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THE NAVIGATOR

Inspiring professionalism in marine navigators

FREE

Error Management

Creating an onboard safety net

A free publication by **The Nautical Institute** in association with the **Royal Institute of Navigation**

NAV BRIEF

David Patraiko FNI
Director of Projects, The Nautical Institute

To err is human…

Have you ever made a mistake? If so, I hope you were lucky and that you or someone spotted it before it caused an incident! The good news is that you can improve your luck and manage situations so that errors are less likely to happen and more likely to be caught before they become incidents.

As humans, it's natural to make mistakes, just as it's natural to have moments of creativity and insight. It's likely at some point that you will make a mistake and that your fellow crew members will do so as well. However, with thought and reflection, professional navigators can reduce the likelihood that a mistake will result in an accident. The simple process of having two qualified people check a decision (thus reducing single person error) can improve safety by more than a factor of 10!

OOW: "Come Port 20 degrees" – Helmsman: "Don't you mean Starboard, Sir?" – OOW: "Oh yes, thank you, I haven't had much sleep lately, come STARBOARD 20 degrees" – Helmsman: "Starboard 20, Sir."

Teamwork matters. But young officers often spend 90% of their time as the sole decision makers on the bridge, responsible alone for deciding when to change course for the passage plan or what manoeuvre to carry out to avoid a collision. In this position, how can you strive for a blemish-free career? The answer is thoughtful management and, yes, teamwork – even when you are apparently alone on the bridge.

Many factors can increase the likelihood of a mistake. These include fatigue, stress, distraction, multi-tasking, poor visibility, complacency, heavy traffic or close proximity to navigational hazards. How can you create an environment where natural error is prevented or captured? Good passage planning is essential to identifying and anticipating where errors are more likely to occur. Bridge equipment also offers a wide range of alarms and support tools that, if understood and used intelligently, can help with error capture.

Where rating are used as lookouts, they should be encouraged to understand the operational aspects of navigation and collision avoidance, so that their intervention can be useful and add to the effectiveness of the bridge team. If you are still in doubt, call the Master.

It is important to understand and accept that errors do happen, and establish a 'just culture' on board that will explore how and why an error may have occurred. Identify and share near-misses so people can learn from them, both those on board and with the industry as a whole.

This issue of *The Navigator* explores the importance of recognising the Human Performance and Limitations (HPL) of navigators. Training, competence assessment, continuing professional development (CPD) and safety management should all help reduce errors to a bare minimum. It's well worth reflecting on error management, discussing these issues with your fellow bridge team members, and of course sharing this and previous issues of *The Navigator* with all on board.

INSIDE THIS ISSUE

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ALL AT SEA

Emma Ward

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Personal error management hints:

1. Be on time, always. For me, that means an alarm clock in my cabin. Running late means standard operating procedure is interrupted, and that can lead to departure from safety regulations.

2. I wear a digital watch with an alarm on it for reminders of important must-dos.

3: ISM checklists are super – as long as I manipulate the checklist, instead of the other way around! Many ships have the *'Assume a Navigational Watch'* ISM on the chart table. Even though I know all the items to check by rote memory, I walk around with the laminated checklist anyway.
John Carlisle MNI

My first layer of defence is my internal alarm system. It is usually based on some unconscious awareness of something missed, something awry. When you get that feeling, invariably something IS wrong. The moment you should call the Captain to the bridge is as soon as your brain says, "Hmmm, should I call the Captain?" Do not wait until it is too late.

As a Bridge Watch Officer, we should not only speak up when we see errors or omissions occur, but we should encourage those in our team to speak up if they see something that is one of those tell-tale things that seem out of the ordinary. NEVER be afraid to speak up. Errors occur to all of us, inexperienced and experienced alike. Catching inevitable mistakes is part of our daily and professional lives.
Captain David (Duke) Snider FNI FRGS

Most newly joined officers face one common mistake. Shyness. It is very common to fear that people on board will judge you if they know that you still need to ask for help, but clearing up your doubts is the only way to avoid mistakes. Nobody will question your competence if you call the Master in dense crossing traffic, or facing a floating fish market in the South China Sea, or a vessel not following Colregs. In my cadetship I saw a second mate of 10 years' experience call the Master when he could not handle a situation with a vessel in the Malacca Strait approaching Singapore. The Master appreciated that, instead of jeopardizing the vessel and the crew, he handed the situation over.
Kumail Raza, Third Officer

