MAIB

MARINE ACCIDENT
INVESTIGATION BRANCH

SAFETY DIGEST

Lessons from Marine Accident Reports 1/2012

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No 1/2012

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is an
INVESTOR IN PEOPLE

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April 2012

MARINE ACCIDENT INVESTIGATION BRANCH

The Marine Accident Investigation Branch (MAIB) examines and investigates all types of marine accidents to or on board UK vessels worldwide, and other vessels in UK territorial waters.

Located in offices in Southampton, the MAIB is a separate, independent branch within the Department for Transport (DfT). The head of the MAIB, the Chief Inspector of Marine Accidents, reports directly to the Secretary of State for Transport.

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

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

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

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MARINE ACCIDENT INVESTIGATION BRANCH

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

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

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

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Glossary of Terms and Abbreviations

AB	-	Able seaman
ARPA	-	Automatic Radar Plotting Aid
BA	-	Breathing Apparatus
C	-	Celsius
CCTV	-	Closed Circuit Television
COLREGS	-	International Regulations for the Prevention of Collisions at Sea 1972 (as amended)
COSWP	-	Code of Safe Working Practices for Merchant Seamen
CPA	-	Closest Point of Approach
CPP	-	Controllable Pitch Propellers
CPR	-	Cardio-Pulmonary Resuscitation
DPS	-	Dynamic Positioning System
DSC	-	Digital Selective Calling
HAT	-	Harbour Acceptance Trial
IMDG Code	-	International Maritime Dangerous Goods Code, IMO
IMO	-	International Maritime Organization
m	-	metre
mA	-	milliamps
"Mayday"	-	The international distress signal (spoken)
MGN	-	Marine Guidance Note
MSN	-	Merchant Shipping Notice
OOW	-	Officer of the Watch
PSV	-	Platform Supply Vessel
RIB	-	Rigid Inflatable Boat
Ro-Ro	-	Roll on, Roll off
SOLAS	-	International Convention for the Safety of Life at Sea
TSS	-	Traffic Separation Scheme
VHF	-	Very High Frequency
VTS	-	Vessel Traffic Services
VTSO	-	Vessel Traffic Services Officer
XTE	-	Cross Track Error

Introduction

I would like to thank Nigel Adams, Rodney Smith and Dee Caffari for their excellent introductions to the individual sections of this Safety Digest. Both Nigel and Dee have made some very wise observations which I urge you to read, and need no amplification from me. However, Rodney's contribution is perhaps the most thought provoking. It starkly reminds us of the horrors that the families of mariners who are lost must endure. I can only express my admiration for the courage it must have taken Rodney to write about the death of his brother Neil, who was the singlehanded skipper of the fishing vessel Breadwinner. I hope that, by reading this Digest, mariners from all sectors of our industry will take on board the lessons it contains and spare their families the trauma that always follows any accident to a loved one.

Emergency drills provide an opportunity for crews to test procedures and develop or fine tune plans that will help manage the consequences of marine accidents. Making the drills realistic can be a challenge but, by regularly practising responses to foreseeable emergencies, crews can ensure that their reactions become instinctive – a common feature in a number of recent investigations conducted by the MAIB has been muddled or confused responses to emergency situations that can be directly attributable to the absence of drills. If you have regularly practised how you might fight a fire in a confined space, wearing breathing apparatus, or considered carefully and then conducted drills in the recovery of an unconscious man from the water, you are more likely to succeed when you have to do so in earnest. Case 2 and Case 21 are examples of the success that can be achieved with a well drilled crew.

Finally, with warmer weather approaching, and the main season for sailing about to begin, could I urge all leisure sailors to take particular note of the contents of Case 26.

Until next time, keep safe.

Steve Clinch
Chief Inspector of Marine Accidents
April 2012

Part 1 - Merchant Vessels

'Keep it Simple'

I always read the excellent MAIB Safety Digest with great interest and occasionally there is a case that brings back memories of a similar situation that I have been in (which fortunately did not end up as an MAIB case). Lifeboat incidents are very much in this category and send a shiver up my spine.

There is a common perception that in the last twenty years lifeboats have killed or injured more seafarers than they have saved. Statistics can neither confirm nor reject this perception; however, significantly in 2001 the MAIB after a detailed review concluded:

- *Lifeboats and their launching systems have cost the lives of a significant number of seafarers.*
- *Accident causes are considered to have their roots in the complexity of systems compounded by poor instructional and training material.*
- *There has been no balancing payoff in lives saved by these systems.*

Manufacturers blamed lack of maintenance or crew error, rarely the equipment. The majority felt otherwise, with the MCA stating in early 2008 that *'many existing on-load release hooks, whilst satisfying the current regulations, may be inherently unsafe and therefore not fit for purpose'*.

So where are we now and what next? At significant cost all lifeboats will be compliant towards the end of the decade (some 25 years after on-load hooks being introduced). The new expensive and complex equipment is going to have a secondary safety system in the form of a safety pin. Some ships will need new lifeboats.

Shipowners lose again and manufacturers stand to make a lot of money. Benefits are at best marginal. Indeed, if the new hooks are going to have 'secondary safety systems' would it not be easier just to fit these wherever possible on existing equipment? Too simple, I suspect.

I read with great interest the excellent MAIB safety flyers on the loss of life on the car carrier *Tombarra*. This involved a davit launched rescue boat, however the same old story; switch failed, crew fell 29m and significantly *'serviced every year by manufacturers'*. Enough said on this!

As I was finishing this introduction, the 'Costa Concordia' incident occurred. The media was full of reports about crew struggling to lower lifeboats and I watched one video where a boat did get stuck and it was clear that the crewmembers involved had little or no experience in the lowering operation. Most of us won't forget the picture of the ship the following morning with the davit launched liferafts stuck half-way down the ship's side.

Lifeboats in the 'Costa Concordia' clearly played a significant part in the rescue operation, however the weather was favourable. It would have been a completely different matter if this had not been the case.

There will no doubt be the usual reactionary, rushed through legislation post 'Costa Concordia'. One hundred years after the 'Titanic' this is a good opportunity for a thorough review. I don't have the solutions, however in line with the MAIB findings previously mentioned more sophisticated and complex equipment is not the answer. Simple liferafts are the preference of the majority of seafarers particularly if there is any kind of sea running (why complicate with davits and release systems). If there is one lesson that should be learnt from the last twenty five years it is ‘Keep it Simple’.

Coming back to the Safety Digest, poor planning and lack of communication appear to be a regular feature and in one case this results in the unfortunate death of an engineering officer. Disturbing is the number of cases where Senior Officers are involved who should know better and lead by example. Post incident actions by well trained personnel also never fail to surprise and shipping needs to work harder at developing the checklist discipline achieved by the airline industry.

We all make mistakes. Learning from other people’s mistakes is an important part of loss prevention and the effort made by the MAIB in summarising the key points of the main reports through this publication is to be commended.

Nigel Adams

Nigel Adams started his career as a Deck Cadet with the P&O Group in 1974. As a group cadet he spent time on various ship types, however on obtaining his 2nd Mates Certificate, he joined the bulk division and spent all his time at sea on tankers, bulk carriers and LPG/LNG carriers. He obtained his Master’s Certificate 1985 and was promoted to Master in 1988. He came ashore in 1992 and worked as Marine Surveyor/consultant with Cargo Analytics Ltd in Glasgow. This involved safety inspections, cargo survey work, accident and incident investigation, port captaincy and usual wide range of work involved with this type of position.

He then joined Acomarit as Marine Superintendent in 1994 with special responsibilities for the oil spill compliance programme and contingency planning. In 1996 his responsibilities increased to take on the safety and risk role for all of the Acomarit Group fleet and as a member of the company contingency team he was heavily involved in the ‘Sea Empress’ response in Milford Haven in 1996. This incident led to the introduction of the SOSREP. V.Ships took over Acomarit in 2001 and after a spell in the integration team Nigel was appointed Risk, Safety and Quality Director for V.Ships Ship Management Division.

In 2007, he was appointed Group Risk Director, however in 2008 for health reasons this post had to be relinquished.

Nigel is still working full time in V.Ships mainly focussing on projects and new regulation compliance. In his time ashore he was involved with the following committees and working group: Intertanko Safety, Technical and Environmental Committee; Informal Tanker Safety Officers Forum; Intertanko Lifeboat Working Group; Founding Maritime Board Member of Confidential Hazardous Incident Reporting Programme (CHIRP); Chairman of Intertanko Pilot Working Group.

CASE 1

Heavy Weather – Serious Injuries

Narrative

A large cruise ship fitted with gyro-fin stabilisers was on an ocean passage in heavy weather. The weather forecast indicated that the centre of the depression and the ship's intended course were converging, so the officers and crew had been ordered to secure the ship for heavy weather. The passengers had been told of the weather forecast and to exercise care while moving around on board the ship.

The master realised he would be unable to monitor the sea conditions during the dark, overcast night. As sunset approached he advised the passengers and crew of his intentions to heave-to; he then turned the ship into the wind and sea and reduced speed, predicting that the depression would pass ahead of his intended track. The ship was occasionally rolling heavily and pitching moderately. The cabaret show was cancelled and the main swimming pool was emptied, but service in the bars and in the restaurants continued as usual.

The ship rolled very heavily several times, heeling the ship to more than 30º. This roll caused passengers and crew, along with unsecured - and some previously secured - equipment to be projected across the ship several times (Figure 1). Numerous passengers and crew were injured, several seriously. The passenger public areas, including rooms designated as passenger muster stations, crew working areas and the galleys were strewn with furnishings, fittings and broken glass and crockery (Figure 2).

The master instructed the passengers to return to their cabins as the crew dealt with the injured, accounted for all the passengers, and started to clear up.

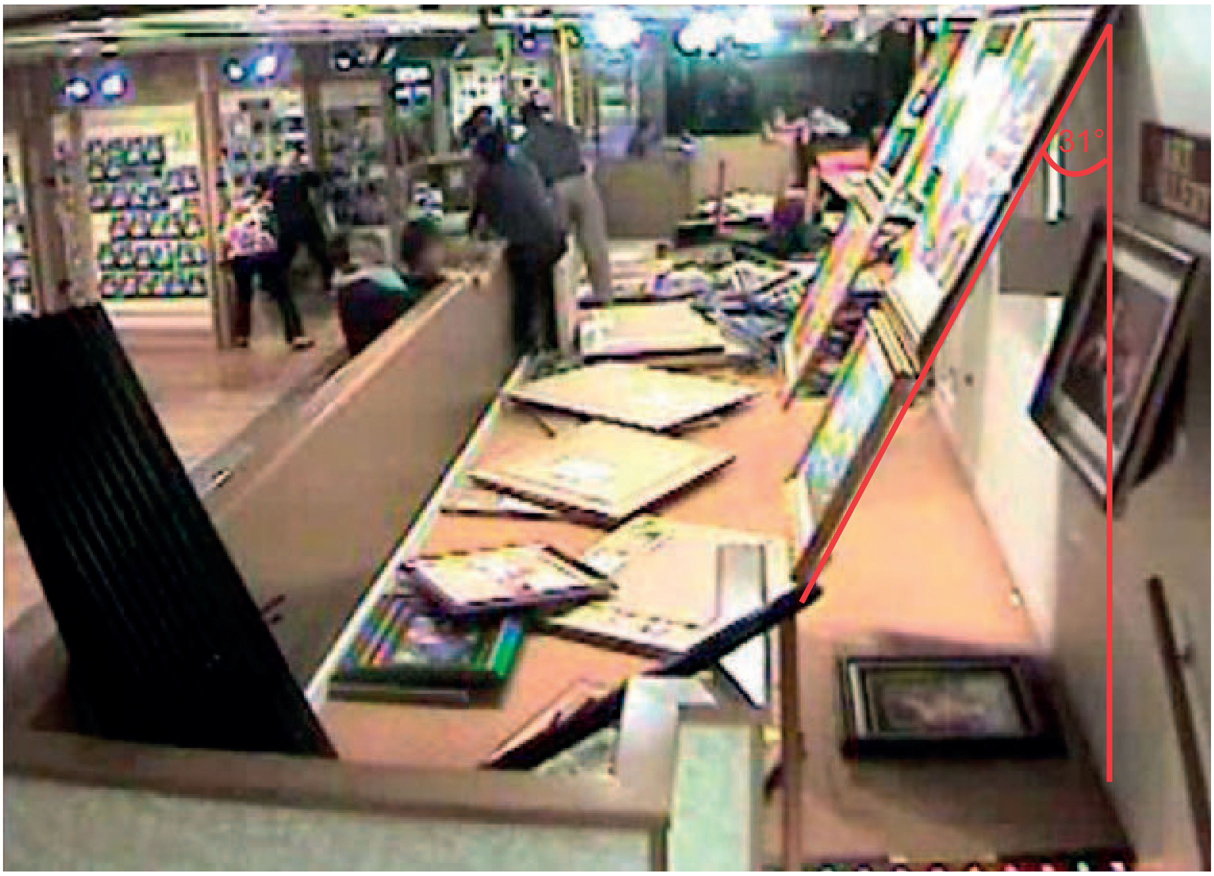


Figure 1: Ship heeled during heavy weather

Figure 2: Crew mess room following the accident

Figure 3: Passenger muster station following the accident

The Lessons

1. When the ship was hove-to at slow speed the stabilisers became ineffective and acted only as a bilge keel. However, their presence gave the ship's officers a false sense of security that any rolling would be reduced.

   Active stabilisers should be evaluated at various speeds and weather conditions so that their likely performance during heavy weather can be factored in to any mitigating action taken by masters and/or officers.

2. The master and watch officers were unable to monitor the sea conditions due to the darkness and the heavy cloud cover.

   Night vision glasses may offer a way to observe the sea conditions on overcast or moonless nights.

3. As the severity of the rolling was not anticipated, the passengers continued to move freely around the ship, served by the crew.

   During particularly bad weather, consideration should be given to limiting the services available to passengers for their safety and the safety of the crew. This may include emptying all pools and spa baths, restricting bar service, closing shops and limiting the menu options offered.

4. Unsecured furniture, equipment and objects were free to move and hinder the usability of the passenger spaces.

   Ships can roll heavily for numerous reasons such as heavy weather, inadvertent use of the helm or deliberate avoiding action. Ships' fittings and equipment should therefore be sufficiently secured to prevent serious injury to passengers and crew. A thorough study of the securing arrangements on board, both permanent and temporary, along with the potential consequences of free to move objects, will confirm whether the ship is sufficiently secured.

5. Some of the muster stations (Figure 3) were made unusable following the accident; had the situation deteriorated the master would have been unable to send the passengers to their designated areas.

   Although not an IMO requirement, specific consideration should be given to ensure the viability of passenger muster stations following the effects of a large angle of heel.

Poor Housekeeping = Own Goal

Narrative

The master of a feeder container vessel was on the bridge, together with a pilot, for a lengthy and busy river transit. It was a warm, very pleasant day and the master expected to arrive at the port on schedule. What he certainly did not expect to see was black smoke suddenly rising just in front of the forecastle break.

The fire alarm was immediately pressed and the crew quickly went to their muster stations. In consultation with the pilot, the vessel's speed was reduced. Soon afterwards, the chief officer reported to the master that a fire had developed in the vicinity where containers had been discharged at a port the previous day.

Events then moved quickly, and regularly practised procedures were followed. All available fire pumps were started from the bridge; the emergency party dressed in fire suits and donned BA in readiness to tackle the fire. All hold ventilation was stopped and the engineers isolated electrical power to the forward part of the ship.

Ten minutes after the fire alarm had sounded, the chief officer reported to the master that the fire was under control and, a short time later, that it was extinguished. Other members of the crew cooled down the area as the emergency party then entered the hold and confirmed it to be clear. A fire watch was then set up to deal with the possibility of re-ignition.

The seat of the fire was found to be a large quantity of linseed oil-soaked cotton waste. This had been used to mop up oil that had leaked from one of the containers discharged at the previous port. The waste had been left in a large pile on rubber matting on the deck which had also ignited.

Fortunately, the fire damage was limited to the paintwork on the forecastle break bulkhead, a reefer electrical supply cable, light fittings and a hold ventilation cowl (Figures 1 and 2).

Figure 1: Bulkhead damage

Figure 2: Hold ventilation cowl damage

The Lessons

Linseed oil is a vegetable oil derived from flax seeds. It is well known that absorbent materials - such as cotton waste, soaked in boiled linseed oil are vulnerable to self-heating resulting in spontaneous combustion; especially if it is in a mass that does not allow the build up of heat to escape. In this case, the cotton waste ignited, causing the heavy rubber matting to also catch fire. Fortunately, there were few other combustibles in the immediate area. Had there been containers in the vicinity, or had the rags been stowed between decks, the outcome could easily have been more severe.

1. When clearing up oil spillages, especially boiled linseed oil, be considerate of the risk of spontaneous combustion; especially if the waste is piled up.
2. Good housekeeping is everyone's business and helps make for a safe ship environment. Do ensure there are arrangements in place for the safe storage and disposal of contaminated waste. Further guidance can be found in Chapter 9 of the Code of Safe Working Practices for Merchant Seamen.
3. In this case, the crew dealt with the fire in a confident and competent manner because they were well practised in fire-fighting techniques. Imaginative and properly de-briefed emergency drills will improve fire-fighting and help make reactions instinctive and success more likely.

