MARITIME REPORTER
AND
ENGINEERING NEWS
marinelink.com
September 2023

Inside NSMV No. 1

Empire State VII

SUNY Maritime's **Captain Morgan McManus** is set to take the helm of the first of five National Security Multi-Mission Vessels

Since 1939 Number 9 Volume 85

The Cost of "Net Zero"
Decarbonization in Ports is a Nice Idea – but Who Pays – & How Much?

Fueling the Future Fighting Force
Exploring the USN's Future Fuel

Enclosed Spaces
Safety by Design


Glosten
DAVID PACKARD
15FT
14
13
12
11
10
9
TRUSTED PARTNERS IN VESSEL DESIGN.
For 65 years, we've found new and better ways to solve our clients' challenging problems. What we bring to the table requires drawing on the best of our past while always looking to what's over the horizon. It requires embracing new technologies and a readiness to adapt. But most of all, it requires teamwork and a desire to enjoy the voyage.
glosten.com
More than
DESIGN.

NO.9 / VOL. 85 / SEPTEMBER 2023

24

Photo on the Cover: Courtesy Philly Shipyard : **Photo this page:** Courtesy Captain Morgan McManus

Departments

ROBERT ALLAN

www.ral.ca

ElectRA 2800 | HaiSea Wamis

Authors & Contributors

Brown

DiRenzo

Ewing

Goldberg

Johansson

Krampiz

Laursen

Marlantes

van Hemmen

Brown
Damiain Brown is Chief Product Officer, Harvest Technology Group.

DiRenzo
Dr. Joe DiRenzo is a national co-chair of the 2023 Maritime Risk Symposium and is the director of research partnerships at the U.S. Coast Guard R&D Center.

Ewing
Tom Ewing is a freelance writer specializing in energy and environmental issues.

Goldberg
Murray Goldberg is CEO of Marine Learning Systems, maker of MarineLMS.

Johansson
Capt. Eric Johansson is a national co-chairman of the 2023 Maritime Risk Symposium and is a third-generation Port of New York and New Jersey tug captain. He has been at SUNY Maritime since 1994 and enjoys teaching and mentoring future professional mariners interested in towing, shipping, marine spatial planning, leadership and ship systems.

Krampiz
Florian Krampiz is Director of Marine Claims, North America for Allianz Commercial. Based in Chicago, Florian was previously Head of Allianz's Marine Complex Claims in Hamburg.

Laursen
Wendy Laursen has 20 years of experience as a journalist. She has a Master of Science research degree in marine ecology as well as diplomas in journalism, communication and subediting.

Marlantes
Kyle E. Marlantes is a naval architect, software developer, and PhD candidate, where he develops methods to leverage data in engineering applications.

van Hemmen
Rik van Hemmen is the President of Martin & Ottaway, a marine consulting firm that specializes in the resolution of technical, operational and financial issues.

MARITIME REPORTER AND ENGINEERING NEWS

MARINELINK.COM

ISSN-0025-3448
USPS-016-750
No. 9 Vol. 85

Maritime Reporter/Engineering News (ISSN # 0025-3448) is published monthly except for March, July, and October by Maritime Activity Reports, Inc., 118 East 25th St., New York, NY 10010-1062. Periodicals Postage Paid at New York, NY and additional mailing offices.

POSTMASTER:

Send all UAA to CFS. NON-POSTAL AND MILITARY FACILITIES send address corrections to Maritime Reporter, 850 Montauk Hwy., #867, Bayport, NY 11705.

SUBSCRIPTION INFORMATION

In U.S.:
One full year (9 printed issues) $90.00;
Two years (18 printed issues) $150.00

Rest of the World:
One full year (9 printed issues) $140.00;
two years $180.00 (18 printed issues) including postage and handling.

CONTACT INFORMATION:

Email: mrcirc@marinelink.com
Web: www.marinelink.com
t: (212) 477-6700
f: (212) 254-6271

Member BPA WORLDWIDE BRAND REPORT

Business Publications Audit of Circulation, Inc.

RISE TO THE CHALLENGE

THE RIGHT OPPORTUNITIES. THE RIGHT TIME TO GAIN SO MUCH.

Now is your chance to embrace the challenge and endless opportunities of a new career as a civil service mariner. Travel the world and serve your country, all while earning an outstanding salary.

See below for some of the impressive, annual average salaries that Military Sealift Command offers.

POSITIONS	BASE SALARY	BONUS	ANNUAL AVERAGE SALARY*
First Officer	$83,344 - $121,737	$42,172	$222,921
Second Officer	$76,211 - $102,854	$38,105	$184,629
Third Officer	$68,118 - $84,049	$34,059	$156,502
Able Seaman	$46,346	$23,173	$98,778
First Assistant Engineer	$82,642 - $119,225	$41,321	$223,537
Third Assistant Engineer	$66,747 - $82,354	$33,373	$190,433
Deck Engineer Machinist	$47,814 - $53,770	$9,563	$111,267
Electronics Technician	$70,277 - $82,540	$35,139	$148,763
Steward Cook	$45,187 - $50,796	$22,593	$137,583
Cook Baker	$38,861 - $47,216	$7,772	$109,346

*Annual average salary includes base, overtime and other special pay.

SEALIFTCOMMAND.COM · 888-891-4577

MSC is an equal opportunity employer and a drug-free workplace.

SCAN TO LEARN MORE ABOUT OUR OPEN POSITIONS

UNITED STATES NAVY
UNITED WE SAIL
MILITARY SEALIFT COMMAND

There are few U.S. shipbuilding projects that have generated more interest and excitement than the design and construction of the National Security Multi-Mission Vessels (NSMV) now under construction at Philly Shipyard. The cumulative $1.5B contract is for a series of five training ships for U.S. maritime academies, and it is broadly considered a big win for U.S. government shipbuilding, as it leveraged commercial shipbuilding standards, and unlike traditional government shipbuilding programs, it whipped through the shipyard at a fairly brisk 2.5 year pace, despite cutting steel on the first ship in the first months of Covid.

Curiously though, the main players – particularly MarAd and TOTE – have been remiss in touting the project and the success, perhaps waiting for the first ship, *Empire State VII*, to be delivered later this year.

Anchoring our coverage of the shipbuilding program is our interview with **Captain Morgan McManus**, who will serve as the Ship's Master on the *Empire State VII* when it is delivered later this year. He offers some excellent insights on the ship, its facilities and its role in helping to shape the maritime careers of the U.S. seafarers of tomorrow, starting on page 24.

Of particular note is the modern propulsion system, as the current Empire State is a 60-year-old ship with a steam driven power plant. Power onboard the NSMV series consists of Wabtec Corporation's 16V250MDC, EPA Tier 4, IMO Tier III marine diesel engines designed to provide the power generation for the ships' electric grid, including the power and propulsion system which is supplied and integrated by GE Power Conversion. Getting schooled on the new system is a process for the instructors, too, and started well before the first ship was launched, with McManus and his team having access to GE Power Conversion and Wabtec training. But installing the modern powerplants will be particularly of interest to the cadets, as it will give them a glimpse of what they can expect to see in the commercial maritime space.

Speaking of modern power plants, Fairbanks Morse Defense (FMD) and Oak Ridge National Laboratory (ORNL) recently signed an MoU to investigate the 'future fuel' for the U.S. Department of Defense/U.S. Navy. MoU's these days – as are 'future fuel' projects – are literally a 'dime-a-dozen', but this one caught my eye for no other reason than ORNL's inclusion. I had the opportunity to visit ORNL several years back when it hosted the Maritime Risk Symposium, and the work being conducted within – even through the abbreviated look I was afforded – is mind boggling. **Keith Haasl**, FMD's VP and GM of Fairbanks Morse Technology; and **James Szybist**, Section Head, Propulsion Science, ORNL, were kind with their time in laying out the importance of fuel flexibility and security to the U.S. Navy, wherever they may roam, particularly as diesel fuel eventually becomes more expensive and less available.

Gregory R. Trauthwein
Publisher & Editor
trauthwein@marinelink.com

MARITIME REPORTER AND ENGINEERING NEWS

MARINELINK.COM

HQ
118 E. 25th St., 2nd Floor
New York, NY 10010 USA
T +1 212 477 6700

CEO
John C. O'Malley
jomalley@marinelink.com

President & COO
Publisher & Editor
Greg Trauthwein
trauthwein@marinelink.com

Editor - MarineNews
Eric Haun
haun@marinelink.com

Offshore Energy Editor
Bartolomej Tomic
tomic@offshore-engineer.com

Production Manager
Irina Vasilets
vasilets@marinelink.com

Production & Graphic Design
Nicole Ventimiglia
nicole@marinelink.com

Corporate Staff
Manager, Marketing
Mark O'Malley
momalley@marinelink

Accounting
Esther Rothenberger
rothenberger@marinelink.com
212-477-6700 ext 6810

Manager, Information Technology Services
Vladimir Bibik bibik@marinelink.com

Circulation
Kathleen Hickey k.hickey@marinelink.com
212-477-6700 ext 6320

Sales
Vice President, Sales
Terry Breese
breese@marinelink.com; +1 561-732-1185

Lucia Annunziata
annunziata@marinelink.com;
+1 212-477-6700 ext 6240

John Cagni
cagni@marinelink.com; +1 631-472-2715

Frank Covella
covella@marinelink.com; +1 561-732-1659

Mike Kozlowski
kozlowski@marinelink.com; +1 561-733-2477

Gary Lewis
lewis@marinelink.com; +1 516-441-7258

International Sales
Scandinavia & Germany
Roland Persson
Orn Marketing AB, Box 184 , S-271 24
Ystad, Sweden
roland@orn.nu; +46 411-184 00

Founder:
John J. O'Malley [1905 - 1980]
Charles P. O'Malley [1928 - 2000]
John E. O'Malley [1930 - 2019]

Pure Radar

The most dependable collision avoidance in any weather condition... day or night!

When You're Serious
FURUNO

Award-Winning NXT & X-Class
Radar Domes & Open Arrays

FR10 & FR12
10.4" & 12.1" Color LCD Radar Displays

Safely navigate high-traffic areas with complete confidence.

Display target speed and course in seconds with Fast Target Tracking™	New Risk Visualizer™ identifies potential collision areas	Choose Solid-State or magnetron configurations	Target Analyzer™ alerts you to potentially hazardous targets	Overlay Radar targets on charts with FR12

TARGET ANALYZER · RISK VISUALIZER · UHD Ultra High Definition

Get the whole story at FurunoUSA.com

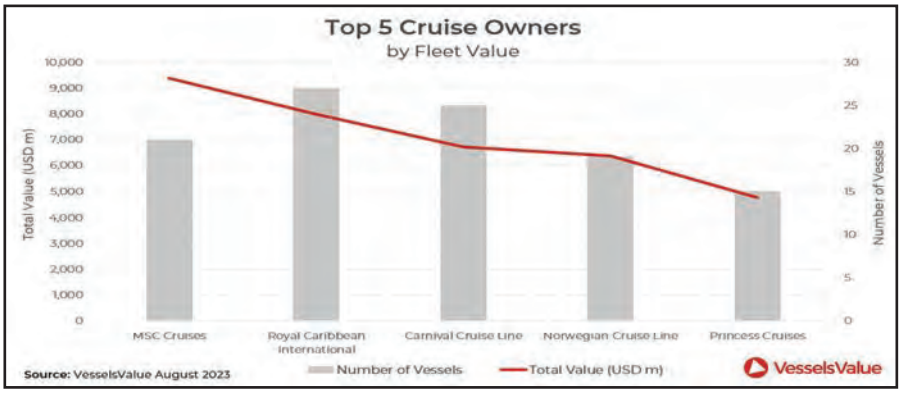
Cruise & Superyachts

Powered by VesselsValue

This month VesselsValue offer insights and a breakdown of the cruise and superyacht sector. By numbers a miniscule part of the world fleet, but by value and style, a global leader.

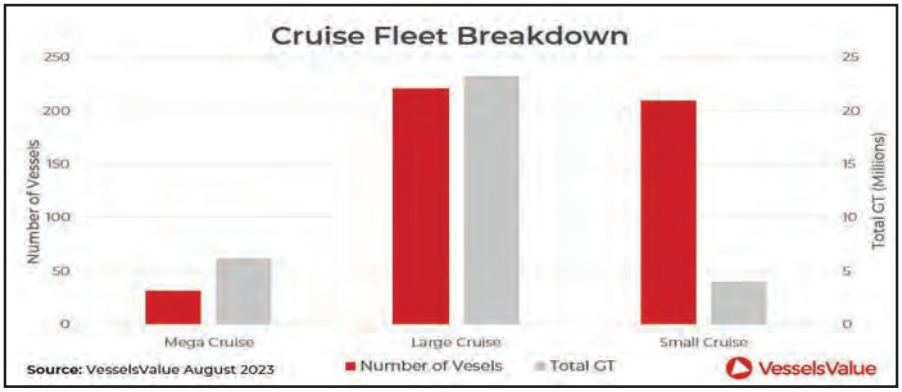
Top 5 Cruise Owners by Fleet Value

Type	# of Vessels	Value ($)
MSC Cruises	21	9,401
Royal Caribbean International	27	7,983
Carnival Cruise Line	25	6,716
Norwegian Cruise Line	19	6,358
Princess Cruises	15	4,766
Grand Total	**107**	**35,224**



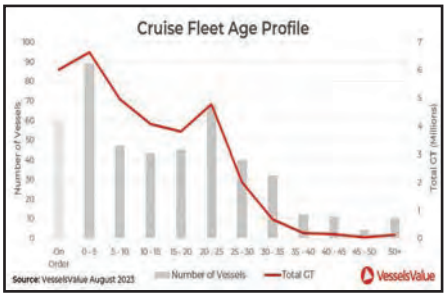
Cruise Fleet Type Breakdown

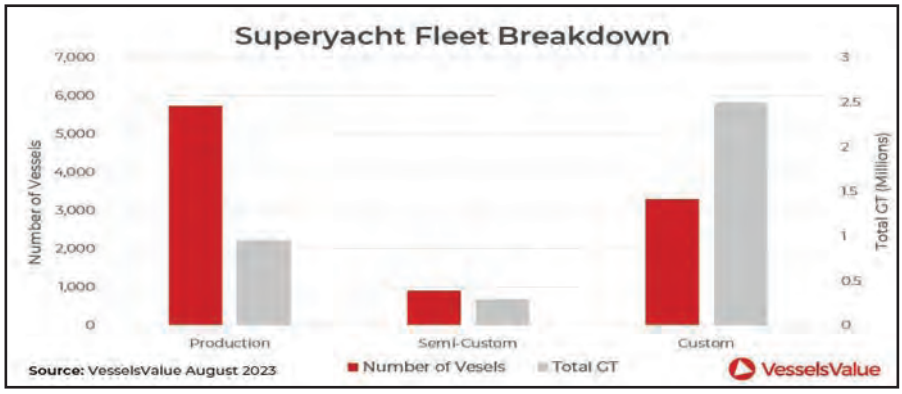
Type	# of Vessels	Value ($)
Mega Cruise	31	6,138,986
Large Cruise	221	23,264,699
Small Cruise	209	3,963,172
Grand Total	**461**	**33,366,857**

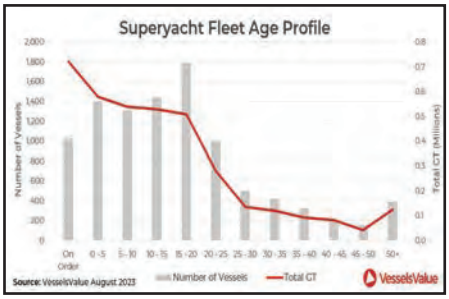


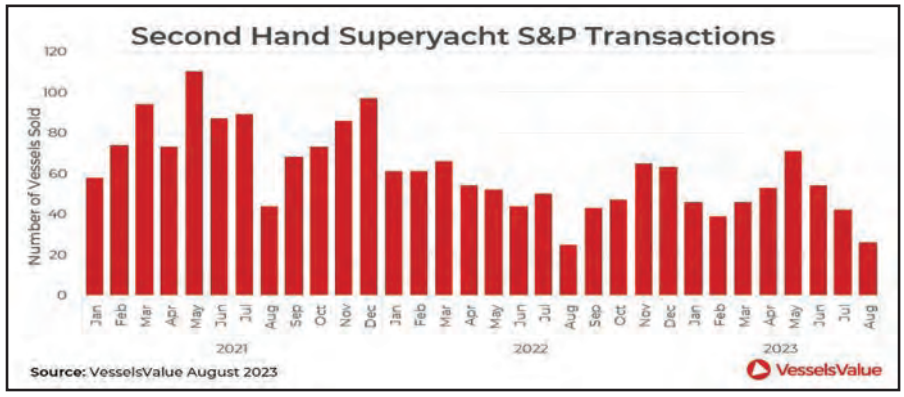
Superyacht Fleet Type Breakdown

Type	# of Vessels	Value ($)
Production	5,735	957,653
Semi-Custom	892	294,079
Custom	3,302	2,490,882
Grand Total	**9,929**	**3,742,614**









EUROPORT 2023
7-10 Nov | Rotterdam Ahoy

ROTTERDAM AHOY

THE MARITIME WORLD TOGETHER, TODAY, TOMORROW

51.9244201, 4.4777325

EUROPORT.NL

REGISTER NOW FOR A FREE VISIT

Since many decades Europort, organized in the world port city of Rotterdam, is the international maritime meeting place for innovative technology and complex shipbuilding. With visitors from over 79 countries around the world, it is an international magnet for maritime professionals.

Tip #51

Overtraining in Maritime: When is Enough, Enough?

By Murray Goldberg

Training is the foundation upon which we build safety and operational efficiency in our industry. Recent advances in technology have made training far more efficient to deliver and assess, which is fantastic! However, these advances have largely erased one of the natural "checks and balances" limiting the amount of training we do. When training was more expensive to deliver, overtraining was less of a problem. Now most would agree overtraining is a significant issue.

This is important for many reasons including unnecessary expense and unneeded time taken from operations. But many consider the biggest drawback of overtraining to be the negative perception created in the eyes of the mariner. In a perfect world, a mariner will look to training enthusiastically as a source of interesting and highly relevant information. Overtraining is very effective at destroying any love of learning that the mariner came to the table with. A monotonous or overwhelming training routine can affect morale, leading to a decrease in engagement and a potential decline in the effectiveness of training sessions. So, how do we address this issue? There is no magic solution, but there are useful techniques we can employ.

First, to reduce the impact of overtraining, consider a balanced approach through blended learning. Combine online training with traditional drills to offer a more diverse and engaging learning experience. This allows for theoretical knowledge to be immediately applied in a practical context, improving retention and engagement. It is also important to understand that not all crew members learn the same way. Some may benefit more from interactive online modules, while others may excel in a hands-on environment. Tailor training programs to fit these individual needs.

Second, ensure that training is absolutely relevant to the mariner by focusing on core competencies. Whether opting for online modules or in-person drills, focus on what is essential. That is not to say other areas of useful training should never be covered - they can and should be. However, their frequency, training approach, deadlines and "test out" options can be more flexible and less formal. This helps to distinguish them from the essential training, and to reduce trainee stress

and fatigue.

Also, remember that overtraining is not the same as over-assessing. In fact, there are many arguments for an increase in the use of assessments. Consider expanding and focusing your use of assessments to not only gauge competency, but to inform training requirements. Regular assessments can help identify which skills are most crucial. They also can help measure knowledge or skill fade which provides concrete data on the ideal frequency for retraining intervals. This approach helps get to the root of the problem; training what is needed rather than training regardless of what is already known.

Another great and often overlooked source of training governance is the trainees themselves. Involve the crew in the decision-making process by soliciting their feedback on the effectiveness, relevance, and frequency of both online training and physical drills. This is one piece of useful data to be considered in your process of regularly reviewing and updating your training programs. Both online courses and physical drills can become outdated because of advancements in technology, changes in regulations, or shifts in operational strategies. Keeping all of your curricula updated and relevant reduces the effects of overtraining.

And in terms of training governance more generally, the most basic and often overlooked advice is to ensure you have a structured approach to reviewing it at regular intervals, not on an ad-hoc basis. Periodic reviews offer an opportunity to identify gaps or redundancies in the training program. Are there areas where the crew is consistently underperforming? Is the training program covering the same material multiple times without adding value? Answers to these questions can guide revisions to the training program, eliminating unnecessary repetition and focusing on areas that need improvement.

Overtraining is an easy trap to fall into in our quest for safety and performance. The first step in avoiding the trap is recognizing that it exists. Once we understand that, give some thought to avoiding the trap using some of the above techniques.

Thanks for reading. Until next time, keep well and sail safely!

