

February 2025

# MARITIME REPORTER AND ENGINEERING NEWS

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## CRUISE CONTROL

The cruise sector stages a historic rebound after Covid

Since 1939 | Number 2 | Volume 87

**Shipbuilding**  
Vietnam Surges

**Border Patrol**  
U.S. Coastal Border in Focus

**Marine Coatings**  
Evolving Options

**'Meet the CTO'**  
Christer Øpstad, Jotun



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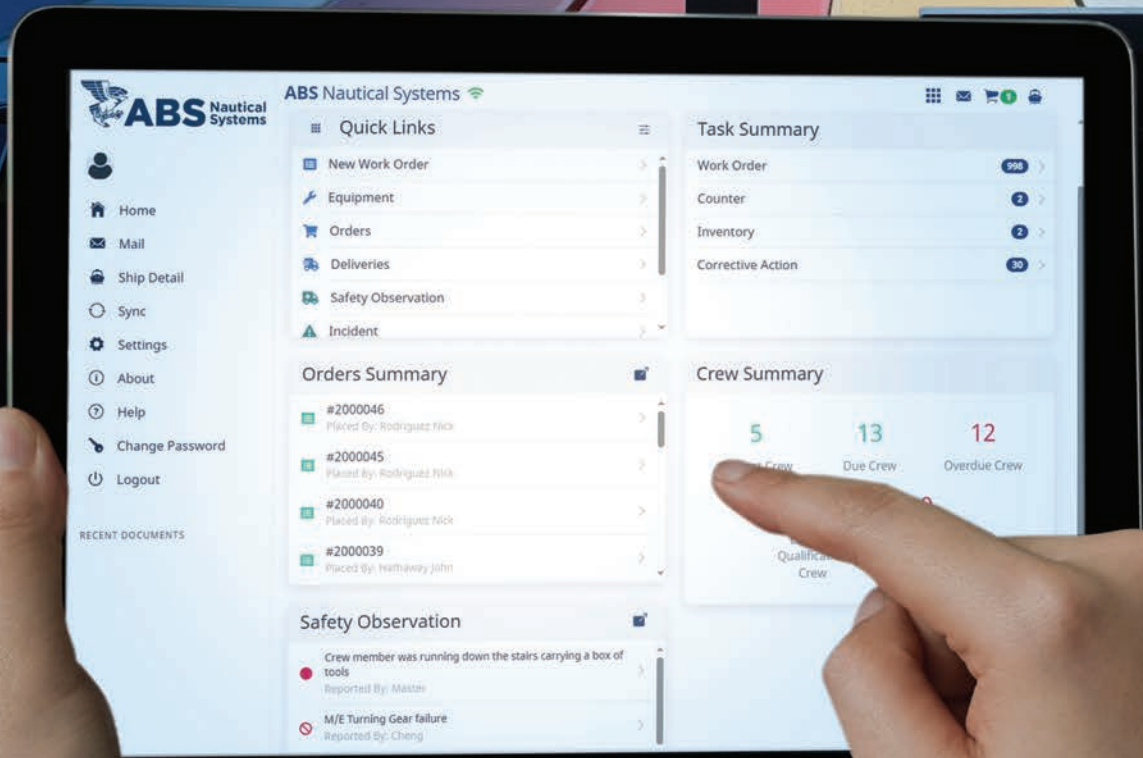
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# 40 Vietnamese Shipbuilding Surges

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The importance of maritime coastal security has been recognized since the founding of the U.S., when Alexander Hamilton established the U.S. Coast Guard (initially as the Revenue Cutter Service) with a fleet of 10 ships in 1790. Today, the topic is more important than ever.

By Bert Macesker & Dr. Joe DiRenzo

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## Authors & Contributors



**Combs**



**DiRenzo**



**Laursen**



**Lewis**



**Lundquist**



**Macesker**



**Parker**



**van Hemmen**



**Zisimatou**

### Combs

Heather Combs is the newly appointed CEO of Ripple Operations and AdonisHR.

### 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.

### 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.

### Lewis

Philip Lewis is Director Research at Intelatus Global Partners. He has market analysis and strate-

gic planning experience in the energy and maritime sectors.

### Lundquist

Edward Lundquist is a retired naval officer who writes on naval, maritime and security issues.

### Macesker

Bert Macesker is the Executive Director of the USCG Research and Development Center.

### Parker

Barry Parker, bdp1 Consulting Ltd. provides strategic and tactical support, including analytics and communications, to businesses across the maritime spectrum.

### 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.

### Zisimatou

Angeliki Zisimatou serves as the Director of Cybersecurity Research for ABS. With more than 20 years of field experience, Angeliki uses her skills in cyber policy, operations management, site inspections, and customer relationship management to design and implement effective and efficient cybersecurity programs, services, and products. Angeliki also serves as the chair of the IACS Safe Digital Transformation Panel.

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### CONTACT INFORMATION:

Email: [mrcirc@marinelink.com](mailto:mrcirc@marinelink.com)  
Web: [www.marinelink.com](http://www.marinelink.com)  
t: (212) 477-6700  
f: (212) 254-6271

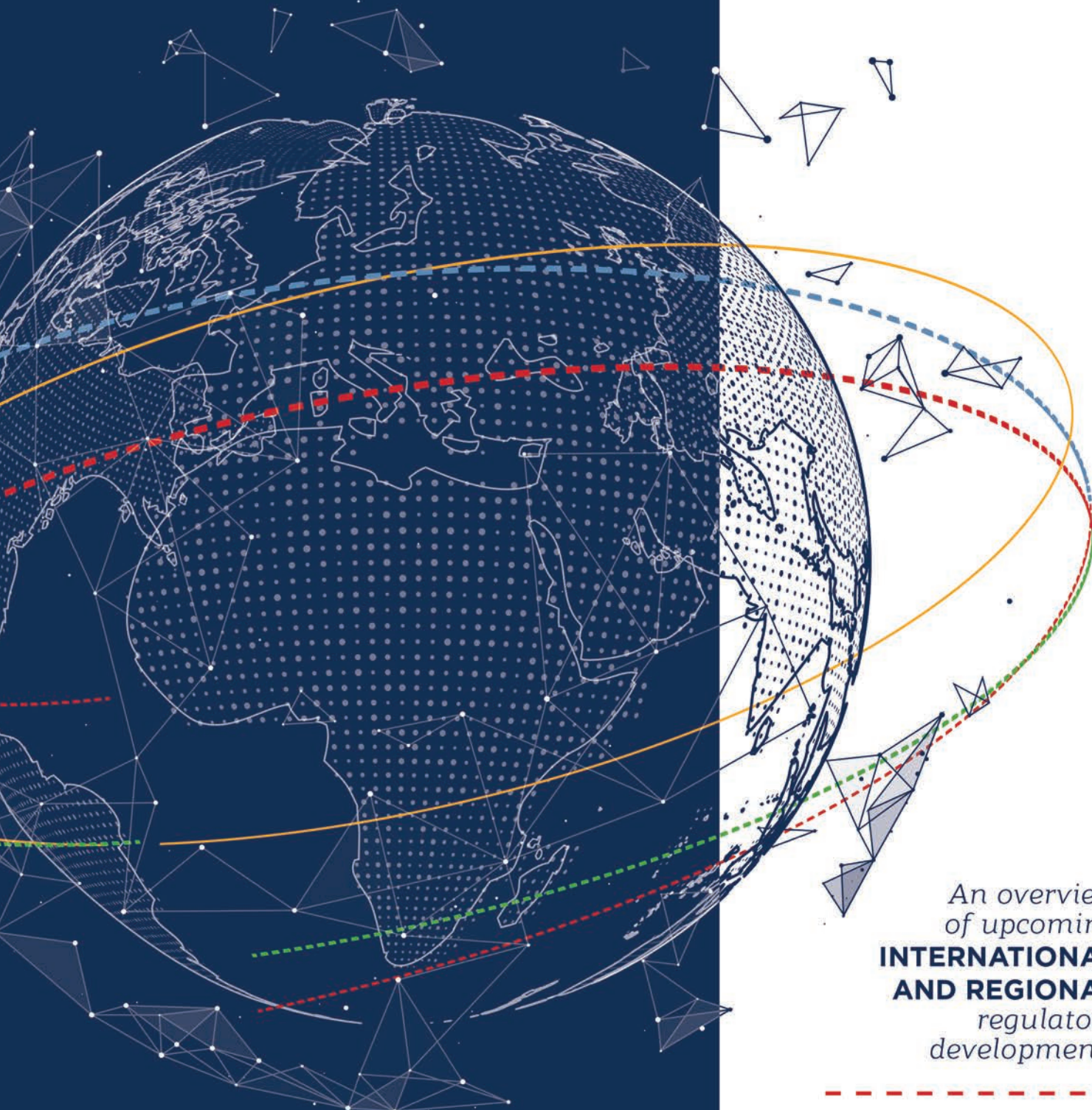


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MARINELINK.COM

**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**  
Joseph Keefe  
keefe@marinelink.com

**Offshore Energy Editor**  
Amir Garanovic  
garanovic@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.com

**Accounting**  
Esther Rothenberger  
rothenberger@marinelink.com  
+1.212.477.6700 ext 6810

**Manager, Information Technology Services**  
Vladimir Bibik

**Circulation**  
Kathleen Hickey | k.hickey@marinelink.com  
+1.212.477.6700 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, Orm 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)



Photo Justin Zurro

**A**s I write this on the final day of the first month of 2025, outside my window in New York is crusty remnants of snow and ice, grey skies and a wind chill that will cut you in half.

That is perfect juxtaposition to this month's cover, a beautiful new Carnival Cruise ship sailing in clear, sunny skies, presumably a fair bit warmer than my current situation.

A shade less than five years ago, the picture for the cruise shipping sector was decidedly different. If you remember, going into Covid the global cruise sector was the literal poster child for Covid, as people and crews were stranded on ships at ports around the world, unable/not allowed by local authorities to disembark lest they spread this new mystery disease. Cruise operations were effectively shut down almost overnight, and in the ensuring 12 to 24 months if a cruise ship was not sent to the scrap yard, it was a mammoth, floating open aorta of cruise company cash flowing into the sea. At the time I remember *'if this industry can recover, it will take a decade or longer.'* (A thought process which, obviously, is proof positive of why I write about the industry and don't run it!)

As we all know now, the end of Covid and the onerous restrictions that accompanied it unleashed a torrent of pent-up demand for leisure travel, a demand that proved particularly positive for the cruise sector, which historically delivers fantastic value for the

consumer spend dollar. The cruise shipping industry is particularly synonymous with the United States, as we are the 'cruise giant' with a fleet worth an estimated \$58.6 billion, the lion's share of the cumulative \$116.4 billion U.S. fleet, a number that gives the U.S. the #4 ranking in the world premised on fleet value according to the most recent statistics from Vescon Nautical's VesselsValue. (see related story on page 43 to get insights on the world's Top 10 fleets by value.)

Today, that Covid-induced cruise industry cash burn has reversed course, as Barry Parker writes starting on page 28. This lead paragraph quote from Josh Weinstein, CEO of Carnival Corp.

"This has been an incredibly strong finish to a record year. Revenues hit an all-time high driven by a strong demand environment that we elevated throughout the year, enabling us to outperform our initial 2024 guidance by \$700 million and deliver nearly \$2 billion more to the bottom line, year-over-year," with overall revenue surging above \$25 billion in 2024. "2025 is shaping up to be another banner year ...". Parker breaks down the investments from the 'Big 3 + Disney' in new ships, amenities and destinations.

As for me? It's time to get back outside to start shoveling some snow!

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





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# Practical AI in Training – Unlocking the Potential of AI-Driven Agents

*By Heather Combs, CEO, Ripple Operations*

**T**he maritime industry thrives on innovation, yet artificial intelligence (AI) often feels more like a distant buzzword than a practical tool. For those managing mariner training, evaluating program effectiveness, or ensuring compliance, the idea of leveraging AI can seem daunting—like it’s reserved for the tech giants of the world. But AI isn’t just for them. It’s here today, it’s accessible, and it can make your life easier.

This month, I want to demystify AI-driven agents and show you how they can transform the way we train, manage, and support our crews. With a bit of guidance, you can harness this technology to build an AI-powered assistant tailored to your organization’s specific needs. No tech expertise required—just a willingness to experiment and adapt.

## Building Your Own AI Agent: The Basics

The beauty of modern AI-driven tools lies in their simplicity. Many platforms, like Microsoft Copilot Studio, Google AI Studio, and Amazon Bedrock Studio to name a few, allow you to create and deploy AI agents that are user-friendly and adaptable. These agents can help you automate repetitive tasks, provide instant access to critical information, and even assist in decision-making.

Here’s what makes these tools so powerful:

- **Build:** You can create agents with no-code, low-code, or full-code options, depending on your comfort level.
- **Connect:** Link your agent to your organization’s internal knowledge sources, like databases or documents, for enhanced functionality.
- **Deploy:** Use the agent across platforms like Teams or Slack, integrating seamlessly into your workflows.
- **Manage:** Maintain control over your agent’s security and compliance, ensuring it works within your company’s policies.

## Training Your AI Agent: A Practical Approach

The phrase “training an AI” can sound intimidating, but it’s simpler than you might think. Essentially, you’re teaching the agent by providing it with curated, relevant data. This could include static documents, spreadsheets, real-time databases, or any other structured information your organization relies on.

For maritime training, imagine feeding your agent data like:

- **Credential records:** Mariners, certifications, expiration dates.
- **Training requirements:** Specific to your vessels or compliance standards.
- **Schedules:** Duty rosters, training plans, and sailing times.
- **Incident reports:** Past onboard issues and corresponding training gaps.

By doing this, you create a knowledgeable, task-oriented assistant that works around the clock, helping you and your team focus on strategic decisions.

## Asking the Right Questions

Once your agent is up and running, its potential is only limited by the questions you ask. Here are a few examples:

- **Credential Management:** “Which mariners have critical training expiring in the next 90 days?”
- **Training Gaps:** “Identify missing sessions based on our compliance requirements.”
- **Incident Analysis:** “Match recent incidents with corresponding training programs and suggest improvements.”
- **Safety Insights:** “Analyze historical training data and recommend programs that lead to safer workplaces.”
- **Resource Planning:** “Create a quarterly training schedule, prioritizing expiring credentials.”

These queries transform the agent into a problem-solving partner, saving time and allowing your team to focus on delivering meaningful outcomes.

## Practical AI for Maritime Training

AI-driven agents aren’t science fiction—they’re practical, accessible, and ready to make a difference. By connecting these tools with the data you already have, you can tackle challenges more efficiently, ensuring better training, compliance, and safety outcomes.

AI is still evolving, but its value as a trusted assistant in training management is clear. Like any tool, its effectiveness depends on the data you provide and the logic you apply to its insights. But with a thoughtful approach, AI-driven agents can become an indispensable part of your team.

Until next time, sail safely!

