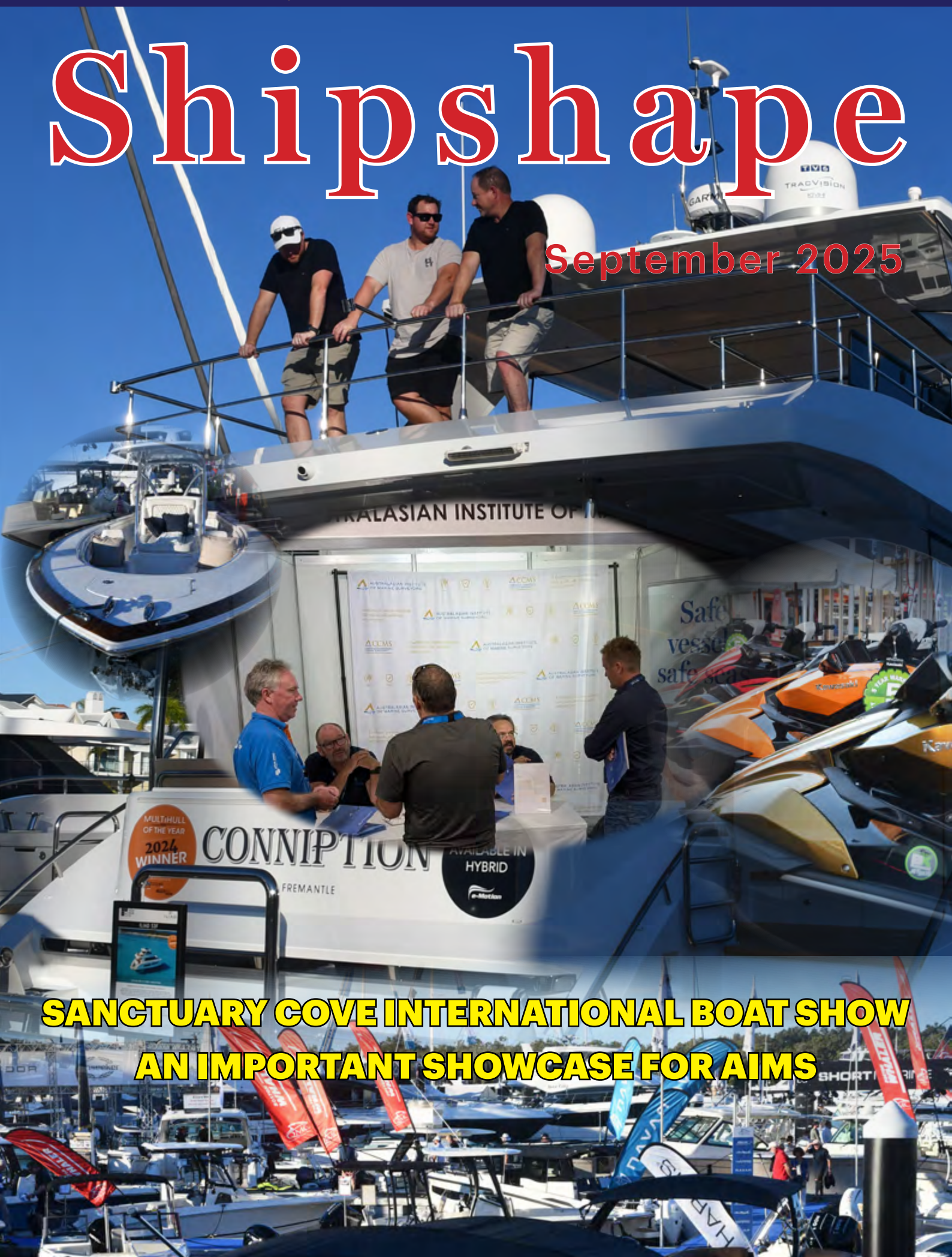
AUSTRALASIAN INSTITUTE
OF MARINE SURVEYORS

Shipshape

September 2025



SANCTUARY COVE INTERNATIONAL BOAT SHOW

AN IMPORTANT SHOWCASE FOR AIMS

DRIVING INDUSTRY CHANGE:
Collaboration within and across borders

40
Years of Operation

2026 AIMS Conference

Fremantle Sailing Club,
Thursday 7 & Friday 8 May 2026

AUSTRALASIAN INSTITUTE OF MARINE SURVEYORS

Shipshape

September 2025

Front Cover: The 2025 Sanctuary Cove International Boat Show was a terrific opportunity for AIMS to join other marine-related businesses and organisations and meet a wide range of people interested in boats and boating. (See article on page 10.)

Maritime safety. (Page 14.)

Ageing fleet, more incidents. (Page 17.)

New report on A.I. (Page 22.)

Tail shaft surveys. (Page 26.)

Let's talk about keels. (Page 28.)

Decode young generation. (Page 38.)

MARINE SURVEYORS INSURANCE FACILITY

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Marine surveying – passport to adventure

"*I RAISED my head. The offing was barred by a black bank of clouds, and the tranquil waterway leading to the uttermost ends of the earth flowed sombre under an overcast sky – seemed to lead into the heart of an immense darkness.*" So wrote Joseph Conrad, the Polish-British 19th Century author, in "*Heart of Darkness*", a re-telling of his time as a riverboat captain in the Belgian Congo.

My travels as a marine surveyor often remind me of some of the distant corners of the globe marine surveyors are required to journey to in the service of our clients.

Whether it be inspecting damaged cargo resulting from a ship collision on the Saigon River in Vietnam, to travel to far-flung Sorong in West Papua to inspect a vessel following a collision with a ferry, to loading barges in remote areas of Australia, the journey is as much a part of the story as the job itself.

The preparation for any job to a remote or foreign location is a detailed one: do I have the necessary visas, is my passport up to date, are my shots current? The list goes on. Then, there are the flights to be arranged, ferry transfers, agents to negotiate with to make sure that you are not stuck in some far-flung outpost and no-one know you are arriving, or you are not supposed to arrive for another two days.

Travelling from a local trading post to a ship by bum boat or local launch, because that is all the is available, brings me to think of Conrad's characters, Marlowe or Lord Jim, traversing the wilds of the Congo or some far-flung coastline in Borneo.

When you are gliding six inches above the water, watching the sun rise through the morning mist, you cannot help but think that, despite all the hassles of delayed flights, suspect immigration officials who look you up and down a dozen times before letting you through the turnstiles, mis-communicated transfer instruction – the list goes on – that being a marine surveyor brings far more adventure, more intrigue, more anticipation than most other jobs that one could imagine.

For those with a sense of adventure and an anticipation for the unknown and the unexpected, the career of a marine surveyor brings with it the sense of "What happens next?" or "How do we solve this problem?".

Each new phone call or email from a client with a request to attend a job in the middle of nowhere is tinged with "*Well, what does this little adventure bring?*". As Banjo Patterson so eloquently put it in "*Clancy of the Overflow*", "*I am sitting in my dingy little office, where a stingy ray of sunlight struggles feebly down between the houses tall … and I somehow rather fancy that I'd like to change with Clancy … but I doubt he'd suit the office, Clancy of the Overflow*".

Eric McIlwain
Chair of the AIMS Board

Building member value

I HAVE worked for the Institute for a little over two years with the purpose of building membership value.

Our strategic plan has provided me a guide to building that value and I thank Sue Brown, our Professional Development and Training Coordinator, for her efforts in building value for our students and members that have undertaken professional development through our diploma offerings.

We continue to work with our partners, deliver professional development opportunities, manage the AGSA Scheme, and build our capabilities through the valuable work and insights of our members who volunteer their time through work on our sub-committees.

1) Industry Workshops and Webinars

AIMS continues to provide workshop and webinar content for members to engage with continuing professional development (CPD).

Workshop 15: Andrew Fielding, CEO of the Boating Industry Association (BIA) and Nik Parker, General Manager Member Services BIA are senior members of the BIA – 10 June.

Topic: The workshop held on 2 June was focused on: (1) an update of the ongoing work of BIA, (2) BIA's committee and standards work and (3) any issues regarding marine surveying.

Workshop 16: Kevin Moran, Managing Director, TYMOR – 11 June

Topic: DRFT MRKS technology, the risks of inaccurate readings and having the proof in the event of a cargo claim.

Kevin is an ex-seafarer with over 35 years in the maritime industry, and in 2012 co-founded, and led, an expanding maritime technology and naval architecture business. His goal is to change how the maritime industry measures, tracks and controls vessel stability – ultimately by embracing the disruptive technology MOSIS.

Workshop 17: Graeme Normington, Principal Marine Surveyor at Queensland Ship Surveyors Pty Ltd – 16 June

Topic: Thrive don't just survive - Understanding the costs of doing business as a Marine Surveyor

Graeme is an experienced and highly qualified

Principal Marine Surveyor with over 20 years of expertise in conducting surveys for both commercial and defence vessels. As the Managing Director of Queensland Ship Surveyors Pty Ltd, he oversees a wide range of marine survey services and hold accreditation as an AMSA Marine Surveyor. His primary focus is on the Guardian Class Patrol Boats (GCPB) for the Australian Defence Force, the Serco DMS fleet of vessels based in the port of Cairns, Queensland and a range of commercial AMSA DCV vessels. His knowledge spans particular stability approval, construction surveys, machinery inspections, safety equipment surveys, and compliance with Australian National Standards for Commercial Vessels (NSCV) and Lloyd's Register (LR) LSSC Rules.

Workshop 18: Nick Parkyn, Nick Parkyn Marine Surveying / MarineML – 25 June

Topic: System Thinking and Survey Process Improvement

Nicholas (Nick) Parkyn has an extensive background in both the marine and information technology disciplines. Nick's work in the marine industry includes marine surveying, yacht and small craft design, and marine software development. He is experienced in composite design and fabrication and has specified synthetic rigging on designs since 1994. He was one of the first to apply Spectra to marine applications. He is the author of the book "What a marine surveyor needs to know about synthetic (composite) yacht rigging".

Workshop 20: Margot De Villiers and Eric McIlwain – 8 July

The session was co-hosted by Emma Campbell, WISTA Australia, Qld State Representative and Dr Eric Perez, AIMS CEO.

Margot De Villiers, Head of Marine – Executive Marine Surveyor, Sedgwick

Topic: Cargo Surveys

When Margot began working as an office manager for a marine surveying firm in South Africa nearly 25 years ago, she had no intention of pursuing a career in insurance. But, after taking some basic courses to learn about the field, she found herself studying project management, training under two respected marine experts, and earning a diploma in marine surveying. Margot conducts assessments to quantify insurance claims related to transit incidents.

Eric McIlwain, Hastings Marine and Engineering and AIMS Chair

Topic: Hull damage and common defects

Eric commenced his surveying career in 2014. He became an accredited surveyor with Maritime Safety Queensland in 2014, then transferred to AMSA in 2015. As an AMSA-accredited surveyor, he is accredited for extra low voltage initial surveys and periodical surveys, initial surveys for construction and alterations for hull, deck and superstructure, machinery, equipment, and commissioning; periodic surveys, periodic surveys for loadline and safety equipment. In November 2024, Eric became the new Chair of AIMS.

Workshop 21: Wendy Sullivan, Director, Marine Medical Solutions Australia – 23 July

Topic: Marine Medical

Wendy has worked as a crew trainer and gained valuable experience on different vessels. One pivotal moment was when she had to take charge of a vessel after the skipper was stung by an Irukandji jellyfish. This experience solidified her desire to become a skipper. She promotes the importance of hands-on experience and learning from experienced crew members. Wendy has a wealth of experience, information and practical experience with her as

a Master 24, MED III and holding a Diploma of Paramedical Science. She has pioneered the delivery of top-tier medical emergency training tailored specifically for the maritime industry in Australia. Her commitment to the safety of those working in maritime environments has made her a respected figure in the industry.

Presenter: Nick Parkyn, Nick Parkyn Marine Surveying / MarineML – 30 July

Topic: Understanding Yacht Rigs

Nicholas (Nick) Parkyn has an extensive background in both the marine and information technology disciplines. Nick's work in the marine industry includes marine surveying, yacht and small craft design, and marine software development. He is experienced in composite design and fabrication, and has specified synthetic rigging on designs since 1994. He was one of the first to apply Spectra to marine applications. He is the author of the book: "What a marine surveyor needs to know about synthetic (composite) yacht rigging".

2) Challenges facing Marine Surveyors

AIMS is collecting actionable insights on current challenges facing marine surveyors, specifically relating to continuing professional development (CPD), and the use of technology, including artificial intelligence (AI).

If you can participate, please use the following survey link: https://www.surveymonkey.com/r/HKGKY8S

3) Annual General Meeting

The AIMS AGM will be held on Friday, 7 November 2025 starting at 2pm AEST / 3pm AEDT.

4) AIMS Conference Update

I am happy to share an update to planning for the AIMS conference. A huge thanks to Wade Nagel, Kerryn Woonings and Stuart Marra, our conference planning team in Western Australia, for their time and effort in helping to deliver a first-class event.

We have confirmed amazing speakers for the event. More details on speakers will be announced later this year.

You can access information regarding sponsorship opportunities and booking tickets by using this link: https://lnkd.in/gtb27-E6

The LinkedIn post can be viewed here

If you would like more information, please contact me at the office on +61 2 6232 6555 or gm@aimsurveyors.com.au.

5) Meet a Surveyor Series

Understanding why marine surveying matters

is critically important as members work across the maritime sector, yet their role is not fully understood. The "Meet a Surveyor" series goes a long way in explaining what marine surveyors do and why it matters.

