

Seaways

The International Journal of The Nautical Institute

VTS and virtual reality
Who has control? **p08**

Cybersecurity
Future technology creates current risks **p10**

Risk and control
What does it mean to be Master? **p15**

Drilling down
Accidents and their causes **p26**



The ship of the future?

Autonomous vessels are already with us – dealing with the challenges **p 24**



Focus

Automation needs professionals

“ We need to be aware of current challenges, intelligently predict those of the future, and absolutely focus on the human element – who will be doing what, the competencies that will be needed and how these will be developed and maintained.



Shipping is one of the safest and most efficient modes of transportation, and this is no accident. Maritime professionals, such as members of The Nautical Institute, continually seek new opportunities to develop better procedures, more effective training, and of course seeking efficiencies through new technologies. Lloyd's Register have recently announced a design concept for a 'TechnoMax Tanker' planned for 2030 that predicts the use of rapidly developing technologies such as smart materials and the management of 'big data' (page 23 – Nautelex). There has also been much talk about Maritime Autonomous Systems (MAS) from around the world, and for good reason – they exist in their thousands. Existing MAS vessels tend to be relatively small (less than 10 metres) and engaged in specialist and often dangerous work. They are particularly employed by the military and science community, but as they become more reliable and accepted, it is natural that people will start to contemplate using them for larger commercial shipping operations. Some high profile projects in this field include the EC funded MUNIN project and a collaboration led by Rolls Royce. Always keen to keep on top of new developments, The Nautical Institute's London Branch organised a two day conference entitled 'Autonomous Ships: what does the future hold?' (page 24-25) which explored issues of risk perception, developments in technology, assurance processes and of course insurance questions. They concluded, in part, that it is vital that the industry start thinking about the implication of the potential change at an early stage.

Only a few weeks later, Sir Alan Massey, CEO of the UK MCA, gave the keynote address to the UK International MAS Conference (page 6-7) where he stressed that the UK Government endorses the research, development and application of MAS. The next step, he said, and possibly, the trickier challenge is 'to de-risk the use of these craft and make them "safe" in the context of MCA's goal of safer lives, safer ships and cleaner seas – and to set out the sensible and proportionate regulatory environment that will make all that possible'. He further states that somehow we need to construct a regulatory regime that takes account of both manned and unmanned vessels occupying broadly the same waterspace in the future, rather than imagining that we can always realistically and safety keep them apart.

Will autonomous ships really be able to meet shipping challenges? In his article on Risk and judgement of risk (page 15-16), Alan Stockdale

recognises that Masters have to contend with less than ideal circumstances, incomplete information as well as cost and time constraints and pilots have concerns about the reputation of the port for safety and efficiency. He questions why we don't give Masters, mates, and pilots readily available specific waterway guidance as to when and under what conditions navigation in restricted waters can be undertaken.

Carlos Fernandez Salinas from the Spanish Maritime Safety Agency also explores VTS, unmanned ships and Colregs, and asks if there is a difference of perception between human senses and artificial sensors, and the possible effect it would have on risk of collision and grounding (page 8-9). All of this at a time when our industry is facing serious issues of Cybersecurity (page 10-12).

So as we look to the future can we make sure that we learn from the past? As usual MARS provides a range of incidents and accidents with plenty of lessons highlighted, reinforcing what a complex environment we operate ships in and how important it is to think ahead, manage risk, and have contingency plans.

We are also very pleased to be able to announce the launch of a new version of one of our most popular books, *Navigational Accidents and their Causes* (page 26). This book has gone through a major overhaul and restructure in order to maximise the ability to learn lessons. Rather than just looking back at previous incidents, we have invited a range of experts in their fields to explain what goes wrong and why for the leading causes of accidents now, and to make predictions for the next 10 years. This handy size book covers such issues as BRM, passage planning, anchoring, under keel clearance, using technology and of course the benefits of mentoring. Every mariner should have one!

This issue of *Seaways* drives home the message that whether you are conning a traditional ship or developing systems and regulation for autonomous ships, a professional approach is essential. We need to be aware of current challenges, intelligently predict those of the future, and absolutely focus on the human element – who will be doing what, what competencies will be needed and how these will be developed and maintained.

