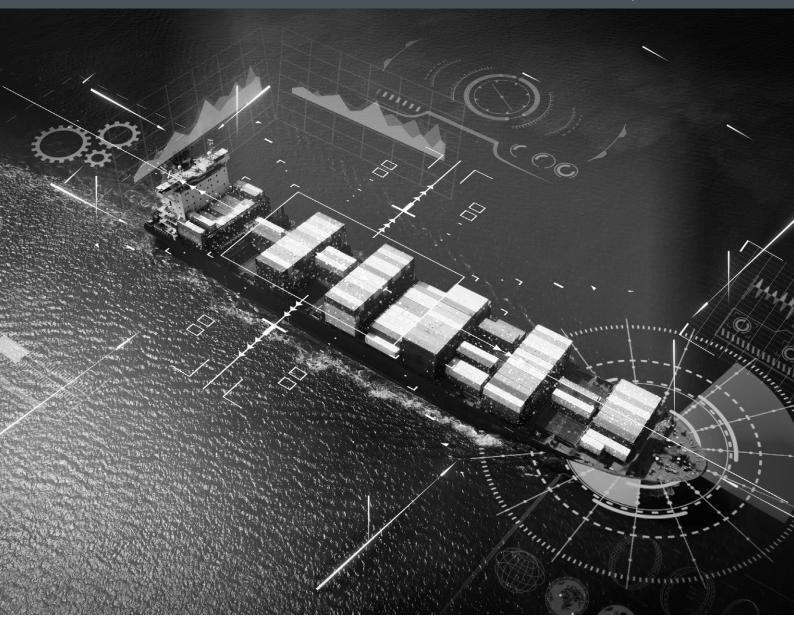




SHIPPING | DECEMBER 2023



AUTONOMOUS VESSELS: DEMONSTRATING DIVERSE AND DYNAMIC DEVELOPMENTS

Welcome to HFW's year-end market round-up detailing some of the most interesting developments that have happened in the dynamic space of Maritime Autonomous Surface Shipping (MASS) in the past few months. Our previous MASS bulletin, published in July, can be accessed here.

Unsurprisingly, developments in autonomous shipping remain diverse. New joint ventures have been established, as well as collaborations between different participants ranging from geoscience specialists to military and defence arms to universities and publicly funded research entities. Various groups and organisations have deployed (or are planning to deploy) MASSs and USVs to assist with operations including research, surveying, ocean



mapping, mine-detection, subsea inspections, waste collection and salvage assistance. We also look at cargo and passenger transportation developments in the form of uncrewed water taxis and unmanned containerships, as well as the use of AI and robotics in autonomous shipping.

Developments are likewise global in nature. In this bulletin we cover updates from Europe, the Middle East, North America, Southeast Asia and New Zealand.

The regulation of MASSs and USVs remains a key and complex issue. Given the pace of developments, we anticipate that the UK Government will gradually phase in a framework to accommodate these vessels and craft. A new edition of The Workboat Code (Edition 3) was introduced which comes into force from 13 December 2023 and provides further guidance for Remotely **Operated Unmanned Vessels** less than 24m in length. We briefly discuss this and other legal developments concerning MASS below.

Industry updates

ZULU MASS enters design phase

Belgian maritime company Zulu Associates entered into a contract with Dutch shipbuilder Conoship International "to advance the design" of Zulu Mass, a 200 TEU vessel.¹ Zulu Mass is anticipated to trade on Green Corridors between Europe and the UK and will be powered by a zeroemission electrical propulsion system to be deployed for short sea voyages. Lloyd's Register granted approval in principle to the vessel's design in December 2022.²

Fugro completes first low-carbon USV in MENA-region and agrees to acquire SEA-KIT International³

Dutch geoscience group Fugro, whose efforts to successfully secure a navigation license we covered in our last bulletin, completed the first entirely remote subsea survey and inspection of an offshore platform in the Middle East in June 2023. Instructed by Chinese operator Atlantis, the operation was achieved by using Fugro's "Blue Essence" technology via the Fugro Pegasus USV, which is part of the Blue Essence fleet built by SEA-KIT International. The survey and inspection were controlled by a team of mariners and surveyors from a remote operations centre in Dubai and completed operations within 40% of the allotted timeframe.⁴ We have been following developments of Fugro's ventures and wrote on relevant updates in our recent bulletins this year.5

