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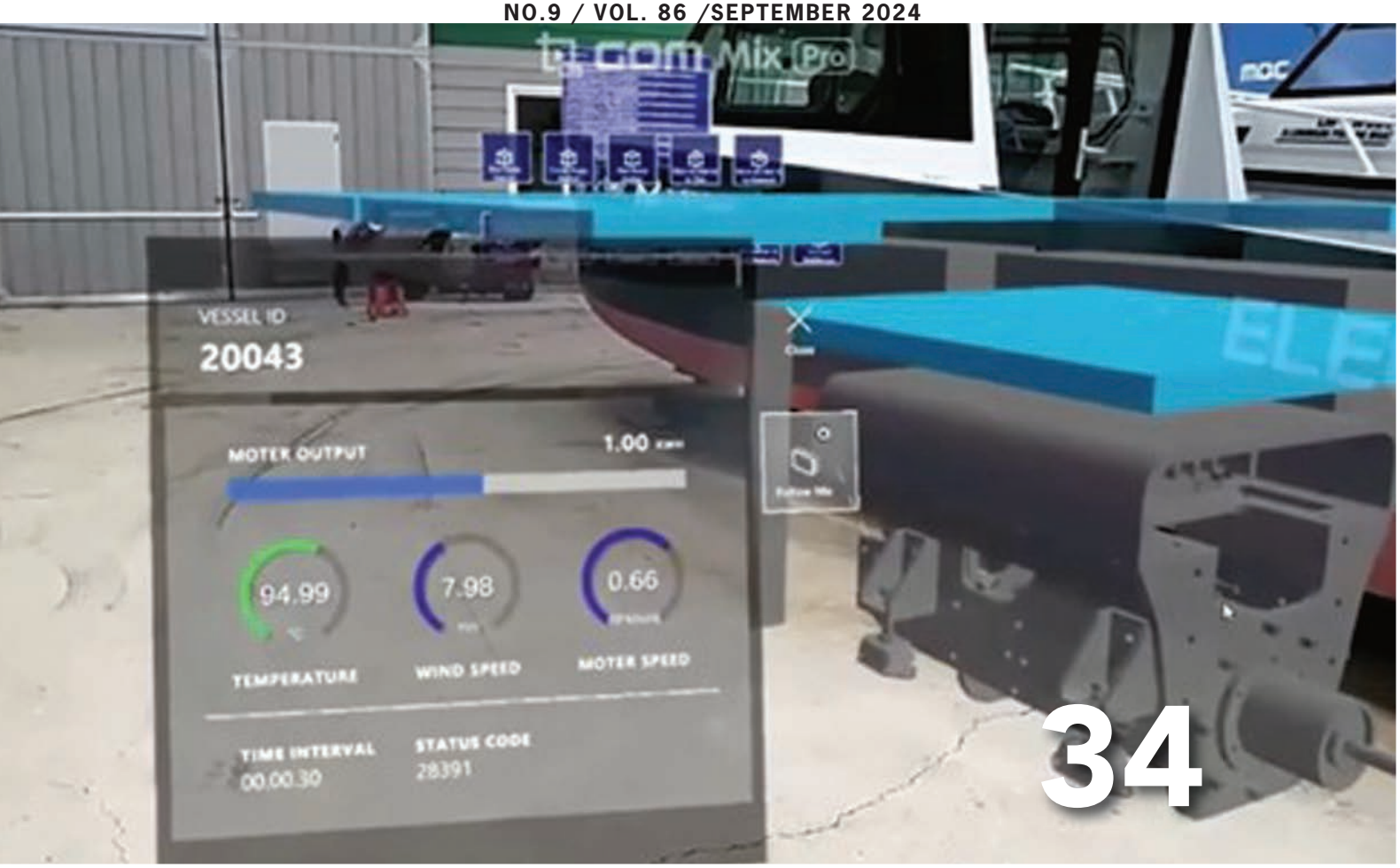

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Photo Justin Zurre

I write this having arrived, again, to Hamburg, Germany, for the **SMM**, which as I've said and written many times is **the best shipbuilding show in the world**. I've been traveling to Hamburg every other year for SMM since 1992 without fail, except of course in 2020 when it was scuttled due to Covid. If you've never been, it's a worthy trip for no other reason than to feel the scale and size of this industry, one that spans all four corners of the world and brings together industry leadership to this historic maritime town time and again, without fail.

The international business is a tough nut to crack for many U.S. businesses, and I understand that many companies are changing dramatically the amount of money they spend to support and attend what has seemingly become a steady and growing stream of trade events globally.

But just as I've known many international companies that have made the investment and the trek to the U.S. and found success, so too have I seen many U.S. companies find success overseas. One such company is naval architecture and marine engineering firm Glosten, which has found great success in leveraging its deep experience and know-how in the Research Vessel market into international success.

We interviewed **Glosten CEO Morgan Fanberg** – the September 2024 cover story – recently on a video call, a video that was flipped after the fact to a **Maritime Matters: The MarineLink Podcast** after the fact.

I chose the Maritime Matters platform as it's generally reserved for more organic, free-flowing conversations, and Fanberg fit that bill perfectly. In Fanberg Glosten has a leader that is clearly passionate about the industry and business he lives: case in point, how many CEOs do you know that started working for their company as an intern and never left?

But Fanberg's appeal transcends loyalty alone, and he talks seamlessly and passionately about all ends of the business, from being deeply involved in UC San Diego's new hydrogen-hybrid Coastal-Class Research Vessel (CCRV), which earlier this year was awarded an Approval in Principle (AIP) by the American Bureau of Shipping (ABS); to his penchant and passion for working with Glosten clients to help extend the life of existing tonnage while meeting new environmental mandates … or as Fanberg simply puts it: *"Keeping old boats running."*

I won't steal the whole story here, rather I invite you to turn to page 28 to read insights on Fanberg, or you can simply go to MarineLink.com and listen to the Maritime Matters Podcast.

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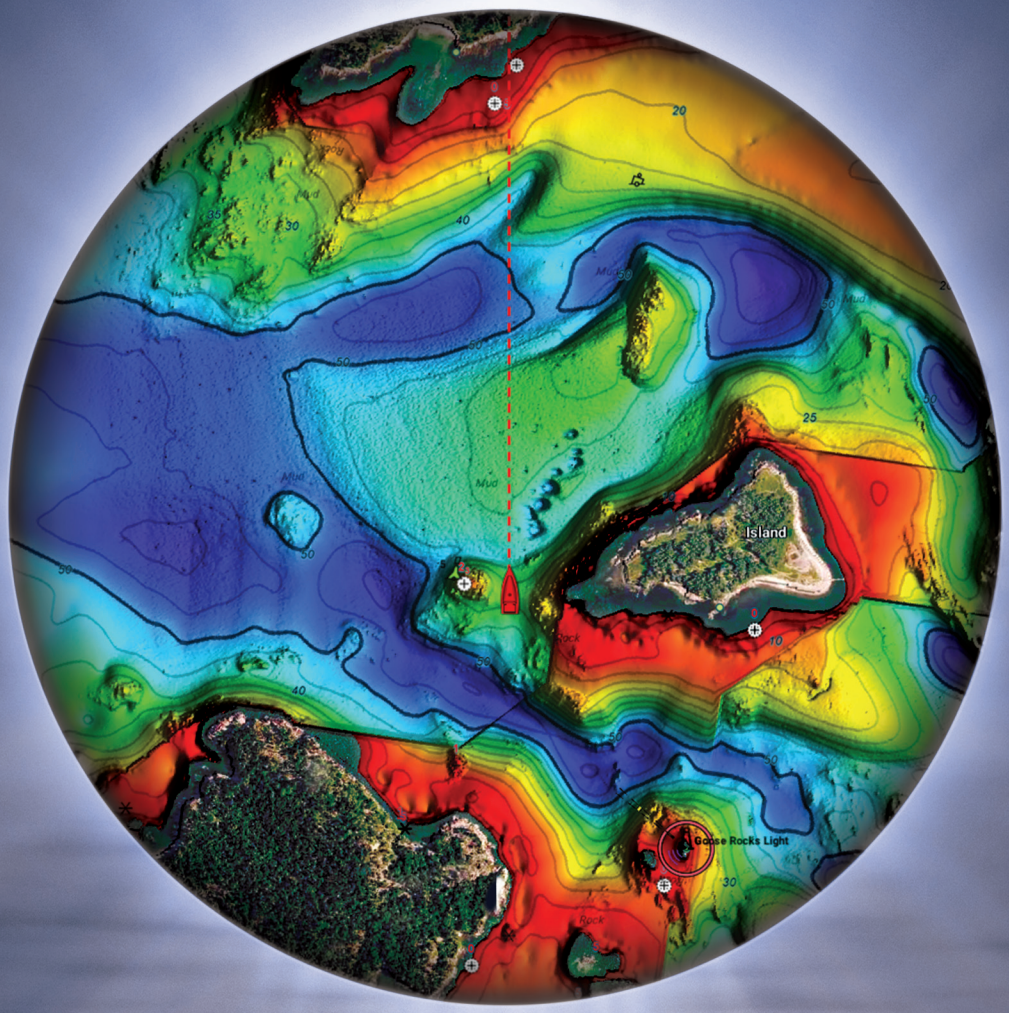

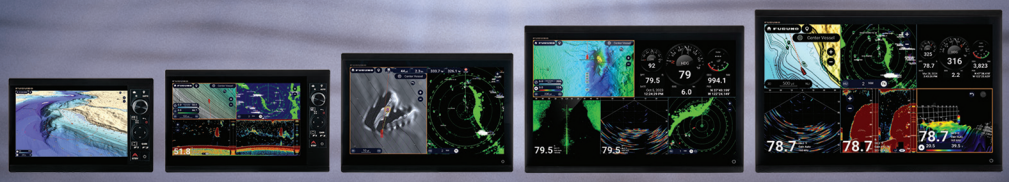

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Training: The Cornerstone of Overall Crew Success

By Dean Shoultz, Chief Innovation Officer, Ripple Operations

As the maritime industry navigates through rapid technological advancements and evolving global standards, the traditional approach to mariner training is no longer sufficient. In this ever-changing environment, companies must shift from simply providing training to fostering a culture of 'Crew Success'—a holistic approach that ensures mariners thrive both on board and within the company as a whole.

Lifeblood of Operations: Mariners' Central Role

Mariners are not just employees; they are the lifeblood of any marine operation. Their actions, guided by effective training, directly influence the safety, efficiency, and reputation of a vessel. Whether it's the tone a mariner uses with an unruly passenger or the critical decision a captain makes when navigating treacherous waters, these frontline decisions, backed by solid training, have profound impacts on both risk management and revenue generation. Recognizing mariners as central to a company's success starts with robust training programs designed to equip them with the skills they need to succeed.

A New Management Paradigm: Empowering Leaders Through Training

In some companies, mariners are still viewed as mere employees. However, the reality is that captains and officers should be seen as part of the senior management team, not just onboard but within the entire company. Their decisions—whether navigating complex waters or managing crew dynamics—carry the same strategic weight as decisions made in the corporate back-office, directly influencing the company's overall success. Comprehensive training that prepares captains and officers for these high-stakes roles is crucial for fostering a culture of Crew Success, ensuring that every mariner, from deckhands to senior officers, is empowered through training to excel in their role.

Beyond Technical Skills: Expanding Training to Develop Holistic Competencies

While technical skills are the backbone of any training program, there are other competencies that are often overlooked but are just as critical to Crew Success. Training in areas like critical thinking, business etiquette, and emotional intelligence can empower mariners to make better decisions, communicate effectively, and represent their company's brand with professionalism. Expanding training programs to include these holistic competencies enables mariners to excel in all aspects of their roles, further driving the success of the crew and the organization.

On the Horizon: Preparing for STCW Amendments

The International Maritime Organization (IMO) is currently conducting a comprehensive review of the Standards of Training, Certification, and Watchkeeping for Seafarers (STCW). This review, led by the IMO's Sub-Committee on Human Element, Training, and Watchkeeping (HTW), is expected to lead to significant amendments that not only address traditional

technical skills but also emphasize broader competencies such as leadership, communication, and decision-making—key areas that should be incorporated into training programs.

Among the key areas identified for review are emerging technologies and digitalization, which will require mariners to be proficient in the latest advancements aboard vessels. Training programs must now include modules on these new technologies, as well as e-certification processes involving digital issuance, electronic validation, and integration with global systems like GISIS. Additionally, training programs must address psychological safety and mental health, with specific training on preventing and responding to bullying and harassment. The review also highlights the importance of interpersonal and 21st-century skills, such as critical thinking, leadership, and effective communication—competencies that are essential in the complex, dynamic environments mariners face. Simulation-based training is also being encouraged, providing mariners with practical experience in a controlled, risk-free setting, crucial for preparing them for real-world challenges.