Eric McIlwain – Video 1 | Video 2 | Video 3
Andrew Laughlin – Video 1 | Video 2 | Video 3
Capt Paul Willing – Video 1 | Video 2 | Video 3
Capt Peter Murday – Video 1 | Video 2 | Video 3

6) Australian Grain Industry Conference

My thanks to Capt Razzak Syed for attending

Capt Razzak Syed, AIMS member and Pat O'Shannassy, CEO of Grain Trade Australia.

the Australian Grain Industry Conference. He has shared his notes from the event regarding Grain Industry issues highlighted by conference speakers.

Drought and Government's support

It was very clearly outlined by the speakers and government representatives that famer's federations and grain trader's associations are working closely and monitoring the weather condition. Farmers and traders were worried about the next year's products, but recent rain fall given big hope for good harvest forecast for all states except South Australia which may just manage to reach last year's target.

Approximately 40 million tonnes of grain expected coming year, 1.4 million tonnes of lentils and 1.5 million tonnes of chickpeas, which has great demand in India and Bangladesh.

Traders are respecting the demand from domestic market and encouraging consumer's bakery and food industries to consume local grains for their products. I missed the session with the government secretary but word of mouth indicates that local food industries are expecting some support for it.

US Tariffs

Concerns were raised regarding tariffs imposed by the US Government. Australia does not have much grain trade with US market, but it is good to know how the American growers and traders will be affected with their government's tariff.

It appeared that no-one supports the introduction of a tariff.

Speakers emphasised the improvement of the quality of the grains on protein and GM products for high yield production. Australian traders are focusing on the ASEAN and Chinese market due to global position and freight rates which will attract Australian grain. Speakers raised concerns about rising port charges, which make Australian grain more expensive in the ASEAN market.

War and Wheat

Due to the current global situation of war between Russia and Ukraine, Mr Dennis Voznesenski gave an interesting presentation on how the grains market was during World Wars 1 and 2. Australian grain is comparatively safe and we may generate increased interest from Europe and Africa, besides the ASEAN market.

Geo-Political Landscape

Hugh Rimington and Senator Simon Birmingham explained the position of Australian trading in global markets. Senator Birmingham was in line with the rest of the speakers. emphasising the importance of the Asia-Pacific market in conjunction with the domestic market. During the Q&A session, concerns raised about government red tape rising of port charges and freight rates.

Technology

Use of AI in monitoring the weather, and use of fertilisers in different soil conditions with different temperatures, helping scientists to improve the quality and production. AI is also helping farmers to harvest their products in an effective way. AI is helping supply chains with real-time information on their freight and end users to plan their production line efficiently.

I met with Andrew Goyder, Chairman of Grain Trade Australia (GTA), Pat O'Shannassy, CEO of GTA and Tim Ross, Projects Manager GTA. I also met a number of Australian and international grain grower delegates. I outlined our members' role and contribution to Australian grain exports, and how our expertise enhances their work in the international market.

7) Newsletter Contributions

Thank-you to the members that contributed to this edition of the newsletter and, for members who do contribute, your article can be used as evidence of continuing professional development.

I encourage members to contribute to the newsletter. If you would like to know more, please contact the office.

8) Your Institute

Please contact me on +61 2 6232 6555 or send me an email with feedback, and ideas at gm@aimsurveyors.com.au.

Dr Eric Perez
Chief Executive Officer

2025 Sanctuary Cove International Boat Show

ANOTHER great Sanctuary Cove International Boat Show (SCIBS). I want to thank members who volunteered to help me engage with attendees at the event – a huge thanks to Capt William Burton, Andrew Laughlin, Eric McIlwain, Bernard Webber and my colleague Sue Brown, AIMS Professional Development and Training Coordinator.

Our continued support of the event extends our work as partners with the Boating Industry Association.

Takeaway learnings?

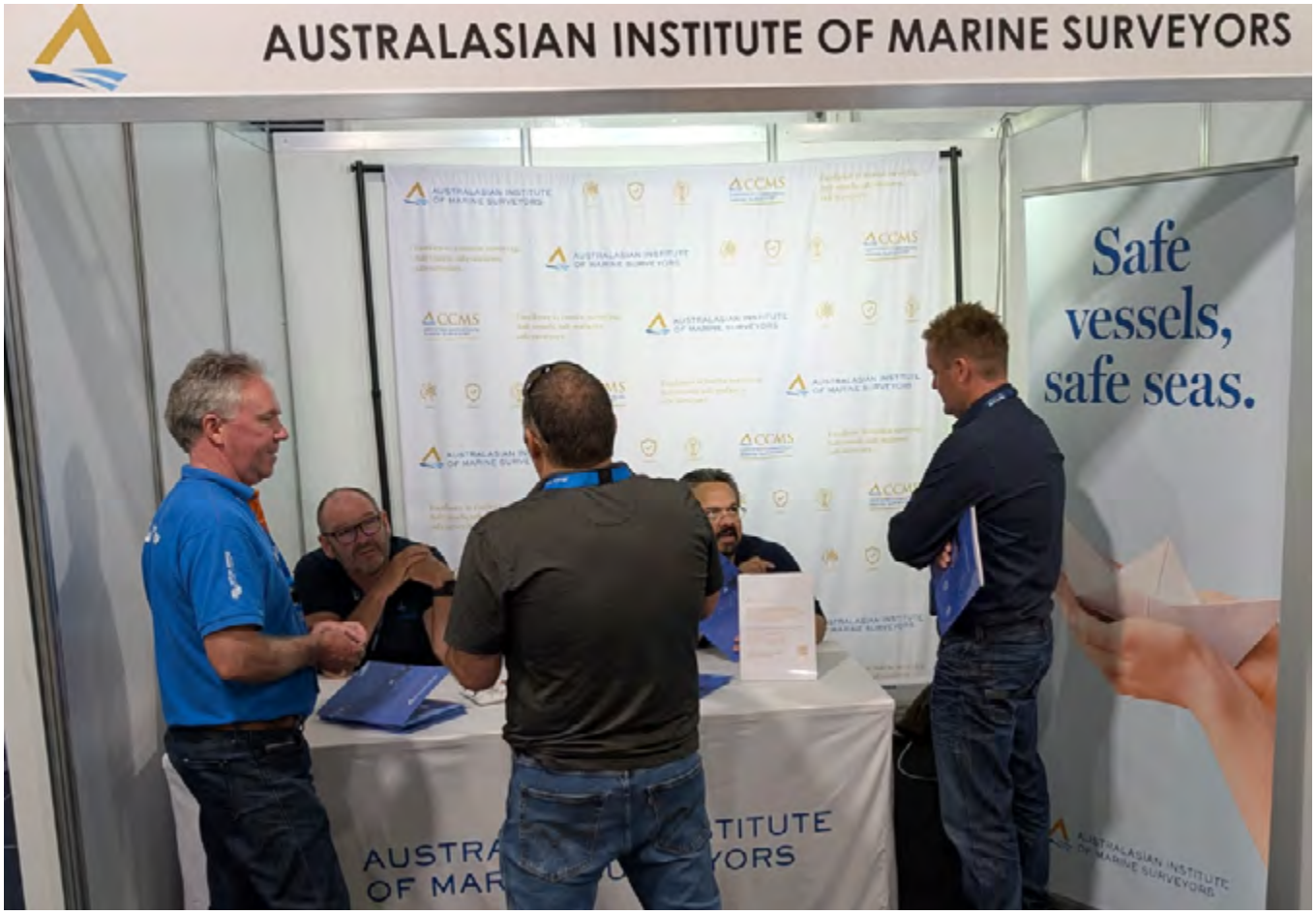
The public have some but limited awareness of the breadth and scope of marine surveying. The event continues to provide a great opportunity to engage with the public.

Individuals buying and selling vessels are unclear why engaging a marine surveyor is beneficial or the difference between the role of shipwrights and naval architects versus the very distinct skill sets applied by marine surveyors.

The four-day exhibition from May 19 to 22 attracted some 350 exhibitors and 46,000 visitors and it also boasted the 36-year-old event's biggest-ever display of boats: 824 in total, 422 on the water and 402 on land.

Dr Eric Perez
Chief Executive Officer

At the Sanctuary Cove International Boat Show (from top), Sue Brown, Professional Development and Training Coordinator, and Capt. William Burton, AIMS Director … Boating Industry Association (BIA) staff Jessica Pyke-Nott, Andrew Fielding, CEO and Maria Hobbs, Program Manager – Marine Jobs … Transport for NSW staff.



Andrew Laughlin, AIMS member and Dr Eric Perez, AIMS CEO talking to SCIBS visitors.

AIMS training update

AS another training year closes, I thought it timely to provide an update on that space.

Enrolments in Diploma courses across all the recreational, working boats and shipping sectors are continuing to grow, indicating a strong interest in surveying as a potential career. When considering the demographic of surveyors, it is interesting to note that the vast majority of entrants are people with extensive skills and experience in the maritime industry wanting to apply their knowledge in a different context (read to get off the tools / water) and surveying provides a pathway to do that.

It seems that there will never be "young" surveyors ... but, along with experience come the life skills which are invaluable in making tough decisions, and dealing with tough people and situations that sometimes crop up.

Speaking of skills and experience, congratulations again to our Student of the Year, Maike Ligan, who has recently sailed through her AMSA accreditation interview and was successful in gaining all categories of accreditation applied for. Maike is employed with Howells Maritime in Cairns and has a big future in the industry.

If you would like to nominate an employee or colleague who is currently a student with AIMS for this award, to be presented again at next year's conference in Fremantle, I would encourage you to do so.

Our newly established work experience program, pairing successful students with established surveyors across the surveying space, has kicked off and is generating interest from both sides.

If you have an existing business, large or small, and would like to be involved in this program please get in touch. It is early days but I am hopeful that this will lead to opportunities for a "passing of the torch" and a way for existing surveyors to tap into an emerging talent pool.

The review of the Advanced Diploma of Commercial Marine Surveying is underway, with the Training Committee hard at work. Their diligence (lack of foresight?) in taking this on in the middle of grain season is greatly appreciated. Don't worry, you can sleep later in the year.

Their efforts will help to ensure that AIMS training offerings remain robust, relevant and meet existing industry needs. Many thanks.

The new student portal is also up and running, assisted by those who helped with trialling the platform. It has definitely streamlined the way in which students interact with the training team and course material, as well as overall administration.

It is planned that the Advanced Diploma content will also be available through the portal on completion of the review.

It has been a great experience meeting and interacting with all of our students and members of the industry throughout the last 12 months and I am looking forward to the next.

Sue Brown
Professional Development and Training Coordinator

Institute of Surveyors NSW seminar

I ENJOYED meeting and presenting to the Institute of Surveyors NSW seminar in Canberra on June 27. A group of approximately 80 "land" surveyors met and exchanged ideas and methods.

There were several presenters from government bodies explaining new requirements and myself for introducing them to marine surveying and AIMS.

Interestingly, but not surprisingly, most thought that marine surveying was what we know as hydrographic surveying, so it was beneficial to them for a general understanding.

I presented how draft surveys are a practical use of Archimedes' principle for shipping bulk commodities, which was very well received.

Their Institute has more stringent requirements for CPD and field time for various types of surveys. They also have university-level course content, which is required to attain various licenses.

The demographic of the room was middle-aged to older men, with very few women in their ranks. They conduct community workshops to younger students in an effort to recruit new blood into the field.

Many of their pain points are similar to ours in marine surveying.

The evening of the conference was celebrated with a nice dinner, and the following day there was breakfast at Mount Stromlo, followed by a tour of the observatory facility.

As maths / science people, we all thoroughly enjoyed the morning breakfast and tour.

One stand-out for me was that their name tag lanyards had a very large font so that I didn't need to put glasses on to read their names ... I must be getting old.

Louis Koutelas
Hunter Marine Surveyors
Director & Senior Marine Surveyor
AIMS Member

Key developments from recent IMO sessions on maritime safety

HE International Maritime Organization (IMO) is making significant progress towards modernising global maritime safety regulations, with new regulations that seek to enhance standards in order to accommodate new technologies and fuels, while making the maritime industry more adaptable and receptive to innovation.

The complexity of maritime safety is evident from the wide variety of topics currently on the agenda of the IMO, some of which are highlighted below.

1. Propulsion and steering – from prescriptive requirements to a goal-based format

Current regulations around propulsion and steering are part of the Safety of Life at Sea (SOLAS) treaty, which was drafted when most vessels were powered by conventional engines and manoeuvred by rudders.

With so many other systems now available and in widespread use, work is underway to translate these existing requirements into a goal-based format that is suitable for all types of propulsion and steering – and which, we can presume, will also account for the wide variety of alternative fuels being introduced.

In its current form, SOLAS Chapter II-1 addresses traditional steering gear arrangements with a propulsion system and a rudder. Modern combined steering and propulsion systems (eg, azimuth thrusters, waterjets) are, however, not addressed in the current regulatory framework, which is therefore seen as an obstacle to innovation.

The IMO is now working on a revision of SOLAS Chapter II-1 that addresses both traditional and non-traditional propulsion and steering systems. The new requirements will be goal-based and therefore naturally apply to all steering and propulsion system types.

Crucially, they will be broader and more flexible than prescriptive regulations, outlining what needs to be achieved as opposed to how this should be achieved, allowing the IMO to define key safety criteria and leave the technical implementation to other stakeholders.

"A key benefit of goal-based requirements is that they provide the industry with the flexibility to accept new technologies and novel designs by meeting broad safety requirements instead of specific design criteria," says Kathrine Ilje Nerland, Senior Principal Engineer and safety regulation expert at DNV.

"In practice, this enables the maritime industry to adopt new fuels or operating systems with total clarity on safety expectations, while avoiding

strict constraints on their ability to innovate."

2. Fire safety for containerships

An increased number of serious fires in the cargo area on containerships has exposed technical challenges related to locating, containing and fighting fires on these vessels.

The IMO is considering measures for the detection and control of fires in container cargo areas. These measures include:

- requirements for portable infrared thermal imagers, suitable for screening containers and detecting hot areas;
- requirements and performance standards for water mist lances, including means for extended reach of containers;
- requirements and performance standards for mobile water monitors and fixed water monitors; and
- water protection systems below the hatch coaming and pontoon hatches.