On 27 November 2023, Fugro announced that it had reached a binding agreement to acquire the rest of SEA-KIT International's shares. In the announcement, Fugro indicated that the transaction is expected to finalise by the year's end.⁶

South Korean city government enters into supply agreement with HD Hyundai subsidiary for autonomous water taxis

HD Hyundai subsidiary Avikus entered into an agreement with the City of Busan in South Korea to develop, supply, and operate four autonomous 6-seat water taxis around downtown Busan. These autonomous water taxis will use Avikus' "NeuBoat", which functions as the craft's "brain". It also makes use of another piece of Avikus' technology, NeuBoat DOCK, which is a video system designed to make it easier for craft to dock and berth. Avikus' NeuBoat seems, to date, mostly relevant to the leisure boating market.7

As discussed in our previous bulletins, Avikus has developed an AI-based navigation system for ships called "HiNAS 2.0". HiNAS was employed in the LNG carrier PRISM COURAGE's voyage from Texas and across the Pacific. The system has now received approval in principle from the Korean Register and the Liberian Registry.⁸

Exail and the University of New Hampshire announce new Maritime Autonomy Innovation Hub

French Robotics company Exail (formed of a 2022 merger between tech companies ECA Group and iXblue) has partnered with the University of New Hampshire (UNH) in New Castle, NH to launch a research and innovation hub catering to "all aspects of marine autonomous operations".⁹ UNH has a

- 1 https://www.conoship.com/2023/09/21/shortsea-vessel-zulu-mass-design-phase/
- 2 https://www.hfw.com/downloads/004825-HFW-MASS-Autonomous-Vessels-The-Momentum-Is-Building. pdf; https://workboat365.com/zulu-associates-contracts-conoship-international-to-design-autonomouszero-emission-shortsea-vessel-zulu-mass/; https://workboat365.com/Ir-awards-aip-for-zulu-mass-short-seaautonomous-zero-emission-vessel-2/
- 3 https://www.fugro.com/news/business-news/2023/fugro-completes-the-middle-east-s-first-remotelyoperated-subsea-inspection-using-an-uncrewed-surface-vessel-usv?utm_source=DSMN8&utm_ medium=LinkedIn
- 4 https://www.fugro.com/news/business-news/2023/fugro-completes-the-middle-east-s-first-remotelyoperated-subsea-inspection-using-an-uncrewed-surface-vessel-usv?utm_source=DSMN8&utm_ medium=LinkedIn
- 5 https://www.hfw.com/downloads/004825-HFW-MASS-Autonomous-Vessels-The-Momentum-Is-Building. pdf; https://www.hfw.com/Mass-Update-Part-2-Autonomous-shipping-A-Reality
- 6 https://www.fugro.com/news/business-news/2023/fugro-gains-full-ownership-of-sea-kit-internationalstrengthening-its-leadership-in-marine-robotics-solutions
- 7 https://avikus.ai/eng/product/neuboat
- 8 https://www.hfw.com/Autonomous-vessels-the-momentum-is-building; https://www.hfw.com/ Autonomous-ships-MASS-for-the-MASSes; https://maritime-executive.com/article/self-navigatingautonomous-water-taxis-to-launch-in-south-korea
- 9 https://www.exail-technologies.com/activities/

"Earlier this summer, the UK Defence Equipment & Support (DE&S), alongside the Royal Navy (RN), conducted a series of sea trials off the coast of Portland to test RFA STIRLING CASTLE's capabilities as a "mothership" for three new autonomous mine hunting systems."

leading oceanography programme, in particular in the field of ocean mapping through UNH's Center for Coastal and Ocean Mapping (CCOM). The arrangement will give CCOM access to Exail's uncrewed vessel DriX, which is a highly manoeuvrable 25ft-long submersible designed for seafloor mapping.¹⁰ As relates to autonomous maritime initiatives, this development marks an important partnership between the private sector and publicly funded research and development in the United States.¹¹

New developments

Baltic Workboats heads European effort "EUROGARD" to develop modular semi-autonomous surface vessel platforms

Estonian shipbuilder Baltic Workboats (BWB) is leading a consortium of 23 companies and research groups across Europe in the development of the "EUROGUARD" initiative. The goal of EUROGUARD, which is financially backed by the European Defence Fund, is to develop a military surface vessel capable of autonomous navigation while avoiding collisions and other navigational hazards and fulfilling various other "mission-specific" objectives. An essential design principle of EUROGUARD is the concept of "modularity", where the core platform can adapt to different use-cases and employ different hardware features depending on each operator's needs. There is no fixed date for trialling the prototype, though the sea trials will take place in Estonian waters with support from Estonia's navy.¹²