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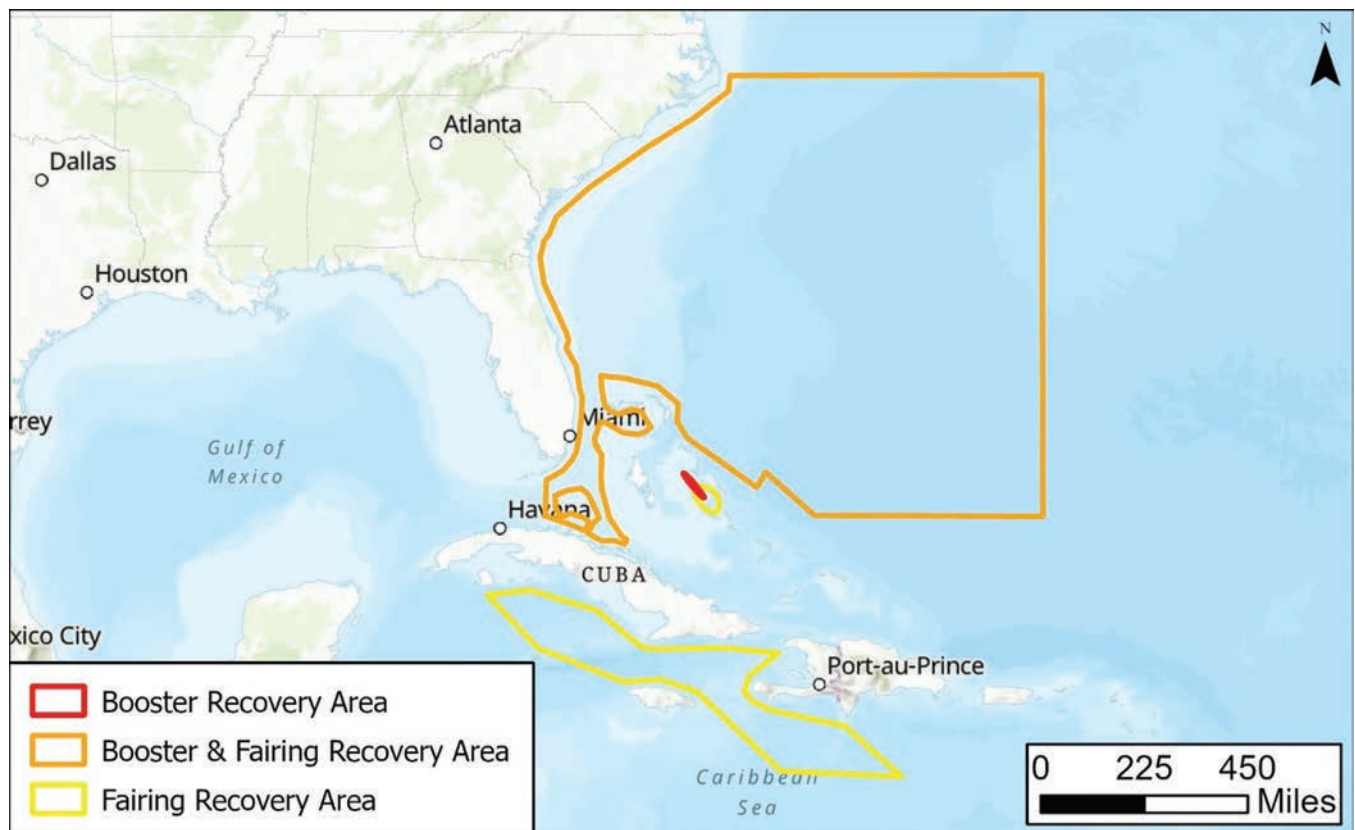
# NOTICE OF PUBLIC MEETING

## FEDERAL AVIATION ADMINISTRATION

The Federal Aviation Administration (FAA), as the lead federal agency, has prepared a Draft Environmental Assessment (Draft EA) to evaluate the potential environmental impacts of modifying SpaceX's existing commercial launch license for Falcon 9 launch operations at Space Launch Complex-40 (SLC-40) at Cape Canaveral Space Force Station. SpaceX proposes to increase the annual launch cadence at SLC-40 from 50 to 120 launches per year. SpaceX also proposes to construct and operate a landing zone at SLC-40 for Falcon 9 first-stage boosters. The proposal also includes Falcon 9 landings downrange on a droneship in the Atlantic Ocean, missions involving expendable first-stage boosters in the Atlantic Ocean, and payload fairing recovery operations in the Atlantic Ocean. The FAA will be holding a virtual public meeting for the Draft EA. Please see details below. Additional information regarding the details of the Proposed Action is available online at: [https://www.faa.gov/space/stakeholder\\_engagement/SpaceX\\_Falcon\\_SLC\\_40\\_EA](https://www.faa.gov/space/stakeholder_engagement/SpaceX_Falcon_SLC_40_EA).

The FAA will hold one virtual public meeting to allow the public to receive information on the Proposed Action and provide comments to the record. The virtual public meeting will be held on March 4, 2025 at 6pm – 8pm (Eastern); the URL and call-in number for the meeting will be provided in advance on the FAA's project website: [https://www.faa.gov/space/stakeholder\\_engagement/SpaceX\\_Falcon\\_SLC\\_40\\_EA](https://www.faa.gov/space/stakeholder_engagement/SpaceX_Falcon_SLC_40_EA).

The FAA will provide a pre-recorded presentation during the first half hour of the public meeting. The public will have the opportunity to submit oral comments during the meetings. A moderator will facilitate verbal comments.



Both English and Spanish versions of the presentation materials will be made available to the public on FAA's project website on March 4, 2025. If any accommodation for the public meeting is needed (such as additional translation services), please submit a request by February 21, 2025 to [SpaceXFalconSLC40@icf.com](mailto:SpaceXFalconSLC40@icf.com).

### **WHY ARE MARINERS BEING SPECIALLY NOTIFIED?**

The Proposed Action includes Falcon 9 launches and landing operations at Cape Canaveral Space Force Station. These operations could temporarily impact transit routes in the area depicted in the figure below. Notices to Mariners (NOTMARS) would be issued that clearly define the temporary restricted areas and their durations, usually between one and ten minutes for launch and landing operations. Restricted areas would be limited to potential landing areas and launch safety zones. Entering closed areas is not prohibited but is strongly discouraged for vessel safety and to prevent potential delays or mission cancellations.

### **Submitting Written Comments**

The FAA invites interested agencies, organizations, Native American Tribes, and members of the public to submit comments on the Proposed Action and analysis in the Draft EA. The public comment period for the Draft EA will close on March 11, 2025. Comments, statements, or questions concerning scoping issues must be identified with the Docket Number FAA-2025-0114 and may be provided to the FAA as follows:

- Federal E-Rulemaking Portal: <http://www.regulations.gov>. Retrieve the docket by conducting a search for "FAA-2025-0114" and follow the online instructions for submitting comments.
- By U.S. mail to Eva Long, FAA Environmental Protection Specialist, c/o ICF, 1902 Reston Metro Plaza Reston, VA 20190.

We encourage you to submit comments electronically through the Federal E-Rulemaking Portal. If you submit your comments electronically, it is not necessary to also submit a hard copy. All comments received will be posted without change to <http://www.regulations.gov>. Before including your address, phone number, email address, or other personal identifying information in your comment, be advised that your entire comment – including any personal identifying information you provide – may be publicly available at any time. While you can request in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

The United States Space Force (USSF) is a Cooperating Agency for this Draft EA. In order to meet USSF's National Environmental Policy Act requirements for adopting the FAA's Environmental Assessment as a Cooperating Agency, (see 32 CFR § 989.15(e)), the FAA has also posted the Draft Finding of No Significant Impact (Draft USSF FONSI) on behalf of the USSF for public comment. The public comment period for the Draft USSF FONSI will close on March 11, 2025.

More information on the Draft EA, Draft FONSI, and virtual public meetings can be found at [https://www.faa.gov/space/stakeholder\\_engagement/SpaceX\\_Falcon\\_SLC\\_40\\_EA](https://www.faa.gov/space/stakeholder_engagement/SpaceX_Falcon_SLC_40_EA).

Subscribe to our mailing list to receive updates on this project: [SpaceXFalconSLC40@icf.com](mailto:SpaceXFalconSLC40@icf.com). Please utilize one of the methods described above to submit public comments. Comments sent to the project email will not be considered a formal public comment.

# VISO DE REUNIÓN PÚBLICA

## ADMINISTRACIÓN FEDERAL DE AVIACIÓN

La Administración Federal de Aviación (FAA, por sus siglas en inglés), como la agencia federal principal, ha preparado un Borrador de Evaluación Ambiental (Draft EA, por sus siglas en inglés) para evaluar los posibles impactos ambientales de modificar la licencia de lanzamiento comercial existente de SpaceX para las operaciones de lanzamiento del Falcon 9 en el Complejo de Lanzamiento Espacial 40 (SLC-40) en la Estación de la Fuerza Espacial de Cabo Cañaveral. SpaceX propone aumentar la frecuencia anual de lanzamientos en el SLC-40 de 50 a 120 lanzamientos por año. También propone construir y operar una zona de aterrizaje en el SLC-40 para las primeras etapas de los cohetes Falcon 9. La propuesta también incluye aterrizajes de los Falcon 9 en el océano Atlántico mediante el uso de una plataforma flotante (droneship), misiones que involucren primeras etapas desechables en el Atlántico y operaciones de recuperación de carenados de carga útil en el océano Atlántico. La FAA llevará a cabo una reunión pública virtual para el Borrador de Evaluación Ambiental. Por favor, consulte los detalles a continuación. Información adicional sobre los detalles de la Acción Propuesta está disponible en línea en: [https://www.faa.gov/space/stakeholder\\_engagement/SpaceX\\_Falcon\\_SLC\\_40\\_EA](https://www.faa.gov/space/stakeholder_engagement/SpaceX_Falcon_SLC_40_EA).

La FAA llevará a cabo una reunión pública virtual para permitir que el público reciba información sobre la Acción Propuesta y presente comentarios para el registro. La reunión pública virtual se llevará a cabo el 4 de marzo de 2025, de 6:00 p.m. a 8:00 p.m. (hora del Este); el enlace URL y el número de acceso telefónico para la reunión se proporcionarán con anticipación en el sitio web del proyecto de la FAA: [https://www.faa.gov/space/stakeholder\\_engagement/SpaceX\\_Falcon\\_SLC\\_40\\_EA](https://www.faa.gov/space/stakeholder_engagement/SpaceX_Falcon_SLC_40_EA).

La FAA presentará una grabación pregrabada durante la primera media hora de la reunión pública. El público tendrá la oportunidad de presentar comentarios orales durante la reunión. Un moderador facilitará los comentarios verbales.



Tanto las versiones en inglés como en español de los materiales de la presentación estarán disponibles para el público en el sitio web del proyecto de la FAA el 4 de marzo de 2025. Si se necesita alguna adaptación para la reunión pública (como servicios de traducción adicionales), envíe una solicitud antes del 21 de febrero de 2025 a: [SpaceXFalconSLC40@icf.com](mailto:SpaceXFalconSLC40@icf.com).

## ¿POR QUÉ SE NOTIFICA ESPECIALMENTE A LOS MARINEROS?

La Acción Propuesta incluye lanzamientos y operaciones de aterrizaje del Falcon 9 en la Estación de la Fuerza Espacial de Cabo Cañaveral. Estas operaciones podrían afectar temporalmente las rutas de tránsito en el área representada en la figura a continuación. Se emitirán Avisos a los Marineros (NOTMARS, por sus siglas en inglés) que definirán claramente las áreas restringidas temporales y sus duraciones, generalmente entre uno y diez minutos para las operaciones de lanzamiento y aterrizaje. Las áreas restringidas se limitarán a las posibles zonas de aterrizaje y las zonas de seguridad de lanzamiento. Aunque no está prohibido entrar a las áreas cerradas, se desaconseja encarecidamente hacerlo para garantizar la seguridad de las embarcaciones y evitar posibles retrasos o cancelaciones de las misiones.

## Envío de Comentarios por Escrito

La FAA invita a agencias, organizaciones, tribus nativas americanas e integrantes del público interesados a enviar comentarios sobre la Acción Propuesta y el análisis incluido en el Borrador de Evaluación Ambiental (Draft EA). El período de comentarios públicos para el Draft EA finalizará el 11 de marzo de 2025. Los comentarios, declaraciones o preguntas relacionadas con los temas de alcance deben identificarse con el Número de Expediente FAA-2025-0114 y pueden enviarse a la FAA de las siguientes maneras:

- Portal Federal de Reglamentación Electrónica: <http://www.regulations.gov>. Localice el expediente realizando una búsqueda de "FAA-2025-0114" y siga las instrucciones en línea para enviar sus comentarios.
- Por correo postal de EE. UU.: Dirigido a Eva Long, FAA Environmental Protection Specialist, c/o ICF, 1902 Reston Metro Plaza Reston, VA 20190.

Le recomendamos enviar sus comentarios de forma electrónica a través del Portal Federal de Reglamentación Electrónica. Si envía sus comentarios electrónicamente, no es necesario enviar una copia impresa. Todos los comentarios recibidos se publicarán sin modificaciones en: <http://www.regulations.gov>. Antes de incluir su dirección, número de teléfono, correo electrónico u otra información personal identificable en su comentario, tenga en cuenta que todo su comentario, incluida cualquier información personal identificable que proporcione, podría estar disponible públicamente en cualquier momento. Aunque puede solicitar en su comentario que se omita su información personal identificable de la revisión pública, no podemos garantizar que podamos hacerlo.

La Fuerza Espacial de los Estados Unidos (USSF, por sus siglas en inglés) es una Agencia Cooperante para este Borrador de Evaluación Ambiental (Draft EA). Para cumplir con los requisitos de la Ley Nacional de Política Ambiental (NEPA, por sus siglas en inglés) de la USSF para adoptar la Evaluación Ambiental de la FAA como Agencia Cooperante (ver 32 CFR § 989.15(e)), la FAA también ha publicado el Borrador de Declaración de No Impacto Significativo (Draft USSF FONSI, por sus siglas en inglés) en nombre de la USSF para comentarios públicos.

Más información sobre el Borrador de Evaluación Ambiental (Draft EA), el Borrador de Declaración de No Impacto Significativo (Draft FONSI) y las reuniones públicas virtuales se puede encontrar en:

[https://www.faa.gov/space/stakeholder\\_engagement/SpaceX\\_Falcon\\_SLC\\_40\\_EA](https://www.faa.gov/space/stakeholder_engagement/SpaceX_Falcon_SLC_40_EA).

Suscríbase a nuestra lista de correo para recibir actualizaciones sobre este proyecto: [SpaceXFalconSLC40@icf.com](mailto:SpaceXFalconSLC40@icf.com). Por favor, utilice uno de los métodos descritos anteriormente para enviar comentarios públicos. Los comentarios enviados al correo electrónico del proyecto no se considerarán comentarios públicos formales.

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# Hull Grooming in Decarbonization: Revolutionizing Cruise Vessel Maintenance with EverClean

It's no mystery that biofouling plays a large part in our pursuit of a greener maritime future. The IMO estimates that the impact of fouling about 0.5 mm thick can increase a vessel's drag, raising fuel consumption and emissions by up to 25%. For the cruise industry, there is mounting pressure to balance operational excellence with environmental stewardship. As one of the most visible sectors of the maritime industry to the public, cruise lines have the opportunity to be at the edge of innovation to decrease costs and decrease our industry's impact on the environment. EverClean offers a highly compatible solution to the unique operational profile for the cruise industry, delivering an optimized hull with a low operational footprint, enabling cruise lines to achieve their fuel consumption goals without disrupting itineraries.