For more error management hints, visit our blog at www.nautinst.org/NavInspire

Thank you for the heads-up in the June 2016 issue of *The Navigator*. I really think it's important that all crew on board a ship are made aware of the consequences when connecting their smartphones to the ship's computer. It is a big eye-opener that most of us ignore.
Jan Lester Aligante, Third Officer, *M/V Warnow Porpoise*

The 'NAVIGATOR' – an acrostic poem
N - Nautical information
A - Admiralty updates
V - Views of professionals on relevant topics
I - IMO news and updates
G - GMDSS updates
A - Accident investigation reports
T - Take 10 on core topics of each issue
O - Offshore oil and gas operation updates
R - Resource of safe navigation data.
Alok Lambert, Second Officer, *Josephine Maersk*

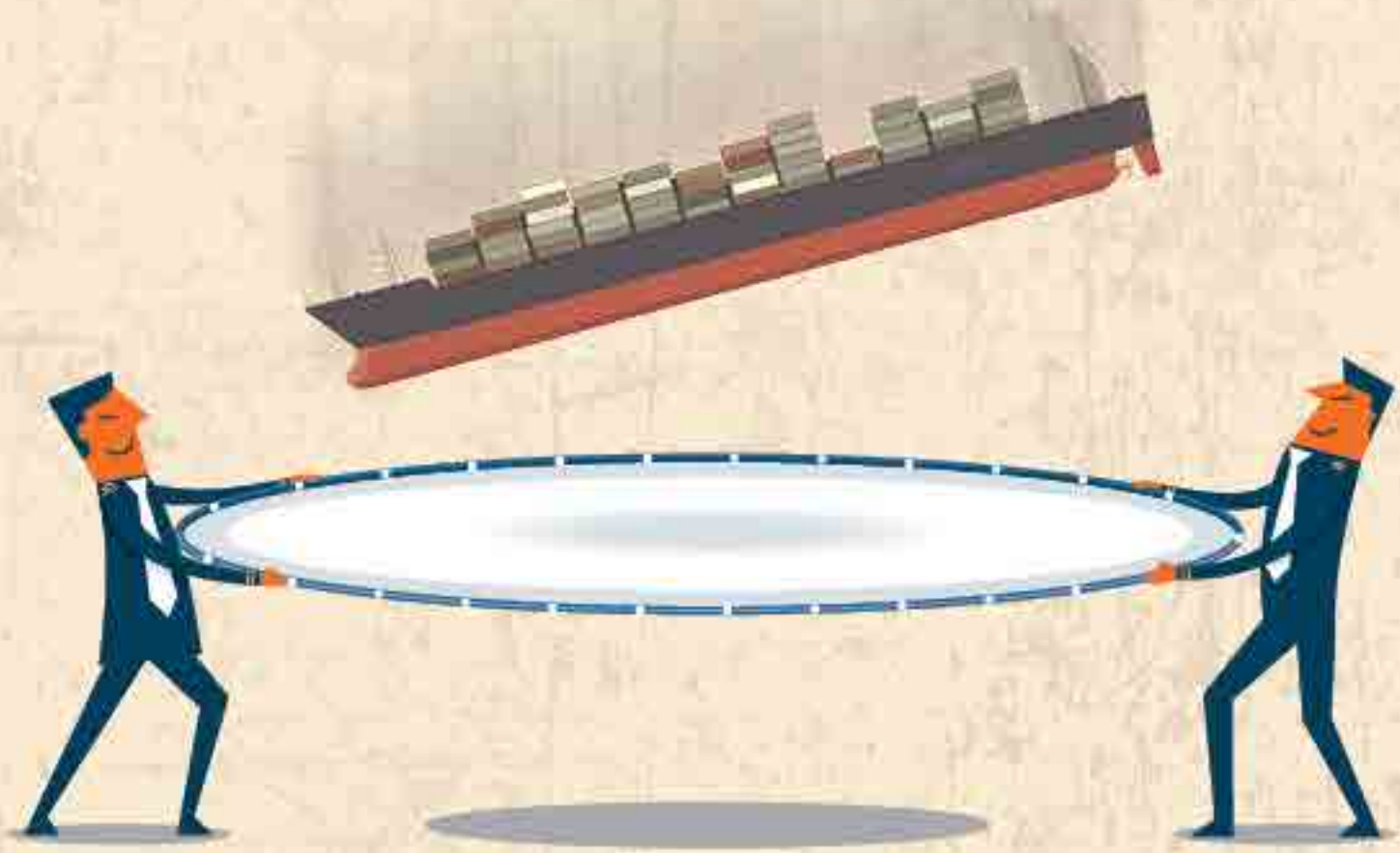
Editor's note: What a fantastic poem, thanks for sending it in.