One important consideration is that any regulations on tackling fires should aim to minimise any risk of danger to crew.

"It's important that regulatory updates improve technical safety without introducing new challenges, balancing the need to tackle fires with prioritising crew safety and welfare," explains Nerland.

3. Charging up electric vehicle transport

An increasing number of electric and new-energy vehicles are being carried on board ships. The IMO has agreed to consider if there are additional fire risks involved, for example related to the carriage of lithium-ion battery-powered vehicles.

Therefore, the IMO has developed an action plan to evaluate the adequacy of fire protection, detection, and extinction arrangements in vehicle, special category, and ro-ro spaces in order to reduce the fire risk of ships carrying new-energy vehicles. The action plan includes the analysis of reports, studies, and technologies; the identification of hazards; and the development of related goal-based measures.

4. Safe Return to Port (SRtP) progress

The Safe Return to Port (SRtP) concept was introduced in SOLAS in 2010 with the intention of increasing the robustness and fault tolerance of passenger ships. Even in the event of a flooding or fire incident, a ship should be able to return to port with its own machinery and provide a safe area for everyone on board.

The SRtP regulations apply to passenger ships with a length of 120 metres or more, or with three or more main vertical zones.

The IMO is working on a revision of the "Interim Explanatory Notes for the Assessment of Passenger Ship Systems' Capabilities After a Fire or Flooding Casualty" (MSC.1/Circ.1369) to facilitate uniform implementation of the concept, taking into account experience gained so far.

One of the key discussions revolves around the concept of remaining operational, particularly in terms of assessing passenger ship systems' capabilities after a fire or flooding incident and defining the criteria for what it means to stay operational.

5. Ensuring plain sailing for autonomous ships

The prospect of autonomous ships operating internationally with little or no human intervention has highlighted the need for a regulatory framework for such ships, including their interaction and co-existence with conventional manned ships.

The current regulatory framework generally assumes manning and human intervention.

The IMO has agreed to first develop a non-mandatory, goal-based code, potentially entering into force as a mandatory code upon experience with its application. The purpose of the code is to provide a framework to address both the remote control and the autonomous operation of key functions of ships.

The chapters of the Maritime Autonomous Ships and Shipping (MASS) Code on risk assessment, remote operations and connectivity are now nearing completion. The chapters on remote operation and connectivity will apply depending on the mode of operation and the functionality being applied.

The non-mandatory MASS Code is to be finalised by 2026, followed by an experience-building phase after its adoption. A mandatory code is expected to enter into force in 2032, at the earliest.

6. Prepare for change

DNV class customers are encouraged to visit the Compliance Planner to monitor how upcoming statutory requirements will impact their ships and subscribe to our Statutory newsletter sharing the main outcomes of safety relevant IMO meetings among others.

This article was sourced in MARITIME SAFETY TRENDS 2014-2024: Preparing for future risks report published by DNV: https://www.dnv.com/maritime/publications/maritime-safety-report-2014-2024-download/

Kathrine Ilje Nerland
Senior Principal Engineer
Kathrine.Ilje.Nerland@dnv.com

Failings around known and avoidable risks identified in Maritime NZ prosecution of stevedoring company

A STRONG reminder has been sent to a stevedoring company and others in the industry after a stevedore was badly injured while unloading cargo.

Qube Ports NZ Limited was recently sentenced in the Tauranga District Court in relation to a 2022 incident onboard the bulk carrier *Daiwan Hero*. It had previously pleaded guilty to breaching its duty as a Person Conducting a Business or Undertaking (PCBU) by exposing an individual to a risk of death or serious injury under the *Health and Safety at Work Act 2015*.

The incident resulted in a stevedore falling about six metres while removing cardboard and debris in the hold. They suffered numerous injuries to their legs, requiring surgery.

When the incident occurred, large tissue pulp reels were being unloaded from the vessel. These were stacked up to nine metres on top of each other.

Maritime NZ Investigations Manager John Maxwell says, while there were safety processes in place to reduce the potential for a fall from height, the operator did not meet all the safety standards required to protect its workers on this occasion.

"Despite the relevant safety documentation being in place, Qube failed to implement the identified safety measures within its operating procedures," Mr Maxwell says.

Working from heights is a known critical risk. The outcome is an important message for operators to properly ensure critical risks are appropriately controlled in order to keep people safe.

In sentencing, Judge Mason made orders totalling just over $300,000 against Qube Ports NZ Limited.

This article was published on the Maritime New Zealand website on 21 July, and reinforces the need to provide safe workplaces and the fact that failing this obligation will have significant monetary and reputational damage.

Nō te rere moana Aotearoa
MARITIME NEW ZEALAND

Ageing fleet driving increase in incidents

A CLEAR uptick in casualties in 2024, driven by machinery damage/failure and an ageing fleet, stands out in the latest analysis of Lloyd's List Intelligence casualty data.

The number of maritime casualties rose by 15 per cent in 2024. Coupled with a 7 per cent rise in casualties in 2023, this represents a concerning development for the maritime industry, particularly with the global fleet growing at a considerably slower rate.

This trend has now been established for several years. While the overall number of incidents declined by 5 per cent between 2014 and 2018, the figure has increased every year since.

Between 2018 and 2024, the number of incidents increased by 42 per cent. Over the same period, the number of vessels in the global fleet increased by 10 per cent.

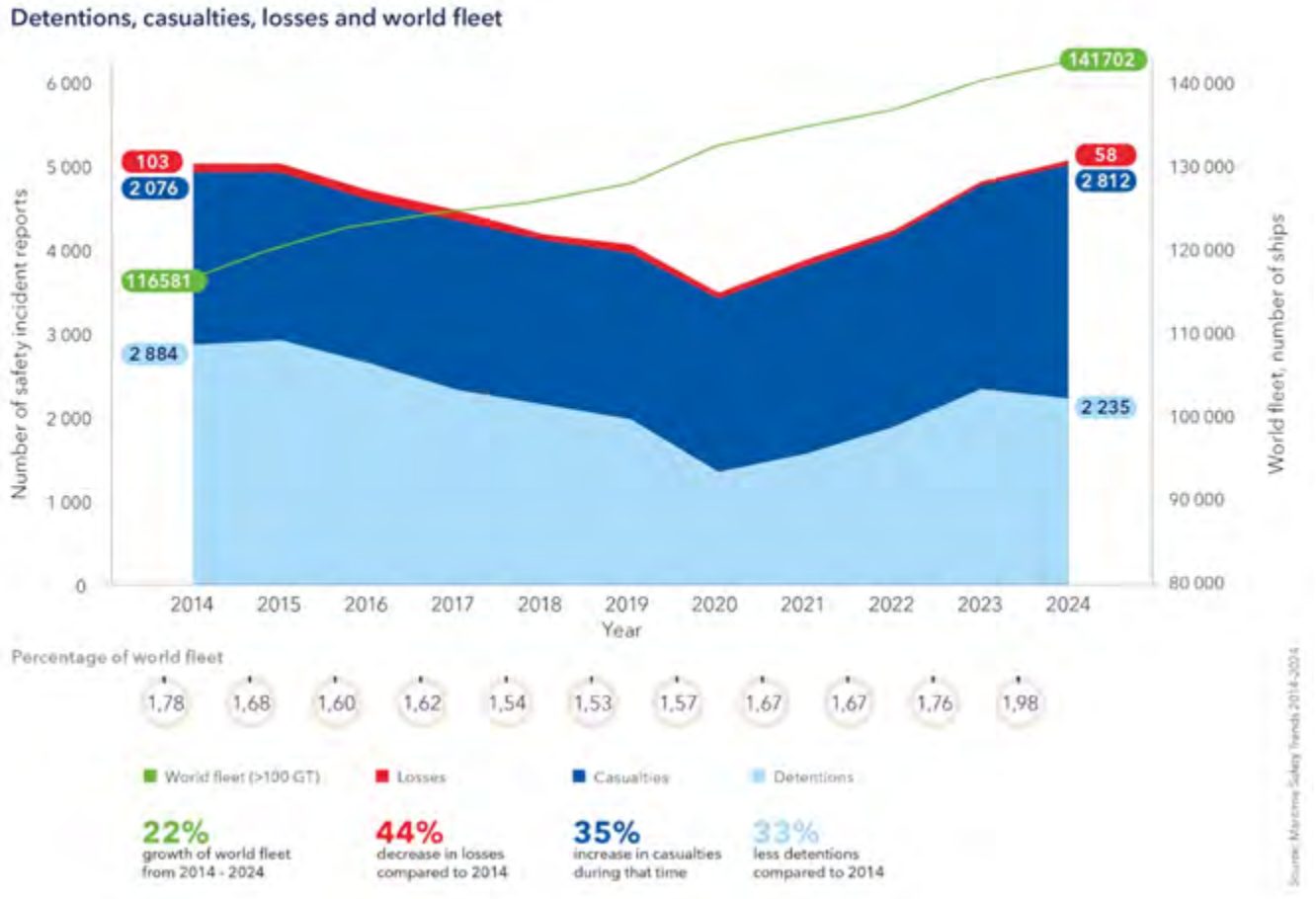
Casualty data, which is sourced from Lloyd's List Intelligence, has been categorised under the following headings: collisions with another vessel, contact with a static object (eg, harbour wall), fire / explosion, foundering (sunk or submerged), hull damage (hole, crack or structural failure), machinery damage or failure (eg, lost rudder, fouled propellor), piracy, war loss or damage during hostilities, and wrecked or stranded (aground).

Continuous increase in machinery failures boosts casualty rate

Machinery damage / failure has traditionally accounted for the largest portion of incidents. However, its share has increased significantly over the course of the past decade. In 2014, this accounted for 38 per cent of all incidents but rose to 60 per cent by 2024.

Machinery damage / failure is also the main driver of the sharp uptick in casualty numbers in 2024, accounting for 80 per cent of incident growth.

While the reasons for these kinds of casualties are wide and varied, some key figures stand out from the statistics. Top of the list is the ageing global fleet. In 2014, 36 per cent of the global fleet was 25 years or older, with a further 7 per cent in the 20 to 24 years age category. In 2024, 44 per cent of the global fleet was over 25 years old, with 9 per cent in the 20 to 24 years age category.



Factors driving the ageing fleet and delayed vessel scrapping

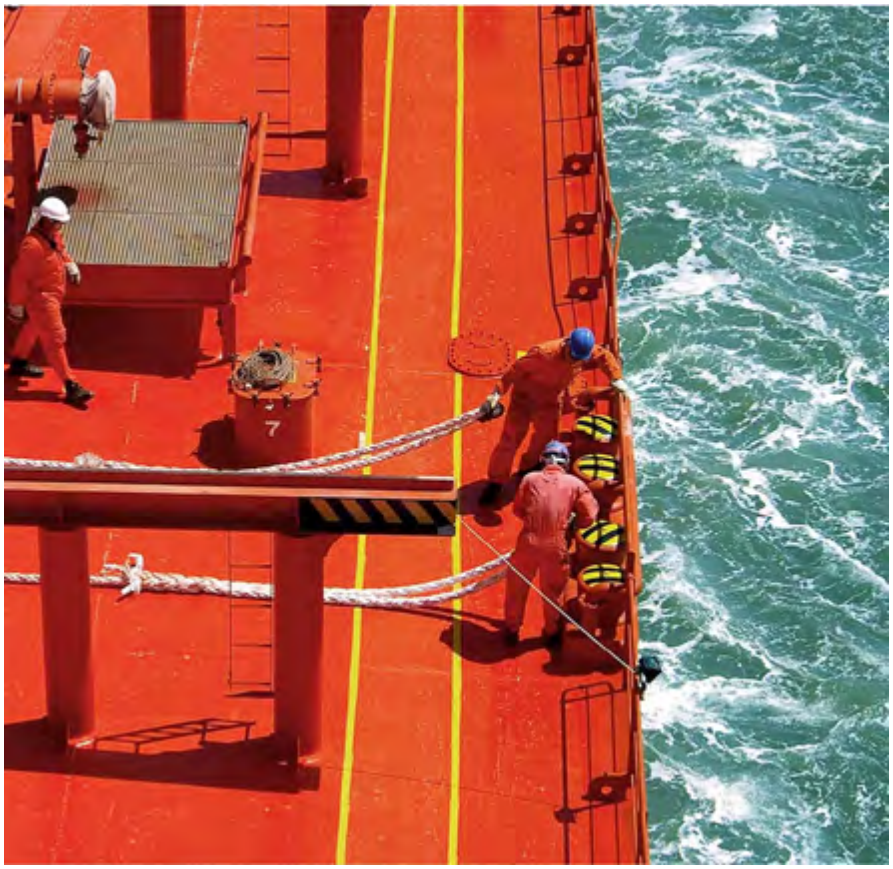
A range of different factors are contributing to the ageing fleet. In recent years, there has been high demand for tonnage, with this translating into sky-high freight rates, particularly in 2024.

Many shipowners are delaying the scrapping of vessels that would normally be decommissioned, opting to profit from these assets instead.

Other factors that are also at play are the new regulations from the International Maritime Organization and European Union on emissions and fuel efficiency. These have made shipowners hesitant to invest in new builds until they are more certain about what new fuels to adopt.

