December 2015 www.nautinst.org

Seaways

The International Journal of The Nautical Institute

Looking out for (virtual) risk

Practical measures for onboard cyber security p13

The Nautical Institute

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Focus

Vulnerabilities and Awareness

> It is certainly to be hoped that ships' navigation and/or propulsion control systems are not knocked out by a cyber attack and the safeguards are effective, but, if the worst should happen, it will come as no surprise that we recommend the maintenance of the more traditional navigation and engineering skills.

After last month's theme of autonomous shipping in the future and Rod Johnson's article on cyber security then and now, it is appropriate to follow up this month with his second article exploring practical ways to mitigate the present risks of cyber attack, whether intentional or inadvertent (see pp 13-16). His advice should be required reading for all Designated Persons Ashore (DPAs), Company Security Officers (CSOs), Masters and Ship Security Officers (SSOs) and can be accessed in full in the Lloyd's Joint Hull Committee guidance document (http://bit.ly/1T0Ecyu). There are also a range of international security standards to implement, but being aware of the vulnerability of the company's and ships' IT systems is the essential starting point to ensure the proper defences are put in place and maintained. It is certainly to be hoped that ships' navigation and/or propulsion control systems are not knocked out by a cyber attack and the safeguards are effective, but, if the worst should happen, it will come as no surprise that we recommend the maintenance of the more traditional navigation and engineering skills. A couple of years ago at an ECDIS Conference we were amazed to hear a DPA say that their SMS required the ship to stop and await assistance if their GPS signal and hence ECDIS was lost because they would not have paper charts to fall back on. The implication also seemed to be that their officers would struggle to navigate without GPS despite the database of charts in the ECDIS which hopefully would still be accessible. If they really cannot be accessed, then there is a very strong case for carrying at least a basic set of charts for the voyage.

Human limitations

Being aware of your vulnerabilities is important or, put another way, your limitations. A number of Branch events and letters continue to identify that seafarers are increasingly expected to be almost superhuman in their capabilities to cope with the demands placed upon them by increasing regulation and the administration burden. In the future autonomous world, it is possible that we will have robotic seafarers but even they could become overloaded which would lead to a crash of their logic based systems. With us humans, adaptable though we are, there are warning signs that overload and fatigue are occurring and, again, raising the awareness of these is an important defence. We are pleased to have published a multi-author book on the subject of Human Performance and Limitation for Mariners (see pp 8-9) covering physical and mental limitations with expert advice on handling the issues.

An essential element of the Institute's work is our continuing campaign to raise the awareness of the dangers of under-manning for the ship's operational schedule (not just the safe manning for a voyage from A to B) and, in particular, the Master / Mate 6 on / 6 off watchkeeping system prevalent in the coastal trades. We have spoken out at conferences on this subject many times and submitted an Information Paper at the IMO to try to get this issue addressed on its own or as part of the wider issue of fatigue. It is obvious that there is opposition to change, ie banning the 6 on / 6 off system, as no flag states would support the paper, but we will continue our efforts and will attempt to mobilise public opinion against this unsafe practice, with the attendant risk of environmental damage – even if the danger to seafarers is not a major concern.

In the meantime, there are numerous other vulnerabilities for us to help address. Who trains the Training Manager is a question worth asking (see p6) and the answer in many cases is 'no one'. It is one of those jobs that promising officers are given on their transition to shoreside employment with little or no guidance. That it is an important role in the overall quest to manage the training and therefore the competence of the sea staff is undeniable. This is a role that deserves proper preparation and career enhancing training. We intend to continuing working with stakeholders to address this lack. This is sure to include cultural awareness on the part of both the trainer and the trainees. The disconnect within STCW and HELM courses on the inclusion of cultural awareness in training has been identified by STAMI (see pp10-12) and it is good to see that they are seeking to address this in their use of simulation training, while asking whether it should become part of competency assessment by flag states.

