bulk Shipping and Associated Bulk Carriers, which included Command at sea, followed by several senior appointments ashore that culminated in a 7-year period as Marine Director.

Appendix A: Preliminary examinations

Started in the period 01/07/03-31/10/03

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**	**Type of Accident**
07/07/03	*Briagha Mara*	Fishing vessel	UK	11.42	Flooding/foundering
08/07/03	*Patsy B*	Fishing vessel	UK	7.9	Grounding
04/09/03	*Produce*	Fishing vessel	UK	1.24	Acc. to person
27/09/03	*Patricia*	Other commercial	UK	2639	Collision/contacts
01/10/03	*Chelaris J*	Fishing vessel	Guernsey	40.03	Missing vessel
18/10/03	*St Rognvald*	ro-ro cargo	UK	5297	Machinery failure
29/10/03	*Phoenix*	Fishing vessel	UK	7.69	Capsize/Listing

Investigations started in the period 01/07/03 -31/10/03

Date of Accident	**Name of Vessel**	**Type of Vessel**	**Flag**	**Size**	**Type of Accident**
12/07/03	Loch Ryan dory	Dory	UK		Capsize/listing
19/07/03	*Breakaway V*	Broads cruiser	UK		Capsize/listing
14/08/03	*Elhanan T*	Fishing vessel	UK	141	Flooding/foundering
23/08/03	*Trident VI*	Passenger	Guernsey		Collision/contacts
03/09/03	6m motor cruiser	Motor cruiser	UK		Hazardous incident

Appendix B: Reports Issued In 2003

Amber - loss of fishing vessel in the Firth of Forth on 6 January 2003 with the loss of one life
Published 23 October

Arco Adur - investigation of a fatal accident on the River Medway on 25 February 2003
Published 25 September

Ash/Dutch Aquamarine - collision between *mv Ash* and *mv Dutch Aquamarine* in the SW lane of the Dover Strait TSS, with the loss of one life, on 9 October 2001
Published 20 March

Bro Axel/Noordhinder - near miss between *Bro Axel* and *Noordhinder,* and the subsequent grounding of *Bro Axel* at Milford Haven on 5 December 2002
Published 16 September

Claymore - investigation of the entanglement in moorings, St Margaret's Hope, on 11 March 2003
Published 3 October

Diamant/Northern Merchant - collision between vessels 3 miles SE of Dover on 6 January 2002
Published 4 April

Flamingo - capsize of fishing vessel east of Harwich on 7 July 2002
Published 12 June

Kirsteen Anne - loss of vessel at Firth of Lorn on 31 December 2002 with the loss of her two crew
Published 31 July

Kodima - cargo shift, abandonment and grounding in the English Channel on 1 February 2002
Published 21 January

Marbella - collision between UK-registered fishing vessel and offshore platform in the Rough Gas Field about 25 miles south-east of Flamborough Head on 8 May 2002
Published 26 April

Maria H -vessel striking the Keadby railway bridge on 29 May 2002
Published 28 March

Norsea - fire in the aft engine room of ro-ro ferry on 2 September 2002
Published 30 June

Nottingham Princess - investigation of *Nottingham Princess* striking Trent Bridge, Nottingham, on 15 November 2002
Published 22 August

Ocean Star - failure of a warp block on board the UK registered fishing vessel north of the Shetland Islands, resulting in one fatality on 26 November 2001
Published 13 May

Osprey - fatal accident to a man overboard from the fishing vessel in Lochinver Harbour on 20 April 2002
Published 3 February

P&OSL Aquitaine - investigation of a fatal accident during a vertical chute evacuation drill from the UK registered ro-ro ferry *P&OSL Aquitaine,* in Dover Harbour, on 9 October 2002
Published 25 July

Portsmouth Express - wash wave incident off East Cowes on 18 July 2002
Published 3 June

Pride of Bath - investigation of a barbecue fire in the galley of *Pride of Bath* on the River Avon, Bath on 20 July 2002
Published 25 February

Pride of Portsmouth - collision between *Pride of Portsmouth* and *HMS St Albans,* Portsmouth Harbour on 27 October 2002
Published 5 August

Pride of the Dart - grounding of the class VI passenger vessel on Mew Stone rocks near the entrance to the River Dart on 28 June 2002
Published 30 April

QE2 - flooding of aft engine room of passenger cruise ship *QE2* on 21/22 May 2002
Published 31 March

QE2 - escape of steam and hot water on board *QE2* in mid-Atlantic, resulting in one fatality on 23 June 2002
Published 8 July

Radiant - capsize and foundering about 45 miles north-west of the Isle of Lewis, with the loss of one life on 10 April 2002
Published 24 January

Solway Harvester - summary report on investigation of the capsize and sinking 11 miles east of the Isle of Man on 11 January 2000, with the loss of seven lives
Published 13 June

Stena Explorer - fire on board HSS *Stena Explorer* entering Holyhead, 20 September 2001
Published 17 February

Tullaghmurry Lass - sinking of fishing vessel *Tullaghmurry Lass,* with loss of three lives, in the Irish Sea on 14 February 2002
Published 3 February

Annual Report 2002	Published June 2003
Safety Digest 1/2003	Published April 2003
Safety Digest 2/2003	Published August 2003
Timber Deck Cargo Study	Published August 2003

A full list of all publications available from the MAIB can be found on this web site
www.maib.gov.uk