EverClean offers a total hull optimization solution specializing

in proactive grooming. As a team of hull performance experts, EverClean considers a vessel's location, operational tempo, coating, and schedule to devise the most effective way to achieve your fuel performance goals. We know that one of the most effective ways to decrease fuel consumption is to maintain a clean hull and propeller. However, vessel managers often don't know how often hull cleaning and propeller polishings should occur to achieve a return on investment in their fuel bill. EverClean eliminates this guess work by analyzing fuel performance to ensure that we are grooming vessels using our advanced robotic technology as frequently as it needs to maintain a clean, performant vessel.

### *Cruise-Specific Challenges Addressed by EverClean*

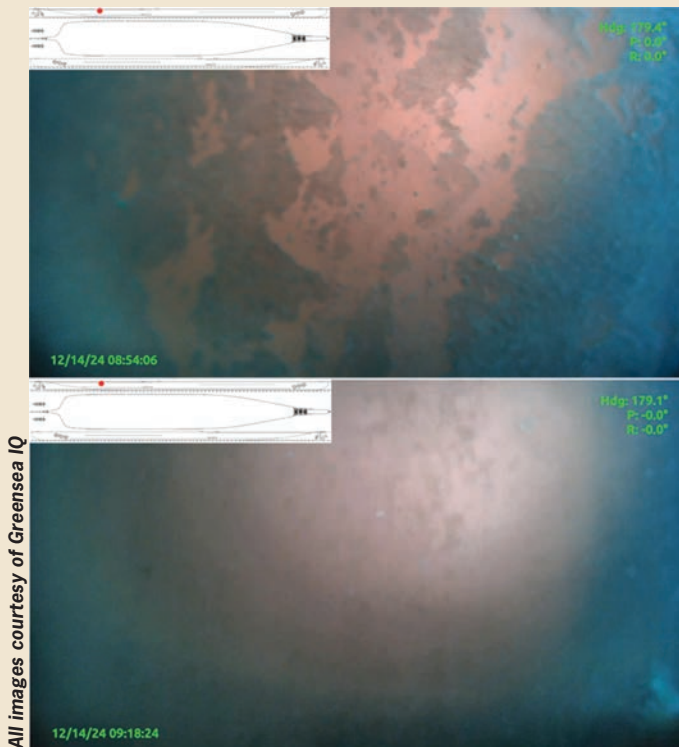
EverClean's service has demonstrated an exceptional fit with the operational tempo of cruise vessels. Here's why:

**Alignment with Operational Schedules:** Cruise ships operate on demanding schedules with frequent port calls, aligning perfectly with EverClean's dedication to regular cleaning for peak performance. With locations in ports across Florida, Texas, and the Bahamas, EverClean is strategically positioned to support the cruise industry's most commonly used destinations.

**Low Operational Footprint:** A major advantage of EverClean is its minimal disruption to pier operations. Unlike traditional hull cleaning methods that often involve time-consuming in-water procedures and potential delays, EverClean operates efficiently using a sprinter van positioned mid-ship, servicing both the outboard and inboard sides of the vessel with ease.

**High-Quality Imaging:** EverClean provides high-resolution before-and-after images as part of its service, enabling cruise customers to clearly understand the condition of their hull and coating. These images not only showcase the effectiveness of EverClean's cleaning process but also offer valuable insights into the hull's maintenance needs, supporting better decision-making and long-term vessel performance.

**Preventative Maintenance:** By addressing biofouling at its earliest stages, EverClean reduces the risk of larger issues that might require more invasive and time-consuming interventions later. This preventative approach is particularly beneficial for cruise ships, where any downtime can impact revenue and schedules.



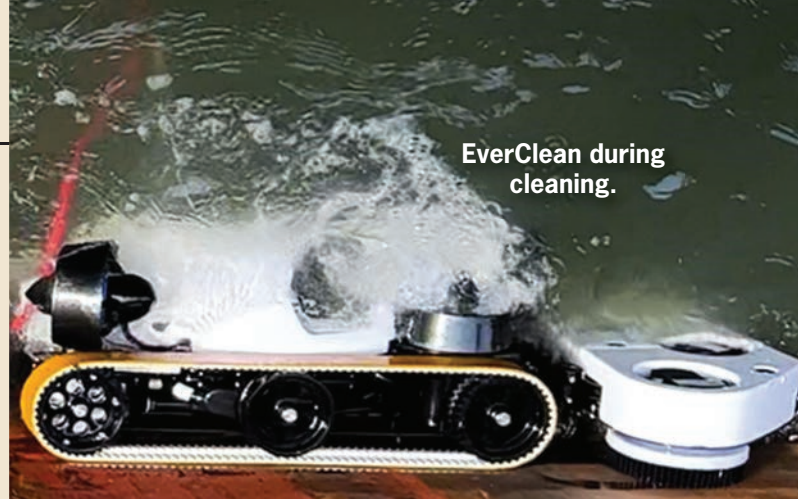
All images courtesy of Greenseal IQ

**Top: Forward camera shows uncleaned section of hull.  
Bottom: Aft camera shows cleaned section.**





At Greensea IQ's Advanced Coating Test Facility, we can ensure that coating thickness is maintained even after years of simulated use.



EverClean during cleaning.

### *Economic Benefits for Cruise Operators*

Fuel efficiency is a top priority for cruise operators, and EverClean delivers substantial savings in this regard. A clean hull can save operators between 1–2 tonnes of fuel daily. For a cruise vessel, this equates to significant financial savings over time, especially given the volatility of fuel prices.

EverClean's non-abrasive cleaning techniques also extend the lifespan of hull coatings. By preventing the need for harsh cleaning methods that can damage protective coatings, EverClean helps reduce the frequency and cost of recoating, further enhancing the economic case for regular hull grooming. This added benefit contributes to long-term savings by reducing material costs and labor associated with the reapplication of coatings.

### *Sustainability: A Win for the Environment and Passenger Perception*

The cruise industry's environmental impact is under increasing scrutiny, both from regulatory bodies and environmentally conscious travelers. EverClean not only minimizes a vessel's carbon footprint but also offers a compelling narrative for cruise companies to share with their passengers.

By adopting EverClean, cruise operators can highlight their proactive approach to environmental sustainability, demonstrating a commitment to reducing emissions and protecting marine ecosystems. This resonates with passengers who increasingly prioritize eco-conscious travel options, providing an opportunity for cruise lines to differentiate themselves in a competitive market.

Furthermore, a cleaner hull reduces the risk of transporting invasive species between regions, a critical concern for cruise lines operating in environmentally sensitive areas. By preventing biofouling, EverClean supports global efforts to maintain biodiversity and protect fragile marine ecosystems.

### *Technological Innovation in the Cruise Sector*

In an industry where operational efficiency and environmental responsibility are paramount, EverClean stands out as a transformative solution that delivers both economic and ecological advantages. Cruise operators, often at the forefront of adopting new technologies, have embraced regular hull grooming as a key component of their maintenance routines. This proactive approach significantly reduces fuel consump-

tion, translating directly into lower operating costs. Not only does this provide immediate savings, but it also ensures long-term returns on investment, making EverClean an invaluable partner in cost-effective operations.

Central to EverClean's offering is its advanced technology, which provides detailed data on hull conditions and cleaning performance. These insights enable cruise operators to make informed, proactive decisions about maintenance schedules, ensuring vessels perform at their best while maximizing cost efficiency. By staying on the leading edge of technological innovation and combining it with practical benefits, EverClean empowers cruise lines to navigate the demands of a modern, eco-conscious market.

### *Conclusion*

As the cruise sector evolves to meet the twin challenges of decarbonization and economic efficiency, proactive hull grooming is emerging as a game-changer. EverClean's innovative service addresses the unique needs of cruise vessels, delivering operational, financial, and environmental benefits that are hard to ignore.

For fleet managers, technical managers, and ship managers tasked with maintaining vessel performance, EverClean offers a proven pathway to achieving sustainability goals while reducing costs. By investing in proactive hull maintenance, cruise operators can sail confidently into a future defined by efficiency and environmental responsibility.

With EverClean, the cruise industry has a powerful tool to stay competitive, meet regulatory demands, and appeal to a growing segment of environmentally conscious travelers. The result is a win-win scenario: cleaner oceans, reduced costs, and a brighter, more sustainable future for cruising.

### **The Author**

## **Glowacky**

Paige Glowacky serves as the Senior Product Manager for EverClean at Greensea IQ. Before her tenure at Greensea IQ and entry into the maritime sector, she held Product Manager positions at various late-stage startups within the technology and financial industries.



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# Beating the *[Wooden Hull]* Drum

By Rik van Hemmen

Even though there is still a substantial amount of wooden yacht construction and restoration out there, wooden hull construction has pretty much gone the way of the mastodons.

To find a new commercial wooden vessel project would be quite a challenge.

Except if you happen to know **Scarano Boatworks**. Scarano Boats was founded by brothers John and Rick Scarano in 1986. They are located in an old waterfront fertilizer factory in Albany, NY, and, too quietly, have built a variety of boats that boggles the mind. Their portfolio defies description. They have built USCG inspected passenger vessels, historic replicas, tiny experimental cruisers, private yachts, adventure schooners, head boat schooners, and billboard, hot tub, and solar hybrid electric drive catamarans.

Almost all the vessels built at Scarano were designed under the leadership of John Scarano. In an oversimplified description, John mostly runs the yard, while Rick mostly runs their boat operations under the name Classic Harbor Lines. Classic Harbor Lines runs about 12 USCG inspected sailing and power passenger vessel in New York City, Boston, Newport, RI, and Key West.

The vast majority of the Classic Harbor Line vessels were designed and built by Scarano boats. While some look similar, all are original designs where the oldest vessel (a wooden schooner) is about 30 years old. The newest vessel, a 114 foot passenger vessels that resembles a 1930's New York City commuter is presently under construction in the yard.

The vessel presently under construction, I'll call her Manhattan III, is an evolution of Manhattan I and Manhattan II which are earlier aluminum passenger vessels that have a similar retro appearance.

However, the new vessel is being built out of wood instead of aluminum, and John has a very good reason for it. It is less expensive to build, more fun to build, and will cost no more to maintain than an aluminum vessel. It will even be a little lighter than an equivalent aluminum hull.

John loves wood, but he is not sentimental about it. He simply knows that wood is better in this application and actually in many other boatbuilding applications. John and Rick know this



Images courtesy Rik van Hemmen

because they design, build, and operate boats, which is a unique opportunity to look at the cost of boats over their entire operating life. To them a boat is a complete lifetime package. Not a sales pitch by a designer and a builder with a profit motive, to only pass the vessel to an Owner who will have to make the best out what he has been provided. Moreover, they are completely unafraid to stray from the beaten path and to experiment. Their experiments have run for over 30 years and the results are in.

As long as custom wooden boats up to about 150 feet in length, and properly designed and maintained, they are less expensive over their life than aluminum, steel or composite boats.

This may seem hard to believe, but let's take a quick look at the construction of Manhattan III.

Manhattan III is a medium speed powerboat that will be carrying passengers in comfort and style.

She is douglas fir epoxy strip planked on laminated frames with multilayer plywood bulkheads. She will be covered on the exterior with about 36 ounces of glass and her interior will be sanded and painted without further composite laminating. It sounds conventional, but technology plays a significant part in the construction. Since the entire hull is 3D modeled, the frames are laminated to a rough shape on easily developed dimensions. Once cured, the rough frames are machined

to exact dimensions on the NC mill. The frames are erected upside down, and from that point on strip planking can be performed in an incredibly straightforward process that is no more complicated than basic basket weaving. John has built wooden boats with more complex approaches and also with simpler approaches (down to hard chine fiberglass covered plywood construction on boats that still pass USCG inspection 35 years later), but this approach is so straightforward that it actually begs for semi production line construction.

Scarano boats is a busy shop running many simultaneous projects, so it is difficult to put a large team on the strip planking job. While it is done within the budget with two ship carpenters who are making slow and steady progress, it would be much more fun, much faster, and even much cheaper, if it were done by a gang that spent some time optimizing the production line.

A team of six builders consisting of one skilled boat builder and 5 teenagers would probably be able to plank this boat at 50% fewer total manhours than John's two skilled boat builders, who spend way too much time picking up and moving tools, moving staging and trimming fresh planks. Once the team would get the rhythm going, it would be a thing of beauty to behold, and construction speed would rival skilled laminating teams building hulls (and framing) in prefab molds.

This may seem counterintuitive, but remember, with composite molded hulls the job is not done until the frames and bulkheads are laminated in. However, on this strip planked, boat the frames and bulkhead are already fitted when the hull is planked.

One may think the smooth molded composite surface is a time and cost saver (discounting the cost of the mold), but fairing this strip planked hull is really not that much work and neither is the downhand laminating of the exterior fiberglass skin. Actually, the big cost saver between the aluminum hull of the earlier boats and the wooden hull is the reduction in fairing costs on the wooden hull.

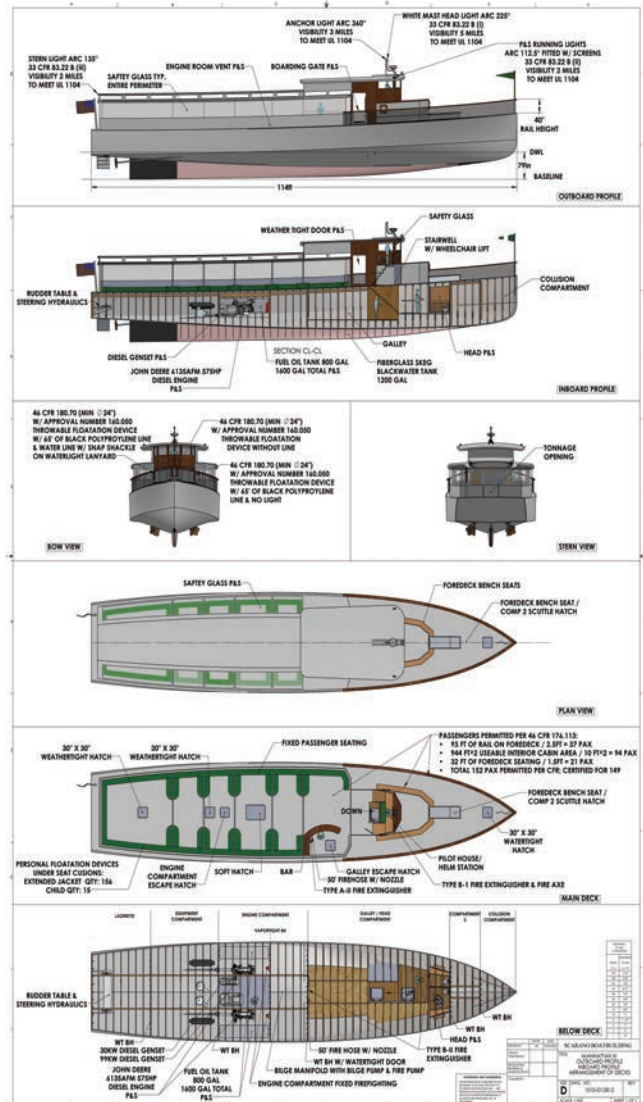
Once the boat is flipped, the interior is half finished and the biggest decision rests on whether the laminated frames and hull interior should be finished bright or painted.