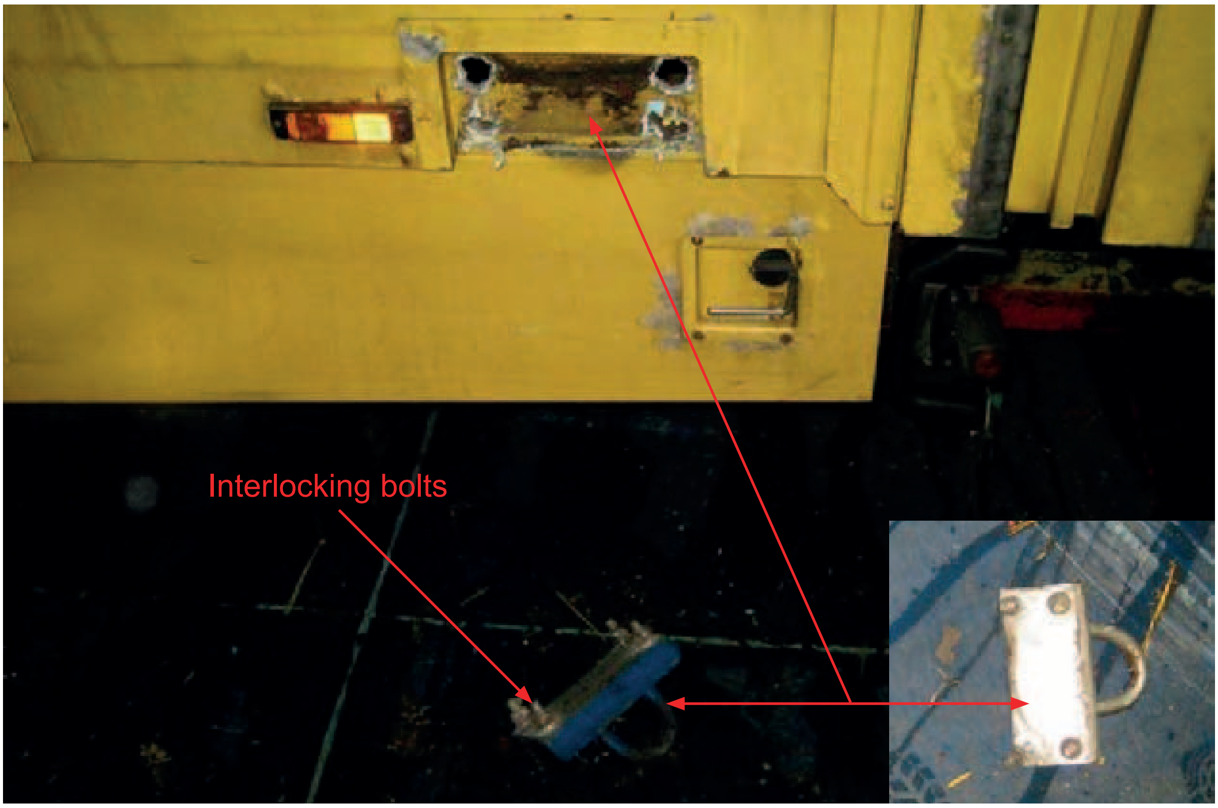
Ship M*oo*vement Highlights Need for Lashing Securing Points to be 'Beefed' Up

Narrative

A ro-ro passenger vessel carrying livestock vehicles encountered heavy weather while on passage. To reduce the ship's motion, course was adjusted and the rolling eased. Consequently, the starboard stabiliser fin was retracted. Seconds later the vessel took a heavy roll, resulting in one livestock vehicle, containing cattle, to break free from its lashings and overturn.

The 70 tonne vehicle and trailer had been secured by eight chain lashings, but all of the lashing points on the vehicle had failed (figure).

Closer inspection showed that the vehicle and trailer had been designed with steel lashing points secured by four steel bolts to the aluminium frame of the vehicle. The force applied to the lashings during the heavy roll had caused the four steel bolts on each lashing point to be pulled through the aluminium bodywork and become detached from the vehicle (figure).



Steel lashing point complete with securing bolts detached from aluminium vehicle frame

The Lesson

Although the steel lashing points on the vehicle appeared to be fit for purpose, the supporting aluminium frame was not strong enough to withstand the loads imparted when the ferry rolled. Requirements for vehicle lashing points are detailed in international standards. However, a coat of paint can disguise many deficiencies, and it is good practice for road hauliers and ferry operators to closely check, wherever possible, that the design, construction, or condition of vehicle lashing points are not flawed.

Lift Shaft Working Can Kill

Narrative

A ship's passenger lift was to be inspected to ensure that the pit at the base of the lift shaft was clean. The lift car was stopped at the deck above the lowest deck to allow a clear view from the lowest deck into the lift pit. The lift controls were isolated by the emergency stop button in the lift car.

The engineer on duty was unable to open the lift shaft door on the lowest deck with the access key that should have released the door and allowed it to be opened by hand (Figure 1).

The chief engineer arrived on the lowest deck and also tried, unsuccessfully, to open the door. The chief engineer then went up the stairs to the deck above and into the lift car through the open doors. He then climbed up a ladder through the emergency escape hatch on to the lift car top and closed the hatch behind him (Figure 2).

The duty engineer followed the chief engineer into the lift car and incorrectly assumed that, as the hatch was closed, the chief engineer had taken control of the lift from the controls on the lift car top (Figure 2). The duty engineer operated the spring-loaded reset for the lift car emergency stop using the reset key that was attached to the door opening key (Figure 3). The lift was now reset to its automatic operating mode.

The lift car was either called from another deck, or responded to a previously stored command. It went upwards at normal working speed, trapping the chief engineer between the lift car and the overhanging sill of the deck landing above (Figure 4).

The chief engineer died almost immediately, however the ship's staff were unable to release him. He was finally released, over an hour after the accident, with the assistance of shore-side lift contractors.

Figure 1: Lift shaft door being released

Figure 2: Escape hatch and lift car top control panel

Figure 3: Lift door opening key and lift reset key

Figure 4: Location of chief engineer after the accident

The Lessons

1. Lack of planning, poor communications and incorrect assumptions led to the chief engineer placing himself in an extremely hazardous position while the duty engineer reset all the safety interlocks.

   Whenever doubt exists in carrying out hazardous duties, the job must be stopped until everyone understands the task in hand. Planning is required prior to lift entry; too often people are killed by lifts when work is not properly considered, particularly when it is carried out at short notice.

2. The lift operating manual or the Code of Safe Working Practices for Merchant Seamen (COSWP) had not been consulted.

   The COSWP provides useful guidance on the safety precautions to be taken when working on lifts, including the necessity for a permit to work to be completed. Instruction manuals should be studied and used to establish safe working procedures for each type of lift on board.

3. The crew were unable to release the chief engineer as they were not familiar with the emergency operation of the lift.

   A proper understanding of how the lift operated, together with regular testing and drills in emergency situations, would have allowed the ship's staff to respond more effectively to this accident.

Figure 5: Door access

A Testing Time

Narrative

The installation of an upgraded dynamic positioning system (DPS) fitted to a platform supply vessel (PSV), while alongside a quay, had proceeded well. The new DPS command and feedback signals were required to interface with three different, but existing, controllers fitted to the vessel's four tunnel thrusters, two controllable pitch propellers (CPP) and the independent rudder systems respectively.

As the installation technician completed his final checks, the company's technical superintendent arrived on board to witness the DPS Harbour Acceptance Trial (HAT). The trial required a small amount of pitch to be applied from the DP operator station on the bridge (Figure 1) to the thrusters and CPPs to check their functionality. The chief officer and second officer were on the bridge as the tunnel thruster tests were carried out. These were successful and the technical superintendent then left the ship for personal reasons, leaving the technician in charge of the HAT.

The technician noted the command signal of 12 milliamps (mA) for the CPP displayed on the DPS operator's monitor and accepted that the 4-20mA signal value range was correct (Figure 2). He did not check it against the specification as required by the HAT documentation. Had he done so, he would have noted that the correct value should have been +/-10 volts, which was the command signal range designated for the CPP controllers.

Figure 1: DP operator station

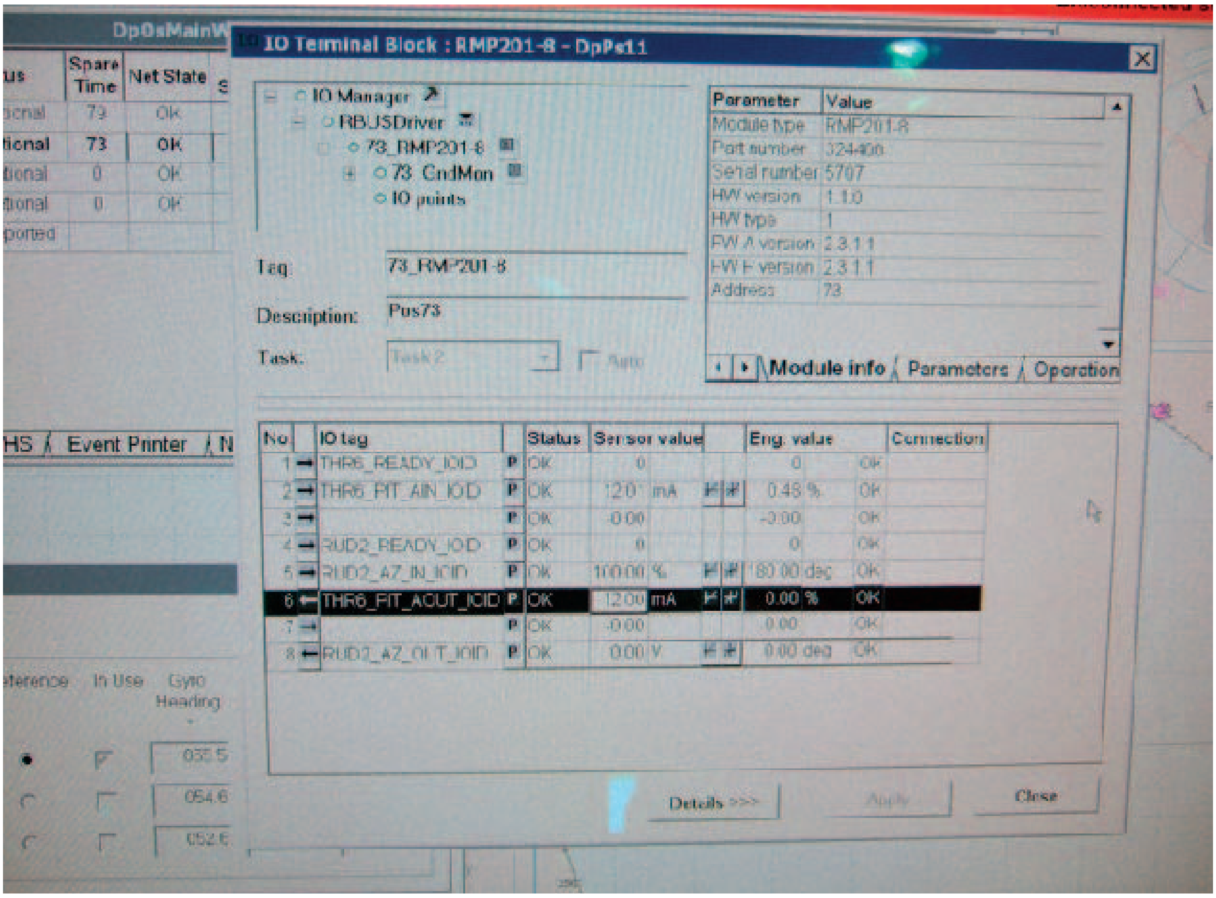


Figure 2: CPP command signal data

Control of the CPPs was passed from the engine control room to the bridge, where the chief officer confirmed he had manual control of the ahead and astern pitch. No other preparations were made such as doubling up mooring lines, removing the gangway, checking main engine emergency stops or, indeed, informing the master of the need to connect an unproven control system with rotating propulsion machinery.

As manual control of the CPPs was passed to the DP system, full ahead pitch was automatically applied and the vessel immediately began to move rapidly up the quay. The mooring lines, which were only turned around single bitts or winch drums, were pulled from the vessel as the chief officer tried to apply astern pitch. This was unsuccessful and the vessel made heavy contact with another vessel moored ahead.

Soon afterwards, he pushed both main engine emergency stops, but only the starboard one worked. In the meantime, the vessel continued ahead, making contact with another PSV, and only came to a stop after the chief officer pushed the port main clutch disengage button. At this time, the master arrived on the bridge and tried to recover the situation by using the available tunnel thrusters. This was also unsuccessful, and he opted to warp the vessel back alongside with the aid of a pilot launch which had arrived on scene.

Varying degrees of shell plate, frame and upper deck equipment damage (Figures 3 and 4) was sustained on the three vessels. Fortunately there was only one case of minor bruising, to one crew member.

Figure 3: Bulkhead and frame damage

It was found that full CPP ahead pitch was inadvertently applied because the 4-20mA command signal resulted in a measured voltage of 13.5 volts at the CPP control module which was greater than full pitch ahead, i.e. +10 volts. This had not been identified during earlier factory test checks or during the installation stage, so it was not corrected. It was found that the most likely cause of the failure to take manual control of the CPP and thrusters was due to the mode selector switch not being correctly moved to the "manual" position after the inadvertent pitch had been applied.

The conduct of the HAT was inadequate. With the absence of the technical superintendent, there was no one person clearly in charge of this important procedure. It was apparent that the crew had not been engaged in the planning process and had only a rudimentary knowledge of the requirement to test machinery. No trial prerequisites had been considered, so no toolbox talk or pre-trial risk assessments had been conducted by any of those involved.

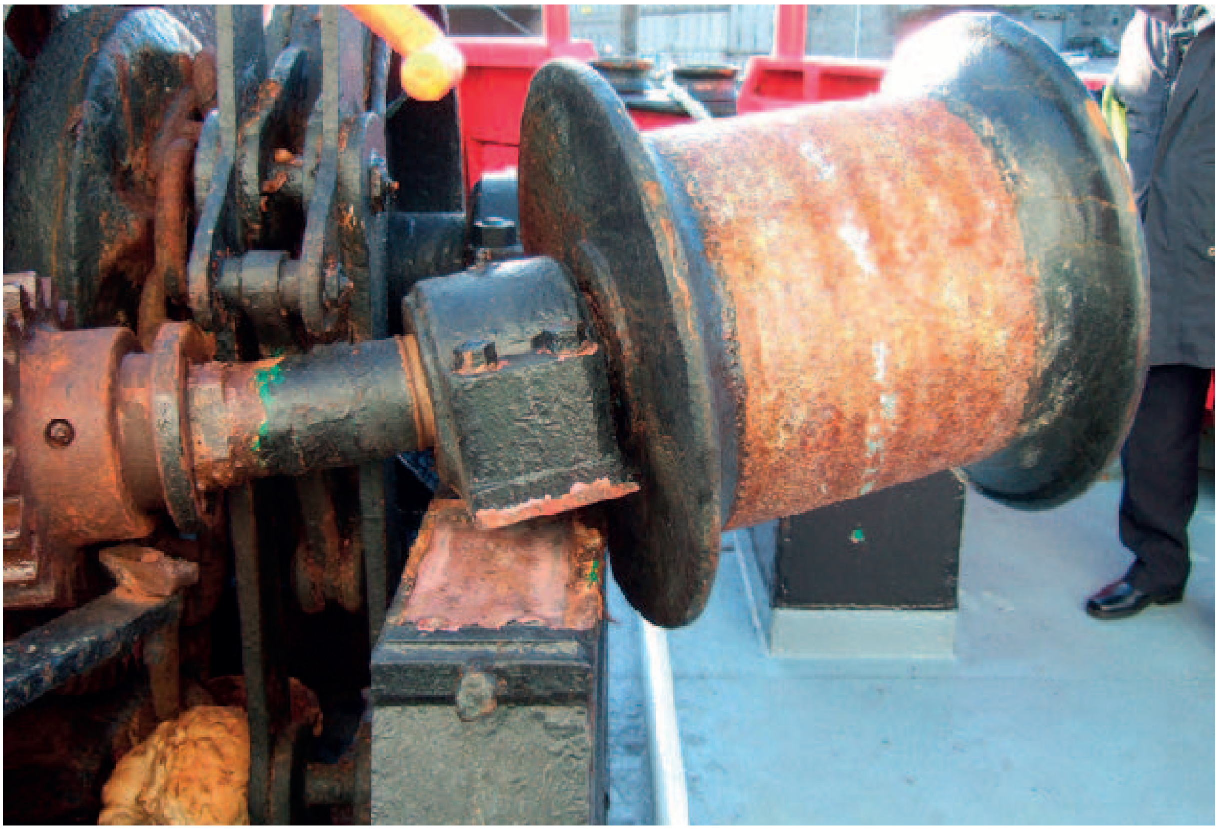


Figure 4: Fractured winch drive shaft

The Lessons

Luckily, the outcome of this accident was relatively slight. This was due more to good fortune than good judgment. Had divers been carrying out hull inspections on either of the two contacted vessels, the outcome would have been far worse, and with the clear potential for loss of life.

1. It is all too easy for crew to distance themselves from refit/upgrade work and rely on shore-side staff to manage the project. However, the safety of the vessel and her crew - including the running ofmachinery - is the responsibility of the master, who should be engaged in the planning process so that appropriate risk reductions are properly identified and implemented.

2. Do carefully consider the implications of connecting unproven control systems to running propulsion machinery and make sure everyone is aware of the trial's intentions.

3. Investigate alternative ways of proving controls, i.e. by linking out electrical/control circuits before connecting to running plant.

4. Check emergency stops regularly and do not delay in rectifying defects. In this case the stops had been checked in accordance with the maintenance schedule. The port one had been identified as being "sticky" during testing; other than lubricating it with WD40 no further action was taken.

5. It is advisable that safety management systems provide guidance on the control of, and liaison with, contractors. In this case, the technician was left in the vulnerable position of assuming control of the HAT.

6. Mooring lines which are simply turned around single bitts or drum ends are far less effective than those secured in a figure-of-8. Doubling up of mooring lines when there is a risk that the vessel might move will provide extra security and more time to take corrective action if needed.

Almost a Step Too Far

Narrative

As well as carrying vehicles on her main car deck, a car and foot passenger ferry was designed to also carry them on her port and starboard mezzanine decks which, when not in use, could be stowed away. When the decks were in the stowed position an interlock bolt was automatically engaged to prevent the mezzanine deck access sliding doors from opening (Figure 1).

The foot passengers and vehicles were loaded on the ferry's main car deck. The mezzanine decks were, as usual, in their stowed positions. Once parked up, the vehicle occupants made their way up to the passenger lounge and the ferry sailed on her short crossing.

It was a pleasant journey, and as the ferry reached her destination the passengers went to retrieve their cars. Two of them proceeded to what they thought was the main vehicle deck entrance. In fact, they were both at the mezzanine deck level. One of the passengers depressed the port mezzanine deck door "open" button. The sliding door opened and the two passengers were just about to step through the door when, to their alarm, they found that there was no deck outside the door, but were instead confronted with a fall of 2.54 metres onto the main car deck below (Figure 2).

Figure 1: View of door from inside

Figure 2: View of door in open position

They immediately pushed the door "close" button and informed the deck officer, who advised them of the correct location of their vehicles.

On investigation it was found that the port mezzanine deck access door interlock bolt, which should have prevented the door from opening when the deck was in the stowed position, had not fully travelled to the safe position because of a build-up of debris in the bolt recess channel.

The mezzanine decks were seldom used, and their maintenance checks were the last to be carried out each month. Although the safe interlock operation was a maintenance monthly check, it is likely to have received little attention, and it is therefore questionable that an interlock functional check was regularly carried out.

The two passengers had a very lucky escape; had they fallen onto the main car deck they would have sustained serious, if not fatal injuries.

The Lessons

Because the mezzanine decks were rarely used it was a matter of "out of sight, out of mind", and the safety interlock systems did not receive the maintenance attention they deserved. Something as apparently insignificant as a build-up of debris in the bolt channel, which was not immediately obvious, could have cost two people their lives.