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Mariners' Alerting and Reporting Scheme

MARS Report No. 278 December 2015

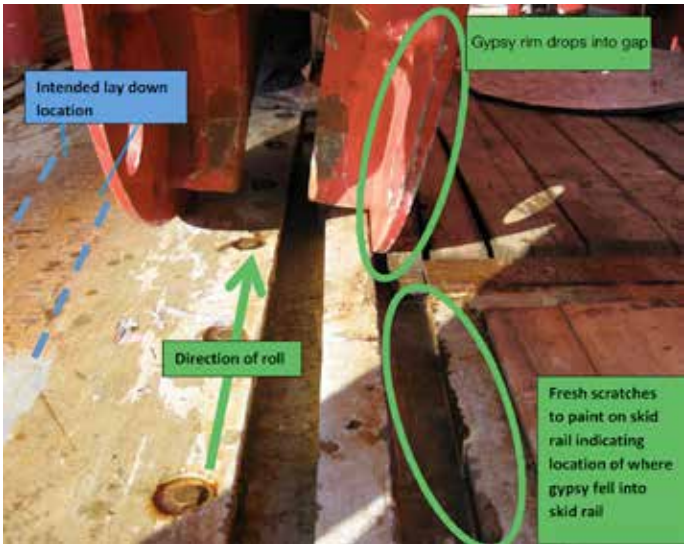
MARS 201566

Heavy chain wheel crushes crew member

Edited from Marine Safety Forum Safety Flash 15-16

➔ An offshore supply vessel was mobilising for a project which required the use of an 84mm chain wheel (gypsy) instead of the 105mm unit already installed. Once the existing unit had been removed and stored on the main deck, the installation of the 84mm unit began.

The crew disconnected the 84mm gypsy from the crane without checking its final landing position. They did not initially see that the rims of the gypsy were on each side of the skid rail instead of further to the left, on the smooth deck. After disconnecting from the crane, the crew started to roll the gypsy to position it for installation. However, during this manoeuvre the right hand rim dropped into the gap in the rail, causing the gypsy to tip beyond its balancing point. It fell over and pinned two crew members against the bulkhead. After rescuing the crew members from their precarious position, one required first aid while the other was subsequently pronounced dead.



Lessons learned

- Identify all hazards and risks prior to starting a job. Due to their size and weight, gypsies should not be manually handled or rolled.
- If the execution of the job does not go according to plan, stop and re-evaluate.
- Ensure there are adequate lifting or handling appliances for handling the intended job.

MARS 201567

Mud causes main engine shutdown

➔ A 50 metre port service vessel loaded cargo and then proceeded to the bunker berth to take fuel. Due to low under keel clearance (UKC) at the bunker berth, cargo was normally loaded after bunkering but because of high traffic volumes at the port this was not possible in this instance.

Shortly after completing bunkering and letting go, the starboard main engine went into auto-shutdown due to a high operating temperature. As the berth was situated in a river with an appreciable current of up to two knots, the starboard anchor was let go as a precaution and the vessel was safely manoeuvred back alongside.

The investigation found that due to the low UKC, and to silt build-up at the berth, one of the cooling suction inlets had ingested large quantities of mud while alongside. On departure, the mud blocked the starboard main engine cooling pipework and heat exchanger. This subsequently caused the auto-shutdown of the starboard engine.

Lessons learned

- Normal practice was to bunker first in order to ensure as much UKC as possible, then to load cargo after taking bunkers. In this instance the sequence was reversed with the resulting negative consequences.
- When established procedures or best practices are not followed, negative consequences can often occur.