The Author

Goldberg

Murray Goldberg is CEO of Marine Learning Systems.
Email: Murray@MarineLS.com

Back to the Drawing Board

Preserving OPA 90 Experience

©Yellow Boat/AdobeStock

By Rik van Hemmen

The maritime industry has seen a very long sequence of environmental regulations since the first implementation of MARPOL in the early 1970's. All of these regulations have very much benefitted the ocean environment and also our industry to some degree. One of those regulations, OPA90, has had an outsized effect to an extent that it may no longer be as effective as it was in recent years due to its own success.

Tanker oil spills in the United States have become so rare that people with actual U.S. response experience are now reaching retirement age without a new cadre of responders with actual spill response experience taking their place.

OPA90 was a unique law that not only existed to reduce a problem, but also resulted in regulations that improved the ability to respond to a problem when it occurs. There have been other regulatory attempts like this such as FEMA, but OPA90 both reduced the problem and created a very effective system of dealing with the problems when they occurred.

This effectiveness relates to the unique combination of participants in an OPA90 response, which forces commercial interests to deal with the problem under government oversight, and with the threat of possible federalization if the commercial response is inadequate. This is quite different from a FEMA response which may have commercial contractors, but no commercial responsibility for the response.

OPA90 creates an interesting situation where both commercial interests and government interests try to achieve the best possible outcome. At first glance the best possible outcomes may not be the same, since the commercial interest wants to spend as little as possible, while the government wants to achieve the highest level of public approval. However, in an actual disaster scenario, these goals align as long as the stakeholders know how to cooperate. One may wonder why a government supervisor may be interested in spending as little as possible, but in disaster response the cost of the response is directly related to the duration of the response, and governments strongly benefit by fixing a disaster as quickly possible. Similarly, a well-run commercial interest never ignores the public's response.

In creating the regulation, the USCG built a response infrastructure that is known as the Unified Command System. That UCS approach was not new, but with OPA90 it first introduced a large-scale catastrophe response system where commercial entities were responsible for the response with government entities providing an oversight function.

Since this approach was new, it took a fair amount of time for all stakeholders to find their place and, most importantly, to establish decision making routines that were most effective in achieving the fastest possible results.

In having lived through the creation of, and improvements to the system, I well remember strange oversights or decision-making failures in the Unified Command System that received careful review after each OPA90 incident.

These were lessons learned, and while they were generally recorded, humanity is bound to repeat mistakes when humans with specific knowledge depart the scene.

I was not involved in the command structure of the Deepwater Horizon, but well remember watching a press conference where the participants were making basic presentation and responsibility mistakes that had been learned in earlier OPA90 responses, but apparently were not known to the Unified Command for the Deepwater Horizon.

Some of those were technical mistakes, but more often they were strategic, tactical, leadership, communication, or decision making (game theory) mistakes and many quite basic.

For rapidly developing, technically uncertain problems such as oil spills, salvage situations, or major technology failures there is a set of Ground Rules that applies almost universally, and when these Ground Rules are absorbed and applied in rapidly developing scenarios, they become second nature and massively increase response effectiveness, both at an individual stakeholder level and at the combined level.

There is no space for a full explanation of these Ground Rules in this column, but the entire package of Ground Rules, including explanations, is probably no larger than the size of a Broadway playbill and it makes sense to at least collect them. Even more importantly they should be exercised and passed on to the next generation if we want to preserve our national ability to respond to disasters.

To provide some insight into the type of Ground Rules that have come from OPA90 experience let me provide a few examples:

- A response that is too large is as ineffective as a response that is too small.
- Stage, but only deploy as needed.
- Never reject conflicting data, instead integrate it in the response and then evaluate.
- Never commit to one technical response, always have a Plan B ready.
- Colorful story telling is incredibly effective in decision making training.
- Manage and update your risks continually.

- On technical disasters the truth is very hard to hide.
- Oversight does not mean making a reasonable response more complicated or burdensome.

These sample Ground Rules require further explanation in the training setting and have underlying experiences and war stories that are fun (or sometimes horrifying) to relate to the next generation.

If these Ground Rules are not fully absorbed by all stakeholders, it can result in frustrations that result in response delays. For example, the last above noted Ground Rule; "Oversight does not mean making a reasonable response more complicated or burdensome" is often violated in smaller disasters such as non-spill minor salvage responses where government oversight is required.

This results in an undesirable effect. A reputable salvage company prepares a salvage plan that is reasonable and realistic and that can be immediately implemented. The plan is sent for review, but the plan reviewer wants to show that they have the power and knowledge to insert their opinions and provides additional requirements. This then results in further discussions and, once agreement on those further requirements has been achieved, the need for the salvor to bring in the resources to meet the additional requirements.

This then results in a delay in the response, additional costs, and the appearance of response ineffectiveness to the public due to delays. Moreover, it raises many additional issues such as: Is the government reviewer really more capable in designing salvage plans than the reputable salvor? If the salvor needs to add additional requirements after government review, is that salvor really capable of performing the work? Or is the salvor actually purposely simplifying their plan, taking into account that government reviewers will feel compelled to add additional requirements regardless of the viability of the plan anyway?

There are no villains in that scenario, each stakeholder is simply functioning to the best of their ability and responding to their fear of the unknown. However, when all stakeholders have a deeper knowledge of that dynamic, they can adjust their actions to create a more effective approach and that is where mutual training comes in.

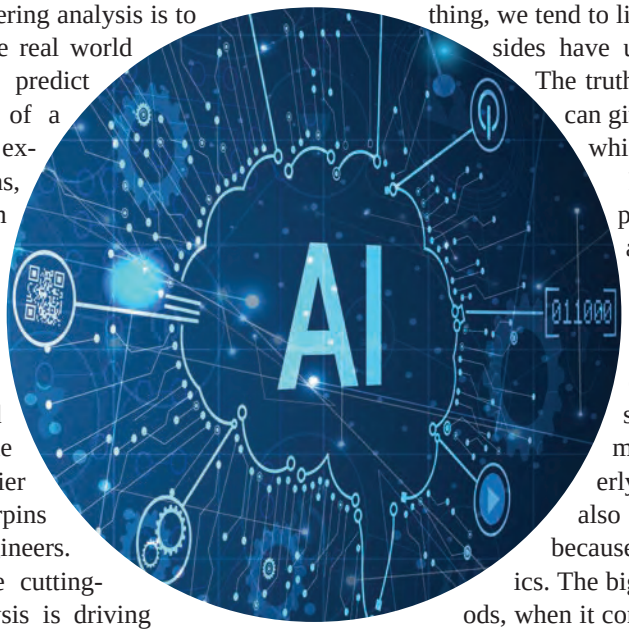
These, and many other conceptual OPA90 issues, are being discussed and evaluated in the OPA90 Forum, an industry group of stakeholders that is interested in perpetuating the public benefits of OPA90.

The organization is still in its early stages, but it may be of benefit to stay in touch with OPA90 Forum if at some time in the undefined future one may be faced with having to come up with rapid and efficient solutions to commercial disasters.

For each column I write, **MREN** has agreed to make a small donation to an organization of my choice. For this column I nominate New Jersey Marine Mammal Stranding Center ***www.mmsc.org*** Almost 50 years and thousands of turtle, seal, and dolphin rescues later, we can forgive them for confusing reptiles with mammals.

Not More Data, More Physics:
How to Use AI To Advance Engineering Analysis

By Kyle E. Marlantes



The goal of engineering analysis is to use models of the real world to simulate and predict the performance of a design with confidence, explore design modifications, and inform downstream stakeholders—the owners, builders, operators, and passengers—with knowledge that the design works as intended before it is built. To do so, we need models that characterize the physical world. That is easier said than done, but it underpins much of what we do as engineers. This is precisely why the cutting-edge of engineering analysis is driving toward high-fidelity simulations which capture the complex nature of the real world with a high degree of accuracy. And at present, the pursuit of high-fidelity simulations largely falls into two camps: the physics-based crowd and the data-driven machine learning crowd.

The former is more traditional: take physical laws, derive equations, and obtain solutions numerically. Think finite difference methods (FDM), finite volume methods (FVM), boundary element methods (BEM), finite element methods (FEM), and many other numerical techniques. In all cases, we are attempting to solve governing equations that are founded on physical principles. The latter, one might argue, is more experimental: utilize machine learning algorithms to build models based on observed or simulated data. Think artificial neural networks (ANN), deep learning, convolutional neural networks (CNN), long short-term memory (LSTM), and transformer networks, to name a few. The landscape of data-driven modeling is vast and rapidly changing, but the main assumption is that modeling can be accomplished using only data.

There tends to be strong bias when you talk to someone from one of the two camps. Physics-based people will suggest that data-driven methods are more hype than substance, and that there is over-confidence in the capability of machine learning models. Data-driven people may suggest that physics-based people are stodgy and old-fashioned. As with anything, we tend to like our own creation the most, and both sides have unique advantages and disadvantages. The truth of the matter is that neither approach can give us what we as engineers really want, which is fast and good.

For physics-based simulations, the appeal is that they tend to provide good answers. Because physics-based simulations are founded on physical principles, they are often more reliable models made up of meaningful mathematics. We can interpret them, understand their output and mechanisms, and modify inputs with confidence. If properly configured, physics-based models also can give very accurate results—again because they are founded on the laws of physics. The biggest limitation of physics-based methods, when it comes to high-fidelity, is that they are exceptionally costly. High-quality simulations require massive computational resources, and even if such resources are available, the amount of data that can be produced is quite limited.

A great example is an operability analysis of a ship in a seaway.

Assuming we only analyze five forward speeds, headings every 30 degrees, 10 different seaways, and use industrial-grade RANS CFD, the time it will take to finish the simulation is on the order of 15 years. The high cost of simulations makes high-fidelity methods practical only for specific cases.

On the other hand, data-driven methods tend to be very fast. Trained models evaluate quickly: a single seaway from the example above might only take seconds to compute. However, data-driven methods suffer from, ironically, a complete reliance on data. Continuing with the seakeeping example, it is necessary to make evaluations in a range of speeds, headings, and wave conditions. This means whatever model we use; it must work over a range of different input parameters. This property, sometimes referred to as transferability, is difficult to accomplish with purely data-driven models without a large training data set. It is not uncommon to need hundreds or thousands of training data samples over the entire range of expected input parameters. This becomes a considerable disadvantage in engineering applications, where we do not have much, if any, data to begin with, and therefore must generate the data using physics-based methods or model testing. It is common for machine

learning researchers to show that if the data were available, the model could perform well, but data is almost never available to the quantity and quality required. Furthermore, the need for a large training data set means that despite the fast evaluation time of a data-driven method, the time to develop training data could be on a similar order of magnitude as a physics-based analysis. And of course, if we spend the time to generate data using a physics-based method, what is the value of the resulting data-driven model? To make data-driven methods viable, the training cost and the evaluation cost must be less than or equal to the evaluation cost of a physics-based method.

If physics-based methods are good, and data-driven methods are fast, it is natural to wonder if they could be used in tandem to make the "fast and good" models that will greatly benefit engineering analysis. But the solution takes more ingenuity than just training a neural network with a physics-based method. The reality is that training data requirements and a lack of transferability will make such an approach of little help to an engineer working on a novel design. Therefore, to achieve useful fast and good models, we need to take a more thoughtful approach.

Imagine that every governing equation—whether it be related to fluid flow, structural deformation, or dynamics—could be decomposed into two parts: a low-cost, low-fidelity part, and then a high-cost, high-fidelity part. In fact, this is a very natural idea in engineering: take the complex, close-to-life model, and make assumptions to yield a model that is tractable. Traditional methods, which still comprise much of the bulk of engineering analysis today, would simply throw out the high-fidelity part and just solve the low-fidelity part, and do so at a great cost savings. For many problems, the low-fidelity part also tends to be robust: it often captures most of the solution. But what if we modeled the high-fidelity part using machine learning? The result is a model which is composed of both physics-based and data-driven parts—a hybrid method.

While talk of generative AI and large language models rages on, when it comes to engineering analysis, the real gem is hybrid methods. Though the idea is very new—even to the research world—hybrid methods are demonstrating a few key characteristics: first, methods of this type greatly reduce the amount of training data required. In general, the amount of data required is a small fraction of what data-only methods need. Second, hybrid methods are almost as fast to evaluate as purely data-driven methods, because the low-fidelity physics part of the model usually requires minimal computational resources. Third, hybrid methods still yield solutions with accuracy similar to that of the training data. This means that if we use a small amount of costly high-fidelity simulation data or model test data, we can make similar-fidelity predictions with the resulting hybrid method. And lastly, but most importantly, hybrid methods are being shown to be transferable. Continuing with our seakeeping example, this means we can take that one seaway worth of high-fidelity data and make similar-fidelity predictions in other seaways. This is what makes hybrid methods incredibly powerful: they leverage data beyond its traditional limits.

Some might argue that the highest-fidelity, most sophisticated solution is not always the most profitable. With good engineering judgment, the low-fidelity, traditional approach can keep engineering costs low and still yield a relatively high-quality product. This notion is certainly one of the biggest hurdles when evaluating and adopting new methods, and hybrid methods are no exception. While it may be true that the benefit a hybrid method can bring to an analysis is limited to certain applications, there is also the ever-increasing demand for design performance: whether it be speed, seaway operability, survivability, safety, efficiency, serviceability, ease and economy of manufacturing, or environmental impact. It may not be unreasonable to expect that the most performant design requirements will benefit from the high-fidelity data-leveraging benefits of a hybrid method.

The Author

Marlantes

Kyle E. Marlantes is a naval architect, software developer, and PhD candidate at the University of Michigan, where he develops methods to leverage data in engineering applications.

Finding USN's Future Fuel

By Greg Trauthwein

Oak Ridge National Laboratory (ORNL) and **Fairbanks Morse Defense (FMD)** last month entered into a Memorandum of Understanding (MOU) to collaborate on the development and integration of alternative fuel technologies aimed at reducing the marine engine's reliance on fossil fuels. Central to this agreement is the future fuel for the U.S. Department of Defense (DOD) which rationalizes that decarbonization efforts will, in the future, drive up cost and drive down availability of diesel fuel, and fuel security is tantamount to national security. The DOD, like many other leaders in the sector, are looking at alternative fuels including low-lifecycle carbon fuels (LLCF) such as methanol, ammonia, hydrogen, and biodiesel.

"Diesel fuel is a major expense for the DOD, and fossil fuels aren't going to be available forever," said **Keith Haasl, VP and GM of the technology division at FMD**. "Historically it's been a very good source of energy for the DOD, particularly the Navy, because of its availability, it's reliability, but going into the future that may not always be there."

Jim Szybist has, for 18 years been the section head for propulsion science at ORNL. "I've spent my career working on engine combustion and alternative fuels for the Department of Energy, primarily to make engines more efficient, cleaner, and more able to use alternative fuels such as biofuels." Most of Szybist's time has been spent working on on-road transportation, but about two years ago, the redirected the team to work on decarbonizing the hard to electrify sectors: larger, heavier applications, ie. rail and marine.

According to Szybist, the DOD is somewhere in the range of 2-3% of the petroleum consumption in the United States, relying heavily on the civilian infrastructure, the refineries, the supply chain. "And the world is decarbonizing right now. The timelines are uncertain, but I think looking [ahead] you can see a future where in certain parts of the world, diesel fuel would be not as available as it is now. So it's not just decarbonizing to meet current mandates, it's operational flexibility, being able to operate on diesel fuel as well as whatever fuel is available in bulk, wherever the needs are. And I know operational energy is a major concern for the Department of Defense as a whole, and this is what we see as something that could provide additional flexibility in the operational energy picture."

The FMD/ORNL MOU is one in an increasingly crowded field of organizations and companies exploring energy transition and future fuel alternatives, but this one is unique on several fronts. First and foremost, for the DOD the primary driver is maintaining full capability. "We want to maintain our capabilities under all circumstances, and that's not always what we're hearing from private sector," said Szybist. "The application's different and the goals can be slightly different even if aligned. I think that's why this is warranted in terms of specific effort for the Department of Defense."

"There are a lot of programs, and they all have merit," said Haasl. "A lot of different companies, a lot of different engine manufacturers are in different consortiums around the world looking at the problem. We're a little different, [led by the fact that we're] us pairing the DOE's top laboratory for alternative fuel research with our expertise in providing power and propulsion systems; it's a really good fit to try to tackle a problem that has some unique characteristics. We're going to have the ability to really look at how we're storing, how we're delivering, how we're preparing that fuel for use for the Navy."

Szybist said ORNL is uniquely positioned "because we are working on this for the private sector on behalf of DOE," but even with that, "relative to the maturity that we're at with fossil fuels, we're at a very early stage and every application is different."

While the teaming is in its infancy, the natural next question is: *What fuels are most compelling for the heavy industry sectors?* "Historically, we've done quite a bit of work on biofuels working in conjunction with the Navy [and other government partners] with good results, said Haasl. "But for me, hydrogen is a real focus because it's probably the most recognizable of the alternative fuels that's out there right now, more people are understanding the pros and cons of having a hydrogen strategy. What makes the marine defense users unique is the storage and delivery of the fuel. That's a big part of the problem we hope to solve." The company is currently working on a proj-

ect in conjunction with NAVSEA, blending small amounts of hydrogen in the combustion process with the intent of improving the combustion characteristics of the diesel.

"This isn't a substitution," Haasl clarifies, "this is trying to make diesel burn better. So if we can quantify the effects of combustion through this testing we're doing now and show that on demand hydrogen production is scalable, it's possible."

From the ORNL perspective, maintaining the broadest possible view is warranted at this stage.

"From my perspective, we're interested in all of these fuels of the new hydrogen economy," said Szybist. "Hydrogen, methanol and ammonia; they all have pros and cons. There will be a lot of factors that are application specific and a lot of factors that are also outside the sphere of influence of the end user in terms of what does the rest of the economy decide in that locality as the best fuel. I think there's a lot of value and a lot of need to study all of these fuels and understand how could we accommodate each of these when the situation arises."

New Fuels, New Challenges

Whichever fuel emerges as the primary future fuel, undoubtedly there will be impact to the physical machinery as different fuels impact different systems and components – fuel injectors, seals, cylinder liners – in ways that today might not be well known when running for the pace and duration demanded.

"The first challenge with hydrogen is lighting the fire to begin," said Haasl. "There are viable options, and they all have unique challenges."

He said when you start "going down deeper into the engine, hydrogen burns much quicker than diesel and pound for pound at a relative loads, you see a real increase in BMEP in the engine. So really looking at all the power components is important."

This is where the relationship with ORNL could really yield dividends, as they house some of the best and brightest material scientists in the world to drill down and help devise solutions to maintain engine rating.

"Having access to people with those capabilities is going to be an important part of not just proving that hydrogen works, but proving that it's effective and you can maintain the same mission readiness, the same type of lifecycle, and expect the same performance."

Sexual Assault and Harassment

Owners and Operators Must Comply with Heightened Reporting Requirements

By Sid Lewis and Sara Kuebel, Jones Walker LLP

In response to increased awareness of the prevalence of sexual assault and sexual harassment (SASH) in the maritime industry — and following a widely reported account by a U.S. Merchant Marine Academy cadet of sexual assault aboard a U.S.-flagged ship during her Sea Year training — Congress enacted into law the Safer Seas Act (SSA) in December 2022. Intended as a direct effort to prevent and punish SASH, the SSA, among other provisions:

- Requires the (USCG) to revoke the license, certificate of registry, or merchant mariner's credential of an individual who has been the subject of an "official finding" of sexual assault within the previous 10 years and to revoke or suspend any such credential of any individual who has been the subject of an official finding of sexual harassment within the previous five years.
- Tasks the USCG with taking a more active role in the investigation of SASH aboard commercial vessels.
- Defines an official finding of SASH as including "a determination after an investigation by the Coast Guard that, by a preponderance of the evidence, the individual committed sexual harassment or sexual assault if the investigation affords appropriate due process rights to the subject of the investigation" (46 U.S.C. § 7704a). Of note is this phrasing: "by a preponderance of the evidence." This requires the USCG to meet a lesser burden of proof as compared with the "beyond a reasonable doubt" standard required to demonstrate criminality.

Of significant importance to owners and operators of U.S.-flagged commercial service vessels, the SSA requires them to report complaints and incidents of SASH directly to the USCG. Specifically, the SSA notes that the "responsible entity of a vessel" must comply with these reporting requirements and further defines a responsible entity as "the owner, master, or managing operator of a documented vessel engaged in commercial service" or "the employer of a seafarer on such a vessel" (46 U.S.C. § 10104(g)).

Because the SSA defines a commercial service as "any type of trade or business involving the transportation of goods or individuals" (46 U.S.C. § 2101(4)), its reporting requirements broadly apply to any documented commercial vessel, regardless of its size, type, tonnage, or other factor.

In the following, we provide answers to key questions about the impact of the SSA on owners and operators of U.S.-flagged vessels and identify several as-yet unresolved issues.

What types of misconduct must be reported?

On February 9, the USCG issued a Marine Safety Information Bulletin (MSIB) providing guidance on these new reporting requirements. Prior to the enactment of the SSA, reporting was limited to a certain class of sexual abuse crimes occurring within the special maritime and territorial jurisdiction of the United States.