1. **Interlocks are designed as control measures to provide for the safe operation of equipment and to ensure the safety of passengers and crew. Do ensure that functional checks and maintenance routines are carried out diligently.**

2. **Where interlock faults are identified, address these promptly.**

3. **When an interlock workaround is unavoidable, possibly because of spares issues or awaiting technical advice, do ensure that a risk assessment is carried out so that safety is not compromised.**

They Didn't Bank on That Happening

Damage was sustained to both vessels

Narrative

A 10,000 tonne container vessel, with a pilot embarked, collided with another vessel which was proceeding in the opposite direction of a narrow channel. Both vessels suffered extensive damage and were out of service for a considerable period while costly repairs were undertaken.

Prior to the collision, the container vessel had increased speed to overtake a small barge as she left a major channel and entered a long, narrower channel. The overtaking manoeuvre resulted in her being on the extreme starboard side of the channel, close to the bank. A short time later the bridge team became aware of an increasing level of vibration in the hull, and the vessel then took a sudden and uncontrollable sheer to port into the path of a vessel proceeding in the opposite direction.

Analysis of the information obtained from the voyage data recorder of the container vessel showed that she was influenced by bank effect and squat prior to the collision. The vessel's speed was excessive, and she was closer to the bank and in less water than the bridge team had planned for.

In shallow water, with reduced under keel clearance, the vessel's pivot point would have moved aft, reducing her steering lever. Close to the edge of the bank the large forces associated with the high pressure area around her bow and the low pressure area around her stern caused the sudden sheer to port which, with a reduced steering lever, the helmsman was unable to correct before the collision occurred.

Fundamental to the vessel being too close to the edge of the bank and at an excessive speed was the decision to overtake the barge at the entrance of the smaller channel. This decision was taken by the pilot to avoid following the slower barge along a channel in which overtaking would have been difficult. However, the decision was made without sufficient communication between the bridge team and without consideration of the consequences of the manoeuvre.

The Lessons

1. The cause and effects of interaction should be recognised and taken into account by all members of a vessel's bridge team. Speed is critical, since the magnitude of forces created by both bank effect and squat increases with the square of the vessel's speed through the water.

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

   • Appraising, Planning, Executing and Monitoring

   When a pilot supplements the bridge team, these requirements do not change; if anything, the ship's permanent team should be even more vigilant when monitoring the execution of the mutually agreed passage plan.

Inexperience and a Lack of Communication - a Dangerous Mix

Narrative

A relief master was in command of a ro-ro ferry operating between two regular ports of call. It was a calm, clear night, the tide was just beginning to flood, and once loading was completed the vessel departed the berth for a night crossing. The bridge was well equipped but the other officers were temporary personnel. There was no pre-departure briefing and almost no information flow between the officers once the vessel was underway.

Shortly after departure, the master became distracted by the remote tidal gauge display which was showing below prediction, and by the echo sounder which was operating intermittently. During this time he was also attempting to negotiate a bend in the channel. He took the turn too wide, and the vessel grounded on the opposite bank. Neither the chief officer nor the second officer warned the master that the vessel was straying into danger.

For the next 45 minutes the master tried to manoeuvre the vessel free. During this time he did not notify the coastguard, harbour authority or his company that the vessel was aground, nor did he inform the passengers or the engine room. Nobody on the bridge consulted the post-grounding checklist. The chief engineer (also a relief) became aware that the ship was aground, but he did not want to disturb the master and did not contact the bridge. Although he took some precautions, the chief engineer also failed to consult the checklists, and no one checked to see if the vessel was taking on water.

Fortunately the vessel floated free on a rising tide without sustaining any damage, and she continued on passage. No checks of the propulsion or steering gear were made and the incident was still not reported. Some shore workers, however, had seen the vessel stationary in the channel, and the incident was brought to the attention of the DPA the following day.

Bridge team

The Lessons

1. A good bridge team would have identified that the vessel was taking the turn wide and was at risk of grounding, and would have told the master in good time.

2. A bridge team needs to know the master's intentions if they are to monitor his actions effectively. This is achieved by a good pre-departure briefing and a commentary from the master during the passage.

3. It is important that the coastguard and harbour authority are made aware of any incident as soon as possible – even if no assistance is required. They can then monitor the situation and be ready to assist should the incident deteriorate.

4. Had a more experienced team been on board that night it is likely that some, if not all, of the post-grounding actions and reports might have been carried out.

Watch Where You Are Going

Narrative

A passenger cruise ship was following the north-east lane in the Dover Strait at a speed of 15 knots at night. Her passage plan crossed the south-west lane when east of the MPC buoy (figure). The second officer was the OOW, assisted by a third officer and a helmsman. The master was also on the bridge to oversee the crossing.

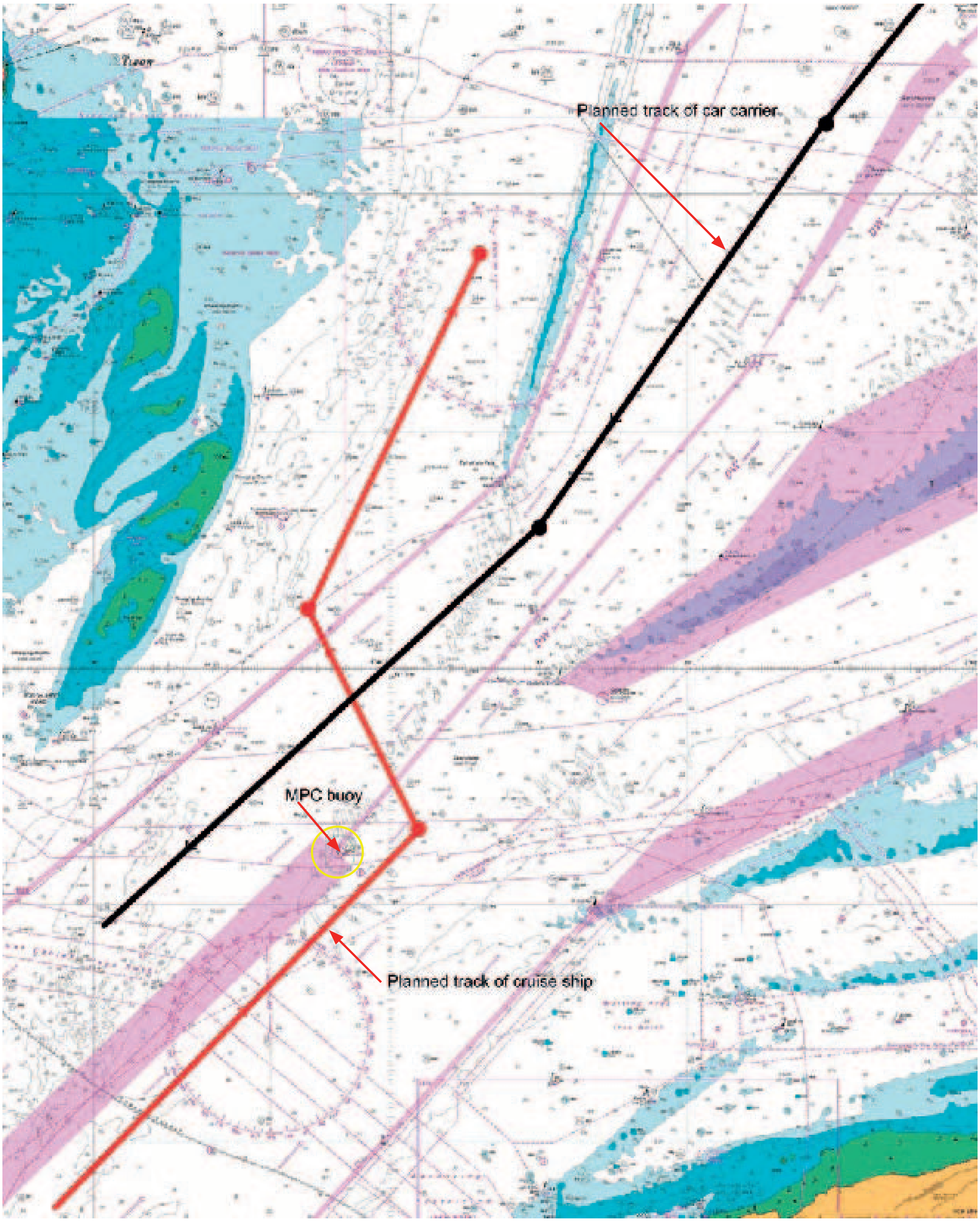
In preparation for the alteration of course, the master and second officer monitored the traffic in the south-west lane by ARPA. Two targets of interest were acquired: Target A at 16nm and Target B at 18nm. Shortly afterwards, the vessel passed the MPC buoy and the OOW informed the master that he intended to alter course to cross the south-west lane ahead of these vessels. The OOW was told to first carry out a trial manoeuvre on the ARPA. This was done, but no time delay was entered and the information shown was misread.

Consequently, the master incorrectly assessed that the planned alteration would result in his ship passing close ahead of Target A. To avoid this, the master instructed the OOW to adjust course to pass close astern of Target A and ahead of Target B. Accordingly, the OOW made a series of small course alterations to port, to round the stern of Target A.

This action reduced the CPA between the cruise ship and Target B to 0.2m. This concerned the embarked sea pilot on board Target B, a large car carrier making good a speed of 17 knots. The pilot called the cruise ship by VHF radio, and when communications were eventually established the vessels had closed to about 1 mile and the CPA between them had reduced to 0.13m. The sea pilot was not happy with the situation and, although the cruise ship was under helm to port to pass astern of Target A, he felt compelled to alter course hard to starboard, and eventually completed a 360° turn.

The Lessons

1. **Crossing the traffic lane in a TSS requires adherence to the relevant collision regulations built on an accurate assessment of the traffic in the vicinity. It also requires that the intent of any action taken is clear to other vessels. On occasion, the position and time of crossing might have to be adjusted to meet such requirements. A delayed course alteration or a reduction in speed is far better than a close-quarters situation – or worse.**
2. **Assessing the movement of vessels in a busy TSS tends to be more difficult at night, when distances and aspect are harder to judge. In such situations, the use of electronic aids, such as ARPA, is invaluable. However, if these aids are used incorrectly, through either a lack of training or familiarity, hazardous situations are likely to result.**
3. **Bold course alterations make a vessel's intentions very clear; small incremental alterations lead to confusion and doubt.**



The planned tracks of the vessels involved

No, Not That One

Narrative

A job that was assessed to be simple and non-invasive turned out to be a catastrophe for the multinational engineering team of a container ship.

With the second engineer supervising the work, the third engineer and fitter were tasked to fit protection shields on Nos. 1 & 7 cylinder units of the main engine. These shields, of a fairly new design, were meant to protect personnel in the vicinity from escaping hot gases under pressure should the cylinder become over-pressurised (Figure 1). Work started on unit No. 1 and was completed within an hour, with no problems encountered.

The fitting of the protection shield on unit No. 7 became increasingly more complex, necessitating the removal of platform plates, a non-pressurised pipe and a protective bracket. No attempt was made to re-evaluate the risks. Shortly after the pipe was removed (Figure 2), the second engineer left the area to respond to an alarm on the boiler. The third engineer then thought that the main bracket (Figure 2), which had supported the pipe, also needed to be dismantled, and removed the bolts which also secured the jacket cooling water pipe connection. As the third engineer and fitter attempted to manoeuvre the shield around the cylinder unit, it dislodged the cooling water pipe and resulted in the fitter becoming drenched with hot water (85º C) at 3.4 bar.

Although the second and third engineers were quick to respond, by isolating the circulating water, the fitter suffered 30-40% burns to his body, had to undergo skin grafts and remained in hospital for a prolonged period.

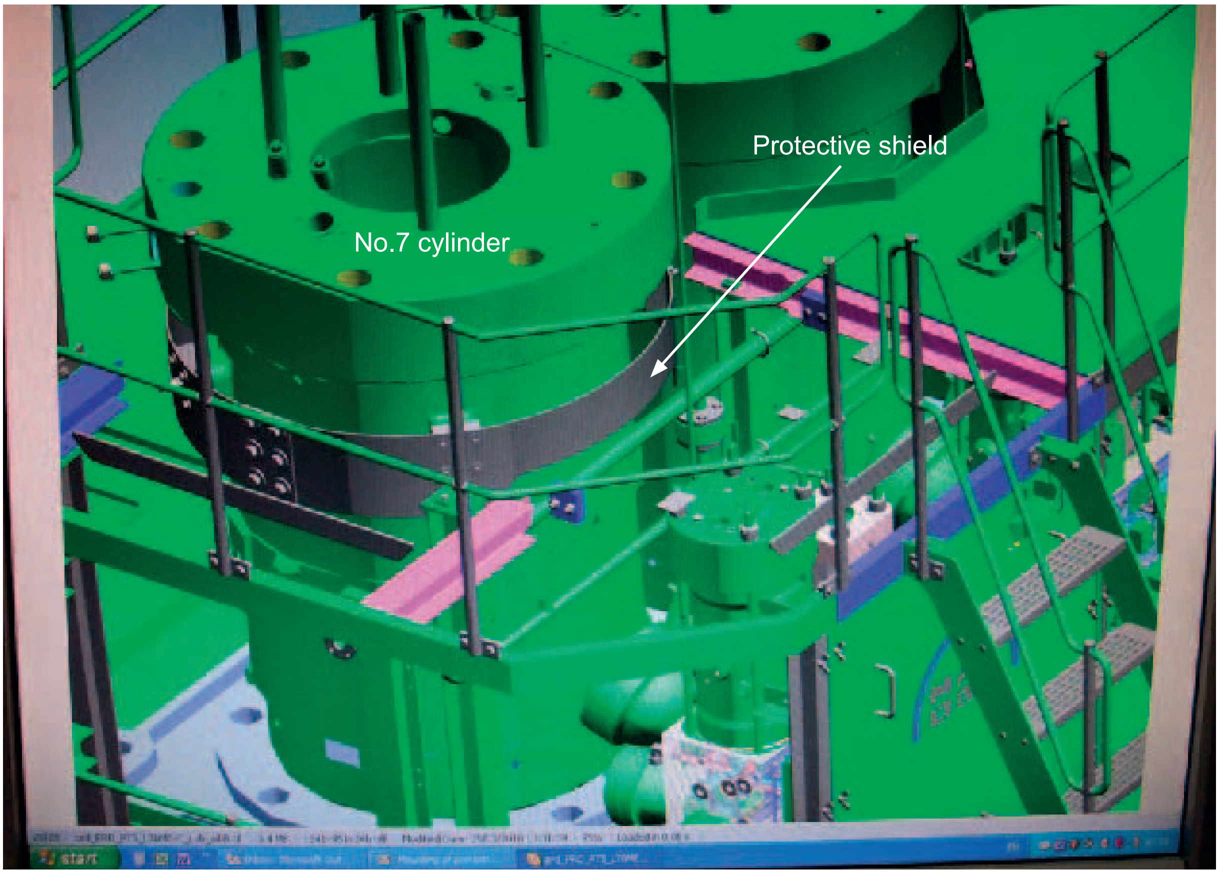


Figure 1: No.7 cylinder arrangement

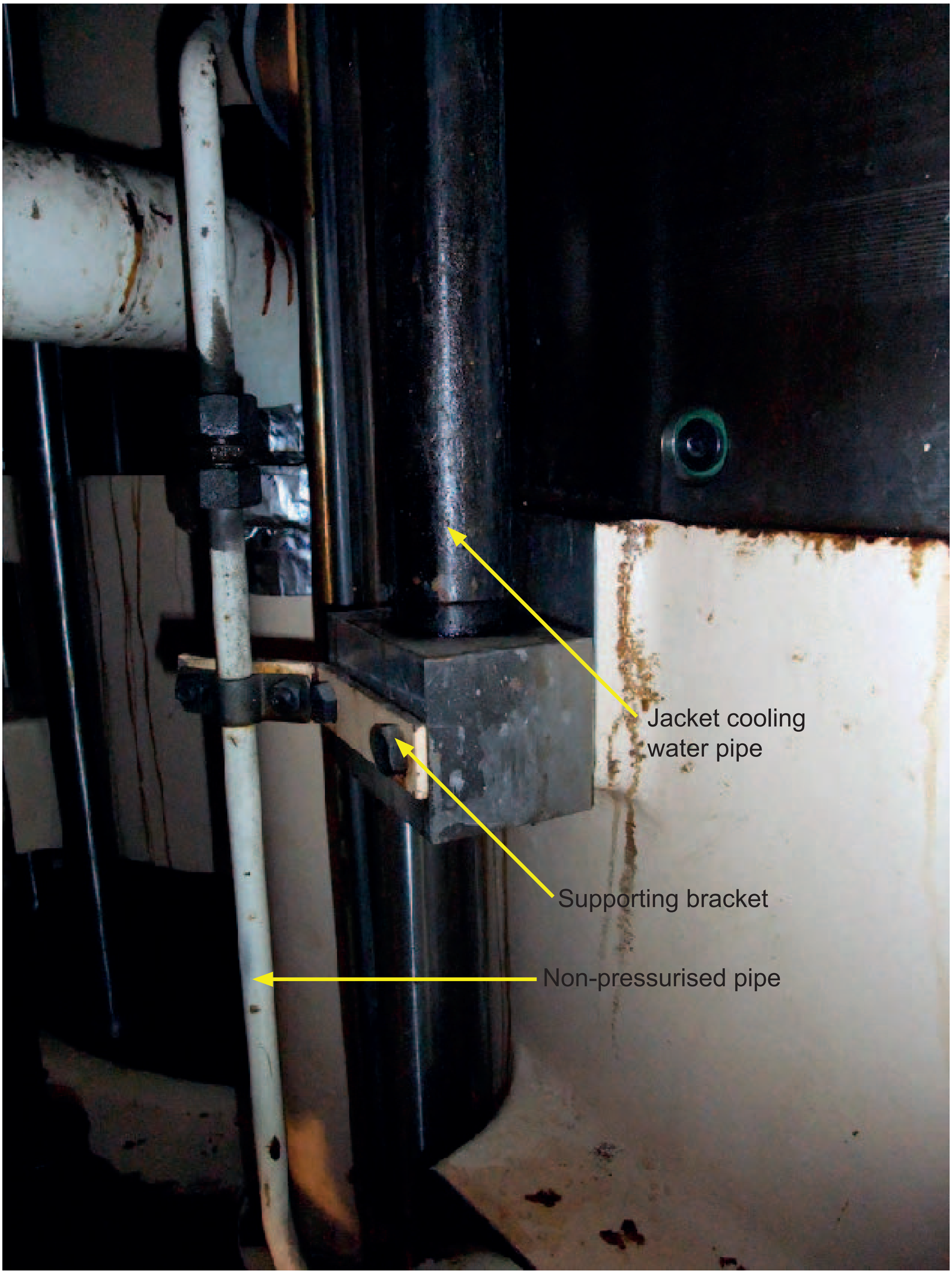


Figure 2: Pipe securing arrangement

The Lessons

1. As the task became more complex, the second engineer should have halted the work and carried out a revised risk assessment. This could have triggered the requirement to complete a permit-to-work, followed by a toolbox talk, which would have identified the extent of work required and the necessary removal of surrounding fittings.

