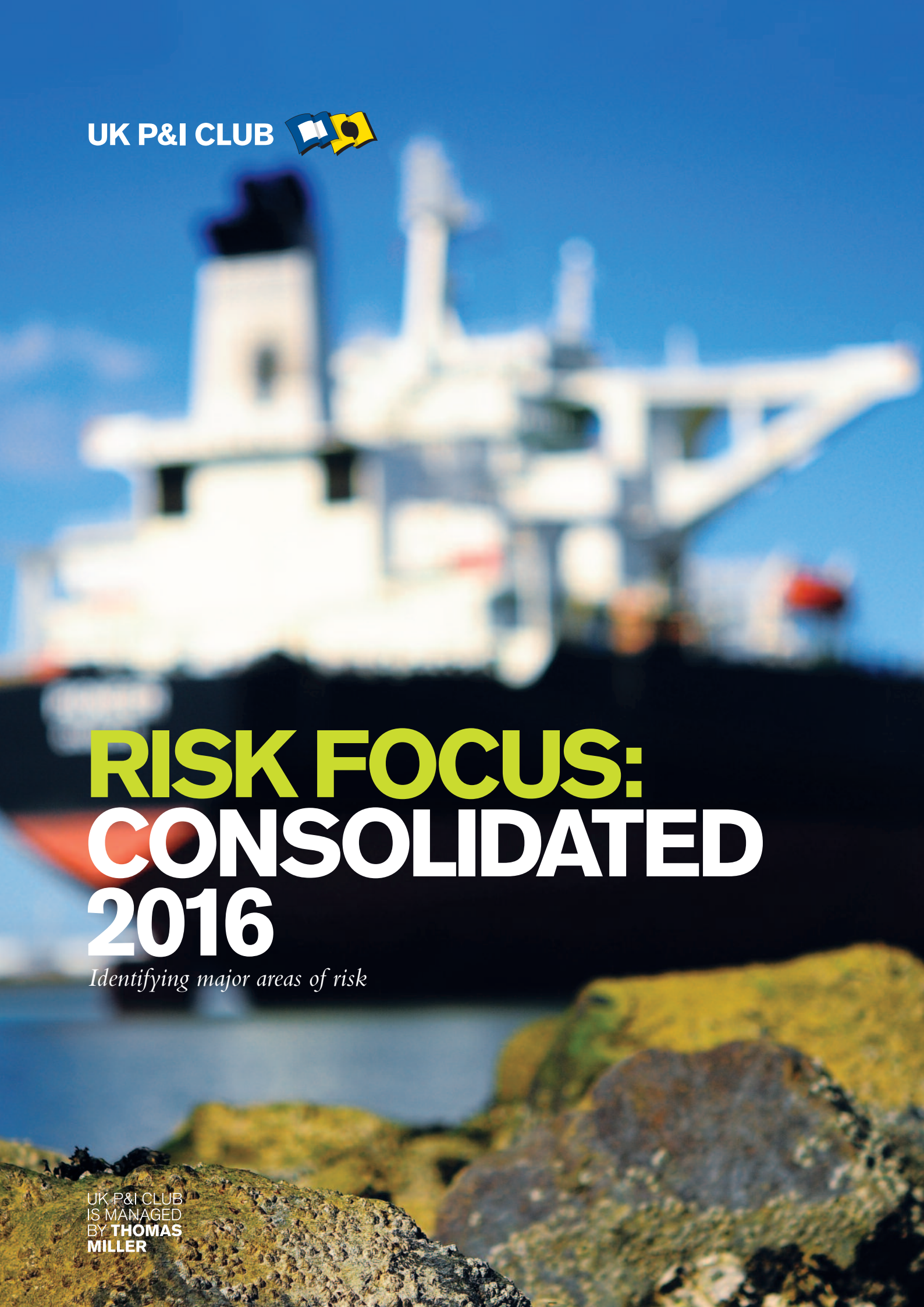


UK P&I CLUB 



RISK FOCUS: CONSOLIDATED 2016

Identifying major areas of risk

UK P&I CLUB
IS MANAGED
BY **THOMAS
MILLER**

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UK P&I CLUB 

RISK FOCUS: ENCLOSED SPACES

*More needs to be done to stem the loss
of life caused by this invisible killer*

UK P&I CLUB
IS MANAGED
BY **THOMAS
MILLER**

Accidents relating to entry into enclosed spaces on board ships continue to blight the shipping industry, with an unacceptably large number of incidents resulting in the death or injury of both ship and shore personnel reported over the first few months of this year alone.

UK Club risk assessor, David Nichol, believes that a paradigm shift is required in the approach to safe management of enclosed spaces so as to arrest the continuing appalling litany of personal tragedy.

It may be instructive to use a couple of examples derived from personal experience to highlight the challenge of managing enclosed spaces. 15 years ago, while working as an independent surveyor, I was carrying out a condition survey on board a Panamax bulk carrier. The scope of the survey included testing the emergency generator, located within a 3 metre deep recessed well in the steering flat and accessed by an inclined ladder. Accompanied by the superintendent and the chief engineer, we had no sooner reached the bottom of the space when the chief engineer urgently ordered us all out. By the time we had exited the space, within seconds, we were all in a state of dizziness and confusion, compounded by our inability to comprehend what had just occurred. Further investigation revealed that freon gas had leaked from refrigeration machinery located in the steering flat and being heavier than air, had migrated into the emergency generator space, displacing breathable air. It was a very lucky escape. Victims of asphyxiation in enclosed spaces deficient in oxygen will normally receive no such warning that anything is wrong or have the ability to quickly escape.

Should we have been aware that this emergency generator space, not being enclosed in the usually perceived sense of the word, was potentially dangerous for entry?

IMO definition of an enclosed space

1. limited openings for entry and exit;
2. inadequate ventilation; and
3. is not designed for continuous worker occupancy, and includes, but is not limited to, cargo spaces, double bottoms, fuel tanks, ballast tanks, cargo pump-rooms, cargo compressor rooms, cofferdams, chain lockers, void spaces, duct keels, inter-barrier spaces, boilers, engine crankcases, engine scavenge air receivers, sewage tanks, and adjacent connected spaces. This list is not exhaustive and a list should be produced on a ship-by-ship basis to identify enclosed spaces.

Most could be forgiven for not considering our generator space to fall within this definition, although it was clearly proven to present a danger in a particular circumstance.

Another very common example of confusion over what actually constitutes an "enclosed space", is the inconsistent perception of the dangers presented by CO² fixed fire extinguishing system cylinder storage rooms. There are a number of reported cases of ship and shore personnel losing their lives by uncontrolled entry into CO² rooms. A leak in the system may accumulate in

the space and displace breathable air if not thoroughly ventilated. Unfortunately, it is frequently found that CO² rooms are not identified as enclosed spaces on board and not provided with appropriate warning signs at the space access. More than once I have had to caution a ship's engineer from opening and immediately entering the CO² room prior to ensuring that pre-entry precautions were observed and that the space was thoroughly ventilated. However, crew members may easily fail to appreciate that a CO² room should properly be included within the aforementioned definition of an enclosed space.

CO² room access – No atmosphere hazard warning notice

The crucial but frequently overlooked words are that "(the) list is not exhaustive". It is therefore important that ship managers and crew apply as wide interpretation as possible as to what spaces on board each vessel could potentially be deficient in oxygen, and/or contain flammable and/or toxic gases or vapours, thus requiring safety precautions to be observed prior to entry.

The dangers associated with enclosed spaces are well known. Regulatory authorities, Classification Societies, P&I Clubs and other industry bodies have produced a plethora of information and advice over many years, and yet the death toll continues to be maintained at an alarming level. Reliable statistics are difficult to obtain but it is commonly stated that more deaths occur on board ships in relation to entry into enclosed spaces than any other shipboard working activity.

So why the unremitting high level of casualties? Part of the answer may lie in the aforementioned misconceptions as to what spaces are or may become dangerous, and how they are identified. It may assist if the industry introduced a uniform approach to physical labelling of all enclosed spaces that have been identified in the Safety Management System. At present, there is no industry standard for the design and siting of warning notices and symbols that may be universally understood by ship and shore personnel. Indeed, on many ships, no attempt is made to provide any such labelling at points of access.

Cargo hold access – No warning notices

However, warning notices alone will not overcome the alarming complacency that appears to affect otherwise professional and well trained seafarers when entering enclosed spaces as is often revealed in accident reports. In May last year, three crew members on board the cargo ship "SUNTIS" lost their lives after entering a cargo hold loaded with sawn timber, a cargo known to cause oxygen depletion. Whilst these crew members should have been aware of the hazard requiring the observance of pre-entry precautions, they also appear to have completely disregarded the unambiguous warning notices sited at the hold entrance as illustrated below.

Such complacency is encouraged by crew members coming to view entry into enclosed spaces as routine, reducing their perception of risk and inhibiting their inability to react to changing levels of hazard. The three deceased crew members on the "SUNTIS" are likely to have entered the cargo hold numerous times during the course of their duties and they could not perceive that on this fateful occasion, anything would be different.

Another part of the solution must also lie in improved levels of education and training of both ship and shore personnel. Reference is made to IMO Resolution A.1050(27) "Revised Recommendations For Entering Enclosed Spaces Aboard Ships" adopted in 2011. These recommendations provide, inter alia, that shipowners must adopt a comprehensive safety strategy to prevent accidents on entry to enclosed spaces, and that procedures for enclosed space entry are included among the key shipboard operations concerning safety of personnel and the ship. Competent and responsible persons should be trained in enclosed space hazard recognition, evaluation, measurement, control and elimination, and crew members trained in enclosed space safety. There is a requirement to ensure a risk assessment is conducted to identify all enclosed spaces on board and that a competent person makes an assessment of any potential hazards in the space to be entered. The recommendations also provide that no person should open or enter an enclosed space unless authorized by the master or the nominated responsible person, and unless the appropriate safety precautions laid down for the particular ship have been followed. Entry into enclosed spaces should be planned and the use of an entry permit system, which may include a checklist, is recommended.

Despite the training requirements included in the above revised recommendations, IMO have recognised that more needed to be done to respond to the continuing loss of life from personnel entering shipboard enclosed spaces. This has taken the form of amendments to SOLAS regulation III/19 "Emergency training and drills", which entered into force on 1st January, 2015, and requires that enclosed space entry and rescue drills are to be conducted at two monthly intervals.

The amendments include the following:

"3.6 Enclosed space entry and rescue drills

3.6.1 Enclosed space entry and rescue drills should be planned and conducted in a safe manner, taking into account, as appropriate, the guidance provided in the recommendations developed by the Organization [i.e. Resolution A.1050(27)].

3.6.2 Each enclosed space entry and rescue drill shall include:

- .1 checking and use of personal protective equipment required for entry;
- .2 checking and use of communication equipment and procedures;
- .3 checking and use of instruments for measuring the atmosphere in enclosed spaces;
- .4 checking and use of rescue equipment and procedures; and
- .5 instructions in first aid and resuscitation techniques.

4.2 Every crew member shall be given instructions which shall include but not necessarily be limited to:

.5 risks associated with enclosed spaces and onboard procedures for safe entry into such spaces which should take into account, as appropriate, the guidance provided in recommendations developed by the Organization".

In addition to these welcome changes, IMO have recently seen fit to rectify the anomaly that until now, no industry wide requirements have been in place, requiring all vessels to carry atmosphere testing instruments. Amendments to SOLAS in the form of new regulation XI-1/7 make it mandatory for all vessels to carry portable gas detectors. As a minimum, portable gas detecting instruments will need to be capable of measuring and displaying concentrations of oxygen, flammable gases or vapours, carbon monoxide and hydrogen sulphide. Although the amendments enter into force 1st July, 2016, IMO have invited SOLAS contracting States to implement the new regulation as soon as practical.

For all of this to be effective, it is necessary that ship staff, with the support of shore management, perform mandatory drills, training and actual entry procedures with a dedication and seriousness that reflects the grave dangers that attend enclosed space entry. The performance of risk assessments and Permits to Work should not be approached as a generic paper exercise and must be able to respond to the particular circumstances of the task, e.g., the hazards presented by the particular cargo within a hold space. A Permit to Work must be fully completed and signed off at the site of the task so that it is contemporary and reflects the actual hazard and safety needs of the operation. All too often, Club risk assessors find that permits are being completed on a PC, possibly even after the event. On every occasion before carrying out a job, pre-work meetings or "tool box talks" need to be arranged to identify who does what, the tools needed to identify the risks involved and what to do if something goes wrong.

Drills and training should be properly planned and be used as an opportunity to assess the challenges of rescue from the variously identified enclosed spaces on board, e.g., can they be accessed by persons wearing breathing apparatus? Training should also emphasise to the crew the importance of raising the alarm when persons are found to be in difficulty within an enclosed space, and that any rescue is properly coordinated in accordance with practiced procedures. The natural instinct to rush in to help a ship mate is understandable but extremely dangerous. It has been reported that more than half of enclosed space casualties are people who have attempted an ill prepared rescue.¹

Comprehensive record keeping and interactive post drill debriefs will assist in identifying any weaknesses in procedures and promote crew ownership of the training programme.

Last but not least, a zero tolerance culture to unplanned and unprepared entry into any enclosed space requires to be rigorously enforced and ingrained into all personnel, on board and ashore.

¹ The Paris MOU, jointly with Tokyo MOU, initiated a Concentrated Inspection Campaign (September – November 2015) on crew familiarisation for enclosed space entry.

Enclosed Spaces – the ‘Bowtie approach’

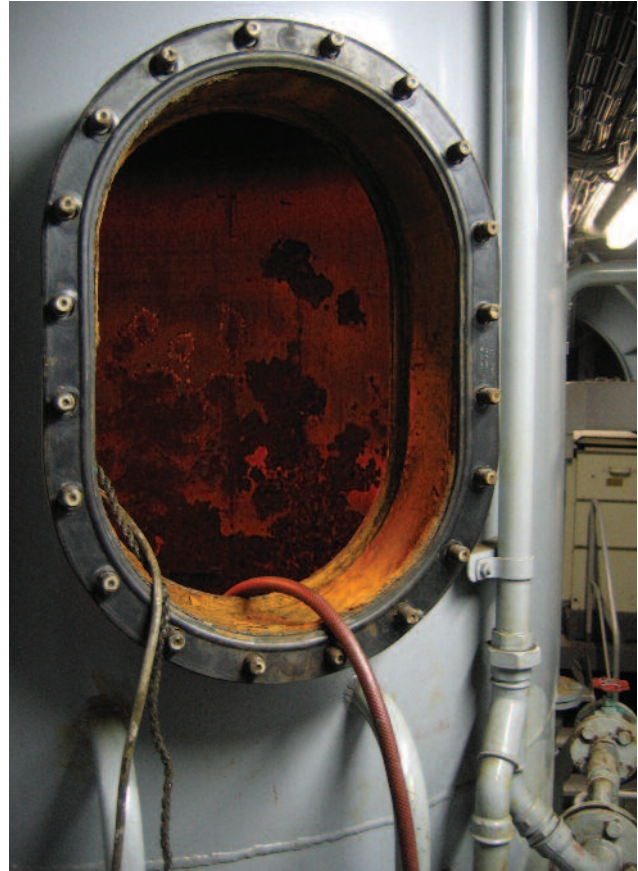
Hazard, threats and consequences: In the centre of the diagram, Hazardous Activities are identified as the ‘hazard’, while blue squares to the left identify a range of ‘threats’, which, if not controlled, could cause a serious incident involving P&I claims and other consequences which can be seen in the red shape on the far right of the diagram.