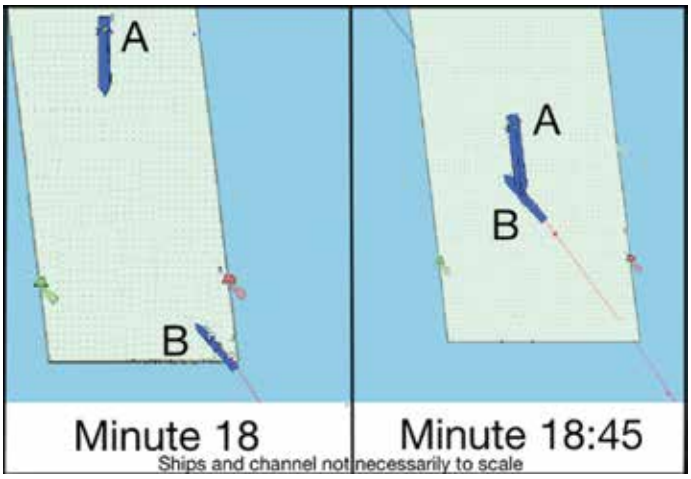
MARS 201568

Collision in fog

Edited from official report issued 2 July 2015 by the Danish Maritime Accident Investigation Board

➔ Two vessels were about to meet at the end of a buoyed channel. Visibility was reduced by fog to about 100 metres. Vessel A had a pilot on board and the pilot boat was secured on the port side ready to board the relief pilot. The vessel was making way at near nine knots in order to match the speed of the pilot boat and was sounding the prescribed fog signal. Vessel B was approaching from the south and had to enter the channel obliquely due to a lighthouse on its port side. The speed was between 11 and 12 knots and the plan was to swing to starboard after passing the red buoy and to keep the speed in order to counter the two knot northeasterly current. Vessel B was not sounding the prescribed fog signal for reduced visibility.

The bridge teams on both ships were aware of the other ship and both had planned to meet in the channel, which was 300 metres wide, near the buoys. The bridge team members on vessel A were under the impression they were close to the western side of the channel, but in reality they were near the middle. The bridge team members on vessel B



were under the impression they were turning as planned and were near the eastern side of the channel. In reality, the turn brought them to the middle of the channel, which was not the plan. Within 45 seconds the situation went from one which both bridge teams perceived as normal to one that was far from being normal. The vessels collided near the middle of the channel and sustained substantial damage.

Lessons learned

- Both bridge teams lacked adequate situational awareness. Each thought their position was appropriate for the meeting but in fact, neither was.
- Meeting in a narrow channel can be a challenge for bridge teams, especially when visibility is reduced. In this instance, factors such as a closing speed of nearly 20 knots, a pilot boat tied onto one ship and the other vessel making a turn all combined to make an unacceptably small margin for error.
- Navigators should act instead of react. Acting means taking early and substantial action to avoid situations that leave little chance for a good outcome.

MARS 201569

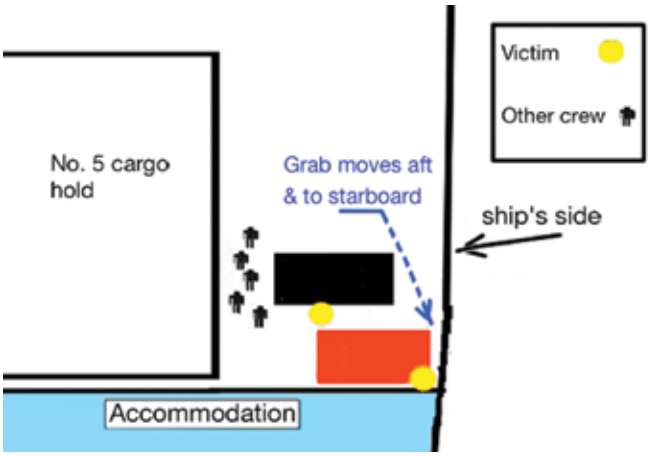
Cargo grab crushes crew

Edited from official report of the Hong Kong SAR Marine Department, 15 April 2015

➔ A bulk carrier was equipped with four cranes, each with a grab. When not in use, the grabs were normally stowed and secured on the pedestals between the cargo hatch covers, as in the photo.