Under the SSA, the scope of what needs to be reported has expanded significantly. Commercial vessel owners and operators as well as masters and employers of seafarers now must report complaints and incidents of "harassment, sexual harassment, and sexual assault 'that violate' any law or company policy" (46 U.S.C. § 10104(a)(1)).

When and how must reports of SASH be made?

Reports of SASH must be made "immediately" after the vessel owner or operator gains knowledge of the incident. Options for making such reports include the Coast Guard Investigative Service (CGIS) TIPS app and/or the email address CGISTIPS@uscg.mil, which can be used by all reporting sources, including bystanders and survivors. The USCG also maintains a 24/7 watch that can field reports of sexual misconduct via the National Command Center (at 1 202.372.2100).

Reports can be made anonymously or with attribution and should include:

- The name, role, and contact information of the person making the report
- The name and official number of the documented vessel
- The time and date of the incident
- The geographic position or location of the vessel when the incident occurred

• A brief description of the SASH being reported

After a report is received, it will be reviewed by the CGIS. An investigation will be initiated for all reports received, and the USCG will provide follow-up communications with all reporting sources who provide contact information.

As part of an investigation, the USCG is required to collect additional information related to the identity of the victim, the perpetrator, and any witnesses, while taking practicable steps to protect the identity of such individuals. To this end, after making the initial immediate report, a vessel owner or operator then must, within 10 days, submit a more detailed report to the USCG.

What are the penalties for failing to report?

The potential civil penalty for failing to report SASH incidents to the USCG has been increased, from $5,000 to $55,000 per violation.

Jones Act [and other] Implications

In addition to a Title VII action against an employer for a failure to address or prevent workplace assault and harassment, vessel owners, operators, and employers can also face liability under the Jones Act and the General Maritime Law doctrine of unseaworthiness. Under the Jones Act, an employer owes a duty to provide a reasonably safe place to work, which includes the prevention of SASH. This duty to provide a safe workplace does not, however, impose strict liability on the Jones Act employer for every injury or incident. Rather, the employer must have notice or knowledge of a condition and an opportunity to correct it.

As for a claim of unseaworthiness, the law requires a vessel owner or operator to provide a vessel reasonably fit for its intended use. A vessel may be rendered unseaworthy for any number of reasons, including a violent crewmember. To recover under this theory, the plaintiff-seaman must show that the crewmember had a "wicked disposition, a propensity to evil conduct, a savage and vicious nature" that would make the ship "perilous" (Boudoin v. Lykes Bros. S.S. Co., 348 U.S. 336, 340 (1955)).

Unlike a Jones Act negligence claim, a claim of unseaworthiness is akin to one of strict liability. In other words, the seaman need not show that the vessel owner or operator knew or should have known of the perpetrator's "vicious nature" — the vessel owner or operator can be held liable regardless of any such knowledge.

Additional issues

All harassment, or just sexual harassment? One of the leading questions about the new rule stems from the use of the standalone term "harassment" in 46 U.S.C. § 10104 and the USCG's MSIB. There is no indication as to whether this includes forms of harassment outside sexual harassment; in fact, all prior commentary related to the passage and implementation of the SSA centers on SASH.

It is likely that further guidance on this issue will be received from the USCG. In the meantime, employers may want to err on the side of caution and report to the USCG any type of internal harassment based on race, religion, national origin, age, or other protected factors.

Updated harassment and discrimination policies and training. All marine employers should ensure that their harassment and discrimination policies reflect the latest guidance. In fact, the SSA also amended 46 U.S.C. § 3203, which now specifically requires vessel owners and operators to include policies and procedures on SASH in their safety management system (SMS).

Under the SSA, a vessel owner's or operator's SMS must include annual training on SASH, which should include information on prevention, bystander intervention, reporting, response, and investigation (46 U.S.C. § 3203(a)(5)).

Employers also should ensure that their policies forbid discrimination and harassment based on sexual orientation and gender identity. Such language comports with the unanimous 2020 decision of the U.S. Supreme Court wherein it found that discrimination on the basis of sexual orientation and gender identity constitutes gender discrimination under the Civil Rights Act of 1964. Maritime industry employers should train their supervisors and management on recognizing and stopping harassment in the workplace as well as on the proper procedures for documenting and reporting harassment complaints.

Installation of closed-circuit television technology. The SSA requires that video and audio equipment and surveillance systems be installed on certain commercial vessels, primarily oceangoing ships (46 U.S.C. § 4901). Such systems must be installed no later than December 23, 2024, or during the vessel's next scheduled drydock (whichever is later) and must be placed "in passageways on to which doors from staterooms open" and in a manner to ensure the visibility of every door in each passageway. Once the surveillance system is installed, the vessel owner or operator must display clear and conspicuous signs on board the vessel notifying the crew of its presence.

The SSA states that video and audio surveillance records must be retained for not less than one year after the footage is obtained. If the surveillance footage is associated with an alleged incident, it must be preserved for not less than five years from the date of the alleged incident.

Take steps now to avoid exposure

Focus on the prevention, investigation, and punishment of SASH will continue to increase. Given the more stringent provisions of the SSA and the likelihood of increased enforcement, employers should take all reasonable steps to ensure their workplace policies are up to date and that they take swift action in investigating and preventing SASH of any form aboard their vessels.

The Challenges and Opportunities of Remote Operations

By Damiain Brown

Digitalization in the maritime industry continues to grow. Technology is constantly evolving, providing organizations with new ways to transform and manage their operations with adoption of technology creating first-mover advantage and future relevancy, and positivity impacting margins.

The offshore services industry has been a major driver in the trend towards utilization of remote inspection and monitoring technology for Inspection, Repair, and Maintenance (IRM) of critical assets and infrastructure. In fact, the global offshore IRM market is estimated to top out at approximately $18.04 billion by 2028, according to Fortune Business Insights.

Yet, to date, vessels and people working in remote locations have largely been excluded from this digital transition due to cost, connectivity, technology barriers, and skills gap. Ranging in complexity, these are challenges businesses need to overcome to effectively digitalize their operations.

Nonetheless, changes in the availability of satellite bandwidth and the ability to use technology to better utilize available capacity is bringing with it the potential to use new applications, furthering the key adoption drivers for marine companies to manage operations remotely. Emerging technologies are designed to reduce operational and capital spend, improve operational efficiency and health and safety exposure, reduce environmental impact, and meet regulatory compliance requirements.

Real-time situational awareness is critical in remote operations. Situational awareness comes with its own innate challenges, such as technology, bandwidth, information, interfacing, video quality, training, implementation, and human error.

Remote Inspection and Remote Operations

Remote operations offer a wide range of benefits over conventional in-person operations, assisting with everything from real-time collaboration, planned maintenance and continuity of operations, to ensuring operators can meet contractual obligations while adhering to environmental and local regulatory requirements.

Remote operations can take many forms – viewing offshore CCTV footage from any location worldwide or providing offshore workers with two-way communications and video-based support from expertise located onshore, through to completely removing personnel from offshore environments to manage and control projects from an onshore operations control room.

The key to successful remote operations is the ability to connect two or more locations securely and seamlessly in real time, anywhere, anytime. Seamless connection means adopting purpose-built streaming technology that enables the reliable and continuous flow of high-quality video, two-way communications, and robust data throughput.

Remote Inspection

Remote technology allows onshore personnel to guide shipboard personnel through inspections – a subset of remote operations. For example, Underwater Inspection in Lieu of Dry-Docking (UWILD) surveys can be carried out remotely in real-time, using Remotely Operated Vehicles (ROVs), with surveyors and stakeholders onshore having immediate and continual access to video, audio, and data through the inspection, ensuring compliance, efficiency, and safety.

Additionally, the technology enables an inspector to carry out remote audits and inspections on several vessels simultaneously, alongside stakeholders, rather than be seconded to an individual vessel for a period of time.

In the subsea sector, typically ROVs, or teams of divers, or sometimes both, would be deployed from a large vessel to complete specific IRM work scopes involving a series of visual status checks, supplemented by a range of different measurements as well as accessible repairs. Operational video is delivered to relevant parties on board where results are recorded for analysis and interpretation.

Seconding personnel to travel and spend time aboard a vessel can be costly, putting more personnel in harm's way, and adding time lag between survey completion due and data delivery, as well as the time and carbon contribution of travel.

Remote operations and communications technology exists to enable the transmission of video and data back to shore, with two-way communication between multiple workstations and stakeholders taking place 24/7 around the globe. This technology facilitates the very functionality required to enable organizations to remove people from austere environments and use of ROVs to conduct the same IRM activities with less people on the vessel, resulting in smaller vessels on the job.

Remote Devices

In the field, there are many devices that enable remote technology applications. For example, wearables are devices that

can be worn by a user onsite to capture and stream video, with two-way audio communication, with experts viewing the live feed in real time. These enable remote support by streaming audio and video data to operations centres or directly to the expert (regardless of location), using ultra-low bandwidth across existing networks. Wearables are hands-free and usually voice controlled, allowing personnel to focus on the task at hand and allowing the recipient to adjust settings remotely.

Mobile devices come with similar features, having cameras, microphones, audio, and display screens but with the added advantage of all parties having access and being highly familiar with how to use them. Specialist software applications can be installed on mobile devices to facilitate real-time live video and audio streaming over any network.

The Satellite Connection – Overcoming the Challenges

In its March 2023 report, Verified Market Research revealed that by 2028, the value of the global maritime satellite communication market could swell to an estimated $6.67 Bn. While that figure is impressive, challenges are still prevalent today, such as limited bandwidth, access to services and comparatively high cost.

Until recently, satellite infrastructure has been engineered for users pulling data from the Internet and consuming it at remote sites, via email, applications, or Internet access. To facilitate remote operations, the focus is on uploading or transacting data from the site to decision makers anywhere for consumption, thus reversing the previous requirement.

The advent of Low Earth Orbit (LEO) services such as Starlink and OneWeb, together with Medium Earth Orbit (MEO) services, provide higher throughput and lower latency than existing Geostationary (GEO) VSAT satellite services, enabling a new layer of complex applications including media transfer, live communications, and monitoring. For remote operations, the load on satellite communications is far higher due to the requirement for exchanging large volumes of data between sites, therefore bandwidth efficiency – no matter the network – will be key as global demand continues to grow.

The technology itself is relatively easy to adopt, but for some organizations, especially those running safety-critical operations or that are inherently risk-averse, adoption has started quite cautiously. Adopting new technology to automate workflows and streamline operations is imperative and can mean upskilling personnel who wish to work closer to home, resulting in retention of skills and experience within the workforce.

Getting Ahead of the Curve

Adopting new technology to stay competitive is critical in maritime, particularly with the advent of digitalization and the focus on operational efficiency. With advanced systems increasingly common, and with a deeper pool of technical experts onshore, more simultaneous work can be undertaken more efficiently and with greater control.

The next technology leap will usher in systems able to complete general assessments through Artificial Intelligence (AI) and machine learning (ML), with humans performing quality assurance and quality control functions to ensure computers are performing correctly. Disruption is occurring in every industry globally, and there is a fundamental change that must happen inside organizations to prepare for this. Nevertheless, the remote inspection and operations market is growing exponentially and will continue to do so as further advances in sophistication of equipment and technology are made.

Remote technology exists to help companies overcome many operational challenges. Those who become early adopters will reap the benefits of greater overall productivity, cost reductions, improved safety, simplified compliance, and gain first-mover advantage over their competitors.

ClassNK & Social Implementation of MASS

While the regulatory framework covering MASS remains a work in progress, it is clear that autonomous ship technologies are already having a transformative effect on shipping.

By autonomously executing certain functions that would typically be performed by crew – especially tasks related to navigation – MASS technologies can reduce the operational burden on seafarers and minimize the risk of human error, thereby enhancing the efficiency and safety of shipping operations. They also hold the potential to help solve issues raised by continuing shortages in key areas of the maritime workforce.

Given the significant benefits that MASS are expected to bring, foundations are being laid globally for their introduction this decade. The mandatory MASS Code – MSC 111 – is due to be adopted in 2026 ahead of entry into force on 1 January 2028.

Meanwhile, Norway and several Asian countries including Japan have been leading research and development towards the realization of autonomous shipping, and practical implementation of MASS is expected from 2025.

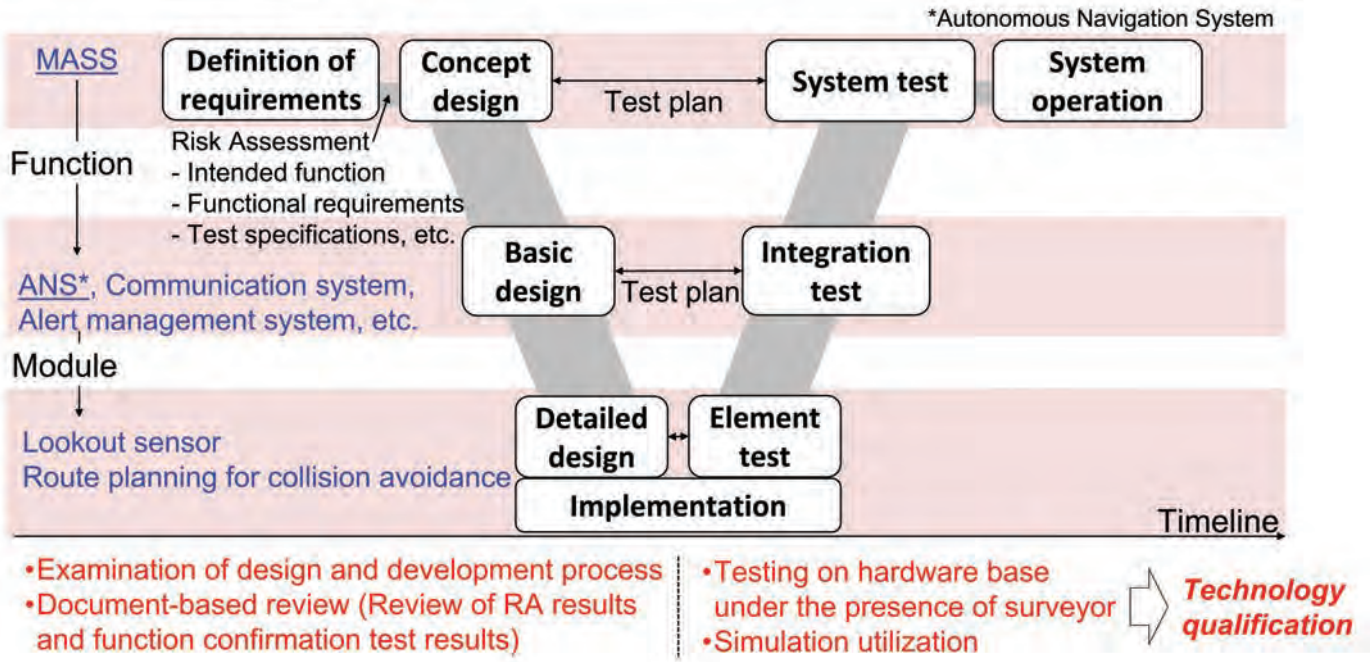
With just a few years remaining on the projected timeline before the mandatory code is adopted and MASS entering the Japanese domestic market, Japan-based classification society ClassNK (the Society) is fully engaged in the certification, rule-development and trialling that will enable social implementation.

Active since 2018, the ClassNK MASS Project Team has been responsible for risk assessment in several projects under the Nippon Foundation's MEGURI2040 Fully Autonomous Ship Program, which aims to "implement fully autonomous navigation to support the ocean of the future".

In 2022, the Society granted approval in principle for the 'APExS-auto' fully autonomous ship framework. Developed by NYK Line, MTI Co., Ltd. and JMS Inc., APExS-auto represents an expansion of the crewed autonomous ship framework – APExS (Action Planning and Execution System) – positioning the computer as an active supporter of the crew capable of executing sophisticated functions. Furthermore, ClassNK will contribute to its upcoming demonstration test by technology qualification as well as classification survey.

ClassNK has also been active in the certification of innovative technologies for smart ships. Groke Technologies' camera sensor system, for example, combines information from various sensor inputs to support advanced situational awareness. Another solution, from Furuno Electric Co., Ltd, deploys virtual technology to offer the user a 3D, bird's-eye view of the vessel, again providing optimised situational awareness. More technologies have received ClassNK's 'Innovation Endorsement' following thorough verification, including those covering shore-connection, navigation monitoring, or cyber protection, enabling advanced vessel management and operational support for safe, secure and smart management of ship operations.

Safety assessment based on V-model



In the rule-development domain, ClassNK has participated in the International Association of Classification Societies' expert group on MASS since January 2020, contributing to considerations for the design and construction of MASS and related systems. In 2018, the Society issued a provisional version of its Guidelines for Concept Design of Automated Operation/Autonomous Operation of Ships, with its Guidelines for Automated/Autonomous Operation of Ships following in 2020. It has also assisted in the publication of the Japanese government's MASS guidelines. With the aim of accelerating discussions and addressing concerns surrounding what remain fast-developing technologies, ClassNK is also working hard to share information on autonomous shipping. The Society contributes papers to national and international journals, has published a special feature on 'Autonomous Operation' in its Technical Journal and recently published a white paper on the topic. Drawing on the findings of ClassNK's research, certification and rule-development activities, the paper – Towards MASS social implementation – proposes a safety assessment framework for the design, development and operation of autonomous vessels.

In the design and development phase, ClassNK aligns with global regulatory consensus in recommending a goal-based approach, to account for the wide range of use cases that MASS are expected to offer and the various technologies that each will require. Given the complexity of MASS as a system, the Society proposes to make use of the concept of V-model in systems engineering. In this model, requirements are identified in a top-down manner at the design stage, and verification is carried out in a bottom-up manner according to these requirements.

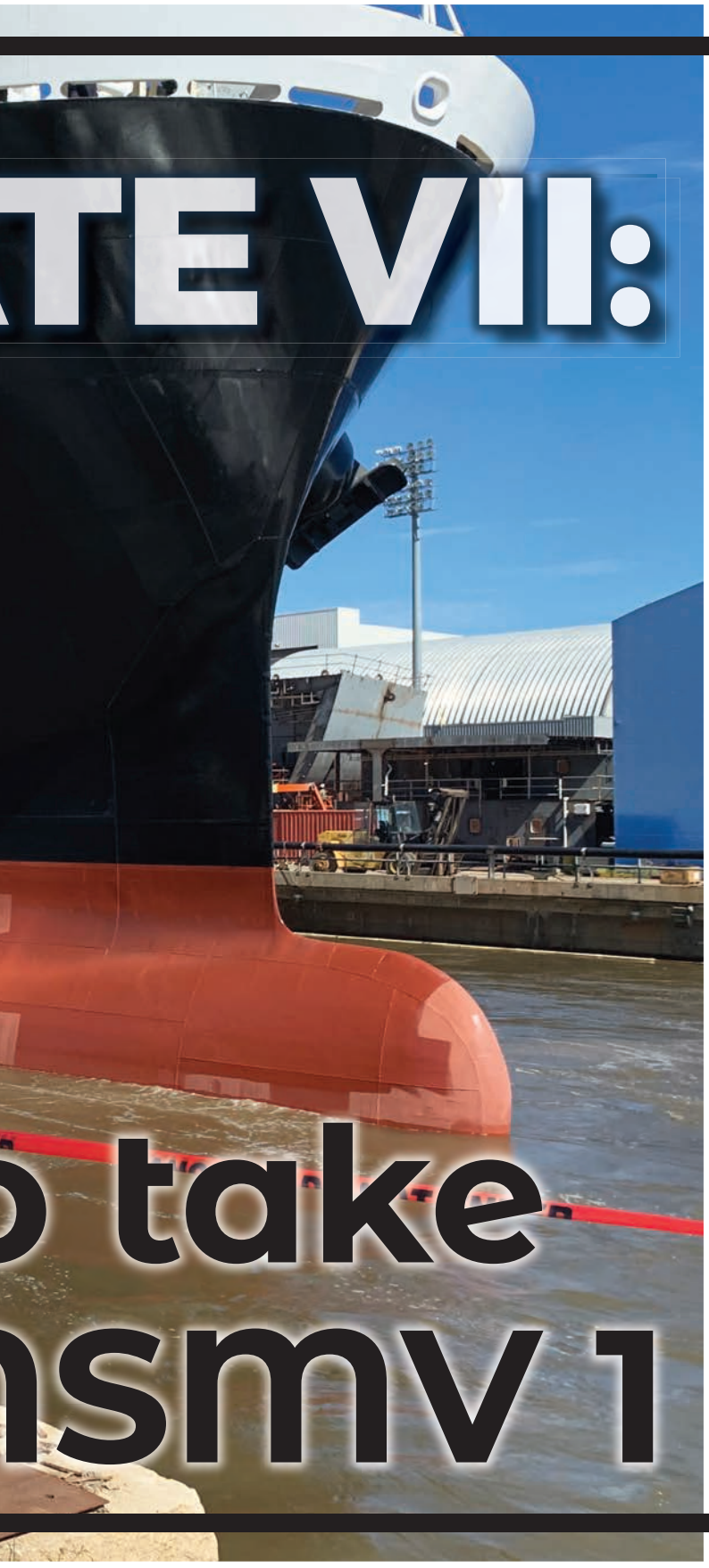
In the operation phase, since novel technologies can only be fully understood once they have been implemented, ClassNK also advocates a 'vulnerability database' for sharing feedback from users with those responsible for technology development, rule development and safety evaluation, where data on defects and near-miss incidents is gathered and used as a foundation for continuously updating regulatory requirements and evaluation methods.