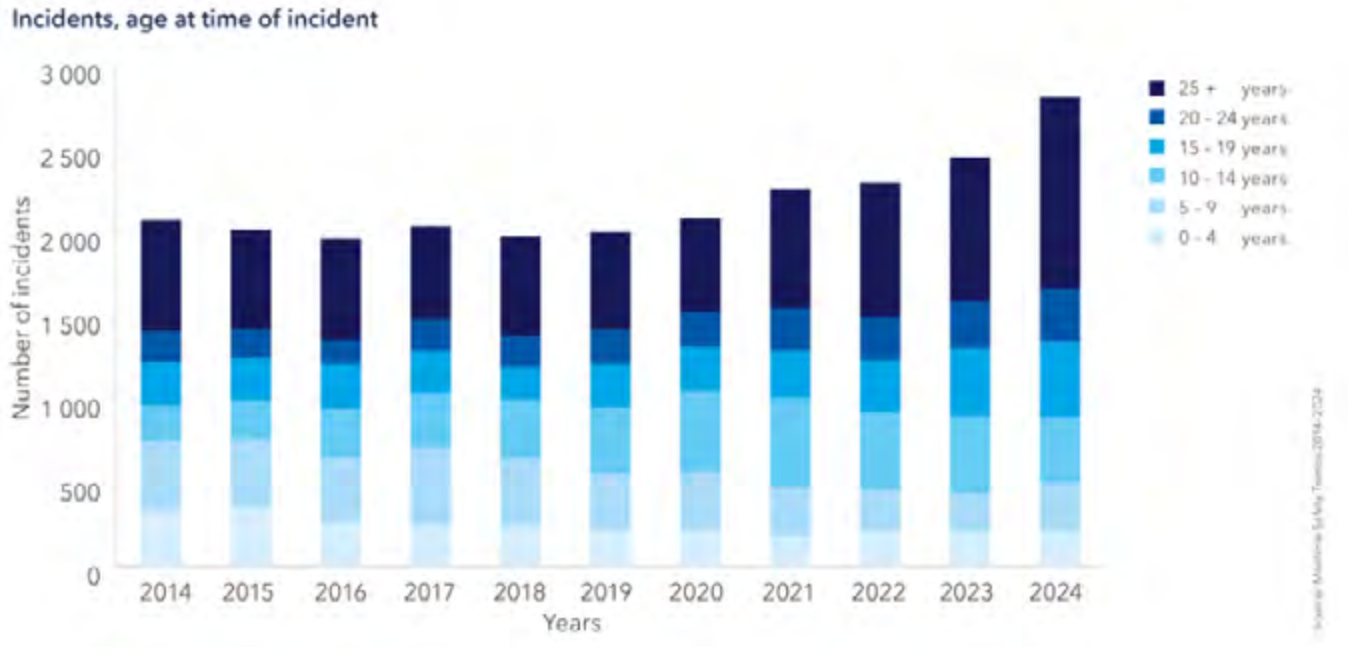
Additionally, space in shipyards is limited and building costs are high, driving shipowners to focus on their existing assets, or else upgrade or retrofit these assets instead of replacing them.

Either way, the ageing global fleet is clearly having an impact on casualty statistics.



Over half (52 per cent) of all incidents in 2024 were attributable to vessels 20 years of age or older, with 41 per cent of incidents for vessels in the 25+ age category. In contrast, 41 per cent of incidents in 2014 came from vessels over 20 years old, with 32 per cent coming from the 25+ age category.

The statistics also show that the growth in incidents in 2024 is mainly being driven by the older portion of the fleet. In real terms, the number of casualties rose by 358 between 2023 and 2024. Some 285 of these incidents came from vessels over 25 years old, representing 80 per cent of all incident growth. Of these, 236



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(83 per cent) were attributable to machinery damage/failure.

For machinery damage / failures, age is an even bigger factor. In 2024, a total of 45 per cent of these kinds came from vessels over 25 years of age, with a further 12 per cent in the 20 to 24 age category. In 2014, the corresponding figures were 39 per cent and 9 per cent, respectively.

The ageing fleet is also a significant factor in the number of hull damages, which increased by 7 per cent to reach 114 incidents in 2024. Some 46 per cent of hull damages were attributable to vessels which were 20 years or older.

While the main way of reversing this trend will be a replacement of the ageing portion of the global fleet with new, modern vessels, some other short-term fixes can be applied. More regular maintenance of vessels, and upgrades to equipment and parts can reduce the risk of casualties for these vessels, helping to prolong their lifespans in a way that is safer for the vessels, their crew, and the surrounding environment.

Urgent need for better fire safety

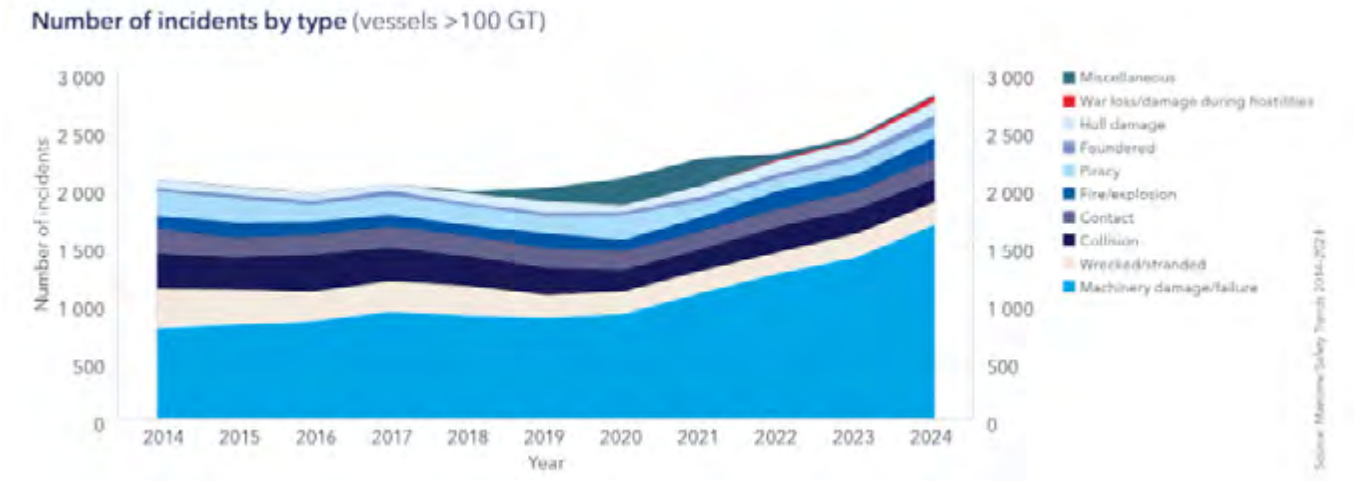
Of equal concern are the numbers of fire / explosions, which increased by 18 per cent in 2024 and by 58 per cent since 2014. As fire and explosions tend to have higher rates of injuries and fatalities, and, with a disproportionately high amount (27 per cent) coming from the passenger / ferry segment, this is a trend that needs to be quickly reversed.

As a matter of high priority, enhanced fire safety measures and emergency response training should be implemented on all vessels where this is deemed to be lacking.

Decline in collision, foundering and piracy incidents but sharp increase in war losses

Putting these trends aside, the safety data does have some more promising stories to tell. Although the number of "accident" casualties – a combination of collisions with another vessel, contact with a static object, foundering and wrecked / stranded – slightly increased in 2024, the overall trend shows that this decreased from a total of 881 in 2014 to 656 in 2024, representing a decline of 26 per cent.

This decline is likely attributable to technological advancements which have seen



significant improvements to navigation systems, digital safety mechanisms, and route and weather planning over the past decade.

Other factors, such as improved vessel design and engineering, stricter safety regulations and data-driven risk management have also contributed.

Casualties involving piracy also fell in 2024, with the overall trend showing a 48 per cent decline in these kinds of incidents between 2014 and 2024. This is largely the result of sustained international cooperation over the past decade, which has led to improved maritime security practices, regional stabilization efforts, and the adoption of best management practices by shipping companies.

In contrast, however, war loss incidents increased with yearly numbers ranging from zero to three until 2021 to 51 in 2024 due to ongoing political conflicts. This underscores the impact of geopolitical instability on maritime safety, highlighting the vulnerability of maritime operations in conflict zones and how this can lead to increased risks for vessels, cargo, and crew.

Machinery-related casualties

The rise in machinery-related casualties cuts across most vessel segments.

General cargo ships accounted for 26 per cent of all incidents, with a 13 per cent increase in machinery failures in 2024.

Passenger / ferry vessels saw a 48 per cent jump in machinery failures and a 29 per cent rise in total casualties, reaching 672.

RoRo/PCTC segment incidents grew 69 per cent, mainly due to an 87 per cent spike in machinery issues.

Bulk carriers saw modest incident growth (2 per cent in 2024), though machinery issues fell 13 per cent, countered by increased fire, hull and piracy incidents.

Container ships had only a 2 per cent increase in incidents, with a 10 per cent drop in machinery failures, though fires and collisions rose.

Tankers were the only segment with a 3 per cent decline in total incidents, despite an 11 per cent rise in machinery issues.

Gas carriers maintained the same number of incidents as 2023, with a 35 per cent drop in machinery failures.

Shipowners and operators urged to take action to mitigate today's and future risks

While there are some glimmers of positivity, the overall trend in maritime safety is unmistakably negative. A steadily ageing fleet is clearly driving an increase in the number of incidents, and it is incumbent on shipowners to mitigate this issue through better maintenance, or other means.

The adoption of new technologies and fuels is also likely to be a growing factor in the years ahead and this should be addressed from an early stage though the implementation of safe vessel designs, profound technical barriers, best practices and comprehensive, continuous training for all crew members.

The maritime industry is in the middle of a period of great transformation. While this offers significant promise, it is also full of uncertainty, and stakeholders across the industry should continue to adopt best practices in ensuring the safety of vessels and crew.

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Øystein Goksøyr
Head of Department Safety, Risk and Systems Advisory

Beyond the Horizon Report on AI

AIMS has covered the impacts and implications of artificial intelligence (AI) at our 2024 conference and over a number of member workshops. Lloyd's Register publication, '*Beyond the Horizon Report*, provides a number of insights relating to the AI boom. The following conclusions and recommendations are noted in pages 24-27 of the report.

1. Start with a specific problem and implement in iterations

When deploying AI technologies, it makes sense to do so in iterations to ensure best risk-management. For example, start by using AI and ML to automate repetitive easy processes, giving people the opportunity to focus on more complex tasks. An easy example is email organisation. Streamline time-consuming processes, then move on to bigger tasks before tackling the seriously complex ones.

Implementing AI solutions incrementally allows for testing and optimisation at each stage. This approach helps to identify potential issues early and make necessary adjustments without disrupting operations. It is important to recognise that AI is a suite of tools and not one specific tool in a toolbox. AI should not be deployed in isolation. It should be combined with other technologies to create the most value.

2. Don't be afraid to embrace AI

While it is essential to manage the risks and remain cautious of AI's capabilities, it is equally important to take the initiative. Do not wait for larger players to act first or delay until more advanced technology becomes available. Embrace the opportunity to be a first mover. Even if a more advanced solution emerges later, you will already have a foundation in place and can continue to build upon it.

3. Consider AI as a stakeholder to foster trust and transparency

One of the challenges with the further growth and adoption of AI is the lack of transparency and trust around its decision-making process. This can generate feelings of unease and limit trust in the technology. One train of thought echoed by AI academics and researchers is that, by engaging with AI like a human stakeholder, barriers to transparency and trust in the technology can be minimised.

This two-way interaction fosters a culture of collaboration and trust, pushing users to embrace the technology rather than disengage with it out of fear. Systems such as AI will only be effective in the long run if users are confident and willing to engage with them. Organisations can further enhance trust in AI by focussing on change management. Sharing knowledge and being transparent about successes and challenges can enhance the value of applying technologies like AI, especially in areas where caution and uncertainty remain.

4. Ensure your AI can rapidly troubleshoot problems

AI must be able to rapidly troubleshoot problems to prevent minor issues from turning into significant failures. This is particularly important in remote operations where rapid detection of machinery issues is necessary to avoid costly vessel downtime.

High-quality data is crucial for accurate detection and diagnosis, ensuring that repairs are targeted and effective.

5. Deploy benefit-tracking to understand the value of AI

AI solutions should incorporate benefit-tracking to help users clearly identify the gains from deployment. Often, the advantages of implementing a particular solution aren't immediately obvious. Benefit-tracking highlights progress and helps assess how and when previous losses occurred in the absence of AI.

6. Consider revenue creation, not just cost

AI is often seen as a tool for cost reduction but Daniel Jacobsen, Vice-President of Artificial Intelligence at Lloyd's Register OneOcean, suggests it should chiefly be viewed as a means to generate revenue – something with no upper limit.

AI can drive revenue growth in various ways, such as offering more accurate insurance models or very accurate predictive maintenance solutions.

Note: You can access a copy of the full report here: https://www.lr.org/en/knowledge/research-reports/2024/beyond-the-horizon/

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Balancing fire protection and environmental stewardship in Australia's maritime industry

FIRE safety is always paramount to effective maritime operations in Australia and across the world, where vessels face diverse fire risks from engine compartments to galley facilities.

The maritime landscape encompasses everything from recreational boats and fishing vessels to commercial ferries, offshore supply ships, cruise liners, cargo carriers and naval craft, which can all be vulnerable to fire hazards that demand serious safety consideration.

For guidance on safety protocols and compliance with fire safety legislation, maritime operators can turn to the Fire Protection Industry (ODS & SGG) Board (FPIB). Operating under the Federal Government's Department of Climate Change, Energy, Environment and Water (DCCEEW), the FPIB establishes standards and recommendations that maintain exceptional fire safety practices across the marine sector.

The Board also oversees the fire protection components of the *Ozone Protection and Synthetic Greenhouse Gas Regulations 1995*, managing permits and licensing for professionals and organisations handling regulated fire suppression agents.

The FPIB has created detailed guidelines for shipboard fire suppression systems whilst ensuring all suppression agents meet federal environmental standards. The maritime industry primarily relies on three scheduled extinguishing agents: FM-200®, FE-227™, and NAF S-III, which serve as effective replacements for the previously used halon. These agents must be sourced from companies holding an Extinguishing Agent Trading Authorisation (EATA) permit issued by the FPIB.