For companies aiming to achieve true Crew Success, it is imperative to start adapting training programs now to meet these forthcoming changes. By incorporating modules that focus on these expanded competencies—emerging technologies, psychological safety, interpersonal skills, and simulation-based training—organizations can ensure their mariners are not only compliant with future STCW requirements but are also equipped to excel in the complex, high-stakes environments they operate in every day.

For more information, visit the IMO website: ***https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/HTW-10th-session.aspx***.

Conclusion: Building Success on the Foundation of Training

The evolution from training to Crew Success represents a deeper investment in the people who power the marine transportation industry. By recognizing mariners as key decision-makers, broadening the scope of training, and preparing for future regulations, companies can cultivate a workforce that is not only skilled but also empowered to drive success on every voyage.

Thank you for reading, and until next time, sail safely.

The Northwest Passage: *Shorter Voyages, Millions Saved,* Perils Galore

By Jamie Rock

The Northwest passage has been the dream of many mariners, traders, explorers and governments, and as the Arctic circle is deicing, passage through the area is now possible for a variety of ships. Currently, the passage is open from July to September, and those three months represent a revolution in maritime shipping, allowing ships to bypass the Panama Canal and shorten voyages by thousands of miles while saving hundreds of thousands of dollars.

But even with the tremendous savings in time and money, there are many variables to consider, because without proper training and preparation, those savings could evaporate and the route could become potentially dangerous and costly. Here's a list of your top considerations if mulling a run through the Northwest Passage:

© Peter Hermes Furian/AdobeStock

1. **Navigation:** Navigation is one of the biggest issues. As of 2016, NOAA produced the *"U.S. Arctic Nautical Charting Plan.*[1]*"* Most mariners haven't practiced polar navigation since they were in school, and at school it was usually taught as a side note to terrestrial navigation. It's important to remember that in latitudes of 55° N and higher, GPS signals degrade.[2] Because of the nature of the earth, all meridians converge at the poles and what is used for bear and course lines can't be adequately relied upon.

2. **Communication:** While navigation is the greatest issue, it is followed closely by communications. In the higher latitudes most Inmarsat coverage is lost and the polar transit of other satellites is minimal. The mariner would be able to inform shoreside offices when they are entering and exiting the Northwest passage, but updates during the transit are difficult at best. Even if polar satellite infrastructure im-

proves, the Aurora Borealis [Northern Lights] plays havoc with both satellite communications and traditional MF/HF and VHF.

3. **Environment Concerns for the Crew:** The land of the midnight sun is exciting for the visitor, but standing watch and not being able to get sleep because "the lights are on" will make a four-day transit feel like weeks. The physical and psychological effects of lack of sleep are well documented. Add to the lack of sleep the stress of transiting an unfamiliar area using a style of navigation that is not used frequently, and the potential for mishap rises quickly.

4. **Survival:** Another environmental consideration deals with survival after the worst has happened. Even though all ships operating in the Arctic are required to have immersion suits and life board in accordance with the IMO Polar code, the reality is the water temperature is still near freezing, meaning a mariner in an immersion suit will succumb to hypothermia in hours, while in a life boat or a raft they may survive days, possibly weeks. There are many small indigenous villages that are in the Arctic circle, but they won't be of benefit to the mariner unless they are lucky enough to get there pushed by the currents and tides. The search and rescue infrastructure in the Arctic is currently nonexistent.

Big picture, longer term, the deicing of the Arctic Ocean and the use of the Northwest passage will be a huge benefit in trade, organizations like the Arctic Council will protect the area while promoting its use. Before it becomes truly viable several issues will need to be addressed and invested in:

1. Increasing the satellite infrastructure allowing uninterrupted, coverage for navigation and communications;
2. A mandatory navigation training or setting up a pilotage program;
3. Search and rescue coverage

I look forward to seeing how this natural asset is used and protected.

NOTE: *The views expressed in this article are the author's own and do not necessarily represent the views of the U.S. Merchant Marine Academy, the Maritime Administration, the Department of Transportation or the United States government.*

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Jamie Rock is currently an Associate Professor at the US Merchant Marine Academy and a reservist with the US Navy currently assigned to 2nd Fleet. He holds a Master Unlimited tonnage, Oceans license with 20 years of sailing experience.

Footnotes:

1. https://nauticalcharts.noaa.gov/hsrp/meetings/juneau-2018/reference-materials/arctic-nautical-charting-plan%202016.pdf

2. https://castnav.com/gnss-ins-simulations-of-high-latitude-operations/

The U.S. Navy and the Future "Hybrid Fleet"

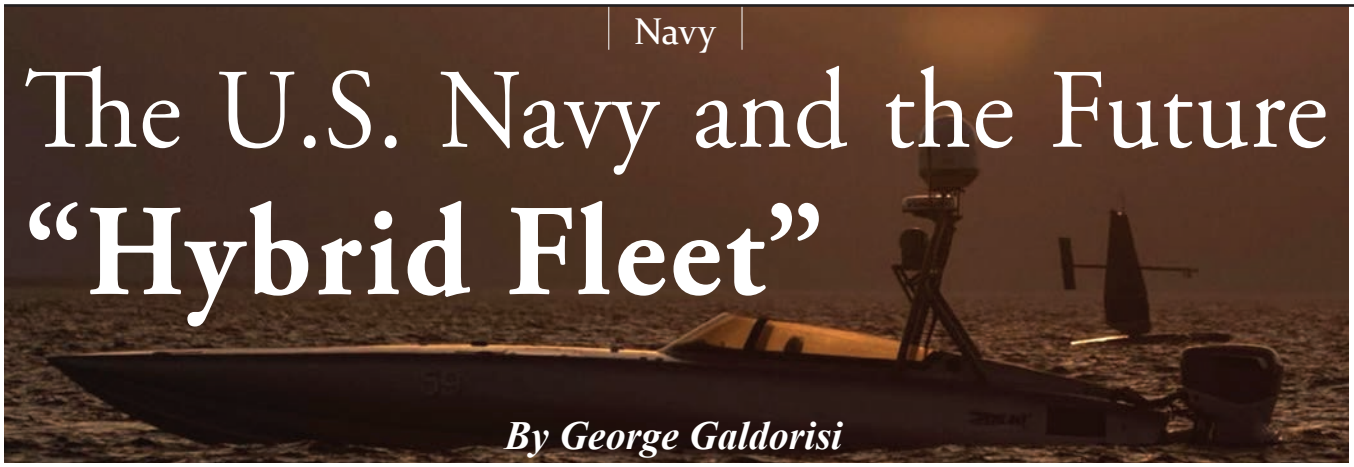

Photo courtesy Mr. Dave Meron

By George Galdorisi

In an address at a major military-industry conference, the U.S. Chief of Naval Operations, Admiral Michael Gilday, revealed the Navy's goal to grow to 500 ships, to include 350 crewed vessels and 150 uncrewed maritime vehicles. This plan has been dubbed the "hybrid fleet." This plan added additional granularity to the Navy's UNMANNED Campaign Framework.

The reason for this commitment to uncrewed maritime vessels is clear. During the height of the Reagan Defense Buildup in the mid-1980s, the U.S. Navy evolved a strategy to build a "600-ship Navy." That effort resulted in a total number of Navy ships that reached 594 in 1987. That number has declined steadily during the past three-and-one-half decades, and today the Navy has less than half the number of commissioned ships than it had then.

The rapid growth of the technologies that make uncrewed surface vehicles increasingly capable and affordable has provided the Navy with a potential way to put more hulls in the water. Readers of *Maritime Reporter and Engineering News* are likely well-aware that such a radical change in Navy requirements will require the maritime industry to come up with innovative ways not only go build those 150 uncrewed maritime vehicles, but to also engineer pathways for crewed and uncrewed vessels to operate together synergistically.

That said, the U.S. Congress has been reluctant to authorize the Navy's planned investment of billions of dollars in USVs until the Service can come up with a concept of operations (CONOPS) for using them. The Navy has announced plans to procure large numbers of uncrewed systems—especially large and medium uncrewed surface vehicles—but a CONOPS, one in even the most basic form, has not yet emerged.

Such a CONOPS must do two things. The Navy must describe how these platforms will get to the operating area where they are needed (for example, the Western Pacific), as well as articulate what missions they will perform once they arrive there. This is key not only to address Congressional skepticism, but to help industry understand what kind of uncrewed maritime vessels to develop.

The answer to the first question is that the Navy has committed to obtaining a number of large uncrewed surface vehicles (LUSVs). These vessels will be between 200 and 300 feet in length and displace 1,000 and 2,000 tons, which would make them the size of a corvette. The Navy's budget plan funds a total of seven LUSVs over the next five years.

An evolving concept of operations is to marry various size uncrewed surface, subsurface and aerial uncrewed vehicles to perform missions that the U.S. Navy has—and will continue to have. Simply put, the Navy can use the evolving large uncrewed surface vehicle as a "truck" to move smaller USVs, UUVs and UAVs into the battle space to perform a number of important Navy missions such as intelligence, surveillance and reconnaissance (ISR) and mine-countermeasures (MCM).

Rather than speaking in hypotheticals as to how uncrewed vehicles might be employed for these missions, this article will offer concrete examples using commercial-off-the shelf (COTS) uncrewed systems that have been employed in recent Navy and Marine Corps events.

While there are a wide range of medium uncrewed surface vehicles (MUSVs) that can potentially meet the U.S. Navy's needs, there are three uncrewed surface vehicles that are furthest along in the development cycle. All are currently in production and fully operational:

- At 132-feet, the LEIDOS Sea Hunter and Sea Hawk are the largest of the three. The Sea Hunter was launched in 2016 and was built at a cost of $20m. It is a trimaran (a central hull with two outriggers).
- The Textron monohull Common Uncrewed Surface Vessel (CUSV), now referred to as the MCM-USV, features a modular, open architecture design. The CUSV has a length of 39 feet, and a beam of 11 feet.
- The Maritime Tactical Systems Inc. (MARTAC), catamaran hull, uncrewed surface vehicles (USV) include the MANTAS T12 and the Devil Ray T24, and T38 craft. The T24 and T38 USVs are 24-foot and 38-foot long, respectively, with beams of 10 feet and 11 feet.

All three of these MUSVs are viable candidates to be part of an integrated uncrewed solution CONOPS. I will use the MAN-

TAS and Devil Ray craft for a number of reasons. First, they come in different sizes with the same hull, mechanical and electrical (HME) attributes. Second, the Sea Hunter is too large to fit into the LUSVs the Navy is considering. Third, the CUSV is the MUSV of choice for the Littoral Combat Ship (LCS) Mine-Countermeasures Mission Package, and all CUSVs scheduled to be procured are committed to this program.

This scenario and CONOPS is built around an Expeditionary Strike Group underway in the Western Pacific. This Strike Group includes three LUSVs under supervisory control from a large amphibious ship. Then-Chief of Naval Operations, Admiral Michael Gilday suggested this CONOPS in early 2022 when he noted that he: "Wants to begin to deploy large and medium-sized uncrewed vessels as part of carrier strike groups and amphibious ready groups in 2027 or 2028, and earlier if I can."

Depending on the size that is ultimately procured, the LUSV can carry a number of T38 Devil Ray uncrewed surface vehicles and deliver them to a point near the intended area of operations. The T38 can then be sent independently to perform the ISR mission, or alternatively, can launch one or more T12 MANTAS USVs to perform this mission. Building on work conducted by the Navy laboratory community and sponsored by the Office of Naval Research, the T38 or T12 will have the ability to launch uncrewed aerial vehicles to conduct overhead ISR.

For the MCM mission, the LUSV can deliver several T38s equipped with mine-hunting and mine-clearing systems (all of which are COTS platforms tested extensively in Navy exercises). These vessels can then undertake the "dull, dirty and dangerous" work previously conducted by Sailors who had to operate in the minefield.

While the full details of how this CONOPS plays out is beyond the scope of this article, this innovative approach accomplishes an important goal. If the U.S. Navy wants to keep its multi-billion-dollar capital ships out of harm's way, it will need to surge uncrewed maritime vessels into the contested battlespace while its manned ships stay out of range of adversary A2/AD systems.

To be clear, this is not a platform-specific solution, but rather a concept. When fleet operators see a capability with different size unmanned COTS platforms in the water working together and successfully performing the missions presented in this article, they will likely press industry to produce even more-capable platforms to perform these missions. This is a win-win for the Navy and industry.

