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Seaways

The International Journal of The Nautical Institute

Cargoworthiness

Going beyond port state control p13

The Nautical Institute

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Focus

Managing Risk

> Teamwork is the essence of a safe voyage

As ever, there are salutary lessons to learn from the MARS reports this month (see pp 17-20). Two of them link directly to safety projects that the Institute has been working on for some time – Enclosed Space Entry and the fatigue-inducing Master/Mate 6 on 6 off watchkeeping system. It is depressing to read an extract from yet another official investigation into the deaths of maritime workers (in this case, stevedores) in an enclosed space. The first casualty was perhaps due to poor procedures in preparing for work in the cargo hold and a lack of awareness of the danger of oxygen deficiency due to the cargo, but the subsequent deaths were caused by the well known emotive response to a colleague's danger and almost certainly a complete lack of training in how to respond safely to the situation. This extract also raises questions about the role of the ship's staff when such an emergency arises and the full report would need to be studied to understand why the Chief Officer only advised on the dangers of entering the hold rather than taking over the rescue attempt. There again the question of training in emergency response comes to mind. Our work in this subject area indicates that there is neither sufficient structured training nor dedicated, specialist equipment across most of the world fleet. This has been amply confirmed during presentations and discussion at the two Enclosed Space Entry seminars held in the UK (see report p 27 on the London Branch organised event) and the correspondence that has been generated on the subject in recent months. If ever there was a risk that is manageable to the point of zero incidents, it is this one, but it does urgently require education to raise awareness, good training, effective procedures, and the consistent application of good seamanship with common sense.

A fine example of managing risk is provided by Captain Duke Snider in the second part of his report as the Ice Navigator for the *MV Mirai* in the Arctic (see pp 6-10). Certainly there is a great deal of technical expertise involved in executing such a research voyage into the Arctic, where years of experience with ice is crucial. However, what comes through from these articles is the intelligent use of information from a range of sources and the close teamwork between the Master, Chief Scientist and the Ice Navigator to draw up and frequently amend passage and work plans. This is not dissimilar to the Master/Pilot relationship in the port environments more usually encountered by most mariners. It is generally accepted that this is the riskiest part of any voyage and it is no surprise that casualty figures show this to be the case, but interpretations of the data that blame pilots for this are well wide of the mark. As Captain Mladen Simicic sets out in his article on the Master/Pilot relationship (see pp 23-24) the Master/Pilot relationship is a key component in managing risk during this crucial stage of the voyage and one that requires a finely attuned perception of risk and of danger. Whether to intervene or not, and if so, when are amongst the most difficult questions facing the Master, and the same applies to the OOW when either the Pilot or indeed the Master has the conn. Nobody in the bridge team is absolved from responsibility for the safe navigation of the vessel just because someone else has the conn and may be more senior in rank. A Master who has been saved from making an error by one of his officers should, on reflection, be eternally grateful as well as pleased that he is running a team in which such constructive challenge can and does happen. Teamwork is the essence of a safe voyage, as is carrying out one's duties in a consistent and seamanlike manner, being reflective to learn from experience (yours or others), and undertaking continuing professional development (CPD) activities.

We hope that all these elements will shine through in nominations for the Trinity House 500th Anniversary Prize (see p 25) being offered by the Institute with generous funding from Trinity House, London. Open to Generation 'Y' members for the best article or seminar presentation on improving the safety of navigation, we will do all we can to help ensure the proposal is taken up and implemented for the good of all seafarers. Please give this Prize as much publicity as possible amongst your colleagues throughout your company, at nautical colleges and maritime universities, and within the Institute's branch network. The judging panel will be delighted to be inundated with entries.


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Mariners' Alerting and Reporting Scheme

MARS Report No. 253 November 2013

MARS 201363

Accommodation ladder failure

➔ A pilot and five other personnel safely boarded an inbound VLCC from a small boat via the port side accommodation ladder. The tanker, in ballast, had a freeboard of about 16 metres. Weather conditions were good with slight sea and a low swell. During preparations for berthing the crew were requested to recover the pilot ladder and to hoist the accommodation ladder to deck level to be clear of subsequent cargo hose handling operations.