Image courtesy of the Fire Protection Industry (ODS & SGG) Board.

FM-200® provides comparable protection to halon whilst presenting significantly reduced ozone depleting potential (ODP). Halon imports and commercial vessel usage were prohibited in Australia in 1993 due to Montreal Protocol regulations.

This ban stemmed from halon's severe environmental impact – possessing an ozone depletion potential (ODP) of 10, making it 10 times more destructive to atmospheric ozone than baseline measurements, and a global warming potential (GWP) of 6200, rendering it 6,200 times more potent than carbon dioxide in atmospheric warming.

The Board's vessel protection recommendations emphasise several key practices. Vessel builders, operators and owners utilising gaseous fire suppression systems with scheduled extinguishing agents should ensure qualified technicians handle installation and maintenance.

Regular servicing of gaseous fire suppression equipment maintains operational readiness during emergencies, and all personnel working with scheduled extinguishing agents must possess proper licensing, authorisation or permits.

Effective marine gaseous fire suppression systems depend on proper design, installation, commissioning, and ongoing maintenance. Inadequate attention to these elements increases system failure risk during critical moments.

Following these protocols helps ensure compliance with relevant government legislation. While system replacement isn't mandatory, owners should evaluate environmentally friendly alternatives when feasible. Several unregulated extinguishing agents exist, including Novec™ 1230, inert gases and condensed aerosols.

Adhering to the Board recommendations serves dual purposes: protecting personnel, vessels and crew while maintaining regulatory compliance that supports Australia's international commitments to reducing ozone-depleting substances (ODS) and synthetic greenhouse gases (SGGs) under the Montreal Protocol.

Environmental protection

requires strict control over scheduled extinguishing agent discharge (except for actual fire suppression), with federal regulations governing acquisition, possession, handling, storage and disposal of these agents throughout Australia.

The Montreal Protocol, established in 1987, represents an international agreement focused on ozone layer protection through the gradual elimination of ODS production and consumption. While initially targeting substances like chlorofluorocarbons (CFCs) and halons, recent emphasis has expanded to include synthetic greenhouse gases due to their climate change implications.

Scheduled gases within fire suppression systems and extinguishing agents release chlorine and bromine when exposed to intense stratospheric UV radiation. These atmospheric elements destroy ozone molecules, contributing to stratospheric ozone depletion. Preventing these gases from entering the atmosphere and creating ozone-layer damage is essential for averting environmental catastrophe.

Ozone-layer depletion increases UV radiation penetration through the stratosphere. Elevated UV exposure threatens human health through increased skin cancer rates and poses serious environmental consequences across ecosystems.

Environmental stewardship in maritime fire suppression extends beyond mere regulatory compliance; it represents a moral obligation. The shipping industry, particularly cargo and freight operations, significantly influences domestic and global commerce, while bearing responsibility for minimising environmental impact.

By adopting fire suppression systems that avoid ODS or SGG reliance, or eliminating extinguishing agent requirements entirely, the industry demonstrates commitment to sustainable practices and safety whilst supporting Montreal Protocol objectives.

Australia's role in upholding international obligations and providing global leadership remains crucial. The maritime sector contributes through proper maintenance and disposal of existing systems containing ODS and SGGs.

By integrating safety and sustainability measures through appropriate licensing, training and maintenance protocols, the maritime industry can address future challenges while generating positive impacts for both the sector and the environment.

Fire Protection Industry (ODS & SGG) Board

Tail shaft surveys – what keeps a ship's propulsion system running smoothly

LET'S talk about something that doesn't always get the spotlight - but plays a massive role in keeping your ship moving safely and efficiently: the tail shaft.

A tail shaft survey is like a health check-up for the propulsion system – done regularly to make sure everything is working as it should, and to catch any signs of wear, corrosion or fatigue before they become serious.

1. So what actually happens during a tail shaft survey?

Depending on the type of system and risk level, the survey may involve:

- ❏ non-destructive testing (NDT) of the shaft and propeller;
- ❏ measuring bearing wear and clearances of the tail shaft and bearing assembly; and
- ❏ visual checks or even full dismantling of key components.

2. What determines the type and timing of the survey?

The type and timing of the survey Sdepends on things like:

- ❏ how the propeller is connected to the shaft (flanged, keyed or keyless);
- ❏ the type of lubrication system for the tail shaft (oil, seawater, or freshwater closed loop);
- ❏ what material the shaft is made of (mild steel or stainless steel); and
- ❏ whether the shaft is protected against corrosion by a protective sleeve placed over the tail shaft.

All of this info is recorded in the vessel's Class survey status report and forms the basis for the next inspection.

3. Shaft materials – what you should know

Mild steel (MS) shafts are most common but corrode easily in sea water, so they must be protected by a sleeve.

Stainless steel (SS) sounds ideal but some grades (like 304) can still corrode in saltwater if not protected properly.

Moral of the story: even stainless-steel shafts sometimes need backup protection.

4. How protected is your shaft?

For mild steel shafts, protection levels are classified into five categories.

Shafts with no liners, or non-continuous liners, or not fitted with an approved lubricating box. These shafts are considered not protected.

Shafts lubricated by sea water but fitted with continuous bronze or stainless steel liners.

Shafts lubricated by sea water, with non-continuous liners but approved watertight protection between the liners (eg, GRP) and an approved lubricating box.

Shafts lubricated by oil and with approved watertight seal glands in way of the fore and aft passages of the shaft in the stern tube. The shaft is protected by a suitable system between the propeller boss and the aft sealing system. (The most modern applications uses the liner of the aft seal to protect the shaft.)

Shaft lubricated by means of fresh water in a closed loop and with approved watertight seal glands to prevent sea water ingress in lubricating system.

5. Survey methods for oil-lubricated shafts (the most common type)

Surveys are due every five years and you can choose from three methods based on the condition of the system.

Method 1 – Full Inspection.

This is the most thorough option:

- ❏ shaft is removed;
- ❏ full internal checks and NDT; and
- ❏ usually done in drydock.

Method 2 – Partial Inspection.

In a partial inspection:

- ❏propeller is removed, shaft stays in place;
- ❏aft end is inspected, and NDT is done if needed; and
- ❏only suitable for oil or freshwater systems.
- ❏Method 3 – External Check.

In an external check:

- ❏no removal of shaft or propeller;
- ❏visual inspection + wear measurements + oil analysis;
- ❏can be done afloat (if safely trimmed); and
- ❏not allowed for keyed shaft connections.

If surveyors find anything concerning, they may escalate from Method 3 to Method 2 or 1.

6. Freshwater-lubricated shafts

These closed-loop systems are quite efficient – as long as the water's pH stays above 10. The survey methods are similar to oil systems but every 15 years a full dismantling (Method 1) is required.

7. Seawater-lubricated shafts

This setup always requires Method 4, which involves complete shaft withdrawal – no shortcuts.

Survey frequency is every three to five years, depending on:

- ❏whether the ship has one or multiple shafts;
- ❏the corrosion protection in place; and
- ❏where the ship operates (freshwater vs seawater).

8. What about other propulsion systems?

Vessels must be surveyed at least every five years, or more frequently based on hours of use or manufacturer guidelines, if they are using:

- ❏azimuth thrusters;
- ❏vertical propellers; and
- ❏water jets.

9. Final thoughts

Tail shaft surveys might sound routine but they are vital for keeping ships in class and out of trouble. Understanding the what, when and how of these surveys can help you plan better, save on drydock time and avoid nasty surprises.

For a ship manager, technical superintendent or marine surveyor, having a solid grip on tail shaft inspection requirements makes a huge difference in operational reliability and safety.

Kalyan Das
ISM-ISPS & Service Supplier Auditor, Marine Surveyor, MLC Inspector at RINA and AIMS member

Let's talk about keels

"Let's talk about keels. That is always a sure way to get someone's knickers in a twist" – Bob Perry, Yacht Designer

LET'S look at the design of the keel for a yacht. The keel is a part of the global design cycle of the yacht. A yacht keel performs four functions.

Develops lateral water force to resist lateral aerodynamic force from sails and superstructure.

Provides physical housing of ballast load as low as possible.

Provides roll-damping to resist energy inputs from waves and disturbed water.

Contributes to directional stability.

On a cruising boat, the keel should support the weight of the boat when hauled out.

Aspects which define the keel dimensions are:

- ❏ design type and mission
- ❏ righting moment
- ❏ maximum draft;
- ❏ position; and
- ❏ material.

1. Traditional keel shapes

"Go ahead and love your crab crusher full keel boat but don't try to justify the design on technical terms. Some traditional full keel designs have a lot of subjective, aesthetic appeal. That's good enough reason to love your boat." – Bob Perry, Yacht Designer

Evolution of Keel Shapes

Traditionally, keels many decades ago were full keels and built as part of the hull (Figure 1). Full keels, by definition, run 50 per cent f the length of the hull. The main advantage of a full keel for a cruising yacht is that the keel imparts very good directional stability. Set a course and a well-designed, full keeled yacht will hold that course.

At anchor, full keeled yachts tend to be more stable, and do not yaw and veer with normal variability in wind direction. Full keels also impart strength, advantageous if you run aground. The basic full-keel shape had the longest run, as it was the standard for blue-water sailing craft from pre-Roman times to the earliest days of yachting.

In 1891, *Dilemma* – one of the American designer Nathanael Greene Herreshoff's most brilliant designs – was launched. It was the first true modern fin keel yacht deserving of this name and with it, Nathanael Greene Herreshoff revolutionised the science of naval architecture.

Dilemma sailed round the world and inspired some audacious copies, including the enormous 1893 America's Cup defender candidates, the 25.9-metre *Jubilee* and *Pilgrim*.

The deep, full keel was supplemented in the mid-1800s, for the shoalwater areas of Britain and North America, by centreboard craft. These cover such working types as the sharpies, Cape Cod catboats, and Chesapeake Bay oyster skiffs, to mention a few.

Until the late 1920s, the typical offshore yacht, whether cruiser or ocean racer, resembled a sailing fishing craft in the shape of its lateral plane: a long, full keel with deep forefoot and fairly vertical sternpost.

Such a shape has the benefits of good directional stability, ease of steering and the ability to heave to in heavy weather, all desirable traits for a boat. However, its faults may include slowness in stays, excess wetted surface making it slower in all types of air and an inefficient lateral plane shape that has excess leeway, considering its relatively large area.

After the transition to steel hulls, the shape remained the same from late 1800s to the 1920s.

Significant development of appendages (keel and rudder) has taken place over the past 50 years.

At first, in the wooden construction period, the long and integrated keels with the rudder hung at the aft end were the fashion. The layout was partially dictated by the possibilities and restrictions imposed by the available materials and methods of construction at that time.

The ballast weight was connected to the forward bottom part of the keel and usually constructed of lead or cast iron. The keel was an integral part of the hull and was faired into the hull, a trend inherited from the older designs.

Designers started to use more V-shaped sections in the hull to generate side force, driving further development of the hull shape evolution at that time. However, the keel was not considered as a wing.

The cutaway keel was revived for ocean racing by Olin Stephens in the late 1920s, with his elegant yawl, *Dorade*, which was still sailing and winning classic yacht races more than 70 years after her launching.

Her offshore racing successes finally proved that the full keel was not essential to seaworthiness, and it definitely detracted from speed and weatherliness. As a result of its improved performance and handiness, the "modified full keel" form caught on quickly.

After the Second World War, the keel and the rudder became more separated. Both keel and rudder were treated as lift generating wings and so the plan form and section shape evolved to reflect that.

2. Evolution

The shape of keels has evolved as a step-wise evolution from the traditional full keel to the modern fin keel with numerous variations driving the evolution (Figure 2).

Evolution encompassed the stepwise cutaway of the full keel and associated adaptation.

Ted Brewer developed a modified full keel, with the rudder set aft and vertically in the contemporary fashion, in order to improve directional stability and handiness. Then, to reduce wetted area, the lateral plane is substantially cut away ahead of the rudder in what some have termed "the Brewer bite" to create the "Full keel with Brewer Bite" variant (Figure 2 and Figure 3).

Regarding the "Brewer Bite", designer Ted Brewer indicated: "The size of the cutout depended to a large degree on how insistent my client was on having a 'full keel', and I tried to make the cutout as large as I could decently get away with. I don't claim to have originated the shape, though, as the late L. Francis Herreshoff used a not dissimilar profile many years earlier in the design of the lovely 57-foot ketch, *Bounty*."

Figure 1: Modified Full Keel. *(Source: picture by the author.)*

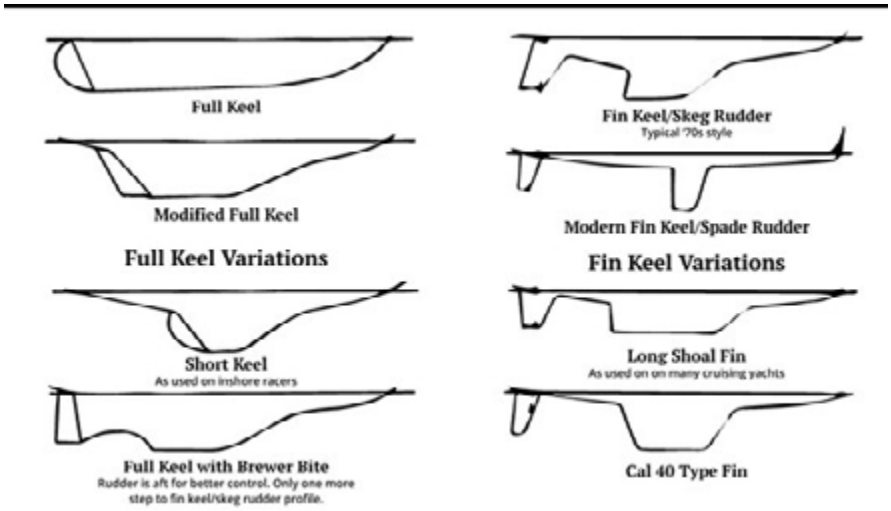


Figure 2: Keel shapes and their evolution. *(Source: Original diagram by Ted Brewer used with permission from Good Old Boat Magazine (Sailrite).)*

Full to fin keels evolution was continued by others, including C&C on their designs, including the C&C Landfall 39 (Figure 4).