Royal Navy's "mothership" RFA STIRLING CASTLE undergoes sea trials with autonomous minehunting vessels

Earlier this summer, the UK Defence Equipment & Support (DE&S), alongside the Royal Navy (RN), conducted a series of sea trials off the coast of Portland to test RFA STIRLING CASTLE's capabilities as a "mothership" for three new autonomous mine hunting systems.13 The trials were to determine whether **RFA STIRLING CASTLE could hoist** the smaller autonomous vessels on board. Future trials will gauge how well the autonomous vessels can be remotely controlled from the ship. These tests mark a significant step in the future of the RN's minesweeping strategy, as traditional mine

countermeasure vessels are replaced by similar maritime autonomous systems.¹⁴

Marine pioneer Robosys Automation embarks on two separate joint ventures both featuring its Al-driven autonomous software

UK-Indian autonomous navigation software developer Robosys Automation (Robosys) recently announced a partnership with the South African small-craft builder Lynx Power Catamarans to build a flexible, "multi-purpose" vessel capable of full surface autonomy and adapted to African ports in particular. Known as the Lynx Multi-Role Vessel, the current design consists of an 11m twin-hulled aluminium structure capable of operating at speeds of 30-35kts and suitable for waterborne surveillance, ambulatory operations and patrolling duties in the defence, coastguard, firefighting, SAR, and fisheries sectors. It will employ Robosys' proprietary Voyager Al Vessel software, enabling the vessel to operate with full autonomy and commanded either from a remote operations centre or ground control station.15

- 14 https://des.mod.uk/autonomous-vessels-join-minehunting-mothership-for-trials-debut/
- 15 https://workboat365.com/robosys-partners-with-lynx-power-catamarans-in-delivering-ai-driven-maritime-autonomy-solutions/

¹⁰ https://www.unh.edu/unhtoday/2023/07/unh-and-exail-open-marine-autonomy-innovation-hub; https://www.exail-technologies.com/activities/

We previously looked at Exail and the development of DriX in last year's MASS update, when DriX obtained its USV certificate from Lloyd's Register in December 2022.
https://bwb.ee/europes-autonomous-warship-platform-will-be-developed-under-the-leadership-of-baltic-workboats/

 ¹³ https://des.mod.uk/autonomous-vessels-join-minehunting-mothership-for-trials-debut/

Separately, Robosys has partnered with navigation product innovator Sea.AI to develop a first-in-class "machine vision-based maritime autonomous surface collision avoidance system" developed for an Indian ship operator. The technology works through a combination of integrated software and hardware that employs low-light cameras to detect objects around the vessel and identify hazards. The technology is suitable for commercial vessels, government crafts, motor yachts and first responders which are either manned or unmanned.¹⁶

Joint venture USV AS commissions Spanish shipbuilder to build a lowemission unmanned surface vessel

USV AS is a joint venture established in 2018 between the European Solstad Offshore, Østensjø, and DeepOcean. The purpose of the venture is to develop and build an unmanned surface vessel (USV). The intent behind the design is for crews to operate the USV shoreside in severe weather conditions according to certain specifications including the ability to travel 30 days without refuelling through the use of a hybrid diesel-electric propulsion system and an onboard remote-operated-vessel with a submarine operation depth of 1,500m. To this end, USV AS has contracted with Astilleros Gondan to produce the USV, which will be 24m by 7.5m. Astilleros Gondan is expected to deliver the USV for trials by year-end 2024, with operational capabilities ready in 2025.17

German navigation specialist Anschütz successfully demonstrates remote control capabilities of Germany's largest autonomous research ship

In August, Anschütz, a German maritime navigational product developer, remotely controlled the MV WAVELAB in a successful manner, as part of the German Clean Autonomous Public Transport Network (CAPTN) Initiative. Germany's largest autonomous research ship is a 21m by 8m catamaran with a complex network of sensors and navigation systems. During the sea trial in the Kiel Fjord the WAVELAB's steering and propulsion were entirely controlled from the shoreside control centre with vessel information supplied to the control centre via monitors and high-volume data transmitters. Several displays are installed in the centre and a large screen provides a 360-degree view, giving the impression of being on an actual ship. This bodes well for Anschütz's own suite of navigation technologies, given that WAVELAB was fitted with the Synapsis NX Integrated Navigation System, which based on the results of the trial suggest has autonomous capabilities.¹⁸