ClassNK believes the processes described in its white paper will be crucial to facilitating the social implementation of MASS and ensuring the technology fulfils its potential to enable safer, more efficient shipping operations.

EMPIRE STA

Preparing to the Helm of N

Photo courtesy Captain Morgan McManus



TE VII:

o take nsmv 1

Captain Morgan McManus *will serve as the Ship's Master on the Empire State VII, the first in a series of five National Security Multi-Mission Vessel (NSMV), which at press time was getting its post-sea trial finishing touches at Philly Shipyard. The project to design, build and deliver the NSMV series is one of the most exciting shipbuilding programs in the U.S. – a government shipbuilding project leveraging commercial shipbuilding efficiencies. For insights, we visited with Captain McManus to discuss the ship, it's technology suite and its role in helping to educate a new generation of U.S. seafarers.*

By Greg Trauthwein

Captain Morgan McManus has a long and varied maritime career spanning nearly 30 years, sailing on everything from tankers to deepwater drill ships, returning in 2019 to his alma mater SUNY Maritime to serve as the captain on the schools training ship, Empire State VI.

"When I joined the college in 2019, they were still in the phases of designing and reviewing the [new] ship," said Captain McManus. Designed from the ground up, NSMV is the first completely new-design ship for the U.S. Maritime Administration (MarAd) in decades, and the project has widely been hailed for taking a commercial – ie. more cost-efficient – approach to a government shipbuilding contract.

Five ships will be built for five maritime academies – Empire State VII for SUNY Maritime; Patriot State for Massachusetts Maritime Academy; State of Maine for Maine Maritime Academy; Lone Star State for Texas A&M Maritime Academy; and Golden State for California State University Maritime Academy –

and each had input on the design, from the size and configuration of classrooms and berthing areas, all the way down to the mess deck.

"They received a lot of our input from all the schools as to what it should look like and what was needed," said Captain McManus. "We said what we thought we needed to make a training ship a training ship."

It's safe to say that any 'first-in-class' ship comes with ample design changes and challenges, and Empire State VII is certainly no exception. Perhaps the biggest challenge though, had nothing to do with ship design itself, as first steel for Empire State VII was cut in mid-December 2020, squarely at the start of the Covid-19 pandemic and shutdown, a situation which slowed, but never stopped the process.

"It made it difficult as far as meetings and project review; a lot was done by Zoom and Teams meetings, and the yard was doing everything they could to keep work going," said Captain McManus. "That made it challenging, trying to build a first-in-class ship with a pandemic going on."

NSMV: A Short History

The NSMV program has a long history, as Jeff R. Vogel, Member, Cozen O'Connor, wrote in the August 2023 edition of sister-publication ***MarineNews***. The program has transcended Presidential administrations and Congressional leaders. In 2015, MARAD engaged with the U.S. Department of Transportation's Volpe Center to make the business case for the recapitalization of the state maritime academy training fleet. The results of the study indicated that if the government failed to take action by 2025, three of the existing training vessels would be inoperable. Volpe's Principal Technical Advisor for Transportation Logistics and Security summarized the critical importance of finding a solution, stating, "Without the state maritime academy training ships, there would be a long-term negative impact on national security, reducing the number of credentialed mariners available to operate U.S. vessels during war, national emergencies, and for domestic and international commerce."

That same year, MARAD began work with Herbert Engineering to develop a design for what would eventually become the NSMV. The demands on the design would be significant. In addition to have to physically fit in the berths available at the state maritime academies, and serve as a state-of-the-art training platform for up to 600 cadets at sea, the vessel design would also have to accommodate use as a humanitarian aid and disaster relief (HA/DR) platform. State maritime academy vessels being used to support HA/DR missions was, of course, not a new concept. For example, in 2012, the TS Kennedy from the Massachusetts Maritime Academy and the TS Empire State VI from SUNY Maritime College were used to house disaster relief workers during the Hurricane Sandy clean-up effort. The difference, of course, is that the NSMV was designed to specifically support HA/DR operations, incorporating a roll-on/roll-off side ramp, container space, onboard cargo handling equipment, a helipad and berthing for up to a 1,000 people.

The result was a mature design, which together with the business case from Volpe, allowed MARAD to receive Con-


Photo courtesy Captain Morgan McManus

gressional funding to begin the NSMV program in earnest. However, Congress saw the value of partnering with private industry to efficiently construct these next generation dual-purpose vessels. Accordingly, the National Defense Authorization Act for Fiscal Year 2017, required "an entity other than the Maritime Administration to contract for the construction of" the NSMVs. The stated Congressional goal was to "leverage the ship construction expertise of… a commercial operator when contracting for the construction of the vessel." This act should be viewed as a moment of divine political inspiration.

This Congressional direction led to a MARAD contract award to TOTE Services in May 2019, leveraging their deep experience in commercial vessel construction. In turn, TOTE Services awarded the initial vessel construction contract in April 2020 to Philly Shipyard.

Designing a Modern Training Ship

Seafarer training is an ample mix of centuries of traditional seafaring skills melded with new and emerging technologies aimed at making a difficult and potentially dangerous job more efficient. The technology on this new series of ships is the show stopper, and in the case of Empire State VII the upgrade is radical, as it replaces a ship that is more than 60 years old.

Starting in the machinery space, Empire State VII has a modern diesel-electric power plant, built with redundancy in that there are two separate engine rooms with a pair of diesel generators in each, both feeding dual high voltage switchboards and dual propulsion motors.

"It's built from a redundancy for the safe return to port feature, but it also helps for training because we'll be able to take off equipment 100% offline for teaching," said Captain McManus. "I think more importantly, the engineering students are going to get such a great working knowledge of power management systems and the computerization of the machinery, learning how reliant and how integral computer software is to engine management and power management," which is what they're going to see when they go out into the job market.

Power onboard consists of Wabtec Corporation's 16V250M-DC, EPA Tier 4, IMO Tier III marine diesel engines designed to provide the power generation for the ships' electric grid, including the power and propulsion system which is supplied and integrated by GE Power Conversion. For the NSMV series, Wabtec will deliver a total of 20 x 16V250MDC Wabtec EPA T4 marine diesel engines plus accessories to its channel partner, Cummins Sales & Service, who has the job of packaging the engines into marine gensets for the five vessels.

Getting schooled on the new system is a process for the instructors, too, and started well before the first ship was launched. "Training wise, we've been going through GE Power Conversion training," said Captain McManus. "My engineers have gone out to Wabtec training school, and MarAd has been very supportive with funding training," from the power to the bridge.

In addition, the SUNY team has been in Philadelphia at the yard since December 2022, observing testing and commissioning. "As systems were coming online, if you're right there in the beginning, you get a lot of knowledge just by watching the technicians," said Captain McManus. Directly before our interview Captain McManus and his team participated in sea trials. "It's [taking a deep dive], immersing ourselves in design review and reviewing the blueprints and going over the ops manuals, the tech manuals for all the equipment."

On the deck side, the ship sports a dual bridge, a separate training bridge from the main bridge "so we get more interaction going on with more students and that makes a big difference," said Captain McManus. "The ship has a bow and a stern thruster, so the deck students are going to be able to get ship handling [experience] and familiarization with operating thrusters, firsthand in the ocean, real-world time."

While the NSMV is purpose built for training plus emergency response when needed, Captain McManus said the vessel feels familiar to the deep water drill ships that he led previously.

"Ironically, from working on the deep water drill ships, a lot of the structure is similar, the forward house and the diesel-electric propulsion. So there are parts of the ship where I walk on, it reminds me very much of a drill ship."

Photo courtesy Captain Morgan McManus

McManus & Mentorship: Be Accountable

As **Captain Morgan McManus** prepares to take the helm of Empire State VII and a new generation of seafarers, he reflects on the mentors in his career that have helped to shape his career path.

"When I was chief mate, I worked with **Captain Steve Werse** at Central Gulf Lines. He really taught me by his leadership style. Once I started sailing captain, I was always able to call upon him with questions or for advice. When I took the role back at the college, **Captain James DeSimone**, the former captain of a training ship, was a great help mentoring me and source of advice [on this position].

Also, I learned how to be a captain by working with a really good chief engineer. When I first started sailing as captain, I had a great chief engineer, **Neil Reilly** was older than I was, and he has since passed away. I started sail captain when I was 35, so I was young and brash [with a big] ego. He had a great, subtle way of keeping me steady."

And when it comes, eventually, to his legacy with the way he would like to be remembered by the students of today? "Never stop learning. Also, be accountable for your actions; be accountable to your mistakes. [Everyone] makes mistakes; learn from them, move on from them, but be honest about it too. We always say on the ship, 'Don't try to hide a mistake. It's going to come out eventually.' So just be accountable."

Custom Built

Not only does the NSMV replace a ship that's 60 years old, the fact that it is custom built for training – not a cargo ship that's been converted – makes a big difference in how all of the maritime academies will be able to structure and deliver training on the ship.

"The designers built it from the ground up, so a classroom is a classroom. I mean, if I was to drop you in a classroom and you opened your eyes, you wouldn't know you're on a ship right away because it looks like a classroom, it's great," said Captain McManus. The difference for Captain McManus is particularly stark as he completed his mug cruise on the Empire State V, where "we had pipe racks in the cargo hold for our berthing area!"

While the new ship is a bit shorter than Empire State VI, it's beamier, giving it a more spacious feel for everything from berthing areas to training facilities to classrooms.

In addition to regular watches and classroom training, the new ships are outfitted with dedicated simulator rooms, simulators for everything from ship handling to automation to high voltage simulators for the engineers.

Captain McManus emphasizes that another big differentiator with the new ship are the aforementioned dual bridge and the dual engine room. "You can manage more students safely for training; you can have dedicated supervision that doesn't interfere with operations; but you could also have that blend where the cadets are involved in the operations, in a controlled environment," said Captain McManus. "An engine instructor can be in the offline ECR reviewing everything that's going on in the online ECR with a whole class, and it's going to really help transfer knowledge."

While seafarer training has changed mightily with the evolution of technology, many core tenants remain the same.

"I remember sailing chief mate and the CargoMax program on the ship died, and we had to do everything longhand for stability; it was a car carrier," said Captain McManus. "So I had to dust off all the math and carry on.

When I first started sailing, you didn't trust the equipment because the hardware didn't have the redundancy or the robustness to work. Now you don't trust the software because of spoofing and cyberattacks. Because of that still teach cadets how to do things the traditional way."

The new generation of seafarers are technology 4.0 natives, and while a certain level of comfort and co-dependence on technology providing the answers has emerged for all generations, "we're always reminding them to 'look out the window' because that's engaging your eyes and your brain. I'll get up in the morning on the training cruise and there will be 60 cadets out shooting morning stars using a sextant, which has been in use for 300 years. They love it."

The new Empire State VII and all of the modern technology within will help to prepare the coming generation for the real world sailing and tech which they will enter, but maintaining a balanced training portfolio is the prudent step. "It's about letting the cadets know [the new technology is] a tool, and not to be dependent on it," said Captain McManus. "The technology is a tool to make your job easier, to make your job more efficient, to make the ship operate more efficient or safely. But it's just a tool. And sometimes that tool breaks. You need to know how to do things another way. Trust but verify is my philosophy with the students."

NSMV Main Particulars

Length	525 ft. (160.05m)
Breadth	88.5 ft. (27m)
Depth	55.1 ft. (16.8m)
Draft, design	21.4 ft. (6.5m)
Range	10,000+ miles @ 18 knots
Propulsion	Diesel Electric
Engines	4 x Wabtec
Total installed power	16,800 kW
Emergency generator	900kW
Electric propulsion motors	2 sets in series with an output of 9,000 kW
Full speed	18 knots with 15% sea margin
Cruising speed	12 knots with 15% sea margin
Bow thruster	1800 kW, retractable
Stern thruster	890 kW
Rudder	Flat type

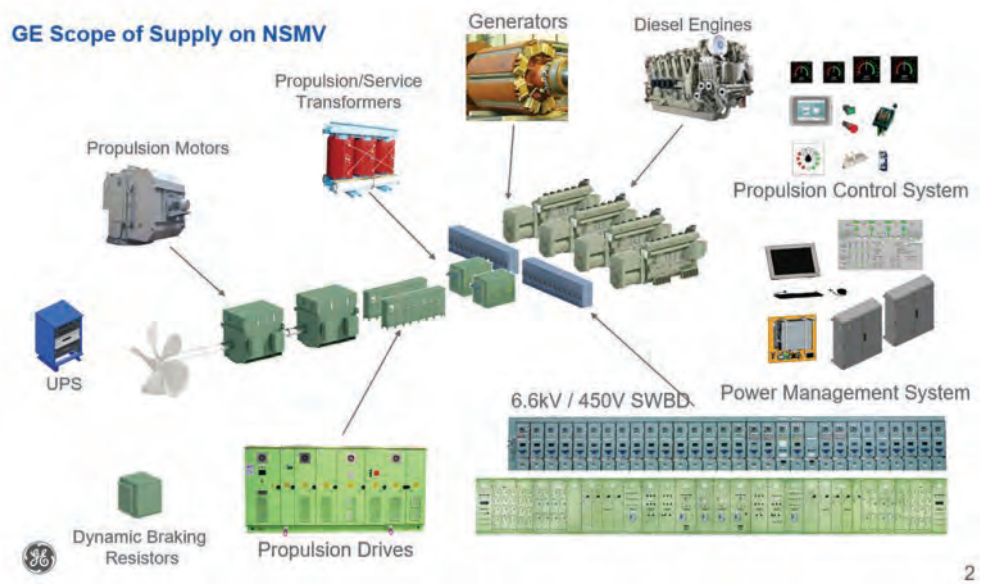
NSMV POWER PLAY

The quest to build a series of five National Security Multi-Mission Vessels (NSMVs), which will serve as training ships for five U.S. maritime academies, has drawn a broad cadre of suppliers. The powerplant was a main focus, helping to evolve the schools from steam power plants to a modern propulsion package.

By Greg Trauthwein

NSMVs being built for the maritime academies is widely lauded as a 'win' for U.S. shipbuilding, an example of commercial shipbuilding practices applied to a government shipbuilding project. Central to the long-term success of the Philly Shipyard-built NSMVs will be the performance of the ship's power system, a modern, proven commercial solution. Anchoring the platform are Wabtec's 16V250MDC, EPA Tier 4, IMO Tier III marine diesel engines, a total of 20 powerplants – four per ship – designed to provide the power generation for the ships' electric grid, including the power and propulsion system. The marine diesel engines plus accessories were delivered to Wabtec channel partner Cummins Sales & Service, who in turn packaged the engines into marine gensets for the five ships. The cumulative propulsion solution is delivered by GE Power Conversion. For GE Power Conversion the NSMV program represents a more than $100m contract [which included the prime movers], signed with Philly Shipyard in July of 2020. "Normally when we deal with the US Navy, and you get the first ship and then the second ship maybe comes three, four years later," said **Steven Mankevich**, Naval Business Development Director, GE Power Conversion. "In this case, we had five ships in a very short period of window." The GE Power Conversion solution starts with the Wabtec prime movers, a company that was a former GE transportation division, which brought familiarity. Wabtec has built thousands of tier four diesel engines for trains, "so they have the capability and experience to build reliable, tier four engines without the need for scrubbers or aftertreatment. That's a huge advantage," said Mankevich.

"Wabtec Corporation is proud to power each of the five NSMVs for the U. S. Maritime Administration with the most advanced, fuel efficient and clean diesel engine technology in the world, built at Wabtec's engine manufacturing facility in Grove City, Pa.," said **Tamara Gromacki,** Vice President - Marine, Stationary Power and Drill, Wabtec. "Our engines maintain world class fuel efficiency while meeting the latest EPA Tier 4 emissions regulations, which reduces engine NOx emissions by 76% over previous engine models, without the use of costly aftertreatment systems." There are four Wabtec 4.5MW engines per ship, combined with a Hyundai electric generator going to switchboards to a 6.6 kv distribution. From there, transformers convert from 6.6 kv down to 3.3 kv, and then into variable frequency drives and finally into the propulsion motors. "The propulsion motors are tandem units that sit in series, and AC induction motors connected to a shaft, which then connects to the propeller," said Mankevich. "The beauty of the AC induction motor is that it has been around for well over a hundred years. It was invented and finalized by Nikola Tesla. There's no doubt that the AC induction motor is still one of the most robust technologies out there because of the simplification."

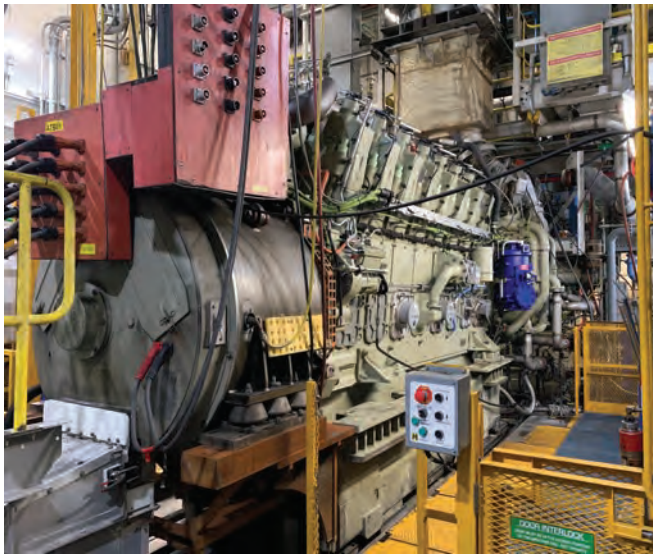


Training the Next Generation

As described bn the previous story, part of the beauty of the new training ships and modern equipment outfit will be the ability to train cadets on the equipment they are likely to see when rotating out of education and into the commercial market. "This will be the first time that an EPA Tier 4 Certified Engine, from any OEM, will be installed into a newbuild government-owned vessel," said Gromacki. "A unique aspect of this project is that the Maritime School of Engineering will include Wabtec's EGR Clean Diesel Engine Technology as part of its curriculum, permit-

Photos courtesy Wabtec

"Our engines maintain world class fuel efficiency while meeting the latest EPA Tier 4 emissions regulations, which reduces engine NOx emissions by 76% over previous engine models, without the use of costly aftertreatment systems."



– Tammy Gromacki,
VP - Marine, Stationary Power and Drill, Wabtec

ting graduating cadets to have a very good understanding of our technology."

She said Wabtec is working with MarAd, Tote, and the maritime academies to provide a practical and efficient training program, including online and hands-on Wabtec Engine University Training, and in-plant (engine design overview and manufacturing process) tours for students and staff.

Looking at the propulsion system wholistically, Mankevich said "as with any ship, there's always going to be the need for maintenance and upgrades. But with the electric drives, the long-term maintenance is altered in part because the biggest antiquity item will be the computer chips." Another focal point for training is safe operation of the onboard electrical system, ensuring the system is de-powered and access per plan.

"We've gone through several training courses and we'll be training the crew on how to maintain it, how to clean it the proper way to, and of course we're using 6.6 kv," said Mankevich. He said the drives are designed to help minimize the chance of electric shock, smartly designed so that if a locked door is opened, the drives shut down.

"However, there are more than just bus bars and electronic equipment," said Mankevich. "You have capacitors, which are nothing more than the batteries. So at times you will still have residual charges inside there." To that end there's a whole regimen of training on de-energizing the system, incldluding using resistive elements to drain all the capacitors so that in the event somebody goes in and touches something, that they're not getting electric shock." In addition, the units have QR codes, too, allowing anyone servicing the unit to scan the code to view a video on accessing the unit safely.

NATIONAL SECURITY MULTI-MISSION VESSEL (NSMV)

All photos courtesy Philly Shipyard

PHILLY SHIPYARD TO THE FORE ON NSMV

Philly Shipyard is in the midst of building five National Security Multi-Mission Vessel (NSMV), a transformational project in U.S. shipbuilding as it's a government ship built via best commercial practices. **Steinar Nerbøvik, President & CEO, Philly Shipyard**, shares with Maritime Reporter & Engineering News his thoughts on the project and its significance.

By Greg Trauthwein

Steinar, I know you're well known in maritime circles, but to start us off can you provide a brief career path?