Modern urethanes work incredibly well on the wooden substructure with the fiberglass skin. Repainting these hulls does not occur more frequently than on any other hull material and the interior finish of these hulls outlasts any other interior hull material. The oldest boats in the fleet have seen very little interior refinishing and often refinishing destroys the patina.

What is also remarkable and unexpected is that proper hull repairs are less expensive than composite, steel or aluminum hull repairs. Especially aluminum hull repairs are expensive, and one of the reasons that John has moved away from aluminum is that he does not have to worry about stray current corrosion in today's electrical world.

Are there any secrets to this approach?

Yes, there are a few. First, only an experienced wooden boat designer should design wooden boats, because drainage and



ventilation are of vital importance. It is not difficult to achieve, but it requires almost fanatic attention to detail. Modern boat operation today requires dry bilges and this actually makes wooden hulls more attractive, since a wooden boat with dry bilges will actually live forever.

And finally, there is one thing that cannot be designed away. No vessel should ever lack maintenance, but with wooden boats it is absolutely imperative that they receive timely maintenance. A composite boat stands a change when neglected for a while, but a wooden boat will simply die from neglect. Love a wooden boat and it will love you forever, whether as your personal yacht or as a USCG inspected commercial vessel.

For each column I write, **MREN** has agreed to make a small donation to an organization of my choice. For this column I choose Rocking the Boat, <https://rockingtheboat.org/> a great kids boatbuilding and messing in boats program in Hunt's Point NYC.

# TALKING MARINE COATINGS WITH CHRISTER ØPSTAD, JOTUN

*Sourcing and maintaining marine coatings systems are arguably a shipowner's most critical means to ensure a long and productive lifecycle for ships, boats and offshore rigs. At the same time, coatings have become a central part of the ship efficiency, decarbonization discussion. **Christer Øpstad**, Global R&D Director Fouling Protection, Jotun, discusses how these macro trends are driving R&D within his laboratories today.*

*By Greg Trauthwein*

## **To start us off, can you provide a 'by the numbers' look at Jotun today?**

Jotun is headquartered in Sandefjord, Norway, still a family-owned company founded almost 100 years ago. We are a global company with operations in more than 100 countries across the world, with more than 11,000 employees worldwide and 40+ factories. R&D is a central part of our operations, and we have seven regional laboratories set across our key markets, including our main central R&D laboratory here in Norway. Jotun is present in four market segments, but if we drill down to shipping and the marine area, Jotun delivers a full range of products and solution, not only the hull performance coatings as the antifouling, but also a full set of corrosion protection, cargo hold solutions and onboard maintenance during the operational stage of the vessel.

## **What is the 'bread and butter' of the Jotun hull coating lineup?**

It's broad, and that's the nature of the industry. The shipping industry is diverse and dynamic, and there is not really any single product or technology that fulfills all needs. Our approach is technology neutral, where we leverage a range of technologies and products in our portfolio to be able to provide that performance for our customers' needs; but having available a wide range of documented solutions where we can help the customer select the solutions that are optimized to their specific trades and vessels.

But if we have to distill it down to, let's call it the bread and butter, I would say that what we focus the most on is our hull performance solution, where we leverage different parts of technologies, different products, helping the customers to do the application right, using also digital tools such as our HullKeeper platform to maximize the benefits of the coating. More and more we're wrapping things around the effect that our coatings have rather than focusing it down on a specific technology because the end goal is the customer experience, not the coating in the can.

## **What digital tools do you offer to ship owners to gauge the effectiveness of their coatings?**

Over the last 10-15 years there's been a significant focus on performance: performance management, performance measurement, assessment and understanding so that they can monitor and optimize along the way. And then comes the digital shift, which has brought upon us new opportunities. We have established the HullKeeper system where we leverage algorithms that can help predict the risk of a vessel. We can have retrospective monitoring of performance to help the customers understand and monitor and gauge how well their vessels are performing and also help them evaluate whether they're operating at peak performance.

## **How are the digital + decarbonization trends, driving your day-to-day focus?**

They are mega topics and they are the core of our focus. It's not about the paint in the can, it's the effect of the paint. For us, a clean hull really sits at the core of our focus and in the shipping industry, decarbonization, fuel efficiency, and also protecting biodiversity are all closely connected with this clean hull.

So our work in many ways is centered on developing technologies, products, and solutions that provide ships with the cleanest possible hulls to support the industry's ambitions to decarbonize and save fuels. One of the things that we're proud of is our flow cell, a tool that we have in the lab. This allows us to recreate the flow conditions on the hull of ships to measure and understand how different surfaces interact with water and generate drag, helping to quantify how different types of coatings, different types of surfaces influence the friction and the total resistance of that ship. We can use that together with CFD, for example, to be able to accurately predict the expected performance of various products and optimize them.



Image courtesy High Level Climate Champions



# Christer Øpstad

*“If we succeed in creating this greater awareness on the connection between the clean hull and decarbonization of fuel savings, I don’t think there will be a significant opposition between delivering innovative and effective solution and also meeting those budgets, operational, and environmental needs because they kind of all swing in the same way.”*

**Global R&D Director  
Fouling Protection, Jotun**

## **What’s the greatest challenge in creating coatings for maritime that meet budgets, operational and environmental needs?**

That’s the biggest paradox, isn’t it? The major challenge that we’re faced with today is basically also that the industry as a whole is lacking uniformity in terms of regulatory requirements. And that goes both on the side of the coating composition, but also on the operating side in the biofouling management for the vessels in operation.

So the challenge here is that diverging and also oppositions in regulatory requirements across regions or countries, they cause delays in development because you have a redundant double, triple work even. Also, the introduction of optimized solutions are delayed, and different regulatory requirements makes it difficult to operate in equal terms across the world. It creates shifts and uncertainties for the whole industry, which makes the dynamic a little bit more complex and makes innovation slower.

Also, the shipping industry is faced with a lot of costly demands in terms of regulations and taxes on carbon emissions and a lot of things which put constraints on their budget, so the willingness to pay in a way also is constrained because they have to spend the money on more things. So raising then the relevance of investing in something which creates value for them is one of the things which is important for us, showing the worth and proving the value of what we deliver.

If we succeed in creating this greater awareness on the connection between the clean hull and decarbonization of fuel savings, I don’t think there will be a significant opposition between delivering innovative and effective solution and also meeting those budgets, operational, and environmental needs .

## **There’s been a recent trend of robotic hull cleaning solutions. What are the pros and the cons?**

New technologies and partnerships open [opportunities] for hybrid solutions where coatings are combined with the other technologies for enhancing the benefits for the customer. The HullSkating solution, as you point out, is one such example where we aim at providing the cleanest possible hulls even in the most challenging operations. But we’re well aware that we don’t operate in a vacuum, and things are happening at lightning speed when it comes to robotics.

To be frank, we welcome all who enter this market with the ambition to make the shipping industry cleaner, because what we know is that there is no silver bullet to solve all the challenges that biofouling represent for the industry operators, owners and stakeholders. They need to have access to as many options as possible to evaluate and test to understand which will give them the right benefits.

It basically comes down to key elements [and questions]: what do you really want it for, what is your key need? For example, is it cost? Availability? Documentation? What kind of assurance do you need? And then understanding also how [your needs] fit the different available solutions.

For example, if a vessel operates into countries which are very strict in terms of documentation, such as New Zealand or Australia, then there would be a much higher requirement for having proper documentation connected to that service. Which ports do you call and can you match it to a port-based solution versus an onboard solution? What level of crew involvement is needed? How does it influence your operational parameters?

We’re only seeing the beginning now of how the industry is taking it on, and what we’re seeing is an approach where offerings come, but a structured approach to the receiving end does not really yet come. So I’m very interested to see also how this will become more structured and regulated also with the ongoing work on the IMO side.

# MARINE COATINGS

## BREAKING WITH TRADITION

*There's a tendency for owners to stick with the coatings they are familiar with, but environmental concerns, particularly regarding marine biodiversity, are providing fresh opportunities for them to reconsider.*

Image courtesy Nippon Paint

**By Wendy Laursen**

**M**easuring hull coating performance from noon reports yields around 350 data points over a five-year docking cycle after including full loaded sailing days and excluding adverse weather days etc.

But it's become a more sophisticated challenge now that owners and operators have to factor in decarbonization regulations, the IMO's 2023 biofouling guidance for invasive species prevention (MEPC 378.(80)) and the potential for reputational damage if a vessel is denied entry to a destination port.

As a result, technology for coating performance monitoring and prediction is growing in sophistication perhaps faster than coating technology itself.

High frequency monitoring is becoming more popular as it can provide hundreds of readings a day. The systems that coatings suppliers are advancing are typically based on historic AIS data which is to determine voyage route and speed combined with seawater temperature data to estimate fouling challenges.

AkzoNobel's **International** marine coatings brand has released updates to its digital forecasting tool, Intertrac® Vision which include the ability to predict CII ratings and assess the financial impact of the EU's Emissions Trading System. Intertrac Vision draws from a database of over 200,000 drydocks and 10,000 vessel operations. It combines this historical data with machine learning to forecast the impact of coatings on a vessel's performance. A new update now provides a total cost of ownership summary, breaking down the cost contributions of each stage in the drydocking cycle. Additionally, users can now forecast over a 120-month cycle either as two consecutive 60-month dockings or one continuous period.

Jotun's fouling risk management program HullKeeper uses advanced big data analytics and includes the company's proprietary algorithm that aims to identify risks and provide recommended actions for maintaining a clean hull. Upcoming developments include integrating performance analytics with the algorithm output and the ability to register events.

“The mission to protect biodiversity has gained more and more focus, as we saw at both COP29 and at the Glofouling R&D Forum, both taking place in November,” says **Morten Sten Johansen, Global Category Director Hull Performance, Jotun**. “The trend is to have focus on transfer of invasive aquatic species and not only on decarbonization of shipping, although it is linked together through biofouling.”

**Kazuaki Masuda, Corporate Officer, Technical Division Director at Nippon Paint Marine**, says that as the industry’s regulatory landscape becomes more complex, customers increasingly expect insightful data that demonstrates a coating’s impact on vessel performance, particularly in terms of compliance with the IMO’s GHG strategy to reduce emissions. Nippon Paint Marine offers a proprietary methodology along with CII predictions using ClassNK methodology and speed-loss analysis in partnership with Oceanix.

**Carl Barnes, Head of Marine Consulting at Safinah**, says optimal biofouling protection can be achieved through informed product selection and specification, controlled application and installation, monitoring and appropriate maintenance. “For example, based on Safinah’s knowledge of antifouling schemes, a significant difference in scheme thickness (the dry film thickness applied) can be needed for what appears as relatively minor changes to the scheme parameters. A relatively small increase in predominant sea surface temperature of 3oC (moving from 25oC to 28oC) could require a significant increase in the antifouling scheme thickness, typically, up to 30%.

“Furthermore, other factors such as application location, season, product availability, biofouling management options, cleaning equipment availability at typical destinations, and many others also need to be considered.”

Barnes says that the choice of hull coatings can be a minefield with over 150 products for fouling control available on the market from the main coating’s suppliers, all making performance claims.

“Safinah attends around 200 – 250 dry docks per year on behalf of the owner as project managers, and therefore we have an in-depth reference point of fouling coating performance. A particular trend we are seeing is an increase in a move towards perceived ‘high technology level’ products.

“However, based on our data from the dry dock returns, there is no real difference between the performance of perceived low and high technology levels. Furthermore, more than half of the ships with >20% macrofouling (animal or weed) on arrival in dry dock opted for the same coating manufacturer and often the same product.”

Coating decisions extend beyond the hull, and Barnes notes a shift away from coating propellers with silicone foul release coatings, as these coatings have poor anti-abrasion properties and are easily damaged, typically suffering from cavitation damage at the propeller blade tips. Epoxy technology is be-

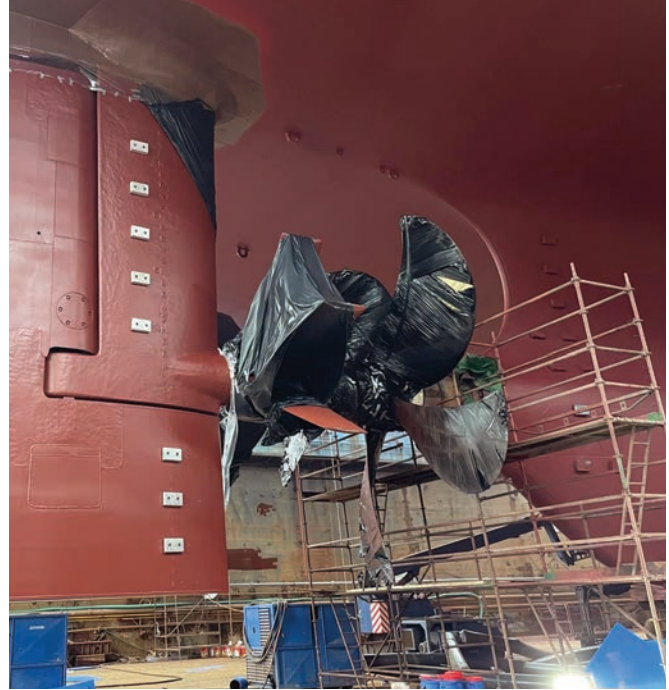


Image courtesy Subsea Industries

*Running gear can be protected with Ecoshield.*

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## COATINGS

In developing the new type approval, **Heather Hughes**, Team Leader for Non-Metallics and Coating Materials at LR, reached out to coatings manufacturers to gather data on the cleanability and performance of their coatings.



Image courtesy Lloyd's Register

coming popular instead.

In the last couple of years, **Subsea Industries'** sister company **Hydrex** has noted a substantial increase in the number of enquiries for underwater rudder repairs and offers its Ecoshield coating to protect against cavitation damage. The company has also had success with the coating for preventing corrosion damage in scrubber tanks, pipes and outlets.

Recognizing that coatings themselves are an important asset, **Lloyd's Register (LR)** awarded the maritime industry's first Enhanced Antifouling Type Approval to **GIT Coatings** last year. The establishment of the advanced approval is a direct response to the IMO's 2023 biofouling guidance for "The Control and Management of Ships' Biofouling to Minimize the Transfer of Invasive Aquatic Species."

## @ PPG, IT'S ELECTROSTATIC

Introduced in 2024 to the marine industry, PPG recently celebrated a milestone in the update of electrostatic application of marine fouling coatings, a process that in practical application has proven to save a lot of paint and effort in minimizing overspray. "We see a significant shift in demand to-

wards the PPG flagship products **PPG SIGMAGLIDE** and **NEXEON**," said **Ariana Psomas**, Global Segment Director New Build & Dry Dock, PPG. SIGMAGLIDE, is a fouling release coating using a very low surface energy material that Psomas says can decrease friction and improve operational

performance, helping to decrease the emissions up to 35% as compared to traditional antifouling coatings. "An exciting addition to sustainability is that both SIGMAGLIDE and NEXEON are designed to be applied with electrostatic application, as such reducing coating overspray and waste and



**Electrostatic application [left] depends on 'Charged' paint to cut overspray and waste, says Ariana Psomas, Global Segment Director New Build & Dry Dock, PPG [right].**





The idea is to provide owners and operators with validated assurance that a coating maintains its performance before and after grooming, with no roughness increase and no thickness loss, and is compatible with the vessel's planned grooming frequency.