Swept-back fin keels were popular before the leading edges of keels became more vertical.

As George Cuthbertson of C&C indicated: "One of the primary objectives going away from the full keel was reducing wetted surface. If you look at a design of ours from that era and look at what immediately preceded, there was no difference. We just removed a lot of wetted surface; the leading edge didn't change at all. Look at the C&C 43. We didn't change the forefoot, just took all this [deadwood] away (simply 'removed' a triangular aft section of keel) that gave the impression of swept back." (Figure 5).

The cross-over point to the modern keel is the fin keel and its variants. Modern keel options will outperform a full keel on just about every point of sail.

3. Modern keel shapes

The fin keel has superior performance in low wind speeds because of its smaller wetted surface and larger chord length and is the most common keel type on today's modern cruising yachts.

However, the disadvantage is that a bulb keel usually has a lower lift to drag.

Fin keel variants are fins with bulbs and these variants include:

- ❏ T-bulb (Figure 6);
- ❏ L-bulb (Figure 7); and
- ❏ Integrated L-Bulb (Figure 8).

Fin keels with bulbs are used for cruising and racing. However,

the disadvantage is that a bulb keel usually has a

lower lift to drag.

Cruising: Typically for shoal draft applications (Figure 9).

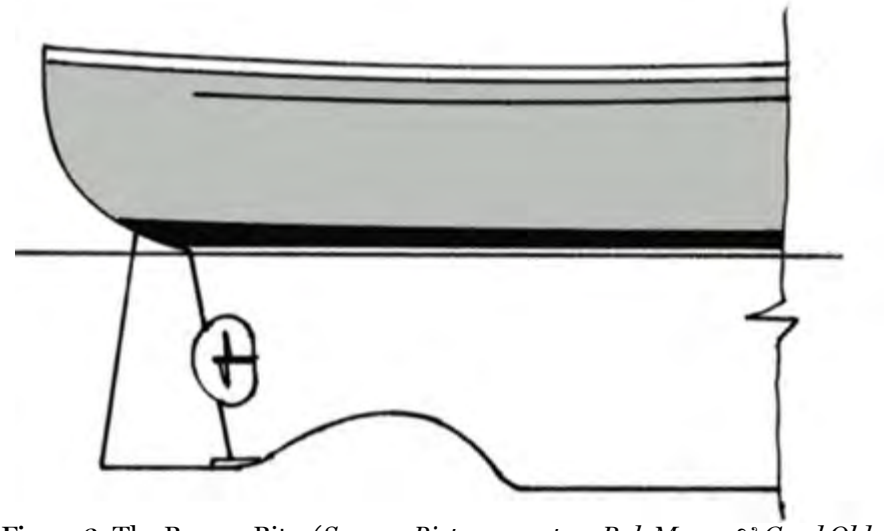


Figure 3: The Brewer Bite. (*Source: Picture courtesy Rob Mazza & Good Old Boat Magazine (Sailrite) used with permission.)*

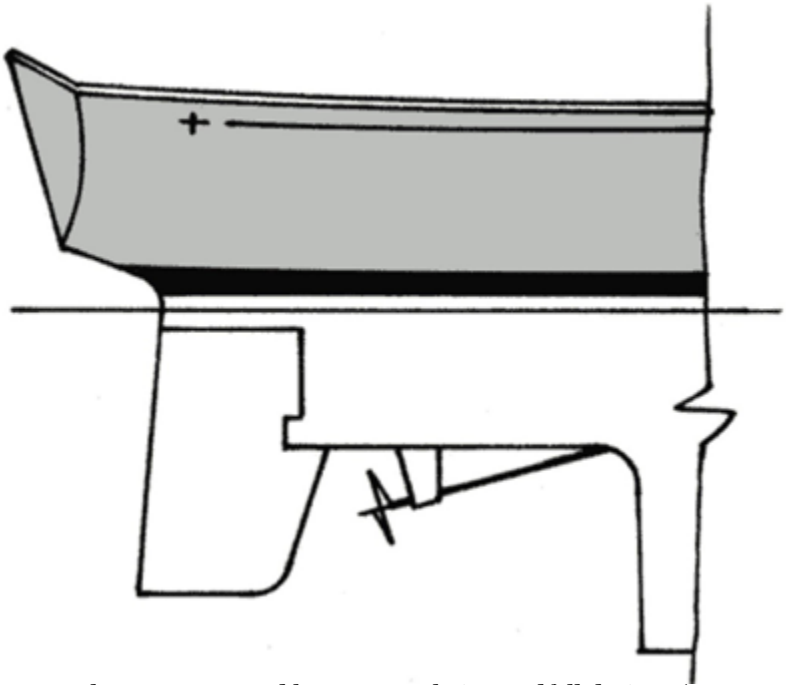


Figure 4: Keel cutaway as used by C&C on their Landfall design. *(Source: Picture courtesy Rob Mazza & Good Old Boat Magazine (Sailrite) used with permission.)*

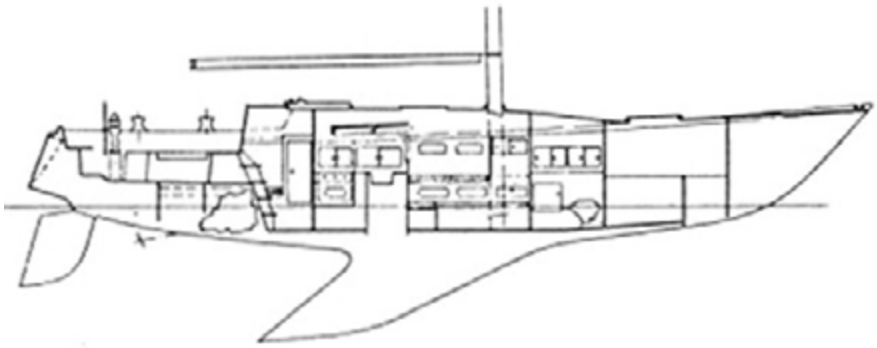


Figure 5: C&C 43-1 with swept back keel. *(Source: by Ken Heaton – Own work, CC BY-SA 4.0,* https://commons.wikimedia.org/w/index.php?curid=75548175)

Racing: Typically, long slender fin with ballast concentrated in the bulb (Figure 6).

During the evolution, initially just the lower section of the keel was thickened. Later a bulb-shaped extension at the lower end which in some cases exceed the chord length at the tip appeared. The Sheel Keel named after its inventor, Henry Scheel, patented in 1974, represents the extreme case of a keel with thickened lower section.

Cruising yacht applications

Bulbs are used on today's modern cruising yachts in an attempt to produce a very shoal-draft yacht for use in shallow waters where they make sense. For shoal draft applications, less draft means more weight to achieve the same stability.

To lower the centre of gravity of the ballast as much as possible, a bulb placed at the bottom end of the keel. For deeper draft cruising yachts, L-bulb and Integrated L-bulb are the most practical, as they are less likely to be fouled by debris or fishing nets.

4. Racing yacht applications

For racing craft, the advantage with a bulb keel instead of a fin keel is that it has a significant lower vertical centre of gravity and typically long narrow fins with bulbs are used. This lowers the centre of gravity of the ballast as much as possible and increases stability. T-bulb, L-bulb and Integrated L-Bulb keels are used.

The keel is always placed so that the forces on the yacht are in balance regarding both heel and trim. The benefit with the T-keel in comparison with the L-bulb keel and the integrated L-bulb keel is that the fin and the bulb can be placed independently.

Research has confirmed that the T-bulbed keel performs best of the bulbed keels, and also better than the fin keel in higher wind speeds.

Figure 6: Racing yacht with T-Bulb keel on narrow fin. *(Source: picture by the author.)*

Figure 7: L-Bulb keel on racing yacht. *(Source: picture by the author.)*

Figure 8: Integrated L-Bulb Keel. *(Source: picture by the author.)*

5. Canting keels

The invention and use of canting keels has been the largest single contributor to the increased performance in ocean going monohull yachts.

Canting keels are a specific form of keel and are a complex subject to be covered in a separate article.

A conventional yacht keel performs four functions:

- ❏ develops lateral water force to resist lateral aerodynamic force from sails and superstructure;
- ❏ provides physical housing of ballast load as low as possible;
- ❏ provides roll-damping to resist energy inputs from waves and disturbed water; and
- ❏ contributes to directional stability.

By contrast, a canting keel only provides a small part of what is required by items 1 and 4; consequently, a canting keel configuration must be augment by daggerboards.

6. Materials for the keels

When the keel is an integral part of the hull, the material of choice was the same as for the hull – ie, wood – and only the ballast part of the keel was fabricated from either lead or cast iron. In the transition from wood to newer hull construction materials for yachts, such as steel, aluminium alloy and (glass) fibre reinforced polyester, also new construction material for the appendages were used.

In steel and aluminium alloy hulls, the keels are often constructed of the same material as the hull and the ballast is fabricated from either lead or cast iron.

In the transition from wood to newer hull construction materials for yachts, such as steel, aluminium alloy and GRP, the new construction material for the appendages were used.

Keel Type	Pros	Cons
Full keel (and modified full keels)	Good downwind performance and tracking. Rudder and prop protection	Tend to be slower and have a lot of wetted area/drag. Often don't point well. Difficult to back-up under power.
Fin Keel (and variants like bulb keels and wing keels)	The most effective keel for driving a boat to weather with minimal drag off the wind. Wide variety of types for many needs.	Vulnerable to groundings. Rudder/ prop is unprotected. Some deep draft versions limit sailing locations. Keel bolts require inspection / maintenance.

In steel and aluminium alloy hulls, the keels were often made of the same material as the hull and the ballast was poured in from the outside after finishing of the hull. This implied that usually lead was used.

In more modern hulls constructed from steel and aluminium, the keels are made from the same materials, which are welded to and are an integral part of the hull.

The choice of materials for the keels, both when the keel is a separate appendage and when it is structurally independent, is influenced by several considerations:

- ❏ the structural requirements of the separate fin;
- ❏ its connection to the hull; and
- ❏ the specific weight density of the materials used the cost involved.

Two materials dominate the field: lead; and cast iron.

Lead has the higher specific weight density of the materials allowed. It comes close to 11 tons per cubic meter, depending on its purity but is quite expensive. To enhance strength, 4per cent of its weight has to be added as antimony to the pure lead. Typically, lead is used in the more performance-orientated designs. When using lead, health and environmental precautions must be taken during melting and pouring and these increase to the cost.

Cast iron has a specific weight density of around 7.8 tons per cubic meter but is structurally sound on its own. It is much cheaper, both in acquisition and in manufacturing. With cast iron, casting is a much more common practice and less hazardous. Typical application of the cast iron keel is therefore in the cheaper series production boat market, though cast-iron keels are often affected by corrosion.

World Sailing does not allow the use of materials for ballast with a higher specific weight density then lead. The yacht *Pen Duick VI* (Eric Tabarly) had a keel made up of ingots of spent (depleted) uranium, a material which is approximately 60 per cent heavier than the same volume of lead.

The IYRU (forerunner of World Sailing) subsequently banned the substance, without grandfathering *Pen Duick's* keel. She was therefore unable to compete in the 1977-78 Whitbread, despite having entered provisionally.

"There is no simple means to know what performance might have been had the appendages been done correctly. Motor-sailing speeds might increase one-half knot, and sailing upwind might be better by a boat length or two every couple of miles sailed. The upwind or offwind broaching caused by a stalled rudder with a highly swept leading edge and stock might never have occurred. But these limitations are not readily observed or recognized" – David Vacanti (Vacanti Yacht Design)

Figure 9: Shoal draft keel application using bulb. *(Source: picture by the author.)*