One crew member was sent down, wearing proper personal protective equipment (PPE) to release the lashings on the pilot ladder and accommodation ladder which were connected to the ship side lashing point. When this crewman was safely on deck the pilot ladder was brought up. However, as the accommodation ladder was being hoisted it suddenly fell down to hang vertically from its hinge pins, the bottom of the ladder submerged in the sea. At the same time the winch wires reached their full extent and were pulled out of their clamps and fell into the sea. Berthing operations were suspended to enable the ladder to be recovered.

Results of the investigation

Examination of the winch revealed that the welded connection between the drum and the cheek or side plate of the winch had sheared off. Since the drive shaft, gears and motor were connected to the side plate, the failure had allowed the drum of the winch to turn freely without any restraint. There was evidence of a previous attempt at repairing this same weld, yet there was no record of this repair on board. Any cracks in the weld would not ordinarily have been visible, being hidden under the layers of wire rope on the drum.

The vessel is 14 years old and the present owners acquired the ship over two years ago. The Master reported that the previous owner had completely removed all maintenance records prior to handover.

Root cause and contributing factors

- Failure of welded connection on winch drum.
- Lack of any historical maintenance records from previous owners.
- Lack of any knowledge onboard of the previous attempt at repairs.
- Lack of diligent visual or technical examination of critical equipment (boarding arrangements).

Lessons learned

Some shipping companies have a policy of attaching a preventer to the accommodation ladder which is tended around bitts or another strong point by the crew in order to support the ladder if hoisting or lowering arrangements fail. This has been based on experience of similar incidents and could be more generally adopted in the industry.

Action taken

Tanker will be required to submit documentary evidence of competent third party certification of repairs to the winch, and satisfactory examination of all boarding arrangements including winches, wires, sheaves and all associated equipment on both sides of the ship, before any future acceptance at the terminal.

The Port Information Booklet – Tanker Pre-Arrival Information questionnaire will be amended to include a statement similar to the following: 'Confirm that prior to arrival the pilot boarding arrangements (pilot ladder, accommodation ladder, winches, wires, davits, sheaves and all associated equipment) have been thoroughly inspected and are in good working order, and comply with IMO recommendations.'

■ **Editor's note:** The lack of historical maintenance records for essential equipment could be seen as a weak link in the ISM Code, as many vessels are sold without important maintenance documentation following the ship. This issue has been raised in accident reports by various investigation agencies in the past. The UK brought the issue to the IMO in 2004 without success. The New Zealand Transportation Accident Investigation Commission (TAIC) arrived at a similar finding regarding the continuity of ship maintenance records and system diagrams when vessels change ownership following its investigation on the loss of power on a passenger ferry in 2008. In 2009, Canada's investigative body, the Transport Safety Board (TSB), recommended that 'The Department of Transport advocate at the IMO effective measures to ensure that maintenance and failure records remain on board throughout a vessel's life.' In February 2013, Canada and the Republic of Korea submitted a proposed amendment to the ISM Code to the IMO Sub-Committee on Standards of Training and Watchkeeping. The future will tell whether this important amendment to the ISM Code will be implemented.

MARS 201364

Mooring winch ties up operator

Official report edited from BSU 413/10

➔ The vessel was to berth port side to. Four crew were working at the aft manoeuvring station, two of whom had VHF radios in contact with the bridge. Two of them deployed the spring on the port side; the slack was taken in using the capstan head of the port winch. The two other crew took care of the simultaneous deployment of the two stern lines. After the eyes of the two stern lines were ashore on a bollard, the slack in the lines was to be taken in using the hydraulic winches. However, on the port winch it was first necessary to stop the spring still located on the capstan head in order for it to be secured on a bollard on deck.

At the same time, the slack on the starboard stern line was taken in by a crewmember on the starboard side, alone and without a VHF radio (his position indicated by white star above). Initially, the crewmember pulled the slack from the line on deck by hand. After that, he began to haul in the section of the stern line now on deck with the winch. While doing this, he noticed that the slack on deck was beginning to form a loop, causing a risk of the line being mis-wound onto the drum. To counter this risk he attempted to remove the loop by kicking it with his right foot while the winch was in motion. In the process, his foot got caught in the loop which dragged him towards the hauling winch. He immediately let go of the winch's spring-loaded operating lever, which then clicked back to the neutral position. However, due to the normal stop delay of the winch control he was nonetheless dragged nearly two metres across the deck. When the winch stopped, the loop in the stern line together with the trapped right leg of the victim had already reached the winch drum.