In developing the new type approval, **Heather Hughes**, Team Leader for Non-Metallics and Coating Materials at **LR**, reached out to coatings manufacturers to gather data on the cleanability and performance of their coatings. This data included scientific measurements, although there are no international test standards for proving cleanability at present. LR is therefore collaborating with laboratories, including **Plymouth Marine Laboratory**, **DHI** in Scandinavia and **Geoffrey Swain at the Florida Institute**, to develop standards for verifying the performance of anti-fouling coatings through independent verification.

Next, Hughes expects type approval for cleaning equipment to ensure it does not negatively impact coatings.

She has already seen an exponential shift in the coatings market that is driven by economic and reputational factors, but, hearteningly and surprisingly, more strongly driven by the industry's environmental concerns.

bringing benefits to owners/operators and shipyards."

The industry, driven by IMO's mandate to decarbonize by 2050 and a host of new energy efficiency measurements across Europe, are driven to pull out every tool in the tool kit to help cut fuel burn, costs and emissions, and coatings has been a 'go to' for several years. Improved coatings, and coatings application, are taking efficiencies even higher. "Electrostatic application is a standard way of application in several industries such as aerospace and automotive for decades," said Psomas. "PPG has long experience in this type of application and decided to introduce it in shipping as it is a more sustainable method of application, reducing waste emissions and overspray while it improving the quality of application," said Psomas, noting that it recently hit a milestone in the 50<sup>th</sup> application since it was offered to the maritime sector starting in 2024. "It is a simple way of application: you charge the paint, and with a special (application) gun, the charged paint is attracted to the surface of the ship like a magnet, meaning all of the paint goes on the ship and not anywhere else," said Psomas. "Reduced overspray [means] reduced waste, and less overconsumption leads to less emissions. Also, improved application, smoother film which leads to better performance."

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# CYBER SECURITY

**Technical Security alone is not a solution; Human Factors have a critical role in managing cyber risk.**

*By Angeliki Zisimatou, Director of Cybersecurity Research for ABS*

**R**egardless of size, nature of business or company position in the energy supply chain, if your business utilizes IT/OT operations, a cyber-attack may occur. Threat actors seek vulnerabilities to breach systems security and networks, aiming to gain access to data for a variety of reasons, including potential financial extortion and financial gain. The urgent realization is that cyber-attacks are high risk situations that may occur at any moment, and cybersecurity cannot be achieved by software solutions alone.

Angeliki Zisimatou is ABS's Director of Cybersecurity and is responsible for leading ABS's efforts through the participation in cybersecurity and autonomous research projects and the development of ABS's rules and guides. In this article, Angeliki reveals why training and the human factor element are key components in the battle for ultimate cybersecurity protection.

Cyber protection is reliant on human awareness and an understanding of how a single action could escalate a cyber-related incident. Human intervention backed by training, simulations, drills, and robust insights is critical in the journey to future-proof your business and its operation.

### Three Critical Threat Actors

As port facilities and shipping vessels become increasingly interconnected, the risk of cyber incidents continues to grow. Businesses can be impacted in many ways. Across the U.S. there are many ports, terminals and facilities, including vessels within the commercial, civilian, government, and military sectors that have thousands of interconnected systems

that control anything from port cranes to a ship's engines or navigation systems. Each port might have different systems - a container terminal for example, will have more systems supporting the movement of shipping containers, whereas a cruise terminal will be focused on supporting the movement of people. As new technologies are developed, they are often added as enhanced 'bolt-on' functionality to legacy company systems, yet these additions often lack the rigorous security testing applied to secure-by-design systems. These systems are often connected to the internet to provide stakeholders with remote access to control the systems. While the increasing digitalization and automation of systems and processes may deliver the opportunity for greater efficiency and competitiveness within organizations, it can also create greater cyber risk exposure through increased potential 'attack surfaces' - the ways in which cyber-attackers can penetrate systems.

The CISCO Cyber Threat Trends Report 2024 outlines the three most seen threat categories: (1) Information Stealers (246 million); (2) Trojans (175 million); and (3) Ransomware (154 million). Each of these categories had average monthly blocks in the hundreds of millions.

As the report highlights, information stealers are malicious programs designed to collect various kinds of personal and financial information from an infected system. Trojans are a type of malware that mislead users of their true intent. Another common installation tactic is when a user gets a malicious link, like an email attachment disguised as an invoice, that once clicked on can enable cybercriminals to spy on you,

## CYBERSECURITY

steal your sensitive data, and gain backdoor access to your system. Ransomware is a type of malware that encrypts files on a victim's computer or network, rendering the entire system inaccessible and disrupting operations.

### Rising Tide of Cyber-threats

In 2023 Cyber Trends and Insights in the Marine Environment (CTIME) report(1), the United States Coast Guard noted the following:

- **Ransomware attacks increased 80% in 2023.** These attacks encrypt systems with the goal of locking users out, then extorting the victim and demanding ransom for a decryption key. Perpetrators are becoming more sophisticated and requested ransoms have tripled.

- **Maritime shipping companies,** logistics and technology service providers; liquid natural gas processors (LNGP) and distributors; and petrochemical companies are common targets.

- **Very basic cyber deficiencies persist.** However, essential measures like patching and updating software, limiting network access, and implementing multi-factor authentication are base level cybersecurity measures that go a long way towards safeguarding systems.

- **Network-connected operational technology (OT)** in

port facilities and shore-side are being targeted. These systems are particularly vulnerable to attacks as they often rely on outdated and unsecure software and network protocols, and insufficient access controls.

While new regulations are designed to help safeguard the U.S. Maritime infrastructure and supply chain, they come with hurdles. For transformational change, the industry will require a large-scale approach to cyber security, covering key areas including account security, device security, data security, governance, risk management, supply chain management, cyber resilience, network segmentation, reporting, and physical security. ABS is leading industry guidance in this area to support industry safeguards.

### The Importance of Upskilling Human Awareness

According to a study by IBM(2), human error is the main cause of 95% of cybersecurity breaches. In other words, if human error was somehow eliminated entirely, 19 out of 20 cyber breaches may not have occurred!

In a security context, human error means unintentional actions - or lack of action - by employees and users that cause, spread or allow a security breach.

This can encompass a vast range of actions - from down-

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## DIGITALIZATION

loading a malware-infected attachment to failing to use a strong password or even a minor unintentional change to an essential configuration file of a system - which is part of the reason why it can be so difficult to address.

With more advanced and complex work environments being created across industry, there is an increasing number of tools and services being utilized with each requiring unique usernames and passwords. This all adds up and when not provided with alternatives or secure solutions, employees can start taking shortcuts to make life easier for themselves. Examples of these mistakes/missteps include posting credentials in visible places, not changing default passwords, and using a single account for multiple operators.

Types of human error can include:

### *Skill-based errors*

Skill-based human error consists of small mistakes that occur when performing familiar tasks and activities. In these scenarios, the person knows what the correct course of action is, however, fails to do so due to a temporary lapse, mistake or negligence. These might happen because the employee is tired, not paying attention, forgets or is distracted. Examples of this type of error include typing errors, misconfiguration settings, forgetting to log out, and accidental deletion of important files/data.

### *Decision-based errors*

Decision-based errors are when a person makes a faulty decision. This can include the person not having the necessary level of knowledge, not having enough information about the specific process, or not realising that they are deciding through their inaction. Examples of these types of errors include ignoring security alerts, weak password choices, bypassing security protocols to expedite a task, inadequate risk assessments: deciding not to implement additional security measures due to underestimating the potential risk or impact of a threat.

## **Reducing Human Error with Training**

There are a variety of factors that play into human error, but most of them can be categorized into: opportunity, environment, and awareness. Employee-focused cybersecurity awareness training can improve business security by teaching people how to add more secure actions into their regular routines.

### *Opportunity*

Human error can only occur where there is opportunity for it to do so. The more opportunities there are for something to go wrong, the higher the chance that a mistake will be made.

### *Environment*

The physical environment of a workplace can contribute to the number of errors that occur. As an example, privacy and

noise-level are things that can contribute to a more mistake-prone environment.

Culture also plays an important role in environmental considerations. Having a culture where security is always pushed to the background will lead to errors becoming more frequent. Implementing a second line of verification, such as peer reviews or automated checks, can help catch potential human errors and reinforce a culture of security vigilance.

### *Awareness*

Human error can result from employees simply not knowing what the right course of action is. Users unaware of risk associated with phishing methods and similar information-extraction tricks, are more likely to fall for such attempts, and those ignorant of public Wi-Fi dangers may have their credentials easily stolen. A lack of knowledge is almost never the fault of the person - but should be addressed by the organization in order to ensure their employees have the knowledge and skills they require to keep themselves and the business safe and secure.

For any company, taking the smallest of steps to reduce human error can create huge gains in security. Mitigation of this risk comes from two perspectives:

### *1. Mitigating Human Error:*

Implement robust security protocols and procedures to minimize the likelihood of human-induced security breaches.

### *2. Enhancing Cybersecurity Awareness:*

Investing in comprehensive employee training programs to foster a strong security culture and reduce the risk of social engineering attacks.

The more knowledge and insight employees (working onshore and offshore) have, the less likely mistakes are to occur, even when opportunities arise.

Companies need to see human risk from a different mindset. While untrained system users may be the weakest link, e.g. the security of port operations, the right tools and training encourages employees to be the first line of defence against attacks or breaches, safeguarding the business and your reputation.

## **Secure in the Knowledge of a Safe Supply Chain**

All have a part to play across the supply chain. By assessing and identifying critical assets with the support of a third-party independent provider like ABS, companies can begin to build the operational and technical infrastructure required to help mitigate cybersecurity risks.

Training is critical. Upskilling teams responsible for meeting tomorrow's industry rules and cybersecurity compliance requirements - and how companies operate alongside the regulatory process - will need significant training across the maritime supply chain. Then there's the vendor relationship. This is an essential part of cybersecurity preparation by enabling the asset owner to better manage expectations with vendors

and the processes required for plant or vessel operational updates or optimization initiatives. While strong external vendor relationships are crucial, a clear internal framework with defined roles and responsibilities is equally essential for a robust supply chain management.

Next is creating and implementing a cybersecurity plan. It is important to choose the right level of independent expertise to help kick off the cybersecurity journey – from initial risk assessments through asset management, configuration insights, vulnerability assessments, and detection analysis including how to respond to incidents when they do happen and how this impacts the business plan and response actions.

The level of technical competence needed to implement technology-based solutions will be key. This includes network monitoring solutions, asset management and determining what are the key components and vulnerabilities likely to impact your organization, and what is needed for effective company-wide resiliency and recovery.

**Next steps**

Maritime and offshore companies of any shape and size, including asset owners, operators, vendors and Flag administrations will need to work together to enact tomorrow’s regulations.

Leaders should empower and encourage individual workers to participate in maintaining safe and risk-aware approaches to their work. ABS supports the need to modernise ‘risk-stressed’ operations in the maritime sector and development best practices.

Maritime and offshore assets are safer now by design thanks to advances over the past 10 to 15 years in technical construction and systems. However, weaknesses in educating the workforce, or the human element, can easily allow cyber threats to escalate rapidly.

No matter how good the technical integrity or systems are of an asset, the organizational integrity of the workforce remains the single biggest risk factor.

Promoting greater understanding of

organizational cybersecurity integrity is the next frontier – a measurable quantity that relates to the operational reliability and safety of an asset. It is the human part of the interaction among people, assets, systems and processes that encourages and supports operational efficiency and responsible cyber stewardship.

(1) <https://www.news.uscg.mil/maritime-commons/Article/3683523/notice-of-proposed-rulemaking-cybersecurity-in-the-marine-transportation-system/>

(2) <https://newsroom.ibm.com/2023-07-24-IBM-Report-Half-of-Breached-Organizations-Unwilling-to-Increase-Security-Spend-Despite-Soaring-Breach-Costs>

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# CRUISE SHIPPING'S HISTORIC REBOUND

Battered by Covid, the cruise industry was down but not out. Today it is setting records in passenger count + the size and cost of a new fleet.



DISNEY TREASURE



NORWEGIAN LUNA



CARNIVAL JUBILEE

By Barry Parker

Starting top and proceeding clockwise, images courtesy Disney Cruise; Carnival Cruise Lines; Norwegian Cruise Lines

## ON THE REBOUND

**P**ost-Pandemic, the fortunes of the big cruise companies have brightened dramatically. A late December, 2024 earnings release from Carnival Corporation & plc (NYSE: CCL), encompassing brands including Carnival Cruise, Holland America, Cunard, Princess Cruises and others, says it all: “This has been an incredibly strong finish to a record year,” said CCL’s CEO Josh Weinstein, in its statement. “Revenues hit an all-time high driven by a strong demand environment that we elevated throughout the year, enabling us to outperform our initial 2024 guidance by \$700 million and deliver nearly \$2 billion more to the bottom line, year-over-year,” with overall revenue surging above \$25 billion in 2024.

And CCL is not done: “2025 is shaping up to be another banner year ...” said Weinstein.

### Rebounding from Covid-19

The pandemic, which began abruptly in March 2020, sent the cruise industry, among others, into a seeming death spiral, with many cruise ships sent to the scrap yard and cruise companies bleeding cash. During the Pandemic era with its vessel anchored outside the big ports, the cruise industry’s debt load ballooned, as the companies needed to keep themselves afloat (as well as financing newbuilds that were on order). Consider the case of CCL: at end 2019, CCL’s long-term debt stood at just under \$10B. A year into the pandemic, the measure had soared to \$26.5B on the balance sheet; fast forward another year, February, 2022, and the CCL balance sheet showed just under \$30 billion of long term debt, reaching a zenith around \$35 billion in January, 2023, before the tide began turning.

But by mid-2022, when the Center for Disease Control (CDC) ended its Covid-19 restrictions, the industry that had been brought to a standstill (with passenger counts of 5.8 million and 4.8 million in 2020 and 2021, respectively compared to 29.7 million in 2019), the comeback started.

Its turnaround didn’t even take three years, as Cruise Lines International Association (CLIA) noted in its mid-2024 “State of the Cruise Industry” report that passenger counts had recovered from pre-Pandemic levels with 31.7 million passengers sailing in 2023, with CLIA was forecasting 40 million total passengers sailing annually by 2027.

To that end, the cruise majors are girding up for this increased demand with new ship orders. Royal Caribbean Group (NYSE: RCL) placed an order with Meyer Turku for a fourth Icon class 7,600-passenger ship, which coincided with initiation of options for two additional vessels with an anticipated 2027 delivery. The lead ship in the Icon class, the LNG-fueled ICON OF THE SEAS, cost around \$1 billion, and was delivered at the beginning of 2024. Two others, STAR OF THE SEAS, and a still un-named vessel, are set for deliveries in Q3 2025, and Q2, 2026, respectively. A smaller “Xcel Class” vessel, the 3,950-passenger CELEBRITY XCEL, is under construction at Chantiers de l’Atlantique with an anticipated Q4 2025 delivery.

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## CRUISE SHIPPING

In late January 2025, RCL announced another order with the French yard, for an Xcel class vessel (to be methanol fueled) with 2028 delivery.