Swansea University announces study on laws and regulations affecting autonomous shipping

In October, Swansea University's Institute of International Shipping and Trade Law (IISTL)¹⁹ published an announcement summarising the efforts of a multidisciplinary research project to identify the regulatory and legal barriers to MASSs and how these regulations and laws can be made fit for purpose.²⁰ Both the Maritime and Coastguard Agency and Assuring Autonomy International Programme have used the research in their own efforts in the MASS space.

Saildrone, Inc. kicks off first seafloor mapping mission off the Gulf of Maine

The US meteorological department National Oceanic and Atmospheric Administration (NOAA) enlisted two 33ft Saildrone "Voyager-class" USVs to survey coral off the coast of Maine between August and October 2023. The sail-vessels are designed to collect high volumes of oceanographic and seafloor data and operate primarily via wind and solar power. The NOAA has commissioned the vessels on this occasion to survey a 1,900sqm portion of the seafloor in the Gulf of Maine. Saildrone, Inc. is a US-owned USV sail-vessel builder and maritime mapping and data solutions company.²¹

Two Dutch companies launch joint venture (JV) targeting hydrocarbon spillages following marine casualties

Dutch companies RanMarine Technology and HEBO announced a joint collaboration to develop a waste-collection autonomous vessel specifically designed for salvage, wreck removal, and offshore work. The JV will combine RanMarine's expertise in designing aquatic environment waste removal technologies with HEBO's reputation as a salvor and offshore support servicer. While the JV is in its early stages, the concept once launched could have a substantial impact on the salvage sector.²²

Aker BP announces agreement with DeepOcean to use its USV

DeepOcean and Aker BP announced an agreement in October to develop together a USV product for subsea inspection, maintenance and repair and survey work at subsurface depths of up to 1500m. The agreement will operate within a pre-existing framework agreement governing the above-mentioned type of work. The vessel's specifications include dimensions of 24m by 7m, shoreside control capabilities, and an ability to operate in severe weather. It will utilise a hybrid diesel/electric propulsion system capable of 30 days offshore operation without needing refuelling or recharging.²³ The parties intend to have the first USV ready for offshore operations by 2025.24

20 https://www.swansea.ac.uk/research/research-highlights/digital-futures/autonomous-shipping/

24 https://jpt.spe.org/aker-bp-plans-to-use-deepocean-operated-unmanned-surface-vessel

¹⁶ https://www.maritimeindustries.org/news/robosys-and-seaai-create-machine-vision-based-maritime-autonomous-surface-collision-avoidance-system

¹⁷ https://www.solstad.com/usv-as-orders-first-unmanned-surface-vessel/

¹⁸ https://www.anschuetz.com/news-and-stories/detail/anschuetz-demonstrates-remote-control-of-mv-wavelab/?tx_news_pi1%5Bcontroller%5D=News&tx_news_pi1%5Baction%5D=detail&tx_news_pi1%5Bday%5D=3&tx_news_pi1%5Bmonth%5D=8&tx_news_pi1%5Byear%5D=2023&cHash=8473fa0adf75dc281600562f58071e5a

¹⁹ Paul Dean, Global Head of Shipping at HFW, is an IISTL Visiting Fellow https://www.swansea.ac.uk/law/istl/members/mr-paul-dean/

²¹ https://www.mainepublic.org/environment-and-outdoors/2023-08-22/unmanned-robotic-sailboats-will-be-deployed-to-the-gulf-of-maine-for-seafloor-mapping-project; https://www.mainepublic.org/environment-and-outdoors/2023-08-22/unmanned-robotic-sailboats-will-be-deployed-to-the-gulf-of-maine-for-seafloor-mapping-project

²² https://www.ranmarine.io/joint-announcement-ranmarine-technology-and-hebo-unite-for-groundbreaking-oilshark-aquatic-vessel/

²³ We note that these specifications are quite similar to the vessel design under the UAV AS JV between DeepOcean, Solstad Offshore and Østensjø.

"Hong Kong-based startup Clearbot announced in June the launch of an unmanned battery powered autonomous vessel designed to collect and remove plastic waste from water bodies."