I'm currently serving as a Junior Officer on board the motor tanker, *Sabrewing*. Since I was a cadet, *The Navigator* has helped me hone my theoretical knowledge on board and ashore. It has taught me that it is better to internalize than to memorise!
Frank Francisco, Third Officer, *M/T Sabrewing*

Find us on social media, and let us know what you think #NautInst

Pulling together on the bridge

We all make errors. It is part of our human nature and how we learn and gain wisdom and experience as we progress through life. However, errors need not result in undesirable consequences if they are detected in time and immediately corrected – and teamwork can be a crucial part of that



Errors can result from incorrectly applying knowledge or from not following rules, but there are other types of error; the unintentional slips and lapses, such as those we may make every day.

As officer of the watch on the bridge of a ship, you still have the potential to make errors, despite closely following procedures and diligently adhering to the Master's standing orders. Such errors can lead to an incident, such as a near miss… or worse.

As the lone officer of the watch, how can you create an environment favourable to the identification and correction of errors before they result in more serious incidents? It is important that you recognise when errors are more likely to occur. Their likelihood may be affected by such things as workload, wellbeing, bridge design and weather conditions.

Method in the madness

Performing important tasks in a methodical manner can help capture errors.

For example, interrogating navigational instruments, such as ECDIS or ARPA, in a careful and systematic manner can help you avoid misinterpreting information.

When conning the ship, using hand signals to support your instructions will allow the helmsman to question your orders if you make an error. For example, putting your right hand out while giving the instruction "starboard twenty" will support what you are saying. Putting your left hand out would create a situation where the helmsman could question the order.

Capitalising on the full potential of the watch-keeping assistant assigned to look-out duties during your watch can also be a great resource in helping you identify errors, for example to independently confirm what you see out of the bridge window and to identify it on the radar.

Discussing error capture with your watch-keeping assistant can be a useful training exercise. This can include discussing how the workload can be shared, training the rating to recognise the behaviours of confusion, fixation or distraction, all of which will have been covered during the HELM course you will have attended. The watch-keeping rating should be trained to be confident about raising an issue, and taught how to do this in the correct way.

For your part, you must be prepared to view the raising of an issue by a watch-keeping assistant as a useful part of the process of error capture and not as a personal criticism. A timely word can spark awareness, prompt you to take stock of the situation and ask for help or call the Master if necessary.

No 'I' in TEAM

How often do you see included in the Master's night orders, "If in doubt call me"? Often, it can seem easier to try to deal with a situation yourself, rather than call what may be a fatigued or even irritable boss. Rationalising the decision to call the Master with the watch-keeping assistant can be a useful part of the decision-making process. Calling the Master is one of the most important error management tools there is.

What about an error made by a pilot or a Master? How can you, as an officer of the watch, bring an error to the attention of the Master or pilot? How do you raise the issue when you observe behaviours associated with errors, such as fixation, distraction, complacency and fatigue?

Pointing out errors that affect safe navigation can be difficult, and requires extreme tact. While some pilots or Masters might welcome you highlighting errors, others might see it as criticism. Nevertheless, it is your duty as a member of the bridge team to raise awareness and bring errors to the attention of someone able to do something about them.

There may be situations in which a Master may hesitate to question the pilot, for instance, even though he or she is not entirely happy with the manoeuvre a pilot is making. The speed could appear to be too slow or too fast, or the vessel might seem to be too close to an object. As officer of the watch in such a situation, questioning the Master quietly and tactfully, or mentioning observed behaviours which increase potential for error, may be just the support the Master needs to tip the balance in favour of raising the issue with the pilot. Never underestimate the contribution you can make.

Excuse me, Captain...

Many years ago, when I was part of a team helping to prepare an exercise on a bridge simulator, an experienced practising pilot was asked to enter the bridge of a simulator just as he would normally do on board. He was then instructed to guide a VLCC, with draft of twenty-one metres, into Europoort, with a full bridge team of officers under the command of a recently promoted Master. We asked the pilot to make an intentional but subtle mistake and conduct a critical turn at slow speed without building up the required rate of turn quickly enough. This was particularly relevant as it was to test practically the application of knowledge gained during a classroom session covering the relationship between rate of turn, radius of turn and speed.

