

Kongsberg Maritime

Insights

Technology and innovation

Featuring

Safe and smart
tug operations

Digital direction
of travel

Featuring

Next-gen
UT vessels

Electric avenue
to greener ships

As cool as ice

Discover the innovative technology enhancing
safety and reliability for polar vessels



Kongsberg Maritime is proud to provide new levels of efficiency and innovation in the latest subsea construction vessels for Olympic. Find out more on pages 23-25.



Welcome

Lisa Edvardsen Haugan,
President – Kongsberg Maritime

The future of maritime is here

The maritime industry continues to navigate a complex landscape of opportunities and challenges and, while the implementation of the International Maritime Organization's decarbonisation framework has been delayed, the urgency to reduce emissions and accelerate towards net zero remains undiminished.

At Kongsberg Maritime, we are committed to supporting our customers on this journey – delivering technologies and solutions that make a tangible difference today, while preparing for the demands of tomorrow.

In this issue, you'll see how that commitment translates into action. From two next-generation subsea construction vessels for Olympic, designed to set new benchmarks in efficiency and environmental performance, to the pioneering Reach Remote USV now operating in Australian waters, we are redefining what's possible offshore. These projects reflect deep, long-standing partnerships and a shared ambition to innovate for a cleaner, smarter future.

Our expertise spans every environment, from the polar extremes to busy ferry routes. Decades of experience in advanced thruster technology continue to deliver reliability where it matters most, while propeller upgrades for vessels such as the *Baltic Queen* demonstrate how incremental improvements can yield significant gains in fuel efficiency, emissions reduction and underwater noise.

Across all these stories runs a common thread: collaboration and innovation. Whether it's hybrid power systems, digital optimisation tools or autonomous operations, we are working alongside our customers to shape a maritime industry that is safer, more sustainable and future ready.

Thank you for joining us on this journey. I hope you enjoy reading about the progress we're making and the possibilities that lie ahead.



Dynamic Positioning
has been in operation
for **50 years**

See pages 14-15



250 dry dockings
were supported by the
Aalborg team in 2025

See pages 26-27



2,800 passengers
can be carried by
the *Baltic Queen*

See pages 28-30

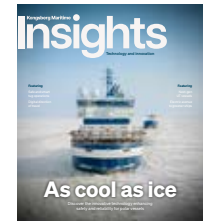
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Cover image: ARC thrusters perform in the harshest conditions. See pages 12 and 13. Image © Arctia

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Kongsberg Maritime Updates



Main pic and below, tunnel and azimuth thrusters with rim-drive technology at Kongsberg Maritime's Ulsteinvik factory in Norway

Marking a decade of thruster innovation

It is 10 years since the launch of Kongsberg Maritime's pioneering rim-drive permanent magnet thruster technology – and the company has been celebrating both this anniversary and the contract for the 100th unit for the groundbreaking propulsion solution.

Following extensive trials of the first prototype tunnel thrusters, including installation on the anchor handling vessel *Olympic Octopus*, the first rim-drive azimuth thruster was introduced in 2015 onboard the Norwegian research vessel *RV Gunnerus*, representing a significant leap forward in marine propulsion.

Since then, the technology has evolved into a versatile offering – available in both tunnel (RD-TT) and azimuth (RD-AZ) configurations – for a wide range of vessel types, including offshore support vessels,

cruise ships and Dynamic Positioning platforms.

The rim-drive thrusters offer a high-efficiency, low-noise operation. This is achieved through a direct electric drive with a permanent magnet motor integrated into the propeller rim.

This design eliminates the need for a vertical drive shaft and gearbox, which reduces mechanical complexity and underwater radiated noise – an increasingly critical factor in sustainable marine operations.

Per Håvard Siljan Hjukse, Kongsberg Maritime's Executive Vice President



Propulsion and Handling, said:

"This milestone reflects our commitment to delivering future-ready propulsion solutions that support the maritime industry's transition to cleaner, quieter and more environmentally conscious operations.

A decade on, the rim-drive thruster is a proven high-end technology that continues to evolve in line with the requirements of our customers."

The RD-AZ variant features hydrodynamically optimised supporting struts and a patented open-flow design that allows water to pass between the supports, reducing drag and enhancing manoeuvrability.

Rim-drive thrusters for India's acoustic research vessel

Kongsberg Maritime has secured a contract to deliver its innovative rim-drive thrusters for a new advanced acoustic research vessel being built for India's Naval Physical and Oceanographic Laboratory (NPOL).

The vessel, under construction at Garden Reach Shipbuilders & Engineers (GRSE), will support oceanographic and acoustic research for India's Defence Research and Development Organisation.

The rim-drive thrusters were chosen for their ability to meet exceptionally strict underwater radiated noise requirements, critical for acoustic research. By eliminating the traditional gearbox and integrating an electric rim-drive motor into the propeller hub, the thrusters deliver ultra-quiet performance, high efficiency and precise manoeuvrability.

The package includes two RD-AZ2600 azimuth thrusters, two RD-TT1600 tunnel thrusters and the MCON control system. This contract also marks another milestone for Kongsberg Maritime, taking the company past 100 units for rim-drive propulsion systems worldwide – a technology first launched commercially 10 years ago and now a benchmark for silent,

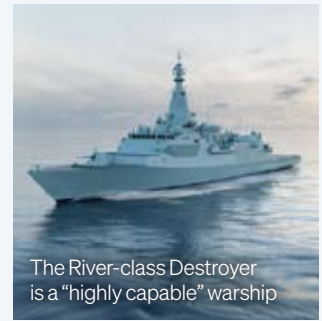
reliable propulsion in research and naval vessels (see story on page 4).

Nils Reidar Valle, Kongsberg Maritime's Senior Vice President, Naval and Workboats, said: "We are proud to support NPOL and GRSE with technology that enables world-class acoustic research. Our rim-drive azimuth thruster is the quietest in its class, delivering exceptionally low underwater noise to meet the most demanding research requirements."

Delivery of the propulsion systems will align with the vessel's construction schedule at GRSE.



The GRSE Indian acoustic research ship



The River-class Destroyer is a "highly capable" warship

Propulsion for Canada's River-class Destroyer

Kongsberg Maritime has secured contracts with Irving Shipbuilding Inc., to supply fixed built propellers (FBP) for the River-class Destroyer programme for the Royal Canadian Navy.

The contract is part of Canada's National Shipbuilding Strategy to replace the existing Halifax-class ships.

Kongsberg Maritime will supply twin FBPs for each of the first three ships in the programme.

Björn ten Eicken, Kongsberg Maritime's Vice President – Naval, said: "We have a proud history of supplying mission-critical technology to some of the world's most important naval programmes and we're delighted to have been selected by Irving Shipbuilding to supply our proven technology to the programme."

"The River-class Destroyer is a highly capable and versatile warship and we look forward to working with Irving Shipbuilding and the Royal Canadian Navy as propellers and other equipment are installed on this exciting project."

Deliveries will start in 2028 and the total programme is planned to be 15 ships, with deliveries into the 2040s.

Kongsberg Maritime will also supply a range of technology for the project, covering non-retractable fin stabilisers, steering gear and rudders, replenishment at sea moveable high point and a technical documentation package.

Nine-ship integrated tech project for Tsakos Group

Samsung Heavy Industries has awarded a contract to Kongsberg Maritime to supply integrated technology packages for nine new Dynamic Positioning (DP) shuttle tankers.

The vessels are being constructed for Greek shipowner Tsakos Group and will be a bare-boat charter by Brazilian energy logistics company Transpetro, supporting offshore operations in Brazil's pre-salt oil fields.

Each of the nine vessels will be equipped with a comprehensive suite of Kongsberg Maritime systems, reflecting the complex operational profile of shuttle tankers operating far from shore.

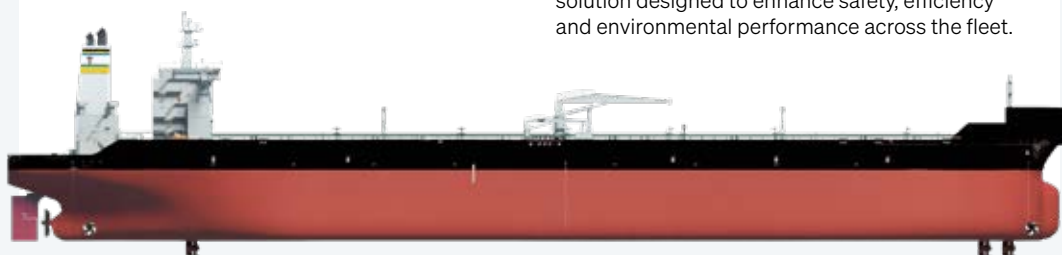
The scope of supply includes the K-Pos DP2 system, ensuring precise station-keeping capabilities in dynamic offshore conditions.

Kongsberg Maritime will also deliver its K-IMS Information Management System and the K-Chief Integrated Automation System, providing centralised control and monitoring of vessel operations.

To support propulsion and power management, the vessels will feature the AutoChief 600 propulsion control system, while the K-Gauge (CLS) tank level gauging system will ensure accurate and reliable cargo monitoring.

A complete single controllable pitch propeller shaftline with an 8.6-metre propeller is also part of the Kongsberg Maritime delivery.

Together, these systems form a fully integrated solution designed to enhance safety, efficiency and environmental performance across the fleet.



Kongsberg Maritime Updates

Enhancing Med Marine's next-gen tug designs

Kongsberg Maritime has signed a contract with Turkish shipbuilder and leading tugboat operator Med Marine to supply US-series azimuth thrusters and a combination of electric and hydraulic towing winches for nine new tug designs.

The agreement includes Med Marine's pioneering new 'VoltRA' all-electric tug that is being built at the company's Ereğli Shipyard, which is renowned for its modern infrastructure and craftsmanship.

The contract covers the supply of eight shipsets of Kongsberg Maritime's high-performance US255 azimuth thrusters for Med Marine's RAmports 2500-W and RAstar 3200-W tug designs. The 'VoltRA' electric tug will be powered by Kongsberg Maritime's US205 azimuth thruster.

The project further strengthens Med Marine's position as one of the most experienced builders of technologically advanced tugboats serving global operators.

The scope of supply includes five shipsets of Kongsberg Maritime's newly launched electric towing winches and four shipsets of hydraulic winches.

The electric winches have been engineered to meet the demanding operational requirements of next-generation electric tug operations. Powered by frequency converter-driven electric motors, they deliver improved efficiency and reduced environmental impact compared with conventional hydraulic systems.

Yıldız Bozkurt Özcan, General Manager of Med Marine, said: "This collaboration represents an important step forward for Med Marine as a global shipbuilder focused on innovation and sustainability.

"Partnering with Kongsberg Maritime enables us to integrate world-class propulsion and deck machinery solutions with our proven shipbuilding expertise.

"The VoltRA series represents our shared vision to lead the tug industry towards a more efficient, electric and environmentally responsible future."