Controls: Between these extremities can be seen the ‘controls’ which, if they work properly, will prevent the accident happening and on the right hand side of the diagram, controls which will mitigate the consequences.

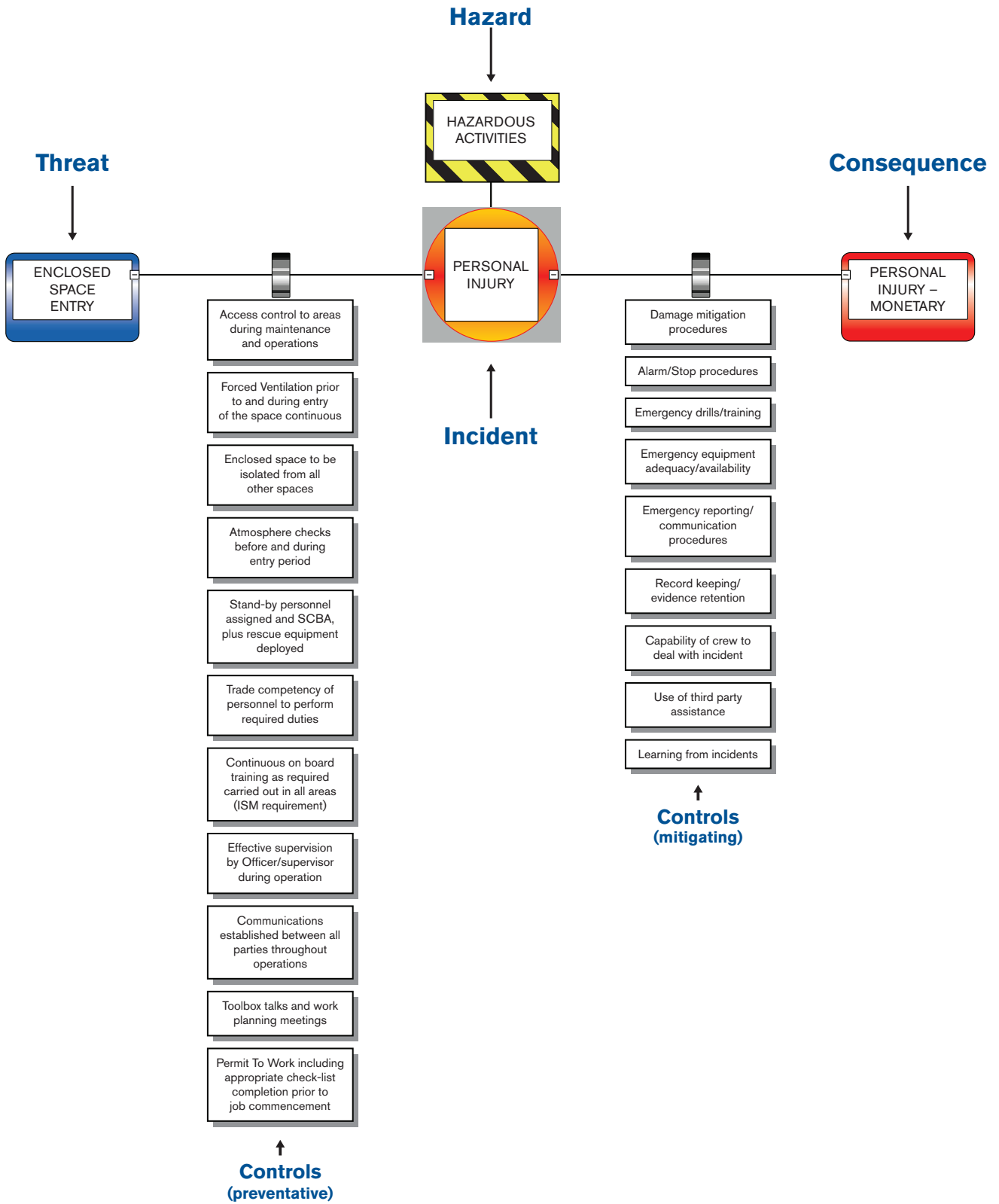
Thus taking as an example the threat of Enclosed Space Entry (left hand side), controls which should be in place to prevent this include atmosphere checks before and during entry period, trade competency of personnel to perform required duties, effective supervision by an officer or supervisor during operation and enclosed spaces to be isolated from all over spaces.

Consequences: The consequences of an accident (right hand side) will be mitigated by the capability of the crew to deal with an incident, good record keeping, emergency reporting and communication procedures, systems and procedures to maintain steering, emergency drills, clear abort procedures, recovery measures implemented by a well-trained crew, tug availability and anchor at the ready.

Threats: This example shows only one threat. A full ‘Bowtie’ with all the threats can be provided on request.



'Bowtie' with one threat – Enclosed Space Entry



What are we checking?

How effective is that control, are there failures just waiting to happen (latent)?

RISK FOCUS: THE MASTER PILOT EXCHANGE

*Good communication and team
work during pilot operations*



NO SMOKING

The final piece of the passage plan?

When the mandatory berth to berth passage plan for a voyage is being prepared, it is often the information that is needed to complete the transit with the pilot onboard, to or from the berth, that is the most difficult to obtain in advance.

Even with the onboard sailing directions and port guides together with what may have been provided by the local agent, there will still be areas where further detail is required by the bridge team.

A master can be familiar with a port after frequent visits, but there will be many aspects that can only be properly completed when the pilot actually boards. That is the opportunity for the master to seek the information and advice that will fill in the missing gaps for the transit, manoeuvre, berth and tugs (if used).

There has been much discussion in the industry on the development of a port passage plan that can be provided to the master in advance of arrival, but it will be some time before it becomes standard practice, if ever. Every transit is different and the passage plan under pilotage must be considered a dynamic process and capable of being updated quickly as it is required.

There are times when the master may be asked to bring the vessel closer to the entrance to the port, perhaps due to bad weather or because the pilot is still on the way. Whatever the reason, one of the first considerations, if complying, is to ensure that there is still adequate time for the master/pilot exchange to be carried out.

The master pilot exchange is the missing piece of the passage plan puzzle and a crucial one.

Amongst other things, the bridge team will need to know the following:

The transit to and from the berth

- Route agreed with waypoints and courses, adequate charts
- Speed and timing for the transit
- Local weather and tidal conditions expected
- Vessel movements, any congestion off the berth
- Local traffic regulations to be complied with
- Depth limitations due to tide and/or squat
- Minimum depth on passage
- Local tidal data, heights, slack water and when the direction of flow changes
- Rate and direction of any currents
- Location of turning areas including those required for a berthing manoeuvre
- Abort points
- Emergency or standby anchorage areas



Tugs

- Number of tugs, their type and power?
- Time of arrival at the vessel?
- Where will the tugs be made fast?
- Ship's line or tug's line to be used?

The berth

- Any limitations such as the maximum/minimum size of vessel, number of bollards, fender capacity
- Turning areas are of sufficient size
- Available depth alongside at low water
- Any air draught restrictions
- Which is the first line ashore
- Will mooring boats assist
- Mooring plan
- Any berthing aids to assist in determining speed when manoeuvring
- Any berthing speed limits
- Time required to order pilot / tugs in an emergency
- Departure procedures for letting go moorings

With the pilot onboard it is the opportunity for the master and bridge team to confirm arrangements and ensure that they are satisfied with the planned transit and berthing/unberthing manoeuvre. This is the first and best opportunity to talk to the pilot and to clarify any issues that have been identified during the preparation of the onboard plan. However, it is important to prioritise this process so that the limited time available at the start of the pilotage can be addressed directly and less urgent matters discussed once on route.

As far as is possible, the pilot needs to be part of the bridge team not outside it, but also has to get on with the vital task of familiarising him/herself with the immediate situation, checking and setting radars, headings and speed and getting in contact with the port control, berth/terminal and tugs.

The co-operation of the master and bridge team includes confirmation of the language to be used throughout so that helm and engine orders can be quickly and properly acknowledged and carried out.

The pilot will be familiar with most types of vessel and what to expect in ballast or loaded condition, however, no two ships behave in the same way, even sister vessels. It is therefore important to familiarise the pilot as quickly as possible of any manoeuvring features which might be unusual, vessel-specific or unexpected. It is also essential that the pilot is told immediately if there are any difficulties for the helmsman in maintaining the heading or delays with engine movements.

In the first instance, the pilot will want to confirm the draught of the vessel and the trim, this will give him a first

appreciation of how the vessel will be expected to respond to the wheel and what under keel clearance will be encountered on passage. For example, some vessels with even a slight trim by the head do not steer as easily as one on even keel or with stern trim.

An accurately completed pilot card gives the pilot all the essential basic information to build his own picture for the passage and any manoeuvres that will be carried out. It can then be supplemented in discussion with the master/bridge team.

For the master, access to a local chart, perhaps due to recent changes in the port, additional hydrographic information or inadequate scale of the chart onboard may be a priority. With advance communication with the local agent, these are issues that can be resolved before arrival.

It should not take long to confirm the route to be taken, the areas of least depth, which might require a reduction in speed and positions where the vessel might be anchored in an emergency, or turned around if the passage has to be aborted. The pilot will need to know what squat to expect on passage.

If there are areas where the direction of the current is not in line with the channel and the bridge team is informed in advance, then they are prepared for what might appear to be unusual helm orders or courses to steer. This avoids unnecessary questions at what might be a critical part of the passage.

It is important that both the master and pilot are both clear about the status of the vessel and the planned passage. It is not the time to rely on assumptions, expectations can be very different to reality.



Is the engine room functioning as well as it should be?

For example; the pilot must know of any particular issues with the engines. It might take a long time to change between ahead and astern, or the vessel must be slowed down over a prolonged period to ensure that steerage can be maintained. There may only be a very limited number of engine starts and

the transverse thrust when going astern may not be as normally expected. When warned in advance, the pilot can make due allowance as the berthing or unberthing manoeuvre is planned.

However competent the pilot is, the bridge team must monitor the progress of the vessel on the chart or Ecdis. A pilot should never mind being asked questions about the position of the vessel in the channel or unexpected depth soundings.

During any pilotage transit, the anchors should be ready to be used in the shortest possible time. However, when there are tugs located at the bow it should never be forgotten to ensure that they are confirmed as being clear first, even in an emergency.



Always be aware of where the tug is

When tugs are to be used, the master must be satisfied that those provided have sufficient power to manoeuvre the vessel and also know what types they are. It is important to know when using more than one tug whether they are similar in their manoeuvring characteristics and have the same, or different power.

Different tug types and power matches are not unusual, but this must be taken into consideration when planning any passage and allowed for. A different method of positioning the tugs on the vessel may be necessary and perhaps a manoeuvre will have to be undertaken in a different area or more time allowed and/or space for a turn to be carried out. The method of dealing with those issues should be a matter for discussion, so that there is no misunderstanding of the proposed procedure.

The master should also consider whether ship's lines should be used to make the tugs fast. There are occasions where it might be necessary, but generally it is preferable to use the tugs equipment, particularly on larger vessels.

The instructions given to a tug by the pilot are often in a different language to that used onboard. It is up to the master to ensure that the pilot at least provides an overview of how the tugs will be used without expecting a word by word



Not all tugs are the same, or as effective

translation of every conversation. If it feels like the speed of approaching the berth or going alongside is too high it probably is, and those concerns should be passed to the pilot so that action can be taken by using the engine and/or tugs moved into position to start to slow the vessel down.

Although the pilot is expected to be the local expert, it is possible that he/she might not have manoeuvred a vessel of the same type or size before. It cannot be assumed that the pilot knows everything, but the more that information is exchanged the more effectively the transit and manoeuvre will be carried out. It should also be remembered that the pilot has not only gained personal knowledge and experience whilst working at the port, but also has access to that of all the other pilots and that is considerable back-up for any pilot.

The master should have information about the berth from the agent, however, the pilot should be able to provide more practical detail. That will include whether line handling boats will be used, which lines to be put ashore first, the configuration of the mooring lines and whether the anchor will be required.

In the end, during any pilotage transit, the key should be to prioritise efficient and timely communication to ensure a safe passage and not the overloading of the bridge team and pilot with unnecessary information and questions.

Solis Marine Consultants is very pleased to be working together with the UK P&I Club to highlight some of the practical aspects of the pilot/master exchange which is a critical part of any passage for the master and bridge team. In the preparation of this focus document, Solis' consultant mariners have used their extensive in-house experience of pilotage and command to draw attention to areas of transits where advance planning and asking the right questions should help to ensure a safe passage to or from port.(www.solis-marine.com).

The Master Pilot Exchange – the ‘Bowtie approach’



Hazard, threats and consequences: In the centre of the diagram, Ship in Transit are identified as the ‘hazard’, while blue squares to the left identify a range of ‘threats’, which, if not controlled, could cause a serious incident involving P&I claims and other consequences which can be seen in the red shape on the far right of the diagram.

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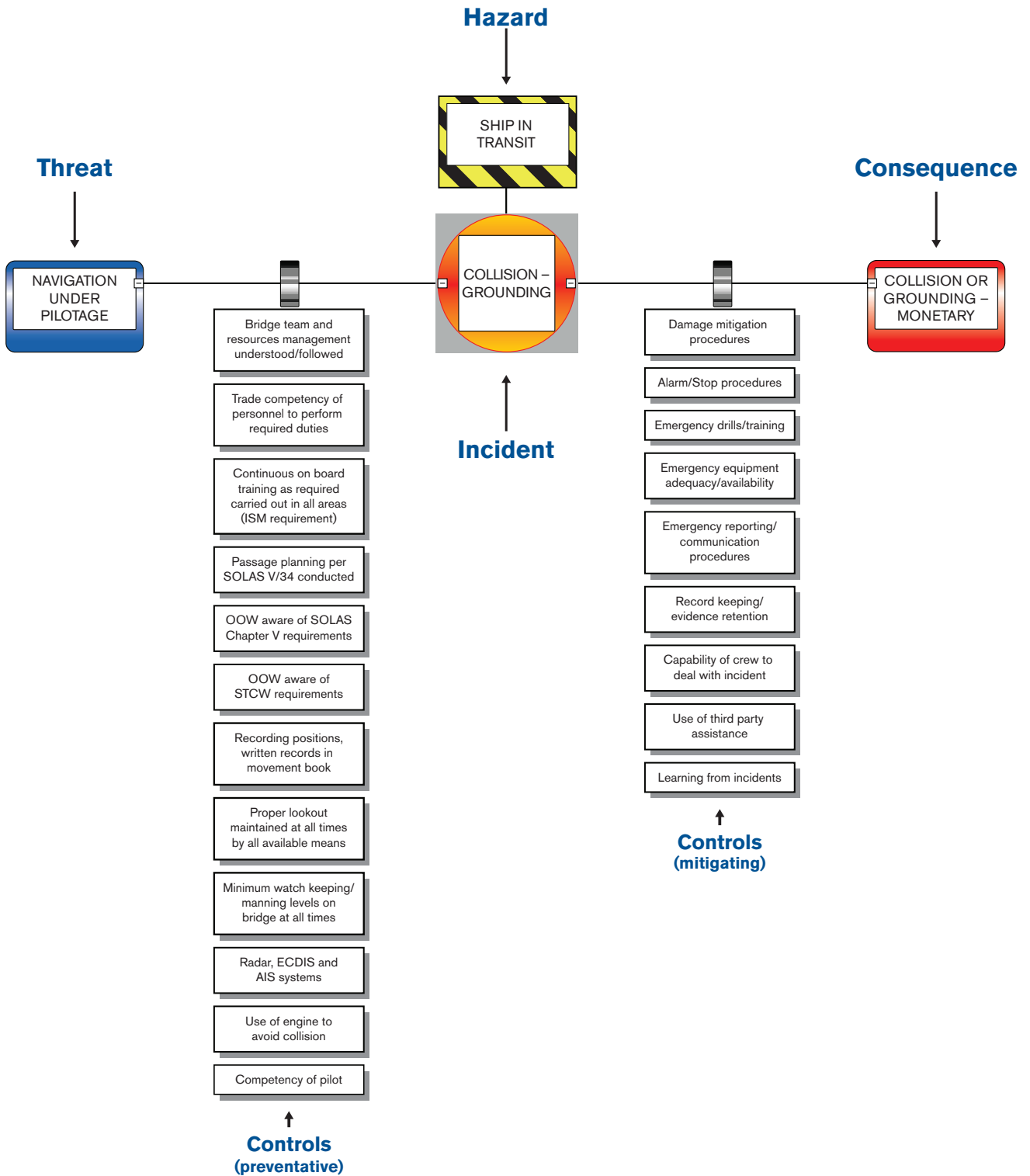
Thus taking as an example the threat of Navigation Under Pilotage (left hand side), controls which should be in place to prevent this include Bridge team and resources management understood and followed, continuous on board training, proper lookout maintained at all times as well as radar, ECDIS and AIS systems.