Loper Bright Takes to Sea

Navigating Legal and Regulatory Uncertainties in the Maritime Sector Post-Chevron

By Sean Pribyl, Joel Roberson & Allison Skopec, Holland & Knight

The U.S. maritime and offshore sectors face a sea of change brought by two recent U.S. Supreme Court decisions that could signal far-reaching impacts of which industry stakeholders should take note. The Chevron doctrine was established in the landmark 1984 Supreme Court decision of Chevron v. Natural Resources Defense Council and was relied upon in over 18,000 judicial opinions over the past 40 years to grant federal agencies deference on their interpretation of their statutory authorities. Federal courts used the Chevron doctrine to defer to an agency's reasonable interpretation of an ambiguous statute under a two-step analysis: 1) whether Congress directly spoke to the precise question at issue and, if not, 2) courts will defer to an agency's interpretation if it is based on a permissible construction of the statute.

Now, the winds have shifted via the Loper Bright Enterprises v. Raimondo (Loper) decision, which overturns Chevron and, thus, expands the judiciary's power to "exercise independent judgment" in reviewing interpretations of ambiguous statutes interpreted by federal agencies. In other words, the interpretation of ambiguous federal law will lie with judges as the primary arbiters in administrative-based admiralty and maritime matters rather than the reasonable interpretation by federal agencies. The Loper decision will be particularly impactful for the maritime sector, which relies on statutes established a long time ago – sometimes more than 100 years – and modern interpretations of its application in the modern world.

The Loper decision stated that the holdings of prior cases that relied on Chevron remain intact under stare decisis (meaning "to stand by things decided"). However, the Supreme Court also decided Corner Post v. Board of Governors, which held that a claim accrues when the plaintiff suffers an injury, not when the agency issues its regulation, so old decisions upheld under Chevron based on stare decisis could be reopened if a new harm occurs to a plaintiff based on an old regulatory interpretation. Therefore, the combined impact of Loper and Corner Post means that maritime regulations where there is a continuing harm are subject to a new review based on the "best interpretation" of the statute.

Loper's Impact on the Maritime Sector

The maritime sector is governed by a wide range of statutes related to safety, security, environmental protections and trade, and numerous federal agencies are charged with enforcing these statutes under their respective authorities. As such, what statutes say, were intended to mean, and actually authorize have long been the subject of interpretation by federal agencies and industry stakeholders and, in some cases, those interpretations do not align. While the full effect of Loper remains to be seen, it may set federal agencies and the industry on a collision course as litigants may seek to challenge agency rulemaking and regulations under the Administrative Procedure Act (APA), civil enforcement actions and affirmative causes of actions that were previously granted Chevron deference. In particular, Loper could have a direct impact on how courts interpret the language and congressional intent of several marine industry-related statutes under which federal agencies promulgate regulations and issue interpretation guidance.

The Jones Act

The century-old Section 27 of the Merchant Marine Act of 1920 (P.L. 66-261), commonly referred to as the Jones Act, as codified in the coastwise laws at 46 U.S.C. § 55102, governs coastwise trade. The Jones Act is intentionally protectionist and restricts transportation of merchandise between points in the U.S. to vessels that are built in the U.S., documented under U.S. law and owned by U.S. citizens. However, these seemingly straightforward statutory requirements have long been subject to interpretation by respective agencies with oversight over various aspects of the coastwise laws.

For example, Customs' agency discretion will remain under watchful scrutiny because it has long been tasked with enforcing the coastwise laws that restrict the transportation of merchandise between two U.S. coastwise points via its interpretation of terms such as "merchandise" as defined in 19 U.S.C. § 1401, as well as what may constitute "transportation," "coastwise point," and "new and different product" in the cargo trade. In the same vein, the Second Proviso of the Jones Act, 46 U.S.C. § 12132(b), permanently disqualifies from coastwise service any otherwise eligible vessel that is "later rebuilt outside the United States." However, the Jones Act itself does not define the terms "rebuilt" or "rebuilding." Interpretations made by the U.S. Coast Guard's National Vessel Documentation Center (NVDC) are now open to further challenge.

Of course, the Jones Act is broader than just coastwise trade, possessing, among other functions, a transactional and vessel registry aspect, and issues may emerge in the context of whether parties are operating under a time charter or bareboat charter and how control of a vessel is allocated, subject to approvals of the U.S. Department of Transportation Secretary and Maritime Administration (MARAD).

Beyond the Jones Act

Other notable examples of far-reaching laws that provide guideposts to marine operations in the U.S. include those related to protection of the environment and priority for agencies, such as the Coast Guard, who are authorized under the Oil Pollution Act's (OPA) implementing statutes to process claims related to oil spill damages and cleanup actions, a function administered by the National Pollution Funds Center (NFPC). In the past, plaintiffs such as Protection and Indemnity (P&I) clubs have brought actions against the Coast Guard under the APA seeking judicial review of NFPC's final agency actions denying OPA reimbursement claims in indirect challenges to NPFC's construction of several OPA statutes.

Lastly, an important function of marine safety and environmental protection under the Coast Guard's statuary purview is the investigation of marine casualties and, while not all such incidents involve pollution, the scope of the marine casualty investigation authority under 46 U.S. Code § 6301 has not been immune to challenge under the APA.

These are only a discrete sampling of the range of statutes that may have been granted agency deference pre-Loper, but the emphasis will now be on the "best" interpretation of a respective authority, with courts looking to agency expertise to assist in deciding what actually is the best interpretation.

Conclusion

The impact of Loper will affect not only interpretation of current law – it will fundamentally change how legislation is drafted going forward and allow prior litigation and rulings to be reevaluated. Typically, Congress reaches a bipartisan compromise that achieves most of what it intends to accomplish and leaves the rest to the executive branch agencies to "fill in the gaps." Loper now puts a great deal of pressure on Congress to draft new legislation that is much more specific regarding the authorities granted – or not granted – and provides opportunities for corporate and legal maritime experts to assist Congress in the drafting process.

Loper may also require Congress to respond to court decisions that strike down maritime regulations that enabled the industry to grow, but lacked adequate statutory authority. Also, the legislative drafting changes required by Loper will particularly impact transportation and infrastructure stakeholders in a highly regulated marine industry where the regulatory framework relies on organic statutes – which are often quite old.

Agencies will also need to examine how a policy fits in the structure of a statute as they look to what is delegated to the agency to define a term. Industry stakeholders should watch for congressional developments and seek assistance if they want to help shape the laws that govern their operations. What lies on the horizon remains to be seen, but the sea of change ushered by Loper is certain.

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A Look Inside the East Asia & Pacific Offshore Wind Markets

By Philip Lewis, Research Director, Intelatus Global Partners

Whereas the foundations of commercial offshore wind development are found in Europe (and Europe will remain the largest overall regional market for offshore wind activity in the coming decade), the rapid development of the large East Asia and Pacific region provides both opportunities and some challenges to the supply chain.

According to World Bank data, the technical potential for the East Asia and Pacific region amounts to over 15,000 GW, of which ~27% is suited to bottom-fixed foundations and the balance floating technologies. 90% of the potential is found in seven countries, which are (in descending order) Australia, China, New Zealand, Japan, South Korea, and Taiwan. Of these countries, only New Zealand does not currently have offshore wind activity.

CHINA

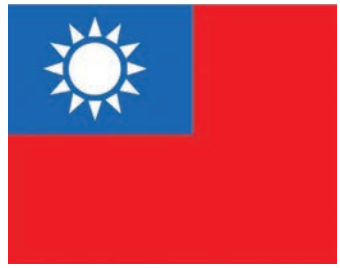
The dominant East Asia and Pacific market, where domestic Tier 1 suppliers are increasingly looking to international markets

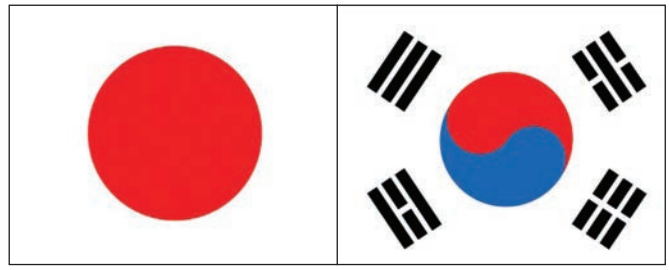
At end of 2023, operational offshore wind capacity in the region amounted to just over 32 GW, of which the majority was grid connected in the regions offshore wind powerhouse and world's largest offshore wind market, China. Growth in the Chinese installed capacity and the domestic supply chain has been rapid, mainly in the bottom-fixed segment. Whereas the Chinese supply chain generally meets the majority of domestic requirements, leading Chinese manufacturers are playing an increasingly important role in the international market. Increasingly large Chinese made turbines and foundations are being supplied to projects in the major European market and the emerging East Asian markets. Cable manufacturers Hengtong, Ningbo Orient Cable and ZTT have also supplied European projects. Of particular note, where the three dominant western turbine OEMS (Vestas, Siemens and GE) are focusing efforts on commercializing ±15 MW turbines, Chinese OEMS are developing a range of models from 16-20+ MW. There has been some resistance to the Chinese players supplying European projects, but where performance, price and delivery times all count, we anticipate an increasing role of the Chinese supply chain in the European and East Asian markets.

Vessel demand in China relies mainly on domestic supply. Chinese yards also maintain a strong position in the international vessel new building segment, both for construction and logistics/support vessels.

TAIWAN, JAPAN, SOUTH KOREA

Taiwan, Japan and South Korea – much promise but measured development and high local content barriers have taken some of the shine of the opportunity





After much initial excitement, underpinned by a clear development plan to support the deployment of ~1.5 GW per year to achieve ~20.5 GW by 2035, Taiwan's offshore wind

market has begun to face increased challenges, with only half of the 2035 capacity aspiration currently awarded. ~5.1 GW of capacity is either operational or under construction. Local weather and ground conditions, high local content requirements, a one-year delay in the Allocation Round 3.1 commissioning and grid connection deadline, and a challenging auction process have resulted in development being behind the aspiration. The gap between reality and aspiration is impacting the supply chain which is looking to other East Asian market to fill order books. In the short- to mid-term, this means Japan and South Korea. Both markets are planning auctions before the end of 2024 to support their respective 10 GW and 14.3 GW aspirations by 2030. Despite the longer-term potential in these two markets, both for bottom-fixed and floating wind technologies, annual auction allocations remain comparatively small (below 1.5 GW), and we anticipate that local supply chains will continue to demand more project activity to justify capacity investments. As with Taiwan, we anticipate that projects in Japan and South Korea will require high levels of local content.

Japan, South Korea and Taiwan all feature floating wind development plans. Whereas as Japan and Taiwan's efforts can be classed as technology and pre-commercial scale, South Korea is moving to auction commercial scale floating capacity in the east of the country by the end of 2024, and South Korean EPCI contractors and shipyards are gearing up to meet the challenge.

All three counties are home to domestically built, owned and operated bottom-fixed construction vessels. South Korea is also a major builder of international construction vessels. Given the comparative weakness in the oil & gas vessel segment of these three countries, it is still to be seen if floating wind auction activity will trigger domestic newbuilding programs of targeted wind vessels.

VIETNAM

Much promise but slow development

Till now, Vietnam has only featured intertidal projects that do not rely on traditional offshore wind supply chains. Central planning aspires to deploy 6 GW of bottom-fixed offshore wind by 2030 from north to south of the country. However, there have been delays in adopting the necessary legal and regulatory frameworks to support the aspiration.

Vietnamese yards are already active in building offshore wind support vessels for the European market. We anticipate that bottom-fixed projects will rely on the support of regional construction vessels supported by the domestic offshore support vessel segment.

AUSTRALIA

Emerging as a potential major regional market

Australia is fast becoming a market with major potential to develop offshore wind capacity. The government has designated a total of six priority offshore wind zones in the country. The government has developed a robust process for identifying and awarding offshore wind licenses. 12 projects have recently received 7-year feasibility licenses to progress the construction and operations planning for projects in the State of Victoria, the first state to set offshore deployment targets – at least 2 GW by 2032, 4 GW by 2035 and 9 GW by 2035. Whilst the initial Victoria wind farms feature bottom-fixed technology, the anticipated feasibility licenses for New South Wales will require floating wind solutions.

As with oil & gas projects in the country, we anticipate that construction vessel supply will be largely provided from the international fleet, but logistics and operations & maintenance support will be met by domestic owners.

THE PHILIPPINES

One to watch

The Philippines is emerging as a potential market for the end of this decade and into the next. The country aspires to deploy the country's first offshore wind farm by 2030 and to install around 20 GW by 2040 and is working with developers to create conditions to advance projects.