Ørsted awards Maxwell Marine contract to supply anchoring system for its first USVs

Wind farm developer Ørsted has awarded New Zealand anchoring system manufacturer Maxwell Marine its contract to design and supply anchoring system for USVs employed in offshore met-ocean measurement campaigns undertaken in the offshore wind farm industry. The contract award follows from prototype trials of Maxwell Marine's anchoring system, which were subjected to hurricane-force winds. Maxwell Marine reports that the final build will be launched by the year's end.²⁵

Lomar Shipping to collaborate with Alicia Bots to install robotic solution on vessels

Private shipowner and operator Lomar has entered into a collaboration agreement with robotics startup Alicia Bots to install "ROVERCLEAN", a robotic solution, on up to 15 of its ships. ROVERCLEAN is deployed for hull inspection as well as to reduce hull fouling, fuel consumption, operating costs and carbon emissions. The Alicia Bot robots are to operate either autonomously or remotely via tethering cables and can assist with subsurface inspections and maintenance of vessels and offshore structures. The design also envisions the robots undertaking cargo hold washing, vessel firefighting, and salvage assistance. The robots will be able to collect data that can help detect corrosion and aid in other preventative measures.²⁶

Marine technology startup Clearbot launches green battery powered unmanned autonomous waste-clearing vessel

Hong Kong-based startup Clearbot announced in June the launch of an unmanned battery powered autonomous vessel designed to collect and remove plastic waste from water bodies. The vessel, whose batteries are charged via solar panelling technology, can process and remove up to 200kg of plastic waste per deployment. The product is one of the only zero-emission plastic waste removal vessels on the market. As part of the announcement, Clearbot stated that it is developing a larger model capable of removing up to 450kg of plastic waste.²⁷ When we last covered Clearbot, it was back in March 2023 when it had won the 2023 Captain Table competition.²⁸

Wärtsilä ANCS delivers autonomous docking capabilities to Seaspan

In November, Wärtsilä ANCS, a subsidiary of the Finnish maritime technology group Wärtsilä, delivered its SmartDock system to Seaspan, a North American shipbuilder and manager. The SmartDock system is capable of autonomously docking vessels at speeds of up to 2kts and uses an onboard system of sensors integrated with the vessel's navigation system to dock the vessel without human input. This marks an important development in autonomous docking capabilities, which may improve safety and minimise docking casualties.29

K Line carrier vessel completes 1,600km coastal roundtrip testing its autonomous navigation software

Japanese shipping and logistics company K Line announced in November that its vessel, the 11,413gt HOKUREN MARU NO.2

28 https://www.hfw.com/downloads/004825-HFW-MASS-Autonomous-Vessels-The-Momentum-Is-Building.pdf

²⁵ https://www.maritime-executive.com/corporate/maxwell-marine-wins-contract-to-supply-anchoring-system-for-first-usvs

²⁶ https://www.libra.com/news-and-insights/lomar-alicia-bots/

²⁷ How This Self-Driving Boat Is Helping To Tackle The Issue Of Plastic Waste (forbes.com)

²⁹ Wartsila and Seaspan transform maritime operations with SmartDock autodocking system | The Global Maritime Business News Portal - The Maritime Economy Publications

had completed a 1,600m coastal roundtrip between Hitachi and Kushiro ports using an autonomous navigation system that demonstrated the ability to accurately navigate and avoid collisions with other vessels. K Line announced it will continue to collaborate with Japan Radio Co, YDK Technologies and Kawasaki Kinkai Kisen to further develop its autonomous navigation abilities and is preparing for a sea test in 2025. The test comprised part of the Japanese Nippon Foundation-backed Meguri2040 autonomous ship project that targets the complete commercialisation of autonomous shipping technologies by 2025.³⁰

Legal updates

Marine Guidance Note (MGN) on certification process for vessels using innovative technology³¹

In September, the above MGN was published regarding the certification process applicable to (a) UK vessels wherever they may be trading; and (b) to non-UK vessels in UK waters using "innovative technology". Further, the guidance applies to vessels where the associated risks to safety, environment and/or security may not be suitably addressed by current regulations, codes or good practice.

"Innovative technology" includes, inter alia, automated functions. The MGN offers useful information on the role of the relevant certifying authorities and the practical steps of the certification process. Four stages are established, in each of which both the applicant and the Maritime and Coastguard Agency are engaged. While a general timeframe for the certification process is not specified, guidance on the relevant documentation is included and highlights the minimum certification requirements.