It was the behavioural psychologist, closely monitoring the exercise on CCTV, who pointed out the head scratching of a junior team member and the slight swaying of the Master as he transferred his weight from one foot to the other, which indicated that something didn't seem right and that they looked uncomfortable. The confident way the manoeuvre was being carried out by the pilot was apparent, and it's perhaps understandable why neither team member felt confident enough to say anything, even though the vessel would eventually have become dangerously close to grounding. If they had communicated their concerns aloud, or even if one of them had simply recognised the unease in the other's behaviour, that could have led to the error being captured and corrected.

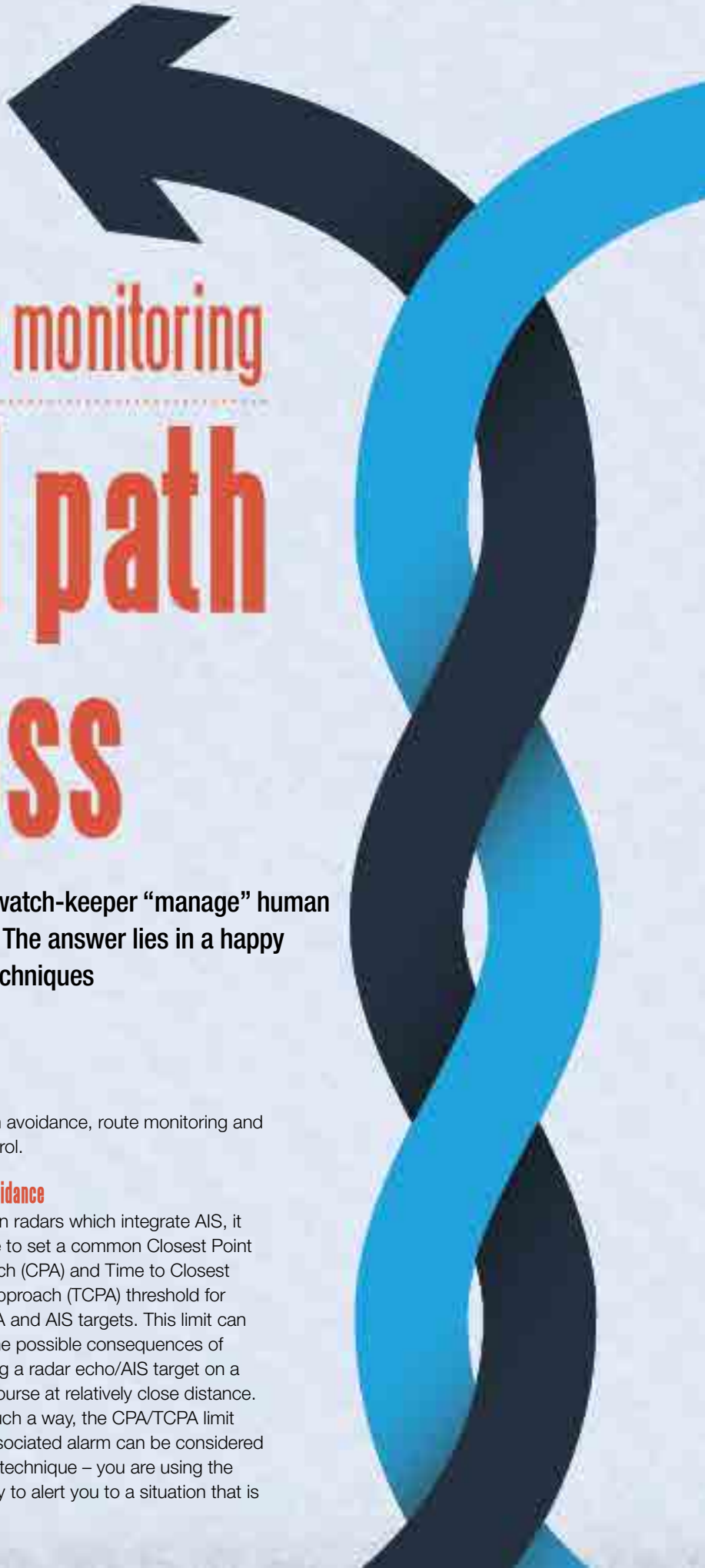
A quiet word with the Master – something like, "Excuse me, Captain, I have checked and it seems that the turn is not going as planned" – might have been the only thing required for the Master to bring the situation to the attention of the pilot.