2. The third engineer was not familiar with this type of engine and did not recognise that by removing the bolts on the main bracket, he was in fact removing the retaining bolts of the cooling water connection. When delegating work, tasks should be allocated according to crew members' competence and skill levels.

3. Before undertaking any work on machinery, instruction manuals should be consulted so that an understanding of the system can be gained. While the second engineer did so, he did not pass this information to the third engineer. However, the third engineer, in turn, after deciding that an additional component needed to be removed to facilitate access, should have sought prior approval and taken steps to isolate the cooling system.

4. When working within a multinational team, the team leader should be aware of the cultural differences that may exist within the team. His/her communications should be clear and concise to avoid any misunderstandings and he/she should then monitor activities to confirm if they have been understood.

5. More junior members of teams can sometimes make ill-advised decisions or actions in an effort to impress their more senior colleagues. This trait can sometimes be exacerbated in situations where the team comprises a number of different nationalities and there is a marked culture of deference between the junior and senior members. As in this case, an effort to please and crack on with the work in an unplanned and uncontrolled way had life-threatening consequences.

CASE 11

Watch 'Sleeping' Leads to Grounding

Narrative

Just after midnight on a cold winter night, a fish transport vessel with a cargo of live fish sailed from a fish farm towards her discharge port, approximately 6 hours away. The vessel had been engaged in this trade for 7 years, but recently her trading pattern had intensified and she was completing one round trip every 24 hours.

There was very little wind, the sea was calm and it was pitch dark outside. The mate was alone on the bridge, navigating with the aid of an electronic chart system while seated on the wheelhouse chair. All the room heaters were on, and the bridge was dark except for the light from a few navigation instruments and the CCTV for monitoring the live cargo.

A few hours into the passage, the vessel approached a restricted transit area and the mate set a south-easterly course to head for the channel between an island and the mainland. Approximately 25 minutes later, the vessel ran aground on the shores of the mainland while still travelling at passage speed. The mate had fallen asleep in the bridge chair and had missed the course alteration into the channel.

Investigations revealed that several pieces of the vessel's cargo equipment, some navigation equipment, and the watch alarm were defective. Historically, the vessel also suffered a high turnover of senior crew, and just the day before the accident the mate had been demoted from the rank of master to that of mate. Consequently, he had changed his watch pattern from the master's 6-12 watch to the mate's 12-6 watch. He had managed only 5 hours of sleep in the 24 hours preceding the accident, and was likely to have been considerably fatigued when he fell asleep in the bridge chair.

The Lessons

1. **The vessel's intense trading pattern, the significant amounts of defective equipment on board, and the lack of continuity caused by the high turnover of senior staff resulted in the crew members working long hours. With only four crew on board, all of whom were busy, there was insufficient manpower to ensure a dedicated lookout was maintained during the hours of darkness. Ship owners should periodically review their vessels' manning levels and operating routines to ensure that sufficient crew are on board and, specifically, that a dedicated lookout can be maintained during the hours of darkness.**

2. **The mate fell asleep because he was fatigued. Not only was he getting insufficient sleep - like the other crewmen - because of the vessel's operating cycle, defects and lack of watchkeepers, but also his circadian rhythm had been disrupted by the abrupt change in his watch pattern just before the accident. In addition to this, he was stressed by his demotion. Ship owners must recognise that there are numerous causes of fatigue, and should take every care to ensure that the working environment on board does not contribute to this.**

3. **A working watch alarm would have ensured that the mate did not sleep for more than 5 minutes at a time. The MAIB considers that a dedicated lookout is required during the hours of darkness. However, had the lookout needed to leave the bridge for a short time the watch alarm would have kept the watchkeeper alert. Watch alarms are effective only if they work, and they should never be disabled deliberately.**

Who Started This?

Narrative

An inbound passenger ferry was rounding a headland and approaching her final waypoint, at which point the passage plan required her to alter course to port and head towards the harbour approaches. Meanwhile, a cargo vessel was leaving the port. It was daylight, with good weather and clear visibility. Each vessel's bridge was manned by the OOW and the master. A number of passengers were also present on the ferry's bridge.

The cargo vessel's OOW sighted the ferry's port aspect on his starboard bow and, interpreting his to be the give-way vessel, altered course to starboard. The ferry's OOW, unaware that the cargo vessel had taken avoiding action, altered course to port in accordance with her passage plan. This resulted in the vessels approaching each other on reciprocal headings with each vessel fine on the starboard bow of the other.

The ferry's OOW was reluctant to alter course, and expected the cargo vessel to keep out of the way. The cargo vessel's OOW was concerned that any further alteration of course to starboard would bring his vessel unacceptably close to the land, and that any alteration of course to port may conflict with a potential starboard alteration of course by the ferry. Consequently, he decided to reduce speed and make a tight round turn to starboard. This resulted in the ferry passing close astern of the cargo vessel.

The Lessons

1. Situational awareness incorporates three elements: perception, understanding and anticipation. In this case, the ferry's OOW had not perceived the cargo vessel's initial starboard alteration of course. Hence, he lacked an understanding that his was a stand-on vessel in a crossing situation and was therefore expected to maintain course and speed in accordance with Rule 17(a)(i) of the COLREGs. Consequently, his anticipation of how the cargo vessel's OOW would react to his alteration of course to port, was impaired. Rule 5 of the COLREGs requires a proper lookout to be maintained at all times so as to make a full appraisal of the situation and of the risk of collision. The ferry's lookout was adversely affected by the unnecessary presence of passengers on her bridge. Bridge team distractions need to be minimised, particularly when entering and leaving port, or when otherwise navigating in restricted waters.

2. The COLREGs provide for collision avoidance communications in the form of sound signals. One short blast by the cargo vessel would have assisted in drawing attention to the fact that she was altering course to starboard. Additionally, five short and rapid blasts would have indicated that the cargo vessel's OOW was in doubt as to the ferry's intentions when she started altering course to port. The requirement to use sound signals for collision avoidance is often ignored in favour of using VHF radio. While MGN 324 (M+F) warns generally against the use of VHF radio for collision avoidance, it nevertheless accepts that, for example in pilotage waters, it may be usefully resorted to. Such was the case here.

3. Rule 2 of the COLREGs requires watchkeepers to "think outside the box" and take any necessary precautions. The ferry's OOW should have foreseen that his intended port alteration of course would result in a head-on situation. Not only would this require him to alter course to starboard, but it would also require the cargo vessel to alter course towards an already close coastline. Instead, a delayed course alteration, although inconvenient, would have avoided any uncertainty, averted a close-quarters situation, and accorded with best practice.

CASE 13

Watch Your Step

Narrative

Monday morning: the start of another week and time to press on with the routine diving inspection and maintenance of a monobuoy. It had been done many times before, was well described in the safe systems of work documentation, and the team on board the small support vessel were well versed in the procedures, so it should have been simple – shouldn't it?

The monobuoy was secured to the seabed by eight anchors and was used to transfer cargo from oil tankers to an onshore storage facility. To enable tankers to swing through 360°, under varying wind and tide conditions, the upper part of the unit was fitted with a turntable to which tankers were secured. Vertical pins were fitted to lock the turntable to the monobuoy's body to prevent it rotating during divers' inspections and maintenance.

In accordance with the well established safety procedure, the vessel went alongside and two ABs, who were wearing calf length, non-slip rigger's boots, jumped from the vessel's boarding platform onto the monobuoy's turntable. The next stage was to pass over the stern and head lines using heaving lines and secure them onto two of the turntable's bollards.

Things didn't go quite according to the plan. The stern line was quickly secured, but the head line heaving line became snagged on an obstruction on the monobuoy's body. The AB who was dealing with the head line went down the short vertical ladder onto the monobuoy's body to clear the heaving line; having done so he passed the head line over the turntable bollard (Figure 1). As the skipper prepared to rotate the turntable to allow the locking pins to be fitted, the AB, contrary to the established safety procedures, remained on the monobuoy's body to remove the heaving line.

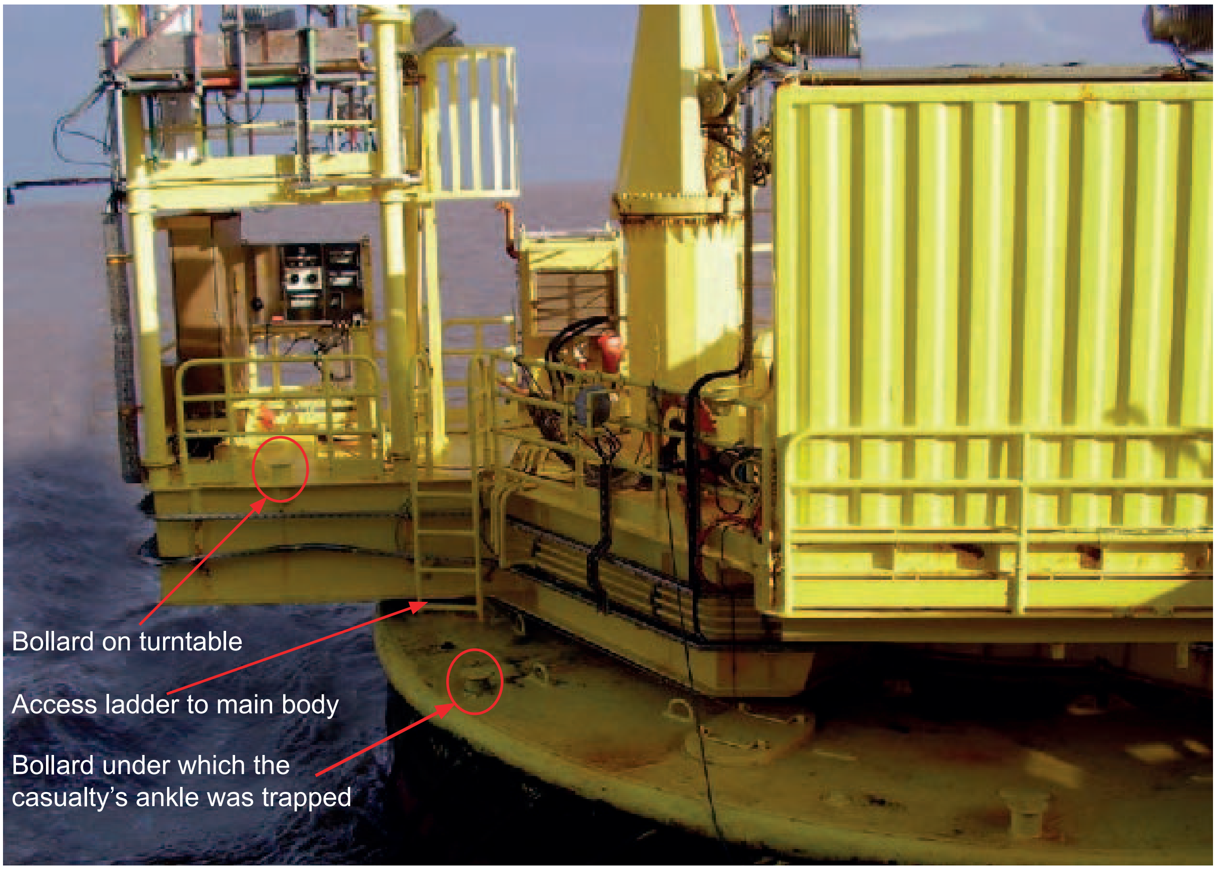


Figure 1: Monobuoy arrangement

The turntable began to rotate under the influence of the wind and tide, but this went unnoticed by the AB, who busied himself with the heaving line. As the turntable continued to turn, the short vertical access ladder pinned the AB's ankle against the flat plate topped bollard (Figure 2).

Figure 2: Point of entrapment

Figure 3: Ankle injury

Fortunately for him, the turntable stopped rotating and he was able to tug his ankle free, but not before it had suffered severe bruising and deep flesh wounds (Figure 3).

The Lessons

This was a simple task and one that had been performed many times before with the same crew who were involved in the accident. The risk of the turntable rotating going unnoticed, while trying to remove heaving lines, had already been identified, as had the need to keep crew off the monobuoy's body until the locking pins had been fitted. Indeed, the chief mate had previously instructed all deckhands to leave the heaving lines attached to the head and stern lines.

The AB thought that, while he was already on the monobuoy's body, he may as well be helpful and remove the heaving line. While doing so he became oblivious to the danger of the turntable rotating, and as a result he almost had his foot severed. Good fortune, and the fact that he was wearing strong leather rigger's boots, saved him from far more severe injury.

1. Risk assessment control measures had already been identified, and should have prevented this accident. The AB was aware of the measures, but a lapse in concentration, and an overriding wish to help, caused his injury.

2. Where it is necessary to isolate parts of a structure for safety reasons, consideration should be given to fixing barriers to access points with the appropriate warning signs – in this case that the locking pins needed to be in place before accessing the monobuoy's body.

3. The use of regular "toolbox" talks to inform crew of the risks, and the standard operating procedures, is an essential weapon in the armoury of accident prevention.

4. This accident amply demonstrates the importance of using the correct footwear. The heavy duty leather boots undoubtedly saved the AB from greater injury.

5. To highlight areas of risk, do consider using "tiger stripes" to bring them to the attention of those at risk.

It's Such a Drag-ging Anchor

Narrative

While waiting to berth, a fully loaded oil product tanker was anchored about 1 mile from the nearest shoal patch. The wind was forecast to increase to Beaufort Force 9 that night. The master wrote his night orders, stating that he should be called if the anchor dragged or if required at any time. He then went to bed having given no instructions to be called if the weather deteriorated beyond a specified threshold. Later, a weather forecast was received stating *'storm force winds soon'*. The wind increased to Beaufort Force 10 and several other vessels nearby either dragged their anchors or sailed from the anchorage. The product tanker remained at anchor.

In the early hours of the morning the ship started to drag her anchor towards the shoal patch. This had not been detected by the OOW, who was monitoring the ship's position using only a single radar range and bearing line from a fixed beacon (Figure 1).

The port's duty Vessel Traffic Services Officer (VTSO), who was monitoring the anchorage, called the ship by VHF radio and asked the OOW to confirm if the ship was dragging anchor. Several minutes later the OOW alerted the duty engineer, who went to the engine room to start the main engine. The OOW then called the master. The master arrived on the bridge a few minutes later and sent the second officer and the duty seaman forward to recover the anchor. The master remained alone on the bridge hoping that, if all else failed, the ship would pass over the shoal patch even though the state of the tide was approaching low water. Once the main engine was started, the master, concerned that he could damage it, used only half ahead power to try to clear the shoal patch.

The ship grounded stern-first onto the shoal around 30 minutes after starting to drag anchor, and pounded onto the rocky bottom several times as it pitched in the heavy seas. The rudder was put out of action and indicated on the bridge that it was hard-over. The port authority sent a tug to assist, however the ship continued to drag her anchor until the wind finally abated and the anchor held in deeper water on a rising tide.

The ship sustained significant damage to the shell plating along her length; the hull was heavily indented, but it was not breeched and there was no pollution. The rudder and the steering compartment were badly damaged (Figure 2).

CASE 14

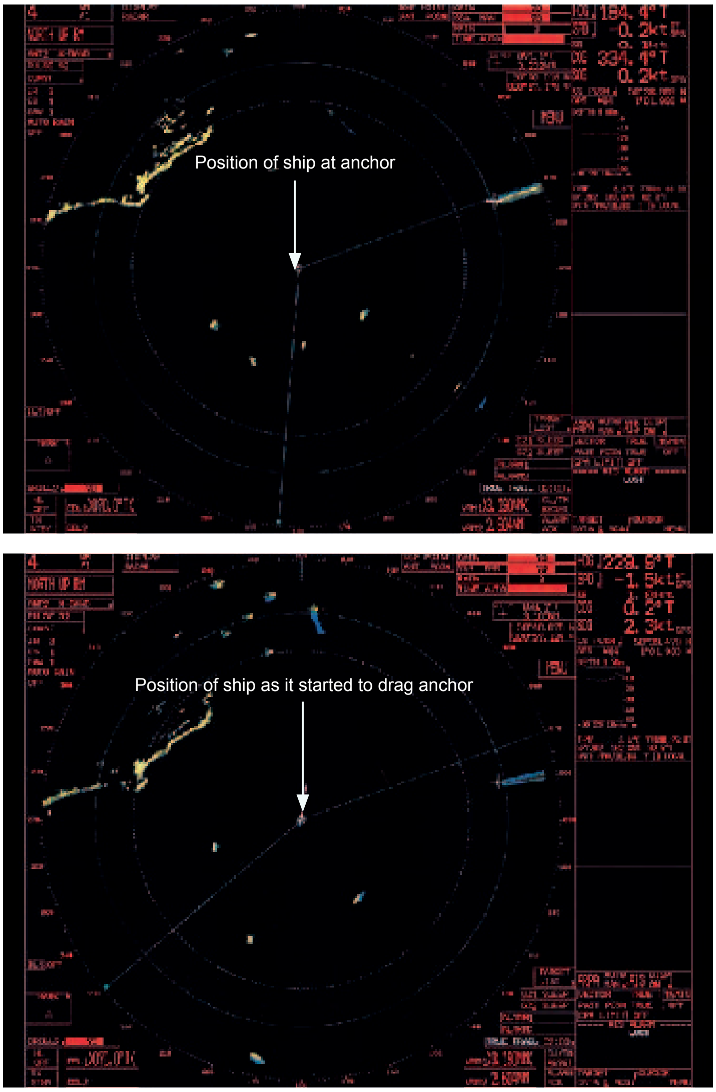


Figure 1: AIS data

Figure 2: Damage to steering compartment

The Lessons

1. The master chose to remain at anchor when gale force winds onto a lee shore were forecast.

   The master could have chosen to move to an anchorage further from danger, or headed out to sea until the weather warning had passed.

2. The position of the anchor had not been plotted, and no swinging circle had been drawn on the chart. The method used to warn if the vessel was dragging anchor was ineffective.

   Plotting the anchor position and estimating a bridge swinging circle is necessary to determine whether a vessel is dragging anchor. The Admiralty Manual of Navigation, Volume 1 provides best practice for plotting a ship's swinging circle at anchor.

3. The OOW did not notice that the ship was dragging anchor. He called the duty engineer and the master only after he had been told by the VTSO. This failure delayed the master's response by around 30 minutes.

   Had the OOW noticed that the ship was dragging anchor, and acted quickly and decisively in calling the master and engineer, the grounding could have been avoided.

4. The master did not leave clear instructions for the OOW on how to determine if the ship was dragging anchor. Similarly, he had not left instructions on when he should be called, or when crew should begin making preparations to leave the anchorage. Such instructions should consider:

   - Maximum tolerable wind speeds
   - Limiting forecast wind limits
   - Whether other vessels are dragging anchor or aborting the anchorage
   - The availability of deck and engine machinery.

   Choosing to leave an anchorage early, rather than waiting for the ship to drag anchor and deal with a critical situation while being blown onto a lee shore, would be the more prudent action.