The Chantiers yard, in Saint-Nazaire, France, delivered an LNG-powered “Oasis Class” vessel, the UTOPIA OF THE SEAS, with a maximum capacity of 7,000 passengers, to the company in mid-2024. In regulatory filings RCL said that: “To finance the delivery, we borrowed a total of \$1.5 billion under the committed financing agreement, resulting in an unsecured term loan which is 100% guaranteed by BpiFrance Assurance Export.” RCL had noted in an October 2024 regulatory filing that: “The aggregate cost of our ships on order ... not including any ships on order by our partner brands [TUI Cruises and Hapag Lloyd Cruises], was approximately \$5.9 billion.”

### Cruise Ship Building Takes Off

Among the biggest news on the ordering front was CCL’s blockbuster mid-2024 three ship order from Fincantieri in Italy. The almost 230,000 gt vessels with a passenger capacity of nearly 8,000 passengers are to be delivered in 2029, 2031 and 2033.

According to the yard, these vessels, to sail under the Carnival Cruise brand, will be “...a new class of LNG powered vessels.”

LNG fueling, with CCL’s Aida brand debuting in 2015, has achieved significant market penetration in the cruise sector. In announcing the new order, company Weinstein stressed the vessels’ “...latest technological advancements to minimize our environmental footprint...” While the price of the order has not been announced publicly, the rumor mill, earlier in the year, had put a price-tag of \$1.25 billion per vessel on the order.

Fincantieri had delivered another LNG fueled vessel, SUN PRINCESS, with a capacity of 4,300 passengers, to Princess Cruises (a brand within CCL) in late February, 2024 from its Monfalcone yard, following QUEEN ANNE (3,000 passengers, under the Cunard brand), delivered several months later from its Marghera facility. Earlier in the year, the LNG fueled CARNIVAL JUBILEE a 6,400 passenger (Excel-class, with a homeport in Galveston, Texas) had been delivered from Meyer Werft in Papenburg. During 2024, Carnival Corporation placed orders for two more Excel-class ships to be built at Meyer Werft, for delivery in 2027 and 2028, ending a Pandem-

Image courtesy Q-LNG



While the maritime industry’s “fuel of the future” is still in flux, LNG has made important strides on the cruise sector. CCL said in a 2023 Sustainability report that: “LNG is currently the best readily available fuel to help reduce GHG emissions. While LNG is a fossil fuel that generates GHG, it can be produced as a low carbon fuel as biomethane and ultimately e-methane.”

In the same report, it said that: “We have nine LNG powered cruise ships in operation as of January 1, 2024, and four that are expected to join the fleet through 2028.” RCL will have four LNG powered vessels in the water by 2026 when its third Icon class vessel is delivered. Disney has three LNG powered ships under construction.

The big cruise ports in Florida, Miami, Port Everglades and Port Canaveral, have enabled Jacksonville to emerge as something of a hub for LNG fueling of vessels including

cruise ships, using ATBs with tugs tied to barges able to fuel the vessels. A major player, Seaside LNG (part owner of LNG producer JAX LNG) is the owner of Polaris New Energy, which supplies fuel to the cruise sector with a trio of barges, CLEAN EVERGLADES (5,500-cu. m., built 2023 at Fincantieri Sturgeon Bay), CLEAN CANAVERAL (5,500 cu. m., built 2021 at Fincantieri Sturgeon Bay), and CLEAN JACKSONVILLE (2,200-cu. m. built 2018 at Conrad Shipyard). A subsidiary of Harvey Gulf, well known in the offshore service sector, owns the Q-LNG 4000 barge (4,000 m<sup>3</sup>, blt 2021 at VT Halter), which serves multiple sectors including cruise, with fuel sourced from Shell in Elba Island, Ga.

Carnival has its LNG-fueled, 6,400-passenger CARNIVAL JUBILEE homeported in Galveston. It is supplied by a Seaside LNG barge, with fuel sourced from Stabilis Solutions.



## ON THE REBOUND

ic-induced drought of new orders. These vessels will also be LNG powered.

At Norwegian Cruise Line Holdings (NYSE: NCLH), with its eponymous Norwegian International, Oceania, Seven Seas and Regent brands, NORWEGIAN AQUA (with double-occupancy capacity pegged at 3,550 passengers and featuring the **industry's first slide coaster**) is due for delivery from Fincantieri in March, 2025. Following a trans-Atlantic repositioning voyage, it will cover itineraries along the U.S. East Coast to Bermuda and the Caribbean. A sister, NORWEGIAN LUNA, will be joining NCLH's fleet in Spring, 2026.

NCLH's Oceania Cruises line is set to see delivery of 1,450 passenger capacity ships, with eyes focused on ALLURA (being built at a Fincantieri facility) set to commence voyages in Summer, 2025. The parent company said, in a mid-2024 release, that: "...Oceania Cruises has two additional ships on order scheduled for delivery in 2027 and 2028 or 2029." The Regent Seven Seas Cruises fleet will be seeing deliveries of two hybrid powered vessels with 850 passenger capacity, SEVEN SEAS PRESTIGE (in 2026) and an unnamed sister due for 2029 delivery.

### More Ships v. More Debt: Walking a Fine Line

At CCL, its discussion of the ordering for increasingly larger newbuilds, in a late 2024 regulatory filing, shines a spotlight on the need for balance and moderation in growth, as it was noted: "The company is following through on its measured capacity growth strategy of one to two ships per year on average, including just three ships scheduled for delivery through 2028. This will enable the company to utilize its substantial free cash flow to strategically improve its balance sheet by significantly reducing its leverage levels over the next several years."

For the major cruise companies, balancing the capital costs of bigger ships (which will bring in revenue) with continued management of outstanding debt

(which has costs) is critical. Financial reporting from NCLH (the smallest of the "Big Three") provides an insight into the importance of debt in cruise ship finance generally. Its end September, 2024 balance sheet showed overall assets of roughly \$19.8B, of which around \$18B was property/equipment, and "other long-term assets". The capital stack shows long term debt totaling \$13.4 (including the current portion); down from nearly \$14.1 at year-end 2023. Borrowings connected with two vessels for Oceania, and two for Seven Seas (both brands within NCLH) being constructed at Fincantieri with export guarantees from the Italian export credit agency SACE S.p.A.

Disney Cruise Line, part of the much larger Walt Disney Company (NYSE:DIS) with a five vessel fleet (and four ships already set for delivery between 2025-2027), is continuing its expansion. The \$1.1 billion, 4,000-passenger LNG-powered DISNEY TREASURE began service in December 2024,

with DISNEY DESTINY, a sistership to follow later in 2025. Powered by MAN 2V 51/60DF engines, Meyer Werft Papenburg is the builder of both vessels. In Summer, 2024, Disney announced a multi-ship order from the same German builder, with deliveries of the LNG powered vessels out to 2031.

Finally, the privately owned (but heavily resourced) MSC Cruises, is now operating nearly two dozen cruise vessels and competing with the "Big Three" + Disney. In Spring 2025, the company's 6800+ passenger MSC WORLD AMERICA, being completed at Chantiers de l'Atlantique, will join its sister MSC WORLD EUROPA (which delivered in late 2022) in cruising out of Miami. Both ships are LNG powered, with the 2025 addition using LNG-fed solid oxide fuel cell providing a portion of the electricity onboard and fitted for shore power. Another sister, MSC WORLD ASIA, is slated for a mid-2026 delivery from the yard in Saint Nazaire, before shifting over to its base in Miami.

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The advertisement features a large image of a cruise ship named 'ULTRAMARINE' sailing through a field of ice floes. The ship is white with a yellow and blue stripe along its side. The background is a cloudy sky. The text is arranged in a clean, modern layout with a blue and yellow diagonal stripe running across the image. A circular logo on the right side of the image celebrates 20 consecutive years from 1984 to 2024. A QR code is located in the bottom right corner of the advertisement.

Image courtesy Edward Lundquist

## SHIP CONVERSION



HII's Ingalls Shipbuilding division successfully undocked USS Zumwalt (DDG 1000), the lead ship of the U.S. Navy's Zumwalt-class of guided missile destroyers on Friday, December 6, 2024.

# USS ZUMWALT

## MODIFIED FOR

## HYPERSONIC MISSILES

***What has been described as the most transformational warship in the U.S. Navy has been transformed again. USS Zumwalt (DDG 1000) recently completed modifications to remove her main guns and replace them with a hypersonic missile capability. The work was conducted at Ingalls Shipbuilding in Pascagoula, Miss.***

**By Edward Lundquist**

**W**hat has been described as the most transformational warship in the U.S. Navy has been transformed again. USS Zumwalt (DDG 1000) recently completed modifications to remove her main guns and replace them with a hypersonic missile capability. The work was conducted at Ingalls Shipbuilding in Pascagoula, Miss.

With the modifications, Zumwalt now carries four “all-up round canisters” for the Conventional Prompt Strike (CPS) missile in place of the forward Advanced Gun System (AGS) gun mount. Each canister can carry three hypersonic CPS missiles. The Army and Navy are jointly testing the new missile, which flies at five times the speed of sound and can strike targets 1,725 miles away.

The CPS missile has long been planned for launched from submarines. In 2023 the Navy contracted with Lockheed Martin adapt the system for use on the DDG 1000 class of surface combatants.

The Zumwalt class is the U.S. Navy’s largest surface combatant, and was originally armed with two AGS mounts.

The 600-ft., 14,564-ton Zumwalt arrived at the yard in August of 2023 and was taken out of the water and moved to a land-level area to conduct the structural work. Upon completion, she was moved onto a drydock and then floated on Dec. 6, 2024.

According to Kiana A. Raines, a public affairs officer with Naval Sea Systems Command (NAVSEA), both mounts were

removed. “The area previously occupied by Mount 61 — [the forward 155mm or 6-inch gun mount] — will be repurposed for CPS. The space previously taken up by Mount 62 “will remain open for future capabilities.”

The third ship in the class, USS Lyndon Johnson (DDG 1002), already had arrived at Pascagoula in January of 2022, to undergo her combat system activation. DDG 1000 came around from her homeport of San Diego to undergo her replacement of AGS and other repairs.

“We’ll still have some work to do on 1000 in the water, but she will have been on land about a year, where all the big structural work was done,” said Kari Wilkinson, executive vice president of HII and president of Ingalls Shipbuilding. She was recently promoted to serve as president of the company’s Newport News Shipbuilding (NNS) division, effective Jan. 1, 2025.

Because Lyndon John is already at the yard, she will also have her AGS system removed. “It will be more efficient with 1002 because they’re already here,” said Wilkinson.

The third ship in the class, USS Michael Monsoor (DDG 1001), remains on the West Coast, but will eventually come to Ingalls to have her weapons system updated.

“It made sense for the Navy to choose a build yard to do this work, because of the nature of the work, the amount of structure involved, and having to put the ship on land,” Wilkinson said.

## SHIP CONVERSION

Typically, the Pascagoula yard's work involves new construction instead of repair or modernization. But there are some notable exceptions, such as the rebuilding of USS Cole (DDG 67) after she was severely damaged in a 2001 terrorist attack; repairs to USS Fitzgerald (DDG 62), which collided with a merchant ship in the South China Sea in 2019; as well as the modifications to the Zumwalt class.

Ingalls is one of two yards that are building the Arleigh Burke (DDG 51) class of AEGIS guided missile destroyers (DDGs) (along with General Dynamics Bath Iron Works (BIW) in Maine), and is the only yard building amphibious ships for the Navy—currently the amphibious transport dock (LHD) and Flight II San Antonio-class LPDs; as well as the Coast Guard national security cutters. It is also the largest manufacturing employer in the state.

BIW, the construction yard for the Zumwalt class, was an “excellent partner,” Wilkinson said. “They shared a lot of information with us to make sure that we were all successful.”

### EVOLVING WEAPONS CAPABILITIES

The AGS gun and LRLAP ammunition were derived from the Army's 155mm long range Excalibur howitzer program. In fact, in 2016 the Navy considered using the existing Army ammunition instead of creating the more capable but more costly ammunition.

Although the Navy shelved its electromagnetic rail gun several years ago, that technology was also considered for the Zumwalts, in part because the ship has the power resources required.

The AGS gun was cancelled not because it didn't work, but because the bullets became unaffordable, and Navy priorities shifted from the littorals to blue water peer competitors—China and Russia—than asymmetric threats in the littorals. Moreover, the Marines are focused on distributed maritime operations, with less emphasis on large scale amphibious landings requiring fire support.

A report from the Congressional Research Service stated, “In

**USS Zumwalt (DDG 1000) leaves drydock after having her Advanced Gun System mounts removed. Her forward mount is being replaced with hypersonic Conventional Prompt Strike missiles.**



*Images courtesy HII*



*“We’ll still have some work to do on 1000 in the water, but she will have been on land about a year, where all the big structural work was done.”*

**- Kari Wilkinson, Executive Vice President of HII and President of Ingalls Shipbuilding**

December 2017, it was reported that, due to shifts in the international security environment and resulting shifts in Navy mission needs, the mission orientation of the DDG-1000s would be shifted from an emphasis on NSFS (naval surface fires support) to an emphasis on surface strike, meaning the use of missiles to attack surface ships and perhaps also land targets.”

Nevertheless, AGS was a marvel of engineering, with incredible accuracy and range of the rocket-assisted LRLAP projectiles. DDG 1000 was designed to be stealthy, particularly useful in littoral operations, although the current focus is on a possible open ocean confrontation. The plans for the class were cut from 32 to 24 to 17 to 7, then two... and eventually three—in fact, at one point, the entire program was threatened with cancellation. But with the class reduced to just three ships, the cost of the ammunition was just too costly.

**NEW TECHNOLOGIES**


The Zumwalts incorporated a plethora of transformational technologies. They included a wave-piercing, tumblehome hull; a composite helicopter hangar and deckhouse (the third ship in the class has conventional steel topside structures);

a total-ship computing environment for the IT backbone for communications and systems management; an integrated electric-drive propulsion system with advanced induction motors; a peripheral vertical launching system; and the now-cancelled advanced gun system (AGS); and more.

The investment in DDG-1000’s stealth was substantial. It was very difficult to detect on radar, and quiet so as to be hard to locate by sonar. DDG 1000 had significant ASW capabilities in the littoral.

While the AGS gun was a marvel of engineering, and the accuracy and range of the rocket-assisted LRLAP round, the stealthy DDG 1000 was not irrelevant, particularly in littoral operations. But the class was cut from 32 to 24 to 17 to 7... and eventually three—but not until the entire program was threatened with cancellation. But at three ships, and the cost of the rounds being similar to high-end missiles, the ammunition was just too costly.

The Zumwalts still have 80 peripheral vertical launch system cells along the sides of the ship, able to hold a variety of missiles, to include Anti-submarine Rockets (ASROCs) and quad-packs of NATO Evolved Sea Sparrow Missiles; as well as two 33 mm guns.