Consequences: The consequences of an accident (right hand side) will be mitigated by the capability of the crew to deal with an incident, good record keeping, emergency reporting and communication procedures, systems and procedures to maintain steering, emergency drills, clear abort procedures, recovery measures implemented by a well-trained crew, tug availability and anchor at the ready.

Threats: This example shows only one threat. A full ‘Bowtie’ with all the threats can be provided on request.



'Bowtie' with one threat – Navigation under pilotage



What are we checking?

How effective is that control, are there failures just waiting to happen (latent)?

UK P&I CLUB



RISK FOCUS: MOORINGS

With its team of risk assessors, the UK Club is in a unique position to gather data and target areas of risk onboard ship



UK P&I CLUB
IS MANAGED
BY **THOMAS
MILLER**

In this article on mooring, we follow up on the Club's analysis of its mooring incidents. A twelve month exercise by the Club's in-house inspectors produced important supplementary findings.

Introduction

Following the LP News article 'Understanding Mooring Incidents' (see Appendix A), the UK Club embarked on a focused inspection. Whilst onboard, the Club's inspectors spent a considerable amount of time looking at each vessel's mooring arrangement, equipment and procedures to directly investigate current mooring issues. This was a large undertaking, and during the past twelve months 373 ships have been inspected. All of this data was recorded and has been analysed.

The aim of this exercise was not only to gauge the standard of mooring arrangements and procedures onboard but also to highlight areas where improvements could be made, as well as areas that were doing well.



Ineffective grease point

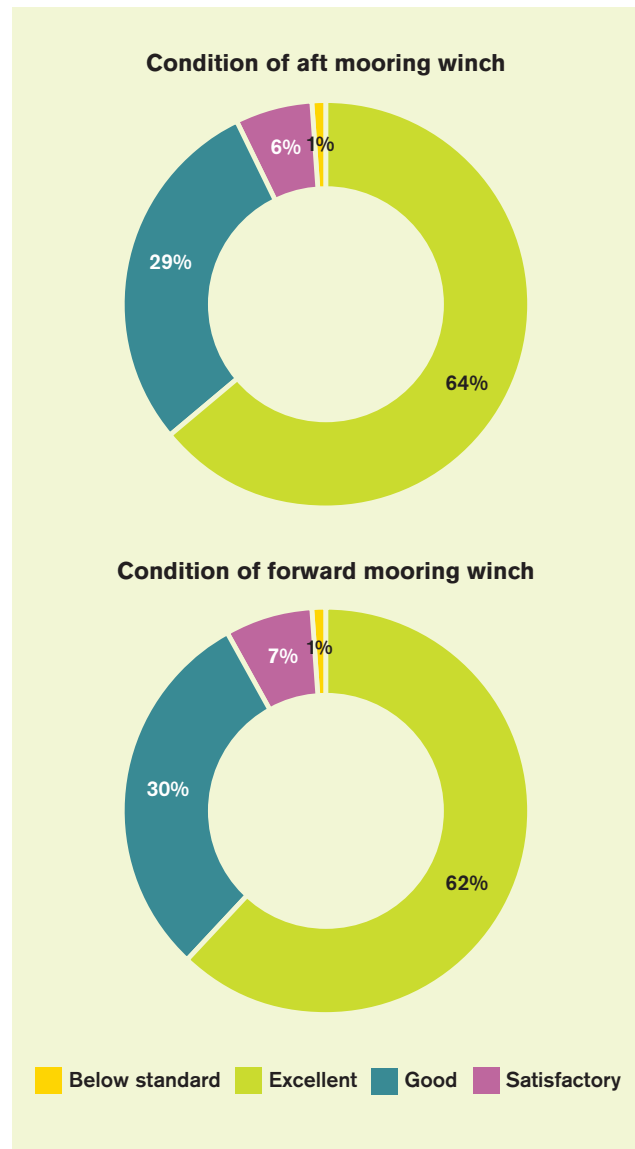
Winches, ropes and equipment

One of the major findings of the exercise was that most of the equipment used in mooring operations was found to be in good condition. Some of the inspectors noted that, despite the overall good condition of the mooring winches, it was sometimes difficult to grease the equipment correctly. It is important that all greasing points are free, working correctly and have not been painted over. To ensure that each point of the equipment is greased it may be beneficial to highlight or number each point and record the information in a plan.

The graphs, on the previous page show the standards of winches inspected to be very high.

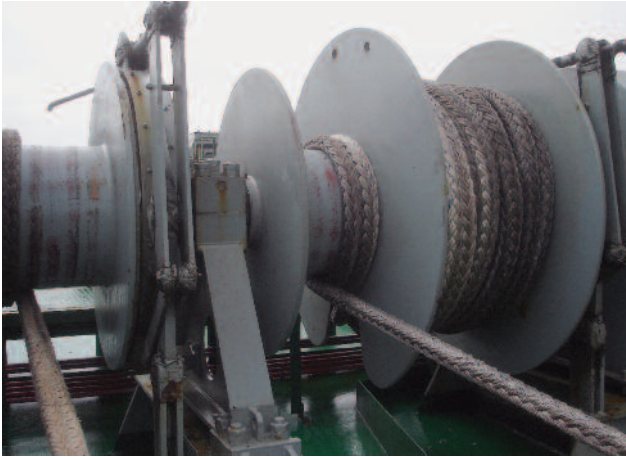
Despite the good overall winch condition, inspectors commented that on a number of vessels the split drums were not set-up correctly. The first picture below shows the correct way to set up a split drum, having only around 4 or 5 turns on the smaller drum and the remainder of the rope on the larger drum.

Of all the vessels inspected 51% carried out brake tests annually (26% did not, and for 23% it was not applicable). It was felt that although this is mainly a tanker requirement, it should be done on more ships, where possible, to improve the overall safety of the ship during high-risk mooring operations.

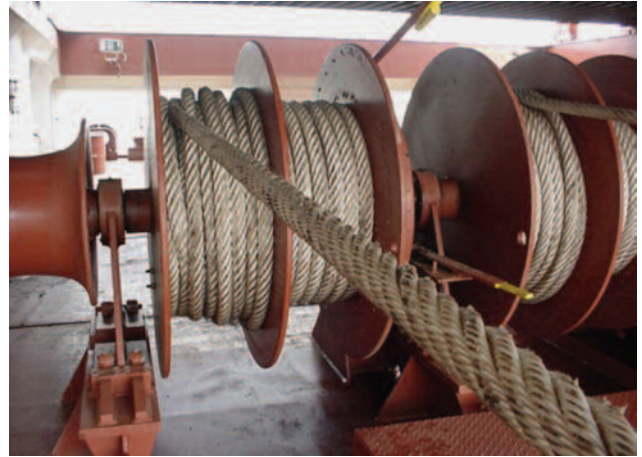


During the course of the exercise it was apparent that the majority of ropes used, were in good condition, the collection of graphs below show the overall standard of ropes, wires and links to be good.

Reassuringly, over 250 of the vessels inspected did not use spliced ropes. Where ropes are in poor or damaged condition, they should be replaced with spares.

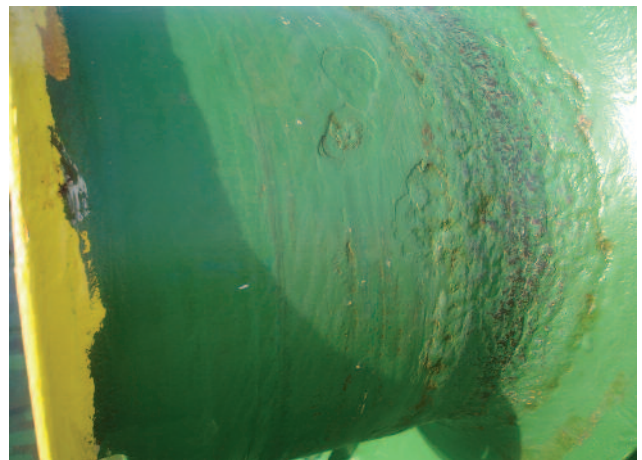


Correctly set up split drum

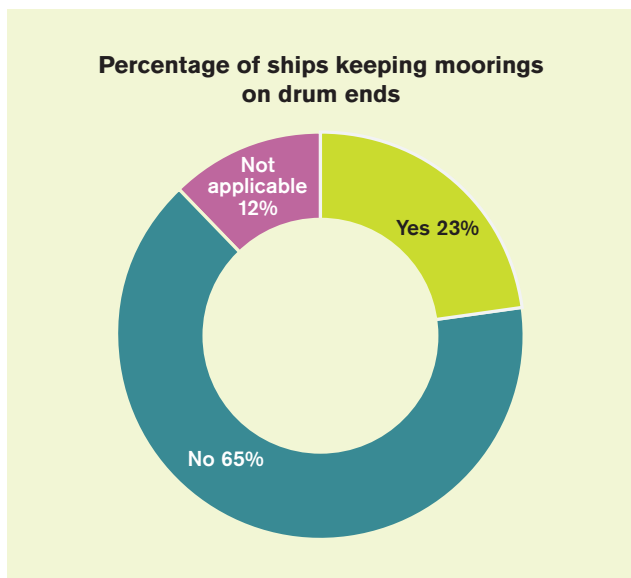


Incorrectly set up split drum with buried mooring line

It is important that all ropes, wires and Tonsberg links used for mooring have a certificate. It is considered good practice for these certificates to be clearly labelled and kept in an easily accessible file ready for inspection by Port Authorities. Spare mooring ropes, wires and links should not be over stowed with paint, chemicals, or any other shipboard or general cleaning items. Spare mooring equipment should be stowed clear of the deck, preferably on a pallet and in a dry ventilated position. If mooring ropes and wires are stowed on deck during sea passages they should not be exposed to sunlight, sea spray or funnel soot. It is suggested that canvas or heavy duty polyethylene covers will prolong the life of the ropes/wires.

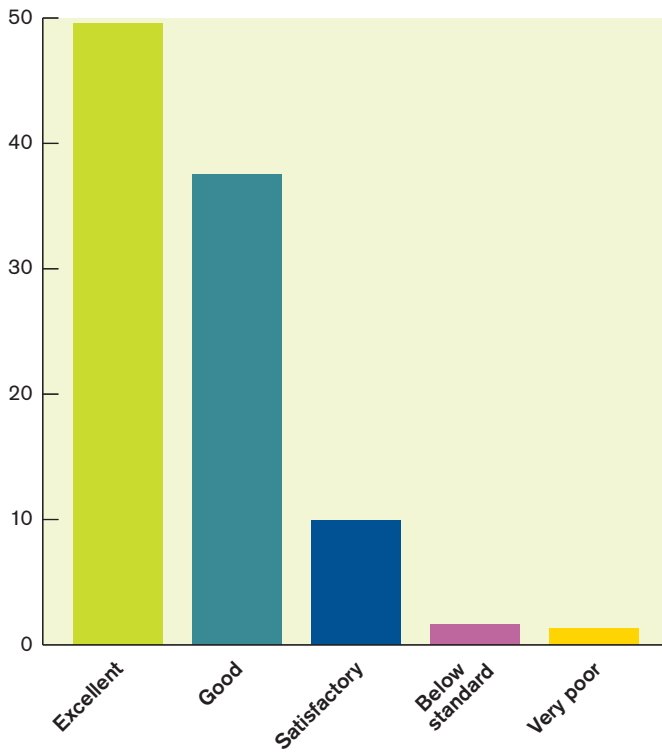


Build up of paint on the drum end



Ropes badly stored on wet deck

Condition of ropes/links and wires



Decks, bitts and ship

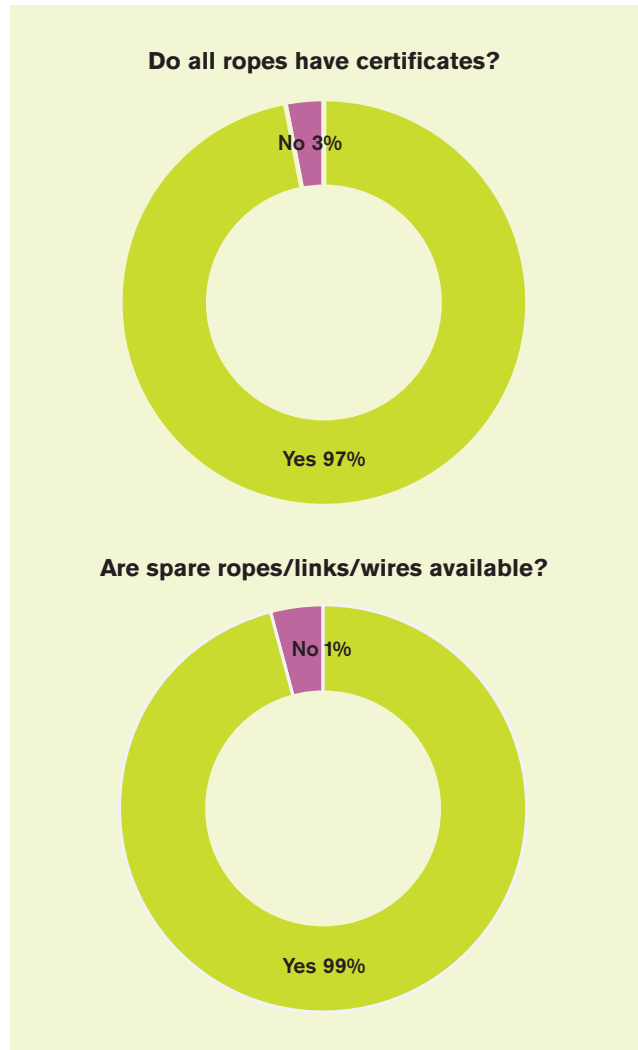
In recent years it has become more and more apparent how beneficial it can be to have a fully non-slip mooring deck.

The following list shows the proportion of vessels with varying degrees of non-slip deck.

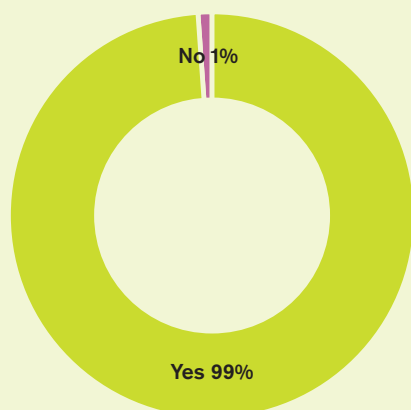
- Non-slip overall, 32%
- None, 32%
- Just in way of bitts, 25%
- Around the drum-ends, 11%

Despite 32% of ships having fully non-slip decks an equal amount had none at all. It is a fact that mixing sand, or an approved non-slip aggregate, into the paint prior to application can be a very effective measure in helping to reduce mooring accidents.