5. The master over-estimated the ability of the anchor windlass and the crew to recover the anchor while the vessel was dragging. Anchors are not designed for use in gale force winds, or to stop a ship that is dragging, as the load placed on the equipment is too great.

   When considering whether to abort an anchorage, the anchor windlass's limitations should be taken into account as part of assessing the risk of remaining at anchor.

6. The master's use of the engine was insufficient to stop the ship's progress towards the shoal. If the master had mobilised extra personnel to assist him on the bridge, and the engine had been placed at full power ahead, the accident might just have been avoided.

   As soon as you recognise that your vessel is in a critical situation, take positive action to use all available crew and resources to stop it from getting worse.

CASE 15

Navigating the Cut

Narrative

A large bulk carrier, in ballast, embarked a pilot at the entrance to the port and headed upriver on an ebb tide. The bridge was manned by the master, second officer, helmsman, and a pilot who had conduct of the vessel.

Just before the entrance to the locks, the vessel was met by three tugs: two were made fast forward and aft respectively; the third was not made fast as it was to be used for pushing. The pilot then manoeuvred the bulk carrier stern-first into the lock.

The vessel left the lock stern-first, under tow by the aft tug. Once the bow was clear of the lock, the pilot ordered the forward and aft tugs to adjust the alignment of the vessel in preparation for a transit through a narrow cut (figure). The third tug was tasked to push on the vessel's port side as and when required by the pilot.

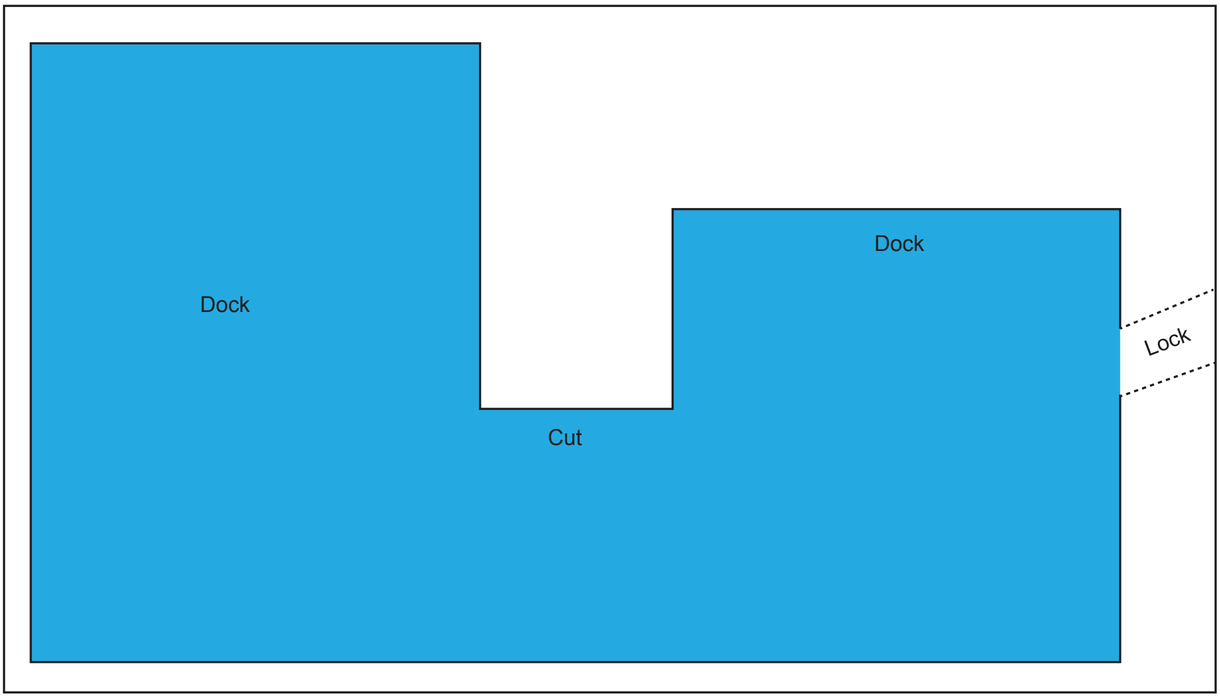


Diagram of lock system

As the vessel headed for the cut, the pilot ordered dead slow ahead to reduce the vessel's speed astern and allow use of the rudder to control her stern's lateral movement. When the vessel entered the cut, the pilot noticed her stern drift towards the port side wall. He ordered the third tug to 'push with full weight', which was acknowledged and implemented by the tug's master. The pilot also ordered the helm 'hard-a-port'. However, these actions did not prevent the vessel's port quarter from making contact with the sharp edge of a counterweight ballast tank fitted on the cut's open and recessed swing bridge.

The contact occurred in way of a topside fuel oil tank and caused a 1.5 metre gash in the vessel's side, which resulted in about 330 tonnes of heavy fuel oil spilling into the dock.

The Lessons

1. The vessel's stern drift towards the wall was exacerbated by the effect of her high freeboard in windy conditions. Given the restrictive nature of the cut and the vessel's limited manoeuvrability, reliance was invariably placed on the port's operational limits and tug assistance to reduce the risk of contact, and the provision of suitable fendering to limit any resulting damage. In this case, the prevailing conditions were within the port's operational limits. The damage was not the result of a contact with the wall, but with the swing bridge counterweight, which was not protected by the fendering.

2. Although the swing bridge was open and recessed, the vessel's port quarter overhang was able to make contact with the sharp corner of the bridge's counterweight ballast tank. This possibility had not been identified by the master, pilot or port authority and did not feature in the port authority's risk assessment. Many structures (e.g. shore cranes) within a dock system may necessarily be located close to the area of navigation. While conducting a risk assessment, it is important to identify all potential contact hazards, some of which may not be as readily apparent as a dock wall.

CASE 16

Is the Forward Store a Dangerous Space?

Narrative

A general cargo ship was loaded with 'steel turnings' in rainy conditions. The cargo was not trimmed or compacted in the hold and was noted to be 'steaming' before the hatch covers were closed (Figure 1). Conflicting information was provided to the master as to whether the cargo was dangerous; however the master treated the cargo as benign scrap metal.

A few days into the voyage, with the ship pitching heavily in gale force winds and high seas, two crewmen were repairing the cabin flooring in a crew cabin. The two men went unseen over the open deck, probably to fetch more tools for the job, and entered the forward store. Once inside, they closed the door behind them and climbed down the stairs into the store. The two men were very quickly asphyxiated, as the amount of oxygen available in the compartment had been significantly depleted.

The plight of the two men was not discovered until a few hours later following a search that was initiated when they did not join the other crew for dinner. The chief officer's reaction was to enter the store immediately to attempt to rescue the men. He was fortunate to be able to retreat to the deck when he felt dizzy and unwell.

The forward store's oxygen-depleted air was caused by the heavily oxidised cargo. The cargo hold was connected to the forward store by holed ventilation ducts that ran to the closed mushroom vent on the forward deck (Figure 2). The forward store was unventilated because it had been tightly secured for the expected heavy weather. The heavy pitching motion had caused the ship to pant, equalising the atmosphere of the two adjacent spaces.

Figure 1: Cargo of ferrous metal turnings

Figure 2: Forward store - vent trunking from cargo hold to deck vent

The Lessons

1. The master accepted the cargo as benign scrap metal. However it was actually an IMDG Code Class 4.2 material, 'ferrous metal turnings', a cargo that was liable to self-heat and deplete the oxygen in the hold, and which the ship was neither permitted nor equipped to carry. The hazardous nature of the cargo was not stated clearly in the cargo documentation that was provided to the master; however he did not question the information provided to him sufficiently to reject the cargo. The prudent master should verify that the cargo he is carrying matches the description provided. If he considers it to be hazardous in any way he must take action to ensure the safety of his ship and the crew.

2. The crew were oblivious to the risks posed by the cargo they carried, and therefore did not identify the potential hazards of self-heating, spontaneous combustion or oxygen depletion. The spaces adjacent to the cargo hold were therefore not considered to be potentially hazardous. Had the crew been aware of the oxygen-depleting nature of the cargo, they might have realised the dangers of entering the forward store and taken the appropriate enclosed space precautions.

3. On discovering the casualties, the chief officer's reaction was to enter the dangerous space to attempt to rescue them, thereby placing himself in mortal danger. The correct response to unconscious casualties, in spaces that may contain hazardous atmospheres, requires effective training and frequent practice, otherwise an individual's desire to enter in order to help can be overwhelming, and may result in more unnecessary deaths.

Part 2 - Fishing Vessels

It is with great sadness that I find myself writing this introduction but it is also with great hope. Hope for lessons learned from past accidents and incidents, which will lead us into a safer future within the fishing industry. Everyone has a part to play in their own safety and the safety of others. It is imperative that safety is encouraged from childhood and onwards. We as adults should make sure that this is a priority and then hopefully we can look forward to a culture change, fewer accidents and a better future.

On a dark winter's night in January 2011 my family and I hear the worst possible news. My brother, Neil Smith, who is a single handed fisherman, and his boat "Breadwinner" have failed to return to port. Because he fishes alone we fear the worst and, as a full scale search and rescue operation swings into action, I must give any information and assistance I can regarding the boat and the position and location of fishing grounds to the Coastguard Station.

By this time it was very late and still hopeful Neil would be found safe and well, we waited till early morning before breaking the news to my brothers, sister and then our elderly Mother. Fearful they would hear through the media. The family then joined in the search. Late the following morning we were informed that the "Breadwinner" had been found partially sunk on a skerry close to the Island of Whalsay but with no sign of our brother.

By this time, both the R.N.L.I. lifeboat and the C.H.C. Search and Rescue helicopter had been searching for almost 12 hours and as usual with small fishing communities help was on hand from many fishing skippers only too willing to assist. Divers were organised to search the boat, leaders were hauled and counted in an attempt to find Neil as by this time the inevitable had to be accepted.

However despite well co-ordinated searches, picking up of leaders etc... it was only after information gleaned from the boats track plotter computer and GPS receiver that we found the position of the final leader. And after nine days of searching we recovered Neil's body.

The detail of the whole operation would have taken considerably more space than this introduction allows and this brief resume of what happened does not reflect the painstaking hours that went into the search or describe the heartbreak felt by our family, friends and indeed the wider community.

As I said, from information gleaned from the boats track plotter computer and the Furuno GPS receiver, we know that Neil's accident occurred at around 11 am, it would be roughly 10 hours later, before the boat was reported overdue and the alarm raised. Obviously Neil's accident had happened very quickly, and in this particular type of accident, none of the regulatory safety and emergency equipment could have helped to save him, but if he had been wearing a MOB Guardian, personal Epirb or similar, the alarm would have been raised automatically and very quickly. This is especially true for lone fishermen as there's nobody else at hand to raise the alarm. The "Breadwinner" would have been found and Neil would almost certainly have been recovered on the same day, instead of nine days and untold family anguish later.

Learning from this and looking to the future I'd like to see this type of equipment made compulsory, for all commercial fishermen.

Rodney Smith

Rodney Smith is 54 years old and was born and brought up in the village of Cunningsburgh, Shetland with his sister and four brothers in a busy fisherman/crofter family. Rodney's father fished shellfish single handed with his own boat most of his life and three of Rodney's brothers have also been fishermen, one of whom owned and operated his own shellfish boat. He has therefore been around shellfish boats and indeed small boats all his life. He left school at 16 and served his apprenticeship as a motor mechanic, after which he worked for 8 years on oil rigs in the north sea followed by many years, and still to the present day, working as a marine engineer/plant fitter and fireman at the Sullom Voe oil terminal in Shetland.

CASE 17

Lookout! Where?

Narrative

Two wooden fishing vessels had spent the day trawling about 25 miles from their home port; the weather conditions and visibility had been good and the catch wasn't too bad. Boat A was crewed by her skipper and two deckhands while Boat B, which was almost 15m long and fitted with a substantial accommodation housing and shelter, was being sailed single-handed by her skipper.

By 1750, Boat A had finished her last tow of the day and began to head back home. It was dark so the skipper had switched on her navigation lights along with the floodlights on the aft deck. The skipper saw one radar target on the starboard bow, which was also returning to harbour. Having set the autopilot and adjusted the throttle to give a speed of about 5 knots, the skipper left the wheelhouse and went to the fully enclosed shelter to help the deckhands sort the catch. He occasionally returned to the wheelhouse, but he did not see any other vessels.

At about 1800, the skipper of Boat B also decided that he had done enough for the day, and stopped his vessel. He then started to bring his catch inboard and stow the gear. The vessel's navigation lights and deck floodlights had already been turned on. At 1840, as the skipper recovered a stray line from the starboard quarter, he felt and heard a loud thud. He ran forward past the accommodation to investigate, and found Boat A embedded into his vessel's port bow. He immediately looked into the fish hold and saw that it was rapidly flooding.

The skipper went to the wheelhouse and informed the coastguard about the collision via VHF radio. He then shouted across to Boat A, and asked her skipper, who had also felt a thud and had run to his wheelhouse, to pick him up from the stern. By the time Boat B's skipper had stepped across on to Boat A, his vessel had started to go down by the head and list to port. She foundered seconds later.

Following the collision, the skipper of Boat B improved the visibility from his wheelhouse by modifying the wheelhouse deckhead (figure).

View of the modified wheelhouse

The Lessons

1. Illuminating a boat like a Christmas tree and then assuming that everyone else will keep well away might seem like a sound plan, but it doesn't work when other skippers in the area have the same idea. Although the chances of two fishing boats being in the same spot at the same time might seem low, they increase considerably at the end of a day's fishing when everyone is heading home but not looking where they are going. Sorting the fish before getting alongside might save some time on the night, but keeping a proper lookout can save a lot more time and money in the long run.

2. Working single-handed is hard work at the best of times, but it is also dangerous when the visibility from the working decks is obscured by accommodation housings and shelters, and the skipper is focused on his work on deck. When working single-handed, the ability to keep a proper lookout is just as important as being able to manage the gear.

3. Poor visibility from the wheelhouse has been a contributory factor in several previous accidents involving fishing vessels. In this case, Boat A had a shelter which, with equipment fitted to the deck, might have obscured her skipper's view of Boat B during his occasional checks. Is the visibility from your wheelhouse good enough?

Scotch on the Rocks

Narrative

It was a foul night, the sort of night to lie in bed listening to the wind howling outside and feeling thankful to be at home and not at sea.

A large trawler was on passage to the fishing grounds, pounding through the rough seas and severe gale force winds. Squally hail showers were reducing the visibility from moderate to poor. The skipper was on watch alone in the warm, stuffy wheelhouse.

Although the skipper had returned to the vessel that afternoon following 10 days on leave at home, he felt tired. He'd only had about 14 hours of sleep over the previous 3 nights. This included 4 hours sleep before he left home early that morning to make the long journey to re-join the vessel. The quality of his sleep had also not been great due to ongoing tension at home.

On arriving back at the vessel, he was faced with an immediate decision. The forecast was poor for the next 4 days where the vessel had previously been fishing. They could therefore either remain in port and wait for the weather to abate, or steam for 2 days to another fishing area where the forecast was more favourable. Keen to get back to the fishing, he chose the latter option.

The initial leg of the voyage was uneventful, and the mate later relieved the skipper for his evening meal break. He joined some of the crew down below for a couple of whiskeys to celebrate two of their birthdays. He then had dinner before returning to the wheelhouse.

As the long evening wore on, the skipper finished some paperwork at the chart table and then returned to sit in the wheelhouse chair. His feet were up, resting on a protective bar (Figure 1) and therefore partially obscuring one of the chart plotter screens, which he was using to monitor the vessel's position relative to a previous historic track. There was no passage plan. The other chart plotter had been switched off earlier. Its computer was connected to loud speakers and he was using it to listen to some mellow MP3 music. He was also using both radars, while navigating on autopilot, but with the watch alarm switched off.

As the vessel approached two islands at around 13 knots, the skipper was still thinking about the situation at home and feeling increasingly tired. He misinterpreted the radar display, which was showing extensive clutter from the squally shower, and he lost situational awareness. His next recollection was of the vessel grounding (Figure 2) heavily on one of the islands – the required course alteration to navigate between the islands had not been made.

His initial reaction was to attempt to go astern, without success. He then activated the emergency stop, sounded the general alarm and sent DSC and Sat-C distress alerts. The crew quickly mustered and donned their immersion suits as the vessel began to take on a port list. Both liferafts were deployed as a precaution, but with a rescue helicopter en route the skipper considered it too hazardous for anyone to either board them or go below to assess damage.

While the crew waited on the forecastle, a lifeboat arrived on scene.

A short while later, the helicopter arrived and airlifted the uninjured crew off the vessel; a couple of the crew (not the skipper) were reported as smelling of alcohol. The vessel had grounded on a rising tide, and was found to have moved from its grounding position the following day. There was pollution as the vessel began to sustain damage and she was eventually declared a constructive total loss.

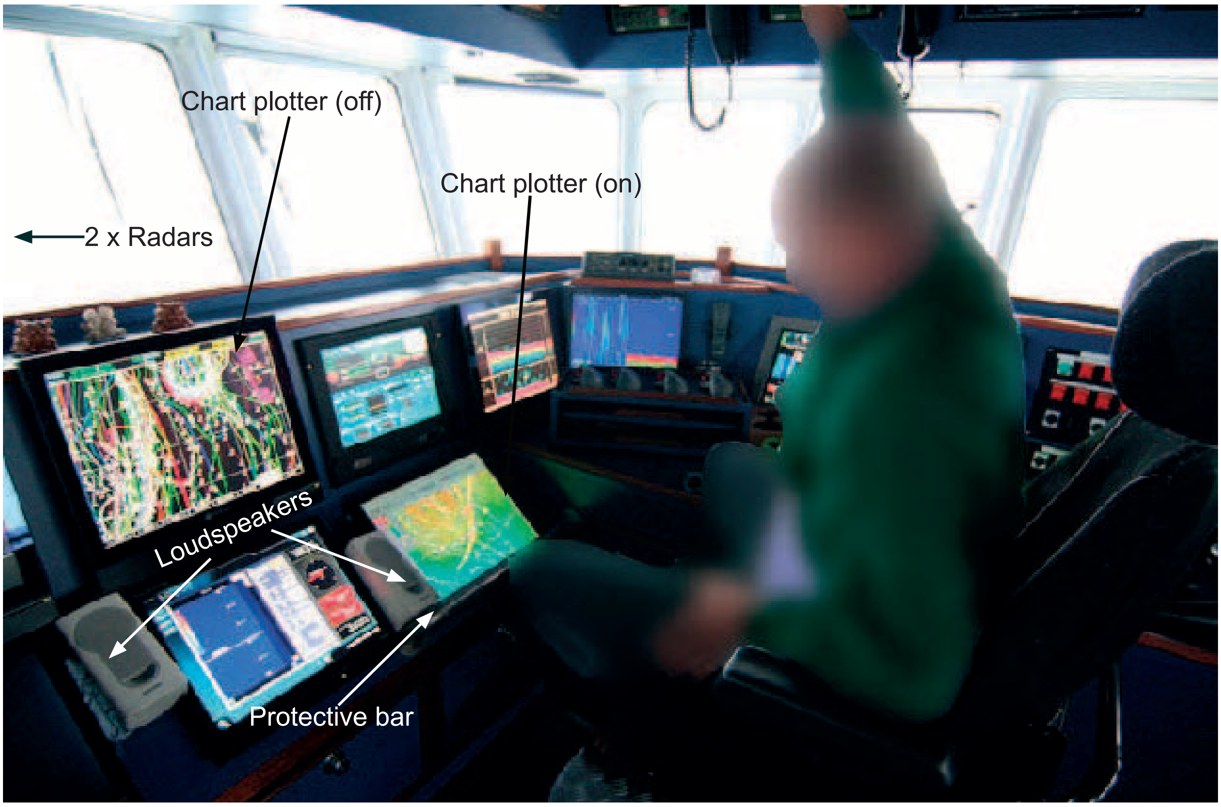


Figure 1: Wheelhouse looking forward to starboard

Figure 2: Vessel following grounding

The Lessons

This is yet another example in a long-running series of fishing vessel groundings investigated by the MAIB where the watchkeeper has fallen asleep. The quirk here is that the skipper was fatigued - not from the working routine, but following a period of shore leave. Lack of poor quality sleep towards the end of his time at home, exacerbated by personal anxiety and the long journey to re-join the vessel on the day of the accident, meant he was tired before he'd even started work. Although his onboard working hours on the day of the accident complied with the statutory requirement for work and rest, this did not take account of his earlier travelling time.