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# MARITIME COASTAL SECURITY: THE ROLE OF USCG RESEARCH & DEVELOPMENT



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*The United States' maritime coastal security poses a significant challenge due to the vastness of its coastline and the complexity of its maritime borders. According to the National Oceanic and Atmospheric Administration National Geodetic Survey there are approximately 95,000 miles of coastline. According to the Department of Homeland Security 2007 Transportation Systems publication there are "361 ports, and 3.3 million square miles of Exclusive Economic Zone (EEZ) to secure". The country's maritime borders present a formidable task for security agencies.*

**By Bert Macesker, & Dr. Joe DiRenzo, USCG Research and Development Center**

**N**ow for a comparison - The combined land borders between the United States and Canada, according to the joint International Boundary Commission is 2,380 miles. In addition, the joint US-Mexico International Boundary and Water Commission state that the Mexico-United States border extends 1,954 miles. The combined US-Mexico and US-Canada borders of 4,334 miles represent only 4.5% of the combined U.S. land and maritime border and coastline that can potentially be exploited.

In 1816, Congress appropriated an initial \$800,000 (\$19 million in today's dollars) to build a fortification system, referred to as the Third System, to protect the country's coastline. President James Monroe's Second Inaugural Address in 1821 highlighted the significance of maritime coastal security, stating that "by these fortifications, supported by our navy, to which they would afford like support, we should present to other powers an armed front from the St. Croix to the Sabine, which would protect, in the event of war, our whole coast and

interior from invasion." The construction of the 42 major forts along the East and West Coasts was a testament to the government's commitment to maritime coastal security. Many of these forts are now National Parks. The USCG Research and Development Center (RDC) is co-located at one of these in New London, CT, called Fort Trumbull. RDC moved into the remaining building from when the Navy Underwater Sound Laboratory, also co-located, had long closed.

While the forts are no longer active in conducting the coastal security mission, it does not mean that maritime coastal security is less important today. In fact, in the last five years, a smuggling situation has become so prevalent in the maritime environment that the U.S State Department issued an "Advisory to the Shipping Industry on the Illicit Movement Methods Related to the Trafficking of Fentanyl and Other Synthetic Opioids" that noted:

*The opioid crisis is a serious epidemic that requires a multidisciplinary approach including aggressive investigation and prosecution, in addition to collaboration with*

The importance of maritime coastal security has been recognized since the founding of the U.S. **Alexander Hamilton, the first Secretary of the Treasury, established the U.S. Coast Guard (initially as the Revenue Cutter Service) with a fleet of 10 ships in 1790. Writing in Federalist Paper No. 12, Hamilton emphasized the need for a force designed to enforce tariffs and prevent smuggling. Hamilton noted, “A few armed vessels, judiciously stationed at the entrances of our ports, might at a small expense be made useful sentinels of the laws.”**  
*Alexander Hamilton’s Federalist Paper #12 (27 November 1787).*

*private sector partners in the fields of technology, health care, prevention, treatment, and education. The Federal government, state, local, tribal, and territorial partners and the private sector must work together to leverage our resources in the fight against this deadly threat. The private sector can play a key role combating the opioid crisis by working with law enforcement to identify the ways in which criminals are exploiting legal platforms for illicit means and referring criminal activity to law enforcement.*

But, with this threat and many others in the modern era, there is a formal organization that serves as the de facto coastal “fortifications” – these are the 37 Coast Guard Sectors, which include small boat stations, small boats, assorted air components, networked command and control, and dedicated Department of Homeland Security professionals.

### **The Mission of Maritime Coastal Security**

The mission of maritime coastal security is critical to the country’s security, economic interests, and protecting its environmental resources. Maritime coastal security involves the protection of our Nation’s coasts from a myriad of threats. These threats range from drug, human, and weapon smuggling, attacks on port facilities, illegal fishing, and criminal activity. The Coast Guard plays a vital role in securing maritime borders, and its efforts are focused on detecting and preventing various threats, including human smuggling, illegal fishing, and the transportation of illicit drugs. Despite the significant challenges, the Coast Guard made notable progress in removing cocaine from the maritime environment, with over 96 metric tons removed in Fiscal Year 2023.

The service is equally committed to stopping the growing threat posed by fentanyl and precursor chemicals shipped from China. Senator Tammy Baldwin (D-WISCONSIN), who is the Chair of the Commerce Subcommittee on Oceans, Fisheries, Climate Change and Manufacturing, held a subcommittee hearing on the Coast Guard’s efforts to stop the flow of dangerous drugs. In her opening remarks the senator noted, “In recent years, the Coast Guard has demonstrated the ability to play a role in the tracking and removal of fentanyl and its precursor chemicals while they are being shipped from China, including contributing to the inspection of 460 metric tons of precursor

chemicals transiting the Pacific in Fiscal Year 2023.”

Senator Baldwin continued: “In recent years, fentanyl has killed thousands of Wisconsinites, devastating families and communities in every corner of the state. I’ve heard from mothers who lost children, cops and paramedics on the front lines, and advocates – all demanding we do more to end this crisis.” She added: “This crisis demands a whole of government effort and I’m pushing to ensure all law enforcement and armed forces are working in lockstep to protect our communities. The Coast Guard plays a critical role in disrupting the global fentanyl supply chain, and I called this hearing today to see how we can bolster their efforts, including stopping the flow of precursor chemicals from China.”

Maritime coastal security is much more than stopping drug flow. Protecting the Marine Transportation System (MTS) includes security patrols as part of the Coast Guard’s Ports, Waterways, & Coastal Security (PWCS) mission and safeguarding the cybersecurity of the Nation’s critical infrastructure. Non-state and state actors that wish to harm the U.S. recognize the vastness of U.S. coastlines and potential for exploitation. Smuggling with large and small hard-to-detect self-propelled semi-submersibles is a real threat and launching of air, surface, or underwater drone swarms from a state-sponsored mothership off the coast may seem unlikely today but is possible.

### **The Role of R&D in Maritime Coastal Security**

Research and development (R&D) is a means to effective maritime coastal security. Maritime coastal security benefits from R&D through its application of the scientific method to acquire knowledge to create/adapt new technology along with the necessary disciplines to solve security challenges through applied research. R&D in maritime coastal security is important to the development of advanced surveillance and monitoring systems. These systems enable authorities to detect and track suspicious vessels, monitor maritime traffic, and respond quickly to security threats. R&D in sensors, radar, and satellite technologies has improved the accuracy and range of surveillance systems, allowing for more effective monitoring of coastal areas. One of the key principles that guide operational priorities and investments from the Coast Guard Operational Posture 2024 calls for “evolving an operational approach leveraging intelligence, information, and improved maritime domain awareness to shift from patrol and interdict to target and interdict.” The coupled use of artificial intelligence and large language models to support intelligence and the lowered bar to attaining space-based sensing capabilities will help facilitate this operational priority.

R&D also plays a critical role in developing effective countermeasures against maritime security threats, such as piracy, terrorism, and smuggling. For example, research into materials science and engineering has led to the development of advanced coatings and materials that can withstand explosive

## MARITIME COASTAL SECURITY

blasts and reduce the risk of damage to vessels.

Furthermore, R&D in maritime coastal security is essential for developing sustainable and environmentally friendly solutions. The maritime domain is vulnerable to environmental pollution, and R&D in green technologies, such as wind and solar power, can help reduce the carbon footprint of maritime operations and provide resilience for attacks on maritime infrastructure.

In addition, R&D in maritime coastal security is critical for developing effective response strategies and protocols. Research into emergency response planning, search and rescue operations, and crisis management has improved the ability of authorities to respond quickly and effectively to maritime security incidents.

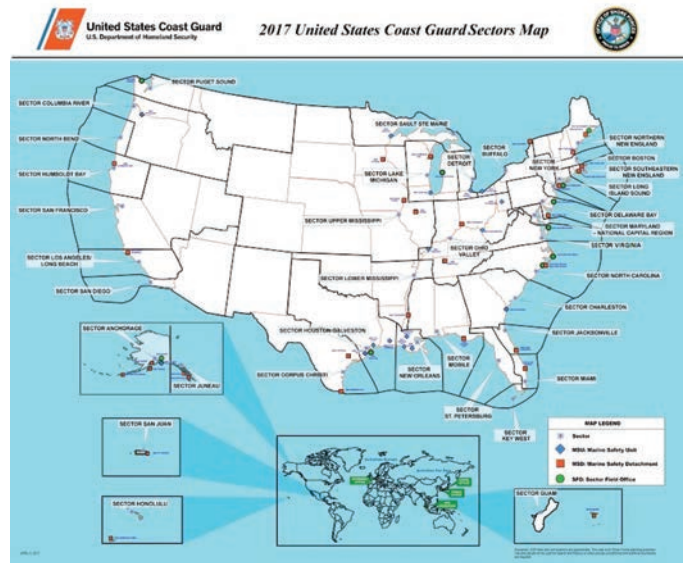
Overall, R&D is essential for enhancing maritime coastal security. By developing innovative technologies, strategies, and policies, R&D can help address the complex challenges facing the maritime domain, protect national interests, and ensure the safety of people and goods.

### The Coast Guard RDC

The Coast Guard Commandant is provided a specific appropriation to conduct R&D under Title 14 U.S.C. 504(a). The RDC plays a role in advancing technologies, using the \$6.7 million appropriation provided by Congress to support the 11 missions of the Coast Guard that include research to secure maritime borders. The RDC recently reorganized its research portfolio under enduring research program areas, including Autonomy, Connectivity, Defense & Safety Systems, Environmental Evolution & Waterway Resilience, Data, Modeling & Decision Support, and Integration, Experimentation, and Transition. These research areas are designed to facilitate collaboration with a wide range of partners, including other armed services, the Department of Energy National Labs, the Federal Lab Consortium, and private industry.

Each enduring research program will have multiple lines of effort (LOEs). For example, the Autonomy research area focuses on the strategic application of automation and autonomous technologies to advance the capabilities of physical, virtual, and other systems. It includes how autonomy may be used by other maritime stakeholders and/or adversaries, how that use will impact the service, and how the service will need to adapt to maintain a competitive edge. LOEs include optionally crewed surface vessels, beyond visual line of sight for uncrewed aircraft systems, and integration into search and rescue (SAR) operations. Each research program area can also be tied back to strategy(s). For example, the Coast Guard promulgated the Unmanned Systems Strategic Plan in 2023.

The Defense & Safety Systems research area focuses on the safety of Coast Guard members, MTS, and the public. Defensive systems including non-lethal vessel stopping technologies, counter unmanned systems (C-UxS), cybersecurity and redundancy in Operational Technology and navigation systems to protect assets from evolving threats.



Source: <https://homeport.uscg.mil/Pages/Sector-Map.aspx>

The Connectivity research area focuses on Command, Control, Communications, Computers, Cyber, and Intelligence and extends to include Information Technology and networking, mobile device solutions, data connectivity from all sensors and platforms (manned or unmanned), at any latitude and longitude. Projects include the next generation of Automatic Identification System and Alternate Navigation Positioning Sources.

The Environmental Evolution & Waterway Resilience area focuses on the changing environment and how the Coast Guard and the public interact with our evolving waterways. This includes evolving missions due to sea level rise, extreme weather events, offshore energy generation and transport, and threats due to a changing maritime domain.

The Data, Modeling & Decision Support area focuses on enhancing Coast Guard effectiveness using data, with research supporting incorporation and development of advanced methodologies, use of emerging data technologies, and complex analytics. Current research includes Space-based Radio Frequency Detection and Risk-based Container Inspection Targeting. The Integration, Experimentation, and Transition area supports the execution of all lines of effort within the five research areas described above. The RDC already has a long history of provisioning cutter crews with prototype equipment and go-kits. These ready go-kits have included, for example, space accountability and contraband marker technologies. Investing in repurposing commercial and government off-the-shelf technologies has always been a part of the RDC portfolio and will be continued in the new Integration, Experimentation, and Transition area. Current low-cost technology being investigated include: the evaluation of glow-in-the-dark maritime equipment to assist with passing tow lines to other boats, man overboard drills, and night anchoring; the use of Amber Alert-like systems to augment PAN-PANs by sending text alerts to a geofenced area with information about local maritime emer-



gencies; testing of body worn camera technology to assess their physical integration in law enforcement operations; and evaluation of various off the shelf sensors for low cost ISR buoys powered by wind, solar, and wave energy.

**Challenges and Future Directions**

A focus of the incoming administration will be on border security. This will involve securing the southern border of the U.S. with the completion of the physical wall that will be monitored and supported by personnel to prevent illegal immigration, drug and human trafficking, and acts of terrorism. Achieving complete operational border control will be difficult. Smugglers and adversaries are driven by profit and/or desire to harm the U.S. They are smart, innovative, well-funded, and will systematically probe border weaknesses to find less risky transit routes. More control of the land border will have the effect of increasing the attractiveness of waterborne smuggling routes.

The coastal fortifications of the past are part of our history. Today, we already have a Fourth System of coastal defense along the coastlines and 360 U.S. ports. They are the Coast Guard, Customs and Border Protection (CBP), and other agencies along with the many cooperating capabilities that include the National Targeting Center, National Vessel Movement Center, Coast Guard Sectors, and CBP Air and Marine Operations. They are the virtual seawall that protects our coasts at the same time facilitating commerce and the safe enjoyment of our coastal waters by its citizens. A barrier, whether physical or virtual, is only as good as the authorities that favor deterrence, intelligence, and the technological and non-technological capabilities to detect, track, and apprehend. And unlike a physical fence, a virtual maritime seawall can be easily updated, modified, or expanded to respond to changing security threats and requirements. Additionally, it can cover a much larger area, including the entire Exclusive Economic Zone (EEZ), and provide real-time situational

awareness and response capabilities.

**Conclusion**

The authors introduced the notion of a Fourth System and concept of a Virtual Maritime Seawall analogy to land border security to inspire more thought, but also to recognize our existing coastal security system and its continued importance to securing the homeland.

As the R&D arm for DHS's largest maritime component, the RDC has completed countless projects aimed at improving Coast Guard operations at sea. Continuing some of the original tenants of defensive coastal fortifications of the past into today's even more complex challenges will require a whole of government approach to monitor and enforce U.S. maritime borders, coastlines, and ports of entry.

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# VIETNAMESE SHIPBUILDING

## *IS DIVERSE & ROBUST*

**W**hile many economic sectors were affected by the COVID-19 pandemic, Vietnam's shipbuilding industry continued to grow, affirming its strong and growing position in the international space. Vietnam's shipbuilding industry achieved many accomplishments in 2024 with the construction, launching and delivery of many specialized ships, contributing to the world's fleet, operating on global shipping routes.

By 2030, to develop the maritime economy, the Vietnamese fleet is expected to be restructured and developed to about 1,600 to 1,750 vessels with a total tonnage of 17-18 million DWT, of which the marine transport fleet will be about 1,200 vessels with a total tonnage of about 13 million DWT to 14 million DWT. The aging of the fleet and the increasing requirement to comply with environmental regulations, especially the International Maritime Organization (IMO)'s regulations on mandatory clean energy conversion under COP 26, will promote the growth of the shipbuilding industry in the coming time when a new generation of modern ships is needed to replace the old, aging fleet to meet the demand.

As of June 30, 2024, Vietnam has 88 shipbuilding enterprises and 411 inland waterway vehicle construction facilities (of which about 120 can build and repair ships with a tonnage of over 1,000 tons). The total new building capacity of shipyards is up to 2.6 million DWT per year. According to the Vietnam Shipbuilding Industry Research Report 2023-2032 on "Research and

Markets", the world's largest market research database platform, Vietnam's shipbuilding industry is growing rapidly.