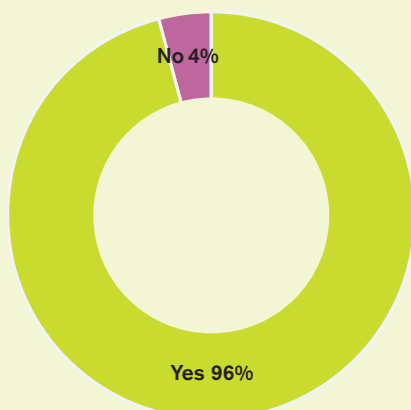
The bitts, rollers and fairleads were generally found to be in good order. 99% of bitts inspected were in good condition with 96% of fairleads and rollers found to be free moving and regularly greased. A well maintained mooring area is essential if a vessel is to operate safely, it is important to ensure that all rollers and fairleads are free moving, decks and bitts are well maintained and that the area is kept free from clutter.



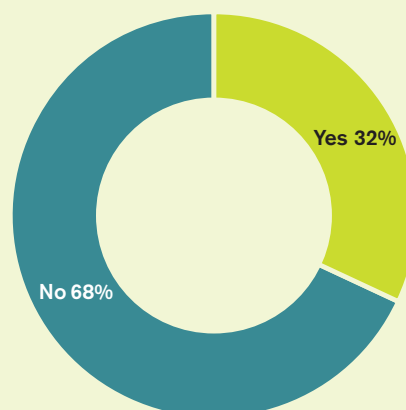
Are bitts in good condition?



Are rollers/fairleads free/greased regularly?



Are non-deck crew used?



Other key factors raised in this section were that 15% of ships used mixed moorings and that 9% of vessels did not use the correct stoppers, both of these points contribute to mooring accidents and should be rectified onboard, it is vital that the correct stoppers are used with the appropriate mooring ropes/wires. Stoppers should not be left around the mooring ropes once they have been made fast to the bitts.

Incidents

Within the last 24 months only 4% of ships had reported a near miss relating to mooring operations. The comments below detail some of the information given to ship inspectors regarding near-miss.

“Several reported and dealt with at safety meetings”

“Yes – rope snapped back (spring line)”

“Spring line snapped back, no injuries”

“Men standing in rope bight”

“Crew standing in bight of rope, guidance given”

“Two lines parted in Amsterdam”

“Yes – cadet was nearly injured – chief mate told him to stand clear of tug line. Line parted but no injuries”

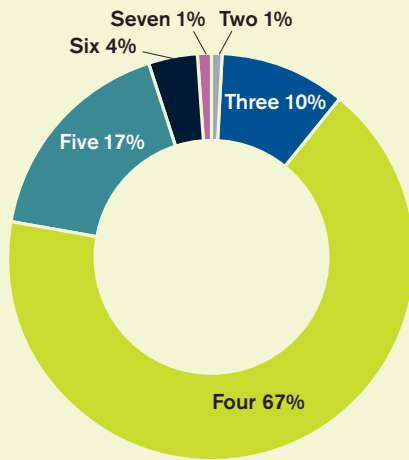
Practices and procedures

A number of key points that arose from the exercise related to the practices and procedures onboard, one of the most notable being that the mooring arrangement on 14% of the vessels inspected was “not satisfactory”. This statistic coupled to the fact that 7% of ISM mooring procedures were not found to be acceptable, shows that a significant portion of those inspected have some way to go if they are to ensure that mooring procedures are of an appropriate standard.

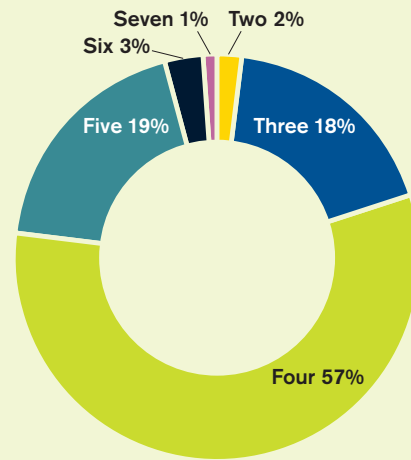
The Club has seen a growing number of incidents occur when non-deck crew are used during mooring operations. All crew should be trained and be familiar with bights, snap-back zones and the hazards associated with mooring operations.

It is important to have sufficient personnel to be able to moor the vessel safely and effectively. The most common number for both forward and aft was 4 people with numbers ranging from as low as 2 (2% aft, 1% forward) and as high as 7 (1% forward and aft).

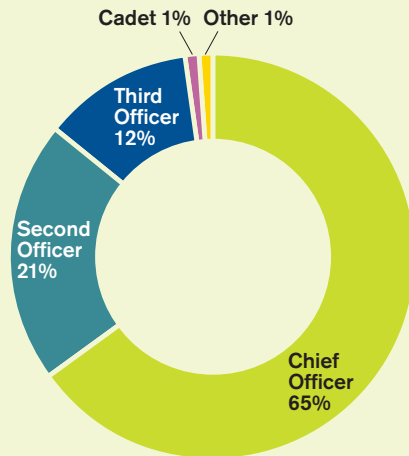
How many crew are used in mooring fwd?



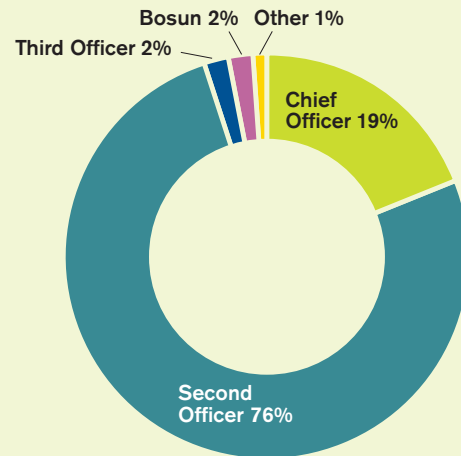
How many crew are used in mooring aft?



Who is in charge of mooring fwd?



Who is in charge of mooring aft?



Summary

From the above report it can be seen that whilst many areas of the mooring operation are to be commended, many are still inadequate in one way or another.

The key points raised are predominantly related to procedures and practices, the use of insufficiently trained crew is still a significant issue.

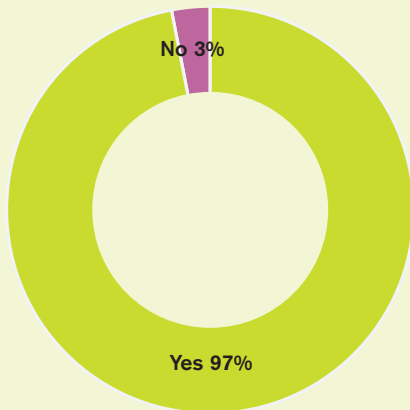
The basic mooring arrangement and ISM mooring procedure were not acceptable on a significant number of inspected vessels. It is vital that time is taken to ensure that procedures are not only acceptable but that they are followed by the crew. A number of familiar factors reoccur in mooring incidents, they are listed below.

- Seafarers stand in bights or snap-back zones, when ropes part those involved are often injured.

- Crew with insufficient training are used during mooring operations, it is often these people who are seriously injured if something goes wrong.
- The person supervising mooring is also involved with operation and is unable to carry out his role effectively.

The survey indicated that the standard of general equipment was relatively high, although it was disappointing to note that 3% of vessels did not have certificates for mooring ropes, wires or Tonsberg links. This may cause problems during any litigation. To reduce the risk of an accident the vessel and equipment must be maintained to a high standard, all personnel should be adequately trained with the correct PPE, the correct procedures should be in place, work permits issued and all mooring operations should be supervised by a competent person. Training in mooring operations should be incorporated into the vessels regular training schedule and include all personnel who are to be involved.

Ships that had a mooring incident onboard during the last 24 months and the associated comments



“Tug pushing in wrong direction”

“Injury to mechanic. Hand and wrist injured, necessitated trip to hospital but no repatriation – light work for seven days”

“One man died in a mooring incident in the Suez Canal in 2008 under command of this captain. Rope was detached from the mooring drum and dragged the fitter by the leg, severing the leg, he died of his injuries”

“Shifting ship, insufficient men on forward stations and Bosun lost the top of his finger during tug operations.”



Moorings – the ‘Bowtie approach’

Hazard, threats and consequences: In the centre of the diagram, Hazardous Activities are identified as the ‘hazard’, while blue squares to the left identify a range of ‘threats’, which, if not controlled, could cause a serious incident involving P&I claims and other consequences which can be seen in the red shape on the far right of the diagram.

Controls: Between these extremities can be seen the



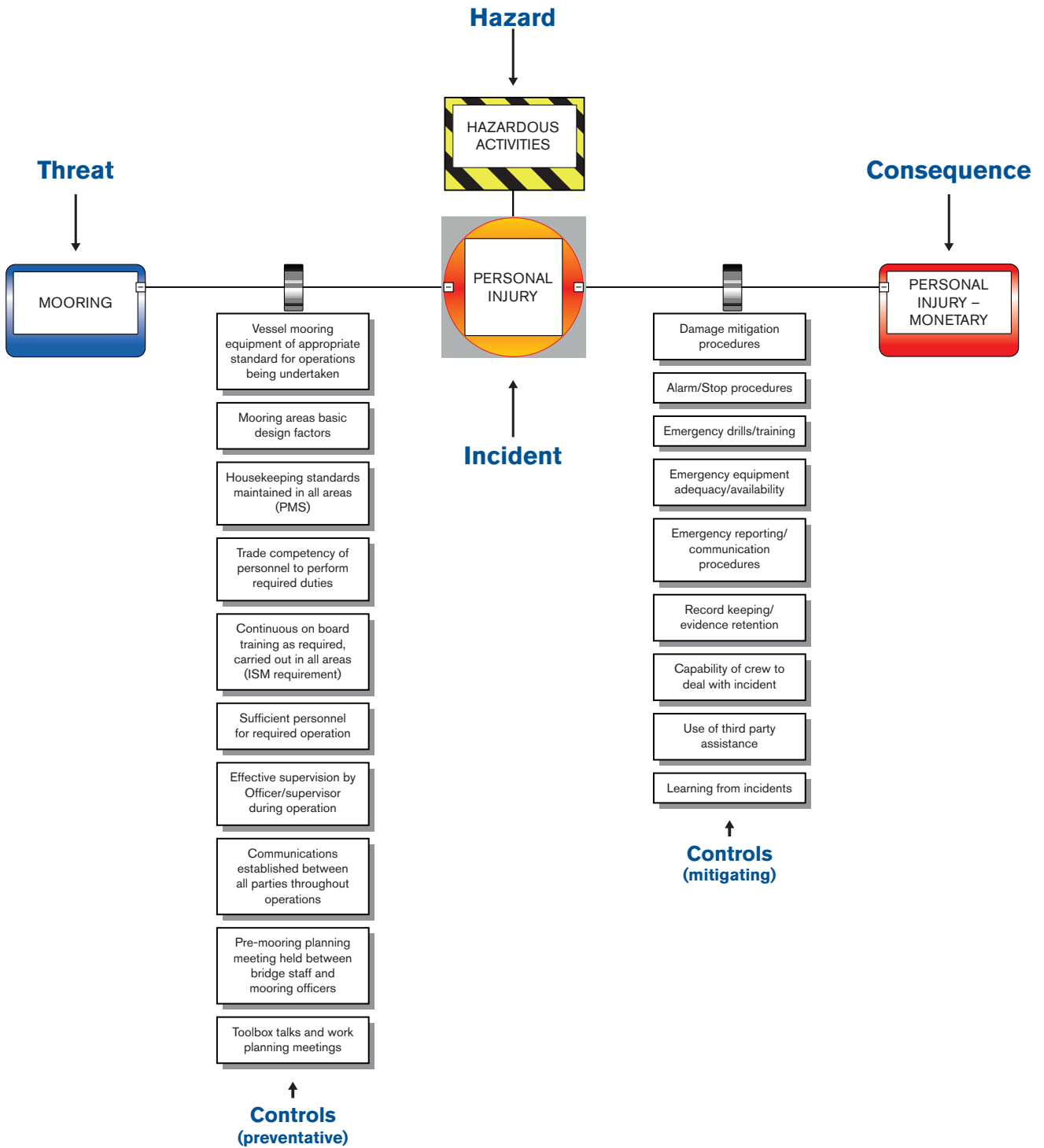
‘controls’ which, if they work properly, will prevent the accident happening and on the right hand side of the diagram, controls which will mitigate the consequences.

Thus taking as an example the threat of Mooring (left hand side), controls which should be in place to prevent this include vessel mooring equipment of appropriate standard for operations being undertaken, housekeeping standards maintained, sufficient personnel for required operation, communications established between all parties throughout operations and pre-mooring planning meetings held between bridge staff and mooring officers.

Consequences: The consequences of an accident (right hand side) will be mitigated by the capability of the crew to deal with an incident, good record keeping, emergency reporting and communication procedures, systems and procedures to maintain steering, emergency drills, clear abort procedures, recovery measures implemented by a well-trained crew, tug availability and anchor at the ready.

Threats: This example shows only one threat. A full ‘Bowtie’ with all the threats can be provided on request.

'Bowtie' with one threat – Moorings



What are we checking?

How effective is that control, are there failures just waiting to happen (latent)?

Understanding mooring incidents

Major accidents involving mooring equipment in the last 20 years have injured many seafarers and have cost the UK Club over US\$34 million



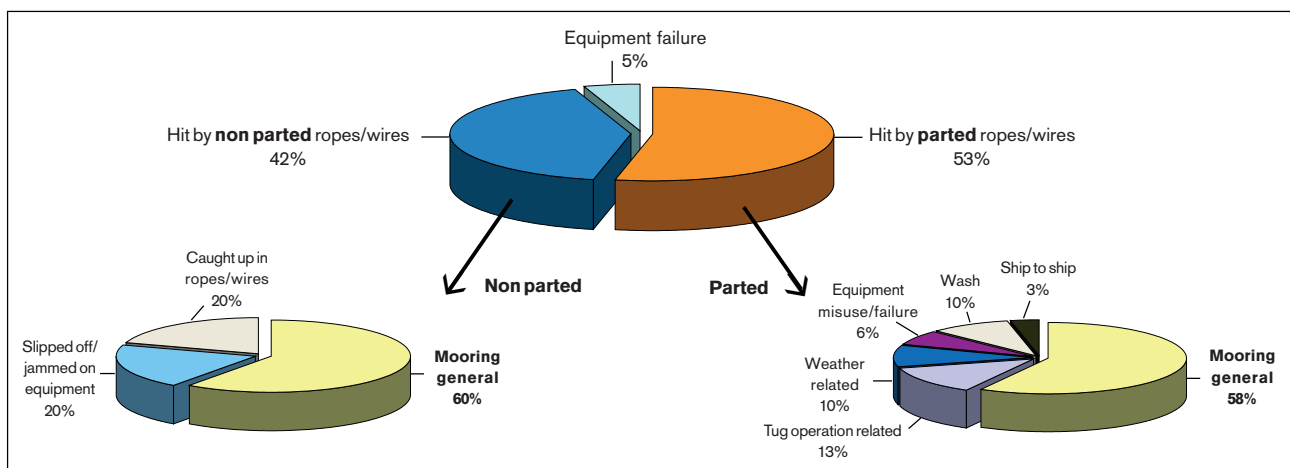
Many of these accidents have occurred during the handling of ropes/wires, where ropes/wires have parted (53%) or where ropes/wires have jumped/slipped off drum ends/bitts (42%) with 5% caused by actual equipment failure (see pie chart below centre).