When the founders of the NI defined our mission nearly 45 years ago it was to 'support those in control of seagoing craft'. What the next 45 years will bring is anyone's guess, but as professionals we will need to work together to get there safely and efficiently. 🌊



Mariners' Alerting and Reporting Scheme

MARS Report No. 277 November 2015

MARS 201560

Unsafe cargo + unsafe anchorage = lost ship

Edited from Hong Kong SAR Marine Department Report, published 16 March 2015

→ A bulk carrier was to load a cargo of nickel ore from barges into four holds. During loading, which took approximately three weeks, intermittent rainfall caused interruptions in loading. The ore on the barges had to be covered over with tarpaulins and the holds on the vessel had to be closed. The crew of the vessel carried out a 'can test' of the ore on each barge before transfer to the vessel. If the test failed, an 'oven drying test' was done to determine the moisture content of the ore. If the moisture content was found to exceed the Transportable Moisture Limit (TML was 34.80%), the cargo in the barge would normally be rejected.

However, records indicate that on at least two occasions cargo was accepted with moisture contents of 35.54% and 37% respectively. Once the loading was completed, the holds were trimmed and pressed by means of cargo grabs; each cargo hold was about half-full. Calculations showed the vessel's intact stability met the requirements of the International Code on Intact Stability, 2008.

About a week after departure the Master had to divert due to a typhoon, eventually dropping anchor at a port of refuge that offered protection from wind and seas from the north. The vessel was yawing and rolling heavily and dredging her anchor at the anchorage due to strong winds and heavy sea, now coming from the southeast. The following day, the vessel encountered a strong wave causing her to heel to port about 20°. The vessel returned somewhat upright but was still listing about 10° to port. Within two hours the list to port increased to 45° and then 90°. Soon afterward the vessel capsized and sank.



Vessel at 45°

All crew successfully abandoned the vessel before sinking and were rescued without injuries. More than 600 tonnes of oil leaked into the sea and took more than three months to clean up.

The investigation into the accident revealed several contributory factors including the following:

- Nickel ore was loaded despite a moisture content that exceeded its Transportable Moisture Limit, contrary to the requirements of the International Maritime Solid Bulk Cargoes Code (IMSBC Code).
- Several of the shipboard safety procedures for loading and carriage of nickel ore were not followed.
- Due to the heavy rolling at anchorage there was liquefaction of the ore cargo.



Typhoon track and refuge anchorage

- The Master's selected refuge anchorage was not appropriate as the location could only shelter from northerly wind and waves. The vessel experienced strong southeasterly wind and waves when the typhoon, as predicted, passed south and southwest of the vessel's anchorage. The investigation also revealed the following safety issues:
- The moisture content certificate of the nickel ore was issued by the shipper instead of the local administration or independent organisation (or authorised organisation)
- The crew was not trained and therefore not competent to carry out the oven drying test to verify the moisture content of the cargo before loading.

■ **Editor's note:** Although 'can tests' can be used by crew to validate suspicions* that the moisture content of the ore may be above the certified TML, the oven drying test should be done in a laboratory. The Intercargo guide for transporting nickel ore, published in 2012, states: **Where there is doubt concerning any cargo declaration information, or suspicion that the cargo has been misrepresented, independent cargo testing to determine the FMP, TML and actual moisture content of the cargo to be loaded should be carried out.**

The guide can be found here: http://www.gard.no/webdocs/Intercargo_Nickel_Ore.pdf

* For example, cargo that appears wet and/or splatters when loaded may raise suspicions that the moisture content of the ore may be above the certified TML.

MARS 201561

'Time Out'

→ A port superintendent sent this MARS report with the title 'A picture speaks a thousand words'. He states that in his job over the years he has witnessed many cases of ship's crew failing to recognise the potential hazards around them while carrying out their work.

In this case, the gangway support wire had come out from its sheave and become jammed and a crew member was attempting to remove it. Thankfully, he did take some precautions, like wearing a life vest, helmet, and gloves but failed to realise that during the process of clearing the stuck gangway wire, the gangway could have moved or lowered onto him.

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The superintendent stopped the work and ensured that concrete blocks were placed on the wharf so that the weight of the gangway could be landed on them. The wire clearing process was then resumed in relative safety.

■ **Editor's note:** In this instance, the person initiating the 'stop work' request was a port official. The lesson here is, even if you are not part of the team involved in the work, if you see a danger you should make it known.