### **The Shift to Asia Continues**

The shift of the shipbuilding market to Asia is an opportunity for Vietnam to take advantage of its existing conditions in terms of technology, resources, and labor to participate in building ships to export, developing a diverse fleet of ships to serve the Strategy for sustainable development of Vietnam's maritime economy to 2030, with a vision to 2045. Vietnam identifies the maritime economy as the driving force to promote the development of other economy sectors, thereby creating a fundamental and comprehensive transformation of the marine economic structure towards industrialization and modernization. On the other hand, currently, due to the increasing demand for maritime transport, the shipbuilding industry is expected to have many market opportunities. According to the list of Top 15 global shipbuilding powers (data from the United Nations Conference on Trade and Development) published by Insider Monkey, Vietnam ranked 7th. Being included in the list of Top 7 shipbuilding powers in the world is a clear demonstration of the capacity and development potential of the domestic shipbuilding industry, thereby attracting many contracts.

The leader of the Shipbuilding Industry Corporation - SBIC shared: "The 21st century is the "Century of the Ocean", along with the advances in science and technology and the rapid de-

VIETNAM



For more information on Vietship 2025, please scan the QR code:



All images courtesy Shipbuilding Industry Corporation (SBIC)

## SHIPBUILDING



All images courtesy Shipbuilding Industry Corporation (SBIC)



velopment of the industries, humans have gradually mastered the nature, mastered the sea; activities and services to exploit the potential of the sea are constantly emerging and developing. The construction and development of the maritime economy has become the top priority and strategy of every country with a sea. The world shipbuilding market is ready to take advantage of various opportunities arising from global economic trends, geography, politics and policies of major countries. The increasing demand for maritime transport and the expansion of offshore energy projects create demand for many different types of ships, including container ships, bulk carriers, oil tankers and specialized offshore support vessels. Emerging markets in Asia, including Vietnam, especially China and South Korea, continue to dominate the shipbuilding industry with significant investments of hundreds of billions of dollars to boost shipbuilding capacity and update and apply technological advances.”

Currently, the demand for marine transport is increasing due to changes in shipping routes, requiring larger ships that can cope with harsher environments. The Vietnamese shipbuilding industry owns a chain of shipyards stretching from the North to the South, with diverse production capacity and products with high quality, meeting the needs of domestic and international markets. Vietnamese shipbuilding enterprises have been successful in building new ships with large capacity, specialized ships, high-speed ships, high-tech ships, affirming the growing importance of the Vietnamese shipbuilding industry in the world market. With the development of global trade, Vietnam's marine transport demand is also forecast to grow strongly by about 10% per year in the period of 2023 - 2030. The total demand for new construction to supplement and replace the Vietnamese marine transport fleet from now to 2030 is forecasted to be about 4-5 million DWT. The world's maritime fleet involved in cargo transport will be approximately 105,500 ships with a capacity of 100 GT or more, with an average age of over 20 years. The average growth in the global fleet's tonnage is 4.9%/year in the period 2011 - 2021.

In recent years, the size of the world's shipbuilding market has grown strongly with the trend of more modern, larger ton-

nage and increasing demand for green technology conversion ships and clean fuel use.

### Managing the Supply Chain

Vietnam's shipbuilding industry is still heavily dependent on imported materials. There is a large room for domestic and foreign material suppliers to grow and participate in the supply chain, thereby promoting the sustainable development of this industry.

To create a playground, exchange and introduce capacity, products and technology, Shipbuilding Industry Corporation (SBIC) in collaboration with Vietnam Shipbuilding Engineering JSC (VISEC) will organize the 10th International Exhibition on Shipbuilding and Offshore Technology - Vietship 2025 from 5th to 7th March 2025. Vietship is the largest and longest established maritime exhibition in Vietnam. Vietship was first held in 2002 and has gone through 9 successful editions, with a large scale and a abundant program of activities, with the participation of many notable domestic enterprises, foreign corporations and companies from countries with the world's leading maritime industries like Japan, Korea, China, the Netherlands, Finland, Singapore... With 9 exhibitions over the past 22 years, Vietship has truly become an ideal opportunity for Vietnamese and international enterprises to meet, exchange, attract investment, discuss technology and promote trade.

In 2025, Vietship will return with a completely new look focusing on the shipbuilding and offshore energy industry. Vietship 2025 is expected to be a place to converge and demonstrate advanced technologies in the fields of shipbuilding, repair of marine equipment, construction and installation of marine structures, and supply of offshore energy services, with the goal of creating innovative cooperative solutions for challenges in the development of the maritime and offshore energy industries.

Hidden in challenges are also opportunities. This is the time for businesses operating in the shipbuilding industry to evaluate and improve their organizational structure and strengthen their brand to continue to maintain and move towards long-term, sustainable development.

# TOP 10 SHIP OWNING NATIONS

In the ever-evolving world of maritime trade, ship ownership is a key indicator of economic influence and global commerce. As we enter 2025, **Veson Nautical** presents its highly anticipated Top 10 Ship Owning Nations, offering a detailed analysis of fleet values and industry shifts. This year, China has surged to the top, overtaking Japan in total fleet value, while geopolitical events and shifting market dynamics continue to shape the rankings. Let's take a closer look at the global giants of ship ownership and the forces driving their dominance.

## #1 CHINA

### New Maritime Powerhouse

For years, China has held the title for the largest fleet in terms of vessel numbers, but now it has also become the world's most valuable fleet owner, surpassing Japan with a staggering \$255 billion in total fleet value, fueled by its Bulker and Container sectors. China's rise is a reflection of its aggressive investments in shipbuilding, expansion into global trade routes, and its growing influence in maritime logistics. **NOTABLE:** Tankers

Lead in Numbers: With 1,764 vessels, China has the largest tanker fleet, worth \$47.9 billion.

## #2 JAPAN

### Historically Strong

Japan, now in second place, still commands a \$231.3 billion fleet, marking a 12% growth from 2024. While China has overtaken it, Japan remains a dominant player, particularly in specialized vessel markets. Bulk carrier values peaked in October 2024, with 20-year-old Capesizes hitting \$20.32 million, reinforcing Japan's commitment to high-value ship assets. **NOTABLE:** Largest LNG Fleet: Worth \$40.9 billion; Leading in LPG & Reefers: LPG fleet valued at \$15.1 billion, Reefers at \$1.3 billion Stronghold in Vehicle Carriers: Holding a \$24.8 billion stake

## #3 GREECE

### The Tanker Powerhouse

Greece remains in third place, consistently ranking among the world's top maritime nations. While China holds more tankers in sheer numbers, Greece's tanker fleet value is higher, standing at

\$71.3 billion—a remarkable \$23.3 billion above China's. Greece's strength lies in its strategic positioning in global shipping lanes and its ability to capitalize on geopolitical shifts, including Russian sanctions and Red Sea conflicts, which have boosted ton-mile demand. **NOTABLE:** Second Largest LNG Fleet: 143 vessels, worth \$32.4 billion

## #4 USA

### The Cruise Giant

The U.S. holds its fourth place ranking with a \$116.4 billion fleet, marking a \$16.5 billion increase from 2024. With

Country	Grand Total (USD mil)	Bulker	Tanker	Container	Small Dry	LNG	LPG	OSV	OCV*	MCOU	Vehicle Carrier	RO-RO	Reefer	Renewable*	Cruise
China	\$255,236	\$68,454	\$47,991	\$63,533	\$12,732	\$26,983	\$9,034	\$3,728	\$943	\$10,306	\$7,416	\$136	\$213	\$79	\$3,750
Japan	\$231,381	\$61,920	\$35,368	\$37,834	\$9,231	\$40,927	\$15,138	\$92	\$64	\$705	\$24,777	\$1,784	\$1,279	\$28	\$2,227
Greece	\$188,125	\$54,371	\$71,317	\$18,302	\$513	\$32,404	\$7,026	\$896	\$988	—	\$1,061	\$79	\$131	—	\$230
USA	\$116,447	\$4,054	\$10,785	\$4,938	\$346	\$4,021	\$1,705	\$12,131	\$3,231	\$12,145	\$1,552	\$2,609	\$101	\$184	\$58,638
Singapore	\$107,213	\$18,189	\$25,748	\$32,873	\$1,729	\$2,117	\$14,042	\$4,459	\$1,310	\$3,197	\$3,241	\$41	\$214	\$40	\$7
South Korea	\$69,646	\$10,055	\$12,437	\$15,088	\$1,707	\$7,790	\$3,819	—	—	—	\$6,992	\$181	\$227	\$4	\$13
UK	\$69,425	\$4,318	\$9,549	\$11,769	\$543	\$3,071	\$5,256	\$1,235	\$1,013	\$12,378	\$1,391	\$478	\$96	\$489	\$17,831
Norway	\$68,467	\$4,455	\$10,953	\$2,295	\$1,909	\$13,565	\$3,122	\$4,404	\$5,453	\$10,616	\$10,803	\$42	\$85	\$24	\$735
Switzerland	\$67,988	\$779	\$1,841	\$41,303	\$456	—	—	\$200	\$416	\$8,095	\$805	\$35	—	—	\$14,252
Germany	\$59,443	\$7164	\$4,677	\$27,698	\$7044	\$1,134	\$1,462	\$166	\$146	—	\$243	\$104	\$79	\$129	\$9,389

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## THE FINAL WORD TOP 10 SHIP OWNING NATIONS

Carnival and Royal Caribbean headquartered in the U.S., the nation continues to dominate the cruise sector. Fleet values have surged by nearly \$10 billion, reflecting growing demand for luxury ocean travel. **NOTABLE:** Undisputed Cruise Leader: The U.S. boasts the largest cruise fleet globally, valued at \$58.6 billion.

### #5 SINGAPORE

#### *Rising Power: LPG & OSVs*

Singapore remains fifth, boasting a \$107.2 billion fleet, a \$21 billion rise from last year. Singapore's strategic location and advanced port infrastructure continue to make it a major maritime hub. **NOTABLE:** Second Largest LPG Fleet: Valued at \$14 billion; Dominant in OSVs: Offshore Support Vessels (OSVs) worth \$4.4 billion

### #6 SOUTH KOREA

#### *LNG & Vehicle Carrier Prowess*

Holding firm at sixth place, South Korea's \$69.6 billion fleet has grown by \$2 billion over the past year. **NOTABLE:** Fourth Largest LNG Fleet: Valued at \$17.2 billion; Key Car Exporter: Investments in vehicle carriers, including six new LCTCs set for delivery by 2028.

### #7 UNITED KINGDOM

#### *Surging Tanker Values*

The UK has climbed to seventh place, despite not ranking in the top 10 for vessel numbers. **NOTABLE:** Tanker Fleet Growth: Values increased by 32% to \$9.5 billion.

### #8 NORWAY

#### *Gas-Driven Fleet Expansion*

Norway has dropped to eighth, with a fleet worth \$68.5 billion, still up by \$10 billion from last year.

**NOTABLE:** LNG Fleet Growth: Now worth \$13.6 billion, making up 20% of

Norway's fleet.

### #9 SWITZERLAND

#### *Back in the Game*

Switzerland reenters the top 10 with a \$68 billion fleet, largely due to container sector growth and MSC's continued expansion. **NOTABLE:** MSC's Influence: In 2024 alone, MSC added 63 second-hand vessels and placed 64 new orders for delivery between 2026-2029.

### #10 GERMANY

#### *A Fading Power*

Germany drops to tenth place, continuing its downward trend. However, its fleet value has increased by 55.6% year-on-year to \$27.7 billion. Germany's historical dominance in containers is still evident. **NOTABLE:** Container Fleet Strength: Germany holds the second largest container fleet in numbers, despite dropping in rankings.

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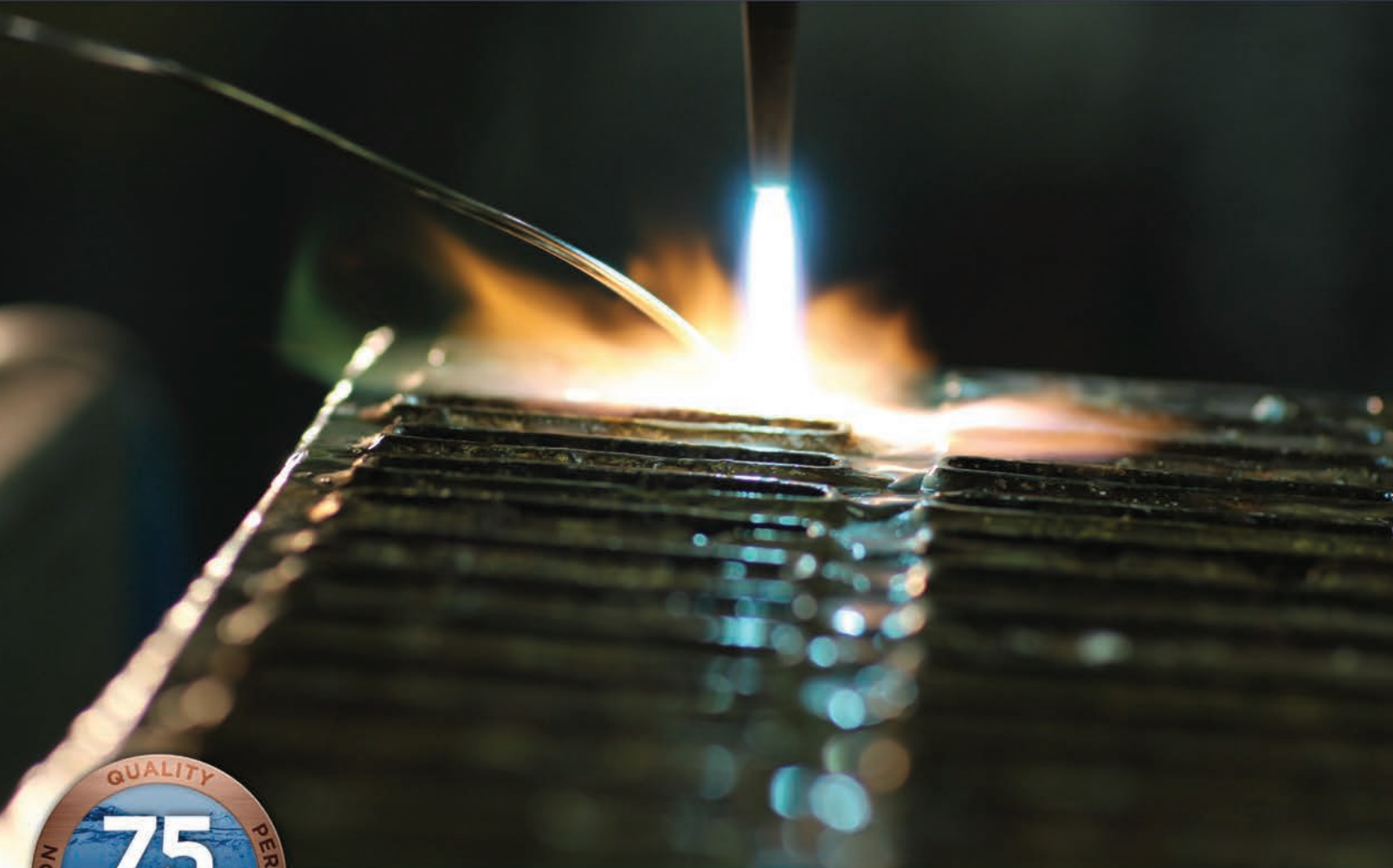
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