Error capture by behavioural observation has long been practised in the airline industry and there is absolutely no reason why the same approach cannot be applied on the bridge of a ship. Empowering everyone on the bridge to identify critical errors in time for them to be corrected can only result in safer bridge operations.

Author: Paul Armitage MNI

Captain Paul Armitage was a seagoing Master with Vela International Marine Limited for 20 years, in command of very large crude oil carriers.

He is currently a Technical Adviser for Seagull Information Technologies UK Limited, providing technical input for the training products it produces for the maritime industry.



Active and reactive monitoring

The dual path to success

How can navigation systems help a single watch-keeper "manage" human error before it results in a serious incident? The answer lies in a happy alliance between pro-active and reactive techniques

Availability and sophistication of navigation systems vary from bridge to bridge, but it is possible to divide the various techniques designed to cope with human error into two broad categories: proactive and reactive. Proactive techniques relate to the active monitoring of critical navigational parameters. Reactive techniques are more about managing the automatic alerts generated by navigation systems.

A single watch-keeper is able to combine both reactive and proactive techniques for each operational function he or she performs on the bridge. As an example, let us consider the various techniques related to collision avoidance, route monitoring and route control.

Collision avoidance

On modern radars which integrate AIS, it is possible to set a common Closest Point of Approach (CPA) and Time to Closest Point of Approach (TCPA) threshold for both ARPA and AIS targets. This limit can mitigate the possible consequences of overlooking a radar echo/AIS target on a collision course at relatively close distance. Used in such a way, the CPA/TCPA limit and its associated alarm can be considered a reactive technique – you are using the technology to alert you to a situation that is

becoming hazardous. However, CPA/TCPA can also be set to perform 'defensive navigation', where the watch-keeper establishes a minimum distance to be kept from any targets, in order to prevent hazardous situations from developing. Set like this, CPA/TCPA limits are used proactively.

It is possible to let the radar acquire an AIS sleeping target (that has not yet been activated by the watch-keeper) automatically when it moves inside the set CPA/TCPA limits. Less obvious is the functionality of modern radars, where an ARPA target is merged with an AIS activated target if the two are within the distance, course and speed limits set by the watch-keeper. This merge results in a single target being shown on the display (either ARPA or AIS), with the other one being compared in the background, but remaining invisible to the user.

If, all of a sudden, *both* targets are shown on the display, it means that the tracking difference between them has gone outside the set merge limits. Used like this, the merge limits become a proactive tool for early detection of potential anomalies in AIS or ARPA target tracking.

Route monitoring

Several ECDIS and radar functionalities can also be employed to manage a solo watch-keeper's errors while monitoring the ship's progress. Whether they are used proactively or reactively depends on the operational concept adopted. Take, for example, the off-track alert, triggered once the ship's Consistent Common Reference Point (normally the conning position) goes beyond the planned track limit. If the track limit is set closer to shallow waters than to the planned track, the off-track alert can be used as a *reactive* tool to make the operator aware of imminent danger.

On the other hand, the same threshold can be set reasonably close to the planned track to act as the limit of a watch-keeper's 'comfort zone' in normal operations. Now, the off-track alert can be considered a *proactive* tool that warns the watch-keeper that a heightened level of attention is required when he/she is going off-track for any unforeseen operational reason. The same concept can be applied to radar Parallel Indexes and clearing bearings.

Route control

When available, Track Control Systems can be used proactively to manage human errors related to conning the ship. A Track Control System can be seen as an additional team member on the bridge, in charge of keeping the ship on-track within pre-planned 'comfort zones'. In addition, the Track Control System allows the watch-keeper to carry out controlled turns. This means that turns can be trialled before being executed by means of a Curved Heading Line adjusted by the operator with the desired turn radius. Controlled turns may well help single watch-keepers prevent errors in giving manual helm orders while busy with other, competing tasks, as they can see the likely result of manoeuvres before they are made.