ANIL RAINA, CTO, RIX

RIX PIONEERS HYDROGEN GENERATION ON DEMAND

As shipowners globally search solutions to hit emission reduction targets, talk often turns to alternative fuels. While most all have drawbacks, RIX is aiming to help eliminate a big obstacle in the adoption of hydrogen as a marine fuel – room for fuel storage – via its hydrogen on demand solution, the RIX M2H2 Hydrogen generator. ***Anil Raina****, CTO, RIX, discusses the technology and the potential for maritime applications in a recent interview with* ***Maritime Reporter TV****.*

By Greg Trauthwein

Anil, to start, can you give a 'by the numbers' look at RIX with insight on the size of the maritime piece?

We are about a 200 people in the company, and about half of our business today is marine (including new sales and aftermarket support). While we are growing our base business, we are targeting a double-digit growth for the next three to five years, and within that growth, our energy and some of our other businesses will grow, especially energy.

In a recent (June 2024) edition of *Maritime Reporter & Engineering News*, we wrote briefly about the RIX M2H2 hydrogen generator. Can you dig a bit deeper into this specific unit?

In our quest for decarbonization, the reformer is solving the need for energy storage. The common pieces of technology are the fuel cells and the power electronics to drive propulsion systems. What we are trying to solve is power density. I come to RIX with some hydrogen and decarbonization experience in aerospace and transportation. The conversations have always been how do we choose the right technology for all the pieces? One of the big things is (centered on) energy density and storage. So when it comes to the application, and especially when it comes to the range, there's a decision that companies and the technology leaders need to make: if we have chosen hydrogen, how do I store that hydrogen for my application? What we are offering is a hydrogen generation on demand. You don't have to store that hydrogen, whether it's high pressure, compressed gas form or a cryogenic form. **We are providing a reformer, which takes a methanol water blend and produces hydrogen on demand and it provides it to the fuel cell stack and then the power electronics for consumption. And that's a differentiator, especially as we are targeting two megawatt or five megawatt loads.** Storing that on a vessel, a vessel that's already challenged for space, is not easy to do.

What do you consider the sweet spot for this technology in the maritime space?

There is availability of methanol already in ports to fuel, and then the ranges are in the size that I mentioned about two to five megawatts of power where we can build our systems to provide that.

In terms of other applications, I think large yachts has been another application there where we've seen some interest because of, again, the wanting to drive clean propulsion and clean solutions in that industry. But we are not that specific for where we can fit, because the technology is agnostic to the application.

We've had some conversations about providing, for example, power to bring the vessel into port or run some hotel load. There you would have a prime power source for propulsion and then you can use our solution close to and then in port.

How do you see your role and that of your team in helping to ease energy and technology transition.

This is a cycle that is repeated in my personal career, and in general across the industry when you look at different segments. There is a need for the entire value chain, when we talk about wells to wheels (or wells to wake) of an energy transition, everybody has to play a role including the fuel producers, to the distribution, upstream distribution to companies like us that then create the technologies for converting that fuel into usable energy.

And in that infrastructure, I've seen success stories where the regulators are playing a useful role in driving regulations with support, as well as some incentives plus some focused targets to achieve. I think in that ecosystem is where energy or any technology adoption has been successful. I talked about my days at Caterpillar with diesel engines. I worked through the Parker Aerospace with natural gas transition. We did a lot of work in Asia on natural gas for emission reduction. But yes, I think you need that entire industry to work together … otherwise it's difficult for that adoption to happen. Some customers have to take that leap of faith and become early adopters, because it is new technology and there's always something to learn as we bring new technologies to the market.

In 2021, Skyway's V2.6 UAS delivered cargo from shore to the flight deck of the USS Gerald R Ford while the aircraft carrier was in port.

Photo source: Skyways

ENVISIONING MARITIME LOGISTICS IN A DIFFERENT WAY

MILITARY SEALIFT COMMAND'S TALUGA GROUP

By Edward Lundquist

As the Military Sealift Command (MSC) celebrates its 75th anniversary, it is looking to the future through the eyes of a forward-thinking "innovation cell" named for a ship from its storied past. USNS Taluga (T-AO-62) was the first Navy replenishment ship that was operated by civil service mariners.

The Taluga Group is a three-person team of Director John Bruening, Dean Vesely and Jerit VanAuker who are focused on capability development and adoption of innovative practices.

The Tulaga Group team have diverse backgrounds to help them look at problems in different ways. Bruening is a retired navy helicopter pilot; Vesely had a 30-year career as a surface nuclear officer; and VanAuker is a retired limited duty ordnance officer.

"We're looking at finding new or better ways to use our existing platforms, as well as envisioning different ways to conduct maritime logistics," said Bruening.

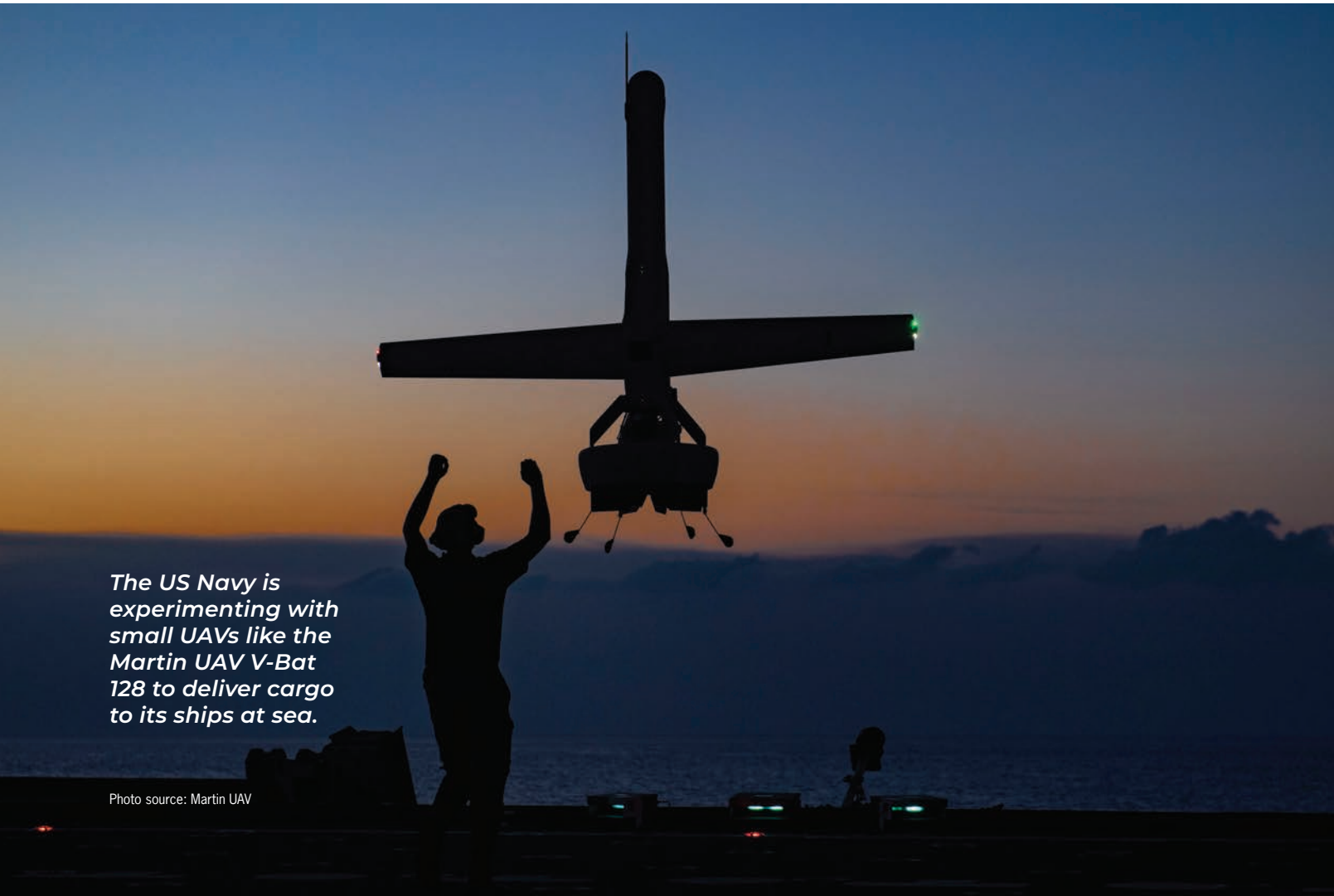
The Taluga Group is working with NavalX, the Navy's technology accelerator, to find new concepts and technologies, as well as adapt existing capabilities to be able to do something new. One of the group's current projects is examining an innovative version of the Jacobs Ladder, used by mariners to climb onto ships—something that seems easy but can often be difficult and dangerous.

This effort started with the need to provide a safe way to safely embark and debark personnel aboard the Navy's two large unmanned vessels, Mariner and Ranger, while at sea from small boats or at anchor. NavalX is investing in the original, patented design from Nautical Structures Industries of Largo, Fla., that the Navy refers to as a Modernized Personnel Transfer System (MPTS).

"NavalX got involved because they have the connections with available funding and the right contracting mechanisms, which we didn't have any experience in," Bruening said.

Bruening explained that MSC has some ships that have a high freeboard, like the expeditionary fast transports (EPFs), dry cargo/ammunition ships (T-AKEs), large, medium speed roll on/roll off ships (LMSRs) and hospital ships (T-AHs). "We liked the safety aspect which we could apply to our current ships by installing an automated Jacob's ladder," he said.

While the Navy's new medium and large unmanned surface vessels may not have crews, there will be times that personnel need to come aboard them. "When a boat crew comes alongside a USV, we can use the automated Jacob's Ladder to provide a safe way to climb aboard the ship. They come up in a RHIB next to the USV, hit the remote control, and the Jacob's



The US Navy is experimenting with small UAVs like the Martin UAV V-Bat 128 to deliver cargo to its ships at sea.

Photo source: Martin UAV

Ladder reels itself out of its drum, comes down the side, and they can then climb the ridged ladder," Bruening said.

Thinking beyond basic use of a Jacob's ladder, the group thought about how else MSC could use that capability.

"We imagined that it could be used to lift a standard Navy litter up to the deck of our hospital ships. USNS Mercy (T-AH 19) and USNS Comfort (T-AH 20) do have a lift system installed, but it has been unreliable and therefore is not used. We wanted to see if we could use this Jacob's ladder not only for its intended purpose, but also for this additional purpose of hoisting litters with patients up to the deck," said Bruening. "We're going to install it on Comfort and see how it works."

SPECIAL DELIVERY

Bruening, Vesely and VanAuker agree that customers tend to take logistics for granted. "They turn in a requisition and expect the part to show up right away," said Breuning.

Bruening said MSC's data analytics team examined the highest priority part requisitions to resolve C4 and C3 CASREPS. CASREPs are casualty reports submitted by ships to notify higher echelons of significant equipment malfunctions. C3 and C4 CASREPs indicate that an "equipment deficiency exists in mission-essential equipment that either causes a major degradation, but not loss of a mission area (C3), or causes loss of a mission area (C4)." What the data showed was that of the thousands of parts MSC delivered to ships at sea in 2018 to fix those problems, 90 percent of them weighed less than 50 lbs.

"In other words, 90 percent of the parts that are breaking your ship weigh less than 50 lbs.," Bruening said. "When we looked at how all of those parts get delivered, we found that those ships came alongside one of our MSC ships, and we passed it over by VERTREP or CONREP (vertical replenishment or connected replenishment)."

Using a large helicopter to deliver a small part may not be the best use of available resources.

The Taluga Group wanted to find a better way to deliver those parts, and looked at using an unmanned aerial vehicle UAV that could carry those packages and deliver them to a ship at sea. In fact, they're making progress. "Being able to deliver 90 percent of CASREP parts by a small UAV will do wonders in increasing our logistics capability at standoff ranges. We started with a 200-mile combat radius—today we're looking at 1,000 miles," said Bruening. "This is doable."

The Taluga Group is working on this problem with NAVAIR (Naval Air Systems Command) and their rapid prototyping division—and the Naval Air Warfare Center Aircraft Division (NAWCAD) at Pax River, Md., which calls the process Rapid Prototyping, Experimentation and Demonstration (RPED).

"They've got a great team supporting us in developing a drone that can do this," said Bruening. "We're studying how to fly a drone autonomously to a ship at sea that's moving; how to fly in a communications or GPS denied environment, and how to operate a drone like this for extended periods that doesn't require 15 people. I want to be able to open up a suitcase, pull it out, load the part, tell it where to deliver the part, then hit 'go.' We're good at sailing T-AKEs and T-AOs. But our mariners are not drone operators, and we're trying to minimize the extra workload we're putting on our people. So, we want to keep the concept simple—fly 1,000 miles to deliver

The Greenough Advanced Rescue Craft (GARC) is an unmanned surface vehicle (USV) that deploys a parafoil-based system that relays data between the Mine Countermeasures USV and the littoral combat ship. Military Sealift Command is evaluating GARC for other missions.