Each vessel for Sea1 Offshore will be equipped with two LARS units

LARS solutions for Sea1 to boost safety and efficiency

Sea1 Offshore has selected Kongsberg Maritime to deliver Launch and Recovery Systems (LARS) for the company's four new offshore construction vessels.

Each vessel will be equipped with two advanced LARS units, supporting subsea construction and ROV operations.

The scope of supply per vessel includes two telescopic A-frames, fully electrical umbilical winches, energy-efficient hydraulic power units and a dedicated control system.

Each system offers a safe working load of 15 tonnes (vehicle dry weight) and winch cable capacity of 4,500 metres, ensuring robust performance for deep-water operations.

Ingar Hovden, Kongsberg Maritime's Sales Manager, said: "The award of this contract demonstrates our renewed commitment to delivering world-class handling solutions for the offshore industry. Our LARS technology combines proven engineering with modern efficiency features, helping operators achieve safe and sustainable operations."

Andreas Kjø, Chief Commercial Officer of Sea1 Offshore, added: "We are confident the state-of-the-art Launch and Recovery Systems will give us market-leading operability in harsh environment operations, with the equipment fully integrated to the vessels' power electric and energy storage systems."

Kongsberg Maritime's LARS solutions offer a wide range of benefits that enhance operational safety and efficiency, such as controlled launch and recovery even in challenging seas, thereby reducing risk.

The systems are designed with a compact and modular approach, making them easy to integrate on different vessel types while maintaining high durability and minimising downtime. Operators benefit from optimised handling for ROVs and subsea equipment, ensuring smooth and efficient missions.

The inclusion of hydraulic power units with frequency control reduces emissions and energy consumption, supporting sustainability goals without compromising operational capability.

Further advances help streamline offshore installation methods

Building on its patent-pending integrated tensioning and remote pull-in technologies, Kongsberg Maritime has further developed its mooring systems for offshore floating structures and is now focused on reducing cost, complexity and environmental impact across the mooring system life cycle.

The latest developments centre on minimising mooring components and enabling future layouts that avoid active

tensioning equipment in permanent systems.

The solution provides a controlled, vessel-based connection method

that compensates relative motions between the floater and vessel.

Mooring lines can be safely installed within an expanded weather window, utilising vessel tensioners or pull-in tensioners/connectors. This simplifies installation, eliminates top chain segments and supports efficient connection and disconnection.

A key benefit is the removal of winches and the need for floater-based personnel, cutting topside weight, reducing maintenance demands and improving safety.

Kongsberg Maritime is also refining its tensioner technology to deliver mooring line tensioning that is precise and reliable.

When combined with the company's cross-tensioning method, high loads can be applied to remove construction stretch in fibre ropes without relying on bollard pull. This reduces propulsion use and engine power demand.

Quantified fuel savings are pending but dependent on the specific mooring system and in the range of 70 to 80 per cent for tensioning operations, due to reduced propulsion and engine power use.

Arild Anensen, the company's Program Manager – Offshore Energy, said: "Our goal is to streamline offshore floater installations by simplifying every step of the process. By reducing components and introducing smarter connection and tensioning methods, we're helping operators cut costs while improving safety and reliability."

Innovation drive with Noble Corporation

Kongsberg Maritime has announced the signing of a Development Programme Framework Agreement with Noble Corporation, marking a key step forward in the co-development of advanced marine technologies for the offshore drilling sector.

This long-term strategic partnership will focus on the joint development, piloting and commercialisation of innovative solutions aimed at enhancing operational efficiency, risk assessment and sustainability in offshore operations.

The first pilot project under this agreement will be launched on the drillship *Noble Sam Croft*, setting the stage for a series of collaborative development programmes. The pilot will feature integrated solutions such as Enhanced Green DP, upgraded Riser Management System and EcoAdvisor

to optimise fuel use, improve safety and reduce emissions.

The agreement brings together Kongsberg Maritime's marine technology portfolio with Noble's deep operational expertise and modern fleet of 21 floaters. This synergy is expected to accelerate innovation cycles and deliver user-centric solutions that unlock new value for offshore operators.

Jouni Raatikainen, Kongsberg Maritime's Executive Vice President Global Customer Support, said: "This agreement with Noble underscores our commitment to being a trusted energy transition partner. By working closely with forward-thinking companies such as Noble, we can co-create technologies that not only improve performance and safety but also support the industry's broader sustainability goals.

"Noble's progressive approach and openness to innovation make them an ideal partner for this ambitious journey."

The first pilot project will launch on the drillship *Noble Sam Croft*



A force of nature

By harnessing wind energy, Kongsberg Maritime's K-Sail solution is delivering greener, more sustainable shipping options. Trials have been positive and the future is bright and breezy.

When *Tern Vik* entered service in late summer 2025, it marked a milestone for Kongsberg Maritime's K-Sail solution and for Terntank's sustainability ambitions.

The chemical tanker, the first of five on order from owner Terntank, is equipped with four suction sails from Econowind and integrated with Kongsberg Maritime's digital optimisation systems. It has been quietly proving that wind-assist technology can deliver real-world benefits.

After its debut as the star attraction at Donsö Shipping Meet, *Tern Vik* transitioned seamlessly into commercial operation.

"This is a pilot installation," explains Henrik Alpo Sjöblom, Kongsberg Maritime's K-Sail Technical Lead. "We're developing K-Sail into a solid wind-assist solution by learning from real-world data."



Henrik Alpo Sjöblom and his team are delivering results

"Our approach is deliberate. We analyse the vessel, advise on the appropriate sail technology, integrate our systems and then refine performance through continuous harvesting of data."

"Aerodynamics around a vessel with sails is complex," Henrik adds. "The only way to get accurate insight is to collect data during operation and refine the wind model as we go."

Working with the Research Institute of Sweden (RISE), Kongsberg Maritime supported a structured sea trial programme last autumn to validate sail performance against theoretical models. And the verdict so far?

"Positive," says Henrik. "The sails are performing slightly better than we expected. Some more testing is needed before the final verdict, but that is what a pilot programme is all about."

"The system is simple – on/off, up/down – and the sails do the rest," Henrik explains. "That low threshold for use means that, so far, the sails are deployed whenever possible,

Tern Vik's wind-assist technology is leading the way in sustainable shipping





Fuel savings are a primary benefit of the new vessels

Images © Terntank

with some exceptions when navigating in and around ports, for visibility.”

Beyond the sails, K-Sail’s strength lies in integration. The ship itself is of Kongsberg Maritime design – NVC 615 CT – and the K-Sail system works alongside an equipment package which includes K-Chief automation and

propulsion control, controllable pitch propellers (CPP) and AutoChief. “We adjusted the combinator curve to match sail performance,” Henrik says. “When wind conditions are strong, the system can optimise propeller pitch automatically.”

Currently, engine speed adjustments onboard are manual, based on advisory input from K-Sail. The next step is to move to semi-automation. This would mean an ‘execute’ button for crew, and eventually full automation. “We need confidence in the system before removing the human from the loop,” Henrik explains. “But optimisation is already happening.”

Focus on fuel

Fuel savings are evident, thanks to reduced engine load when sails are deployed. While exact figures are still being compiled, Henrik confirms performance is tracking ahead of expectations.

Today, with the *Tern Vik* in operation, calculations and verification in service remain key factors for Terntank, driving future efficient operation of a growing fleet.

Claes Möller, CEO of Terntank, shares his perspective on the early results: “Both *Tern Vik* and our second vessel, *Tern Land*, are now up and running with the suction sails and, so



Claes Möller, CEO of Terntank, is delighted with the project

far, we are very satisfied. The implementation has gone very well and the crew feels comfortable using the sails.

“When it comes to fuel savings, we can see that we meet the expectations based on the theoretical calculations made before installation. There is also a possibility that the savings will increase over time.”

He continues: “Our crews have received training to understand how wing sails work, including their aerodynamic principles, control systems and integration with navigation. Charterers are attracted by the potential for reductions in fuel consumption, so it is important for us to demonstrate the benefits with hard data.

“We must prove that wind-assist isn’t just a nice idea, it’s a practical solution for reducing fuel consumption. With five of eleven vessels equipped, we will have a critical mass to gather operational data across different routes and conditions.

Claes adds: “These ships will serve as testbeds, allowing us to compare fuel savings, emissions reductions and maintenance costs against our other vessels. Based on proven savings and operational reliability, we can decide whether retrofitting older vessels is economically viable.”

Digital voyage optimisation

The next step for K-Sail is the addition of its Voyage functionality, a digital tool that goes beyond route planning to optimise entire voyages. “It’s about using weather forecasts and adjusting speed and power dynamically,” Henrik explains. “If strong winds are coming, you can slow down now and take full advantage later. The goal is to match the ETA in port, not just maintain speed.”

This capability, combined with wind-assist and hybrid propulsion, promises significant savings, both in fuel and emissions. ●

“When it comes to fuel savings, we can see that we meet the expectations based on the theoretical calculations made before installation”



Simulation

Safe and smart tug operations

From training pilots to validating ship designs, Kongsberg Maritime's K-Sim advanced simulation technology is transforming modern tug operations.

Advanced simulation is transforming tug operations, delivering safer ship handling, optimised port development and more efficient training for tug masters and pilots. Over the past decade, simulation has evolved from a training tool into a strategic enabler for the towage industry.

Today, tug simulators are not only used to teach advanced manoeuvres in a risk-free environment, but they are also helping to shape port infrastructure, validate tug designs and support operational planning for complex projects.

Modern tug operations involve high-risk tasks such as escorting LNG carriers at speed, docking ultra-large container ships and performing ship-to-ship transfers in challenging conditions. Simulation provides a safe, cost-effective way to test these scenarios before they happen in real life.

Garland Hardy, Consultant and tug simulation expert at Kongsberg Maritime, says: "General motion of tugs and their ability to maintain control are prone to exterior factors acting on them and affecting assisted ships. Simulating tugboats' motions has become much better in the last 20 years due to developments in simulator platforms."

Kongsberg Maritime's K-Sim advanced navigation simulator platform has hardware and instruments similar to those onboard a vessel. It delivers a visual scene that brings complete marine environments to life. That includes

time of year and day, waves, currents, tides and their impact on tug and ship behaviours. The platform incorporates hydrodynamic manoeuvring models and algorithms that replicate real-world cause-and-effect, including forces on hulls, towlines and winches. This enables operators to explore performance limits and safety margins before committing to operations.

Simulation has played a critical role in major infrastructure projects. During the Panama Canal expansion, simulators were used to trial ship towage and escorting processes, ensuring safe navigation through new locks. More recently, Kongsberg Maritime supported LNG Canada and HaiSea Marine in planning escort and docking operations for gas carriers along a 200-nautical-mile route to Kitimat, British Columbia. These exercises evaluated winch performance, alternative routes and weather scenarios to prevent towline failures.