The intention is for this MGN to be read alongside MSC.1/Circ.1455 published by the IMO, which itself provides guidance to Administrations and submitters when dealing with an approval request for a vessel of an alternative and/or equivalent design to comply with applicable statutory IMO instruments.

This is a welcome step to encouraging new technology – especially MASS and autonomous vessels – into UK waters which will hopefully make it easier to obtain approval for their operation.

Consultation response on maritime autonomy and remote operations³²

The consultation response on the "Future of Transport Regulatory Review: Maritime Autonomy and Remote Operations" was published in September as well. Several issues were covered including, among others, some key definitions and responsibilities, port and harbour considerations. insurance and liability challenges and maritime security (from both a physical and a cyber perspective). Broadly, the government has reacted to the responses by either (a) taking responses forward for consideration, (b) accepting comments which are intended to be used to refine the government's policy or (c) stating that the existing framework is appropriate.

As highlighted in the consultation, close collaboration between the Government, industry and academia will be critical in updating and creating legislation in a sensible, robust manner. Space for innovation might be essential but placing safeguards through regulation is not expected to be taken lightly.

The Government is planning to update primary legislation covering MASS "when parliamentary time so allows". This will be accompanied by secondary legislation, for which another consultation process will be carried out.

The Workboat Code – Edition 3

The new edition of The Workboat Code – Edition 3 (the Code) – see here – as supplemented by MIN 698(M) (Workboat Code Edition 3 – Standards and Guidelines for Best Practice – see here) applies to workboats that operate at sea, and to all dedicated pilot boats operating either at sea or in categorised waters. The Code applies to vessels less than 24m in length in commercial use, other than when in use for recreational, sport or pleasure, for which there are more appropriate regulations.

This Code applies to vessels operated by crew, and to vessels with no persons on board operated from a Remote Operation Centre. Such vessels are treated, by both UK and international law, as a type of cargo vessel and the level of safety and protection for those on board, and/ or operating the vessel remotely, is considered commensurate with the current expectations of the general public for such vessels.

A vessel intending to operate as a Remotely Operated Unmanned Vessel has to meet the requirements set out in Annex 2 of the Code in addition to the other relevant sections. Importantly, the Code clarifies that a vessel which does not carry out any of its operation on the water's surface (i.e., operates underwater) is outside of the scope of this Code.

Compliance with the Code does not remove the need for vessels and/ or masters to comply with relevant bylaws made by either the local/ navigation authority or the port/ harbour authority for the area in which the vessel operates. For example, local authorities may have powers to require vessels to have passenger liability and third-party insurance cover, and to set the level of that cover. Additionally, recognising that some vessels operate both at sea and on inland waterways, attention is drawn to the common approach to vessel safety adopted by the major UK Inland Navigation Authorities. The Code requires that owners and/ or operators of such vessels shall also comply with any applicable requirements of any relevant authority for the area category of operation.

Look out for our further in-depth update on the implications of the Code in the New Year.

³⁰ https://www.lloydslist.com/LL1147402/K-Line-ship-completes-test-voyage-with-autonomous-navigation-system

³¹ https://www.gov.uk/government/publications/mgn-664-mf-amendment-1-certification-process-for-vessels-using-innovative-technology/mgn-664-mf-amendment-1certification-process-for-vessels-using-innovative-technology#more-information

³² https://www.gov.uk/government/consultations/future-of-transport-regulatory-review-maritime-autonomy-and-remote-operations#full-publication

Past event

Marine Autonomy and Technology Showcase 2023 7 & 9 November 2023 https://www.maritimeindustries.org/events/all-events/ marine-autonomy-technology-showcase-2023

Upcoming event

UK Maritime Autonomous Systems Regulatory Working Group Conference

16 & 17 January 2024 https://www.autonomousshipexpo.com/registermaritime.php

Given the closing gap between MASS and cyber incidents, we invite you to read our report "Maritime Industry Pays Average US\$3m Ransom in Cyberattacks" (https://www.hfw.com/CyberOwl-HFW-Report-Maritime-Industry-Pays-Average-US3m-Ransom-In-Cyberattacks-March-2022), published in collaboration with CyberOwl. If you are interested in finding out more about HFW's work in the MASS area, or require guidance with respect to autonomous shipping matters, please feel free to reach out to our team:



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