For maintenance purposes, one grab had been moved off its pedestal and secured by belts and chain blocks on the starboard side main deck.

As the vessel made way the wind increased in strength, becoming force 8 to 9, with wave height of about 4.5 metres. The lashings of the grab loosened and the grab shifted away from its position on deck. In order to avoid damage to the grab and the vessel, crew members were called to put on extra lashings. While the crew members were lashing the grab (black in diagram), a large wave washed on deck and the grab was pushed aft and to starboard. As the wave came on deck, most crew took shelter near the hatch coaming but one crew member was crushed between the grab and ship structure (position to which the grab shifted is shown red in diagram). While some crew sustained minor injuries, the victim that was crushed was later pronounced dead.



Lessons learned

- Hindsight is often 20:20. In this case the grab was secured by belts and chain blocks but without any frame or welded structure on deck. Given the size and weight of the grab, and the difficulty of getting proper securing points on deck in an ad hoc manner, this was unwise.
- Before sending crew to work on deck in heavy weather all contingencies should be considered; among others, deviating to a more sheltered area, changing course and speed to reduce green seas on deck and planning crew placement and the work procedure before placing oneself in a hazardous position.

■ **Editor's note:** Make your foresight as good as your hindsight – when deviating from an established practice, brainstorm with your team and think about the possible consequences. Mitigate risks accordingly.

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MARS 201570

Both crews in a fog

Edited from official report RS 2015-02 from the Swedish Accident Investigation Authority

➔ A small taxi boat with two passengers on board was crossing a navigation channel in dense fog. During the journey the Master had to rely on his electronic aids to navigation, including a newly purchased navigation system with radar and chart plotter. As they made way in the fog at approximately 15 knots, the Master pointed out to the passengers an echo on the radar screen; a small target that he explained was another boat that would pass close to them. Shortly thereafter, out of the fog, they saw the other boat pass by their port side. No other targets were seen on the taxi boat's radar.

Meanwhile, a ferry was en route in the main channel making way at about 14 knots. On the bridge, the team were unaware that the taxi boat was heading on a collision course with their vessel. Seconds before the collision occurred, the bridge team saw the taxi boat coming out of the fog on their port side and crossing their bow. The bow of the ferry hit the taxi boat's starboard side; the taxi boat was pressed down into the water and pushed along ferry's side and then came over on the ferry's starboard side.

Persons on a nearby island were able to rescue the three persons from the taxi boat who had ended up in the water and were without flotation devices.

Swamped taxi boat as seen from ferry shortly after collision

The official investigation notes that neither vessel took evasive action to avoid the collision as none of the vessel operators realised the other vessel was present. Although the official report is silent on why the operators of both vessels were ignorant of the other vessel, the absence of sound signalling from both ships is mentioned as a contributing factor to the collision. Also, the report mentions that had the taxi boat been equipped with AIS, there may have been a better chance of that vessel being detected by the ferry.

Lessons learned

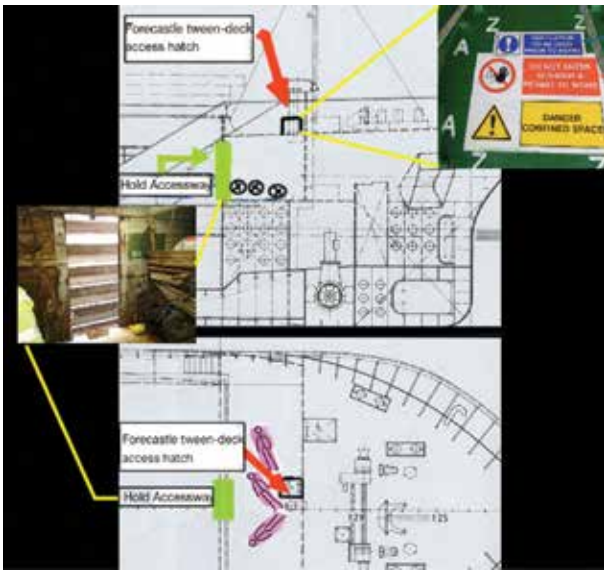
- When in thick fog, use your sound signals as prescribed by the Collision Regulations.
- When in thick fog, slow down.