Photo: U.S. Navy

U.S. Navy photo by Mass Communication Specialist 1st Class Claire M. DuBois

Capt. Derek Rader, center, shows the inside of a Global Autonomous Reconnaissance Craft (GARC) to distinguished visitors as they tour the new crafts at Unmanned Surface Vessel Squadron 3 (USVRON 3). The 16-foot vessels built by Maritime Applied Physics Corporation enable research, testing, and operations that will allow integration throughout the surface, expeditionary, and joint maritime forces.

50 lbs. We've been testing this, and have actually worked it into a fleet battle problem and used it to deliver some simulated CASREP parts from an MSC vessel over to Marines on the beach, and then the aircraft returned to the ship. We've also delivered parts to an aircraft carrier while pierside at Naval Station Norfolk. We proved we could do it, and do it autonomously. And we've kept it simple — Hit the button, it links up with SATCOM, and off it goes."

Bruening said the Navy has been testing drones such as the Skyways V2.6B and Martin UAV V-Bat 128 drones for logistics, but they can support other missions. "We've been working with the Air Force. They're looking at small UAVs for search and rescue. We've actually done the hard part—getting the autonomy as well as the 'launch and recover' to work."

The Taluga Group is also looking at DARPA's AdvaNced airCraft Infrastructure-Less Launch And RecoverY (ANCILLARY) ISR drone program, which is designed to carry a 60 lb. sensor payload with long endurance.

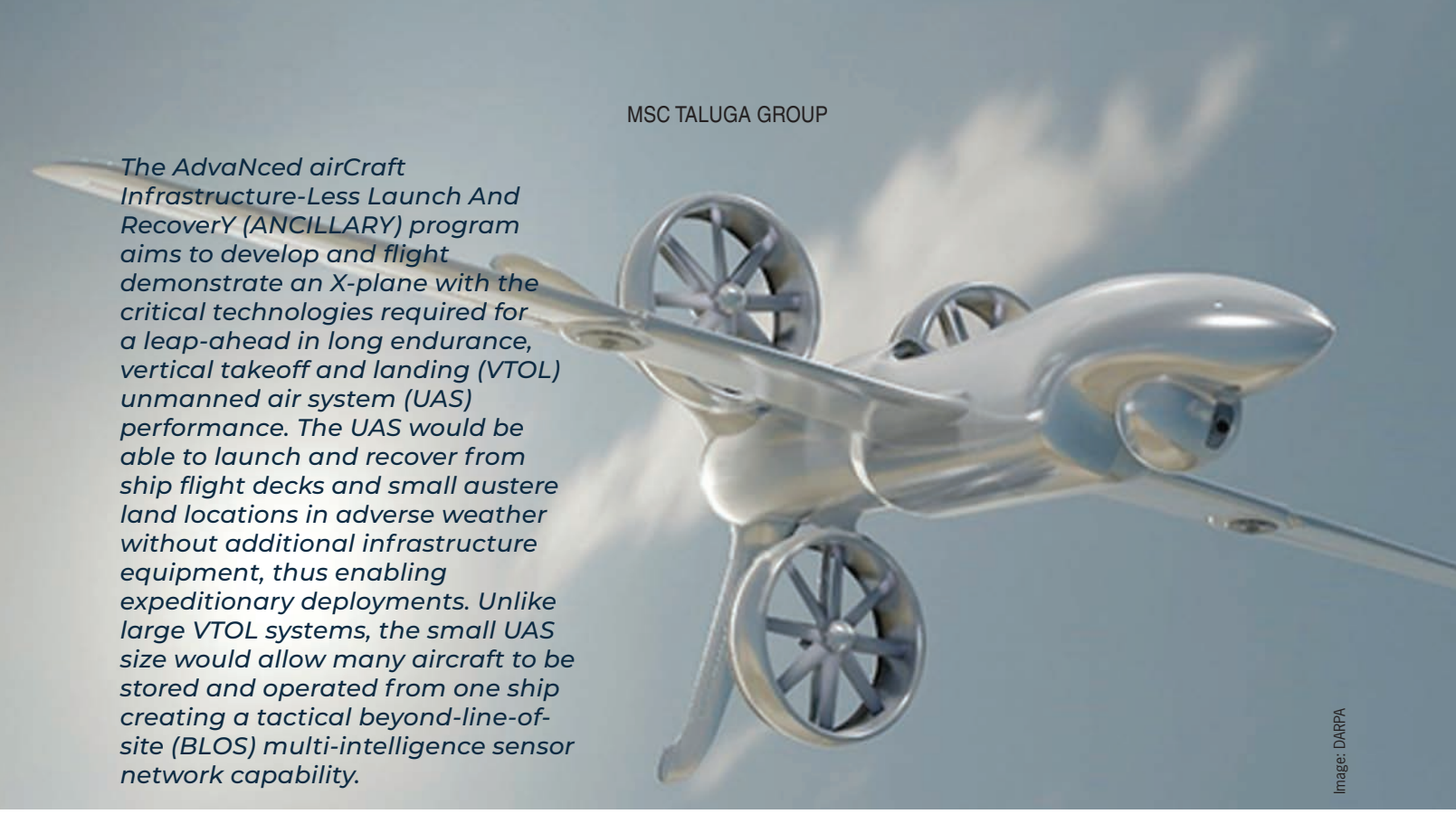
"If it can carry 50 lbs. then we can handle 90 percent of our needs," said Bruening.

"If we look beyond CASREP parts, we can see a value in making high-priority deliveries for things like blood," added VanAuker. "There's a different twist to this mission, because the cargo needs to be kept at a specific temperature."

Another example of the Taluga Group looking at using existing capability for a new purpose envisions delivery of relatively small shipments is using unmanned surface vessels (USVs), especially after observing a GARC (Greenough Advanced Rescue Craft), made by Maritime Applied Physics Corporation (MAPC), of Baltimore, Md., being used for anti-terrorism force protection (ATFP).

"We were working with Fleet Forces Command during one of our local ATFP exercises, and they were using a weaponized GARC for the ATFP mission. Think of it like a super jet-ski, about 15 feet long and five feet wide. It weighs

MSC TALUGA GROUP



The AdvaNced airCraft Infrastructure-Less Launch And RecoverY (ANCILLARY) program aims to develop and flight demonstrate an X-plane with the critical technologies required for a leap-ahead in long endurance, vertical takeoff and landing (VTOL) unmanned air system (UAS) performance. The UAS would be able to launch and recover from ship flight decks and small austere land locations in adverse weather without additional infrastructure equipment, thus enabling expeditionary deployments. Unlike large VTOL systems, the small UAS size would allow many aircraft to be stored and operated from one ship creating a tactical beyond-line-of-site (BLOS) multi-intelligence sensor network capability.

Image: DARPA

4,000 lbs. and can carry 1,000 lbs., and carries an LRAD (long-range acoustic device), a laser dazzler and a gun. We wanted to see if we could use this autonomous, advanced super jet-ski to escort one of our HVUs (high value units). We envisioned providing this type of USV to our T-AKEs and T-AOs to give them a self-contained way to protect themselves when they pass through choke points or high threat areas. Our maritime security detachments can lower one into the water, and use its autonomy to monitor, patrol and defend the ship," Bruening said. "Then we looked at it from a logistics perspective. It has a big open area in the center, and can carry 1,000 lbs. If we removed the LRAD, the dazzler and the gun, now we have an open container to carry those 1,000 lbs. and go 400 miles. We looked at it as kind of a pickup truck with a roller bed that you could load up with whatever you needed to put in it. We tested this at Key West by loading the GARC and sending it out to an expeditionary fast transport (EPF). They used a remote-control actuator to open the cover and then used the EPF's crane to pick up items from inside the GARC. In looking at distributed maritime operations, and needing to resupply Marines ashore at a remote location in a contested area, we might not want to get the EPF in too close. But we can reach out to those Marines with 1,000 lbs. of what they need from a very safe distance. And it's not so expensive that we can't afford to lose it."

According to Bruening, there are a lot of companies out there looking at the problem of how to navigate in a contested environment. "We're going to figure it out. It's just going to take time and resources."

ADDITIVE MANUFACTURING

Bruening said the Taluga Group sees a future in additive manufacturing to create parts for the ships that need them. "MSC delivers a lot of parts. But if we can make a part on demand using additive manufacturing, that's even better," he said. "We can make the part on one of our ships, and deliver it by drone."

The challenge isn't just the 3-D printer. According to Bruening, it's important to have the specifications and digital files for those parts, as well as the correct stock materials, to make a part that meets Navy standards. "In some cases, we would have to transfer a lot of data back and forth, and we're looking at free space optics, which is a secure way to transfer information at a very high bandwidth using light."

Delivering fuel to ships at sea usually requires specialized vessels. But the Taluga Group is evaluating a containerized astern fueling system, capable of passing fuel using a 700-foot hose, that can be placed on the fantail of a ship.

EMCON

Ships can be vulnerable when any radars or communications equipment are radiating. So, the Taluga Group has been investigating ways to help ensure their ships are not emitting when in EMCON, or "emission control."

"We've conducted a study using four different commercial-off-the-shelf spectrum analyzers, and took them aboard ship to look for sources of RF emissions during EMCON. We set up test conditions on a ship and tried all four of them. We liked the handheld device that we could walk around the ship with. When a ship sets EMCON, we can take the device out to the weather decks and see if somebody has their cell phone on, or a WiFi hotspot," said Vesley. "Eventually we need to get the cost down so we can put one or two on every ship."

While the number of emitters on ships used to be limited, today everyone with a cell phone is a potential emitter.

Not only is a CLF ship and its cargo valuable, but it potentially could lead an adversary to a carrier strike group in EMCON and heretofore not detected.

"We can also increase of likelihood of detecting emissions using a small UAV with a three-dimensional view, and downloading the data on the ship for analysis, and determine what emitters and antennas are still radiating," VanAuker said.

Similar to the Afloat Training Group for the combatants, MSC has an Afloat Training Team that trains the CIVMARS so they can get certified. "I'd like to see the trainers have a couple of them to take aboard our ships so they verify that EMCON has been properly set, and show the crews where they still have something transmitting," said Vesley. "There's another group that follows that certifies the crews, and they can have a couple of these to verify that the crew does indeed know how to properly set EMCON."

Vesely said such a device could also be useful for Navy ships or Marine units. A common UAV built with a modular architecture could also be reconfigured for inspecting for corrosion and preservation issues, battle damage assessment, search and rescue. "We're looking at one system that the Department of Interior uses that has the right payload and endurance to go around a ship with a predetermined profile for a variety of missions," Vesely said.

ASTERN REFUELING RIG

Refueling at sea is usually accomplished using very specialized ships. But the Taluga Group is testing out a new containerized system that can be placed on the fantail of a ship. The system has a 700-foot hose, and turns the host ship into an oiler that can refuel other ships, especially smaller ships and boats. Since the astern refueling rig is made by a Norwegian company, VanAuker said MSC is using the Office of the Secretary of Defense's Foreign Comparative Testing (FCT) program that helps to test systems and technologies from foreign allies and partners to satisfy valid defense requirements quickly and economically.

According to VanAuker, the plan is to test the system out using an offshore supply vessel, which has plenty of deck space. "OSVs have the room back aft for containers, and their decks have the fittings to secure cargo and containers. The astern refueling rig container is secured to the deck of the OSV using the existing ISO locks, and jumper hoses are installed between the rig and fuel risers. The power comes from umbilical cords connected to the electrical distribution system. It's going to have two reels—six inches for DFM (diesel fuel marine) and two and a half inches for JP 5 (jet fuel for aircraft). It's literally plug and play."

With an OSV, the rig is closer to the waterline than many other types of ships, which is one of the reasons OSVs are suited for this mission.

"We received Foreign Comparative Test funding to buy the rig, put it in the container, and design and conduct the test," VanAuker said.

Bruening said that in most cases there isn't funding for something new. So, we're looking at existing systems and technologies that we can adapt from a logistics lens. And we're working with organizations like NavalX, and DoD's Defense Innovation Unit to provide the resources to develop these concepts and technologies."

"We're trying to figure out how we can utilize other people's goodness," Bruening said.

U.S. Coast Guard photo by Petty Officer 3rd Class Dustin R. Williams

A Coast Guardsman climbs aboard a ship using a Jacob's ladder.