The use of Track Control Systems, like any other automated tool, opens the door to different types of errors. The most common of these are related to overlooking settings affecting the track-keeping accuracy, i.e. rudder economy, rudder limit and loading condition. So, how can we manage the consequences of such errors? The answer lies in a concept known as 'active monitoring'. This type of monitoring consists of a pro-active, cyclical visual scanning of critical navigational parameters, rather than simply monitoring alerts – that is to say, actively looking at the information, rather than waiting for the alerts to tell you something is wrong.

Active monitoring of speed, cross track distance, drift angle and the aforementioned settings should be performed at regular intervals. Read the values observed out loud, even if you are acting alone on the bridge. This not only allows early detection of problems, it also enables the watch-keeper to take over manual controls, if required, without becoming 'out of the loop' with the related automation. Active monitoring is not just desirable when operating a Track Control System. It is a technique that can be applied to all instrumental navigation tasks to help overcome the risk of overreliance on technology.

In conclusion, defensive navigation, automated track-keeping and active monitoring are all key proactive techniques that can help prevent errors from occurring in the first place. Radar, ECDIS and AIS alerts are often used more as reactive tools to mitigate the negative consequences of an error that has already been made. This slight, but very important distinction underpins the two faces of error management doctrine: 'error reduction' and 'capture of error consequences'.

A SINGLE WATCH-KEEPER IS ABLE TO COMBINE BOTH REACTIVE AND PROACTIVE TECHNIQUES FOR EACH OPERATIONAL FUNCTION HE OR SHE PERFORMS ON THE BRIDGE

'All available means'

To quote a well-known expression in our industry, *'all available means'* should be used by the single watch-keeper to manage his/her own errors. Increasing levels of technology and automation on ships' bridges mean that effective error management techniques will require a deeper understanding of multiple complex navigation systems, as well as higher levels of awareness of our vulnerability to human errors and their potential consequences.

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Captain Antonio Di Lieto has sea-going experience as hydrographic surveyor, Master of a hydrographic vessel and cruiseship officer.

He currently works as a simulator instructor at Smartship Australia in Brisbane, where he facilitates port development projects and trains Australasian port pilots.

Antonio's present professional interest is in bridge design, human factors and instrumental navigation technologies.

WATCH-OUT

In this series, we take a look at maritime accident reports and the lessons that can be learned

Radar errors led to collision

What happened?

A cruise ship collided with a container vessel in heavily congested waters. The cruise ship's radar/ARPA had not been set properly. This led to an overload of information at the exact time when the vessels were approaching each other. In addition, no action was taken by the container ship, which was the stand-on vessel, apart from a VHF call made to the cruise ship five minutes before the collision took place.

The Traffic Separation Scheme in place in the area and the proximity of other vessels made it hard for either ship to take early action, even if they had attempted to do so in time. No passenger or crew injuries were sustained and both vessels made port under their own power.

Why did it happen?

Reports into the collision found that the watch-keeping officer on the cruise ship had become confused by the vast amount of information being relayed at the time of the crash, as well as the manner of its transmission. There was heavy traffic in the area, resulting in a large amount of data being communicated.

The container vessel was overtaking the cruise ship on the port side, while another ship was overtaking to starboard. It is possible that the lights from both overtaking ships were confusing when viewed from the cruise ship's bridge. The watch-keeping officer's attention was also distracted by a crew member arriving on an administrative errand and needing to be let in via the bridge door, which was kept locked.

The issues

> The watch-keeping officer on the cruise ship was left to stand watch alone, despite the area experiencing heavy traffic. More could have been done by the captain to ensure he had adequate support.

> The watch-keeping officer on the cruise ship relied heavily on radar for his anti-collision checks and carried out few visual inspections. He used the ARPA output from two radars instead of just one, meaning that he didn't have a single, continuous, reliable plot to follow.

> He allowed himself to become distracted at the wrong time by a crew member coming onto the bridge.

> The container vessel made little to no attempt to avoid the collision. A VHF call, five minutes before impact, seems to be the only action of significance reported to have been taken.

What changes have been made?

> The cruise ship's company's watch-keeping officers have been advised to set just one anti-collision plot if they are using multiple radars. Further training in radar use has also been arranged.

> More explicit standing orders will now be drawn up to clarify when sole watch-keeping officers should call for assistance.

> The layout of the Traffic Separation Scheme will be reviewed to investigate reducing traffic concentration in the area.