Parted ropes/wires normally occur during general mooring, tug and ship to ship operations with equipment failure, misuse, wash damage and weather also playing

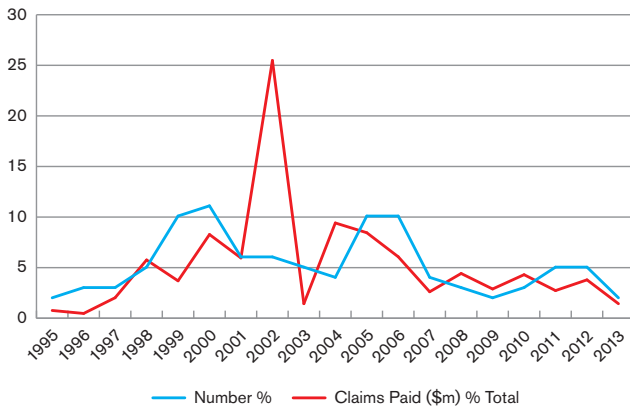
a role. Injuries from non parted ropes/wires normally occur due to crew being caught up in ropes/wires and ropes wires slipping off and becoming jammed on drum ends during normal mooring operations (see pie charts).

Whilst mooring injuries are the seventh most frequent cause of personal injuries in the Club they are the third most expensive per claim indicating how horrific some of these injuries can become.

Types of incidents resulting in personal injury



Mooring incidents by year (claims over \$100,000)



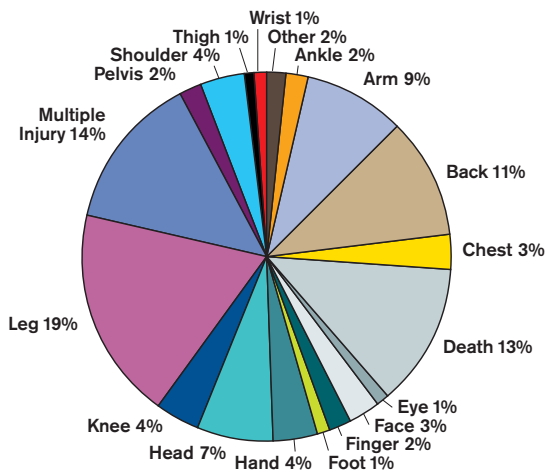
Risk assessment of mooring stations

A risk assessment should be made of all mooring areas on board; looking at the space with a view of purposely searching for hazards that may cause injury. Mooring areas naturally contain many trip hazards, and highlighting these is a good starting point.

Hazard highlighting

Physical hazards to be highlighted should not be limited to bulkhead frames, mooring bits, pedestal fairleads and cleats. It should also include structures such as platforms at the windlass and hawse pipe covers.

Type of injuries from 1987 to 2013 (claims over \$100,000)



Two seafarers killed when struck by a parting mooring line

Crewmember in coma – struck on the head by a parting mooring line

3/O sustained 90% partial amputation of leg and fractured elbow

A/B suffered a fractured hip when struck by a parting mooring line

Both legs broken when struck by a parting mooring line

Mooring line slipped from windlass drum and struck crewmember's head

C/O killed when tow-line to barge parted and snapped back

Deck cadet suffered serious arm injuries during mooring operations

Poor and potentially unsafe mooring area example



Unfortunately this photo illustrates a sight sometimes experienced by the UK Club ship inspectors. Not only are the windlasses rusty and poorly maintained, but the mooring area as a whole suggests poor safety and maintenance standards on board:

- The mooring area is dirty and all surfaces are in need of maintenance.
- All surfaces are painted the same colour, hiding trip hazards such as save-alls, windlass platforms, forecastle access hatch and bits.
- There are no hazard highlightings or warning markings.

Highlighting hazards is particularly important for the safety of crew that are new to the vessel, cadets and other trainees, and visitors. It is also important for the benefit of experienced crew who easily become complacent, tired, or too busy in their work to not notice a hazardous situation developing.

The following images illustrate how effective hazard highlighting can be, when compared with a mooring station that is simply well painted.



Well painted but poorly highlighted mooring station



Mooring station with effective hazard markings

Maintenance

An A/B was seriously hurt when a roller fairlead detached from its pedestal whilst under the influence of a mooring line under tension. The A/B was standing in the snap-back zone and was struck by the rope, which hurled him into the foremast causing head injuries.



The rope hurled the roller fairlead 20 feet from the ship to the quayside.

The angle or directional lead of a rope should be considered when using leads in order to prevent incidents like this. But this particular incident also highlights the importance of proper maintenance of mooring equipment.

Do not forget to include in the maintenance schedule the checking of all grease nipples on mooring equipment (deck machinery) to ensure the nipples remain usable. It is a good idea to highlight grease nipples in order to prevent them from being overlooked.

Not only should moving parts be greased, and surfaces suitably coated, but metal that is wasted should be



replaced and not simply painted over.

The image (left) shows a pedestal fairlead that is well maintained. There is evidence that it has recently been turned and greased and the grease nipple on top is highlighted.

In what condition is mooring equipment on board your ships?

Mooring equipment that has suffered severe wastage will not perform to the certified standard. This also applies to the steel to which the equipment is welded. The image shows mooring bits that are badly wasted. The deck is in equally bad condition and there is a danger of the bits being torn from the deck.



Snap-back zones

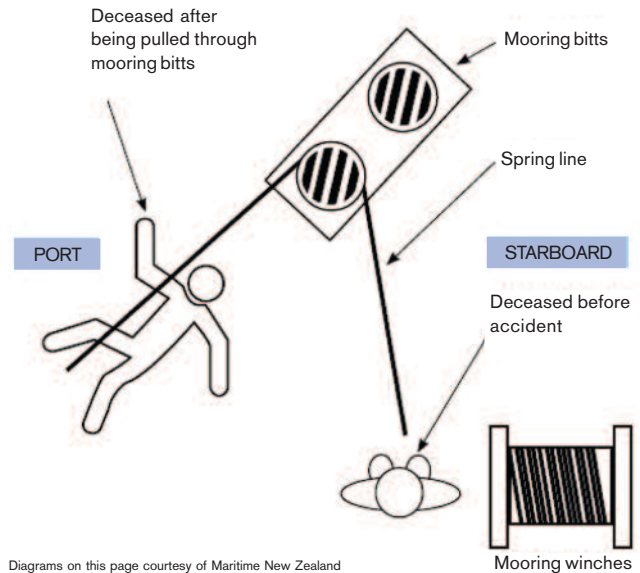
The majority of serious incidents in mooring areas involve parting lines!

Qualified seafarers are aware of the fact that snapback zones exist when a mooring line is under tension. Painting of these zones was previously advised. However, new industry recommendations have been published recently, discouraging permanent marking. The reason behind this is that it may lead to false sense of security, as the snap-back zones differ with the different mooring configurations. Pre-mooring toolbox talk should be held to identify the snap-back zones for the proposed mooring configuration and to ensure that all crew members are aware of the danger.

Awareness of bights

Trained deck hands understand the dangers of standing within a bight or coil of rope and it is therefore surprising that a significant number of personal injury incidents during mooring operations involve seamen doing just that.

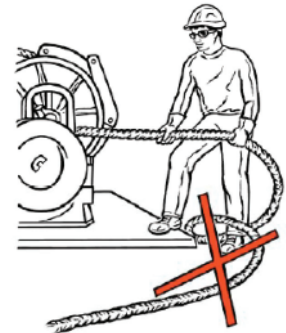
The diagram forms part of an investigation report into the death of an A/B who was dragged through a set of bits by a mooring line.



Diagrams on this page courtesy of Maritime New Zealand

This incident also highlights procedural and awareness issues because the mooring party forward informed the bridge that all lines were clear when they were in fact still in the water. Nobody noticed that as the vessel was manoeuvring away from the berth, one of the lines became snagged on one of the wharf buttresses.

The unfortunate seaman was recovering the line but stepped in a bight of the mooring line as it became taut and was then dragged through the bits as the fouled line ran from the vessel.



Bights don't always look like bights. Here a seaman has inadvertently stepped over the line and put himself at risk

Who is at the mooring station?



Mooring operations are dangerous to crew on board because of the great loads that the mooring lines will carry, and the danger of them breaking while taking up this tension.

Only personnel involved in mooring operations should be present at mooring stations during mooring operations.

It should be policy on board that inexperienced personnel such as cadets in the early stages of their training, who are to be involved in mooring operations, should be under the supervision and direction of an experienced seafarer. Effectively, someone should be appointed to ensure the safety of the inexperienced person, and both should be aware of who is undertaking that duty.

Everybody on board should be aware that only personnel directly involved in mooring operations may visit mooring stations during mooring operations. This is best done with safety notices and implementation into on board policies.

The number of crew found on board is often the minimum required to safely operate the vessel. Although some ships may find themselves stretched for manpower, mooring operations should never be undertaken with less crew than is considered necessary to do the job safely.

There should always be a minimum of two people to each mooring station throughout the operation. Even where automatic mooring systems are installed, a second person should always be present in case something goes wrong.

Crew should not be allowed to operate a windlass or capstan and handle the rope at the same time. This is a two person job. Fixing a lanyard to an operating lever and pulling on it from the rope-handling position should strictly be forbidden. If only two crewmembers are on deck for mooring operations then they should work together on the lines at one end of the vessel and then the other.

Incident!

A vessel moored alongside during cargo operations was fully laden with her deck level below the dock level. It was noticed from the quayside that the forward spring was caught under a padeye located on the ships side. The spring, a wire rope, was taut and there was concern that in this position it might break.

An attempt was made to free the line by slacking and hauling it on the windlass but due to the curvature of the forward hull section, and the extremely long lead of the spring line, it would not free. The line was heaved taut in the hope that it might jerk free. When the line did free itself the tension it was under caused it to oscillate up and down, passing 5 feet inboard of the

ships rail and striking a young engineering apprentice in the head.

The engineering apprentice was not involved in the operation and nobody involved was aware of his presence until after the accident. He was also not wearing a hard hat.

In this incident the spring line had an extremely long lead. A bollard was available closer to the bow of the ship but this was not used. It was found that if the nearer bollard had been used then the line would probably still have become caught under the padeye, but it is unlikely that it would have jumped inboard of the ships rail upon freeing from the padeye.

This incident highlights the need for control over people present at mooring stations, the wearing of PPE and efficient mooring arrangements.

Mooring arrangements

Bad mooring arrangements can also be responsible for claims for damage to cargo handling equipment, docks and other structures. In these incidents it is often the case that the vessel surged extremely or broke her lines because of strong currents or the influence of passing vessels.

The image below shows a vessel considerably overhanging her berth. She is therefore unable to lead any stern lines aft of the ship. The image shows one line in particular being lead an extremely long distance, rendering it pretty much useless.

The ship has correctly put out as many lines as possible but should also consider the use of the anchor and mooring lines running aft from either the main deck or other suitable areas. In situations like this it is important to analyse local tidal and weather patterns in order to predict how the vessel will be affected. The vessel owners should be informed and cargo operations stopped (or not commenced) if conditions do not appear safe.



The following image shows insufficient mooring arrangements ashore and the vessel is forced to pay out an extremely long lead on the stern lines. In this event, the master should protest to the port authority, take photos and inform the owners.



Personal Protective Equipment (PPE)

When struck on the head by a parting mooring line, the wearing of a hard hat will be the life or death deciding factor. A hard hat should be worn at all times when involved in mooring operations, as well as appropriate safety footwear and boiler suit (or other protective full-length clothing).



It has been the general opinion on some vessels that the wearing of gloves when handling mooring ropes is an unsafe practice. This is due to concern that loose gloves may become trapped under a line on a windlass drum and haul the crewmember over it. Gloves should be worn but crew need to be aware of the dangers associated with ill-fitting gloves when handling ropes.

The photo below shows a chart that highlights the compulsory PPE to be worn for various operations on board. This can be devised on board and is a very useful aid to crew when posted in changing rooms or mess areas.

	Safety Helmets	Safety Boots / Shoes	Coveralls / Boiler suit
deck	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
machinery Space	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Mooring Operations	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Welding Operations	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Other Operations	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Mooring practices

Professional seafarers must be monitored during mooring operations to ensure they do not become complacent in their work; putting themselves and others in a dangerous situation.

Deck officers monitoring mooring operations must be actively watching for hazards and give instructions to ensure hazards are controlled.

Mooring operations should be conducted in a safe manner. In the image below:

- The line on the windlass drum is being handled safely. The crewmember at the drum is keeping his hands clear of the turns and positioned so as not to become fouled in coils of rope.
- The crewmember operating the windlass has a good line of sight of the rope and the man handling it.
- Both crew are appropriately attired in correct personal protective equipment.



Correct use of stoppers

UK Club ship inspectors often notice when boarding Club vessels, that stoppers have been left on lines after they have been secured. This bad practice puts



unnecessary strain on the stopper as the line continues to tighten on the bitts. It may also result in the stopper rope tightening to the point where it can't be released.

The second image (right) shows a chain stopper setup for use with polypropylene ropes. Only rope stoppers should be used with rope mooring lines; chain stoppers are for use with wires.



Consult an on board seamanship manual for proper seamanship practices.

Wire to rope



A rope mooring line should never join a metal line without the use of a thimble.

The condition of the rope and wire in this example is poor and the lack of a thimble increases the likelihood of the rope breaking.

An eye in the end of a wire

If it is necessary to create an eye in the end of a wire, then it would be worth investing in crimping equipment. Many ships prefer the use of bulldog-grips for creating an eye in the end of a wire rope, but there is a correct way of doing this:

- An allowance of 150 mm should be made between the last bulldog grip and the end of the 'dead' wire. It is important to ensure that the lashing wires are not cut short immediately next to the bulldog grips.



- Bulldog grips have a grooved surface in the bridge piece which is suitable for a standard wire of right-hand lay having six strands. Crosby grips have a smooth surface in the bridge piece. The grips should not be used with ropes of left-hand lay or of different construction.

- The first grip should be applied close to the thimble or at the neck of the eye if a thimble is not used.

Other grips should be placed at intervals of at least one clear grip (albeit a distance of six rope diameters apart is suggested) between each other.

- The grips must all face in the same direction and must be fitted with the saddle or bridge applied to the working or hauling part of the rope. The U-bolt must be applied to the tail or dead-end of the rope. If the grips are not applied as indicated above, the effectiveness of the eye can be seriously affected.

Secure to bitts

Windlass drums are not designed for taking the weight of mooring lines for a long period of time. If windlass drums are used for this purpose then over a period of time they will suffer damage and be in need of repair.



This windlass drum suffered bearing damage and is being overhauled



Once ropes have been hauled tight they should be secured to bitts as in the good example on the left

Care and maintenance of ropes

In order to preserve the usage life of ropes, ensure they are protected from the elements and not subjected to unnecessary chaffing.

Do not store ropes on wet decks. Ensure they are stowed off the deck and if possible away from precipitation and direct sunlight. If baskets or other storage devices are not available then ropes should be coiled down on pallets (see below).



Ropes correctly stowed off deck



Ropes badly stored on wet deck

Over time, ropes and wires will suffer wear and damage and the general condition will be evident in the rope as a whole. But a part of the rope may become particularly damaged at any time and it is important to check the rope at every opportunity.