Training takes place on Kongsberg Maritime's K-Sim platform

"We can simulate tugboat responses in various environments and in many ways, including their performance limits and the practical life cycle of winches"

Kongsberg Maritime simulators have also been deployed in Salina Cruz and Veracruz, Mexico, and in numerous United States ports to model container, tanker and bulk carrier operations. These projects demonstrate how simulation informs tug selection, power requirements and operational strategies.

Port authorities use simulation to model harbour layouts, predict tidal and current flows and assess how dredging may affect manoeuvrability. Seasonal runoff and tidal streams can dramatically alter water levels and current velocities, requiring different manoeuvring rules and risk factors. By modelling these conditions, operators can anticipate challenges and reduce operational risk.

Naval architects also rely on simulation to refine tug designs, adjusting hull forms and propulsion systems to meet specific operational needs. Some escort operations demand highly manoeuvrable tugs with unique hull shapes – requirements that can be validated virtually before steel is cut. For LNG carriers and container ships with pronounced flares, simulation helps determine the optimal tug configuration for safe and efficient handling.

“We can simulate tugboat responses in various environments and in many ways, including their performance limits and the practical life cycle of winches,” Garland explains. “Simulation also considers different ship designs and how this changes towage and pushing operations. There could be different forces on ships and tugs, and all of this is incorporated into proof of concept and training programmes.”

Simulators are also used for mooring analysis and practising ship-to-ship transfers, replicating forces on tugs and towlines in various sea states. This capability is vital for offshore oil loading and other high-risk operations.

The latest evolution in tug simulation is the integration of augmented reality (AR) and virtual reality (VR). These technologies deliver immersive experiences while reducing hardware requirements, making advanced training more accessible. “VR is okay for visual cues, but operators need tactile feel of controls and to monitor real instruments,” Garland continues. Full-mission simulators replicate the tug wheelhouse, while AR offers a cost-effective alternative for smaller setups. “In years to come, AR will be incorporated in proof of concept and training simulators.”

This approach makes advanced training accessible and cost-effective.

Simulation is redefining safety and efficiency in tug operations by enabling risk-free training, supporting strategic planning, validating designs and making advanced training more accessible. As ports expand and ships grow larger, the ability to model and prepare for every variable will remain essential for safe and efficient towage. ●



K-Sim allows operators to practice tug handling, such as escorting a large container vessel



K-Sim replicates the tug's physical wheelhouse

Engineered for ice

Global demand is soaring for vessels that can operate in polar conditions – and Kongsberg Maritime’s innovative technology and exceptional service model ensure reliability and safety.

Operating in polar regions is one of the most demanding challenges in maritime engineering. Icebreakers must navigate thick, multi-year ice, overcome ice ridges up to 10 metres high and endure temperatures that can plunge to -50°C (-58°F). Their missions range from escorting commercial vessels and maintaining vital shipping lanes to supporting scientific and environmental research programmes.

These conditions place extraordinary strain on a range of equipment, including propulsion systems, deck machinery and navigation – all areas where Kongsberg Maritime has decades of experience in delivering proven solutions.

Trond Paulsen, the company’s Vice President Sales – Research and Icebreakers, says: “Decades of experience in the Arctic and Antarctic have shaped our technology, our engineering practices and our service model, combining robust hardware, intelligent automation and global life cycle support.”

As global demand for ice-capable vessels grows, Kongsberg Maritime can draw on its experience of heavy-ice operations.

ARC thrusters: Engineered for ice

The core of Kongsberg Maritime’s icebreaker capability is the ARC azimuth thruster, purpose-built for heavy-ice operations.

Trond continues: “Reliability is paramount when vessels operate many miles from service hubs, so our ARC thrusters integrate condition


monitoring – including vibration, temperature and pressure sensing – and seal monitoring. Our engineers can track performance in real time, provide advance alerts and plan maintenance optimally.”

Manufactured at Kongsberg Maritime’s factory in Rauma, Finland, ARC thrusters benefit from rigorous computational fluid dynamics, model tests and close collaboration with Arctic research partners. The thruster body, gears and drivetrain are optimised to handle the enormous forces encountered in icebreaking, particularly in pushing mode, minimising vibration and structural stress when large ice blocks impact the unit. References include Finland’s *Nordica* and *Fennica* icebreakers, in service since the early 1990s, and the Norwegian polar research vessel *RV Kronprins Haakon*.

Kongsberg Maritime offers both pushing and pulling arrangements, with ducted or non-ducted options to suit all operational profiles. “Pulling thrusters provide excellent inflow during transit, while pushing thrusters excel in heavy ice, reducing vibration and enabling channel widening well beyond the width of the vessel,” says Trond.

ARC thrusters can also mill ice, a critical capability for overcoming ice ridges and complex navigation in heavy ice. Power ratings start at 3 MW and extend beyond 10 MW, depending on polar class and mission profile, meeting the demands of the largest icebreakers.

The current boom in icebreaker construction is driven by multiple factors: scientific research, environmental and climate studies, commercial shipping needs and geopolitical presence. Research organisations require advanced, environmentally compliant systems to support long-term climate



Arctia’s *Fennica* icebreaker benefits from Kongsberg Maritime’s ARC azimuth thruster
Image © Arctia



and resource monitoring. Commercial operators need vessels that can keep Arctic routes open for cargo transport.

“Many nations, including the United States, Canada, Finland and South Korea are investing in ice-capable fleets and shipbuilding capacity to assert sovereignty and maintain strategic access to polar regions,” says Trond. “Finland remains a centre-of-excellence for icebreaker design and testing and we work closely with shipyards and designers to meet the requirements of these demanding conditions.”

Icebreakers require systems that function flawlessly in extreme cold. Kongsberg Maritime addresses this with the Ice Bridge navigation solution, an adaptation of the K-Bridge platform certified for operation at -50°C (58°F). Radar and outdoor electronics are tested for continuous performance under Arctic conditions, giving crews confidence during low visibility, high wind and shifting ice.

Deck machinery

Deck machinery is another critical area. Anchor and mooring winches must meet stringent steel requirements for low temperatures and, in polar service, key components such

ARC thrusters are optimised to handle the enormous forces in icebreaking

as cylinders, oil circuits and piping need heating to ensure responsiveness and safety. For research-focused icebreakers, Kongsberg Maritime offers a full range of scientific handling equipment, including A-frames, scientific winches, CTD booms, core handling systems and customised moonpool and hangar systems.

Mission-ready support

Kongsberg Maritime operates dedicated thruster overhaul facilities at key locations, including Canada, Finland, Norway and the United States.

Tero Venttola, the company's Service Operations Manager – Thrusters, explains: “In Rauma [Finland], our teams have experience of overhauling the ARC units for Arctia's icebreakers *Nordica* and *Fennica*. Because Arctia maintains a spare thruster, overhauls can be expedited, so if the customer demands it, a full overhaul could be completed in around three weeks.”

Propeller configuration influences maintenance strategy. Some owners choose to carry spare blades on board for ‘built’ propellers with bolted blades, enabling rapid replacement if damage occurs.

Global service network and spares

In addition to its thruster centres, Kongsberg Maritime maintains a large network of service facilities and field engineers across many countries, with a particularly strong presence in North America, Northern Europe and Asia.

“Our teams deliver complex repairs,” says Tero. “This includes planned maintenance and life cycle upgrades, coordinating closely with owners to align work scopes with limited docking windows.”

Availability of critical components is one of the biggest challenges in polar operations. Kongsberg Maritime maintains extensive stocks of long lead-time spare parts to support urgent needs and planned overhauls. Coupled with remote condition monitoring, the company helps operators anticipate issues, schedule interventions and reduce risk. Tailored service agreements for polar-class vessels, training solutions such as K-Sim Ice Operations and digital support tools provide a service model designed for reliability, safety and total life-cycle value. ●

“Reliability is paramount when vessels operate many miles from service hubs, so our ARC thrusters integrate condition monitoring and seal monitoring”

50 years of Dynamic Positioning

Norwegian technology that changed the maritime world.

At sea, nature's forces are relentless: storms, waves and strong currents push vessels off course. Yet, thanks to a pioneering Norwegian technology vessels can remain completely still without an anchor. Dynamic Positioning (DP) is that technology and it has made life at sea safer for 50 years.

The story began in the mid-1970s. The North Sea was a new Klondike – full of opportunities, but also deadly. Offshore operations were emerging, but vessels drifted uncontrollably in waves and currents. Anchors were heavy, impractical and often dangerous. A solution was needed, and it came from a small inland Norwegian town: Kongsberg.

"If it hadn't been for DP, there would have been no oil adventure," says Vegard Sæterlid, Kongsberg Maritime's Head of Positioning and Manoeuvring.

In the late 1970s, Professor Jens Balchen of NTH, the former Norwegian Institute of Technology, presented a bold idea: a system that could keep a vessel completely still in the open sea, without an anchor. Scepticism was widespread,

but Balchen persisted. In 1975, he convinced Kongsberg Våpenfabrikk to give the project a chance. A small team led by Nils Albert Jenssen and Steinar Sælid worked day and night to turn theory into reality. Algorithms were refined, sensors integrated and thrusters controlled with precision.

The result was groundbreaking: the world's first Norwegian DP system. On 17 May 1977, the system – named Albatross – was tested live on Stolt-Nielsen's vessel *Seaway Eagle*. It worked flawlessly. For the engineers, it was like landing on the moon. This was the beginning of a technology that would transform the global maritime industry.

What is Dynamic Positioning?

DP enables vessels to remain motionless at sea, even in waves, wind and currents. Using advanced sensors, thrusters and propellers, the system calculates and counteracts environmental forces in real time. It is used on everything from supply vessels and drilling rigs to cruise ships, research vessels and even superyachts. The benefits are clear: safer, more precise operations and countless lives saved.

Since its introduction, development has progressed at an impressive pace. Today, more than 4,000 Kongsberg Maritime DP systems operate globally – on offshore vessels, semi-submersible platforms, wind farm service ships and even aquaculture vessels. Its modern DP systems, such as K-Pos, combine sensor data with power management to ensure accurate positioning and efficient operation (see panel).

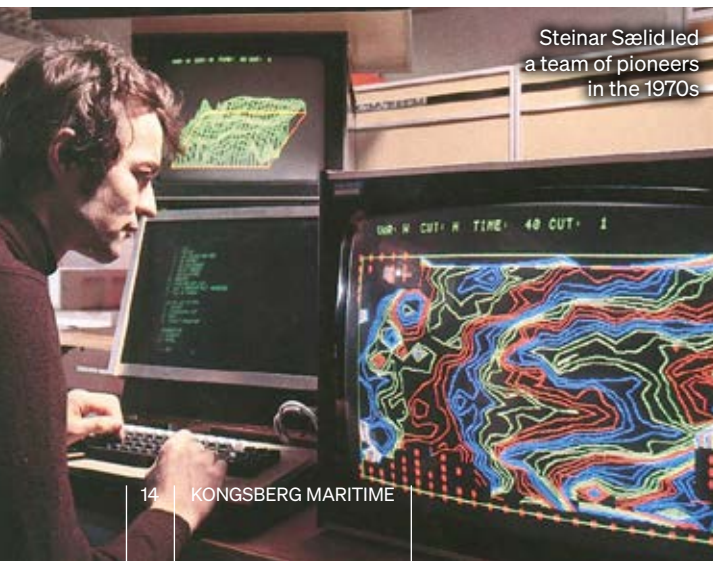
Driving the future

DP is also a key enabler of the next big shift: remote and autonomous operations. Whether commands come from a captain, a joystick or an algorithm, DP ensures the vessel moves exactly as intended. This opens new possibilities for efficiency, sustainability and safety.