The *'BoatNerds'* Ringleader –

MORGAN FANBERG, CEO, GLOSTEN

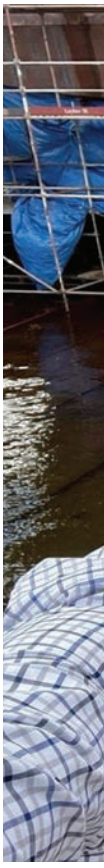
When he joined Glosten more than 26 years ago as an intern, little did **Morgan Fanberg** know that one day he'd be at the helm leading one of the largest privately owned naval architecture firm in the United States. But this USMMA-grad was well outfitted for the task, and in this ***Maritime Matters: The Marinelink Podcast***, Fanberg's passion for the maritime industry and his company is clear as he candidly discusses the challenges he, his team and the maritime industry face in meeting legislatively mandated goals; plus adopting new fuels into new designs while keeping to his mantra to "keep old boats running."

By Greg Trauthwein

All images courtesy Glosten

Morgan Fanberg has worked his entire career with one company – Glosten – evolving from a 'full-head-of-hair' intern to CEO today.

All images courtesy Glosten



The maritime industry is filled with executives that have an internal passion for the business that has driven their careers … then there's Morgan Fanberg, CEO of Glosten who takes it to the next level: Glosten is the only place that Fanberg has worked to date, and apparently, it's the only place he'd like to work.

"I like to say we're a bunch of boat nerds, to tell you the truth," said Fanberg on the **Maritime Matters: The Marinelink Podcast**. "And that's not just our engineering staff, it's also our administrative staff."

Today Glosten is just north of 120 employees – roughly half of which are employee/owners. Glosten has been in business for more than 67 years, and cumulatively it has worked more than 10,000 projects in 20 different countries. One of the biggest upgrades to the organization in recent years was the acquisition of Noise Control Engineering, a wholly owned subsidiary of Glosten that specializes in habitability, noise abatement, underwater radiated noise mitigation and vibration issues.

Since 1998

Fanberg jokes that one of the biggest changes during his tenure is that "when I started, I had a full head of hair! I love my job; this company has been amazing to work for. But I joke with people, too, because I've never worked anywhere else. I always have to remind people, when I talk about how great it is to work here, just be aware I've never worked anywhere else … but it is great to work here!"

When reflecting on the change that has happened during that time, he cites the speed of technological evolution and the resulting significant growth of Glosten itself.

"We are engaged in projects worldwide, we embrace new technologies, an we've added a lot more expertise, because I think the challenges in the marine industry have gotten more complex than they were 26 years ago," said Fanberg. "Not that we didn't have difficult problems then, but the level of technology and the advancement of technology in that rapid advancement has really pushed us to take on more expertise and grow from simple marine engineering and naval architecture."

But even with the rapid pace of technology and growth, Glosten remain firmly rooted with a focus on safety, reliability, and efficiency. "Whether it's a naval architect company or an operator, I think those pillars have not changed one bit. If anything, they've grown stronger," said Fanberg. "When I started 26 years ago in the industry, we used to joke about the marine industry being one of the last industries on the planet that would adopt new technology. That has completely changed. You couldn't ask for a better time to be a naval architect or a marine engineer, because of the challenges we're facing."

Grounded, too, is Fanberg and the Glosten team's focus on problem solving for the client.

"You don't know exactly where the clients are going to take

MORGAN FANBERG, CEO, GLOSTEN

The Glosten team at an industry exhibition.

The Glosten team on site at Freire Shipyard.

you, or what problems they're asking you to solve, so I think we need to be a lot more flexible," said Fanberg. While requests from individual companies may vary, when looking at the industry as a whole, Fanberg sees out the porthole window that the biggest challenge is, and will remain, decarbonization.

"In 2020, I had a distinct privilege to speak in front of Congress about this move to decarbonize," said Fanberg. Part of that testimony was about the support private industry needed from government in this change. "If you think about how long it took to go from steam to diesel, that encompassed decades, maybe a century really. And now what we're talking about is moving away from fossil fuels in a fraction of that time," said Fanberg.

"This energy transition is profoundly transforming our work," said Fanberg, noting the recent approval from ABS of a hydrogen hybrid research vessel for the Scripps Institution of Oceanography. "There's no question that this shift towards future fuels and renewable energy sources goes beyond meeting regulatory pressures. It really reflects our vision to lead the maritime industry in sustainable practices.

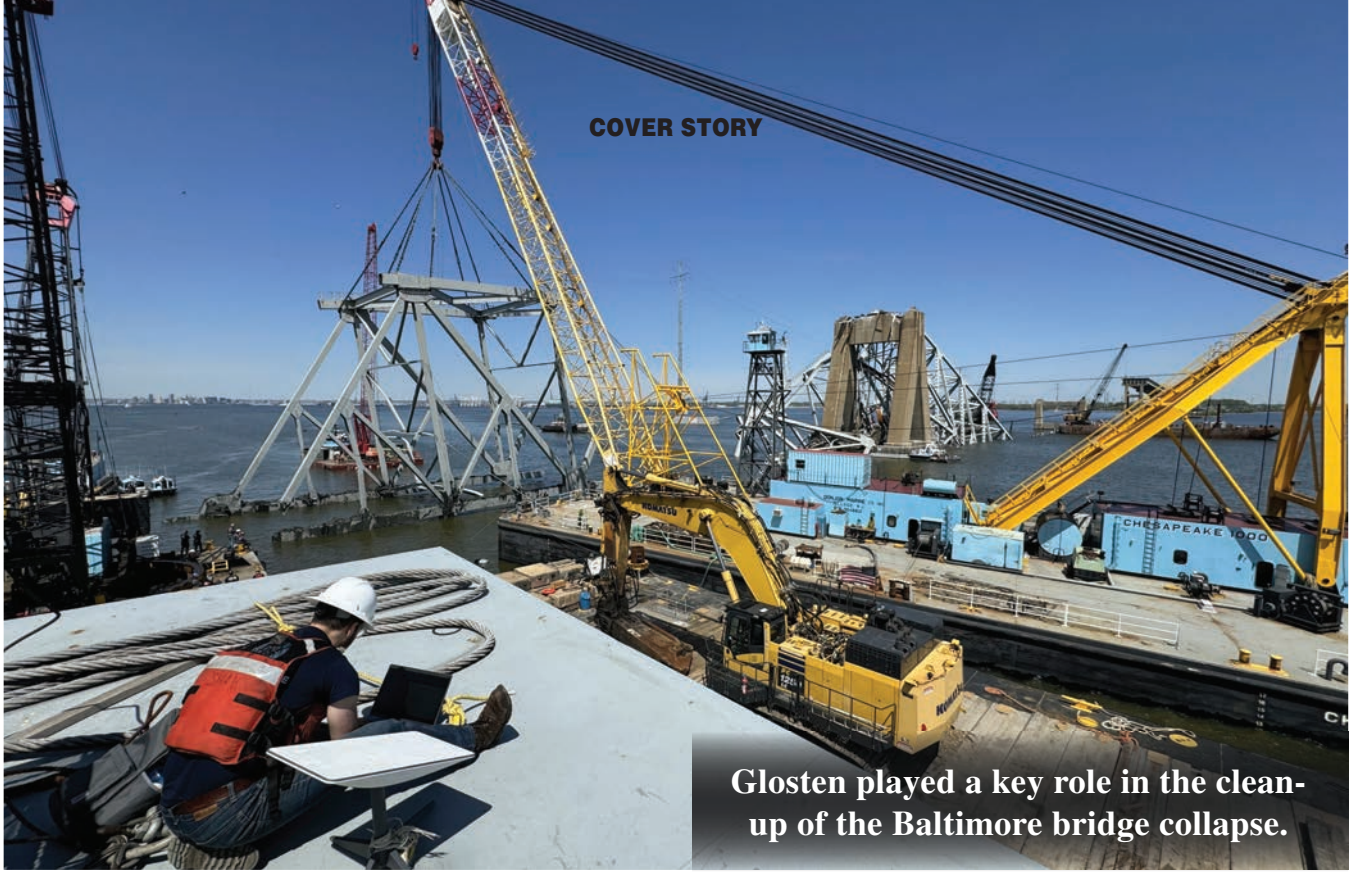
Tools of the Trade

Picking favorites can be difficult, and when asked to identify the one tool that has helped to make his job more efficient and effective, Fanberg found it challenging to narrow down his selection to just one.

"That's a fantastic question, but actually very difficult to come up with just one tool, to tell you the truth," said Fanberg, noting that something as simple as the cell phone, and the ability to communicate with working teams in the field, could easily make the top two. "Remember, we used to use phones in hotels to call people. I mean, I don't even know why they have phones in hotels anymore," said Fanberg.

But when pressed, he named computational fluid dynamics (CFD). "CFD has revolutionized the way naval architecture can be done today," said Fanberg. "I'm not trying to diminish the value of doing real model testing; what I'm saying is that based on the cost of using CFD, we can do a lot of work within the office to optimize designs today using a tool that used to be outrageously expensive and required a ton of computing power. We've been able to adapt CFD more and more into every design tool at a very efficient price point for our clients."

Scanning technology, too, is close to the top, "another area that has completely revolutionized; I mean, it used to be tape measures and film, using cameras with film that took a week to process," said Fanberg. "Now we take the scanner wherever we go; it's not a question, it's a part of a process."



Glosten played a key role in the clean-up of the Baltimore bridge collapse.

Working Today, Planning Tomorrow

The maritime sector today faces challenges that are often as clear as they are fuzzy: For example, in the here and now, the vast majority of assets still run on diesel fuel; yet stakeholders working toward decarbonization goals must plan for an uncertain future premised on not only the dominate maritime fuel that will be used, but also the timeline of its wide availability.

"On one level, yes, there is a push on just about all of our clients to clean the environment and to decarbonize," said Fanberg. However, that doesn't necessarily mean a new vessel, "partially because you might not need a new vessel, but also the outrageous cost to recapitalize and build new," said Fanberg.

All images courtesy Glosten

The conversations with most owners start with modifications that can be enacted on the existing fleet to offer some incremental change to meet requirements and get them through the next 5-10 years. This is understandable given the capital expenditure required to build the original boat or ship.

"That means we have to be very broad in our capabilities," said Fanberg. "It's not just all about new vessel designs and alternative fuels. The other part of that equation is: 'I have an old boat that I need to get 10 more years out of, I have these regulations that I need to meet … help me do that.' In some cases the even bigger challenge is to keep old boats running," said Fanberg.

One area in new design that Glosten historically has excelled in is the global research vessel market, a small but highly specialized sector where its acquisition of Noise Control Engineering really comes into play.

Earlier this year Glosten was awarded an Approval in Principle (AIP) by the American Bureau of Shipping (ABS) for the design of UC San Diego's new hydrogen-hybrid Coastal-Class Research Vessel (CCRV). The CCRV will be operated by Scripps Institution of Oceanography and feature a propulsion system that uses hydrogen fuel cells for zero-emissions operation. Glosten and the project's electrical integrator, Siemens Energy (SE), completed the preliminary design for the CCRV in March 2024. As an uninspected, California Air Re-

An innovative design for San Francisco pilots.

MORGAN FANBERG, CEO, GLOSTEN

Watch the full, uncut interview with Glosten CEO Morgan Fanberg on the **Maritime Matters** *podcast:*

source Board (CARB)-compliant, ABS-classed vessel and an alternative design under SOLAS, the CCRV faced a complex regulatory regime.

Prior to submitting the design for AIP, Glosten completed a week-long risk assessment workshop with the USCG, Scripps, SE, and major equipment providers, Ballard Power Systems and Chart Industries.

"We started doing work for the research industry quite a while ago," noting its design of the FLIP vessel.

The iconic Floating Instrument Platform (FLIP) — was officially retired from service in 2023. Built in 1962 with funding from the Office of Naval Research (ONR), FLIP helped generations of scientists and oceanographers better understand the mysteries of the sea, including internal waves, air-sea interaction and long-range sound propagation. FLIP was owned by the U.S. Navy and managed by Scripps Institution of Oceanography at UCSD.

"It's a fascinating vessel, and Larry Glosten with FLIP solidified our spot with the research community," said Fanberg.

"Research vessels are extremely complex and difficult to design, and it's because scientists want their vessel to be able to do everything in a small package. And to do that, it requires a lot of effort on our engineering side using new design tools to basically go further with our engineering design and to make sure that no details are left unknown."