I'm a proud second-generation shipbuilder and studied Engineering at the Norwegian Institute of Technology in Trondheim, Norway. I've been fortunate to serve in a variety of leadership roles, then as SVP Yard Director for Vard Langsten (former Aker Yards and STX OSV Langsten) and ultimately as President & CEO of Philly Shipyard. In total, I've been involved with 50 ship construction projects in Norway, plus another 20 here at PSI, wow…70 ships in total!

The NSMV program has generated interest and excitement in U.S. shipbuilding circles. Can you put in perspective the deal to build this series of ships versus other shipbuilding projects you've been involved with in your career?

We love to hear the excitement and interest in the NSMV program, and are honored to be building these important vessels for the government. Ironically, from the shipyard's perspective, this project is similar to all of the commercial projects we've completed. It's a series construction, with applied commercial best practices. It's the very type of project that has allowed us to earn the trust of our commercial clients over the years. The difference (for us) is that our ultimate customer is the government. We couldn't wait to leverage our 25 years of experience and get it started.

Compared to our past projects, I would say the major difference in the type of vessel is the amount of outfitting in the NSMV. We have a strong history of product tankers and container vessels, but this is the first time we've been involved with a significant number of cabins, living spaces, classrooms, etc. One more thing – we never thought we would be kicking off a new construction project at the start of world-wide pandemic, so yes, that was different as well!

Can you discuss the interaction between the key stakeholders in the project, from MarAd to TOTE to the academies to the designers that were given the mandate to utilize COTS technology and its impact on Philly Shipyard's end of the project?

Marad's approach in developing a concept design with Herbert Engineering was important to giving us confidence in developing the bid for these vessels. Marad had spent considerable time on the

business case for these vessels, budget reviews and studies which were completed before the RFP was issued by TOTE Services. In contrast to other government newbuild programs, the design was essentially frozen when the RFPs were released, which enabled us to understand the potential costs and risks of the program, as well as optimizing the production flow to maximize efficiencies. The wisdom of this approach has been confirmed in the minimal changes we've seen during construction. To us, it has validated the benefits of the Vessel Construction Manager (VCM) structure for the construction of other vessels for the government.

How did Philly Shipyard invest in the yard, its equipment, specifically for this shipbuilding project?

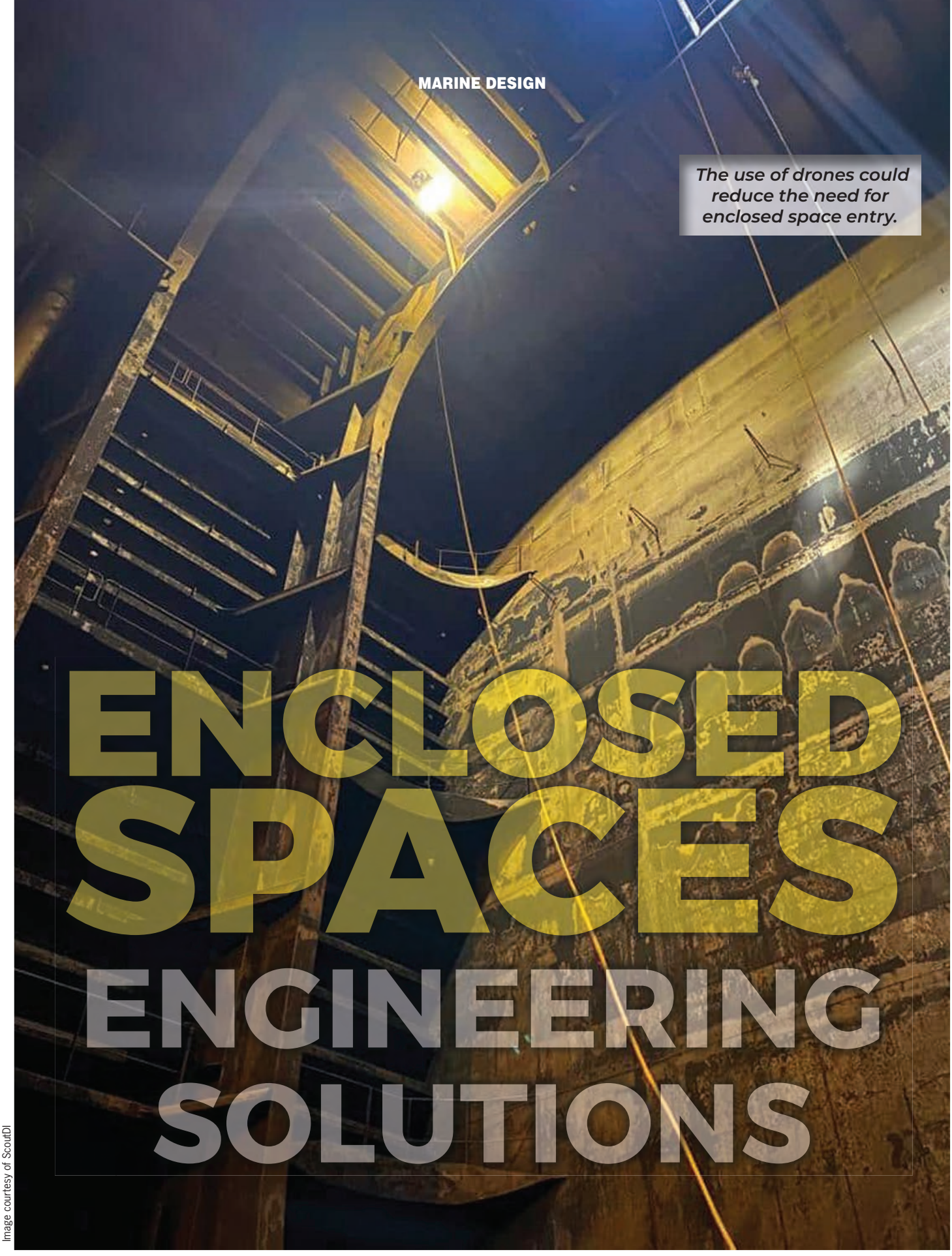
The first thing we had to do was to address the significant amount of outfitting required for this vessel, something we had never experienced with product tankers and container vessels. We had two large docks, sophisticated fabrication shops and a suitable yard layout for steel flow. What we didn't have was a workflow for an accommodation area to build cabins. This ended up being the largest investment we would make – a cabin factory. We borrowed best practices from the cruise ship industry in Europe to build completed cabins and lift them on board, rather them build them on board, and investing in a new cabin factory allowed us to do that. To accommodate the new cabin factory, we also added additional dry storage area for the cabin equipment.

Despite the best laid plans, first ships of a series are always a challenge. What do you estimate was the biggest challenge to building Empire State VII?

Notably, the biggest challenge to building this first vessel was the impact COVID had on both the workforce and the supply chain, including material shipments. When we first signed the contract in April 2020, at the beginning of the pandemic, no one could foresee the significant long-term impact it would have. Ramping up the workforce, keeping safe and healthy operating conditions, handling the accumulating absences and supporting our workers through the pandemic was new territory; and operating within those conditions was difficult for everyone. Although it seems to have lifted, the whole country is still feeling the effects and it could take years to fully recover from the many challenges we faced during the pandemic.

What are some of the lessons learned from the first ship that can be applied to other ships in the series—or perhaps even other future new build programs?

One of the best opportunities with series-built projects is the opportunity for ship-to-ship improvement. This is something that has long been built into the culture here at Philly Shipyard. It's even reflected in our CORE values (the "E" in CORE stands for Evolving – being better than yesterday). We have a strong improvement program that captures input from every department in the shipyard and we spend a lot of time discussing the input. For example, we look at employee retention, lessons learned, how well we coordinate, how well our systems operate, etc. We are lifelong learners and are always trying to improve.



The use of drones could reduce the need for enclosed space entry.

ENCLOSED SPACES ENGINEERING SOLUTIONS

Image courtesy of ScoutDI

If you think the human element is the only cause of enclosed space deaths, think again.

By Wendy Laursen

Enclosed space incidents are cited as the largest cause of on-duty fatalities in commercial shipping. The risks can't simply be engineered out, but there's a powerful coalition wanting action nonetheless.

There's a tendency to blame failure to follow procedures, they say. Investigations seldom focus on the practicality of those procedures or the influence of the operating environment and vessel design, they say. Currently, IMO guidelines are just that, guidelines, and they can be interpreted differently by different shipping segments.

Paul Markides, Marine-Quality Manager at INTERCARGO, notes that even the definition of what is an enclosed space can vary. On LNG carriers, there is a case for not designating compressor rooms as enclosed spaces as people enter them so regularly. It would be an inconvenience to have to fill out a permit and test the atmosphere every time. "So what? Inconveniences are a necessity of life."

Having inbuilt detection systems would be a step forward, he says. However, beyond the initial expense, there is also the need for testing, calibration and maintenance. "You might not get that investment from owners until the IMO makes them mandatory."

INTERCARGO is part of the coalition trying to make change happen. Members of the Human Element Industry Group (HEIG) also include International Chamber of Shipping, OCIMF, International Marine Pilots Association, International Federation of Ship Masters' Associations, Institute of Marine Engineering Science and Technology (IMarEST), InterManager, the Royal Institute of Naval Architects (RINA),

Image courtesy of ScoutDI

"I don't believe there has ever been a ship that was designed to be safe from the point of view of enclosed space entry."

Martin L. Shaw
President of IMarEST

International Christian Missions Association, International Transport Workers Federation and The Nautical Institute.

Martin L Shaw, President of IMarEST, says HEIG made a submission to the IMO in June about the classification of enclosed spaces based on hazards and risks that should form the basis for procedures and regulations. HEIG has also submitted an update to the IMO 1050(27) Revised Recommendations for Entering Enclosed Spaces Aboard Ships.

"I don't believe there has ever been a ship that was designed to be safe from the point of view of enclosed space entry," says Shaw.

The use of Australian ladders, which were designed to reduce 'fall from height' risks at loading ports are an example. In some designs, these ladders were enclosed creating a trapped atmosphere once the cargo is loaded. This can result in fatalities at the discharge port.

HEIG has produced the Systemic Analysis and Reduction of Enclosed Space Hazards in the Design of Ships and Systems (SARESH) – defining a hierarchy of hazard control and providing guidance on reducing the risks through engineering solutions. It has also produced Technical Solutions to Enclosed Space Fatalities.

Designers could aim to avoid the need for entering an enclosed space at sea: drydock entry reduces the risk as the ship should be in a safer, more planned and predictable environment. Achieving this would involve avoiding the need to fit equipment in enclosed spaces, enabling its removal for maintenance and repairs or ensuring it requires minimal or no maintenance between drydocking.

The International Association of Classification Societies has robust procedures for enclosed space entry, and many states have national requirements as well, but HEIG sees the need for an integrated review of PPE for enclosed space entry, as it is often a collection of mismatched equipment that does not fit comfortably and may not operate correctly.

The relocation and expansion of access holes might be a mitigating engineering change that would be easily achievable in drydock. Access arrangements should allow for a rescue party wearing SCABA and for casualty lifting equipment. Access for ventilation could be remote from the manhole, and fixed ventilation could be provided in cases where regular access is required.

The use of drones could reduce the need for enclosed space entry. This technology is being developed by several class societies including the REDHUS project involving DNV, NTNU, shuttle tanker owner Altera, bulk ship operator Klaveness and robotics company ScoutDI. The group is furthering the development of beyond visual line-of-sight (BVLOS) operation for inspections without human entry. Equipping a team with an indoor inspection drone reduces the number of people required and makes inspections faster. If they choose to enter the space, fewer people will be exposed for a shorter time.

"If you walk into a room of 100% nitrogen, you will most likely never notice the lack of oxygen before you die."

Sarah Watts
Chairwoman of the RINA Safety Committee

hip designs should be reviewed with the aim of reducing the number of enclosed spaces. Still, it's easier said than done. The simplicity of the cargo tank in a double hull tanker, for example, is offset by the complexity of adjacent ballast tanks.

Sarah Watts, Chairman of the RINA Safety Committee, points out that naval architects are often criticized for poor design, but it should be recognized that they have to work within many constraints, including compliance with regulations and the specification and wishes of shipowners and shipyards. The fit-out of ships may involve contractors routing pipes and cables through the internal structure with little consideration of how they restrict access inside the space.

Watts points to the physiological risk that there is no bodily response to low oxygen, rather it is high CO2 concentration that causes the 'out of breath' sensation. "If you walk into a room of 100% nitrogen, you will most likely never notice the lack of oxygen before you die."

The hazard that a small opening poses is usually obvious. Cargo holds with large openings but atmosphere depleting properties from cargoes such as coal are not so obvious. "It is possible that in these instances the size of the hatch actually hides the problem." And, she says, the alternative to eliminating enclosed spaces is to reduce the number of them which might then reduce the training given, which would potentially exacerbate the problem.

However, Watts recognizes that more can be done on design, and along with HEIG, RINA is involved with the industry consortium Together in Safety, a non-regulatory industry consortium connecting the maritime sector with the common purpose of working together to improve safety. Naval architects need to take account that the design allows for safe operation, she says. "If the design does not allow for safe operation; it is simply bad design."

Zero Emission is a Nice Idea, *but Who's Going to Pay for It?*

EPA Readying Big Money for Zero Emission Ports

By Tom Ewing

US EPA is working on two high-profile port initiatives that it hopes will move the needle in a big way towards US ports' zero emissions (ZE) operations and clean air goals.

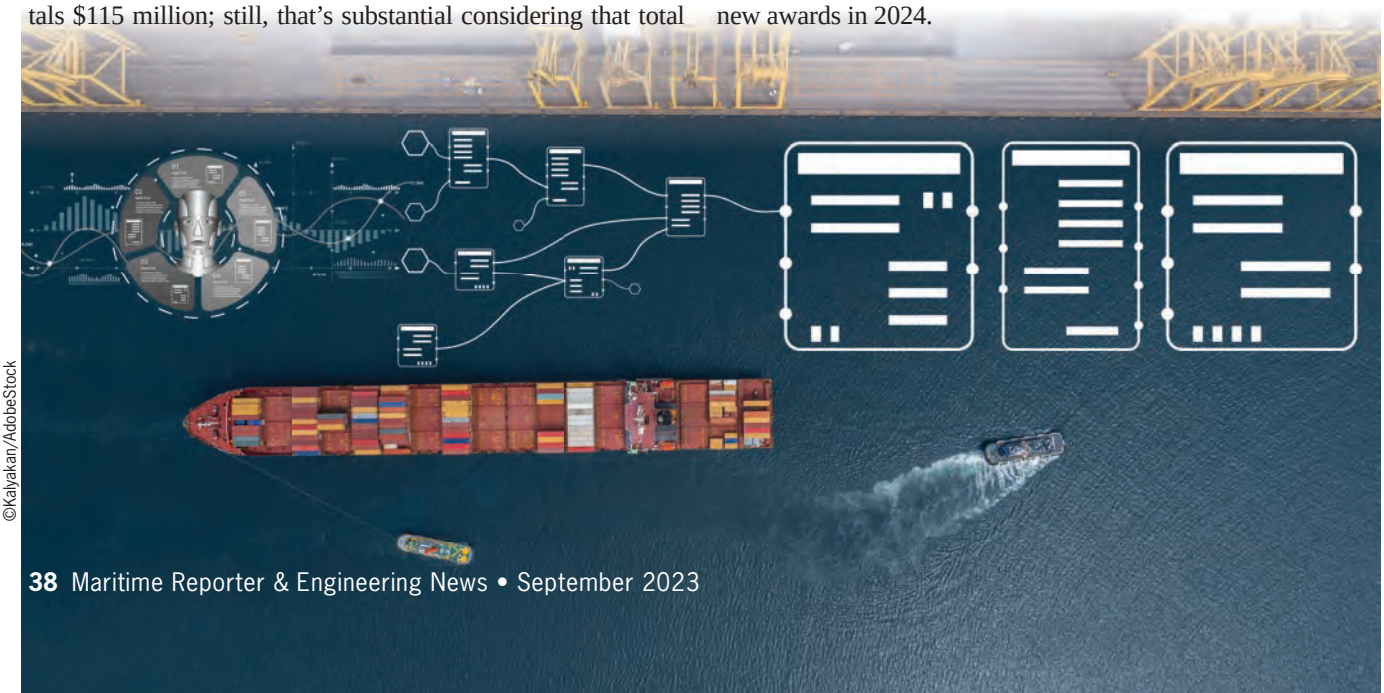
The first initiative started last May when EPA published a request for information and comments that would help the Agency develop Guidance it could use to evaluate funding requests for projects for zero-emission vehicles, port equipment and related infrastructure. EPA has $4 billion available for these investments: $1 billion is for heavy duty vehicles; $3 billion is for clean ports.

The second initiative was announced in August when EPA opened up the application period for 2022-2023 DERA funding – Diesel Emissions Reduction Act grants. DERA is not a new program, funding started in 2008. DERA money is linked to federal budgeting. As a program, DERA is not as rich as EPA's upcoming ZE funding. The new round of DERA funding totals $115 million; still, that's substantial considering that total DERA funding from 2008 to 2020 was $171 million.

DERA's goal is to help fund projects that reduce diesel emissions and exposure, especially at ports and areas designated as having poor air quality. Examples of recent projects (2020) include:

- **$1 million to the Connecticut Maritime Foundation Inc. to replace engines in a New York ferry.**
- **$1.1 million to the Georgia Ports Authority to replace 37 drayage trucks operating in Savannah.**
- **$2.3 million to the Virginia Port Authority to replace 10 diesel straddle carriers with Tier 4 hybrid powered equipment.**
- **$323,773 to the Port of Seattle to install marine shore power at the Bell Street Cruise Terminal.**

The DERA application deadline is December 1. Award maximum is $4.5 million. EPA expects to grant between 4-10 awards in each of EPA's 10 geographical regions. Watch for new awards in 2024.



©Kalyakan/AdobeStock

VISIT US AT

BREAKBULK

AMERICAS 26-28 SEPT 2023

BOOTH #C47

SENNEBOGEN

BEYOND THE MACHINE

WE ARE ON A MISSION
to maximize your uptime and reduce your Total Cost of Ownership.

You trust SENNEBOGEN for industry-leading productivity, safety, and efficiency. Now think "beyond the machine" with life-long SENNEBOGEN support.

PEOPLE
- Expert application support
- Innovative financing

PARTS
- Local in-stock parts
- Prepackaged service kits

SERVICE
- Factory-trained technicians
- Free technical training

Learn more about our commitment to our customers

sennebogen-na.com/beyond-the-machine

+1-704-347-4910
sennebogen-na.com

New: EPA's Upcoming $4 billion ZE Guidance

EPA's ZE initiative, announced in May, reached an important milestone in June when the public comment period closed. EPA wanted insights on issues pertaining to –

- **ZE class 6 and 7 heavy-duty trucks and port equipment;**
- **Charging and fueling infrastructure;**

And information on –

- **Availability and production capacity;**
- **Performance;**
- **Pricing; and,**
- **Program design, best development practices and workforce training needs.**

The response from port and industrial leaders was extensive. Here's a look at some top concerns and suggestions.

Port Leadership

Comments from the American Association of Port Authorities (AAPA) are based on information from its membership - leadership at America's top ports. AAPA comments cover a wide range of issues. The following is a review of some of those issues.

Regarding domestic production (Build America, Buy America, or "BABA"), a critical priority for DOT, EPA and DOE programs, AAPA writes that "the vast majority of equipment types have zero American manufacturers" and that delivery lead times are typically in the 12-18 month range." AAPA suggests that because of this lead time "it is critical that EPA conduct its grant administration and permitting in such a way that grants can be obligated prior to the delivery of equipment."

Regarding performance, AAPA notes that real work experience remains limited, and questions are still open about long-term dependability. Reports from one port said that electric yard tractors provide 9-10 hours of "light work" and 7-8 hours of "heavy work." Some ports are looking at increasing the number of tractors to allow one unit to charge while another works. "This arrangement" AAPA comments, "would obviously be far from ideal and would cost significantly more than employing a single diesel-powered tractor."

Pacific ports are lasered-in on ZE operations.

Image courtesy of Port of LA

Similarly, the Northwest Seaport Alliance (NWSA, includes the Ports of Tacoma and Seattle) reached out to its terminal operators about funding and project priorities. NWSA commented that electric yard trucks "have functioned well" and that "the user experience has been very positive and there have not been any range constraints." One caution, though, is that is based on about 9 hours of operation, a schedule that allows overnight charging. NWSA writes that for terminal operators battery range is a constraint for some applications, "especially duty cycles that require 2 or more shifts per day."

Regarding domestic materials and sourcing to meet Buy America requirements NWSA write that some charging equipment could comply but there are no commercially available trucks. Northwest terminal operators indicate interest in "small scale deployments of zero emission terminal tractors, provided ample grant funding" (italics added). "These deployments" NWSA advises, "will need to be significantly de-risked since they will be the first in our region at marine cargo terminals."