Resources

Vacanti Yacht Design - https://vacantisw.com/

Good Old Boats Magazine - https://goodoldboat.com/

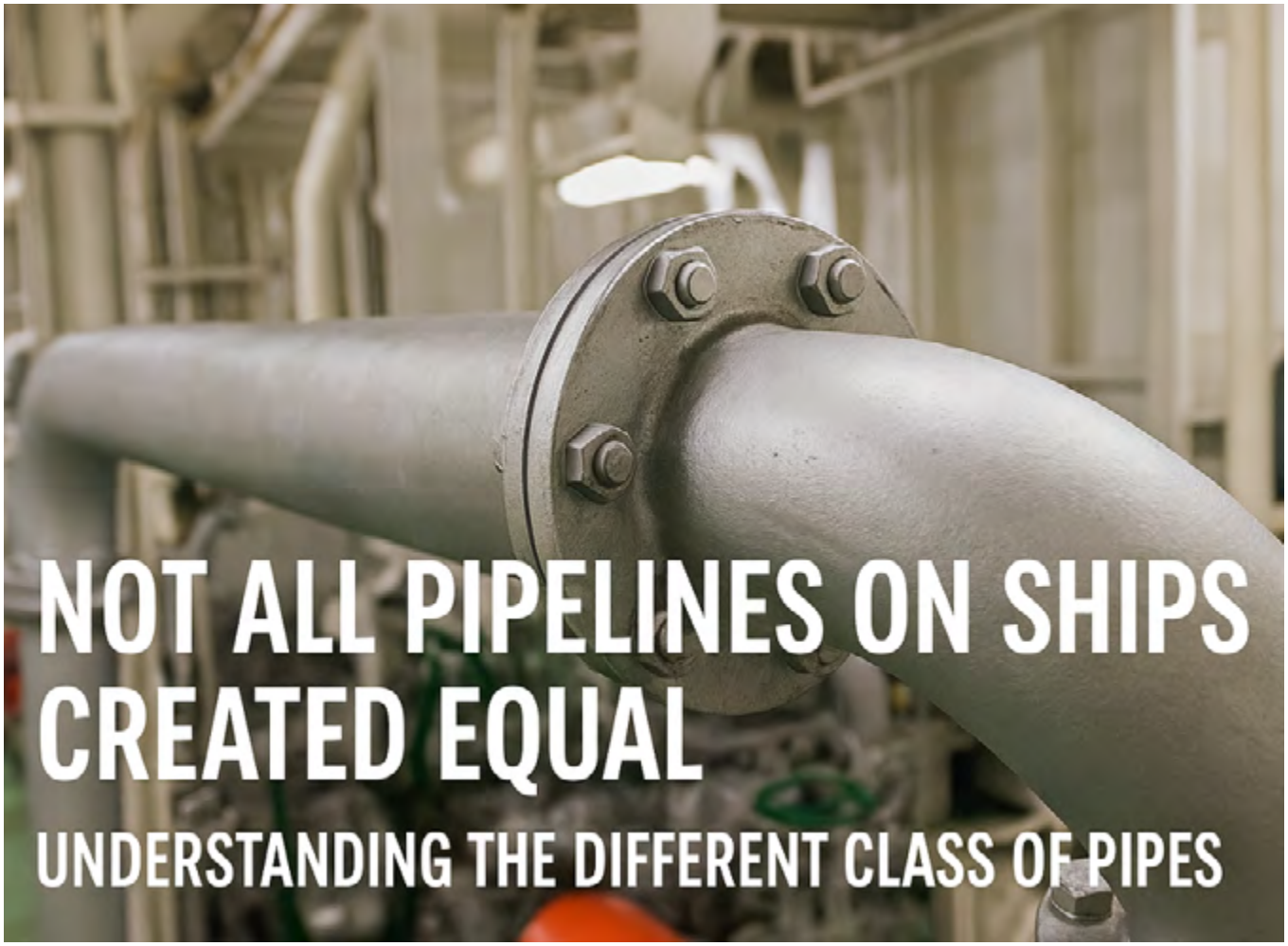
Sailrite - https://www.sailrite.com/

Ted Brewer – https://www.tedbrewer.com/

C&C Yachts Ltd – https://www.ghcarchives.com/the-yachts

Robert H Perry Yacht Designers - http://www.perryboat.com/

Nick Parkyn
Marine Surveyor / Director,
Nick Parkyn Consulting & Design Pty Ltd



NOT ALL PIPELINES ON SHIPS CREATED EQUAL

UNDERSTANDING THE DIFFERENT CLASS OF PIPES

"WHY do some pipes need class approval and others don't?"

If I had a dollar for every time I was asked this question — I'd probably have enough for a decent lunch!

It's a fair question and one I hear often, especially during drydock surveys or emergency pipe repairs.

So, I thought I'd put together an answer. Because, when it comes to piping systems on ships, not all pipes are created equal — and understanding why can save you time and money, and a lot of back-and-forth with class.

Let's talk about how pipes are classified by most classification societies — into Class I, II, and III — and what that means in real-world ship operations.

Class I pipes – the high-risk systems

These are the critical lines where failure isn't just inconvenient, it's dangerous. Think:

- fuel oil;
- lube oil;
- high-pressure steam;
- compressed air; and
- toxic or flammable media.

Pressure and temperature criteria:

- pressure above 16 bar; and
- temperature above 300°C or below -10°C.

Because of the risk involved, these pipes require the most stringent controls.

Materials and fabrication:

- seamless carbon steel or stainless steel (welded pipes are avoided to reduce failure points); and
- in special cases: Cu Ni or duplex steel, depending on media.

Repairs:

- must be carried out by a class-certified welder;
- require approved WPS (Welding Procedure Specification);
- NDT (usually UT or RT) on welds;
- hydrostatic pressure testing is mandatory; and
- class attendance is essential.

Bottom line: if it carries something hot, flammable, toxic or under high pressure — it's Class I. Handle it accordingly.

Class II pipes – medium-risk but no less important

These pipes carry things like:

- cooling water (jacket water);
- bilge and ballast;
- low-pressure steam; and
- condensate return

Pressure and temperature range:

- 7 to 16 bar; and

- up to 300°C

Materials and Fabrication:

- usually welded carbon steel, sometimes seamless in high-vibration areas

Repairs:

- class involvement may be required, depending on location and extent;
- welds often require Dye Penetrant (DPT) or Magnetic Particle Testing (MPT);
- pressure testing generally expected after repair; and
- class approval may be needed for pipe specs and replacement materials

These aren't always life-threatening but they're still essential systems – and a flooded bilge or failed cooler line can ruin your day.

Class III pipes – low-risk and low-pressure

These are your general service lines:

- fresh water;
- vents;
- drains; and
- sanitary discharge

Pressure and temperature limits:

- under 7 bar; and
- below 60°C.
- Materials and fabrication:
- welded mild steel, galvanized steel, or even PVC or Cu Ni in some cases; and
- welded pipes are typical here due to lower stress exposure.

Repairs:

- in most cases, no need for class attendance;
- visual inspection is sufficient; and
- NDT not required unless specified by the surveyor

These are your "routine" pipes but don't let routine lead to complacency. A failed vent or freshwater line can still cause problems.

Takeaway

So, what's the takeaway?

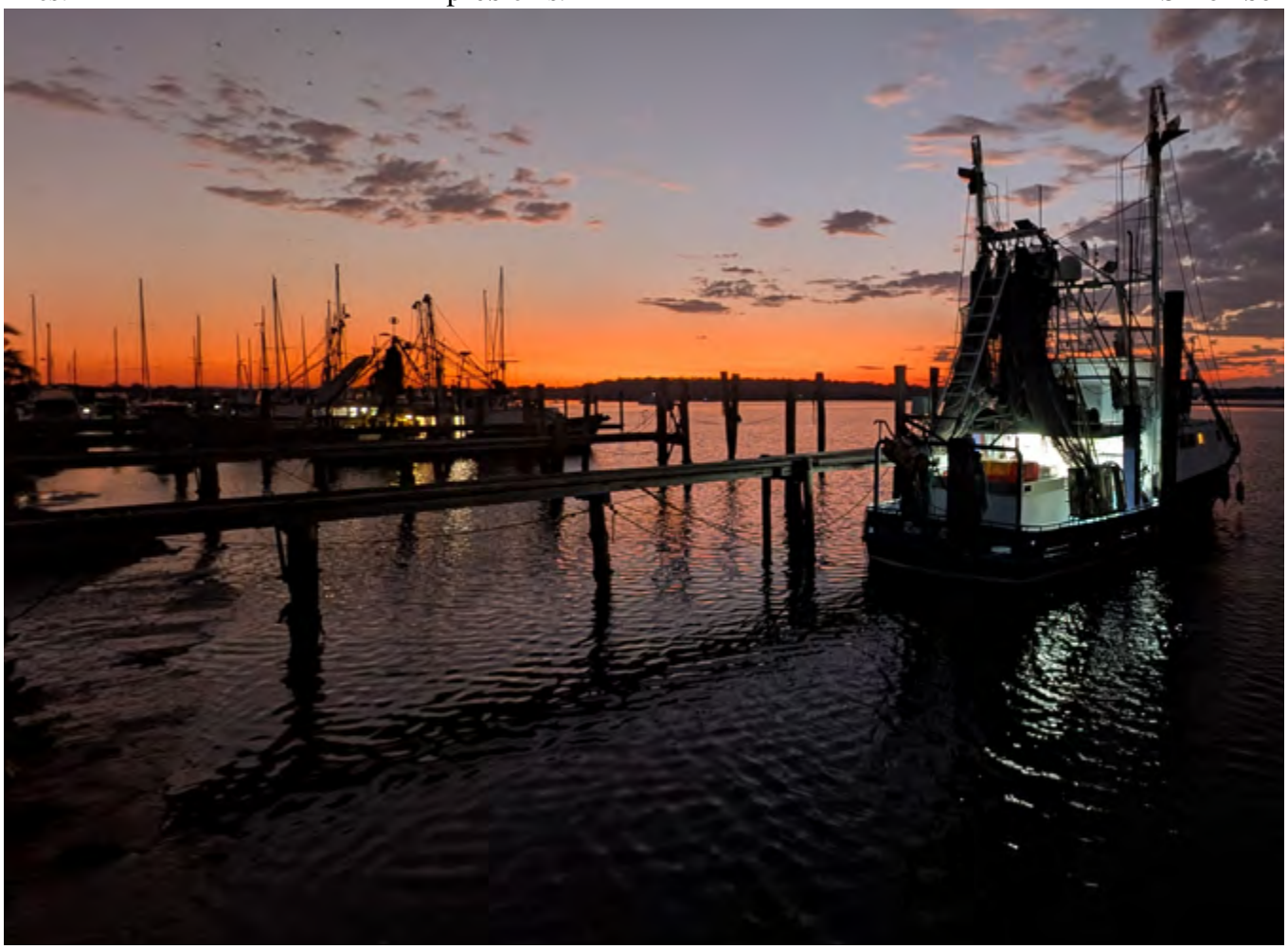
The moment I'm called to attend a pipe repair or renewal, the first question I ask is: "What class is this pipe?"

Because that determines:

- the material and specs you're allowed to use;
- the inspection and NDT requirements;
- whether you need class-certified welders; and
- whether the work needs to be witnessed by class.

Getting this right early avoids delays, unnecessary rework and. most importantly, ensures the repair is safe and compliant.

Kalyan Das
ISM-ISPS & Service Supplier Auditor, Marine Surveyor, MLC Inspector at RINA and AIMS member



Your ship, is our ship.

You keep our world moving, we keep you in business.

Shipping is the lifeblood of our country and it's our job to keep you working safely and hassle free. Trusted. Experienced. Certified Commercial Marine Surveyors™.

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AUSTRALASIAN INSTITUTE OF MARINE SURVEYORS

Revolutionising draft surveys: DRFT MRKS app now available for free download

MARINE surveyors now have access to a powerful new tool that is set to transform the draft surveying process: DRFT MRKS, a breakthrough smartphone app developed by UK maritime technology specialist Tymor Marine.

Recently launched on the Apple App Store and Google Play, the basic app is now available to download free of charge.

Powered by advanced AI and Deep Learning, DRFT MRKS delivers accurate and verifiable draft readings from smartphone video in as little as three minutes. It provides a consistent, verified digital record that reduces discrepancies, enhances operational efficiency and ensures full audit traceability.

Survey data and videos are securely stored in the app, offering an accessible, single source of truth for vessel operators, cargo owners, terminals, and insurers.

1. A new chapter in draft surveying: speed, accuracy and safety

For centuries, draft surveys have relied on manual observation – a subjective and error-prone process dependent on individual judgment – experience and, when used, accurate gauge recalibration.

While essential for calculating vessel displacement and cargo weight, traditional draft surveying methods have often resulted in costly discrepancies, legal disputes, and operational delays.

Even slight misreadings of just a few centimetres can lead to significant financial consequences. In bulk shipping, for example, 63 per cent of cargo shortage claims for grain are linked to draft reading discrepancies, with each claim averaging $35,000, according to a 2023 report by The Swedish Club.

"With DRFT MRKS, we've completely reimagined the draft survey process," said Kevin Moran, Managing Director of Tymor. "By replacing guesswork with expert-trained AI, we provide more accurate readings every time – reducing human error and potentially saving the industry millions of dollars annually."

2. AI-powered precision, verifiable results

DRFT MRKS uses AI-driven algorithms to interpret video footage of draft marks, delivering accurate, repeatable results regardless of environmental challenges.

Common obstacles such as rusted markings, marine growth, wave swell, and poor visibility are mitigated through AI and Deep Learning backed analysis, removing subjectivity from the process entirely.

In addition to improved accuracy, the app's secure digital storage allows stakeholders to retain a verifiable, time-stamped record, providing clarity in case of disputes and reducing administrative overhead.

The free basic version of the app offers draft readings with convenient smartphone access to the last 10 analysed videos.

For users seeking deeper insights, a subscription service provides enhanced analysis capabilities along with complete access to the full library of original and processed videos.

The technology also improves health and safety for surveyors by enabling data collection from safer distances via handheld devices or drones, eliminating the need for close-proximity manual readings.

3. Beyond cargo vessels: versatility across marine operations

While developed for cargo vessels, DRFT MRKS is equally suited to a broad range of maritime applications, including:

- ❏ semi-submersible vessel operations;
- ❏ wave height, period and energy for access and monitoring at offshore windfarms;
- ❏ tide monitoring;
- ❏ reservoir and water level assessment;
- ❏ river flood risk monitoring; and
- ❏ salvage operations.

This versatility makes the app an essential tool not just for marine surveyors but also for naval architects, port operators and environmental teams.

4. Tymor's path to innovation

DRFT MRKS originated from Tymor's internal need to improve efficiency and accuracy in its own naval architecture and marine services projects.

With support from Scottish Enterprise, the University of Edinburgh and CENSIS (Scotland's innovation centre for digitalisation and advanced enabling technologies), the team fine-tuned the app's Deep Learning algorithms to perform reliably in the harshest maritime conditions.