Strategically, involvement in the research vessel community has helped Glosten to compete globally. "It's difficult for a US-based firm to compete on the global market, make no mistake about it," said Fanberg. "But when it comes to this level of complexity, it highlighted our ability to compete more broadly. Our avenue going global was really on the backs of our research vessel capabilities," a development that has also helped Glosten to find new clients in other sectors who also have complex engineering problems to solve."

Image courtesy KR

KR'S MIXED REALITY DASHBOARD FOR UNDERSTANDING THE DIGITAL TWIN OF AN ELECTRIC-PROPULSION SHIP.

BUILDING A BUSINESS CASE FOR DIGITAL TWINS

3D models make a great start for developing a ship's digital twin, but the story doesn't start or end there.

By Wendy Laursen

Mikko Forss, Executive Vice President, NAPA Design Solutions, recently reminded his audience of a saying, a cautionary saying, from MIT researcher Dr. George Westerman: "When digital transformation is done right, it's like a caterpillar turning into a butterfly, but when done wrong, all you have is a really fast caterpillar."

As a first step, fast is an improvement over slow, as the speakers at the NAPA User Meeting 2024 attested to. For instance, Kawasaki Heavy Industries demonstrated how it used 3D tools to develop a large liquefied hydrogen carrier design. Using one NAPA model from the initial development to detail design stage, the company's teams worked on outfitting arrangement and structure simultaneously, which increased efficiency and helped identify challenges early.

Others, including ABS, ClassNK, DNV, Nihon Shipyard and VARD, spoke of the practical benefits of 3D model-based class approvals. The exchange of 3D models for class approvals is important because it has opened a dynamic digital dialogue between the main actors in ship design: owner, yard, designer and class. Each has a stake in any potential butterflies, and each has something to gain beyond speed.

Together, there is now the potential for a new era of digital twins that combine data from these stakeholders and overcome the current fragmentation of data, models and systems that is limiting butterfly development. These digital twins don't have to involve the 3D model that was used to design the ship to deliver insight, but the calculations and assessments will be

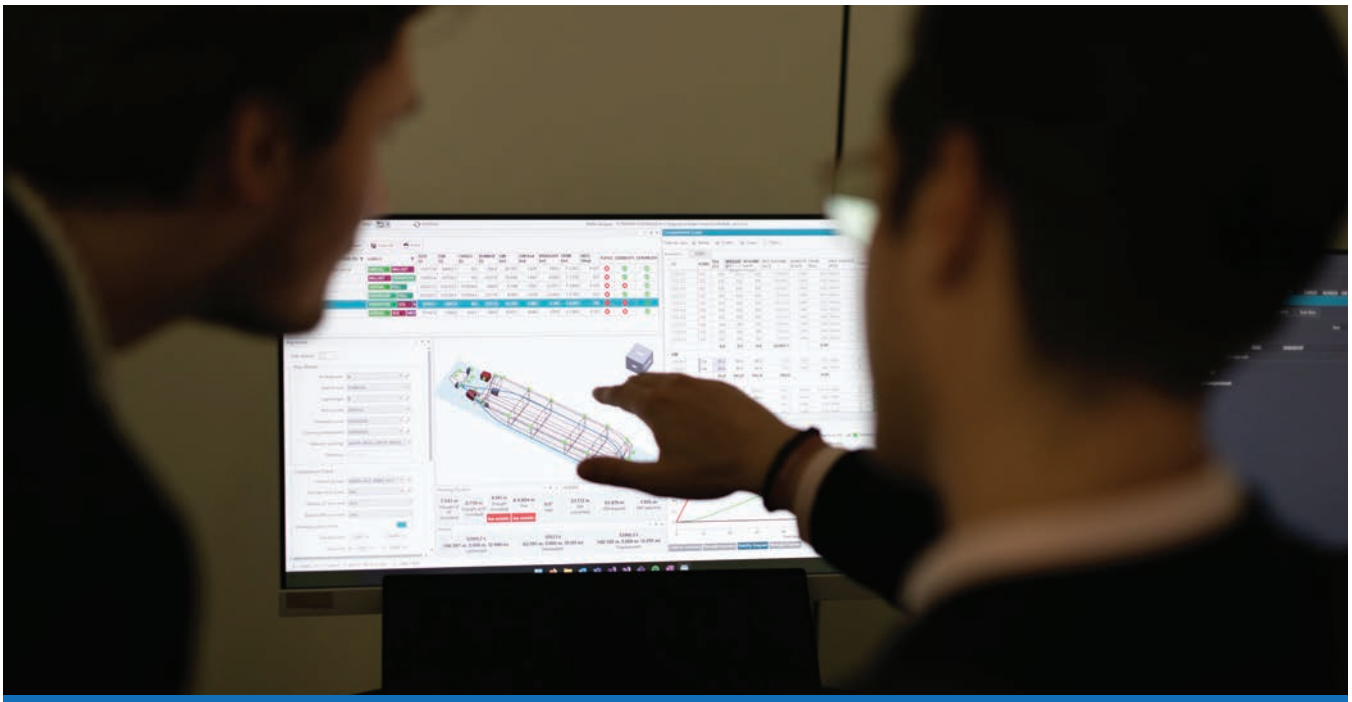


Image courtesy NAPA

AT THE NAPA USER MEETING 2024, THE TEAM DISCUSSES THE DIFFERENT FEATURES OF NAPA DESIGNER, INCLUDING HULL FORM AND STRUCTURAL DESIGN.

more realistic and accurate when they do.

"Going forward, the magic will be fully unlocked by combining data from operational simulations with digital twins that are based on the ship's unique 3D model," says Joakim Heinolainen, Technical Consultant, NAPA Design. "This offers game-changing potential: testing different design variations and modelling how they would perform in real life. These simulation capabilities mean that naval architects and engineers will be able to compare potential shapes, configurations, technology and fuel options, and calculate their implications on the future ship's fuel consumption, GHG emissions, stability parameters and hydrodynamic profile."

But, as Dr Gaute Storhaug, Senior Principal Specialist in DNV Maritime Advisory, points out, it's important to have a business case because the components of digital twins can involve an investment of well over $500,000. This needs to be defended by a cost benefit analysis. "We see focus lacking on this aspect in both the research community and in industry. For this reason, DNV has developed a range of digital twins from very scalable but inexpensive to state-of-the-art digital twins utilizing both sensors and design models to serve different purposes and needs for different stakeholders."

George Jagite, Senior Structural Engineer at DNV, agrees. "What's most important is to have a physical meaning and a practical meaning. Just making a black box and predicting a number looks nice in a paper, but maybe it's useless in reality."

Storhaug explains how AI fits into the dynamic potential of digital twins. "The simplest way of thinking about it is to think of machine learning as statistical regression, based on being trained on past datasets that are then used to predict the future based on current input in a static sense. Same input, same result. AI is taking in additional data automatically as time passes, so it's trending itself as it gets more available data, and the future prediction will change and improve compared to a machine learning model, so AI is like a dynamic machine learning model. It is easy to imagine that this can be useful because the past dataset may be deficient and may not push the boundaries of operation where the physics may change. Neglecting this may in worst case remove the safety margin, so AI must be accepted but needs a proper assurance process to ensure avoidance of false warnings or false impression of safety."

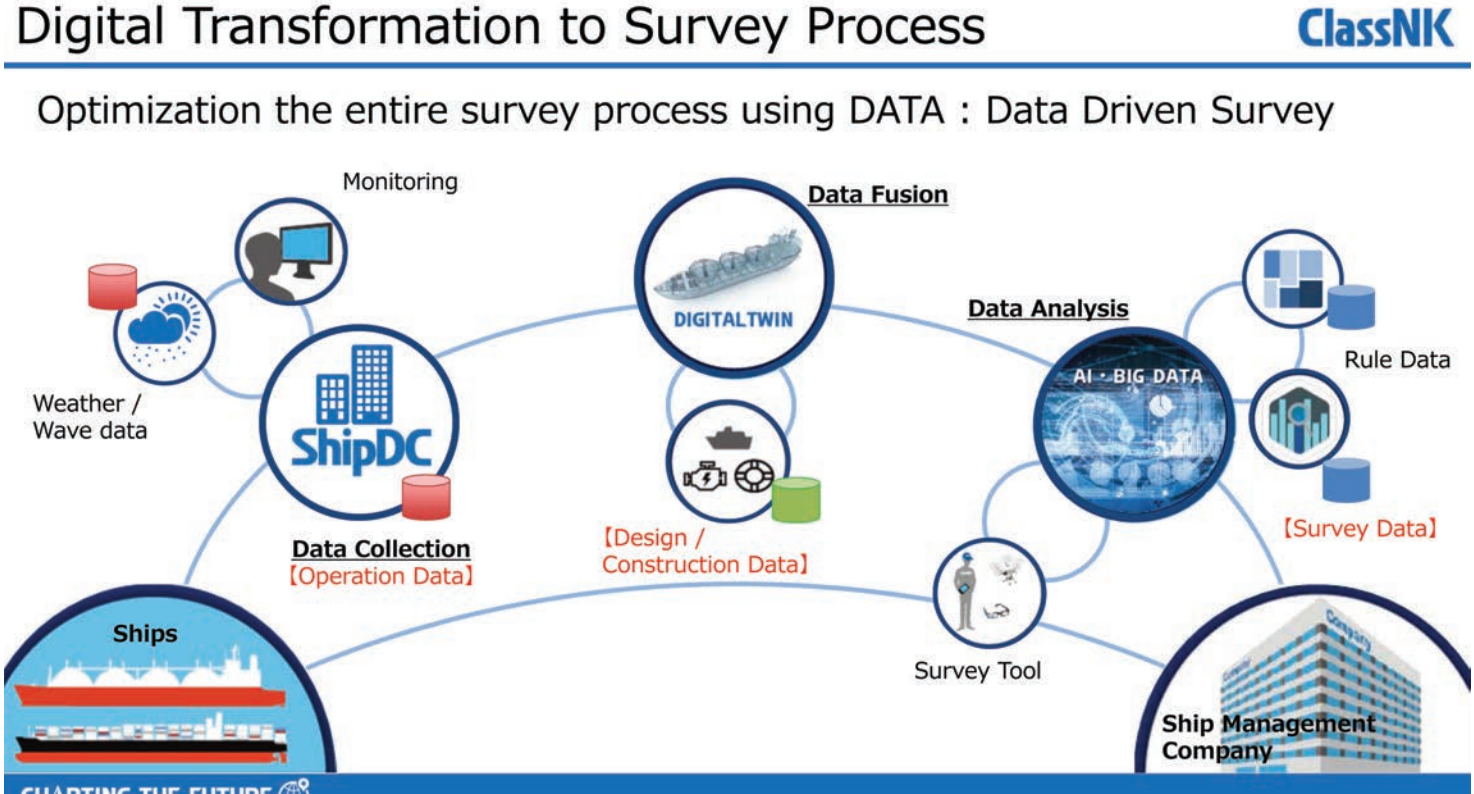
Hwasup JANG, General Manager of Korean Register's AI Convergence Research Team, says that for digital twins to develop, key technologies need to be advanced including big data-based learning models, communication speed, marine environment forecasting, extended reality (XR)-related utilization technologies and simulation technologies. KR is forging ahead with developments, including that of a mixed reality dashboard for understanding the digital twin of an electric-propulsion ship.

BV's Ship Energy Efficiency Calculation and Analysis Tool (SEECAT) has simulation models that offer enhanced capabilities to optimize designs by modelling the performance of new ship types, new fuels and green technologies. Going into operations, SEECAT provides a database that can

"BVs digital twin collaboration with tech company Aras will enable it to create a single source of truth for each ship and asset."

– Laurent Hentges, Vice-President, Digital Solutions & Transformation at Bureau Veritas Marine & Offshore

Mikko Forss, Executive Vice President for Design Solutions at NAPA, delivers a presentation on 'Accelerating The Future of Ship Design" at the NAPA User Meeting 2024.



CLASSNK IS WORKING ON AN INITIATIVE TO DIAGNOSE THE CONDITION OF INDIVIDUAL SHIP HULLS, MACHINERY AND OUTFITTING WITH DATA RATHER THAN BY SURVEYORS' VISITS.

Image courtesy ClassNK

"AI must be accepted but needs a proper assurance process to ensure avoidance of false warnings or false impression of safety."

– Dr Gaute Storhaug, Senior Principal Specialist, DNV Maritime Advisory

"Going forward, the magic will be fully unlocked by combining data from operational simulations with digital twins that are based on the ship's unique 3D model."

– Joakim Heinolainen, Technical Consultant, NAPA Design

be used by digital twins to optimize operations by powering weather routing applications, for example.