The winch had come to a standstill just before the victim's upper body was brought onto the winch drum, which in all likelihood would have been fatal. Initially, the crew on the other side of the vessel were not aware of what had happened; from where they were they had no visual contact with the scene of the accident. The victim's situation was soon discovered by two other crew who attempted to help. However, the assisting crew briefly moved the operating lever of the winch in the wrong direction by mistake, causing the victim to be pulled slightly further onto the winch. The error was quickly corrected, the victim freed and first aid applied. He was taken to the hospital where it was found that he had suffered a femoral fracture of the right leg and injuries to his back.

Report findings

Tests showed that the stopping time of the winch was about 3.5 seconds after the operating lever is released. During this period the winch's angle of rotation is 210 degrees. If the emergency stop button is pressed immediately after the operating lever is released, the stopping time is about 1 second.

The crewmember risked life and limb by making an ill-considered foot movement towards a line that was being hauled in. That one and the same person controlled the winch and cleared the line being wound onto the drum simultaneously contradicts the principles of good seamanship.

Working alone in one of the two separate work areas without a radio appears to be highly problematic. For safe execution of a berthing manoeuvre, it is essential that information can be exchanged at all times between the various work areas of the manoeuvring station, but also between the work areas and the bridge, in particular.

The accident shows that it is easily possible to confuse the winch's direction of rotation and that doing so can have serious consequences. The handwritten and only partially readable 'label' on the winch's control station shows that uncertainty with respect to the direction of rotation of the winch in relation to the respective lever position apparently also existed before the accident.

Safety action taken

The control units of the winches on the stern of the vessel (and her sister ship) have been moved to a position further forward and each equipped with a safety cage for the winch driver.

MARS 201365

6 On/6 Off watchkeeping = fatigue

Edited from MAIB official report 14/2013

➔ A small cargo vessel was on a coastal passage and proceeding at full sea speed. At midnight, the Master, one of the two watchkeepers on board, was relieved by the other officer. Soon after taking over the watch the OOW, as was the common practice on this vessel, sent the duty lookout below.

It was later determined that the OOW fell asleep sometime after sending the lookout below. With the Bridge Navigational Watch Alarm System (BNWAS) turned off and other alarms not activated, available bridge resources that could have alerted the crew and/or awoken a sleeping OOW were silenced. As a result the vessel steamed at 11.5 knots with no-one in control on the bridge for over an hour before grounding.

All of the vessel's crew, with the exception of the OOW, were awoken by the vessel running aground. The master ran to the bridge, where he found the OOW still asleep. He roused him and simultaneously placed the engine control to neutral. The OOW awoke confused and was shocked to find that the ship was aground.

In the days leading up to the accident, the OOW had maintained the 0000-0600 watch. However, for the 24-hour period preceding the accident this routine was reversed. While the vessel was alongside he was the duty night officer, but was expected to rest from midnight (when he would normally be on watch) and work through from 0700-1200, (when he would normally be asleep). It is likely that this change

of routine impacted upon his quality of sleep during the night in port. He did have over four hours rest before taking over the watch from the Master at midnight and appeared to be fit and well at that time. However, within one hour of taking the watch the OOW failed to call the pilot station, despite specific instructions in the Master's night order book (which he had signed) and the Master's verbal reminder to him at the watch handover. This suggests that weariness was already affecting his cognitive ability.

Findings of the report

- The OOW fell asleep on watch as a result of insufficient stimulation and probable fatigue following a change of work and rest pattern.
- There was no lookout on the bridge, as required during the hours of darkness, allowing the OOW to fall asleep unnoticed. It was not unusual for lookouts to be dismissed from the bridge during the hours of darkness.
- By including the AB/cook on the look-out duty roster, there would have been sufficient manpower for a dedicated lookout to be maintained during the hours of darkness, whilst ensuring personnel did not work excessive hours.
- The Master did not exercise his overriding authority for the safety of the vessel to delay sailing until his watchkeepers and lookouts were adequately rested.
- Navigational aids were not used effectively to ensure a vigilant and effective watch was maintained at all times.
- The vessel was equipped with a BNWAS. However, neither the ship's managers nor the Master required that this equipment be used; it was seldom, if ever used by the bridge watchkeepers.