MARS 201571

Three deaths in an enclosed space

Edited from official BSU (German Federal Board of Accident Investigation) report 140-14

➔ A general cargo ship was in port to discharge a cargo of moist, partially impregnated and freshly sawn timber. Two crew were instructed to begin removing the tarpaulins protecting the timber stowed on deck. At one point, the chief officer and another deck rating lost sight of the two crew detailed to remove the tarpaulins. They went forward to try and locate the two persons. The chief officer called down



to the forecastle tweendeck and then entered the space. The deck rating who was also searching arrived at the forecastle tweendeck access hatch soon after, just in time to see the chief officer collapse on the tweendeck, next to the two missing crew who had also collapsed.

The rating quickly switched on the ventilation to that space and ran aft to raise the alarm. Emergency procedures were enacted and help was solicited from stevedores. The three victims were eventually brought out by rescuers using breathing apparatus (BA) and other gear but they were later pronounced dead.

The investigation later found that halfway down the ladder to the forecastle tweendeck, oxygen concentrations were in the order of 10% and only 5-6% at floor level. The victims had succumbed to oxygen starvation. Since the forecastle tweendeck had an access way to the hold, the timber cargo had reduced the oxygen content of forecastle space to below life sustaining levels.

The carriage of wood products was a common practice for this ship and crew and all were apparently well versed in the risks of such a cargo. Additionally, the forecastle tweendeck access hatch was clearly labelled as a confined space that must be ventilated and a permit to work issued before entry. Nonetheless, three people entered without taking these precautions and died.

Lesson learned

- Placards and signs are a good safety measure but they are never enough. Training, awareness and procedural integrity are needed to ensure safety.
- Never descend into a confined space to save a victim unless you are equipped with proper breathing apparatus and have support from other personnel.
- A confined space untested for adequacy of oxygen or the presence of harmful gases is a death trap.

MARS 201572

Ship hits navigation beacon while disembarking pilot

➔ After leaving the port under pilotage, the outward transit of about three and a half hours was without incident. The Master and the pilot were on the bridge throughout but without a helmsman. The vessel was, for the most part, on autopilot. As the vessel approached the pilot disembarkation area, the pilot requested to reduce speed to seven knots for his transfer to the pilot vessel. He indicated he would disembark north of the nearby beacon, which is sometimes a local practice, rather

than at the official pilot disembarkation spot south of this same beacon. The Master was somewhat surprised but agreed to the pilot's request.

The pilot left the bridge, leaving the Master alone. The pilot boat was having difficulty coming alongside in the waves so the pilot, now on deck, requested the Master change course to 180° and then to 160° to make a lee. Once the vessel was on a course of 160°, and as the pilot transfer took place, the Master went out to the bridge wing to better view the transfer. Once the pilot was on the pilot boat, and while the Master still on the bridge wing, he was called by both the pilot boat and crew and informed that the vessel was very close to the beacon.

The Master returned to the wheelhouse but was unable to manoeuvre the loaded vessel quickly enough to avoid a collision with the beacon. The vessel made contact with the structure at a speed of about five knots. Two tanks were ruptured on the port side and the vessel took a list. The vessel then proceeded back to port.

Lessons learned

- The Master allowed himself to be alone on the bridge during a critical time and at a critical place. He unwittingly placed himself in a situation that was prone to single point failure.
- By concentrating on one task (pilot disembarkation) to the detriment of another (navigation), the Master lost his situational awareness.
- A complete pilotage plan should be discussed and approved – in this case the Master was surprised that the pilot was to disembark north of the beacon.