THE WATCH-KEEPING OFFICER RELIED HEAVILY ON RADAR FOR HIS ANTI-COLLISION CHECKS AND CARRIED OUT FEW VISUAL INSPECTIONS

If you find our accident reports useful, check out The Nautical Institute's Mariners' Alerting and Reporting Scheme (MARS). A fully searchable database of incident reports and lessons, updated every month. Seen a problem yourself? Email the editor at mars@nautinst.org and help others learn from your experience. All reports are confidential – we will never identify you or your ship.

Operating off-shore

Evgeny Rubeko MNI is Third Officer and Senior Dynamic Positioning Officer (SDPO) on board the *Polarcus Amani*, a seismic survey vessel working to provide seismic data and help energy companies find oil and gas reserves offshore

What interested you in building a professional career at sea?
For me, a career at sea offers unique life and professional experience and an opportunity for self-development in a challenging environment. It allows me to travel around the world, visit various countries, meet different people and make new friends. I can keep myself physically fit and it gives me time to spend with my family.

What work does your vessel, *Polarcus Amani*, do and whereabouts in the world have you travelled with her?
My vessel is a modern seismic survey vessel with DP 2 class and ice class. She works to provide seismic data and help energy companies find oil and gas reserves offshore. She can work anywhere in the world, even in Arctic regions. Personally, I have travelled with her from Europe to America; from America to Africa; from Africa to Australia, and to the Far East.

What particular challenges do you face on such a vessel?
Seismic surveys are a very specific type of operations and not easy to understand if you have never experienced them before. All operations, such as bunkering, supply, crew changes, helicopter and small boat ops must be carried out while the vessel is underway, travelling around four to five knots. Recently, *Polarcus Amani* completed a job towing the largest seismic spread in the world; for a time she was the largest moving man-made object in the world! The whole crew played a part in this achievement. It was very challenging and nobody knew quite how it would go until the last unit was deployed. However, we did it and I am very proud.

Name: Evgeny Rubeko MNI

Current position: Third Officer SDPO

Training: Admiral Makarov State University of Maritime and Inland Shipping, St. Petersburg, Russia

THE CHANCE TO WORK OFFSHORE SEEMED AS REALISTIC AS HAVING A JOB ON A SPACE SHIP!

What are some of the harder aspects of your job in DP?
One of the hardest aspects is simultaneous operations (SIMOPS), when you must control not only the position of the vessel on DP (usually operating in 'seismic track mode'), but also the traffic, position and actions of the support fleet and other related operations. Another challenge is communication, as there can be more than 15 nationalities on board and the bridge is the coordination centre not only for the vessel, but also the wider fleet (mother vessel and supply/guard fleet). Our bridge team overcomes these challenges via constant training. Sometimes we use *The Navigator* magazine and other Nautical Institute publications for this purpose.

What do you like most about your position as Senior DPO and would you recommend it to others hoping to follow in your footsteps?
The idea of a Belarussian seafarer might sound ridiculous, since Belarus is a country without a shoreline, but that is exactly what I am. I work on one of the best vessels in the world with one of the best crews. I would advise anyone to never give up their dreams; if you cannot achieve your life goals right now, plan, reassess and look for different ways to succeed – but never give up. I started as a deck cadet on tankers and the chance to work offshore seemed as realistic as having a job on a space ship! However, I looked for opportunities and gained my DP certificate. Never be scared to ask questions and never stop learning. Pay attention to your relationships with others and remain open and sincere.

WAYPOINT

Dr Andy Norris FRIN FNI

It's not just a human problem…

Dr Andy Norris, an active Fellow of The Nautical Institute and the Royal Institute of Navigation, explores why humans are not the only source of mistakes – and how to spot technology error

Humans are not alone in making navigation-related mistakes. The equipment used on the bridge can also make them, not least when poorly set by the user. Fortunately, humans are in a very good position to check the credibility of displayed information coming from any one source. We should never rely too heavily on data that has not been collaborated. We must always look for consistency in our understanding of the present and evolving situation, using all available information.

Many issues can be automatically detected by the equipment, setting off warnings and alarms. Unfortunately, this is not always the case. Poor user-settings on some systems, such as radar and ECDIS, lead to frequent automatic alerts, which can make operators miss the more important equipment failure alerts. User-chosen alert settings should always be configured properly to meet the current situation without obscuring more important issues.

Continual checks on consistency must be made concerning position. Does my ECDIS-indicated position tie up with all other information, such as radar, visual observations and depth readings? Is my present heading consistent with my indicated track, bearing in mind expected set and drift? Even knowing roughly where the sun should be relative to your own heading is very useful in detecting more extreme error circumstances, not least in ocean waters.