■ **Editor's note:** Although the change in the OOW's work routine probably exasperated his fatigue, it has been amply demonstrated that a watchkeeping system using a 6 on/6 off routine does not allow for enough continuous hours of rest to be restorative. The Nautical Institute is of the opinion that this watch system should not be used. For further information on fatigue, industry guidance, to read confidential reports on fatigue or to provide a confidential report specific to fatigue onboard, please visit the Institute's 'Fatigue Forum' on the NI website www.nautinst.org.

MARS 201366

Wire rope corroded

Edited from Britannia Risk Watch Volume 20, Number 2 August 2013

➔ A general cargo ship fitted with twin cranes was discharging a project cargo weighing 27 tonnes when the steel hoisting wire failed. The project cargo fell into the hold and damaged other items of cargo as well as causing damage to the ship's tween deck. The lift was within the safe working load (SWL) of the cranes and the wire.

The wire rope had been installed a few years earlier and was inspected annually by a classification society surveyor, with the most recent inspection taking place two months before the incident. Despite this recent inspection, experts concluded that the wire failed as a result of serious local degradation of the wire in excess of the limits set by the classification society in their 'Rules for the Certification of Lifting Appliances Onboard Ships'.

The degradation of the crane wire was attributed to the long term lack of a suitable protective lubricant. It appeared that normal engineering grease was being used by ship's crew to lubricate the wire but that this had not penetrated to the core of the wire. Not only had this thick layer of grease failed to penetrate the core of the wire, but the use of such grease meant that moisture had been trapped within the wire which accelerated the corrosion. In addition, the thick layer of grease made it hard to make a proper inspection of the wire.

Classification society surveyors can only spend a limited time on board looking at the whole ship and crew and shore staff must be aware that inspection of the crane wires may be visual only and will not usually involve a close-up examination of the core of the wire. In any case, crews should make their own ongoing and thorough assessment of the condition of ship's crane and derrick wires at regular intervals. In order to avoid corrosion of the core of the wire rope, a suitable penetrative lubricant should be applied. Even if the correct type of lubricant is used, it is important to make sure that the wire ropes are always cleaned prior to lubrication to avoid the effects of marine salt and trapped moisture within the wire.

MARS 201367

Copper sulphide concentrate depletes oxygen – three die

Edited from official report MA2012-04, Japan Transport Safety Board

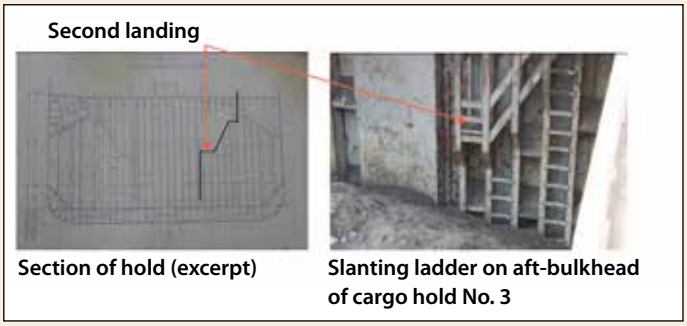
➔ A cargo ship was to discharge a cargo of copper sulphide concentrate and hatch covers of cargo holds No. 1 and No. 3 were opened to that end.

Before discharge operations began, the stevedores had a safety meeting and discussed the unloading procedure. It was to be as follows:

1. Foreman has crew of the ship open hatch covers.
2. Foreman measures oxygen concentration in the holds.
3. Foreman opens entrance hatches of holds to be discharged and closes other hatches.
4. Foreman sets notice boards on entrance hatch.
5. The ship's crane hoists the backhoe and carries it into hold.
6. Backhoe gathers cargo (copper concentrates) in the centre of hold.
7. Grab bucket of the on-shore crane grabs cargo and drops it into hopper.
8. Discharge the remaining cargo that the grab bucket cannot grab and collect using scoops and brooms.