A visual inspection should be performed every time before, during and after a rope has been used.

Flaking a rope on the deck ready for running is a good opportunity to look for damage which a part of the rope may have suffered, causing a weak point in the rope.

A general visual inspection can also be performed by the person handling the line on a windlass drum as it is received, hand over hand.

UK P&I CLUB 

RISK FOCUS: LOSS OF POWER

Industry has noted an increasing number of blackouts and main engine failures

UK P&I CLUB
IS MANAGED
BY **THOMAS
MILLER**

Increasing numbers of main engine failure related incidents and accidents following blackouts have led to a data collection exercise by the UK Club's risk assessors and a detailed analysis of more than 700 claims, which has given cause for concern.

A significant number of these claims for third party property damage, many of which were enormously expensive and, in some cases, amounted to millions of dollars, could be attributed, directly or indirectly, to main engine failures or electrical blackouts.

Ships effectively out of control as a result of these problems have caused extensive damage to berths, locks, bridges, dolphins, navigational marks, loading arms, cranes and gantries along with moored ships. Costly collision and grounding claims can similarly be caused by these failures.

It is no exaggeration to suggest that main engine failures and blackouts tend to occur most regularly at the point in a voyage where the ship is at its most vulnerable. In confined waters or entering and leaving port, the stable loads which

will generally prevail with the ship on passage are disturbed. There is additionally some evidence that compliance with the low sulphur fuel regulations and changing from one grade of fuel to another has exacerbated these problems.

Reports from pilots, operating in emission control areas where fuel grade changes have been implemented, indicate that these problems have become quite widespread, noting that ships regularly seem to be experiencing power losses, invariably at critical times in their manoeuvres and which are attributed to 'fuel problems'. In the Club's recent Loss Prevention Bulletin 785-09/11 (fuel switching), Members were alerted to warnings from the US Coast Guard which had just enforced their own ECA, noting a marked increase in incidents after vessels lost propulsion and had linked many of these incidents to vessels operating on marine distillate fuels.

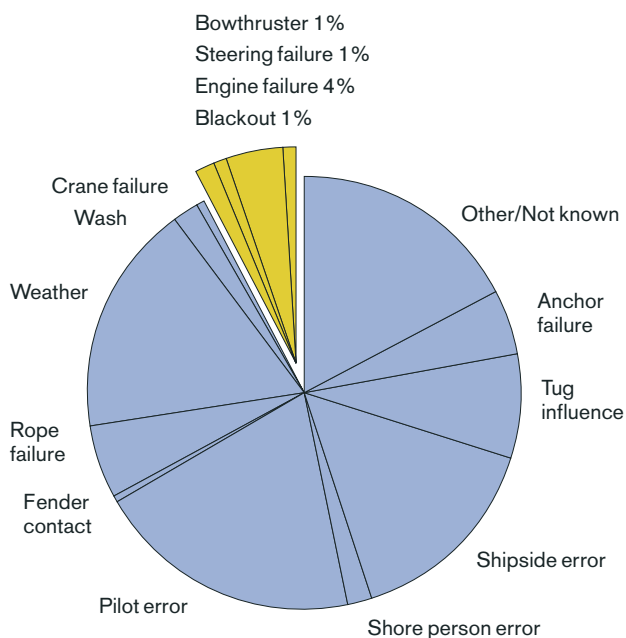


Vulnerability of ships to such problems has also tended to increase as a result of the 'self-sufficiency' of modern vessels, the provision of lateral thrusters tending to persuade operators to minimise their dependence upon tug assistance in port waters. Thus, where in an earlier era a vessel experiencing mechanical difficulties would be merely held safely in position by assisting tugs, a single tug in attendance may not be able to sufficiently intervene with a large ship suffering a blackout or main engine failure at a critical point in the manoeuvres.

The consequences of main engine failures or blackouts leading to steering gear failure can be little short of disastrous, in terms of the enormous third party property damage claims which can result. An entire canal system or waterway could be put out of action as a result of an out of control ship damaging a lock or bridge, while months of expensive inactivity could be suffered should a specialist berth with bulk loaders or gantries be damaged by a ship. The costs of ships rendered inactive as a result of third party damage can be substantial as can all claims from collisions and groundings attributable to such causes.

The Club's analysis of more than 700 claims provides ample evidence that these problems are not merely anecdotal, as the graphical presentation of large third party property claims (diagram 1) illustrates. Engine failures, steering failures, failure of bow thruster or blackouts (which may well be connected) amounts to a substantial percentage of the whole.

1. Cause of large third party property claims

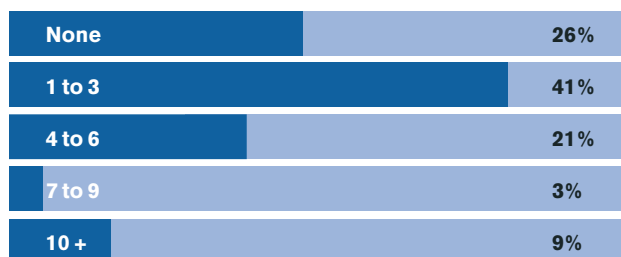


Evidence has been provided by a twelve month exercise by the Club's in-house assessors employing a questionnaire during their routine ship visits, which was designed to identify and highlight problems experienced aboard the Club's entered vessels. Altogether, 249 ships' crews were questioned during this investigation about their experience with blackouts, main engine failures and fuel switching problems.

Blackouts

While there may be an understandable reluctance to admit to having such a problem, with a total of 64 (26%) of chief engineers claiming that they had never had a blackout on board any ship, it is considered that this is likely to be understated. There were 22 chief engineers (9%) who reported that they had experienced more than ten blackouts. The graphical representation (diagram 2) indicates that such problems are certainly not unknown, with around three quarters of all chief engineers questioned reporting blackouts.

2. Number of blackouts as reported by chief engineers



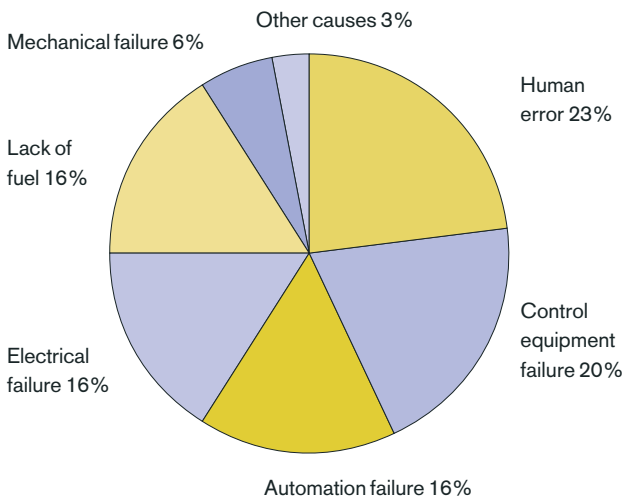
Their answers on the causes of blackouts, which are thought to be fairly accurate, are similarly revealing and may be listed thus:

- **Automation failure**
(auxiliaries load control/sharing failure etc)
- **Control equipment failure**
(eg. governor failure, defective trips for high temperature cooling or low luboil pressure etc)
- **Electrical failure**
(eg. overload, reverse power trip, preferential trip device failure etc)
- **Lack of fuel**
(eg. blocked filters, water in fuel, fuel supply piping and pump failures etc)
- **Mechanical failure**
(eg. lack of compression, engine seizure, loss of lubrication, overheating etc)
- **Human error**
- **Other causes**

Out of a total of 400 reported blackouts, the highest number (90 or 23%) was attributable to human error. Several of these incidents were caused by procedural errors – 'pressing the wrong button' – and stopping or tripping an on-load generator.

A further 65 (16%) were caused by electrical failure and a notably high number of these blackouts were reported as a result of starting bow thrusters and deck machinery such as mooring winches or cranes, with insufficient electrical power being available. It is clearly not always realised that the starting current of electrical motors can be several times the full 'on load' current and starting large motors can sometimes cause breakers to trip and lead to blackouts. While many modern ships have in-built safety features to prevent this happening, it is still a sensible precaution to have routines in place to ensure that adequate generating power is available before starting large electrical motors.

3. Cause of blackouts



A shortage of fuel supply to the generating engines accounted for 64 (16%) of reported blackouts, with a high proportion of these attributed to blocked fuel filters.

Automation failure was blamed for 16% of blackouts, failure of control equipment 20% and mechanical failure 7% of those reported. There was, however, no noteworthy reason provided for these failures.



Main generator

Main engine manoeuvring failures

There was a perhaps understandable reluctance to report main engine manoeuvring failures, with a high percentage of engineers reporting fewer than four failures during their careers and a surprising 44% admitting to any failures at all. Nevertheless, there were a total of 249 such failures reported by the chief engineers interviewed.

4. Number of main engine manoeuvring failures as reported by chief engineers

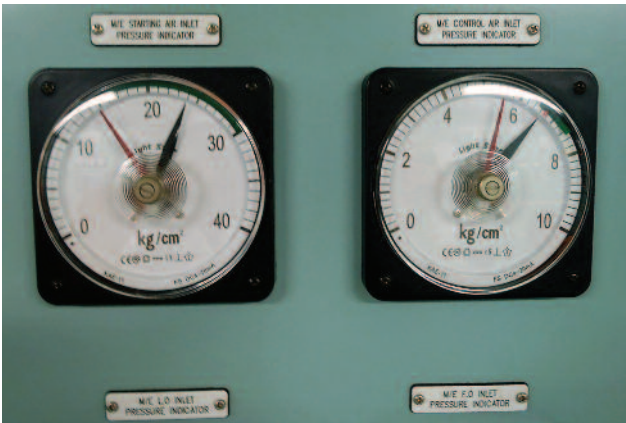
None	56%
1 to 3	31%
4 to 6	8%
7 to 9	2%
10 +	2%

These failures were categorised as follows:

- **Control equipment failure** (eg. governor failure, load control failure, defective trips for high temperature cooling or low luboil pressure etc).
- **Electric failure** (eg. loss of electrical power etc)
- **Human error**
- **Lack of fuel** (eg. blocked filters, water in fuel, fuel supply piping and failure of pumps etc)
- **Lack of starting air**
- **Mechanical failure** (eg. reversal system failure, lack of compression, engine seizure, loss of lubrication, overheating, crankcase oil mist, scavenge fire, gearbox problems etc)
- **Other causes**



Depleted air bottles: Excessive numbers of engine starts/stops during manoeuvring will deplete pressure in the main engine start bottles which can result in loss of control of the vessel at critical times, such as when docking, due to the engine failing to start.

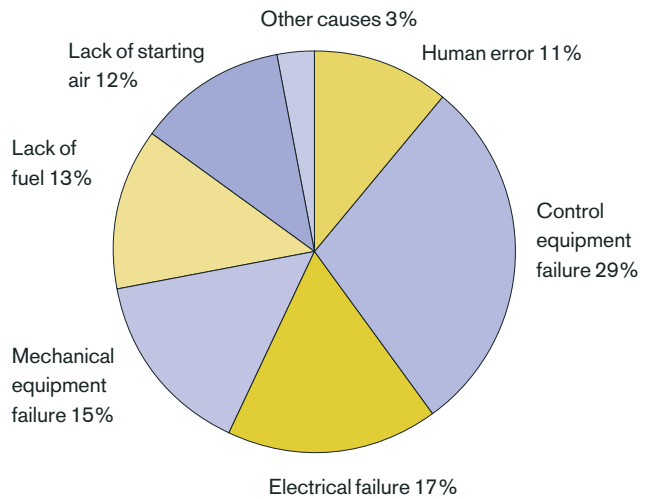


Good start air pressure with safe operational limits marked

As is illustrated in diagram 5, control equipment failure accounted for the greatest proportion of main engine manoeuvring failures, this being mainly caused by the lack of or leakage of control air, along with other malfunctions. Blackouts (as discussed previously) accounted for the next highest cause of electrical failure. Of the 15% of mechanical failures, these were attributed to defects with pneumatic valves, start air valves and defects in reversing systems.

Lack of fuel accounted for 13% of failures, and as with generator failures, blocked filters were identified as the main reason for these. While 12% of manoeuvring failures were

5. Causes of main engine manoeuvring failures

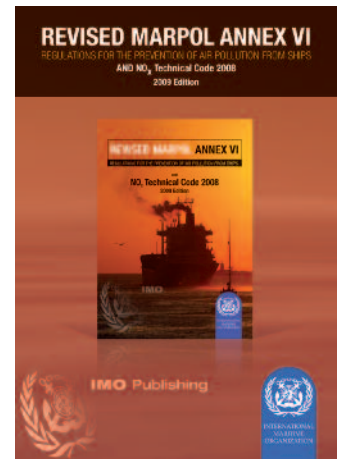


attributed to a lack of starting air, it is important that the start air pressure is monitored while the ship is being manoeuvred and also vital that the pilot and bridge team are made aware of the maximum number of consecutive engine starts they can demand. Human error of various kinds accounted for a further 11% of failures.

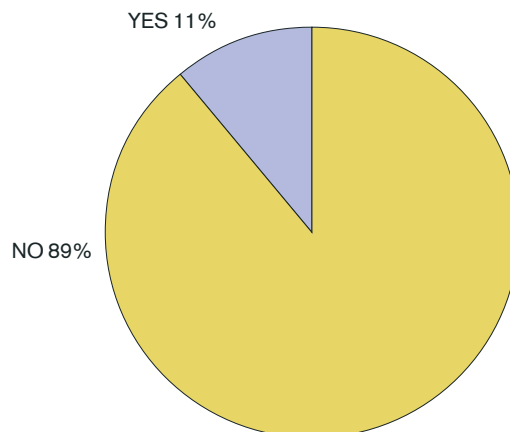
Low sulphur fuel problems

Of the chief engineers questioned, 28 (11%) confirmed that they have experienced, or were anticipating, problems complying with the low sulphur fuel regulations. (See diagram 6).

It might, however, be suggested that these are relatively early days, and the spread of emission control areas relatively limited. Stricter implementation of regulations and an extending network of ECAs around the world may well see the problems multiplying for those aboard ship.



6. Number of chief engineers reporting problems complying with fuel regulations

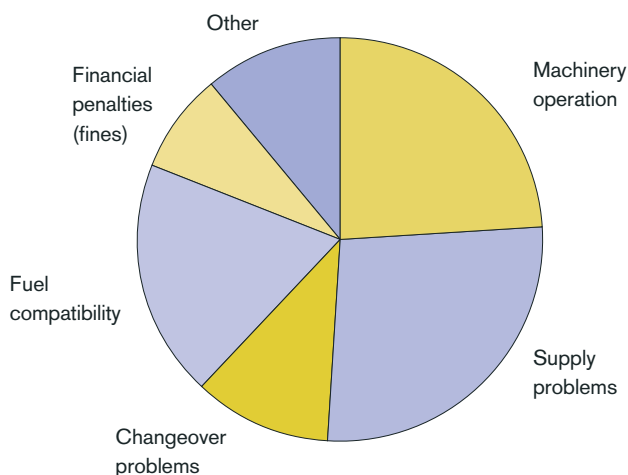


Problems already encountered and reported to the Club's assessors included that of supply and storage, difficulties with machinery operation, fuel compatibility difficulties, changeover problems, financial penalties and others. (See diagram 7).

Supply and storage problems were reported by the chief engineers of ten ships. While there is now said to be widespread availability of low sulphur fuel around the world at the major bunker supply ports, the cost differential compared to high sulphur fuel is between \$20 and \$80 per tonne.