1. Irrespective of the reasons for feeling tired, whether through work, stress or for another reason, there is a responsibility to ensure you are fit for duty and that you admit to others when you are not; the consequences otherwise can be immense. On this occasion, the skipper had various options to remove the risk of his falling and remaining asleep:

    - The vessel had a bridge watch alarm, but this was rarely used. It was considered a "nuisance" because the watchkeeper had to rise in the chair and lean aft to cancel it!

    - Lookouts were rarely used, even though a number of the crew were qualified to act as such. The presence of a lookout would have clearly reduced the chance of this accident occurring.

    - Although himself tired, the skipper decided to remain on watch beyond the normal handover time; he perceived the mate, who had been on board for the previous trip, was also tired and needed more rest. The skipper could however have simply re-arranged the watch periods to ensure that both he and the mate were adequately rested that night.

    - The bridge environment was conducive to a tired watchkeeper falling asleep. The effect of factors such as the warm, stuffy atmosphere; mellow music; and remaining seated with his feet up could all have been removed, or at least reduced.

    - Although there was no evidence to confirm that whiskey had contributed to the skipper falling asleep some 6 hours later, even a minimal amount of alcohol can induce sleepiness if you're already tired. So it is best avoided.

    - Had a formal passage plan been prepared, the skipper could have set up waypoint and cross track error (XTE) alarms on the chart plotters to make him aware that the vessel was off track. As it was, one of the plotters was switched off; the other was partially obscured by his feet and was not being effectively used to monitor the vessel's position.

    - Given the poor weather conditions and the fact that the skipper was tired, his best option was to delay sailing. There was no commercial pressure from the company to sail, and it is clear that the self-imposed pressure to maximise the vessel's earning potential, particularly as share fishermen, outweighed the safer, more sensible option.

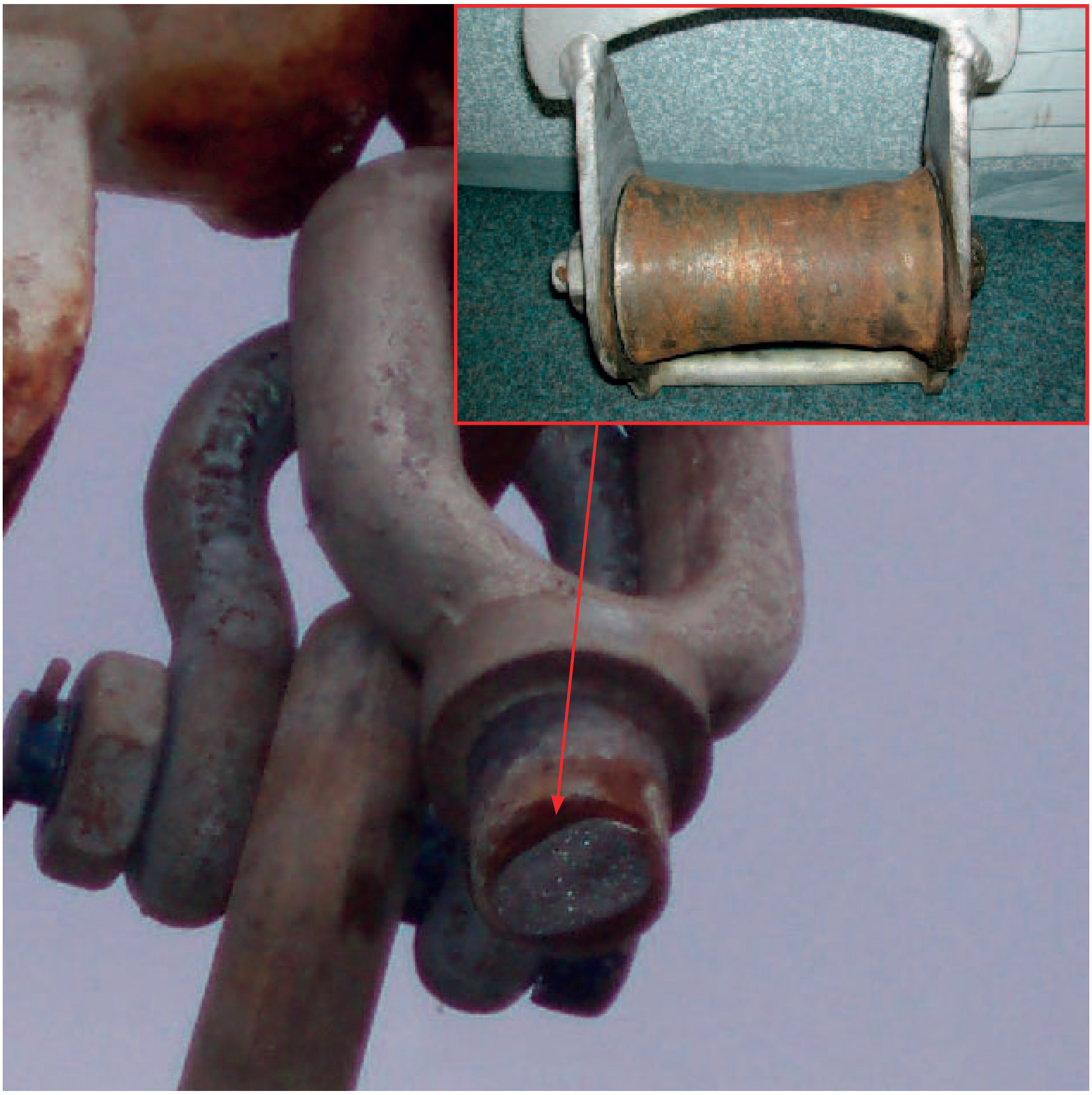
Clocked by a Block

Narrative

A crewman on a scallop dredger suffered a fractured skull after an overhead block failed and came down upon his head.

The two-man vessel was lifting her loaded dredges inboard by means of an overhead block; the lifting strain had just been applied when the block failed by the collar of the swivel eye and fell on the deckhand. The skipper immediately administered first-aid, ran off the fishing gear and made ashore as quickly as possible, contacting the coastguard at the same time. A lifeboat and helicopter were tasked and the injured man was transferred to hospital, where he underwent surgery for his injuries.

A critical sample of the failed equipment was recovered for inspection and testing along with the partner block from the other side. This revealed that uneven loading of the failed swivel eye fitting, caused by continual sideways pressure, was the primary factor why the block failed.



Corrosion visible on overhead block and swivel eye

The Lessons

1. The block that was being used was unsuitable for the job. There was no need for this vessel to be using a block with such a wide swallow. This width allowed the wire travel several inches across the sheave until it abutted the outside cheek of the block, resulting in uneven loading on the swivel eye shank, by the collar. This continuous uneven loading induced fatigue and ultimate failure at that point.

   All blocks are at their strongest when the strain is applied in a straight line pull. Always ensure the proper type of block is employed for the job. Also, avoid using inappropriate blocks - even for a jury rig, because temporary fittings often end up in place permanently.

2. Inspect all overhead equipment - not just blocks - regularly (and keep a record of inspections). These blocks were regularly greased, and sideways loading, evidenced by the wear on the cheek plates and sheave, must have been apparent to whoever did the greasing. If something doesn't look right it generally isn't right; so do something about it straightaway.

3. In fishing vessel operations it is impossible to keep clear of all overhead lifting devices. Nevertheless, avoid standing under loads whenever possible – especially when the load is initially applied, as was the case in this accident. Do not stand below loads if you don't have to.

4. Wear a hard hat when involved in lifting operations or working near overhead loads. Hard hats are mandatory in every other hazardous industry, so why should fishing be any different?

5. The skipper's actions following this accident were commendable in getting the casualty to safety as quickly as possible by immediately jettisoning his fishing gear and contacting the coastguard. Depending upon the distress situation (which this was), seriously consider jettisoning fishing gear unless it is needed to keep the vessel from drifting or to keep her on the right wind, or dampen her rolling motion. The gear can always be retrieved later.

An Unwanted Christmas Present

Narrative

After spending 3 days at sea, a potter headed back to port on Christmas Eve. The mood was jubilant among the five-man crew as they were returning after a successful haul, a full catch of valuable crabs. They were looking forward to spending Christmas in port, some with their family members.

The skipper had started his day by standing a watch from 0100 to 0300 after which he fished with the crew for the whole day. He decided to head for port at about 1900, and shortly afterwards handed the watch to another crew member. He had hardly put his head down before he was woken up to deal with a mechanical problem. Thereafter, he did not sleep well.

The skipper had just begun to drift into a deep sleep when, at 2330, he was once again woken up by the watchkeeper. The vessel had reached the designated position from which the skipper wanted to be on watch to manoeuvre the vessel into port. He got up, made himself a cup of coffee and headed for the wheelhouse. He took the watch and then sat down in the chair. The next thing he knew he had been jolted forward as the vessel ran aground on a sandbank. The skipper had fallen asleep.

Fortunately, the vessel suffered no structural damage or pollution and the local lifeboat was able to tow her off 10 hours later on a rising tide.

The Lessons

1. The vessel was fitted with a watch alarm connected to the autopilot, but this was not working on the day of the accident. Marine Guidance Note (MGN) 313 (F)-Keeping a Safe Navigational Watch on Fishing Vessels provides essential guidance on this subject. Watch alarms should be fitted on all vessels where one person will stand a navigation watch. It should be connected so that it not only alerts the watchkeeper, but also other crew members when the watchkeeper fails to reset it.

2. Guidance on the requirements of hours of rest is contained in Merchant Shipping Notice (MSN) 1786 (F)-Application of the Fishing Vessels (Working Time: Sea-fishermen) Regulations 2004. While these regulations do not apply to share fishermen, guidance on acceptable hours of rest is available in the Fishing Industry Code of Practice on Working Time Standards.

3. Fishing is recognised as an activity conducted in a harsh, unpredictable and labour-intensive environment. However, fatigue does not discriminate between the experienced, inexperienced, old or young. The natural reaction to fatigue is to fall asleep. It is important to recognise the early signs and do something about it rather than wake up to an unwanted present.

CASE 21

Fire-Fighting Drills – a Sound Investment

Narrative

The skipper and two crew of a wooden hulled stern trawler had enjoyed a successful week's fishing. They were all looking forward to a well earned weekend of rest as they prepared for their last haul before returning to port.

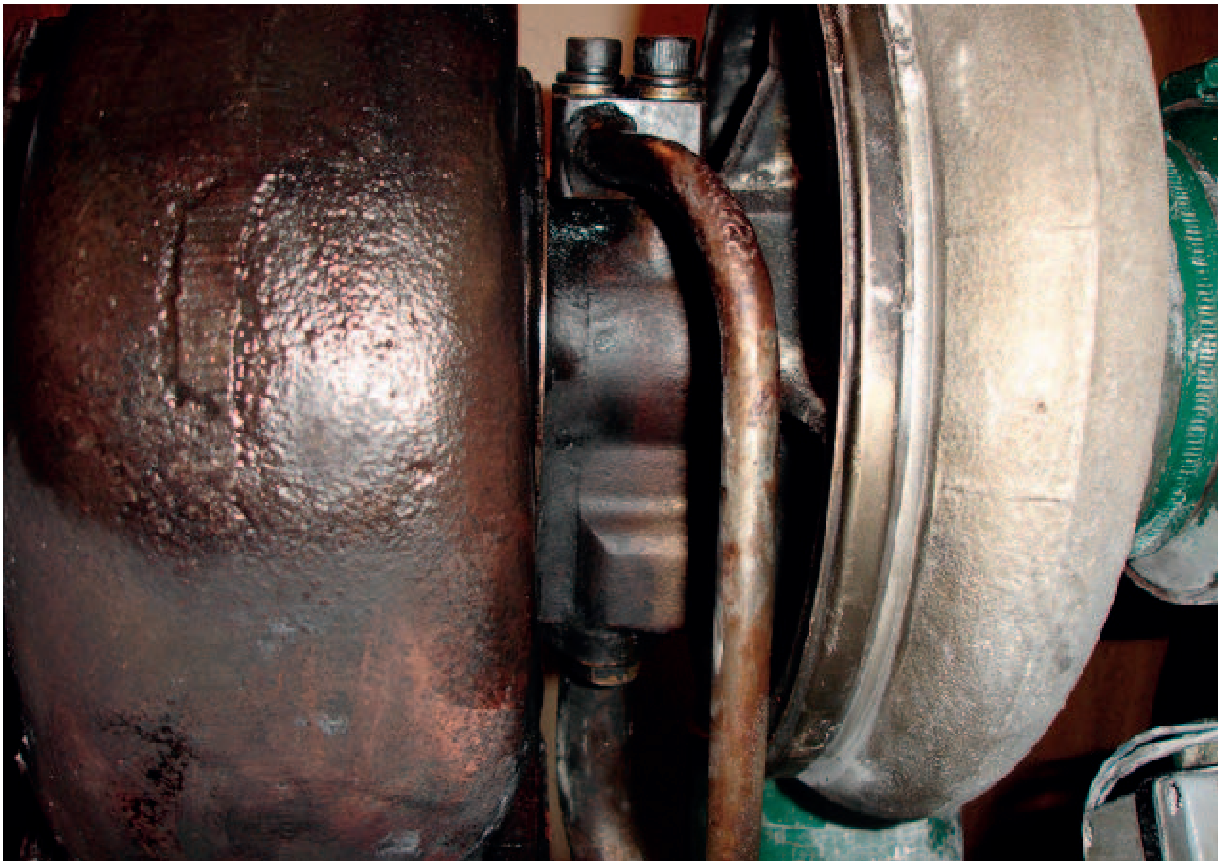
As usual, the skipper was in the wheelhouse as the crew were at the stern preparing to haul in the fishing gear. As the skipper reduced the main engine speed to engage the hydraulic pump clutch, the engine room fire alarm sounded in the wheelhouse. The skipper alerted the crew as he went to the engine room and carefully "cracked" open the door. He did not need to enter the engine room to see that a fire had developed around the main engine turbo charger.

The skipper shut the door, went to the accommodation area and got a dry-powder extinguisher, which he discharged into the fire. He then shut the door again and opted to leave the engine running to enable him to haul in the fishing gear. The main engine was shut down a few minutes later. In the meantime, the skipper notified the coastguard, who activated two lifeboats and a rescue helicopter.

By now the crew, who had regularly exercised fighting an engine room fire, had blocked off the engine room vents, carried out boundary cooling on the deck using the hand-operated deckwash pump, and monitored the deck and adjacent bulkheads for a rise in temperature – none was observed.

As the helicopter circled the vessel the pilot switched on his thermal imaging camera, but no significant hot spots were found, suggesting the fire had been extinguished. The casualty was subsequently escorted safely into harbour by the lifeboats.

On investigation, it was found that the lubricating oil supply pipe to the turbo charger had suffered from fatigue cracking at its brazed connection to the oil distribution block (figure). This caused oil to be sprayed onto the hot turbo-charger, where it ignited. The pipe braze failure was caused by critical vibration stresses because the pipe was inadequately clamped.



Failed turbo-charger lubricating oil pipe brazed connection

The development of the fire was reduced by the heat shield cowling around the turbo charger. As result of this and the crew's prompt actions, damage was extremely light, and even the plastic fittings in the immediate vicinity of the fire were unaffected.

The Lessons

The crew's prompt actions in containing the fire were well considered. They had all attended the mandatory fire-fighting course and, importantly, had regularly practised fire drills and had discussed what they would do in the event of an engine room fire. However, the skipper's decision to leave the engine running to recover the fishing gear after the fire had apparently been extinguished, was risky, and could easily have led to re-ignition of the fire.

1. There have been many cases of engine room fires resulting from vibration-induced fuel and oil pipe failures. It is good engineering practice to regularly check the effectiveness of pipe clamping arrangements while the engine is running.

2. Do examine brazed connections, especially on the underside, to check the integrity of the joint, and do *NOT* delay repairs. The use of a mirror set will help determine the condition of connections in awkward positions.

3. Consider carefully if it is safe to run equipment after a fire. In this case, there was a real risk of re-ignition as the engine was run to recover the fishing gear. The skipper did have the option to buoy off the gear for later recovery.

4. The crew dealt with the fire in a competent and confident manner because they had been trained and drilled for the eventuality. This was a small investment for the likelihood of saving the vessel from severe damage – remember - *TRAINING PAYS!*

CASE 22

Prompt Actions Avert a Tragedy

Narrative

A fisherman working on a small creel boat had a lucky escape after his leg became caught in the back rope during shooting operations, dragging him overboard and down to a depth of up to 40 metres. It is unknown whether the fisherman had gone aft to help a fellow crewman who had also, momentarily, become caught in the back rope, or if he had gone aft to help clear a creel that was wedged in the stern shooting opening. Realising what had happened, the skipper of the boat stopped his engine, cut the back rope and steamed round to the marker buoy to haul in the fleet of creels and recover his colleague. The skipper also made a distress call straightaway to alert the coastguard, and he told them about the situation.