A prime example is Reach Remote (see pages 20-22), an Uncrewed Surface Vessel (USV) operated remotely from



Jens Balchen,
the driving force
behind the
technology



Steinar Sælid led
a team of pioneers
in the 1970s



The technology has helped ensure the success of oil exploration

Massterly's Remote Operations Centre in Horten. "We can send it out for 30 days to perform underwater inspections and interventions – all with 90 per cent lower CO₂ emissions than a traditional vessel," explains Vegard. "Reach represents a completely new approach to offshore operations. It's disruptive."

DP also underpins concepts such as the *IWS Skywalker* CSOV, designed for the offshore wind industry. With DP, *Skywalker* can remain stable alongside and safely move between wind turbines in challenging conditions, enabling technicians to work safely and precisely.

Today, DP is an essential part of the maritime industry. It makes demanding operations safer, protects lives and enables progress in some of the world's harshest environments. Norwegian engineering didn't just set the standard for DP – it shaped an entire industry. After 50 years, Kongsberg Maritime remains at the forefront, driving innovation for the next era of offshore operations. ●

"If it hadn't been for DP, there would have been no oil adventure"



Kongsberg Maritime is inspiring innovation at sea

Strong positioning

Dynamic Positioning (DP) works by integrating multiple sensors, including GPS, motion reference units and wind sensors, with powerful thrusters and propellers. The system continuously calculates environmental forces and applies precise counteractions in real time, ensuring the vessel remains exactly where it needs to be. This level of control is vital for offshore operations, where safety and accuracy cannot be compromised.

Today, Kongsberg Maritime's latest DP solution, K-Pos, represents the pinnacle of this technology. It combines advanced sensor data with power management and intuitive user interfaces, enabling operators to maintain position efficiently while reducing fuel consumption and emissions. K-Pos is trusted globally for its reliability and adaptability across a wide range of vessel types, from offshore supply ships to windfarm service vessels.



Digital direction of travel

Kongsberg Maritime's new Digital Solutions portfolio is a modern approach to using data to provide the best and most efficient products at sea. It's safe, secure and delivers a simple solution to complex issues.

The launch of KM Digital Solutions represents Kongsberg Maritime's vision of the future – a unified digital portfolio of applications where ship owners, operators and managers can access all their digital tools and performance data securely and seamlessly.

As the maritime industry races to meet stricter environmental targets and rising efficiency demands, digitalisation has become essential. Yet many ship operators are still navigating a maze of disconnected systems from multiple providers, delivering diverse data streams that make it difficult to see the full operational picture.

The new Digital Solutions portfolio cuts through that complexity to simplify the digital experience for users, both onboard and onshore, by providing a secure and unified digital ecosystem.

Erik Korssj en, Kongsberg Maritime's Vice President Product Management – Digital, says: "Our mission is to empower safe, efficient and sustainable operations at sea. Our Digital Solutions portfolio achieves this by combining Kongsberg Maritime's digital capabilities into unified scalable solutions based on our deep maritime domain expertise. We aim to provide a secure and consistent experience for our customers across fleets, reduce complexity in mixed environments, and deliver value at scale."

The new portfolio integrates four Kongsberg Maritime product families:

The software can help ship operators maximise fleet efficiency

Vessel Insight, K-Fleet, K-IMS and Coach Solutions into a single value offering for its customers and users.

At the heart of the new application suite lies Kongsberg Maritime's Performance Solution, which supports every stage of a voyage – from planning and sailing to reporting. The Voyage Planning and Voyage Optimisation modules help ship owners balance safety, estimate time of arrival and fuel efficiency when charting routes. During sailing, Dynamic Trim Optimisation provides automated advice to improve hydrodynamic efficiency, while Hull Performance analytics flag deviations in fuel consumption so corrective measures can be taken.

After arrival, the solution turns voyage data into clear reports (including mandatory environmental reports such as CII, MRV and EU ETS, amongst others), compares plan versus actual and supports Charter Party follow-up and claims with solid, auditable evidence. A fleet view brings all vessels together for easy benchmarking and to track the impact of company initiatives across the fleet.

Digital Solutions will also help customers move from data collection to operational impact, as Erik explains: "It all begins onboard: an edge computer on the vessel collects, aggregates, compresses and stores data from control systems and sensors. Data is then transferred securely and redundantly to the Cloud, where it is contextualised and organised – ready for the applications to turn data into information.

"In the Performance Portal, users get a fleet-wide dashboard with configurable KPIs, automated alerts and drill-downs to ship, voyage and event level. The Performance Portal closes the loop by





**“Through Digital Solutions
we aim to be our customers’
trusted digitalisation partner”**

tracking before/after impact and turning proven actions into standard procedures and default settings, making improvements repeatable over time.”

In today’s era of stricter environmental regulation – from FuelEU Maritime to IMO decarbonization rules – data accuracy is paramount as shipping companies are required to track, report and verify emissions and fuel use with precision. Along with data accuracy comes data security, and that’s where Kongsberg Maritime can draw on its best-in-class cybersecurity protocols. The company’s digital applications not only meet IEC 62443 standards and the new IACS UR E27 requirements, but it was among the first organisations to receive special cybersecurity certifications from classification society DNV.

Erik adds: “Digital creates value only when it understands operations. Kongsberg Maritime’s advantage in this space is ‘domain plus digital’: we instrument and automate complex vessels at scale, so our software reflects real-world constraints – safety, latency, class and life cycle service – and turns insights into reliable outcomes, not just dashboards.

“With a dual footprint across operational technology (OT) and information technology (IT), we provide end-to-end visibility: from sensor-level data capture and equipment



Erik Korssj en
is helping drive
the digital
transformation

control on board to cloud-based analytics and decision support on shore. This delivers traceable, trusted guidance that enables safer, more efficient and more sustainable operations. Furthermore, we are well positioned for IT/OT convergence, which will translate into more real-time insights and improved decision making.”

Digital Solutions is designed to continually evolve to provide customers with not only the tools and functionality but also the advice to help them navigate their digital journey, as Erik outlines: “Our strongest differentiator is the experience and advisory behind the software. We’ve worked onboard thousands of vessels across segments, studying real operations, trends and outlier cases. We know how to read data – patterns, trends and exceptions – and convert it into clear operating guidance for bridge, engine room and shore. We co-design KPIs and trials with our customers, benchmark against similar assets, and build operational best practices, then stay engaged to verify outcomes and embed the habits for sustained improvement.

“Through Digital Solutions, we aim to be our customers’ trusted digitalisation partner – working alongside them to shape and apply digital technology that improves their operations and helps them reach their business ambitions.” ●

Full of positive energy

Kongsberg Maritime is proud to be a partner in an innovative offshore gas extraction project that is setting new standards in reliability and efficiency.

Golar LNG is redefining the offshore energy landscape with its pioneering Floating Liquefied Natural Gas (FLNG) technology. At the heart of this transformation is the company's MkII FLNG project, a bold, complex, engineering feat that builds on the success of its first and second FLNG units, the *Hilli Episeyo FLNG* and the *Golar Gimi FLNG*. With Kongsberg Maritime as a key technology partner, the MkII project is setting new standards in offshore gas extraction.

"Golar is the only proven provider of liquefaction as a service," says Morten Skjong, Golar's Chief Technical Officer. "We design, build and operate floating liquefaction, storage and offloading units."

This model enables countries with limited infrastructure to monetise offshore gas reserves by exporting LNG directly from the field, without the need for costly onshore facilities.

Golar's first FLNG unit, *Hilli*, proved the concept. Converted from an LNG carrier, it enabled Cameroon to become an LNG exporter and is now preparing for redeployment to Argentina. "We've learned a lot from the *Hilli*," says Bojan Cicovic, Golar's Senior Engineer. "It was the first FLNG built from an old LNG carrier and it proved the concept."

The MkII FLNG project builds on these lessons. The vessel is being converted from the LNG tanker *Fuji LNG*. The 290-metre ship is being lengthened by nearly 100 metres at the CIMC Raffles shipyard in Yantai, China.

The result will be a next-generation FLNG unit which will increase Golar's total liquefaction capacity by about 70 per cent, increasing capacity from 5.1 to 8.6 million tonnes per annum. "It's a \$2.2 billion investment and our biggest project yet," Morten adds.

The FLNG concept is something of an engineering marvel. "Space is a major constraint," Morten explains. "We stack everything – heat exchangers, pumps, steam turbine generators, electrical and instrument rooms, into every available square metre." The vessel must accommodate complex systems including gas turbines, cryogenic storage and steam generators, all while maintaining safety and efficiency.

Bojan highlights the operational complexity: "Onboard the *Hilli*, we typically have 70 to 100 personnel depending

on the campaign. Departments include liquefaction, marine operations, maintenance, HSE, electrical and instrumentation. Synchronisation is critical due to the compact layout and the need for rapid communication."

Kongsberg Maritime has been a trusted partner throughout Golar's FLNG journey. Morten says: "We needed experienced partners and starting with Kongsberg Maritime gave us a solid foundation from our work on the *Hilli*."

Bojan adds: "Kongsberg Maritime is not just a supplier. They work closely with us in operations, troubleshooting and implementing new ideas. Their in-house knowledge has been invaluable."

Kongsberg Maritime's scope of supply for the MkII FLNG is extensive. The contract includes a fully integrated package of electrical, control, safety and propulsion systems. At the core is the Integrated Control and Safety System (ICSS), which manages everything from process control and energy management to cargo handling, ballast and auxiliary systems. It also incorporates critical safety features such as Emergency Shutdown (ESD), Fire and Gas Detection (F&G) and Process Shutdown (PSD) systems.

"The ICSS is a key part of the overall safety system and needs to be robust and reliable," says Jan Simonsen, Kongsberg Maritime's Sales Director for Offshore Production Units. "It ensures immediate shutdowns in emergency conditions and provides full control and monitoring of all vessel operations."

"Our delivery also includes high- and low-voltage switchboards, transformers and distribution panels, as well as a full telecoms system for internal and external

"The ICSS is a key part of the overall safety system and needs to be robust and reliable. It ensures immediate shutdowns in emergency conditions"



The Hilli Episeyo was Golar's first FLNG unit

The project's complexity is heightened by the fact that it's a conversion. "We're managing existing ship equipment while also integrating a new 100-metre section," Jan says. "It can feel like a new build. Lengthening a vessel that's already 290 metres presents challenges for many systems, especially electrical."