Storage problems have been reported on particularly older ships because of the lack of dedicated settling/ service tanks for both types of fuel, difficulties being encountered when changing from one grade of fuel to another.

7. Type of problems associated with low sulphur fuel regulations



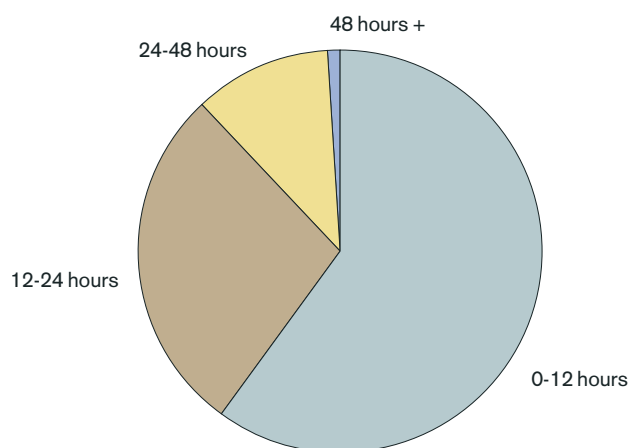
Nine ships reported having problems with machinery operation when operating on low sulphur fuel, which included fuel oil lubrication of pumps and nozzles, sticking fuel pumps, generator starting problems, fuel oil leakages and delayed pick up speed of engines.

Seven ships suffered compatibility problems between the two fuel types, resulting in purifiers requiring more frequent cleaning and filters becoming blocked. It is also pointed out that if a vessel changes over from higher sulphur fuel (HFO), when MGO is introduced into the system it may act like a solvent, releasing any asphaltenes which then collect in the fuel filters/strainers and clog them.

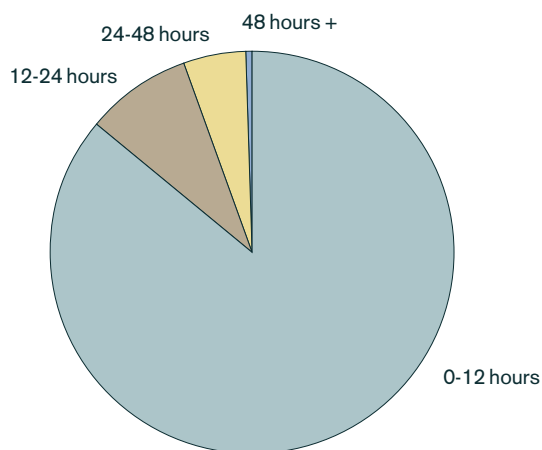
Only four ships reported having any problems when changing over from one fuel type to another and one vessel reported that the changeover time had been miscalculated and the ship had been subsequently fined and detained. Another ship reported being fined after the <1% sulphur fuel bunkered was found to contain >1% sulphur when analysed.

It was reported that 60% of ships took up to 12 hours to change the main engine over from one type of fuel to another. However, this included many ships which were operating exclusively on low sulphur fuel. Some 28% of ships took between 12 and 24 hours to effect the changeover and the remainder longer.

8. Fuel changeover times for main engines



9. Fuel changeover times for generators



It was reported that 66% of ships had dedicated storage tanks for low sulphur fuels and if the ship is equipped with two day or service tanks, then the requirement for the changeover procedure will be very much reduced.

It is assumed that the one day or the service tank will contain higher sulphur fuel (HFO) with the other tank already filled with the required low sulphur fuel oil. Thus, the whole procedure will only require the isolation of the feed from the HFO service tank and the flushing of the feed pipeline to the engines from the low sulphur day or service tank.

If the ship is equipped with only a single day or service tank then flushing of the system will take very much longer, this procedure consisting of:

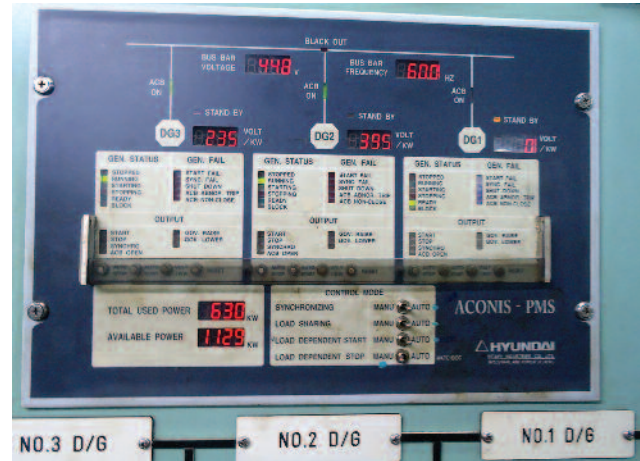
- Reducing or emptying as far as is possible the settling tank of the previous HFO
- Flushing the pipeline to the settling tank and filling it with low sulphur fuel
- Reducing or emptying as far as possible the day or service tank
- Flushing the connecting pipeline from the settling tank to the service or day tank with low sulphur fuel from the settling tank

- Filling the service tank with low sulphur fuel and commencing to use this fuel before entry into the ECA

It was reported that 19% of ships had required new equipment to be installed in order to run the engines or boilers and 28% had been required to carry more than one lubricant. If engines are expected to operate for lengthy periods within an emission control area, then the lubricating /cylinder oils may need to be replaced by low base number oils. The engine manufacturer's guidance should be obtained about this matter.

Only 2% of ships considered that they had inadequate storage capacity for the different grades of oils.

In order to run on low sulphur fuels, 10% of ships reported that they needed to adjust the fuel pumps of their engines.



Switchboard load out of balance

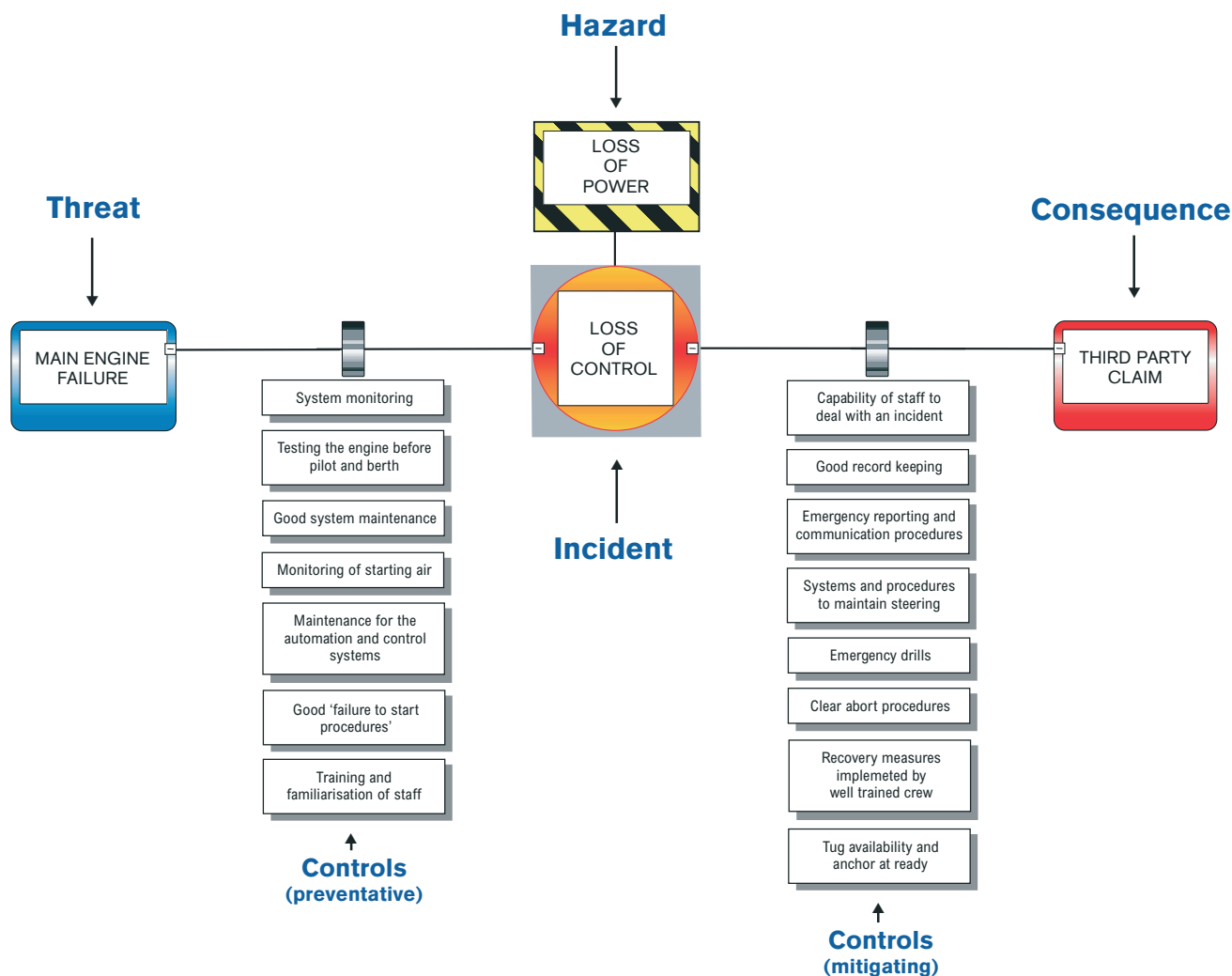
Recommendations to reduce the risk of power losses and blackouts

- Engine and boiler manufacturers should be consulted for advice on operation with low sulphur fuel and the need for any equipment/system modifications
- Ensure correct maintenance of all equipment; engines, purifiers, filters, fuel systems and sealing arrangements
- Ensure fuel oil viscosity and temperature control equipment is accurate and fully operational
- Ensure that system temperature and pressure alarms, fuel filter differential pressure transmitters etc are accurate and operational
- Ensure fuel changeover procedures are clearly defined and understood
- Ensure that engineers are fully familiar with fuel systems and main engine starting systems and establish 'failure to start' procedures. These should include familiarisation with operation locally and from the engine control room
- Ensure that the starting air pressure is monitored during manoeuvring operations and that the deck department appreciates the limitations of starting air availability
- During standby, run two (or more) generators in parallel whilst ensuring sufficient power availability should one stop or trip. Monitor and balance switchboard power loads equally
- Test the astern operation of the main engine prior to arriving at the pilot station and, if practical, before approaching the berth
- Establish procedures to ensure that there is adequate electrical capacity available before starting up lateral thrusters, mooring equipment or other heavy equipment, bearing in mind that simultaneous starting of large electric motors will lead to a large power surge and possible overload
- Ships fitted with shaft generators should, where appropriate, change over to auxiliary generator power well before entering restricted waters and undertaking critical manoeuvres. Manufacturer's guidelines should be followed and ship's staff guided accordingly.



Photo by kind permission of Australian Transport Safety Bureau

'Bowtie' with one threat – Main Engine Failure



What are we checking?

How effective is that control, are there failures just waiting to happen (latent)?

Loss of power – the 'Bowtie approach'

Hazard, threats and consequences: In the centre of the diagram, Loss of Power is identified as the 'hazard', while blue squares to the left identify a range of 'threats', which, if not controlled, could cause a serious incident involving P&I claims and other consequences which can be seen in the red shape on the far right of the diagram.

Controls: Between these extremities can be seen the 'controls' which, if they work properly, will prevent the accident happening and on the right hand side of the diagram, controls which will mitigate the consequences.

Thus taking as an example the threat of Main Engine Failure (left hand side), controls which should be in place to prevent this include system monitoring, testing the engine before pilot

and berth, the monitoring of starting air, good system maintenance, tests and maintenance for the automation and control systems, good 'failure to start' procedures and training and familiarisation of staff.

Consequences: The consequences of an accident (right hand side) will be mitigated by the capability of the crew to deal with an incident, good record keeping, emergency reporting and communication procedures, systems and procedures to maintain steering, emergency drills, clear abort procedures, recovery measures implemented by well-trained crew, tug availability and anchor at the ready.

Threats: This example shows only one threat. A full 'Bowtie' with all the threats can be provided on request.

UK P&I CLUB



RISK FOCUS: SLIPS, TRIPS AND FALLS

Representing nearly one in three of the large personal injury claims submitted to the UK Club

UK P&I CLUB
IS MANAGED
BY **THOMAS
MILLER**

What is so special about slips, trips and falls? They are 'accidents' aren't they, part and parcel of life; maybe something which have to be expected aboard ships, which are mobile, sometimes even violently moving, places of work?

They are special because slips, trips and falls represent nearly one in three of the large personal injury claims submitted to the Club and which aggregate to a staggering \$155 m over the past ten years. They are constant too, with very little variation in numbers of claims from year to year.

But they are also special because they represent, not just money, or the squashed metal or damaged ships encountered in other sorts of claim, but genuine pain and suffering from people who have been injured or even killed, because they have slipped, tripped or fallen aboard ship. So these claims go beyond numbers, each of them a story of individual injury, which has happened because of a moment's carelessness, thoughtlessness or complacency, as people have moved around a ship, possibly doing their jobs, or even just because the ship is not only their place of work, but where they live.

It is easy to dismiss these unpleasant accidents as 'human error', or even 'crew negligence', but to examine the detail of so many of them is to reveal other contributors to the chain of causation. Training could have been deficient or even completely missing, as there is often an assumption that people 'can look after themselves' and must take responsibility for their own actions. The environment, which is mostly a function

of design, may well have been a contributor, if there was inadequate lighting, or the dangers were not obvious, or the particular design of the ship required people to put themselves 'in hazard' just to get a job done. And the procedures aboard ship may have been devised without proper consideration of the risks of carrying them out. 'We have always done it this way!' may be no guarantee that it will be the safest way, and may involve people in taking hazardous short cuts. But because of the huge costs of these claims, and because of the human suffering represented by each of them, the Club strongly believes that a concerted attack must be made on the incidence of slips, trip and falls. These are accidents which occur for a reason, and if we understand the reasons behind the existence of these hazards rather better, then we can put in place controls that will hopefully prevent accidents occurring, but will also mitigate their consequences.

A proactive and precautionary approach can be very useful in reducing the incidents of slips, trips and falls, in first of all identifying hazards which have the potential to hurt people. Very often accidents occur because nobody has considered that what they are doing might be hazardous. Just walking around the ship with a sharp eye and an open mind can help to identify features which might, in an unguarded moment, hurt people.



It is very often not the obvious, like working at height, or with machinery, that will cause the accidents, because an experienced seafarer will probably be taking the proper precautions, and will be adequately clad with procedural controls in place. Rather, just moving around the ship, going up and down companionways and ladders, carrying weights or neglecting to keep 'one hand for the ship and one for yourself' are not infrequently behind very nasty accidents.

Slips

How many slips are caused by people moving around slippery or greasy decks, possibly wearing inappropriate footwear? The answer is a large number, almost all of which could have been avoided with forethought and proper controls. But decks do get slippery! Of course they do, but in locations like mooring decks on the forecastle or poop, non-slip paint can make a huge difference to traction when handling ropes around drum ends, or simply moving about.

Isn't non-slip paint expensive? The simple expedient of stirring sand into deck coatings works wonders, if special non-slip paint is unavailable. If decks are greasy, or liquids have been spilt, a sensible control is to wash them down, before somebody falls over and hurts themselves! Precautions, housekeeping, good procedures – all make a difference, as well as the exercise of sensible seamanship by individuals.