Oxygen content was apparently measured at various points in both holds and found to be normal (20.9%). The driver of the backhoe for hold No. 3 entered the hold via an access hatch and went down a straight ladder (about 2.5m length), across a landing, and another slanting ladder (about 4m vertical). When he moved to the second landing, he fell feet-first, landed on his behind, and remained motionless. The crane operator who witnessed the fall put the backhoe down on the cargo pile and raised the alarm. He then got off the crane and ran to the entrance hatch of cargo hold No. 3.

Two stevedores entered the cargo hold through the entrance hatch leaving the self-contained breathing apparatus (SCBA) on the upper deck.



Section of hold (excerpt)

Slanting ladder on aft-bulkhead of cargo hold No. 3

Because they entered the cargo hold without SCBA, another stevedore followed them to prevent them from going down. When the third man had climbed halfway down the slanting ladder he felt breathless and one of the men in the hold signalled him to go back. He exited the hold, as did the man that signalled, but the third man had collapsed.

While the two men that had just exited the hold were catching their breath, crew of the ship provided them with gas masks. The canister attached to the gas mask indicated 'Inorganic gases and vapours'. One stevedore, equipped with a gas mask and carrying the SCBA, headed for the hatch of cargo hold No. 3. The chief officer advised the stevedores that they should use the SCBA gear and that going into the hold with only gas masks is dangerous. Nonetheless, a stevedore equipped with the gas mask and carrying the SCBA on his back entered cargo hold No. 3 through the hatch again. At the time, the other stevedore could not understand the chief officer's advice (spoken in English). He thought the mask might be an oxygen supply mask and as such, he too went into the hold with only the mask. When he climbed halfway down the slanting ladder he felt breathless and when he arrived at the second landing he felt faint. He turned back to the upper deck and used all his strength to crawl up the ladder. When he arrived near the hatch, the ship's crew rescued him by pulling him up to upper deck by his arms. The other stevedore began to climb up the final ladder but fell into the hold after climbing one or two rungs. Now there were three casualties in the hold and rescue efforts to remove them would take time – too much time to save them.

The subsequent report found that oxygen in cargo hold No. 3 was consumed by the copper concentrate through oxidation. Some of the other findings of the report related to oxygen testing practices by the stevedore company were as follows:

1. Measurement locations were not standardised and often O_2 concentration at the entrance hatch was not measured.
2. If the measured O_2 concentration was less than 20.9%, measuring continued until it returned to 20.9%, hence it is not strange that all values in the record book were 20.9%.
3. If an entrance permitted notice board was exhibited on entrance hatch, stevedores entered the cargo hold even without permission of the cargo work supervisor.
4. The person measuring the O_2 concentration did not inform the stevedores of the O_2 concentration; the stevedores entered the cargo hold relying on the smell of the cargo and the entrance permitted notice board being displayed.
5. Usually, a stevedore was not very aware of the O_2 concentration, but trusted the smell of the hold and his intuition.

■ **Editor's note:** This event is sadly all too common. One worker needlessly dies due to lack of procedural rigour and then others follow due to lack of planning and proper training.

The NI submitted a paper to IMO some two years ago to mandate carriage of an oxygen meter on all vessels. After debates in several IMO sub-committees, the carriage of a mutli-meter has been agreed and hopefully will come into force in the near future.
An Enclosed Spaces Forum has been created on the NI website (http://www.nautinst.org/en/forums/enclosed-spaces/index.cfm) to help raise awareness and education in entering into enclosed spaces. Contributions welcome.

MARS: You can make a difference.

You can save a life, prevent injury and contribute to a more effective shipping community.

Everyone makes mistakes or has – or sees – near misses. By contributing reports to MARS, you can help others learn from your experiences. Reports concerning navigation, cargo, engineering, ISM management, mooring, leadership, design, training or any other aspect of operations are welcome, as are alerts and reports even when there has been no incident. The freely accessible database (http://www.nautinst.org/mars/) is fully searchable and can be used by the entire shipping community as a very effective risk assessment, loss prevention and work planning tool and also as a training aid.

Reports will be carefully edited to preserve confidentiality or will remain unpublished if this is not possible.

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