AWO – American Waterways Operators

AWO wants EPA to include ZE vessel propulsion systems in the definition of ZE port equipment or technology "provided that the vessel involved is a harbor craft." AWO's comments are written by Caitlyn Stewart, VP of Regulatory Affairs. Stewart writes that "the Clean Ports program represents a generational opportunity to reduce the carbon footprint of our ports, including the harbor craft that are so integral to port operations."

Stewart points out that there is no dedicated, direct federal funding for vessel engine/emission upgrades to reduce greenhouse gas emissions. This is in contrast to funding availability for road and nonroad vehicles.

Additionally, regarding funding, AWO suggests that the selection criteria for Clean Ports grants should give extra weight to projects that provide charging or fueling infrastructure for ZE maritime vessels that call on the port, as this will provide benefits beyond those projects focusing on vessels and vehicles working within a port.

Stewart comments that it will take several different clean fuels as well as electric charging options to decarbonize ports. Therefore, Stewart advises EPA to make funds available for a range of fueling options "as there is no single zero-emission technological solution available to meet the diverse operational needs of the port equipment and vessels used in the maritime and intermodal transportation sectors."

Powering Ports and The Environment Into The Future

PROPANE-POWERED EQUIPMENT REDUCES EMISSIONS WITHOUT SACFRIFICING PERFORMANCE

From forklifts and tractors to fleet vehicles and generators—propane-powered equipment can reduce emissions in your port operation without skipping a beat on the performance you need and expect. New research in real-world conditions proves that propane yard tractors produce near-zero emissions without sacrificing performance — a significant improvement over similar industry-standard diesel models.

Get the full study and learn more about how propane can help you meet your port sustainability goals.
https://propane.com/for-my-business/material-handling-for-ports/

ENERGY FOR EVERYONE
propane

Pricing

There's no question that $3 billion is a lot of money. But similarly, nobody questions that it will be very expensive to transition to zero emission ports. Some of these larger costs – for utility projects and port infrastructure – are eye-opening.

AAPA, for example, tells that one of its member ports commented that "in general, electric models cost twice and hydrogen three times as much as diesel machines."

AAPA writes that shore power systems cost about $20 million per berth. That figure, AAPA adds, "was consistent for multiple ports building shore power systems for cruise or cargo berths." This work would include a new substation, duct bank work, switch gear and cable-handling equipment.

With hydrogen, one of AAPA's member manufacturing companies wrote that a payback period is entirely dependent on the cost of fuel "as the cost of hydrogen makes up about 70% of the total cost of ownership of a hydrogen fuel cell vehicle." Because the hydrogen supply chain is just emerging, and federal production incentives have not had sufficient time to impact national markets, AAPA writes that "it is difficult to estimate the payback period of hydrogen equipment."

Similarly, NWSA references shore power costs and its latest estimates are that shore power will cost between $8 million and $15 million per berth. It also notes that shore power does not provide a financial return to the port, but to the vessel operator. NWSA writes that it needs a minimum of 50% of total project costs, from federal funds, for shore power projects. Furthermore, it suggests that utility upgrades be eligible for funds.

With specific equipment, NWSA similarly cites estimates that ZE equipment can be three times more expensive than diesel equivalents. Related charging infrastructure could cost about $100,000, depending on what might already be on site. NWSA advises EPA: "We believe that it is safe to assume similar or greater cost multipliers for other types of zero emission cargo handling equipment, which are generally farther from full commercialization than terminal tractors."

©Crowley

Private Sector Comments

Crowley is developing the e-Wolf, the nation's first all-electric tugboat, said to be ready for launch in 2024. The company tells EPA there are just three battery developers producing in the US. It writes that "this limited competition and the nascency of zero-emission vessels in the United States leads to challenges on cost and may inhibit the ability to achieve standardized charging systems for the maritime sector in the near future."

Crowley's comments – signed by James Dumont, Grant Director – are expansive. It writes that US shipyards are struggling against global competition. "A lack of demand for non-government vessel construction," Crowley writes, "has ceded technical expertise to specialized foreign shipyards which are able to construct vessels in as little as one-third the time it takes an American shipyard." Crowley suggests that large-scale ZE investments "could incentivize shipyards to retool to mass produce certain vessel classes in a manner more akin to an assembly line as opposed to the one-off vessel construction common today."

Regarding pricing, Crowley's assessment is stark, as the new ZE economy starts. Crowley expects zero and near-zero-emission harbor craft to be "approximately twice the cost of a conventional diesel tug, and that does not necessarily include the cost of the charging infrastructure." Conventional diesel tug: $12 million to $18 million. A full battery e-tug: $25million or more. Hydrogen: triple that of a conventional tug.

Westinghouse Air Brake Technologies (WABTEC), headquartered in Pittsburgh, PA, designs, manufactures and services freight rail and marine transportation projects. The company writes that it is "developing a commercial strategy that provides a clear path to power new locomotives and repower existing locomotives with batteries, hydrogen internal combustion engines, and hydrogen fuel cells."

The company writes that EPA's initiative provides a "strong avenue to support the deployment of clean energy technologies in the broader freight ecosystem." It writes that "Federal investment is critical to support the demonstration, deployment, and adoption of clean energy technologies."

Crowley is developing the e-Wolf, the nation's first all-electric tugboat, said to be ready for launch in 2024. Crowley expects zero and near-zero-emission harbor craft to be "approximately twice the cost of a conventional diesel tug, and that does not necessarily include the cost of the charging infrastructure."

Zero emissions equipment

Image courtesy Port of Long Beach

In reference to its marine operations WABTEC specifically cites successful ferry operations. Ferries can be recharged during loading and unloading, keeping the vessels in service. In a system in use in Norway, charging times vary between "a few minutes to an hour." Reliability is over 98% for vessels operating up to 14 hours/day. Marine charging sets short-term high-power demands. These peaks, WABTEC writes, "have the potential to challenge the resiliency of electric service providers and stress local grids and power plants." Peak offsets could come from battery storage systems or local power generation which secures power availability at the spot.

Regarding BABA, WABTEC asks EPA to "keep in mind the near-term challenges to meet Build America Buy America (BABA) requirements. EPA must allow sufficient time for U.S. manufacturing companies (to) undertake efforts and invest resources to enhance their domestic supply chain and comply with these requirements." WABTEC suggests that EPA needs to balance the need for domestic content with ZE goals at ports.

Red Hook Container Terminals is based in New Jersey. Its comments reflect partnership operations with Climate Change Mitigation Technologies and EV Edison. It has direct experience, starting in 2021, with 10 BYD heavy-duty battery electric terminal tractors at Port Newark. RH seeks to convert all 35 diesel tractors as well as top-pickers, cranes, and refrigerated power units to battery electric.

Regarding performance, RH tells EPA that the 10 BYD tractors have had virtually no problems over two years. But the company references two important factors for start-up: New Jersey provided a funding grant of 75% and the site had existing, sufficient electrical service and amperage.

In a section titled "Key Challenges" RH notes that utility-side electric power upgrades are required at just about all ports. RH writes that "the existing grid is simply not sized to support the significantly increased demands created by EV fleet charging in Ports."

To work around waiting for these upgrades, RH's partner, EV Edison, has developed mobile battery energy storage systems that can be deployed on marine barges and tractor-trailer trucks to solve the immediate problems of available power supply and electrical equipment shortages. RH writes that "barge-based storage and charging systems are ideally suited for EV fleet charging at marine terminals in Ports because that can provide the necessary power for EV fleet charging now." RH writes that "with the proper level of federal funding" battery storage can be deployed at Red Hook's terminals.

Zeeboat

Startup Zeeboat reflects ideas and possibilities from entrepreneurs newly drawn to zero emission markets. Zeeboat is based in New York. It is collaborating with Houston-based Industrial Service Solutions, The Shearer Group and Ingram Industries. Zeeboat CEO Jonathan Braun says the availability of grant money, such as EPA's clean ports initiative, is critical for developing balanced, equitable financing. Zeeboat's plans include towboats and pushboats for a full range of applications, from coastal ports to the inland waterways. An initial project has been on harbor-based container on barge service, the kind of back-and-forth work assignment particularly well-suited for battery powered vessels. EPA's final Guidance is of keen interest to emerging companies like Zeeboat.

Next Steps

EPA received more than 100 comments in response to its request for information. When asked about its timeline for the Guidance and related funding EPA said it anticipates releasing the new Clean Ports Program funding opportunity in late winter 2024. Funds are available to eligible recipients through September 30, 2027.

Container Shipping 2023:
Post-Covid Turmoil Continues

While container shipping thrived during Covid, the thrill is gone as rapidly changing trade patterns premised on geopolitical turmoil and logistic chain snarls have sent container rates racing to the abyss on certain routes. ***While most shipowners are flush with cash, a massive influx of new ships and capacity entering the market in 2023 and 2024*** *projects to unprecedented turmoil.* ***Maritime Reporter TV*** *recently talked to* ***Xeneta's Chief Analyst Peter Sand*** *for its Container Shipping Outlook segment, for his insights on what's next.*

By Greg Trauthwein

I noted a dramatic headline on Xeneta's weekly container rate update: "Transatlantic Spot Meltdown Puts Shippers Back in Charge as Carriers Squeal." What are the numbers and context behind the headline?

I can definitely tell you why it's dramatic: it's because the development in the Transatlantic front haul from North Europe into the U.S. East Coast have seen demand coming down by double-digits and capacity deployed by carriers on that trade growing by double-digits, [resulting in] a complete meltdown of rates. The Transatlantic fronthaul was the one that defied gravity for an extended period of time, but now it's catching up with a vengeance. Carriers operating only in the spot market on the Transatlantic route are bleeding, as they find spot [rates lower than ever before] and there's literally no room for anything but loss making right now. Long-term contracts only sit $500 above where they used to do in the range of $1,800 to $1,900 per FEU.

Dramatic headlines aside, this seems to be a particularly eventful time in the history of container shipping. What do you see?

Nothing will ever be the same, and that is not a dramatic, catchy headline, that's just a fact of life. I tend to talk about the 'next normal' instead of 'getting back to normal' because there is no such thing as a 'normal' market, not in container shipping, not in the maritime business. Global supply chains are still struggling from the problems during the Covid years [and on top of that there is a] water shortage in the Panama Canal. But if we put the entirety of the market into perspec-

Our expectations for global demand is a little bit down [1-2%] this year and it's a little bit up [2-3%] next year. **But you have to set that against a fleet which grows 6% this year in nominal terms and 5.5% next year.**

Peter Sand, Chief Analyst, Xeneta

tive, I think what makes this downturn special is the fact that carriers arrive into this downturn market loaded with cash, so they may act more confident than ever before.

We can see that in terms of capacity management. The idle fleet sits around 250,000 TEU, way below our expectations of at least a million TEU at this point in a down cycle.

So, the cards at least fundamentally, are stacked against the carriers, but they seem to be more confident this time around. The next normal is continuing to postpone itself; there's so much over capacity in the market, but carriers are dealing with it in a smooth way. With the exception of the Transatlantic, we now see inbound rates into North America, in particular on the spot basis going up by 50% over the past two months.

The rate collapse coincides with the simultaneous growth in the container shipping fleet: good news for shippers, bad news for carriers. How do you see this supply and demand dance playing out in the coming year or two?

Our expectations for global demand this year is down 1-2% from last year – that's two years in a row – which has never been seen before. For 2024 our expectations are for demand to grow, from that base, 2-3% roughly. So, it's a little bit down this year and it's a little bit up next year.

But you have to set that against a fleet which grows 6% this year in nominal terms and 5.5% next year. It's easy to see that there's a huge gap between demand and supply, something that really needs to be managed.

Rates should be at a complete meltdown level, all of them if we looked only at the fundamentals, but I guess that's why guys like you and I still have a job, right, Greg? Because there's so much more to it, on top of the nominal figures of fleet and the number of boxes that are moved, the distance they cover, the deployment efficiencies of the carriers, how they make use of tonnage, say [sending older ships to smaller trades] where they may actually turn around a small profit and avoid sending [ships] directly to the demolition yards.

So read between the lines, in the sense when you can see carriers, for instance, announcing that they introduced a new route from Far East to South America via Europe, for instance. That is one smart way of deploying capacity inefficiently, but only when you do so as a carrier. So, watch out for developments like that because it may be where you can find the actual answers to the market movement. Volatility will stick around, even though the fundamental direction seems to be pretty clear.

We would be remiss to not discuss the ongoing Panama disruption. What is going on today in the Panama Canal Zone and what are the projections for the coming months?

Right now the Panama Canal is transiting ships at capacity, so we have 23 in total transiting the canal every day, that includes 10 NeoPanamax ships in the new locks. Any uptake in demand from the current level, and we'll have to find another way to going through. Container Lines do have the priority of the Panama Canal and they're also capable, to a large extent, of booking in advance, so they can transit more or less uninterrupted. Some of the container ships had to wait at least a day and a half when they normally wait a few hours for transiting.

So no one is left out, and we all have heard about the capacity reduction with the draft restrictions of say, 44 feet, which the authority has publicly said will likely to stay in place for another 10 months.

Carriers and shippers have a risk to manage here. If they fail to do so, you and I will only see higher prices and fewer options on the shelves when we go shopping for Christmas!

It's crunch time, and the Panama Canal is one of the catalysts also behind, for instance, the Far East to a US Gulf Coast long-term contract rates. Crowd-sourced data from Xeneta shows they are going up for the past month or so, an early indicator of more shippers wanting goods on that trade than the carriers offer, so long-term contract rates also now picking up since early August.

What's Driving the Increase in Cargo Theft?

By Florian Krampitz at Allianz Commercial

There has been a significant rise in cargo theft in recent years, with a change in the goods being targeted and increasingly sophisticated tactics used by criminals. Businesses need to be aware of the heightened risk and review their logistics and supply chain strategies to mitigate it.

Supply chains in North America faced a spike of 13% in the volume of cargo theft between 2021 and 2022, with an increase in value of 16%, a trend that has continued in 2023. While electronic goods remain highly vulnerable, thieves are increasingly targeting household items and food and beverage, indicating that inflationary pressures are driving changes in criminal activity.

In line with evolving supply chains, criminals are developing sophisticated and organized methods to gain access to cargo, ranging from straightforward theft, cyber-attacks, fraud, and technology-based crime.

The consequences for businesses can be grave. Supply chain disruptions caused by theft prevent shippers delivering products to customers promptly and safely, while a failure to meet contractual obligations can lead to reputational risk and loss of market share.

With a stolen commodity value of $107m in 2022 – a significant increase on the $68m reported in 2020 – cargo theft is clearly a risk that calls for heightened vigilance.

Similarly, Allianz has seen an uptick in cargo theft incidents in recent years and particularly in transportation and logistics. In North America, the number of theft claims has increased for the past six years in a row in this area with a 20% increase year-on-year in 2022 (169 claims). The total for 2023 is likely to surpass 2022.

Where is Theft Occurring?

According to CargoNet, warehouses and distribution centers are the most vulnerable locations across North America followed by parking lots and truck stops. Incidences of cargo theft in North America vary according to state, with areas that are ports of entry and also large distribution centers dominating.

Types of Cargo Theft

Criminals use a variety of tactics when targeting and stealing cargo. Straight theft (where the driver and/or commodity is being watched by thieves) was the most common occurrence

of cargo theft in North America in 2022, with 1,059 reported cases, compared to 316 cases of burglary and theft (more opportunity-driven), 139 cases of fictitious pick-up (where a criminal uses false ID or documentation to impersonate a carrier), and 92 cases of broken seal, according to CargoNet.

Straight Cargo Theft

Products are stolen from their storage site, typically truck stops, warehouses or distribution centers, train stops, and loading and unloading docks. Sometimes thieves target commodities by staying near a warehouse and waiting for the cargo to be loaded on to the trailer. They follow the trailer until the driver makes a stop to rest or spend the night. The thieves then break the seal and take the entire cargo or a few targeted items.

Strategic or Deceptive Cargo Theft

Criminals disguise themselves as legitimate drivers, employees or business representatives and deceive truck shippers, brokers, and carriers. This type of theft can include identity theft and fictitious pick-ups.

In recent months, Allianz has seen claims where the motor carrier is holding the cargo hostage and will not release the cargo until they are paid for the transit. They proceed to open the seal, transload and store the cargo in a warehouse until payment has been received.

Technology-Based Cargo Theft

Criminals sometimes use devices that detect hidden GPS trackers placed in or on the cargo. These devices interfere with the signals of GPS trackers and make it more difficult to recover stolen goods. Usually, the driver is not involved but the thieves conduct countersurveillance and put GPS trackers on to the units. Once the driver goes to sleep, they remove the cargo from the trailer. Thieves have also been known to use AirTags (small tracking devices), staying close enough to the driver and cell reception to get a signal.

Cyber Crime

Thieves exploit cyber weaknesses to gain access to computer systems and goods, using tactics such as phishing emails, when they impersonate a trusted supplier or entity. Criminals also use emails to install malicious programs that grant hackers access to valuable data from a company's system. The information can then be used to forge invoices and delivery documentation or to divert shipments.

It is essential for any company at risk of cargo theft to identify and manage security threats using internal processes and external advice such as partnering with their insurer to implement risk mitigation practices.

The Author

Krampiz

Florian Krampiz is Director of Marine Claims, North America for Allianz Commercial. Based in Chicago, Florian was previously Head of Allianz's Marine Complex Claims in Hamburg.

AST Harnesses the Power of Connectivity, Digitalization

*Latest advances in digital technologies and faster, cheaper connectivity walk hand-in-hand as vessel owners of all sizes aim to cut fuel consumption, cut emissions and increase efficiencies. AST is aiming to do both, offering connectivity plus a suite of productivity solutions courtesy of its new Integrated Remote Asset Management System (IRAMS) solution, as **CEO Andrew Peters** explains.*

By Greg Trauthwein

The maritime industry is often lamented as slow on the uptake of new technologies, but many of these boats and ships were born and raised in an analog society, designed to last up to 50 years. Making the 'digital' switch is neither quick, cheap or easy, and the investment in capital and man hours to design, install and learn the new way simply doesn't make sense.

But as a whole, maritime is starting to embrace increased ship connectivity to unlock the potential fuel and efficiency savings that lie within – hardware, software, faster bandwidths, resilience and cybersecurity – with newbuild ships and their armada of modern equipment being the tip of the iceberg.

"There's a lot of change happening in the industry, but you need to think about it in a number of ways," said Andrew Peters, CEO of AST in a recent interview with Maritime Reporter TV. "The retrofitting of technology into existing vessels is slightly more difficult, but the new vessels coming out all-embracing with digital connectivity solutions is happening now."

According to Peters, unlocking the true value that digital solutions offer is not about any one factor, such as increased connectivity speed, rather it's "all of these things coming together in a managed service portfolio," which has served to help shape AST's business plan and offering to the sector.

"It's a myriad of things that come together, and it's really starting to happen. We are definitely seeing it in our business," said Peters.

Meet IRAMS

Shipowners today face a myriad of pressures from different entities to improve performance. There are financial pressures to optimize operations, as getting funding for new assets is increasingly tied to the carbon footprint of operations. Legislators keep tightening the emission performance screws, effectively forcing to the scrapyard older assets that cannot be optimized. Peters and his AST team see digital technology and automation as providing many of the answers, a guiding principle for its product and service development in recent years.

Last year AST celebrated its 30th year in business, and today the consolidation of all that AST offers is being rolled up and rolled out to the maritime industry with a single software package known as the Integrated Remote Asset Management System, or more simply, IRAMS.

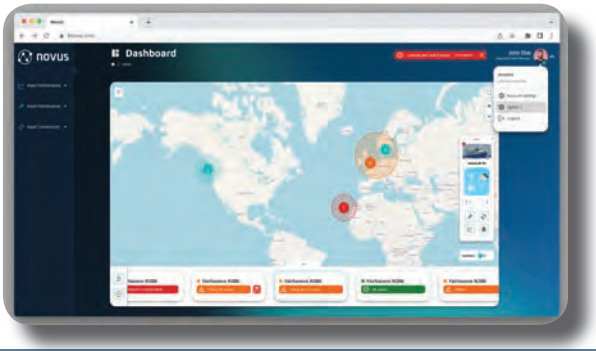
"We have been [essentially] six different businesses, but we've never rolled those businesses into one," said Peters. "We have a number of software areas where we are good, but not consolidated into one clear platform and one clear software solution. We've taken location-based services; we've taken monitoring of vessel performance, particularly in relation to engine management, predictive maintenance, weather reporting, and put that into one complete package. And that is around some of the things that are really important in the market, such as crew welfare, which is massively important."

IRAMS is AST's dedicated software platform designed to support the maritime sector, and the aim of IRAMS is to allow

Photo courtesy AST

"It's about maritime digitalization. It's about new high speed, low latency networks. I suppose really thinking about it, it's about providing more options in terms of the service that's available."

– Andrew Peters, CEO, AST



vessel owners and managers to remotely control and monitor maritime assets, bringing together live asset performance data, predictive maintenance scheduling and environmental impact reporting onto a single platform.