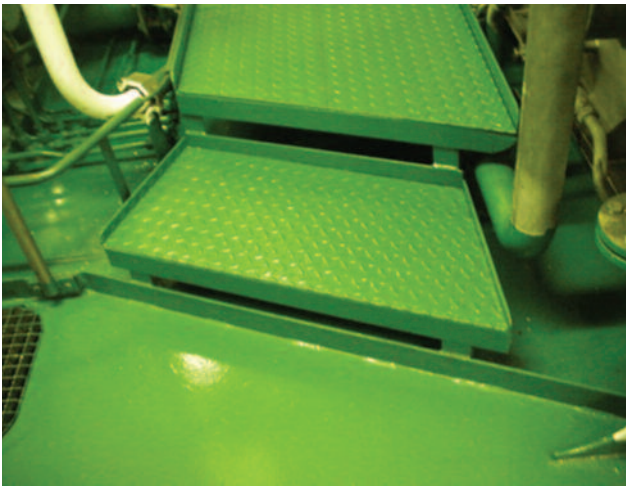
Trips

Walking about a ship, how many trip hazards can be identified? All too often obstructions like ringbolts, lugs or sills will be found in a direct line where somebody needs to walk to get from A to B. It may not say much for the designers of the ship, but 'human element design' has come along only recently! And one do the same walk around after dark, and discover that lighting around these obstructions may be inadequate!

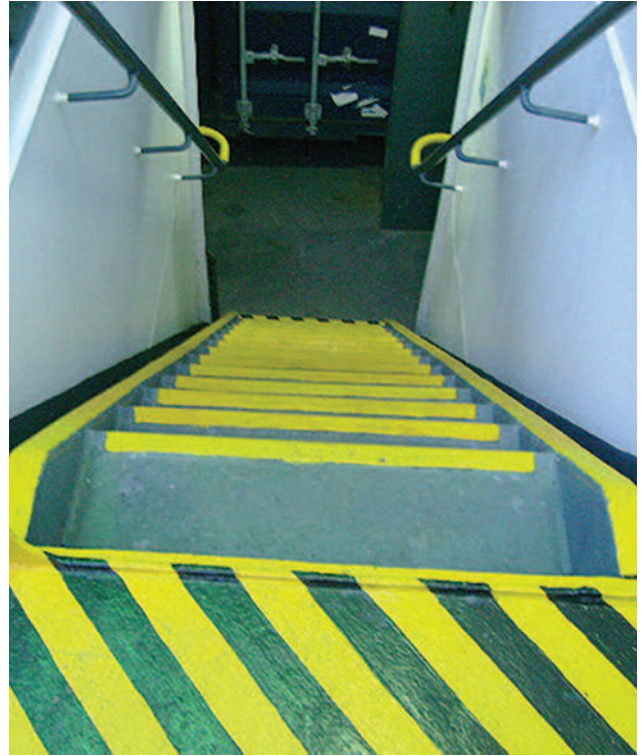


Just identifying these hazards, by day or by night, is important, but it is well worth considering what might be done to make them more visible and more obvious to somebody who is not so familiar with the ship. This is important work, because some of these hazards may be potentially lethal, should somebody trip over an obstruction and plummet down a ladder. A simple trip can become life changing, even life threatening and give rise to enormous claims.

Will the eye pick out that ringbolt or other obstruction on a dark deck? Five minutes work with a pot of yellow paint will make the obstruction obvious. That potentially deadly sill at the top of a ladder can be quickly made distinguishable by



painting it a bright colour, while the same strategy can be used to highlight hazards such as overhead pipes which can brain the unwary in the engine room or on deck. Top and bottom steps on ladders painted brightly, really will help people negotiate them without tripping up.



Falls

What fall hazards can be identified by somebody walking around a ship really looking for trouble? Are guard rails available and in place? Once again, is lighting adequate around ladders and gangways? Are gangway nets properly deployed? Are properly approved harnesses available (and always used) by people working at height, or down hatches, or close to the ship's side when railings are removed? More to the point, are people who might be endangered doing hazardous tasks, properly briefed in a 'toolbox talk', before they get on with the job? Are they wearing the correct personal protective clothing? Are ship's procedures for personal safety properly thought through and always adhered to?



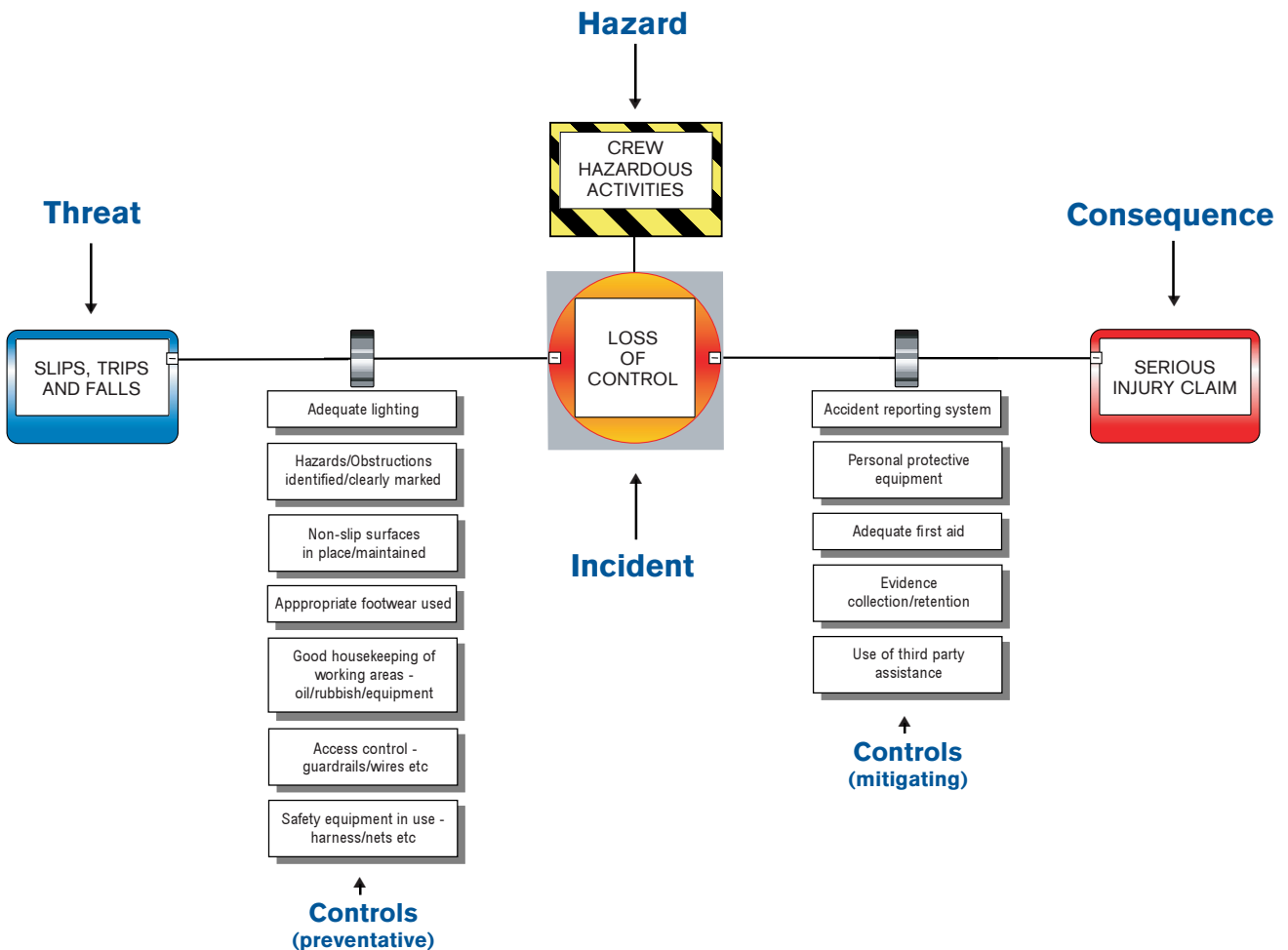
Common sense

None of this is exactly 'rocket science'; all might be thought of as simple seamanship and common sense, but the Club's statistics confirm time and time again the absence of these precautions, and simple human carelessness, between them, really do cause enormous amounts of human misery and heavy claims. Not infrequently, visits to ships by the Club's expert assessors point to potential hazards that have not been identified and thus are left uncontrolled.

But self-help can be very effective, if those aboard a ship will recognise that they are in a good position to develop their own system of hazard identification and put in place the appropriate controls. Walk around your own ship with these hazards very much in mind and try to firstly identify them, and secondly devise the appropriate controls.

To assist in this process, the Club has developed a simple 'Bowtie' methodology that can easily be employed in developing effective precautions against slips, trips and falls; these 'accidents that are waiting to happen', but, with some effort and thought, need not!

'Bowtie' with one threat – Slips, Trips and Falls



Slips, Trips and Falls – the 'Bowtie approach'

Hazard, threats and consequences: In the centre of the diagram, Crew Hazardous Activities are identified as the 'hazard', while blue squares to the left identify a range of 'threats', which, if not controlled, could cause a serious incident involving P&I claims and other consequences which can be seen in the red shape on the far right of the diagram.

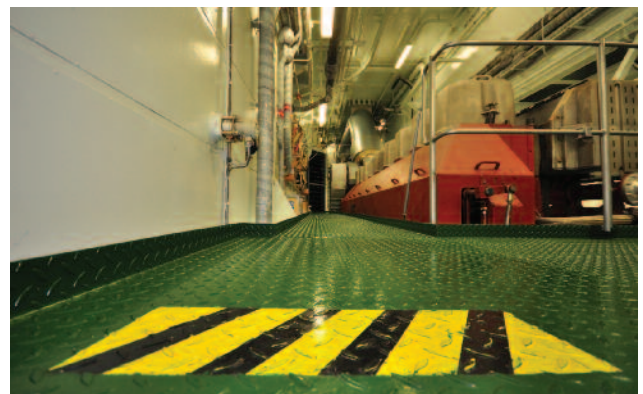
Controls: Between these extremities can be seen the 'controls' which, if they work properly, will prevent the accident happening and on the right hand side of the diagram, controls which will mitigate the consequences.

Thus taking as an example the threat of Slips, Trips and Falls (left hand side), controls which should be in place to prevent this include adequate lighting, hazards and obstructions identified and clearly marked, appropriate footwear used, safety equipment in use, non-slip surfaces in place and access control to guardrails.

Consequences: The consequences of an accident (right hand side) will be mitigated by the capability of the crew to deal with an incident, good record keeping, emergency

reporting and communication procedures, systems and procedures to maintain steering, emergency drills, clear abort procedures, recovery measures implemented by a well-trained crew, tug availability and anchor at the ready.

Threats: This example shows only one threat. A full 'Bowtie' with all the threats can be provided on request.



UK P&I CLUB 

RISK FOCUS: MENTAL HEALTH

Managing the emotional well-being of crew at sea



UK P&I CLUB
IS MANAGED
BY **THOMAS
MILLER**

Mental well-being of seafarers – are we paying enough attention?

Sophia Bullard, PEME Programme Director at UK P&I Club, discusses the importance of managing the emotional well-being of crew at sea.

Loneliness, isolation and fatigue – these are usually the answers seafarers give when asked how they feel in their job. Being thousands of miles away from home and loved ones, it is no surprise that a seafarer's life can be a lonely one. The hostile environment, with low, or no, social interaction, can easily bring about depression and mental health issues.

For many seafarers, forming relationships on-board can be very difficult, and a clash of personality and culture types can be unavoidable, particularly when spending such long periods of time confined within a restricted space.

In 2013 Swansea University undertook research, which showed that between 2001 and 2005, merchant seafarers scored the second highest level of suicides amongst all professions, after coal miners. Today, the rate of suicide for international seafarers is triple that of shore workers, according to the International Maritime Organisation (IMO).

Despite such high suicide rates within the industry, seafarers' mental well-being is seen as a taboo subject and a poorly discussed issue. Due to a high level of prejudice and poor education about tackling mental health and its implications, seafarers are not likely to seek counselling or professional support, and this often leads to grave consequences.

Choosing a career at sea

For many, a career at sea is a dream come true, and we must not forget the reasons for wanting to pursue such a career. Below are the top ten reasons, according to the International Chamber of Shipping, as to why people want to work at sea.

1. Good wages

Wages earned by seafarers are normally above similar professions ashore. Opportunities for accumulating savings, even when young, are considerable. The real value of wages may often be substantially greater because they are often tax free.

2. Early responsibility

Ships' officers enjoy considerable responsibility from the start of their careers. Within ten years it is possible to qualify as a Captain or Chief Engineer, with total responsibility for the operation of a ship and the management and safety of its crew.



3. Opportunity to travel

A career in shipping gives the chance of incredible global travel. This gives seafarers the chance to experience interesting and unusual places, rather than just the typical business or holiday destinations visited by many people.

4. Long-term prospects

There is a great need for more qualified ships' officers to meet the skills required by international shipping companies. There is a massive shortage predicted, so the demand for good people will increase.

5. Doing something useful

Seafarers make a massive impact – on both their immediate vessel and on world trade too. In most jobs it can be a struggle to see the value brought, being a seafarer makes it obvious.

6. Career flexibility and job security

Shipping is an ideal occupation for young people seeking something exciting and different to just working in an office, which in the long run will also lead to an enjoyable and well paid executive career in a major international industry.

7. International recognition

Ships' officers hold internationally recognised qualifications, so most officers are qualified to work for the thousands of international shipping companies located all around the world, on ships flying the flags of almost every country.

8. Long holidays

In most jobs, it is only possible to take a maximum of two or three weeks holiday at one time, but seafarers commonly enjoy generous leave or holiday periods. So while seafarers may sometimes be away from home for extended periods, they also enjoy the benefits when they come home.

9. A career that is different

A ship is a unique working environment, and those working on-board ship often develop lasting friendships with their colleagues and have a stimulating life which is different to the experience of many people working ashore.

10. Transferable skills

Qualifications and experience gained at sea are also readily transferable to other industries outside merchant shipping. Career opportunities extend to thousands of shore-based management jobs, which require people with seagoing experience.

Wellness at Sea programme

In claims presented by members, UK P&I Club has continued to see an increase in mental health and suicide cases. Mental health affects crew of all ages, nationalities and ranks and a recent analysis of crew mental health revealed anxiety, social isolation, pressure of work and disturbed sleep can all be experienced by crew. These situations often lead to an incident and sadly, in some severe cases, they even lead to the death of a seafarer.

To assist members concerned with the rise in suicide cases, we spoke to a number of industry experts, including Sailors' Society, who introduced us to their *Wellness at Sea* Programme. We

quickly realised the programme was a unique product and a valuable addition to the training of crew worldwide.

Wellness at Sea seeks to combat issues by addressing 'wellness' as a holistic concept made up of five areas of well-being: Social, Emotional, Physical, Intellectual and Spiritual. The UK P&I Club is supporting Sailors' Society's Emotional Wellness training module within its *Wellness at Sea* coaching programme.

The training, the second in a set of five modules, is designed to improve emotional well-being through early identification of mental health issues and empowerment of the seafarer to handle challenging situations at sea.

Through the training, we believe crew can become better equipped to identify and manage the challenges of life at sea, and this can help prevent deterioration of their health whilst on-board. The programme could lead to a decline in incidents and potentially could save lives.

Wellness at Sea also seeks to educate seafarers, often before they embark on an offshore career, about the challenges of a maritime lifestyle and how to efficiently cope with them. By tackling issues before they become a problem, seafarers will be better educated as to what to expect with a life at sea.

As an industry we need to work together to break the cycle of not speaking up when it comes to mental health. Courses such as the *Wellness at Sea* programme help educate seafarers about mental struggles and can help improve retention rates and keep up staff productivity. For more on *Wellness at Sea*, visit: www.sailors-society.org/wellness



GLOBAL NETWORK



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