Technical specifications

- Compatible with iOS 12+ and Android 8+

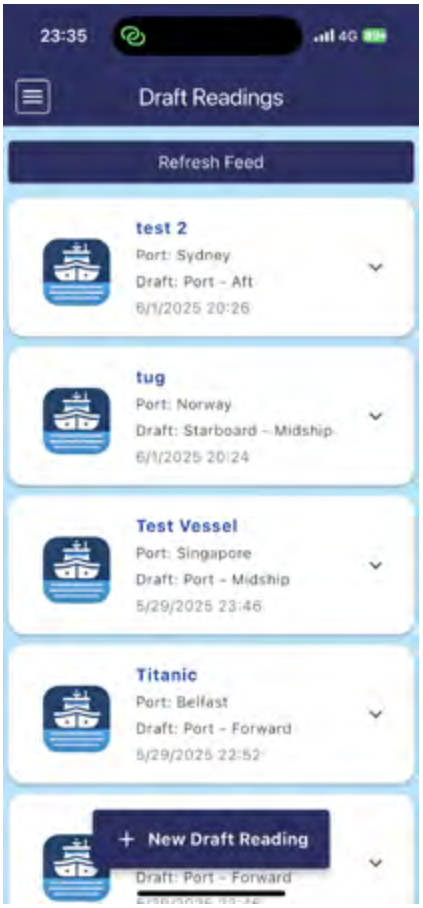
- AI-powered video analysis using Deep Learning.
- Secure storage of surveys and associated video records.
- Compatible with both handheld and drone video capture.

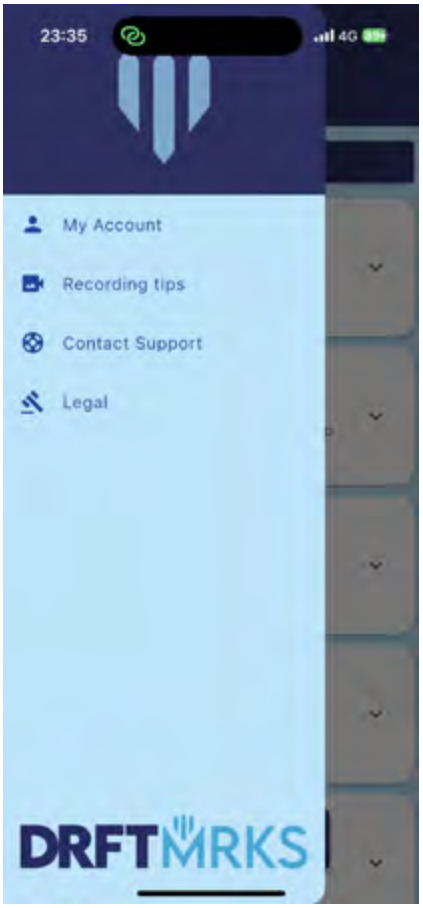
5. Available now

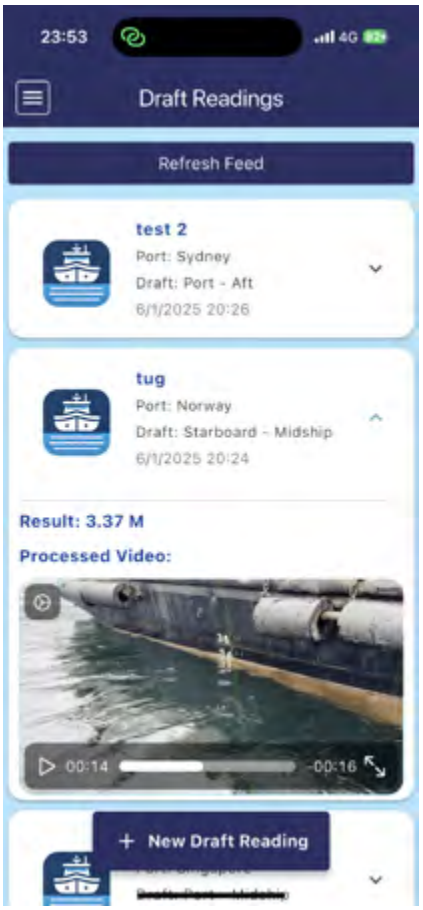
With intuitive design and proven real-world application, DRFT MRKS is an essential addition to every marine surveyor's professional toolkit.

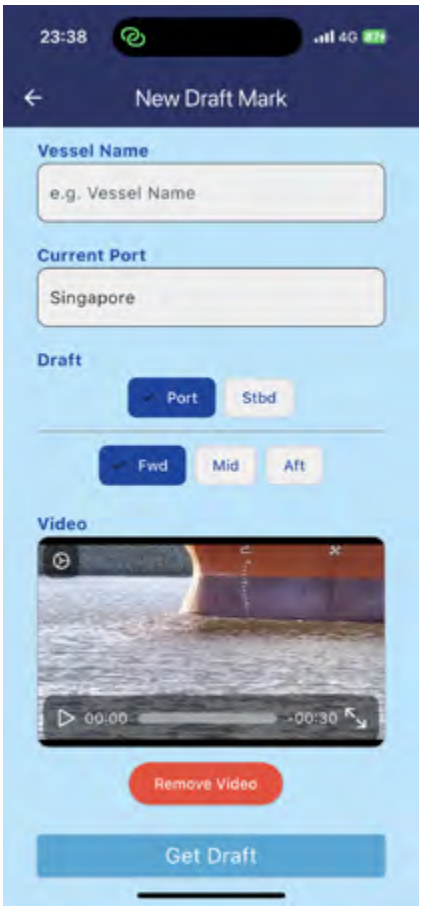
To help users maximise the platform's capabilities, Tymor has created a comprehensive series of tutorial videos available on their YouTube channel, demonstrating best practices and advanced features: https://tymor-marine.com/

Ready to transform your surveying process? Download DRFT MRKS free today from the Apple App Store or Google Play Store: https://www.drft-mrks.ai/









Decoding the young generation of seafarers

THE following article is a reprint of an article drafted by Capt. Debashis Basu, Managing Partner, Navguide Solutions, and was published by *Sea and Beyond*.

Capt. Debashis Basu, founder of Navguide Solutions, is a widely published thought-leader, with books and research papers published under his name, and whose work on Gen-Z seafarers and maritime competency was recently presented at the IMO. He has given several keynote speeches at global forums on this topic. Navguide's flagship app, Guide2Inspections™, built with empathy-led technology, is gaining rapid popularity among the present-day seafarers. He is uniquely qualified to speak on what today's seafarers need and how the industry must evolve to meet them.

It was 1998. I was 18 and had just landed on my first ship.

Life was different. Unapologetic work hours, no communication with the outside world and continuous rolling of the North Atlantic winters seemed harsh. Most of the time, our seniors had neither the time nor the intention to speak to us.

One day, however, in the morning watch, my Chief Officer empathised. He said,

"Son, your home is this neat, manicured garden. Everybody loves you; it's prim and proper, you have help when you need it, and you can maintain it the way you want. The ship is like a forest; it is unruly and unapologetic, and many times, you are your own plumber, your own electrician. I have even been my own cobbler. It is not always perfect, but just like a forest, it is beautiful because it is not perfect, it is real, it prepares you for a journey that is far more exciting. It is not 'just another job'."

That analogy stuck with me; it made sense.

1. The Great Misunderstanding

Life at sea cannot be compared with any other. While shipping still moves 90 per cent of world trade, the perception of a career at sea is shifting – and not in our favour. The present generation very often does not see shipping as a career of choice. But are we giving them the right environment to thrive and succeed in this profession?

Let's face it, we've all heard the whispers: "These young ones don't have what it takes," or maybe comments about their screen addiction, attention spans and "lack of seriousness".

What if we never understood their triggers and strengths?

This article is an invitation to step back and take a closer look at what's really going on. The generational gap isn't widening, it's closing. We're just now learning to speak the same language. Once we do, something remarkable happens.

They thrive, and so do we.

(These are not just ideas; they stem from our in-depth research on this generation, which has led us to create actionable tools that are currently being used by thousands of seafarers.)

2. The problem isn't them. It's us. (And that's a good thing.)

The modern seafarer doesn't lack passion or intelligence. We lack a structure that suits them.

The systems we have – of leadership, training, reporting and mentorship – are based on assumptions from the 1980s. Back then, we performed by watching others, sitting through long lectures and reading massive circulars. Those were the only options. And it worked. Sort of.

Now, we have a generation that is accustomed to the immediate knowledge transfer from YouTube and Google, the constant validation of social media and video games that reward problem-solving in real-time. They expect purpose, relevance, autonomy, and fairness in the workplace. And when they get pushback, disengagement creeps in.

This isn't rebellion. It's a mismatched design.

3. Five fundamentals we often get wrong

Without being judgmental, let us understand the thought process of the present generation of seafarers and bust a couple of myths that are costing us money, trust and time.

A. We are visual communicators

One of the biggest myths we perpetuate is that "checklists rock" and "written text is the only way to guide the younger generation in performing. Ninety-nine per cent of information conveyed to ships is text-based: checklists, manuals, PMS, SMS, safety circulars, vetting bulletins, emails and so on.

Let's face it: people don't like to read when audio-visual information is readily available for every other aspect of their lives. Then again, you cannot show an application skill, such as tying a knot, using only text.

Visual performance instructions – using micro-learning, storytelling, and mobile-first design – appeal to the young minds and convey a lot more information in a short time.

B. We need smarter mentoring tools

While direct mentorship from a senior is the most effective way to learn, it often doesn't occur due to language barriers, cultural differences, time constraints, busy schedules or a lack of interest.

Today's generation has grown up with instant validation – every like, every blue tick is a dopamine hit. When thrown into an environment where a senior shouts at them, they're far less likely to ask questions.

There are smarter ways of knowledge transfer that we can use. We are working on smart apps and AI-based mentoring tools, and already showing incredible results.

C. We seek relevance: let's flip the narrative

The young seafarer is often looking for relevance in the workplace. "Do I matter here?"

Reverse mentoring – where the younger crew shares operational insights with seniors – often builds mutual respect faster than traditional top-down models.

And here's a bold thought: while we spend hours discussing near misses, what if we spent equal time analysing what went right? A Chief Officer just completed a mooring station in record time with perfect coordination. Let us see what went right here. Can we learn from it?

Celebrating success isn't vanity; it's validation. And to the young mariner, that's cool.

Because nothing's more motivating than knowing you made a difference.

D. We seek autonomy: let them choose their journey

Holding attention is the most challenging task, isn't it? How do we grab attention?

This generation has grown up customising everything – from playlists to career paths. Generic, cookie-cutter approaches may not work very well for them.

Gen-Z engages better when they have control. In the context of training, self-paced, skill-based development pathways with options to dig deeper where curiosity strikes, and adaptive learning paths – where content evolves based on performance – are far more interesting and compelling.

When learning feels like a journey you designed yourself, ownership follows. And with it, absolute mastery.

E. Technology without empathy is just noise

One of the biggest myths that costs us unproductive time and money is our belief that technology itself fascinates the younger generation. See, technology amazes us only when we have lived in the era before that tech existed. My two-year-old son is not fascinated by seeing his father on the phone; that is not technology; to him, that's how phones work!

So, just because you've spent two million dollars implementing the best virtual reality glasses, produced a 3D animation video or developed an AI assistant, it doesn't make it any more interesting. Without the right context, it can become really boring really soon.

When tech is paired with task-specific use-cases, relevant gamification and instant application, it clicks. Literally

and metaphorically. For Gen Z, it's purpose-driven tech that works.

4. Why is the industry resistant?

Smart options to optimise work environments exist. But they are not implemented easily.

Not everyone's ready to throw out the old playbook. Common barriers include:

- ❑ cost concerns ("Is it really mandatory yet?");
- ❑ cultural inertia ("This is how we've always done it"); and
- ❑ fear of digital overwhelm.("I am not that tech savvy.").

We don't need to overhaul everything overnight. Start with pilots. Use a hybrid model. Empower one department to experiment. You just need the willingness to give it a shot.

5. The magic potion: a sense of pride and purpose

Here is something that cuts through generations.

When we went out to sea, life was tougher. Calling home was a luxury. We were on floating islands thousands of miles from civilisation. But on those days when we were about to give up, there was something that kept many of us going. It was called a sense of pride. This feeling that I was part of a bigger purpose, a small cog in a large machine driving the world economy.

In the age of social media, as the world becomes a smaller place, we feel the need to compare lives and regret what we do not have. I believe in the bargain; it is tough for the younger generation to develop a sense of pride in the profession.

If we make a conscious effort to bring it back, a number of problems could get resolved. If we aspire to build a generation of seafarers who are loyal to the profession, simply paying them more or reducing workload won't do it.

That is extrinsic motivation and, while it has a role, a far more effective approach is to create work environments that are inherently meaningful, where people take pride in their jobs, even if they aren't easy.

So, to the young seafarers

If you are a young seafarer reading this, take a step back from your phone for an hour or two during your off-duty hours. Look around. You're hundreds of miles from home, on your own. You're waking up to breathtaking sunrises and sunsets, breathing the freshest air, and having great food. Your quality of life is better than most CEOs.

You are working with diverse cultures, which supercharges your emotional intelligence. In 10 years, you will realise the value of a strong EQ. The challenges you face, while they seem bitter, are moulding you into champions for life. This environment is uncompromising and, just like the ruthless nature of a forest, it is incredibly enriching and fulfilling.

As someone who has spent over 25 years at sea, I can tell you there's no other profession I'd rather be in. When you are on watch, you are in charge of a billion-dollar asset and several lives on board. That is more than any other profession in the world will entrust you with. So, find your own reason to be proud. This profession provides all the ingredients to become a truly well-rounded human being.

6. Final thought: we are all in transition

The world needs seafarers, but not just any seafarers – we need sharp, passionate, purpose-driven youngsters. So we need to start meeting them where they are. The truth is, Gen Z didn't change the rules. They just reminded us that systems must evolve.

Let's not try to fit them into our mold. Let's build a better mold. The future belongs to those who can bridge generations – not by asking Gen-Z to "toughen up" but by helping the system smarten up. It's only a matter of time before competence-based onboarding and mentorship systems become the norm. Can we turn this ship around together?

Because, as my Chief Officer made me realise in 1998, it is more than "just another job".

Capt Debashis Basu
Founder of Navguide Solutions

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