Collaboration has been a cornerstone of the project's success. The interface between Golar, Kongsberg Maritime and the shipyard has required constant coordination and problem-solving. Jan adds: "It's a huge effort in terms of documentation, engineering and layout planning. The yard has been very responsive, and together we're working through key milestones to keep the project on track."

The MkII FLNG is designed for 20 years of continuous operation without dry docking. "As an FLNG operator that takes on eight-to-20-year contracts, Golar is reliant on quality solutions not only for the project execution phase but products and services such as Kongsberg Maritime's that will serve us reliably during the full term of the operations contract," Morten Skjong adds.

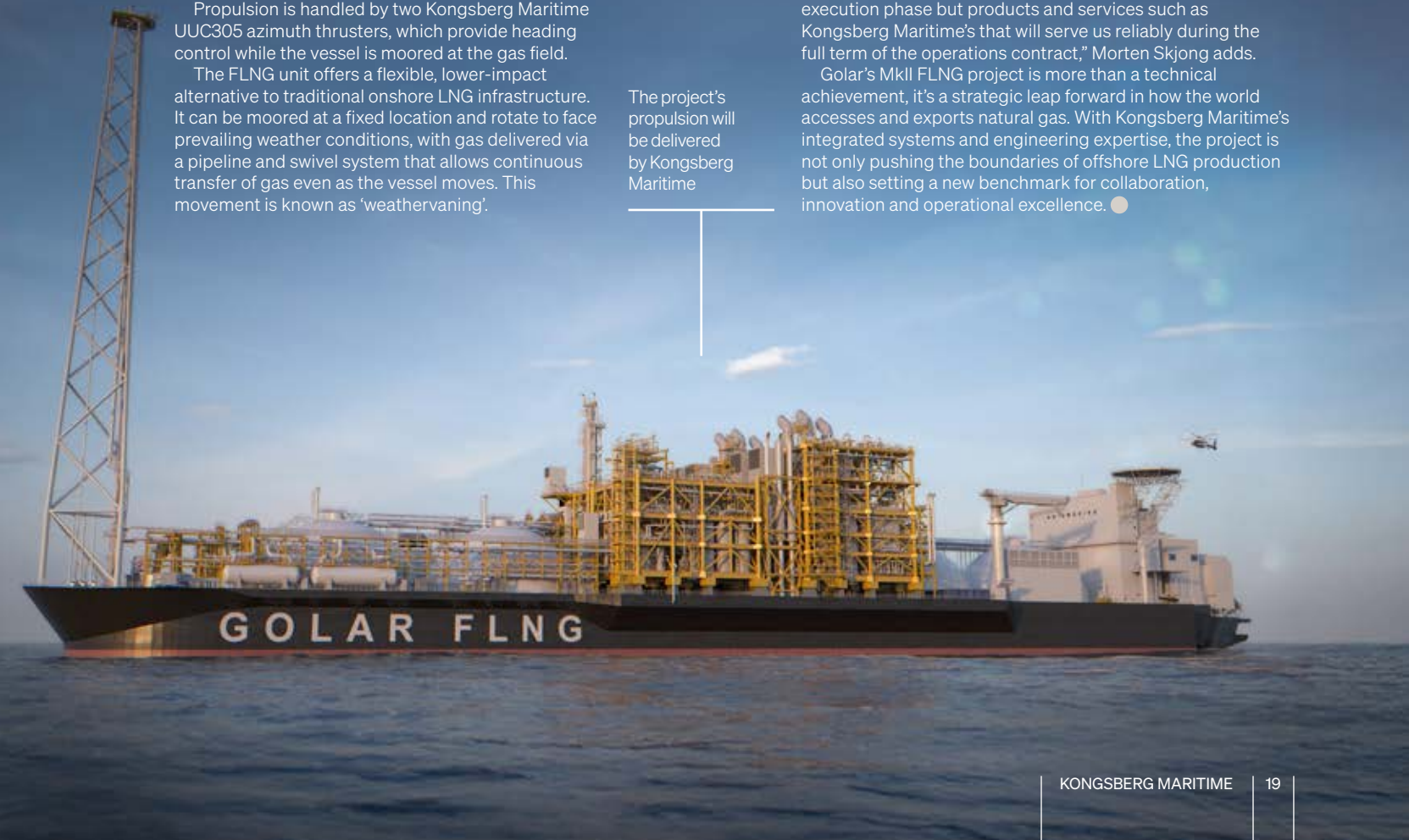
Golar's MkII FLNG project is more than a technical achievement, it's a strategic leap forward in how the world accesses and exports natural gas. With Kongsberg Maritime's integrated systems and engineering expertise, the project is not only pushing the boundaries of offshore LNG production but also setting a new benchmark for collaboration, innovation and operational excellence. ●

communications. Navigation, radar and positioning systems are part of the package, ensuring safe and efficient operations."

Propulsion is handled by two Kongsberg Maritime UUC305 azimuth thrusters, which provide heading control while the vessel is moored at the gas field.

The FLNG unit offers a flexible, lower-impact alternative to traditional onshore LNG infrastructure. It can be moored at a fixed location and rotate to face prevailing weather conditions, with gas delivered via a pipeline and swivel system that allows continuous transfer of gas even as the vessel moves. This movement is known as 'weathervaning'.

The project's propulsion will be delivered by Kongsberg Maritime





Reach Remote 2 is now in operation offshore Western Australia

Remote control

The Reach Remote project is changing the future of shipping by delivering uncrewed vessels that can be deployed around the world. It's a proud achievement for the people at Kongsberg Maritime.

When Reach Subsea launched its pioneering Reach Remote project, the vision was clear: transform subsea operations through uncrewed, remotely operated vessels. That vision is now a reality that's helping to shape the future of offshore operations.

From the first commercial deployments of *Reach Remote 1* in the North Sea to the recent arrival of *Reach Remote 2* in Australian waters, the project has achieved milestones that are redefining what's possible in marine operations.

Supported by Kongsberg Maritime's advanced technology and vessel design, Reach Remote is proving that remote and autonomous operation at sea is not just viable, but is efficient, sustainable and ready to scale up.

Reach Remote 1's debut year was marked by a series of successful campaigns demonstrating the vessel's capabilities in real-world conditions. The highlight was a reservoir survey for Shell at the Ormen Lange field, a complex operation that showcased the vessel's ability to deliver high-quality surveys.

Additional projects followed, including an IMR (Inspection, Maintenance and Repair) campaign for Equinor and an assignment for TotalEnergies. Most tasks focused on survey and non-contact inspection, though intervention work was also trialled during pilot phases.

“From a client perspective, the vessel has delivered exactly what it promised”

Main image © REACH



“The biggest learning curve has been how to organise ourselves around this new asset,” says Bjørg Mathisen Døving, Reach Remote’s Vice President. “We’ve had to rethink logistics, from containerised support systems to multi-location coordination. It’s a different mindset when your vessel is hundreds of kilometres offshore with no crew on board.”

To manage this complexity, Reach Subsea developed Reach Horizon, an in-house digital platform that streams live video, sensor data and operational logs from the vessel to stakeholders worldwide. “It’s a collaborative tool that gives everyone, from pilots to client, real-time insight into what’s happening offshore,” Bjørg explains.

Operationally, *Reach Remote 1* has performed well, though not without minor challenges. Connectivity was occasionally disrupted, because of seagulls nesting on the Starlink antennas. “These are the kinds of issues you only discover through real-world experience,” she says. “From a client perspective, the vessel has delivered exactly what it promised.”

A regulatory milestone: Sailing solo

Perhaps the most symbolic achievement of 2025 was *Reach Remote 1*’s ability to operate without an assisting vessel.

“Removing the support craft was a hard-fought victory,” says Bjørg. “The Norwegian Maritime Authority [NMA] required extensive reporting and risk assessments before granting approval. Seeing *Reach Remote 1* depart Kristiansund solo was an emotional moment for the team.”

For Marthe Kristine Sand, Kongsberg Maritime’s Project Manager, the milestone highlights the project’s disruptive potential. “Operating without a support vessel demonstrates how groundbreaking this technology is,” she says. “The fact that the *Reach Remote* now operates on its own has impressed many. The technology that we’ve developed to make remote and autonomous operations a reality is the backbone of these vessels. And this milestone wasn’t just a technical achievement, it was a regulatory breakthrough.

Marthe Kristine Sand, left, and Bjørg Mathisen Døving

“For the Kongsberg Maritime team it has been an exciting journey, from a project that started as a research programme and continued into delivery and now into operations. It’s a really proud moment for everyone involved,” Marthe says.

Australian adventure

While *Reach Remote 1* was making headlines in Norway, its sister ship was preparing for a new frontier.

Reach Remote 2 is now in Australia, reflagged under the country’s registry and cleared for operations following successful client acceptance tests. Since its first deployment in December 2025, the vessel recently completed a further 26-day remote operation offshore.

“This was a significant moment,” continues Bjørg. “We’ve proven the

concept in the North Sea and now we're demonstrating its global applicability. Number 2 performed a gWatch reservoir campaign for Woodside's Scarborough field, the same type of work we completed for Shell at Ormen Lange."

Australia represents a strategic opportunity for Reach Subsea. Local clients are mature in adopting uncrewed technology, and the assembled team brings deep expertise and strong industry connections. "We're building towards a permanent presence in the country," Bjørg confirms. "The interest from clients is high, and the USV's deployment is just the beginning."

Beyond Norway and Australia, Reach Remote is next looking towards the UK. "We're actively working with UK authorities to explore how Reach Remote can operate in British waters," Bjørg reveals. "The North Sea is essentially a shared environment and opening up UK opportunities is a natural next step."

This effort is supported by broader collaboration among European nations. The UK, Norway, Denmark, the Netherlands, Belgium, France and Germany have signed a memorandum of understanding (MOU) aimed at creating a pathway for remote and autonomous vessel operations, where Kongsberg Maritime representatives are playing a vital role as advisers to the national regulators.

"These discussions are critical," says Bjørg. "They will determine how quickly we can scale operations across borders. We're using Reach Remote as a real-world asset to help shape these frameworks."



Reach Remote 2 arrives down under in Perth, following its voyage from Norway with AAL Shipping

Fleet growth and future vision

The success of the early missions has accelerated Reach Remote's expansion plans. Orders for *Reach Remote 3* and *4* are confirmed (see panel below), supported by European funding, marking the transition from prototype to series production of Kongsberg Maritime's UT 5208 USV design.

"We've proven the business case," says Bjørg. "Now it's about scaling up. More vessels mean greater efficiency and resilience, enabling simultaneous projects across regions."

The long-term vision is ambitious: a global 'follow-the-sun' model, with vessels operating across oceans and regional ROV control centres eliminating night shifts. "Our ultimate target is a fleet operating freely on the seven oceans," she explains. "Worldwide operations, managed seamlessly across time zones, that's where we're heading."