"It's about things like collecting sensor data, putting that information and data in the cloud to supports onshore managers who are trying to understand what's happening with their vessel," said Peters. "And that can be about engine overheating; it can be about fuel monitoring and control. If you want to control the cost of the vessel, fuel monitoring is one surefire way you can do it."

To that end, AST has spent the last six to nine months building – building the software development team, building its capability, building the interoperability of that capability. "We had a team originally of six software developers, now we've got 20 and they've spent the last six to nine months now developing this new IRAMS suite of software," said Peters.

On the Horizon

Opportunities abound for AST, and when Peters looks ahead he sees particular strength in the mid-tier market.

"If you look at tugs, barges, small to mid-tier vessels rather than the big tankers, that's where we see ourselves heavily focused," said Peters. "Our software is applicable to that market because a lot of the large customers are building their own software and they will continue to do that. But if you look at that [mid-tier] market, there are around about 105,000 vessels in that marketplace."

"I think what we are seeing ultimately is a lot of growth in internet traffic, particularly in Asia. It used to be used more for just ship-to-shore reports and getting data from one place to another. Now it is being used as more of a tool, and particularly, as I mentioned earlier, for things like crew welfare."

In Europe, he said, it's more about resilience.

"It's about quality of service. It's about some of the other elements like cybersecurity, visibility of assets, internet usage, and making sure they're able to manage and monitor. So it's that holistic approach to providing service, not just saying, 'Okay, here's a bit of software. Use that. Not just saying, Here's a bit of airtime.' It's combining a true, whole service to the customer. That's really what we're about."

Looking forward to 2024 and beyond, Peters is getting the entire AST on board with driving that single platform message with a focus on what it can deliver.

"It's about maritime digitalization. It's about new high speed, low latency networks. I suppose really thinking about it, it's about providing more options in terms of the service that's available," said Peters

Rather than just going down one route, it's making sure you've got the route that's right for the customer, he emphasized. "it could be one of a number of networks; it could be A number of hardware operators; it could be other elements that you have in the marketplace like data compression technology, for example, for video. Anything that improves that fleet performance, makes that availability of management and information much more seamless across the business. For us, that's what we are focused on."

Maritime Risk Symposium

Managing Impacts of Supply Chain Disruptors, Renewable Energy, Emerging Technology on the Maritime Transportation System (MTS)

By Dr. Joe DiRenzo and Capt. Eric Johansson

The 2023 Maritime Risk Symposium (MRS) will be held Nov. 14-16, 2023, as an in-person event, hosted by Maritime College, State University of New York (SUNY) at the Maritime Academic Center. The theme of the 14th annual event is *"Managing Impacts of Supply Chain Disruptors, Renewable Energy, Emerging Technology on the Maritime Transportation System (MTS)"* with a focus on offshore infrastructure risk and disruptors.

Founded in 1874, Maritime College is the oldest maritime college in the United States, providing mariner training for 150 years. This will be the second time for New York Maritime College to host the event, in collaboration with the U.S. Coast Guard, National Academy of Sciences, academic institutions, industry partners and federal, state and local agencies. SUNY Maritime last hosted in 2019.

This international event has previously focused on various elements of risk including choke points, maritime cyber security, and resilience. MRS 2023 will bring together academics, government, and commercial entities to discuss the emerging offshore energy industry and its threats, challenges and risks to the Maritime Transportation System. With a focus on the articulation of current and future marine transportation challenges and threats, the symposium will help frame issues that impact the implementation and operationalization of a sound marine transportation strategy. The symposium will assess threats and recent advancements in research to inspire ideas for innovative research that will help define offshore energy infrastructure safe working parameters to the maritime transportation system.

Why is this Important?

The idea of assessing and quantifying massive offshore energy infrastructure and the various associated threat vectors is an issue that has come front and center since the horrific attack of 9/11. State and non-state actors understand the vulnerabilities within a global system that moves trillions of dollars of goods annually. Complicating this issue are growing threats to: the system's cyber components, the dawn of autonomous shipping, electronic navigation, advances in fuel systems and the continued automation of the nation's ports. MRS 2023 takes a more strategic and holistic view.

Superstorm Sandy paralyzed New York and it was the Marine Transportation System that answered the call, delivering needed supplies when shoreside transportation was shut down by the devastating storm and playing a major role in storm debris removal and infrastructure redevelopment. The MTS supports our nation's needs in peace and in times of peril and relies on safe and sound policies regarding navigation safety; technology; support services; subsea and surface quality standards and assurances; offshore energy; cyber risk; port state control and infrastructure risk; and much more.

The issue of threats and risk to offshore energy systems has been well documented and a concern to navigational safety, the energy grid, cyber and national security. On Oct. 26, 2022, the Government Accountability Office released their report entitled "Offshore Oil and Gas: Strategy Urgently Needed to Address Cybersecurity Risks to Infrastructure." This highlighted one significant threat vector – cybersecurity.

In the report the GAO noted, "Offshore oil and gas infra-

structure faces significant and increasing cybersecurity risks in the form of threat actors, vulnerabilities and potential impacts." The threat actors highlighted in the report: "State actors, cybercriminals and others could potentially conduct cyberattacks against offshore oil and gas infrastructure. The federal government has identified the oil and gas sector as a target of malicious state actors."

The same report highlighted vulnerabilities, noting, "Modern exploration and production methods are increasingly reliant on remotely connected operational technology – often critical to safety – that is vulnerable to cyberattack. Older infrastructure is also vulnerable because its operational technology can have fewer cybersecurity protection measures." The long-term impacts of a successful attack off shore was also highlighted in the same report, "A successful cyberattack on offshore oil and gas infrastructure could cause physical, environmental and economic harm, according to federal officials. For example, officials said that the effects of a cyberattack could resemble those that occurred in the 2010 Deepwater Horizon disaster. Disruptions to oil and gas production or transmission could also affect energy supplies and markets."

In 2015 NATO conducted a workshop that also highlighted the risk to offshore energy platforms. The article NATO published on the event noted, "A growing share of energy resources – both oil and liquefied natural gas – is produced offshore and transported by sea. This means that countries are increasingly dependent on the security of maritime energy infrastructure, which is vulnerable to a range of well-known risks and threats, including terrorist attacks, piracy and natural disasters. More recently, concerns about the potential consequences of cyberattacks have become more widespread."

Recently discussions have gone from risk issues above the water, on wind farms and similar energy systems to the cable systems that transmit developed power. In a June 21, 2023, article for Euronews, reporter Denis Loctier highlighted how Belgian authorities were "stepping up efforts to ensure the safety of offshore infrastructure in the North Sea following a series of incidents that raised fears of attacks on underwater internet cables, gas pipelines and wind farms. Sightings of an undetected Russian ship in both Dutch and Belgian waters last November prompted intelligence officials to question if Moscow was spying on the North Sea's offshore wind farms."

When interviewed for the Loctier article, Cmdr. Kurt De Winter, director of the Belgian Navy's Maritime Operations Centre, said, "One of these threats is espionage and sabotage actions by the enemy to our vital infrastructure on the sea bottom. The threat is not only hypothetical, it's a real danger." Subsea transmission systems have been the focus of think tank work. The Center for European Policy Analysis, in a Jan. 23, 2023, article by Lukas Trakimavičius, warned that, "Energy installations at sea and subsea transmission infrastructure are at risk from a wide array of threats. These include anchoring, trawling or even terrorist attacks. However, there is also an even greater concern that hostile regimes could target this infrastructure to disrupt electricity flows." The attack on the Nord Stream pipeline has underscored vulnerability and risk.

How will the Maritime Risk Symposium analyze these issues? The symposium will be broken down into seven panels:

- Calculating Offshore Energy Risks
- Maritime Autonomy: The Future is Technology
- Subsea and Surface infrastructure Quality Standards and Assurance
- Offshore Energy and Autonomy Cyber Risk
- Offshore Energy Port Infrastructure Risk
- Wind Farms: Who is in Charge?
- MRS Wrap-Up Panel – Symposium Highlights and Offshore Wind MTS Risk Management Interface and Research

Panel facilitators and panel members are world-class researchers, industry leaders and academics. Among the participants are Dr. Henry Willis of the RAND Corporation, a senior policy researcher and a professor in the Pardee RAND Graduate School; Dr. Kevin Jones, executive dean of the faculty of Science and Engineering University of Plymouth in the United Kingdom; and Capt. Zeita Merchant, commanding officer, U.S. Coast Guard Sector New York.

An evening reception on Nov. 14 will feature a student poster contest that will showcase some of the best and brightest students. Participating colleges include SUNY, U.S. Merchant Marine Academy, U.S. Coast Guard Academy, Stevens Institute, Webb Institute, Rutgers University, Old Dominion University and many others.

More information on the Maritime Risk Symposium 2023 can be found at: ***https://www.maritimerisksymposium.org/***. For registration information, please contact Eric Johansson at ***ejohansson@sunymaritime.edu***

The Author

DiRenzo

Dr. Joe DiRenzo is a national co-chairman of the 2023 Maritime Risk Symposium and is the director of research partnerships at the U.S. Coast Guard Research and Development Center. A retired Coast Guard officer and former cutter commanding officer, he teaches for American Military University and National University.

The Author

Johansson

Capt. Eric Johansson is a third-generation Port of NY/NJ tug captain. He has been at SUNY Maritime since 1994 and enjoys teaching and mentoring future professional mariners interested in towing, shipping, marine spatial planning, leadership and ship systems. He is founder of the annual SUNY Maritime College Towing Forum.

PopEye: Autonomous Anchoring for Large Commercial Vessels

Innovation is the lifeblood of any industry, and this month we present – in their own words – insights on a device which combines AI and video to help a ship's captain predict anchor drag before it begins. Created by a group of five engineering seniors from the University of Pennsylvania, the innovation has caught the eye of some powerful potential collaborators, including the U.S. Coast Guard.

All photos courtesy the PopEye team

By Orestis Skoutellas, Jack Bendell, Mario Ferre, Ben Abt and Nick Anderson

Coming Together: Team First

We knew that working on our senior capstone project was unlike any other university assignment we had ever attempted before. This was the culmination of four years of intense engineering work at an Ivy League university on a project we had to actively work on for a whole year.

On a sunny morning of August, two months before our team formation deadline, we sat together outside Panera Bread in West Philadelphia, five of the brightest engineering seniors across campus. The first thing we had to align on was motivations and goals. Nobody was sitting on that dusty table in search of an "easy A" or to judge each other's technical competence - those were a given - but what more? We soon arrived to our core five principles of what our project should be:

- **Engineering**. Software is cool, hardware is cooler, a combo is the coolest.
- **YC S23**. Not just a technical solution, but there is a willing-to-pay customer.
- **A project is a project**. If we're going to solve a problem, it may as well be big and noble.
- **No-BS**. So, no Software as a Service, no VR, no smart coffee machines.
- **Awkwardly specific**. Not too many dependencies, so it's within our wheelhouse.

With mutual agreement on the project basis, the arduous journey began of brainwriting and subsequent judging of ideas, not from our own biases but by cold-calling hundreds of industry experts across domains.

Finding PopEye

During a phone interview with a Greek Captain, he brought up the current practice of anchor-watch: the deckhand, "let's call him Popeye", walks every hour all the way to the front of the vessel to report back to the bridge the direction and tension in the chain. Popeye does this rain or shine, even at a moonless night at 4am, on a frozen deck. And that happens every hour at this moment on every anchored vessel worldwide.

"That can't be right", we naively thought. The safety hazard for the deckhand, let alone the myriad risks from re-active anchor dragging, seemed quite profound to us, five passionate engineers. There must be a way that technology can help boost safety and productivity, while reducing risk and cost.

Robotics AI meets maritime

We happen to be engineers in one of the world's best universities for Robotics and Artificial Intelligence. Taking advantage of our knowledge in our past four years of classwork and with guidance from professors, like Sid Deliwala, Nick McGill, Micheal Carchidi and Kostas Daniilidis, we were able to re-define the problem from first principles and come

up with some unique insights leading up to our novel solution.

Using state of the art Computer Vision techniques, we have developed the world's best chain-recognition model. By pointing a camera placed at the bow of the ship directly on the anchor chain, we're able to extract the tension and direction of the chain. Using that, we model the shape of the catenary and back-out the static friction coefficient at the specific geolocation at the anchorage.

That's all pretty cool AI and math, but so what? Well, by doing all that, we're able to predict before you start dragging anchor. Knowing this, the captain can save fuel by avoiding unnecessary re-anchorings as well as protect Popeye. Storing the footage provides also a system of record for insurance purposes.

Beyond PopEye: Pirates, Overboard and Perimeter

After being invited to present at the US Coast Guard's HQ in Washington DC, three new directions were proposed to us. The 20 senior officials pointed out that our 900 rpm self-cleaning lens technology together with our infrared camera capability has perhaps even more important use cases. What else can a smart camera inside a weather-proof casing do?

- **Pirate mode**. While the ship remains at anchor, it is at its most vulnerable stage. We heard from several ship operators that it has happened that unauthorized individuals gain access to the vessel by climbing the chain. PopEye comes to the rescue here, by detecting the human figure climbing the chain and proceeds to alert local port authorities and the captain so as to protect the crew and cargo.
- **Overboard mode**. At 3am at a frozen deck on a moonless night, it can happen that the deckhand falls in while attempting to point their flashlight at the anchor chain. In that case, PopEye is able to detect that, alert the Coast Guard and protect our seamen 24/7.
- **Perimeter mode**. Perhaps the biggest need amongst ship operators was to have eyes where they now don't. At 1 mile out, you can see everything from the bridge, but at 50 meters away you have no idea what's happening along the 200 meter vessel perimeter. By placing multiple PopEye devices across the ship railing, the captain can now have 360° awareness and receive alerts when unauthorized personnel or suspicious activity is detected.

The team @ United States Coast Guard headquarters in Washington, DC with Katie Burkhart.

Team Accomplishments

Our team has been invited to speak at the main stage of international conferences such as Ocean Business 2023 as well as at the national level at the annual conference of the American Society of Naval Engineers and at the SAGE conference winning "Best Paper" award. At our engineering school, we've won the Leadership award across all other senior capstone projects and on a university-level we've won the most innovative, most interdisciplinary and the best application of AI in Business. We're fortunate and humbled by these recognitions, which are a testament to how far phenomenal team collaboration and work ability can bring you.

Online: www.popeyelabs.co
Email: orestis.skoutellas@gmail.com

Weld Engineering Services Help Enhance Vessel Functionality, Durability and Longevity

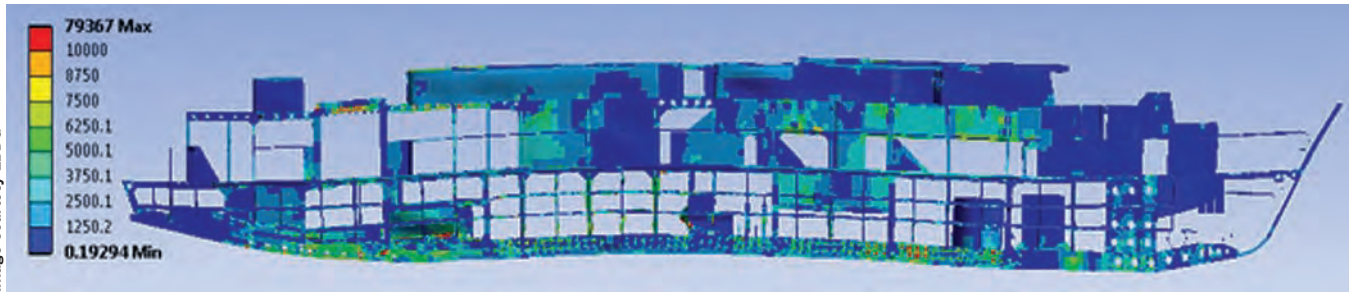


Image courtesy EBDG

Welding technology and its application is critical to the marine industry. The art and science of welding is a pivotal component of all vessels, joining vessels into functional and durable assets. Precise, quality welds have a direct influence on a vessel's functionality, durability, and the longevity of the service life of the entire vessel as an asset.

In this article, one of Elliott Bay Design Group's Technical Managers, Matthew Wichgers, P.E., sheds light on the need for expert weld engineering services and explore the critical importance of welding technology and processes within the maritime sector. Matthew draws upon more than 45 years of experience from EBDG's team of Certified Weld Inspectors (CWI). Each member has been certified by the American Welding Society (AWS) and are licensed Professional Engineers that have cultivated a wealth of knowledge and expertise, specializing in aiding vessel operators, shipyards, and welding fabricators with their complex welding needs.

Wichgers joined EBDG in 2007 and serves as the Technical Manager for Vessel Structures. He has a high degree of expertise in EBDG's analysis tools, particularly computational fluid dynamics (CFD) analysis and structural analysis, and in the implementation of analytical results in project design. In addition to being a professionally licensed engineer, Matthew is a certified weld inspector (CWI) through the American Welding Society (AWS).

"Through my career as an engineer in the marine industry, a supporter of shipyards, and as an owner's representative, I have seen the need for mastery of welding at all stages of design and construction. Across the spectrum of marine projects, whether it be dry dockings, overhauls, new construction or repairs involving steel or aluminum vessels, the need for welding expertise is indispensable," said Wichgers.

The combination of theoretical engineering acumen and hands-on CWI expertise forms a powerful resource for ship repair facilities, fabricators, and vessel owners and operators. Key areas of welding expertise offered by Professional Engineers and CWI experts include:

- **New Build & Repair Weld Inspections:** Meticulous inspection during both new builds and repairs is paramount to ensure the integrity and safety of the welds.
- **Development of Welding Procedures:** Crafting and fine-tuning weld procedure standards contribute significantly to the quality, reliability, and safety of weld seams, joints, etc.
- **Optimized Pre- and Post-Weld Heat Treatment:** Implementing well-considered heat treatment processes enhances the materials strength and structural durability while also considering the economics of welding.
- **Structural Quality and Design for Producibility:** Balancing structural integrity with producibility during the design phase will result in efficient manufacturing.
- **USCG and ABS Approved Structure Repair Plans:** Obtaining regulatory and classification approval is an important aspect.
- **Forensic Analysis of Structural Failures:** Analysis of failed structures results in an understanding that breeds confidence in the right path forward.
- **Thermal/Structural Finite Element Analysis of Welding Heat Input and Distortion prediction:**

Analysis of the weld itself helps direct the development of weld procedures.

- **Work in Tandem with Shipyard QA/QC Personnel as Onsite Owner's Representatives:** Constructive collaboration between both parties to a contract can result in success for

everyone involved.

- **Weld Design and Sequencing:** Plan out weld sequencing during fabrication to minimize distortion. Weld design for economical and improved fabrication.
- **Practical Welding Experience at all Stages of Vessel Design:** Practical experience provides a pool of understanding to draw from in solving today's welding challenges.

Theory: Engineering Analysis

As the maritime industry continues to advance, the significance of precision welding extends beyond mere joining of materials. The lifespan, safety, and operational effectiveness of marine vessels are factors explored by professional engineers through technology. EBDG leverages its analysis background to better inform the science of welding, using structural and thermal Finite Element Analysis (FEA).

Structural Analysis

Structural analysis using FEA enables a deeper understanding of complex loading and structural configurations. EBDG has the capability to quickly model the target structure in three dimensions, apply design loadings, and iterate through structural design. Both smaller scale and large-scale structures can be treated in this manner, from minor structural features like mooring bitts all the way up to complete hull analyses of vessels.

The scope of a structural analysis can include static structural, modal/vibration, and fatigue. Often FEA is used as a forensic tool to find root causes of in-service failures or to design structural detailing that eliminates failures due to fatigue effects. Finding solutions to these issues ultimately saves the operator from expensive down time and recurring repair bills.

Why keep making the same crack repairs year after year when a redesign of the structural detail could supply decades of trouble-free service?

Thermal Analysis

EBDG has used thermal FEA to better understand heat input and cooling rates for complex weld procedures. A transient thermal analysis can capture the effect of an arc weld traveling along a joint, showing the dynamic thermal contours in the material that gives insight into the heat affected zone and resulting material microstructure after a joint is completed. This can have a profound effect on the resulting strength of the base material after welding.

Practice: Welding Process Improvements

The heart of a good weld is the process used by the fabricator. These processes can range from the ad-hoc experience of each individual welder, up to a formally approved weld procedure accepted by the cognizant class or regulatory body. The weld procedure, whether formal or informal, is the recipe through which a skilled fabricator can make a quality weld. Through this spectrum of practice "where the arc meets the metal" there are opportunities to create "better" welds. The definition of "better" is project and even joint specific:

- Higher quality - appropriate to the service of the structure
- Easier for the welder to execute
- Cheaper - in materials or labor or both
- Fewer defects = less rework
- Reduced time to create

Joint Design

Metals much thicker than 3/8" (9.5 mm) typically require some level of joint preparation to create a complete penetration weld. This type of weld completely fills the joint and is critical for butt joints in hull plating. The joint preparation in this situation opens up the cross section of the weld and allows the welder to access the "root" of the joint and build the connection from the inside out via multiple weld passes.