MARS 201562

Anchors away

Edited from USCG Marine Safety Alert 5-15

➔ Recently, a freight ship was underway in 15 foot seas when the forepeak flood alarms activated. The crew investigated and discovered the starboard anchor had slipped 10-15 links, causing it to strike and puncture the hull. As a result, seawater flooded the bow thruster and emergency fire pump compartment. The casualty resulted in excess of \$1 million in vessel damage and a month's lost revenues while the vessel was out of service undergoing repair.

During the repair period, it was discovered that the anchor windlass brake pad had worn down to 2-3mm thickness. With only this amount of pad, the fully applied brake could not achieve its designed holding power. The crew should have recognised the excessive wear to the brake pads and that these required replacement.

It was also discovered that the anchor involved in the incident was a replacement, and had different specifications to the original anchor. The replacement anchor's relative position in the hawse pipe was not the same as the original, because the shank length and connecting linkages were different. The size difference prevented the riding pawl from properly engaging the anchor chain.

As an added safety device, a wire sling had been used to secure the anchor while at sea. The wire sling was threaded through a chain link and secured to the vessel with a pelican hook. When the sling broke and the brake failed, the anchor's weight and the ship's movement then caused it to drop before the riding pawl could properly engage. The sling failure was likely caused by the corrosion



of the inner wire strands; the inner wire strands being exposed to the elements because of the sharp bend in the wire. Although the wire sling was inspected regularly, those performing the inspections were not instructed on how to examine and determine its serviceability.

Lessons learned

- All preventative maintenance programmes should be up to date and include specific language on anchor windlass equipment, particularly emphasising when brake assemblies must be renewed or adjusted.
- When key vessel components, such as anchors, are to be replaced, a proper review should be undertaken and all possible variables considered.
- Persons involved with vessel maintenance and repair should have the technical resources available to them in order to assist in determining serviceability or replacement of shipboard equipment.

■ **Editor's note:** Inspection of wire rope is not an easy task and cannot be properly done without opening the lay with a spike and examining the inner core. Even this step is not foolproof, and wire rope degradation within the core can be hard to spot. Crew should adopt the 'precautionary principle' when using and examining wire rope – that is, if unsure, replace with new.

MARS 201563

Fatal fall overboard

Edited from official report published by the Dutch Safety Board, May 2014

➔ After unloading containers from a general cargo vessel, crew prepared the decks and holds for a new cargo. One task was to move the hatch covers forward; a crew member operated the ship's crane to move the hatch while two other crew guided the hatch with securing lines on each side. The crew member guiding the hatch on the starboard side was blocked by the vessel's heavy lift spreader stored on deck, so he had to climb the spreader in order to continue his pace forward. At some point while on the spreader he lost his balance and fell overboard between the ship and the dock. An officer nearby heard the splash and rushed to the scene. With the help of other crew, the officer was able to recover the fallen crew onto the quay but the victim was unconscious. The victim was taken to hospital but died of his injuries later that day.



It is not known how the crew member lost his balance, but after the accident it was found that his shoes and coveralls were in very poor condition. At the time of the accident the victim was not wearing a safety harness, life vest or helmet.



Work boots in poor condition

Lessons learned

- Personal protective equipment such as boots should always be in good order for proper support, protection and traction.
- When working on deck a safety helmet should always be worn.
- The crew considered moving the hatch covers a routine job. As such, they did not discuss arrangements and possible risks prior to moving the hatch cover on the morning of the accident.
- The spreader had an uneven surface and was without fall protection. It was probably slippery due to the morning dew; it had no anti-slip paint applied as it was not intended to be walked upon.

MARS 201564

Flood tide breaks mooring lines

Edited from official Canadian NTSB report MAB-14-21

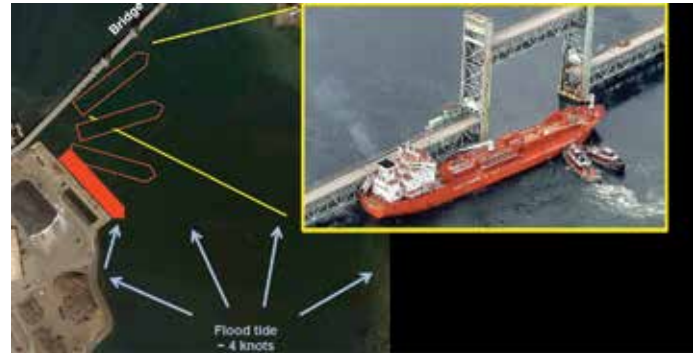
→ A small products tanker docked at terminal to load a cargo of tallow. The pilot had given the Master the local pilot information card that warned of three to five knot tidal currents in the river waterway. The card also warned of the importance of skilled line tending when moored in the river, stating: "equal tension or equal weight on all ropes at all times; mooring winch brakes shall have a holding near the strength of the line".