Strength in numbers

We are fortunate in having three totally different ways of detecting targets, all with different strengths and weaknesses, namely sight, radar and AIS. True correlation of all three techniques on all targets of interest is ideal; you are then very sure of the reality of the situation. The correlation of the optical view with the equipment displays is essential in identifying targets of interest undetected by the radar and AIS.

Obviously, in poor visual conditions a much more cautious approach to potential dangers is essential. However, targets that have correlated both radar and AIS returns should incur immensely less suspicion than those with just one. A radar return alone could indicate that the target doesn't have an AIS signal. However, it could also be the result of a false radar target in that position, maybe from a reflection or a 'second-time-round' effect.

If there is just an AIS target showing, is it because a vessel in a totally different position is emitting incorrect AIS signals? Is the radar signature unobservable due to the vessel's 'blind angle', or has it been obscured by clutter?

HUMANS ARE IN A VERY GOOD POSITION TO CHECK THE CREDIBILITY OF DISPLAYED INFORMATION COMING FROM ANY ONE SOURCE

Always alert

We must also be aware of being over-confident in apparently benign conditions. *"The ECDIS shows me to be on track and there's nothing significant on the radar or from what I can see through the bridge window, so I can relax for a while,"* is certainly **not** a good approach.

Acting with such naivety does not generally result in an accident, which perhaps gives false confidence that it's acceptable practice. In reality, if your positioning system is in error, the comforting situation of being shown to be on track can be far from the truth. You could be any number of miles off, perhaps with a grounding imminent...

Finally, as emphasised in the last edition of *The Navigator,* don't forget the growing possibilities of false information being displayed on navigation equipment through cyber-crime. Fortunately, on vessels being navigated with good error management in mind, such an attack is highly likely to be identified very early on, allowing the vessel to proceed safely.

TAKE 10

In this issue of *The Navigator*, we look at the crucial area of error management and learning how to minimise our mistakes

1
To err is human…
We all make errors. It is part of our human nature – and, on a positive note, how we learn and gain wisdom. However, it's best if human errors are caught before they cause accidents.

2
Managing mistakes
Once it's recognised that it is natural for humans to make errors, a management strategy should be considered. Training, skills, competency and procedures are essential, but so is a plan for 'capturing' error as they occur.

3
Call for back-up
It is claimed that having two professionals agreeing a decision can improve safety by a factor of 10 (reduction of single person error). When in doubt, call the Master!

4
Look out for your look-outs
Look-outs, or 'bridge assistants', are a vital aspect of error management. A well-trained and respected look-out can be invaluable in helping to identify risk and capturing human error, particularly if you are the sole officer on watch.

5
All available means
Professional navigators will use 'all available means' to manage errors. This should include knowledge, skills, common sense, teamwork and technology.

6
Happy talk
Good communication is key within a bridge team for managing error. Good language skills, closed-loop communication techniques, the use of hand signals for rudder commands and even the verbalisation of actions when alone will all help improve safety.

7
Risk factors
Errors are more likely when there is fatigue, distraction, complacency, unusually high or low workload and so on. Good passage planning should identify these risks and introduce contingency plans.

8
Plan to fail
Navigators must be alert to 'single point failures' of equipment that can lead to errors. They must continually use both proactive and reactive techniques to monitor the plausibility of technically derived information. Do visual clues agree with radar/ECDIS or vice versa?

9
More than words
When things are going wrong, people often perceive this before they voice their concerns. A professional navigator can often pick up 'concerns' in body language from any member of the bridge team, including the helmsman, OOW, Master or Pilot. Trust your instinct – never underestimate the contribution you can make!

10
Pass it on
Learning the art of error management is an ongoing task. Reflect on it often and pass on your wisdom to others. Your life and career may depend on it one day. Don't forget to share this and other issues of *The Navigator*.

LIKE OUR TOP 10 TIPS?

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AND THE WINNER THIS ISSUE IS...

Congratulations to Charles Kinneth Mondares, winner of our Issue 13 NavSnap competition! Born in the Philippines, Charles is an ordinary seaman on board the container ship *Kristin Schepers*. He became a seafarer to travel the world and meet new people in new places. Thanks for entering the competition, and we hope you enjoy your prize, Charles!