The joint preparation allows for this access by providing a chamfer or other cutaway on the edge of the adjoining plates. The decision of what type of joint preparation style can have a profound impact on the economics of the weld. Chamfers are easier to create but require more weld passes to fill the resulting gap.

J-cut edge preparation needs more expensive machine tooling but could more than pay off through reduced welding

time, labor, and inputs. A change or upgrade in welding machines could allow thicker materials to be used without any edge preparation at all!

Heat Treatment

Some alloys or material thicknesses require heat treatment either before or after the weld is made. This heat treatment stage could be as simple as preheating the joint a certain amount above ambient temperature, up to a complex multistage post weld heat treatment that occurs over multiple days. Any of these activities add time and cost to the welding operation. Taking the time to revisit a tried-and-true weld procedure may allow a reduction or even elimination of the previously required heat treatment.

The subject of welding is both deep and broad in scope. It is an intricate blend of practical skill, the science of metallurgy, and the artistry of skilled craftsmanship. Welding technology continues to evolve and mature, with new tools and new practices available for all ranges of fabrication. EBDG's team of Professional Engineers and Certified Weld Inspectors stand ready to contribute our insights and expertise to the continuous evolution of welding technology within the maritime realm. Consider applying new analysis and fresh perspective to improve your welding practices.

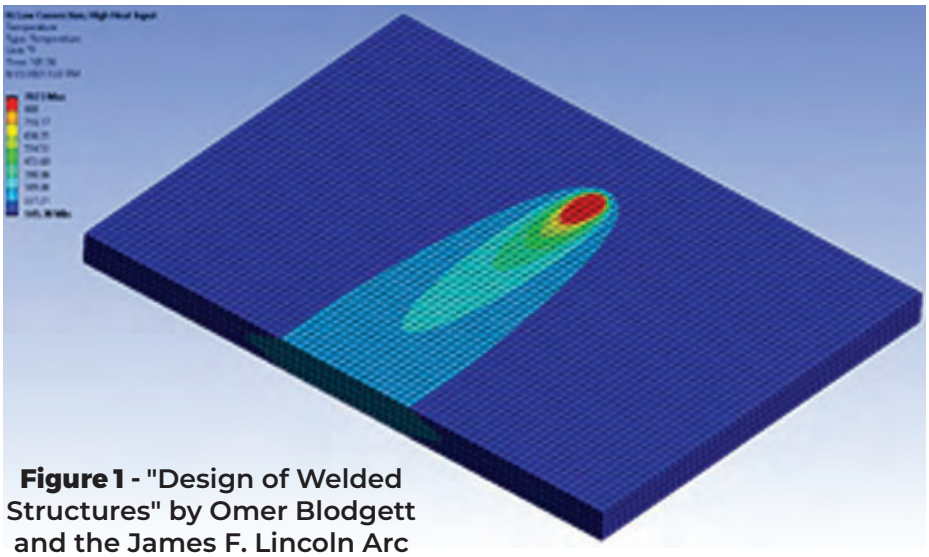
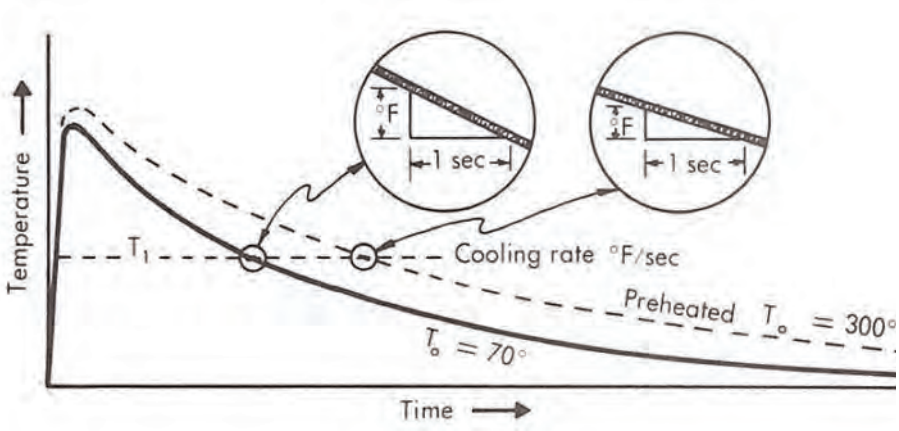


Figure 1 - "Design of Welded Structures" by Omer Blodgett and the James F. Lincoln Arc Welding Foundation



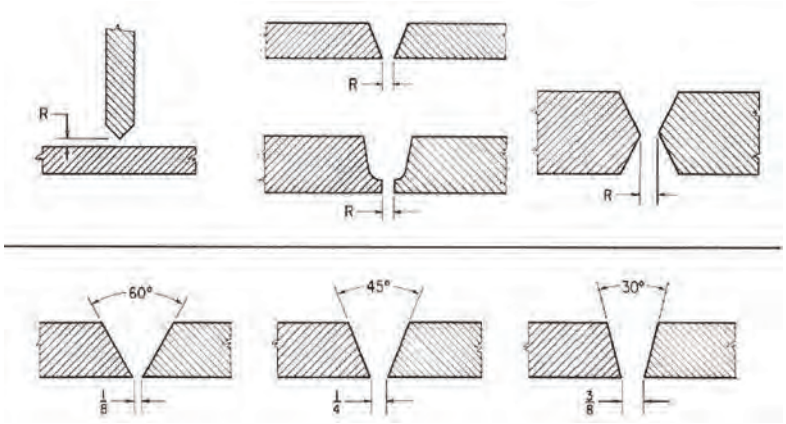


Figure 2 - "Design of Welded Structures" by Omer Blodgett and the James F. Lincoln Arc Welding Foundation

Tech Files

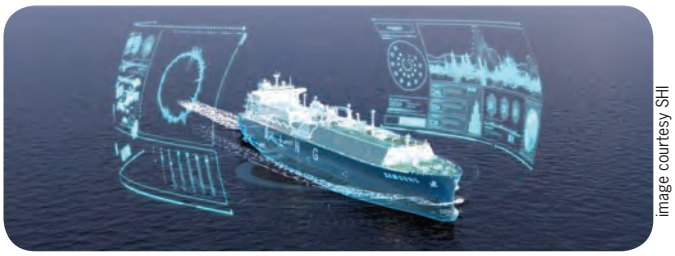


image courtesy SHI

SHI Unveils 'Eco-Friendly' Strategies at Gastech

At Gastech 2023, Samsung Heavy Industries (SHI) showcased its developments in LNG and LCO2 transport vessels, centered around the FLNG (Floating Liquefied Natural Gas Production Facility) models. At the event SHI held a technology seminar dubbed *"Sustainable Future with Green & Digital,"* divided into two sections: *"Products for Future Energy Transition"* and *"Digital Twin-Based Autonomous Navigation."* Here, SHI informed about its future eco-friendly products such as ammonia and hydrogen transport vessels, floating wind power, and Small Modular Reactor (SMR) power plants, as well as the status of development for new technologies such as Digital Twin-based autonomous operation and smart ships, aiming to strengthen their order-based business.

During this event, SHI also signed a technical cooperation MOU with Lattice Technology for grid-type pressurized tanks, a tech to be used to develop new models of LCO2 transport vessels and floating CO2 storage facilities.

Image courtesy Stillstrom

Offshore Charging Partnership

Stillstrom and North Star signed a Memorandum of Understanding (MoU) to accelerate the adoption of offshore charging and vessel electrification technologies for Service Operation Vessels (SOVs) in the offshore wind sector. Stillstrom will leverage its experience in offshore charging infrastructure to demonstrate how Stillstrom's charging solutions can benefit the operations of North Star's growing SOV fleet. These solutions will enable the vessels to recharge their battery systems using wind energy while in the field.

North Star, with its experience in offshore operations, will provide insights into the vessel integration operations with the charging units.

nauticAi Log

Electronic Logbooks

Northern Baltic Sea ferry operator Tallink Grupp, which operates vessels under the Silja Line and Tallink brands, has selected the Finnish-developed nauticAi Log type approved electronic record book for its fleet of ships, with the Swedish-flagged cruise ferry Silja Symphony as the first one to go paperless.

"We switched to paperless engine logbooks here on Silja Symphony from 1 June and feel that this is a good step towards even more modern and digitalized operations as well as our overall sustainability goal of going paperless," said Marcus Åkerholm, Chief Engineer of Silja Symphony.

Glamox

Marine Luminaires

Glamox launched a new range of energy-efficient indoor lighting for vessels and offshore installations, aimed at newbuilds with an eye on style: the AL40 LED range. The fully marine-approved range has a standard light output of 2200lm to 4000lm and light color of 3000K and 4000K. Other variants are available on request. The luminaire is vibration resistant, and the range comprises the entry-level and upgradeable AL40-GP (M) and the deluxe AL40-R (M). Both can come with an emergency lighting system with either a three-hour battery pack or an internal battery for the short luminaire.

Mitsubishi Shipbuilding

Ammonia Handling System

Mitsubishi Shipbuilding is developing the Mitsubishi Ammonia Supply and Safety System (MAmmoSS), an ammonia handling system to support the use of ammonia as marine fuel. Using the AGAS demonstration facility at the Nagasaki District MHI Research & Innovation Center, it will conduct demonstration tests of the processing performance under various scenarios. MammoSS comprises several subsystems in addition to AGAS, including a high-pressure/low-pressure ammonia fuel supply system and an ammonia fuel tank system. A key feature: each of these subsystems can be modularized.

In the Shipyard

Latest Deliveries, Contracts and Designs

World's Largest Battery Electric Ship Started

Incat Tasmania is setting a record for the largest, lightweight battery electric ship in the world with a new 130-meter (427-foot) RoPax ferry under construction for South American customer, Buquebús. The aluminum ferry will be the first fully electric vessel in South America when delivered in 2025, operating between Argentina and Uruguay. It will have a capacity for 2,100 passengers and crew and 225 cars and will feature a duty free shop of over 2,000 square meters (21,500 square feet).

The vessel will sail on the longest zero-emission journey, at the highest speed, and will be charged with the world's highest capacity chargers. Once in operation the shoreside charging systems will have 50% more capacity than any current installation worldwide. The onboard energy storage system (ESS), at over 40MWh, will be four times larger than any battery installation that has been installed anywhere in the world for the marine transport environment. The batteries will power a series of E-motors which drive a water jet propulsion system specially designed for shallow water operation. The project has been made possible by Corvus's lightweight battery, Dolphin NextGen, which features a rackless battery configuration that will weigh less than half of what its standard technology would weigh. Corvus has therefore achieved a high energy density, just under six kilo per kW hour.

The ESS will be deployed across four battery rooms and

Copyright: Incat Tasmania Pty Ltd.

will provide power to electric motors that will power a unique eight waterjet propulsor configuration from Wärtsilä. Eight waterjets, four steerable and four booster jets, were chosen to meet the shallow water operation requirements set for the vessel, rather than having fewer, larger waterjets.

The full Wärtsilä scope of supply includes Wärtsilä's own energy management system, the power conversion system, DC shore charging system, the 40MWh battery modules, the DC hub, the eight electric motors, eight Wärtsilä axial flow WXJ1100 waterjets, and the ProTouch propulsion control system. "We're looking at quite a number of projects at the moment, and in five years' time, we might not consider this a big project at all," said Robert Clifford, Incat Chairman.

6770 HP, Tier IV Class McAllister Tug Arrives in Virginia

McAllister Towing announced the arrival of the tug Jane McAllister, equipped with 3516E Tier IV Caterpillar engines powering twin Schottel SRP 490 Z-drive units. Packed into her 93 x 38-ft hull producing 6,770 horsepower, the Jane achieved more than 91 short tons during her ABS bollard pull certification. Combining her eco-friendly CAT engines with Markey winches on the bow and stern makes the Jane one of the most advanced and powerful shipdocking tractor tugs serving the port of Virginia.

Delivered from Washburn & Doughty and set sail for her new home port. The construction of the tug was overseen by Engineering Manager Martin Costa. McAllister President & CEO B. Buckley McAllister added, "We are proud that the JANE is the 10th tug in our fleet with over 80 metric tons of bollard pull and escort capability, making our fleet one of the best in the country for the larger ships entering into service."

The Jane McAllister was christened at her launch by Jane

Image courtesy Washburn & Doughty

Woodfield Morin, daughter of Alexandra McAllister Woodfield.

Both Jane and Alexandra are direct descendants of James McAllister, who founded McAllister Towing in 1864.

In the Shipyard

Latest Deliveries, Contracts and Designs

Kirby Christens Hybrid Electric Inland Towboat

Photo courtesy Corvus Energy

The US' first plug-in hybrid electric inland towing vessel was christened at a ceremony in Houston: Kirby Inland Marine's Green Diamond will be time chartered by Shell Trading (US) Company, which will use the vessel to push barges throughout the Houston port region. According to Kirby, the vessel can achieve an estimated 80% reduction in fuel use and related emissions.

"We are excited to be the first to market with a plug-in hybrid inland towing vessel," said Christian O'Neil, president of Kirby Inland Marine, a subsidiary of Houston-based Kirby Corporation. Built by San Jac Marine, Kirby's shipyard in Channelview, Texas, Another Kirby company Stewart & Stevenson Manufacturing Technologies, designed and installed the power management, control and propulsion systems.

Propulsion is provided by two 575 KW Danfoss electric motors that can be driven either by the Corvus Orca series battery system, which provides 1243 KWH of power, or, if needed, onboard Caterpillar generators.

A Shell-owned Zinus charging system will be used for dockside charging of the battery system, allowing the vessel to complete trips within the Houston area without using its generators, Kirby said. Shell Energy Solutions will provide electrical power matched 100% by Green-e certified renewable energy certificates to charge the vessel's battery system.

According to Kirby's modeling, when operating on shore supplied power, the fuel use can be reduced by almost 80%, resulting in an estimated 88-95% reduction in emissions of nitrous oxides, carbon monoxide and hydrocarbons. Engine run time can be reduced between 93 and 98% compared to a conventional inland towing vessel, Kirby said. When in hybrid mode with the generators running, the towboat is expected to have an estimated 27% reduction in emissions compared to a conventional towing vessel, the company added.

Image courtesy SHI, MISC

SHI, MISC Develop Floating CO2 Storage Unit

Samsung Heavy Industries received basic certification for a floating CO2 storage unit (FCSU) from DNV. The FCSU, jointly developed by Samsung Heavy Industries and MISC, is 330 x 64m, and has a high-pressure tank capacity that can store 100,000 cu. m. of liquefied CO2 at -50 degrees Celsius or less. The FCSU is designed to be deployed across multiple depleted oil and gas fields offshore that have been earmarked as potential CO2 storage sites.

LNG Dual-Fuel VLCC for Shell

AET delivered its newest vessel, the first of three 300,000-dwt Very Large Crude Carrier (VLCC) powered by dual-fuel liquefied natural gas (LNG) engines, on long-term charter to Shell Tankers (Singapore) Private Limited. The Malaysian-flagged Eagle Vellore was named at a ceremony at the MMHE Pasir Gudang yard.

Built by Hanwha Ocean (formerly Daewoo Shipbuilding & Marine Engineering) in Geoje, South Korea, the ship is classified by Lloyd's Register.

Eagle Vellore's two sister vessels are currently under construction by Hanwha Ocean and due to be delivered later this year on long-term charter to Shell Tankers (Singapore) Private Limited. The three ships are designed with optimized hull forms and propellers, wake improvement ducts and rudder bulbs to further improve vessel's energy efficiency.

Photo courtesy AET

SHIPPINGInsight

2023 10-12 OCTOBER

THE DECADE OF COLLABORATION

Hilton Stamford Hotel | Stamford, CT | USA

PARTNER WITH US!

partner@shippinginsight.com

203 - 255 - 4686

www.shippinginsight.com

SHIPPINGInsight

where fleet management meets maritime technology

MARKETPLACE

Professional

www.MaritimeProfessional.com

Products & Services

www.MaritimeEquipment.com

Products & Services

www.MaritimeEquipment.com

Vessels, Barges & Real Estate for Sale/Rent

BUYER'S DIRECTORY

This directory section is an editorial feature published in every issue for the convenience of the readers of MARITIME REPORTER. A quick-reference readers' guide, it includes the names and addresses of the world's leading manufacturers and suppliers of all types of marine machinery, equipment, supplies and services. A listing is provided, at no cost for one year in all issues, only to companies with continuing advertising programs in this publication, whether an advertisement appears in every issue or not. Because it is an editorial service, unpaid and not part of the advertisers contract, MR assumes no responsibility for errors. If you are interested in having your company listed in this Buyer's Directory Section, contact Mark O'Malley at momalley@marinelink.com

ANCHORS & CHAINS

Anchor Marine & Supply, INC., 6545 Lindbergh Houston, Texas 77087 , tel:(713) 644-1183, fax:(713) 644-1185, david@anchormarinehouston.com

BATTERY CHARGERS

Britmar Marine LTD, 102 2433 Dollarton Hwy N. Vancouver V7H OA1 BC Canada, North Vancouver , Canada

ENGINE ORDER TELEGRAPH

Prime Mover Controls, 3600 Gilmore Way Burnaby B.C. V5G 4R8 Canada , tel:604 433-4644, fax:604 433-5570, Michael.Combs@pmc-controls.com

INERTIAL SENSING SYSTEMS

Silicon Sensing Systems Ltd, Clittaford Road Southway, Plymouth, Devon PL6 6DE United Kingdom , UK , tel:+44 (0) 1752 723330, sales@siliconsensing.com

MEMS MOTION SENSING

Silicon Sensing Systems Ltd, Clittaford Road Southway, Plymouth, Devon PL6 6DE United Kingdom , UK , tel:+44 (0) 1752 723330, sales@siliconsensing.com

METEOROLOGICAL INSTRUMENTS

R.M. Young Company, 2801 Aero Park Drive Traverse City, Michigan 49686-9171 , tel:(231) 946-3980, vsherman@youngusa.com contact: Viola Sherman

NAVAL ARCHITECTS, MARINE ENGINEERS

JMS Naval Architects, 70 Essex Street, Mystic, CT , USA , tel:(860) 536-0009 EXT 2, fax:(860) 536-9117, RickF@JMSnet.com

NAVIGATION AND CONTROLS

Prime Mover Controls, 3600 Gilmore Way Burnaby B.C. V5G 4R8 Canada , tel:604 433-4644, fax:604 433-5570, Michael.Combs@pmc-controls.com

REMOTE OPERATIONS TECHNOLOGY

Harvest Technology Group Limited, 7 Turner Avenue, Bentley 6102, WA, Australia, tel:+61 8 6370 6370, sales@harvest-tech.com.au

SENSORS

Silicon Sensing Systems Ltd, Clittaford Road Southway, Plymouth, Devon PL6 6DE United Kingdom , UK , tel:+44 (0) 1752 723330, sales@siliconsensing.com , www.siliconsensing.com

ADVERTISER INDEX

The listings above are an editorial service provided for the convenience of our readers.
If you are an advertiser and would like to update or modify any of the above information, please contact: productionmanager@marinelink.com

IGP

INTELATUS

GLOBAL PARTNERS

OFFSHORE WIND MARKET INTELLIGENCE

Intelatus offers solutions to grow your business globally.

- **U.S. Offshore Wind Market Report**
  The monthly report and database contains all of the latest developments and information on the projects that will lead the U.S. to deploy 30 GW of offshore wind by 2030 and 110 GW by 2050.

- **Polish and Baltic States Offshore Wind Market Report**
  Intelatus forecasts that over 30 projects accounting for over 30 GW of offshore wind capacity are likely to be committed by 2035.

- **International Wind Turbine and Foundation Market Forecast**
  We provide a forecast of the bottom-fixed offshore wind turbine and foundation installation vessel demand and identify supply gaps in the market.

- **Floating Wind Turbine Installation Vessels Market Forecast**
  Intelatus provides a forecast of floating wind turbine installation vessel demand and identifies supply gaps in the market.

Get all the information you need to access this growing multi-billion dollar market today!

VISIT US

WWW.INTELATUS.COM

ABS WAVESIGHT™

My Digital Fleet™ Webinar Series

Presented by ABS Wavesight

On September 14, we will continue our **five-part series** on how **My Digital Fleet** supports maritime's journey toward sustainability — and how vessel owners and operators can achieve a competitive edge.

This webinar will not only provide an overview of the powerful ABS Wavesight fleet performance system, but will address the topics below:

- Overcoming maritime emissions and performance concerns
- Streamlining critical commercial, operational and technical functions
- Latest best practices in monitoring and voyage planning

Register today for the remaining webinars from September 14 to October 5.

Learn more about the My Digital Fleet series here:

abswavesight.com/MDFWebinarSeries