The skipper and one remaining crewman hauled in the creels and managed to recover the fisherman back on board, but by that time he had been submerged for several minutes and was showing little sign of life. The two men carried out cardio-pulmonary resuscitation (CPR) until he began to cough and eventually breathe freely. They then placed the fisherman in the recovery position and kept him warm until the coastguard helicopter (which had been despatched within 5 minutes of the skipper's call) arrived on scene to take him to hospital. The fisherman was kept in intensive care for 11 days, but went on to make a full recovery.

Figure 1: Creel and stern opening

Figure 2: Working deck with a crewman standing in the position where the man was dragged overboard

The Lessons

1. The skipper was not aware that either of the crewmen had gone aft, and at the time that the fisherman was dragged overboard, the boat was still making way at the normal speed for shooting creels. The first crewman had gone aft to free a creel that had become jammed in the stern opening. If crew need to go aft to clear fishing gear, it is essential there is a system in place that ensures the skipper is aware of their intention. He can then reduce speed, take the weight of the back rope and in turn reduce the risk of harm before they do so.

2. The creels on this vessel could become wedged if they went through the stern opening at certain angles. A wider opening or a smaller creel would have solved this, and might have avoided the need for either man to put himself in danger by going aft to clear the jam. It is important to consider all possible hazards when designing the working arrangement on a boat.

3. Poor housekeeping meant that areas where the men could have stood in order to avoid coming in to close contact with the back rope, were filled with spare creels. The safety benefits of a self-shooting arrangement are lost if the routine working of the boat still requires the crew to come in close contact with the back rope.

4. The skipper's early call to the coastguard and the swift despatch of the rescue helicopter ensured that the injured fisherman received the required medical attention as quickly as possible. If faced with an emergency situation, the seafarer should not hesitate to make a distress call on channel 16 – the call can always be downgraded at a later time.

5. It is rare for a fisherman who has been dragged overboard in this way to survive. The techniques that the skipper and the other crewman had learned on first-aid courses undoubtedly helped them to save their workmate's life. It is essential that all seafarers receive first-aid training and refresh their knowledge at regular intervals.

Part 3 - Small Craft

Every time we put out to sea or even just play on the water we engage with nature. No matter what vessel you are utilising they are all exposed in the big outdoors to the forces of nature. The wind and the waves are beyond our control and the challenge is often finding the best way to use these elements to our advantage. I often say that every day is a school day as I continue to learn each time I am on the water. I sail different boats and sail with different people and try to take a gem away with me each time. If we were not to learn from our mistakes we would fail to progress, improve and reduce the risks involved.

As a solo sailor I have enjoyed the euphoric high of success and also the chilling despair of failure. I have been pounded by waves in December in the Bay of Biscay and heard that gut wrenching crack as the rig fell down in gale force winds. Having never been in this unique position before, I did all the things I had read about and dealt with the situation with a surprising amount of calm, given the flow of adrenalin running through my body. I have been a skipper dealing with an injured crew member facing life and death decisions in the depths of the Pacific Ocean, supported by a team and specialists carrying out one of the biggest Southern Ocean rescues in New Zealand history. All these experiences have helped develop me as a sailor and have given me the tools to deal with situations now as we come across them in the right manner.

The role of the MAIB is to look in detail at any marine accident and work with others to determine the causes and circumstances of that accident and then publish the findings to help all of us reduce the likelihood of such a cause or circumstance from recurring in the future. Do not wait to experience a misfortune before listening to advice, seek it out in advance. Best practice is normally in place for a reason. Some lessons are simple, like communicating your whereabouts and plans before and after your time on the water. It can avoid unnecessary worry or even assist a search and rescue should it be needed. Some are more advanced, like assigning a next in charge if you are the skipper and being aware of there being different tether lengths for harness lines and why this is now the case.

Quite often being safe at sea is about common sense and acting responsible, whether it is in the harbour, along the coast or in an ocean. When things go wrong they often go very wrong and it all happens very quickly. Heightened emotions and stress can often completely blank the individual of both decision making skills and common sense so practise every time you go to sea, so safe actions become natural. After all we want you all to come back in from a fabulous time on the water and share your experiences with a smile on your face. The water is there to enjoy, we just ask you to do it safely and responsibly and reading this safety digest will facilitate that without having to gain these experiences first hand.

Dee

Dee Caffari

Dee Caffari is the first woman to have sailed single-handed and non-stop around the world in both directions and the only woman to have sailed non-stop around the world three times.
In 2006 Dee became the first woman to sail solo, non-stop, around the world against the prevailing winds and currents and was awarded an MBE in recognition of her achievement.
Dee successfully completed the gruelling Vendée Globe Race in 2009, crossing the finish line in 6th place out of an original fleet of 30 competitors. In June of the same year, Dee and an all-female crew went on to smash the mono-hull speed record around Britain and Ireland. Now having completed her third non-stop circumnavigation in the Barcelona World Race, Dee is looking to the future.

Dee aims to compete in the Vendée Globe once again with the intention of securing a podium position. Dee's race to the start line has now begun and she is actively looking for a new title sponsor to support her 2012/13 Vendée Globe campaign.

CASE 23

The Case of a Broken RIB

Narrative

It was a balmy summer's day, one that seemed perfect for the regular family gathering close to an inland stretch of water. After a pleasant lunch three of the group, including a 12 year old boy, decided to take a RIB, which belonged to one of the group, onto the water.

The boat had been deflated, rolled flat and stored in a garage for about 5 years until it was used a few months before the group gathering. It was fitted with an outboard engine controlled by a remote throttle, gear selector, and steering wheel (Figure 1). The boat was not fitted with a "dead man's" switch and so the engine would not automatically stop if the helmsman was tipped from the steering position. The steering cable had been replaced using an outdated spring-loaded ball joint to connect it to the outboard engine frame. Because the cable had not been set up properly, the port and starboard ranges of movement were unequal. The throttle and gear cables had been flaked around the deck and were easily seized by foot pressure (Figure 2). In addition, the fabric of the hull was in poor condition and had been patched; the patches were peeling off.

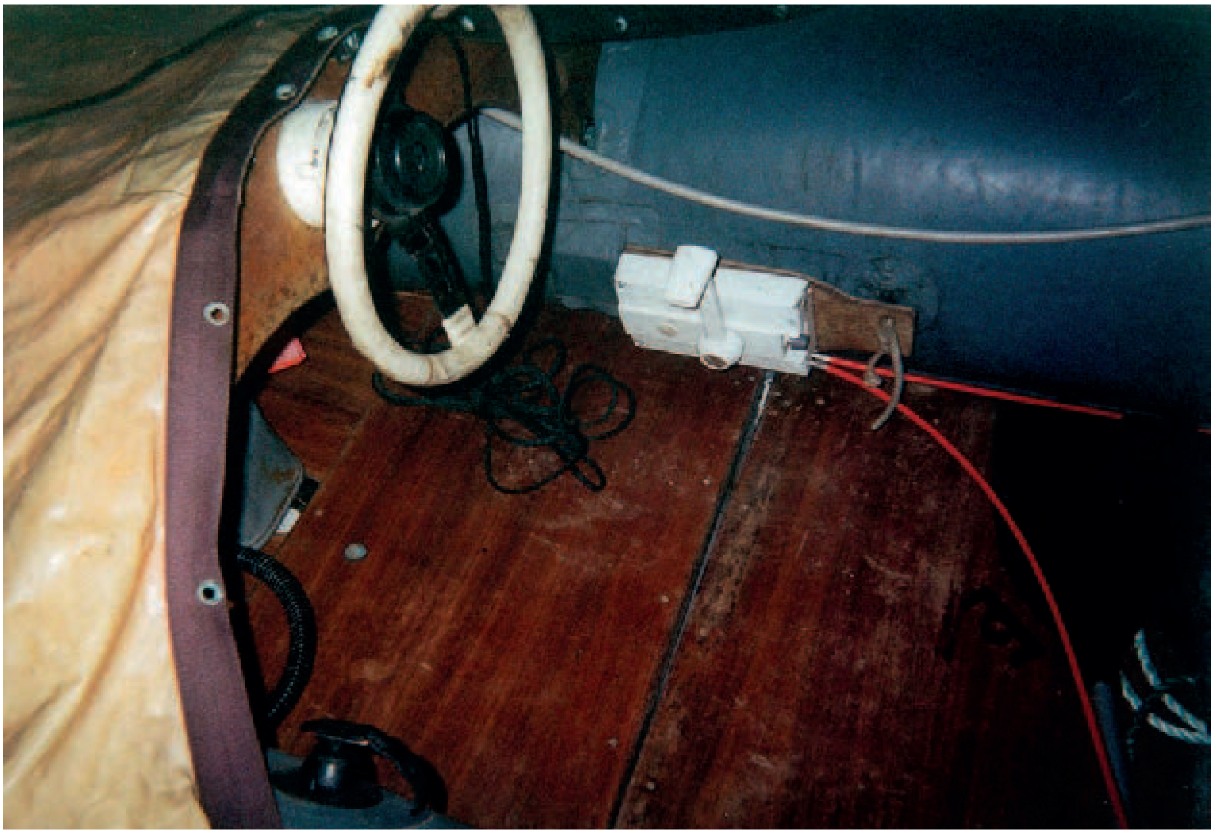


Figure 1: Steering gear and throttle controls

Despite the obvious poor condition of the boat, it was put into the water as members of the family watched from the shore. The 12 year old boy donned his buoyancy aid and, although there were two lifejackets on board, neither was worn by the other two occupants.

The engine started after a number of attempts, and with the owner now at the helm the boat went astern and pulled away from the small pontoon. The owner selected the "ahead" gear and increased the throttle as he steered the boat around to port to head towards open water.

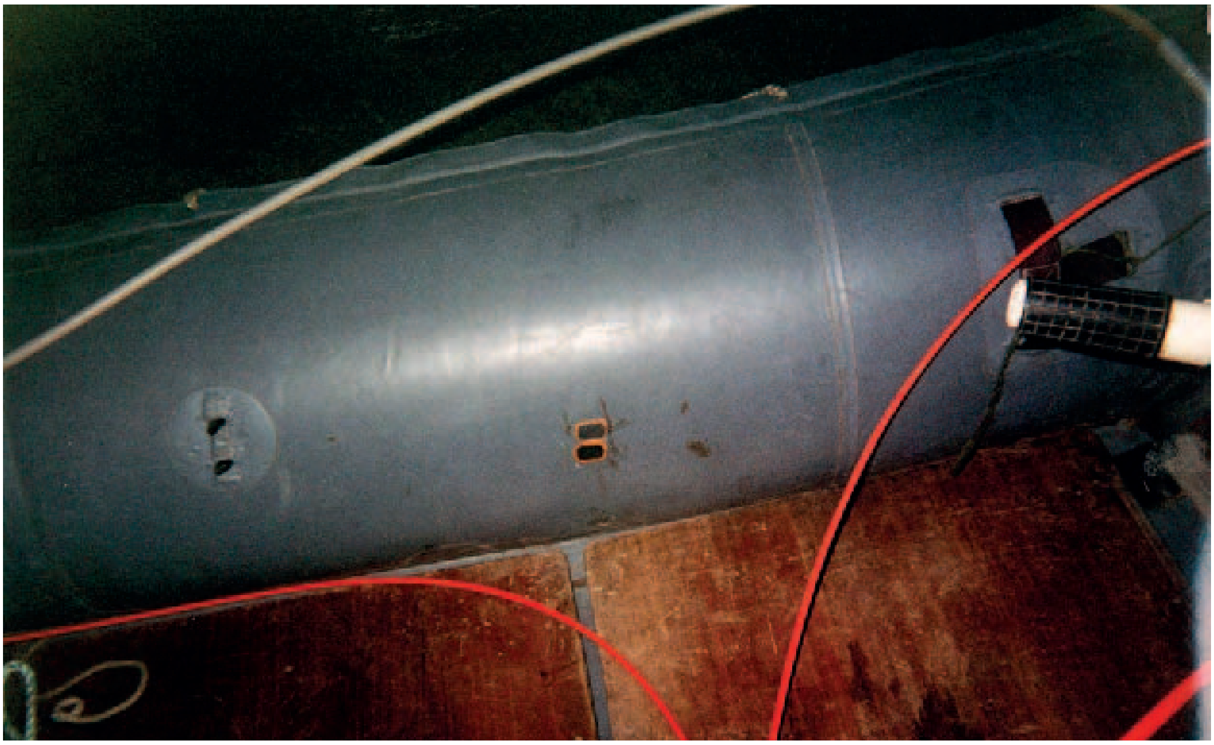


Figure 2: Layout of gear throttle cables

As he did so, the steering cable ball joint became disconnected from the outboard engine frame (Figure 3), and the engine turned hard to port. At the same time, one of the occupants trod on the throttle cable, preventing it from following the engine's movement and causing the engine to go to the full throttle position. The boat careered out of control, bouncing off a moored vessel before colliding with the rocky shore and rebounding. Fortunately, the aftermost passenger then managed to hit the stop button on the outboard engine.

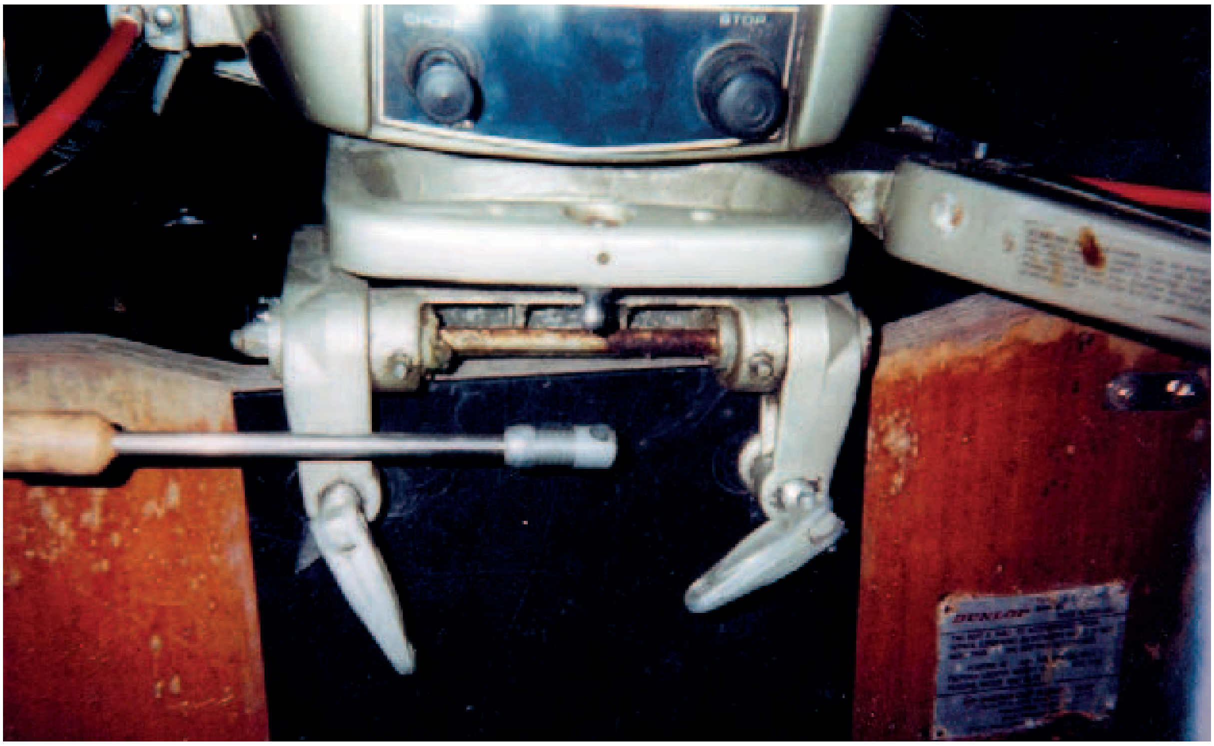


Figure 3: Disconnected steering gear connection ball joint

Family members on the shore managed to pull the boat back alongside the pontoon from where the casualties were taken to hospital. The owner suffered a broken ankle and lower leg as the boat hit the rocks. The other two passengers slid into his back, forcing him against the steering wheel and fracturing some of his vertebrae. The other two passengers received minor injuries.

The Lessons

It is easy to understand the attraction of taking to the water, during a warm day, in a relatively powerful boat to provide excitement, particularly for those unfamiliar with water activities. However, there is a responsibility to ensure that the boat is in a safe condition and that those on board wear the appropriate lifesaving equipment. As this case shows, inadequate preparation and poor maintenance by unskilled persons could easily have cost lives.

1. **Rubber boats that have been laid up for long periods can suffer from significant fabric deterioration, and merit careful examination for evidence of tears, especially in folds, and fittings separating from the hull.**

2. **If you are not confident about your technical ability, consult an expert. In this case the steering controls were incorrectly fitted and the various control cables were not properly secured to prevent jamming.**

3. **This boat was not fitted with a "dead man's" switch, and in the event of the helmsman being tipped overboard would have run on in an uncontrolled manner, putting the individual at risk. Modifications can be made to older vessels to incorporate the switch; seek professional advice.**

4. **It is difficult to reconcile that sufficient lifejackets were on board but were not worn. There have been too many incidents of people drowning after being thrown overboard, especially in cold water. Even if you consider yourself to be a strong swimmer, cold water will dramatically affect your swimming performance and survivability - wear a lifejacket.**

5. **The steering gear ball joint connections are prone to inadvertent disconnection as the spring tension weakens through age. If your boat is fitted with one of these, it is advisable to regularly check its security. If unsure, seek professional advice.**

Be Prepared – Even on a Nice Day

Narrative

A helmsman and crewman sailed their 1980's built Wanderer dinghy from a yacht club late one morning in light winds and good weather conditions. Neither man told anyone when they were likely to return.

The two men sailed out into the estuary. After a late lunch, the boat was becalmed and the two men decided to row the dinghy back to the shore. By sunset, the boat was still about a mile off the coast and the wind picked up. The helmsman set the sails to head back to the yacht club. In freshening winds, he tacked and the boat capsized. Both men were wearing buoyancy aids. The helmsman was wearing a light wetsuit and waterproof jacket; the crewman was wearing a waterproof jacket and trousers.

The boat was righted, but it quickly capsized again. The two men righted the boat again, however the additional buoyancy fitted in the stern had been lost along with the bucket and bailer. The men tried to bail out the waterlogged boat by hand, but again the boat capsized and partially inverted to 45° where the mast head stuck into the seabed. The helmsman and crewman were unable to right the boat or use the partially upturned hull to keep themselves out of the water.

In darkness, with the helmsman's mobile phone now drenched and unusable, with no other way of raising the alarm, and no-one aware that they were missing, they swam towards the shore.

As they swam, the crewman eventually tired and lost consciousness. The helmsman continued to pull the crewman with him until it was clear that he had died. The helmsman swam alone, eventually reaching the shore 5 hours after the boat had first capsized, and raised the alarm. The crewman's body was found 2 hours later. The helmsman was treated in hospital for hypothermia.

Figure 1: Dinghy involved in the accident

The Lessons

1. The helmsman had not expected to capsize in the light wind conditions of the day and had taken no precautions to secure equipment to the boat.