The next day after loading, and in order to refuel, the vessel was shifted about three miles downriver during slack water. This was accomplished by the same pilot from the previous day and the transit was uneventful. At the new berth, ten mooring lines were used as illustrated.



Because of draught considerations, the vessel was docked such that the ship's bow extended 30 feet beyond the east end of the wharf. After docking, a crew member conducting a patrol noticed dust and smoke coming from the brakes of the mooring line drums on the bow. The alert was given and the bridge team tried using the ship's bow thrusters to push the vessel toward the dock but to no avail.

As the vessel's bow was pushed into the river, the three mooring lines that were on bitts parted (both forward springs and one aft spring). The remaining mooring lines were on winches; the winch brakes began slipping and the lines quickly ran free off the drums and fell into the water. Within about 10 minutes of the initial warning, the ship was adrift in the river. Anchors were dropped but they only slowed the drift. A few minutes later the vessel struck a bridge, which sustained approximately \$2.5 million in damage, while damages to the vessel were estimated at \$1 million.



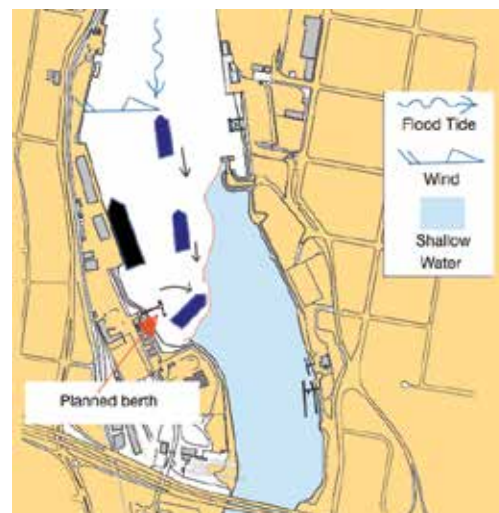
Lessons learned

- All mooring lines should be equally tensioned so as to share the load.
- Never underestimate the force a current can exert on the vessel and carefully evaluate the vessel's mooring situation with respect to possible current interactions.
- Mooring winch brakes should always be in top condition and properly adjusted.
- Given the vessel's bow was exposed to the flood tide current, several bow lines should have been on bitts as opposed to on mooring winches.

MARS 201565

Beached instead of berthed

→ Our tanker arrived in port and was to go to berth at the southern extremity of the port. The manoeuvre required swinging the vessel 180 degrees and then backing astern to berth port-side to. Another tanker was moored just to the north of the intended berth which restricted the manoeuvring room somewhat. The berthing plan was discussed between the pilot and the Master but the pilot had not mentioned the restricted room due to the other berthed tanker. Although there was a flood tide and the westerly wind was blowing at 15 knots, a tug was not considered necessary. Once turned successfully, the pilot began backing



the vessel; running astern with main engine and bow thruster, the wind and the flooding tide were slightly on the vessel's port side.

When our vessel was approximately 15-20 metres from the berth, an aft spring line was sent ashore by heaving line and secured. The forward mooring station lowered the headlines to the mooring boat but they could not be made secure in good time. The vessel was now swinging to starboard even though the bow thruster was full to port. Since the headlines were not secured at the designated bollards, and in an attempt to reduce the vessel's swing to starboard, the headlines were sent for securing at the designated bollards for the springs, but still to no effect.

Realising the vessel was approaching shallow water, the bridge

team ordered the port anchor dropped but the headlines were now obstructing the anchor's release. By the time the anchor was finally released, the vessel was already aground; the vessel's position almost perpendicular to the berth. A tug was promptly called and with the rising tide the vessel was quickly re-floated and properly berthed.

Lessons learned

- The angle of approach to the berth was more open than 'usual' due to another tanker alongside the adjacent berth. This placed the vessel in a more vulnerable position, especially considering the effect of the wind and current.
- When manoeuvring a vessel in a confined waterway where the margin for error is small, a tug is always a good investment.

Making a difference to the shipping community

The Institute gratefully acknowledges the support of its Nautical Affiliate partners. Through their contributions, MARS saves lives, prevents injuries and contributes to a more effective and safer shipping community.



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