Reach Remote has certainly moved beyond proof-of-concept. It's delivering real-world value, reshaping offshore operations and setting new standards for autonomy at sea. ●

The future, now

Kongsberg Maritime has signed a contract to deliver two more Uncrewed Surface Vessels (USVs) to Reach Subsea, expanding the pioneering Reach Remote fleet.

The move follows the success of *Reach Remote 1* and *2* and confirms the viability of large-scale remote and autonomous offshore operations.

Lisa Edvardsen Haugan, Kongsberg Maritime's President, said: "This contract reflects a growing industry confidence in our remote and autonomous technologies. The success of *Reach Remote 1* has proven that remote operations are not only viable, but they're also transformative. By delivering these vessels, we ensure seamless integration of our advanced systems and a streamlined path to deployment. The *Reach Remote 2* concept is not just a technological achievement; it's a glimpse into the future of offshore operations."



Lisa Edvardsen Haugan seals the deal with Jostein Aendal, Reach Subsea CEO



A highly flexible and automated power system is at the core of the design

Next-gen UT vessels strike Olympic gold

Efficiency, sustainability and innovation are at the heart of Kongsberg Maritime's latest subsea construction vessels – a project steered by hugely successful collaboration.

When Olympic approached Kongsberg Maritime with a request for two new subsea construction vessels, their ambitions were clear: efficiency, sustainability and innovation. These vessels, based on Kongsberg Maritime's renowned UT design family, represent a significant leap forward in offshore technology, combining advanced engineering with environmental responsibility.

Olympic's requirements went far beyond the norm. While the base case was a subsea construction vessel, the company insisted on strict targets for fuel consumption and environmental impact.

Olympic took an active role in developing the vessel's general arrangement, ensuring accommodation standards

were exceptional. This collaborative approach challenged Kongsberg Maritime's design team to think differently, an opportunity that Stig Ole Borgundvåg, Chief Designer – Subsea, describes as "a very good process with a customer who pushes us to innovate".

Unlike projects constrained by tender deadlines, these vessels were built on speculation, giving both parties time to refine the design. "We had the opportunity to do more analysis, fuel consumption calculations, power system comparisons and optimisation," says Stig Ole. This iterative process resulted in a vessel that sets new benchmarks for efficiency.

At the core of the design is a highly flexible and automated power system. Engines operate at optimal load under all normal conditions, reducing fuel consumption significantly. Heat recovery systems repurpose waste energy for electricity



Image © Cecilie-Holoy, More Media

Stig Ole
Borgundvåg

and heating, further lowering the vessel's environmental footprint. While details of the thruster configuration remain confidential, Stig Ole confirms that advanced technologies, including permanent magnet motors and rim-drive solutions, play a key role. "The set-up is optimised for Dynamic Positioning (DP), enabling the vessel to maintain station in rough weather with minimal energy use," he explains.

The vessel accommodates about 120 personnel and offers facilities more akin to a cruise ship than a traditional offshore vessel. Panoramic windows in mess rooms and day areas, spacious cabins and modern amenities reflect a growing trend – shipowners competing to provide the best living conditions for their crews.

The hull has been optimised using advanced computational tools, including machine learning techniques that allow thousands of design iterations. The result is a form tailored for DP operations and subsea work, while maintaining efficiency during transit.

Olympic's commitment to sustainability extends to future fuel flexibility. The vessels are prepared for methanol conversion, with tanks, ventilation and spaces arranged to enable a smooth transition when required. Battery technology also supports hybrid operation, though reliance on large packs is minimised thanks to the optimised power system.

Internally, Kongsberg Maritime coined the term "sustainable energy vessel" to describe this design. While intended for oil and gas projects, the vessels are equally suited to offshore wind operations, underscoring their role in the energy transition. "We wanted a name that reflects the effort and investment in reducing environmental impact," says Stig Ole.

Steel cutting for the first vessel has taken place at the CMHI shipyard in Shenzhen, China, and the first vessel is due to be delivered in 2027. ●

"The set-up is optimised for Dynamic Positioning, enabling the vessel to maintain station in rough weather with minimal energy use"

Interview

Working towards a more efficient and low-emission offshore future is vital, says **Runar Stave, Chief Technical Officer, Olympic**, with this UT 7623 design offering smarter, more sustainable and future-facing operations

“The strength of the UT 7623 lies not in any single technology but in how the different systems work seamlessly together. The combination of variable-speed generators, advanced energy storage and an integrated power management system allows the vessel to operate in an exceptionally wide range of modes while always staying close to the optimal point for fuel efficiency.



Runar Stave

Hybrid propulsion gives us the flexibility to balance battery power and diesel power dynamically, depending on the operational situation. This means we can maintain DP-class performance with fewer engines online, reduce unnecessary running hours and ensure that the engines we do use operate under ideal load conditions.

It's this holistic approach, not one component alone, that delivers the major step-change in consumption and emissions performance.

The vessel's smart energy management system continuously analyses the power demand of every operation and selects the most efficient and environmentally friendly way to supply it.

By coordinating all available power sources, the system ensures no energy is wasted and that we always operate in the most efficient mode possible. This supports Olympic's emissions-reduction objectives, by reducing fuel burn and unnecessary equipment usage across the vessel's life cycle.

Based on our analysis and benchmarking, we expect the UT 7623 design to deliver fuel and CO₂ reductions in



Fuel and CO₂ reductions of between 30 and 65 per cent are expected

the range of 30 to 65 per cent compared with comparable vessels currently sailing. In certain operational modes, we also anticipate significant reductions in maintenance requirements, thanks to fewer running hours, better load control and smarter system integration. Over the vessel's lifetime, this translates into substantial cost savings as well as a far lower environmental footprint.

Sustainability has been a core focus for Olympic for many years, long before it became industry standard. Our ESG programme is now a structured, measurable framework that guides decisions across the organisation, and the UT 7623 fits directly into this long-term direction.

We are proud that this work has been recognised externally, including being shortlisted for the OSJ Environmental Award 2026. The jury highlighted our structured ESG work, our commitment to ethics and safety, our climate transition efforts and our ambition for net zero by 2050.

These new vessels are a major step on that journey and a natural continuation of the culture we have built over decades.

Our collaboration with Kongsberg Maritime has been both inspiring and highly productive. Many of their engineers know Olympic's operational philosophy well – we've worked with several of them for decades – and that creates a unique foundation for innovation.

Their hydrodynamic and design teams have challenged every part of the vessel's interaction with the ocean, from hull form and appendages to propeller design and energy optimisation. Their willingness to 'leave no stone unturned' has been crucial in shaping a vessel that truly pushes the industry forward.

“Our collaboration with Kongsberg Maritime has been both inspiring and productive... their willingness to ‘leave no stone unturned’ has been crucial”

Olympic was the first to test rim-drive thrusters in full-scale commercial offshore operations and that experience has given us a solid technical basis for choosing the technology again. We know how it performs in demanding offshore work, both in terms of efficiency and precise manoeuvring.

For the UT 7623, rim-drive is a logical continuation of that proven approach. The response characteristics, low noise levels and reduced mechanical complexity fit well with the advanced driveline and DP philosophy, as well as supporting the high level of operational control for which these ships are designed.

For subsea operations, safety and predictability are everything. On the UT 7623, we have heavily focused on creating a clean, obstacle-free hangar to improve both operational flow and safety during ROV handling.

The Launch and Recovery System itself has been designed with greater outreach and height for improved handling of both ROV and cage. It incorporates advanced motion compensation to ensure safe operations even in challenging conditions and all winches are based on permanent magnet technology, delivering both environmental benefits and exceptional reliability.

Hybrid and smart energy solutions are not new concepts for Olympic – they have been part of our thinking and culture since the company was founded. With the UT 7623, we are taking the next natural step in that journey.

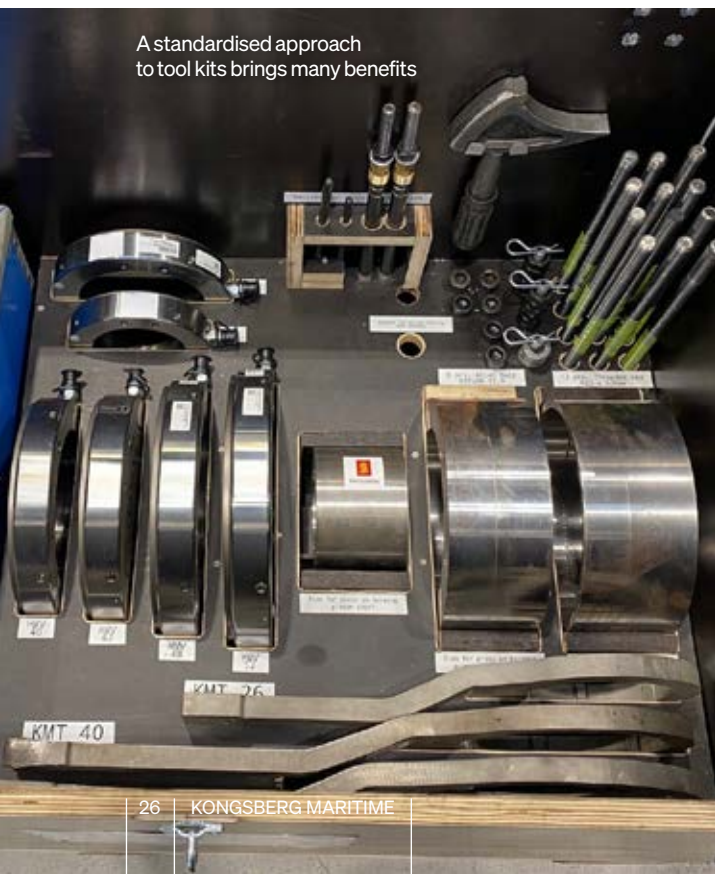
The solutions developed with Kongsberg Maritime give us a strong platform for the future, ensuring that we remain ahead of regulatory development, customer expectations and our own internal ambitions.

These technologies will continue to shape our fleet strategy as we move deliberately towards a more efficient and low-emission offshore future.” ●

Aalborg: The centre of it all

Covid-19 was a source of inspiration for Kongsberg Maritime engineers in Aalborg, Denmark. They transformed their facility from a relatively quiet service centre into a global hub for standardised tool kits for field service engineers, resulting in dramatically faster maintenance and repairs on vessels worldwide.

Aalborg has been transformed into a global hub supporting maintenance operations worldwide



In the Port of Aalborg, Denmark, a once-quiet workshop has undergone a remarkable transformation in recent years. The workshop, which traditionally served Danish shipowners and charterers, has rapidly evolved into a bustling global hub for field service tool kits supporting Kongsberg Maritime's maintenance operations worldwide. This transformation has led to faster maintenance and servicing times for shipowners and charterers. The key was Covid.