Laurent Hentges, Vice-President, Digital Solutions & Transformation at Bureau Veritas Marine & Offshore, says that BV's digital twin collaboration with tech company Aras will enable it to create a single source of truth for each ship and asset, including the equipment installed on board, ensure end-to-end traceability of ship data, continuously update data from design to operations, increase collaboration with real time access to ship condition and anticipate the evolution of regulatory requirements.

ClassNK is working on an initiative to diagnose the condition of individual ship hulls, machinery and outfitting with data rather than by surveyors' visits. This is done by integrating unique design data for each ship, class-related data and operational and environmental data that ClassNK has independently collected from traditional ship surveys. So, the data related to individual ships is combined with the analysis results of classification data from thousands of ships. The safety aspects of the ships recreated in the digital world will be represented and evaluated by indicators, and by making these indicators public, ClassNK hopes to promote further effort on ship safety.

Cross-industry research projects have also broken new "butterfly" ground. The CHEK project, with 11 partners, involved the development of a digital twin platform that was able to assess the energy efficiency gains of multiple, potentially interacting, clean technologies and model their combined business case. And the SeaTech project, with seven partners, modelled the combined effect of new engine technology and an energy-saving foil to enable the development of both the technology and its lifecycle costs.

To again quote Westerman: "Technology leadership is not just about IT leaders, although they are part it. It's not just about technical skills, although they're essential. It's about merging the skills and perspectives of business and IT leaders so that they drive transformation together."

Image courtesy Cadmatic

SHIPBUILDING 4.0

DIGITAL TWINS & ENHANCED EFFICIENCY

Ship and boat builders globally – from the largest to the smallest shipyards – can leverage new digital tools, including digital twins, to improve productivity and reduce costs. In a recent episode of **Maritime Matters: The MarineLink Podcast**, *we welcomed a trio of executives from ABS, Fincantieri and Cadmatic to discuss in granular detail the best steps to start leveraging new technology in ship design and construction.*

Change in the maritime industry is happening rapidly and revolutionizing the ways that ships are being built. The landscape is evolving quickly, driven by new rules and regulations to clean up our seas and embrace greener, more efficient technologies. New fuels, digital solutions and artificial intelligence are helping shipbuilders embark on a journey to future-proof their business operations over the lifecycle of a vessel.

We ask three experts from the field to give their perspectives and comments on the marine industry going digital. How do they see the market changes, adoption challenges and using Digital Twins as an opportunity?

Charting the Course

According to **Patrick Ryan, CTO, ABS**, digitalization and

digital lifecycles comprise a very wide base of specific technology. The greatest challenge lies in organizing, applying and attracting investment effectively across this spectrum.

"At ABS, we have divided digital technology into four themes to find opportunities and then scale up:"

- Visualization
- Artificial intelligence
- Virtual vessels
- Autonomy

"The next challenge is connecting the technology to the desired outcomes. It is wrong to assume a certain technology will deliver some specific value. People are the real drivers of value creation – and technology is only a means to that end.

We find prototyping and executing small projects help to prove the value of a technology. Once successful prototypes are in hand, scaling up is possible."

Becoming digital is often defined as being agile and able to manage change. In the maritime industry, decarbonization is the primary driver of this change. In the end, we need results with greater value and efficiency. This can mean faster design using CAD, simulations or other digital approaches. Managing this change with great results is why it is essential for the maritime industry to become a digital industry.

"Digital technology also changes all the time. Becoming digital isn't necessarily about simply using software to solve problems. It's about being adaptable to change. It demands a cultural shift, a willingness to grow in the face of uncertainty, find the right people with the right digital skills and a commitment to lifetime learning," said Ryan.

Setting Sail – Overcoming Adoption Challenges

For shipyards, embracing a digital lifecycle approach is not without its hurdles, says **Pete Sinclair, Director of Technical Services at Fincantieri Bay**. It requires evolving IT infrastructure and personnel training, which is not the normal focus for a shipyard.

"Departments across the board feel the impact of IT. This includes how technologies reshape traditional workflows for engineering, planning, procurement and production. And the biggest change is on the shop floor, where such new technologies have not even existed before. With a clear end goal in sight and a roadmap to serve as a guide, shipyards can also chart a successful course toward digital transformation.

The key lies in delivering small victories, showcasing the tangible benefits of digital tools and processes – and then building on them. It is also important to engage the influencers at every level of an organization and have them onboard from

Scan the QR code to watch this episode of **Maritime Matters: The MarineLink Podcast**

Image courtesy Maritime Matters: The Marinelink Podcast

the beginning to serve as ambassadors and build momentum throughout the organization."

Navigating the Digital Seas – Unlocking the Power of Digital Twins

Amid the waves of change, Digital Twins have emerged as beacons of hope, guiding the maritime industry toward a new era of efficiency and compliance. These virtual replicas offer a glimpse into a vessel's entire lifecycle, from design to decommissioning, providing real-time insight accessible to all, according to **Juan Nunes Prieto, Cadmatic Regional Manager Americas**. "Today, the digital life of a vessel is born before its physical life – and buried after recycling has occurred. Those players best able to adapt and offer effective solutions over the digital lifecycle of their vessels will outperform the others. The biggest obstacle is to get everyone involved. The technology is available. Implementing a Digital Twin is not such a big task if the company is already doing 3D modeling.

Digital lifecycle thinking bridges the communications gap between the different stakeholders in the shipbuilding cycle – between the designer, yard and owner – by using a 3D model with colors and interactions. It also helps departments communicate better internally.

Using Digital Twins is an opportunity to enhance collaboration among all stakeholders – and helps create new designs and solve engineering problems as a result."

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ANTICIPATING THE FUTURE:
Life Cycle Assessment (LCA) for Ship Projects

*Former postdoc researcher **Shqipe Buzuku** has been working for the Finnish ship design firm Deltamarin for the past 18 months, pioneering Life Cycle Assessment (LCA) for ship projects amid growing interest from key industry stakeholders. Here she explains what LCA involves and how it can empower shipowners to reduce emissions at the early design stage. And it soon may be obligatory.*

Since joining Deltamarin, Buzuku has worked on the three formal LCA projects as well as related in-house studies. At the time, the company had just embarked on a three-year, EU-funded project called CHEK, which aims to contribute to decarbonising shipping by enabling key technology symbiosis on real vessel concept designs.

"My job was to develop LCAs for the two bespoke vessel cases – a Kamsarmax bulker and a cruise ship – as part of a work package in collaboration with World Maritime University in Malmö. The results are now with the European Commission and will be published later in the spring. We have also written two scientific articles, one already published* and the other currently under peer review," she says.

Her third case was calculating an LCA at the request of a client covering the operational phase of a Trans-Shipment Vessel (TSV) as part of a design contract, estimating life-cycle emissions for carbon dioxide, methane and nitrogen monoxide. The results are subject to an NDA.

Raising Awareness

"The main driver for LCA is a growing interest among industry stakeholders – especially financiers investing in new vessels – even though it is not yet required by the IMO. Most of our clients are aware of the concept, and some early movers are approaching us for help as they don't really understand what it entails. We aim to offer, in the first instance, operational LCA – meaning environmental impact/carbon footprint assessment of the operational phase of a vessel – as part of the design process, as it can guide owners in their choice of fuel and propulsion technologies."

Fuel LCA is something the IMO is already addressing and Buzuku is sure that performing operational LCAs for new ship designs will be the regulatory norm within 10 years. "That will likely be extended to cover construction and recycling, including all the materials and equipment that go into a vessel. This is positive as it will ensure responsible behaviour and banks may refuse to finance ships without an LCA detailing their full impact."

In the LCA Vanguard

"Deltamarin is doing this up front because we want to be optimally prepared," says Buzuku. "Setting up all the background information is challenging and time consuming. We will also need to properly evaluate and plan for the construction and scrapping phases. While shipowners are right now consumed with upcoming regulations such as the ETS and Fit for 55 package here in Europe, we will be ready to help them when the time comes."

Buzuku sees LCA coming first in offshore shipping serving renewable energy production, where there are more enquiries than from mainstream owners. "Nobody is using it right now as a basis for decision making but there is a lot of potential," she says.

Fuel Choice

Fuel selection is critical because the operational phase represents 80% to 90% of the vessel's life-cycle environmental impact. Taking operational LCA into account at an early stage of the design process could produce better opportunities to potentially influence the result. "Fuel availability and cost remain the core drivers, but LCA and the well-to-wake footprint of each possible fuel will be increasingly important as banks typically prefer to fund sustainable vessels."

Energy Use and Material Flows

Buzuku is sure that LCA will become

Image courtesy Deltamarin

MARITIME TRADITION:
Buzuku pictured by the Finnish Navy school ship Suomen Joutsen (built 1902) in Turku where she is based.

be the ultimate measure of a ship's total environmental performance. "In construction this will include measuring the impact of electricity usage at shipyards and the footprint of materials and equipment, including energy use in steel production and materials' logistics. LCA will likely also introduce a lot of new environmental impact considerations – for example, acidification of land around shipyards. Very little consideration is given to such things today."

Buzuku says LCA may show a bias towards Northern Europe, where yards have access to cleaner energy, but the reality of shipbuilding is 60% in China, 25% in Japan and 20% in Korea. "Some Asian yards will certainly have to clean up their act to stay competitive."

Deltamarin is in a unique position because its mother company shipyards in China are the first in the country to have started measuring these kinds of inputs. "They are sending us aggregated data on the type and amount of electricity they use, but are working to break that down to individual workstations in order to assess the exact energy use per ship. The same goes for material flows. This will help us make the LCA models of ships more accurate."

Mapping Suppliers

In terms of equipment and hardware, within the EU it is very likely all vendors will have to supply Environmental Product Declarations (EPDs) in the coming years, which can be included in LCAs. "This will be a tough job, especially regarding supply chains, because in complex equipment there are components from sub-suppliers all over the place and all their energy use and material footprints will have to be calculated or otherwise taken into account," Buzuku says.

"Regulating this all at once is impossible but, in the future, you should only need to do one full LCA at the design stage, so modifications to the environmental impact of a ship can still be done. That is the logical end of the environmental path. The ideal approach will be to create a shipbuilding specification that clarifies which type of materials/equipment are best for the ship's environmental performance."

Build New or Upgrade?

Another application for LCA is in deciding whether to replace an older vessel with a new one. Is replacement the better option given the challenges in quantifying the building and scrapping phases properly, or is it best to upgrade the vessel with a new engine to run on a new fuel? "One should also be mindful of the overall environmental impact if we build more (and often bigger) vessels. We can now provide high-level operational LCAs for both options, however, the drivers remain cost and compliance with current IMO rules. As long as that is the case, the interest in and prioritization of environmental performance will remain on a second plane," Buzuku says.

Practical Steps in LCA Creation

Buzuku's team generate the first level of LCA based on data from reports, scientific articles and equipment manufacturers' data, for example engine performance measurements and specifications. "In addition to the databases we are building in-house, including for the building phase, we also use the global standardised databases, such as Ecoinvent, integrated into our LCA software application. You need dedicated soft-

ware to pull everything together – it's not a job you can do in Excel.

She adds that if this analysis is done during the ship design stage, the data regarding the ship's fuel and energy utilization during its operational stage is generated by Deltamarin's ship system-level energy simulations using its in-house DeltaKey tool. Otherwise, measurements can obviously be taken from the existing ship.

The task is then to match a ship LCA with LCA models in the software, calculating all the information for steel and other materials, fuels (well-to-tank results require data on refining, manufacturing and transport) and electricity usage. All stages are covered. "The software provides a standardized way to develop the LCA model and the emission types you want to consider in the scope. We then we run the model and extract the results in a standardized format."

Need for a Global Standard

As yet, there is no global standard for ship LCAs to ensure unbiased results. There are no existing shipping-specific databases, which is why Deltamarin has started to build its own. "Our results are pretty objective, but for credibility in future all LCAs will have to be validated by a third party. Implementing a global a standard with guidelines and instructions from class and/or the IMO would be very helpful," Buzuku says.

Buzuku's background is in industrial and environmental engineering and she learned about LCA methodology and tools during her postdoc research. "It's already common in land industries and I'm happy to be developing LCA for real marine cases. Developing a profitable service together with my colleagues is exciting because it's completely new. It's intense but very rewarding, knowing that even in a small way we are helping to make the industry more sustainable," she concluded.

**Environmental Performance of Bulk Carriers Equipped with Synergies of Energy-Saving Technologies and Alternative Fuels (Tuan Dong, Shqipe Buzuku, Mia Elg, Alessandro Schönborn and Aykut I. Ölcer; J. Mar. Sci. Eng. 2024, 12(3), 425; https://www.mdpi.com/2077-1312/12/3/425 (free full text))*

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