2. Had the helmsman and crewman informed someone of their plan, either at the yacht club or another person they would contact when they returned, their late arrival would have prompted a search for them.

3. The helmsman relied on his mobile phone for communications, however his phone was not kept in a waterproof pouch and when it got wet it stopped working.

4. The helmsman had fitted additional buoyancy in the aft compartment, but it was not secured sufficiently to survive repeated capsize. When it broke free, the boat was lower in the water, making it less buoyant, more liable to further capsize and more difficult to bail out.

5. As the buckets and bailer were not secured to the boat, they quickly drifted off after the boat capsized, leaving the men no effective means of bailing out.

6. There may be a strong temptation to leave the boat and swim for shore. But this is rarely the best thing to do. Your boat will provide additional buoyancy, enabling you to remain still and thus warming the water next to your skin. Swimming uses additional energy and will increase the cooling effect of the water.

7. Wetsuits are designed to keep someone in the water warmer, and they are much more effective than waterproof clothing once in the sea.

8. The helmsman had previously considered fitting an outboard motor. This would have been very useful, and it should be considered as an option - particularly when sailing independently.

Crash Gybe Results in a Broken Neck

Narrative

Eight people with varying levels of sailing experience paid to take part in a season-long sail-training campaign. The campaign consisted of a weekend of practical sailing in sheltered waters, a weekend of theoretical training, a practical sea survival course and three offshore races, the last race being the 608nm Fastnet Race in mid-August.

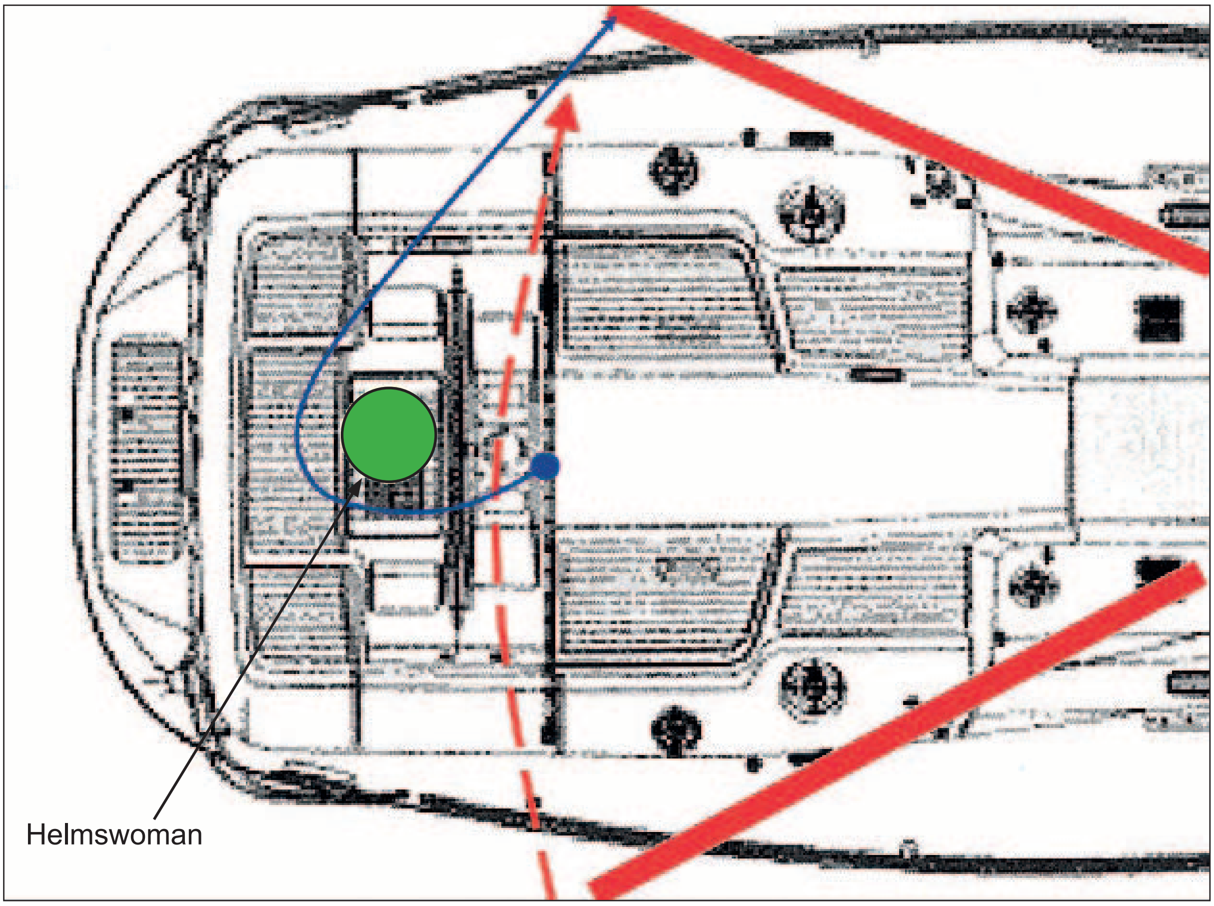
For the first of the offshore races, which was in the English Channel, a 12m cruiser-racer with a skipper and mate was provided. The trainee crew, some of whom had never raced offshore before, found the outward leg quite challenging. During the first 22 hours, the wind reached up to 25 knots and several of the crew were seasick in the uncomfortable sea conditions.

When the boat rounded the first mark, the crew members' spirits rose as they headed downwind on the return leg. A spinnaker was hoisted, but 'blew out' as the wind speed increased, tearing down both luffs. The skipper ordered the mate to replace the torn spinnaker with a smaller, heavier, sail. However, as the replacement sail was being hoisted, it wrapped around the forestay and the mate and some of the crew were unable to work it free.

The skipper, who was helming at the time, handed the wheel to one of the trainee crew and instructed her to keep on a port tack on a broad reach. He then went forward to help unwrap the spinnaker. Almost immediately, the helmswoman saw a fishing boat to starboard that seemed to be on a collision course. She shouted for advice from the skipper, but his reply was difficult to understand because of the wind and flapping sails.

Uncertain of the skipper's instructions, the helmswoman put the helm to starboard. Without warning, the boat gybed and the boom and the mainsheet swung violently across the cockpit. The mainsheet struck the helmswoman, knocking her to the deck, unconscious.

The skipper immediately broadcast a "Mayday" and, after some difficulty in recovering the helmswoman from the cockpit due to the limited space available, the injured crew was evacuated to hospital by helicopter. She then underwent emergency surgery for a fracture to her upper cervical vertebrae and remained in hospital for 2 months.



Accidental gybe - movement of the boom and the mainsheet

The Lessons

1. Uncontrolled gybes are extremely hazardous and frequently lead to serious injury or worse. Usually, it is the fast-moving boom that causes head injuries, but it is clear that the mainsheet can be equally as hazardous.

2. Offshore racing is exciting and adventurous, but it can also be dangerous, particularly in adverse conditions when crews are inexperienced and tired. All skippers naturally want to do well, but, when race-training, the wellbeing and capabilities of even willing and eager crew need to be carefully judged and taken into account at all times.

3. The temptation for skippers to 'get stuck in' when something goes wrong is understandable. Indeed, on some occasions it will be absolutely necessary. However, in doing so, it is important they keep a broad view and do not lose sight of the overall objective: vessel safety.

Your Lifejacket – Are You Giving it Your Full Attention?

Narrative

A very experienced offshore racing skipper had assembled his crew to take part in a 95-mile cross-channel race which was a qualifier for competing in a classic 600-mile offshore race later in the year.

The ability to cope with the high demands of offshore yacht racing, especially in severe weather conditions, calls for a well-trained competent crew, a robust and suitable vessel which is structurally sound, and good quality, well-maintained equipment.

In this case, the circumstances were indeed most challenging. The crew had been looking forward to taking part in the race and, although gale force winds were forecasted, they had plenty of experience; the skipper had seen far worse and they were in a good boat.

Although the yacht carried its own stock of lifejackets, the crew, as usual, preferred to wear their own equipment with which they were familiar.

During the race, the weather rapidly deteriorated and just before midnight the skipper, who was tethered to a jackline, fell overboard while working on the foredeck. The yacht was heeling well over to port as the crew found the skipper, unconscious and pinned under the yacht's port shoulder.

The skipper's lifejacket had inflated and the bladder, which had been pulled over his neck, covered his face, making it very difficult for the crew to check his airways and his condition. The yacht was still making slow speed through the water and was dragging the skipper along with it as the crew battled hard to recover him. However, they found it very difficult to find a suitable point on his lifejacket harness to attach a hoisting halyard. After about 15 minutes, a halyard was connected directly onto the skipper's tether and he was hoisted clear of the water.

Figure 1: Lifejacket showing harness and thigh straps

Figure 2: Lifting loop

Just as he was recovered to the deck, his lifejacket was pulled up his torso and over his head. The lifejacket waist strap was still fastened but the thigh straps side release buckles were undone.

Sadly, and despite the crew's best efforts, the skipper had drowned.

The skipper was wearing a good quality Level 150 lifejacket which was suitable for use during offshore racing. The lifejacket complied with the European Norm (EN) 1095/International Organization for Standardization (ISO) 12401 and 12402 requirements. Among other equipment, this meant that the lifejacket had the appropriate tether point at the front of the lifejacket's waist belt and was fitted with a lifting loop, although the latter was exposed only after the bladder had inflated. In this case, the lifting loop was black and was a little difficult to identify (Figures 1 and 2). Other brands of lifejacket are fitted with contrasting and brighter coloured lifting loops, which are sometimes annotated with "lift here" as shown in Figure 3.

Figure 3: Contrasting coloured lifting loop

Where a lifejacket is fitted with a safety harness it should be capable of lifting the person from the water with minimum displacement, as long as it is adjusted properly. The purpose of the crotch/thigh straps is to prevent the lifejacket from riding up the body when the person is in the water and the lifejacket has inflated. It is not their purpose, and neither are they designed, to prevent the lifejacket riding up the person as he/she is lifted from the water. In this accident it is possible that the crotch/thigh strap buckles were not fastened in the first place or that they released because of the dynamic forces acting on them as the skipper was dragged through the water.

The Lessons

Remember - in a man overboard situation your lifejacket is your very best friend. It can save your life as long as you look after it and you understand its features.

The importance of correct adjustment cannot be over-emphasised. In this particular case, it is likely that the lifejacket safety harness was not properly adjusted, which allowed the lifejacket to be pulled from the skipper. If, when recovering a man overboard, he/she should slip out of the lifejacket while over the water, their chances of survival are severely compromised. In this sort of situation, being unconscious or conscious makes little difference. Had it happened on this particular occasion it is most doubtful the skipper would have been recovered as it was dark and the weather conditions were extremely poor.

The following safety lessons can be drawn from this accident:

1. *Prevention is always better than cure* - where possible, use a short tether to reduce the chances of going overboard. This may seem obvious, but many crew only use standard 2-metre long tethers and feel safe – they often do not appreciate that when it is connected to a flexing jackline it will often still allow them to fall overboard and into the water, especially when the yacht is heeled.

2. The lifejacket wearer should be fully familiar with how to don and correctly adjust the lifejacket's waist belt or safety harness, and crotch and/or thigh straps, where these are fitted.

3. It is essential that all of the features of the lifejacket are fully understood – there is, for example, a common misconception that the tether connection point of a lifejacket with an integral safety harness, is the lifting point. It should be noted that all Level 150 and above lifejackets, with or without an integral safety harness that meets the international standards, are in fact fitted with a dedicated lifting loop.

4. Do take the time to ensure you know the position of the lifting loop, how to orally inflate the bladder, operate the light and other warning devices such as a whistle, and how to use the spray hood, where these are fitted. Full details should be included in the manufacturer's lifejacket manual.

5. Some lifejackets are also fitted with a knife with which to cut a safety tether if you are being dragged along with, or worse still, under the vessel. Could you immediately put your hand on the knife if one is fitted?

6. Do try locating the lifejacket's equipment in the dark – be prepared – finding out when you are over the side at midnight is not the time to wish you better understood your lifejacket and its associated equipment!

7. Regularly examine your lifejacket for general wear, especially abrasion, and do check that the inflation gas cylinder is firmly screwed into its connection. If you are unsure how to carry out the checks, the Royal National Lifeboat Institution (RNLI) runs free lifejacket clinics where owners are advised on how to inspect and correctly don their lifejackets.

8. Ensure that the lifejacket is maintained and serviced in accordance with the manufacturer's recommendations. Some manufacturers include free periodic safety checks – take advantage of these, there really is no excuse not to.

9. There are many types of lifejacket on the market which are designated as junior, child and adult sizes. Indeed, some manufacturers also provide differing adult sizes. Do ensure that you are using a lifejacket suitable for your particular activity. The (RNLI) provides comprehensive advice on choosing, fitting and maintaining lifejackets. The information is freely available on the RNLI's website at www.rnli.org.uk/seasafety.

Investigations started in the period 01/10/11 to 29/02/12

Date of Accident	Name of Vessel	Type of Vessel	Flag	Size (gt)	Type of Accident
5/10/2011	*Moon Clipper*	Ferry	UK	98	Machinery failure
22/10/2011	*Pride of Calais*	Ro-ro vehicle/ passenger ferry	UK	26433	Machinery failure
27/10/2011	*Scot Pioneer*	General cargo	UK	2528	Accident to person
21/11/2011	*Cameron*	Other commercial	UK	507	Accident to person
	Moyuna	Fishing vessel	UK	43	Grounding
27/11/2011	*Swanland*	Single deck cargo	Cook Islands	1978	Hull failure (6 fatalities)
	Norcape	Ro-ro vehicle/ passenger ferry	Bahamas	14087	Grounding
11/12/2011	*Hyundai Discovery*	Container	UK	64054	Collision
	Acx Hibiscus	Container	Panama	18502	
17/12/2011	*Tempanos*	Container	Liberia	88586	Accident to person (1 fatality)
18/12/2011	*Johanna*	Container	UK	6363	*Contact
20/12/2011	*Heather Anne*	Fishing vessel	UK	11.67	Foundering (1 fatality)
13/01/2012	*St Amant*	Fishing vessel	UK	57.00	Accident to person MOB (1 fatality)
16/01/2012	*Dette G*	Dry cargo	Antigua	3999.0	Accident to person (1 fatality)
29/01/2012	*Zenith*	Fishing vessel	UK	116.0	Accident to person MOB (1 fatality)

* Investigation being led, by agreement, by the Danish Marine Accident Investigation Board

Reports issued in 2011

Antonis – contact with Langton-Alexandra swing bridge in the Port of Liverpool on 11 December 2010
Published 2 June

Blue Angel – man overboard, west of Gigha on 6 January 2011
Published 22 July

Boxford/Admiral Blake – collision, 29nm south of Start Point, English Channel on 11 February 2011
Published 22 September

Cardiff Bay Yacht Club RIBs – collision between two RIBs, resulting in injuries to three students on 27 October 2010
Published 6 October

Commodore Clipper – fire on the main vehicle deck while on passage to Portsmouth, 16 June 2010
Published 15 November

Cosco Hong Kong/Zhe Ling Yu Yun 135 – collision in the East China Sea, resulting in the loss of 11 lives on 6 March 2011
Published 14 December

Delta 8.5m RIB – injury to a passenger on board a Delta 8.5m RIB on the River Thames, London on 6 May 2010
Published 27 January

Discovery/Breadwinner – MAIB combined report on the investigations into the loss of the skipper from fv *Discovery* during single-handed fishing operations 3 miles east of Fraserburgh on 9 October 2010, and the loss of the skipper from fv *Breadwinner* while fishing single-handedly 5.5 miles east of Score Head, Bressay on 20 January 2011
Published 3 November

Ever Excel – fatal accident to the chief engineer in the lift shaft on board the container ship, Kaohsiung, Taiwan on 21 April 2010
Published 12 May

Fremantle Express – fatality during a mooring operation, Veracruz (Mexico) 15 July 2011
Published 22 December

Homeland/Scottish Viking – collision 4.2 miles off St Abb's Head on 5 August 2010, resulting in one fatality
Published 17 March

Jack Abry II – grounding on Isle of Rum on 31 January 2011
Published 12 August

Joanna – fatal man overboard from the cargo vessel alongside in Glasgow, Scotland on 13 December 2010
Published 2 June

Karen – grounding at the entrance to Ardglass Harbour, County Down, Northern Ireland on 3 January 2011
Published 2 June

K-Wave – grounding near Malaga, Spain on 15 February 2011
Published 22 September

Liquid Vortex – serious injury on board the yacht on 28 May 2011
Published 1 December

Norman Arrow – contacts made by the high speed craft with quays in Portsmouth International Port, Portsmouth, UK on 31 March 2010 and with a mooring dolphin in Le Havre, France on 29 August 2010
Published 19 May

Our Boy Andrew – fatal accident to the skipper, 9 miles east of Eddystone Rocks on 24 March 2011
Published 8 November

Philipp/Lynn Marie – collision 6nm south of the Isle of Man on 9 April 2011
Published 13 October

***Platon* (CMA CGM)** – contact with Bevans Wharf, River Thames on 15 May 2011
Published 8 December

RMS Queen Mary 2 – catastrophic failure of a capacitor in the aft harmonic filter room while approaching Barcelona on 23 September 2010
Published 22 December

Sapphire II/Silver Chord – collision between the fishing vessels *Sapphire II* and *Silver Chord* resulting in the foundering of Sapphire II off Stornoway, Scotland on 12 January 2011
Published 13 October

Oscar Wilde – machinery space fire in Falmouth Bay on 2 February 2010
Published 10 March

Princes Club Water Sports Park – fatal accident at Princes Club Water Sports Park, Bedfont, Middlesex on 11 September 2010
Published 20 July

Royalist – sea cadet's fatal accident on board the sail training ship in Stokes Bay in the Solent on 2 May 2010
Published 3 March

SBS Typhoon – contact in Aberdeen harbour on 26 February 2011
Published 22 July

Skandi Foula – contact by *Skandi Foula* with OMS *Resolution* in Aberdeen harbour on 29 May 2010
Published 12 August

Yeoman Bontrup – fire and explosion on board the bulk carrier at Glensanda Quarry, Loch Linnhe, Western Scotland on 2 July 2010
Published 5 May

APPENDIX C

Reports issued in 2012

CSL Thames – grounding in the Sound of Mull on 9 August 2011.
Published 1 March

Golden Promise – grounding on the Island of Stroma on 7 September 2011.
Published 1 March

Vellee – flooding and foundering in the Little Minch on 6 August 2011.
Published 23 February

Safety Bulletins issued during the period 01/10/11 to 29/02/12

RMS Queen Mary 2 - catastrophic failure of a capacitor, and an explosion, in an 11kV harmonic filter on board the passenger cruise vessel RMS *Queen Mary 2*
Issued 3 December