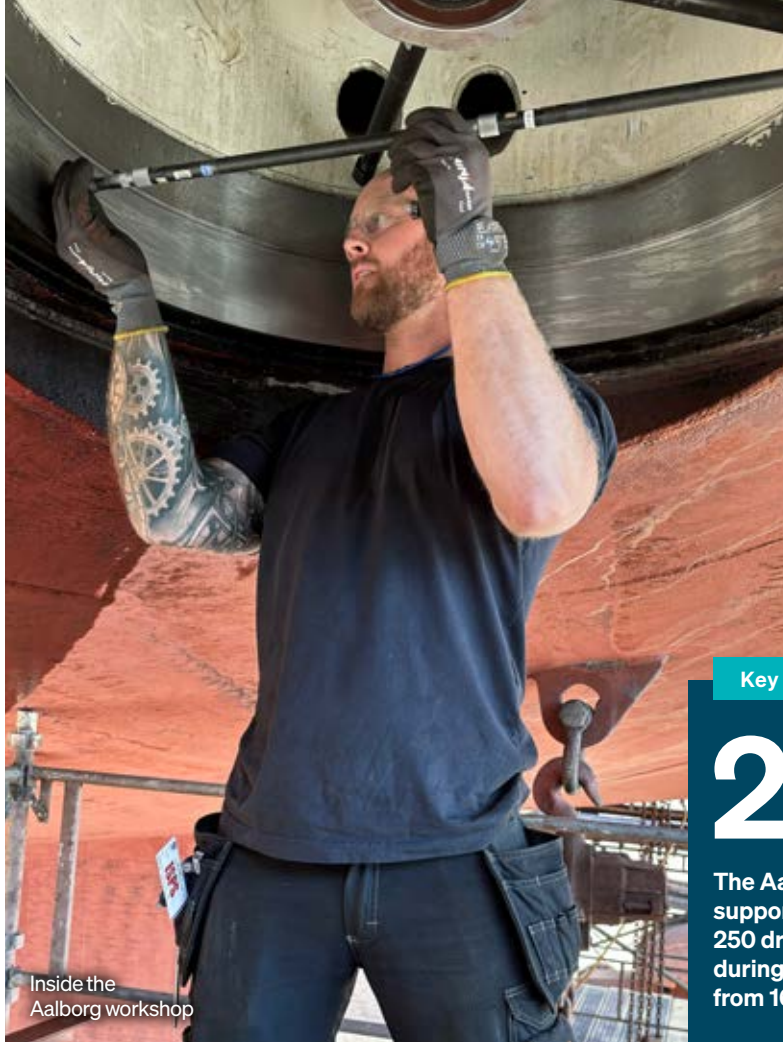


A vision for growth

The journey began in 2019 when the Aalborg workshop developed the idea for standardised toolkits for field service engineers working on dry-docked vessels. These toolkits have since become a key feature of Kongsberg Maritime's global field service operations.

The project was the brainchild of Rasmus Ydegaard, the company's Aalborg Workshop Manager and a former field service engineer. He understood the challenges engineers faced when working on docked vessels in remote locations. Highly specialised and expensive tools needed by service engineers might not be immediately available, causing delays. Shipyards might not have such equipment as specialised hydraulic wrenches or unique lifting gear on hand when field engineers arrive.

"We decided that we needed to do something dramatic," recalls Rasmus. "We saw an opportunity to streamline our operations and provide better



Inside the Aalborg workshop

Rasmus says. “However, we are continuously expanding our tool inventory and hiring new staff to keep up with demand.”

With a growing team and an expanding inventory of specialised tools, the workshop is well-positioned to continue as a global hub for field service tooling. The team is also exploring new opportunities, such as on-site machining, which will allow company engineers to carry out advanced repairs directly on vessels, further reducing downtime and costs for customers.

“We have all the technical information: tech support, machine drawings, know-how and repair procedures,” Rasmus says, and he has high ambitions for his workshop. “We also have the skilled people, and extra machinists were hired recently.”

“We are constantly looking for ways to innovate and improve our services,” he continues. “Our goal is to provide the best possible support to our engineers and customers, ensuring that they have the tools and resources they need to succeed.”

The Aalborg workshop has been so successful that Kongsberg Maritime will develop the concept into key global hubs, cutting maintenance time even more.

“Right now, we are effectively controlling and coordinating everything from Aalborg. Where we want to be is to have regional hubs, similar to Aalborg. This would make servicing in the Americas and Asia-Pacific even faster than it is now,” says Tony Cove, the company’s Head of Global Workshops. ●

Key fact:

250

The Aalborg team supported more than 250 dry dockings during 2025, up from 160 in 2024.

support to our engineers in the field,” he says, adding that by addressing this challenge, he and his colleagues could ensure quicker turnaround times, while improving the quality and safety of the task. By using Kongsberg Maritime tooling, the calibration and certification is guaranteed, and the correct tools are always available. This makes the work safer and more controlled for the field service engineers.

The key to everything was getting the toolkit and the delivery system right. Standardised containers, arrangements and accounting, backed up by rigorous measuring and calibrating of tools, ensured that Kongsberg Maritime field service engineers would arrive on site and be able to start work without delays.

Though work began on the toolkit idea in 2019, it was the Covid pandemic that accelerated things. “During lockdown we weren’t as busy with regular operations, so we used that time to create and perfect our toolkits,” Rasmus explains. “It was a period of intense focus and innovation.”

His idea has taken off and the Aalborg office now distributes its toolkits to docked vessels worldwide.

The transformation of the workshop has not been without its challenges. Managing the logistics of shipping tools to various locations around the world requires plenty of coordination and planning. Aalborg currently has 13 administrative personnel, 26 field service engineers and 10 workshop engineers. The team supported more than 250 dry dockings during 2025, up from 160 in 2024.

“We face bottlenecks, either in tooling or human resources,”



The upgrade of *Baltic Queen* has delivered many game-changing improvements. New propellers use less fuel, are better for the planet and have reduced noise levels.

A quiet revolution in ship technology

When Tallink Group decided to upgrade the propellers on its cruise vessel, *Baltic Queen*, the goal was clear: cut fuel consumption, reduce emissions and improve environmental performance without compromising its schedule.

Today, that decision is paying off as fuel and emissions are down, together with an added bonus of reduced underwater noise, all thanks to the new propeller profile.

Operating the busy route between Stockholm and Tallinn, with a stop at the Åland islands, the *Baltic Queen* is more than a ferry, it's a vital link between nations.

At 212 metres and carrying up to 2,800 passengers, the vessel runs a tight overnight schedule at speeds of 17 to 18 knots.

"We operate like a bridge between countries," says Andrus Vaher, Tallink's Fleet Environmental Compliance Officer.

"Passengers can enjoy entertainment overnight and arrive fresh in the morning. It's a popular choice for business and leisure travellers alike."

Despite its efficiency, *Baltic Queen's* operational profile required three main engines on certain legs to maintain schedule. With four engines powering twin shafts and Kongsberg Maritime controllably pitch propellers (CPP), the team saw potential to optimise performance. "We constantly search for possibilities to increase efficiency and reduce fuel consumption across our fleet," he explains. "We believed there was a way to run on two engines throughout the trip."

That's where Kongsberg Maritime came in, and with hydrodynamics and naval architecture expertise, the intervention proved decisive. After



The new propeller system has improved efficiency and reduced emissions



Baltic Queen is now more energy-efficient during journeys



feasibility studies and simulations, the solution was clear: re-blade the CPPs to improve propulsion efficiency.

“Timing was critical,” says Andrus, as the upgrade had to align with *Baltic Queen’s* dry dock in September 2023. “Looking back, everything was deployed in due time and that’s a good recipe for success,” he recalls.

The project involved replacing propeller blades and conducting sea trials to validate performance.

Andrus praises Kongsberg Maritime’s role: “All answers and solutions from the company were extremely helpful and everything worked just fine. The performance even exceeded what was promised – a pleasant surprise.”

The impact was immediate. *Baltic Queen* now completes its crossings using two main engines instead of three, thanks to optimised blade geometry. Fuel consumption dropped by an average of 13 per cent per trip, saving about 4.5 tonnes of fuel on each crossing. “Such a fuel reduction is huge for a ship like this,” says Andrus. “With each voyage consuming around 35 tonnes of fuel, the annual savings are substantial, both financially and environmentally.”

Verification was key. Tallink compared post-upgrade data against years of historic records on the same route. “Verification is very important for us to see if the ROI is as promised,” he notes. The results confirmed the projections, and then some.

Fuel savings translate directly into lower greenhouse gas emissions, aligning with Tallink’s sustainability strategy. But the benefits didn’t stop there. In collaboration with Tallinn

Andrus Vaher has been impressed by Kongsberg Maritime’s performance

The ship provides high-quality facilities for its passengers



Technical University (TalTech), Tallink measured underwater radiated noise before and after the upgrade.

The measurement report concluded that: "Taking into account the whole calculated ship spectrum (20 - 20 000 Hz), the broadband source level of the ship was reduced by about 8 dB after the refit. For context, an 8 dB noise reduction is a significant and easily noticeable decrease in sound intensity, though not quite half the loudness which is perceived at 10 dB reduction."

This represents a considerable reduction in underwater noise, and a forward-thinking move as the International Maritime Organization (IMO) explores future noise regulations.

"We wanted to be forward-thinking," Andrus says. "And we monitored a considerable reduction in underwater noise. The project has attracted interest from the international maritime community and now forms one of the data inputs for developing global guidelines."

Passenger comfort improved too. *Baltic Queen's* Masters reported less vibration during manoeuvring, which has been a subjective but welcome bonus.

For Tallink, the upgrade reinforces its commitment to sustainability. The company published its first ESG CSR-aligned sustainability report in 2025, featuring *Baltic Queen's* success story. "We constantly work with Kongsberg Maritime to see what gains we can get from different solutions," Andrus says. Feasibility studies are under way for other vessels, though route-specific economics will dictate viability.

"We constantly work with Kongsberg Maritime to see what gains we can get from different solutions"

He is crystal clear about Kongsberg Maritime's contribution: "We highly appreciate the technical knowledge, such as the hydrodynamics and the understanding of naval architecture. We are not naval architects, so having that expertise was crucial. From concept to execution, the collaboration delivered beyond our expectations."

Tallink operates one of the Baltic's most extensive ferry networks, connecting Estonia, Finland and Sweden. Its vessels are more than transport – they're cultural and economic lifelines. "We have achieved a strong position of providing the reliable services that our customers have become accustomed to appreciate," he notes, demonstrating the importance of maintaining reliable schedules.

As sustainability pressures mount, from EU ETS compliance to IMO decarbonisation targets, projects such as *Baltic Queen's* propeller upgrade set a clear direction for innovation in reducing emissions. "It's been highly successful," Andrus concludes. "And it shows what's possible when you combine operational insight with world-class engineering." ●



Passengers can enjoy the *Baltic Queen's* buffet



The ship's cabins are the perfect place to relax and unwind



Safe and sound attitudes

The risk of cyber crime is a clear and present danger for the shipping industry, however Kongsberg Maritime's experts are working hard to keep vessels and crews secure.

When Kongsberg Maritime announced DNV type approval for its ship systems in 2024, it marked a major milestone in maritime cybersecurity. However, as Oscar Kallerdahl, the company's Director of Business Development at Product Cybersecurity, says, the story has moved on.

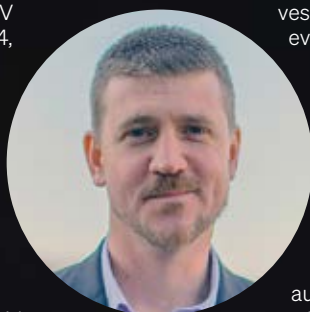
"Certification for our products was the first step," explains Oscar. "We have also taken the second step by defining our Kongsberg Integrated Network, which is a zoned architecture complying with IACS UR E26.

"We use our integrated network to ensure consistency and quality in all system deliveries, both large and small, with standardised documentation for product and system levels that make the process of integration and vessel certification much more efficient," Oscar explains. "It reduces engineering effort and risk. Essentially, we're implementing the 'defence-in-depth' philosophy in a very concrete way."

The third step is to support customers' operations to reduce risks and stay compliant through the lifetime of the vessel with services such as Kongsberg Remote Support, Malware Protection System (MPS), Intrusion Detection System (IDS), Asset Inventory and our 24/7 Global Customer Support.

"Now we're helping customers go further, especially those with sailing vessels and rigs, asking how they can be more cyber secure."

The biggest change to the company's offering is the move into cybersecurity advisory services. "Owners of older



Oscar Kallerdahl,
Director
for Product
Cybersecurity

vessels are asking how to improve security without replacing everything," says Oscar.

The company now offers product and system upgrades, as in most cases customers are looking at how to improve security but not necessarily to achieve IACS UR E26 certification. For those cases, Kongsberg Maritime can offer a partial system upgrade with recommendations on which actions will give the most impact on reducing risk.

The cybersecurity team has completed gap and risk assessments for several vessels, including remote and autonomous vessels, analysing all the requirements and reviewing the risks across all installed products. Advisory reports show customers where high-risk areas are and how to reduce them. "It's about understanding risk in detail and implementing actions to increase resilience," Oscar emphasises. "If something fails, the impact should be limited and predicted, not catastrophic."

"Cybersecurity is now central to our promise of quality. And it is our focus to ensure Kongsberg Maritime quality in the cybersecurity context, to be a trusted partner to owners and operators in designing and updating their vessels for secure operations," Oscar says.

And the stakes are high: recent industry disruptions have shown how costly cyber incidents can be.

"Whether you operate one vessel or a fleet, cyber risk is real. The key is starting now, to understand the risks and implement the functionalities that enable resilient operation." ●



An electric avenue to greener ships

Improved technology and new regulations are the driving force behind a move towards fully electric vessels, with Kongsberg Maritime at the heart of the action.



Efficient battery technology means that electric vessels are now a possibility

For years, the idea of large, fully electric ships felt like a distant ambition.

Today, that future is within reach. Battery technology has matured, costs have fallen and new regulations are reshaping the economics of shipping.

For RoPax vessels, especially cargo-focused designs, the case for going fully electric is stronger than ever. Oskar

Levander, Kongsberg Maritime's VP Business Development – Emerging Solutions, explains the potential decarbonising of major transport routes.

"We're at a tipping point," says Oskar. "What seemed futuristic five years ago is now commercially viable."

The European Union has made its intentions clear: shipping must decarbonise. Two key regulations – EU ETS (Emissions

Trading System) and FuelEU Maritime – are changing the game. ETS now applies to vessels over 5,000 GT operating in EU waters, requiring shipowners to buy allowances for every tonne of CO₂ emitted. He adds: "FuelEU focuses on greenhouse gas intensity in marine fuels, pushing operators towards renewable energy sources. Compliance isn't just about efficiency; it's about clean energy."

"These regulations don't just penalise emissions, they reward the use of clean energy," Oskar explains. "A battery-electric vessel can actually generate compliance revenue, not just savings."

Kongsberg Maritime carried out an extensive study, looking at a variety of European ferry routes, from the Mediterranean to the Gulf of Finland. Oskar says: "We analysed total costs for diesel versus battery-electric RoPax vessels over the period between 2030 and 2040.

“The results were clear: electric RoPax ships can deliver 8 to 15 per cent lower lifetime costs despite higher upfront investment,” Oskar notes.

“Additionally, operational expenditure [OpEx] savings range from 20 to 27 per cent, thanks to lower energy costs and zero ETS exposure. We looked at a lot of routes, but some of the most potential routes are across the Gulf of Finland and the English Channel!”

These busy routes are favourable because of the short distances and frequent sailings making them ideal for electrification.

Just two years ago, diesel RoPax vessels were clearly cheaper than their electric counterparts. That’s no longer true. Battery prices have fallen sharply, and ETS costs for fossil-fuel ships are significant, adding millions of euros annually to the costs of operating on busy routes such as Tallinn to Helsinki or Dover to Calais.

“FuelEU adds further penalties for conventional fuels, while electric vessels with zero emissions can earn extra revenue by pooling with other vessels,” says Oskar. “Battery-electric RoPax vessels can cut operating costs and generate extra income and thereby reduce total annual costs by millions of Euros.”

Kongsberg Maritime has developed two vessel designs: one for cargo and one for passengers. The cargo RoPax design optimises speed and schedule.

Oskar says: “Looking at the Vuosaari [Finland] to Muuga [Estonia] route, that means operating at slower speeds, around 16 knots, and having four crossings per day instead of six. This reduces energy demand and cargo throughput is kept unchanged by increasing lane metres for trucks and trailers. Propulsion comes from two Kongsberg Maritime Elegance electric pods for high efficiency and manoeuvrability.”

Battery capacity ranges from 35–56 MWh, with modular compartments along the hull sides for easy expansion. The simplified layout uses straight walls and fewer watertight doors, reducing complexity and building cost.

“We’ve integrated intelligent energy management, modular battery rooms and heat pump systems to replace waste heat from engines,” he says. “It’s practical, efficient and future-ready.”

“Regulations don’t just penalise emissions, they reward the use of clean energy”

The passenger-focused concept targets higher speeds of up to 20 knots and combines a centre shaft line and controllable pitch propeller (CPP) with two pods for added power to suit the higher speed operation. It features extensive public spaces, tax-free retail and cabins arranged for comfort, making it ideal for routes such as Tallinn to Helsinki where passenger demand is high. Battery capacity can reach 100 MWh,

supported by advanced energy management systems.

“Passenger RoPax vessels pose unique challenges,” Oskar explains. “They require more power and faster charging, but the principles of electrification remain the same: efficiency, sustainability and customer appeal.”

Electrification isn’t without hurdles. “The biggest is the charging infrastructure. High-power connections aren’t available everywhere and ports must invest.

“Collaboration between shipowners, ports, grid operators and even cargo owners is essential. So, this is a systems and operational challenge, not just a shipdesign challenge.

“For RoPax operators, the question isn’t if electrification will happen, it’s when,” he concludes. “From where I stand, that time is now.” ●



Oskar Levander is focused on creating ships that are kinder to the planet

Battery powered vessels cut operating costs



From classroom to capability

From its Aberdeen training centre, Kongsberg Maritime delivers training that ensures maritime professionals develop vital skills for the future.



Aberdeen harbour

In today's maritime industry, competence isn't optional – it's a lifeline. Offshore operations are becoming more complex, safety standards more stringent and the energy transition is reshaping the sector.

For marine professionals, practical, high-quality training is the key to staying ahead. At Kongsberg Maritime's training centre in Aberdeen, they don't just teach – they transform capability into confidence, ensuring crews are prepared for the toughest challenges offshore.

Meeting needs through innovation

The training centre's portfolio is built around real-world applications. From Dynamic Positioning (DP) and anchor handling, to USBL/HiPAP positioning systems and K-Chief automation, every course combines theory with immersive, hands-on practice.

Delegates train on identical software to onboard systems and advanced simulators, mastering system setup, calibration, troubleshooting and emergency response in a safe, controlled environment.

The centre caters to all roles – operators, engineers, technicians, surveyors and managers – offering both standardised programmes and bespoke courses tailored to vessel types and operational scenarios. Customised sessions for DP operators and electro-technology officers earn exceptional feedback for their depth and relevance, proving that flexibility and precision are key to effective training.



Aberdeen's flagship K-Sim offshore DP3 anchor handling simulator, a £250,000 investment, represents a leap forward in maritime training. Using physics-based simulations, hydrodynamic modelling and additional specialist software applications, it is possible to replicate lifelike conditions for pipelay, drilling, heavy-lift operations and emergency scenarios. Delegates rehearse complex manoeuvres, failures, procedures and test responses without the risks or costs of on-the-job training.

"The simulator is impressive, and we use it to push delegates out of their comfort zone," says Mark McIntosh, the centre's Team Manager. "We throw in unexpected events and monitor how they respond as that's what happens offshore."

Beyond DP, the simulator supports anchor handling, tow assist and tensioning operations, as well as emerging applications such as floating wind projects. "We can simulate laying anchors, tensioning lines and towing barges for wind turbine installation," Mark adds. This capability positions the company's Aberdeen centre as a critical resource for the energy transition.

Demand for training remains strong and more than 800 delegates attend courses each year. To meet evolving requirements, the team has introduced multi-week intensive programmes alongside established short courses, enabling

deeper engagement with complex systems. These developments reflect the industry's need for advanced competence and ongoing certification renewals.

The centre's instructors are specialists with real-world experience – many are former mariners or technical experts – bringing practical insight to every session. Training scenarios are designed to challenge delegates, with unexpected events introduced to test decision-making under pressure. On some DP emergency response courses, a psychologist adds a human-factors dimension, monitoring teamwork and communication – all critical skills for high-stakes offshore operations.

Aberdeen is more than a location – it's a strategic advantage. As the beating heart of the North Sea energy sector, the team is surrounded by major operators and supply chain partners. "Some customers have offices across the road," notes Nicole Allardyce, Training Coordinator. This proximity enables rapid response to client needs and strengthens collaboration.

As offshore wind and renewables gain momentum, the role the team plays is evolving. Their expertise and technology make them an essential resource for training the next generation of maritime professionals.

Delegates consistently highlight three things: practicality, realism and confidence-building. They value training delivered by instructors with extensive real-world experience in a welcoming, professional environment. Nicole explains: "We see a lot of familiar faces. People come back because



K-Sim simulation software training is available

they feel comfortable here. We act as hosts, helping with questions about the centre and even the local area."

Success isn't measured by certificates alone – it's seen in safer operations, fewer errors and improved efficiency offshore.

While virtual learning has its place, nothing compares to the immersive experience of hands-on training with simulators and expert instructors. Post-pandemic, demand for classroom-based learning remains strong because practical competence cannot be fully achieved online.

Aberdeen is part of Kongsberg Maritime's global training network, ensuring consistent standards while addressing regional needs. Expansion plans in Greece, Dubai and other strategic locations reinforce the commitment to supporting customers worldwide. ●

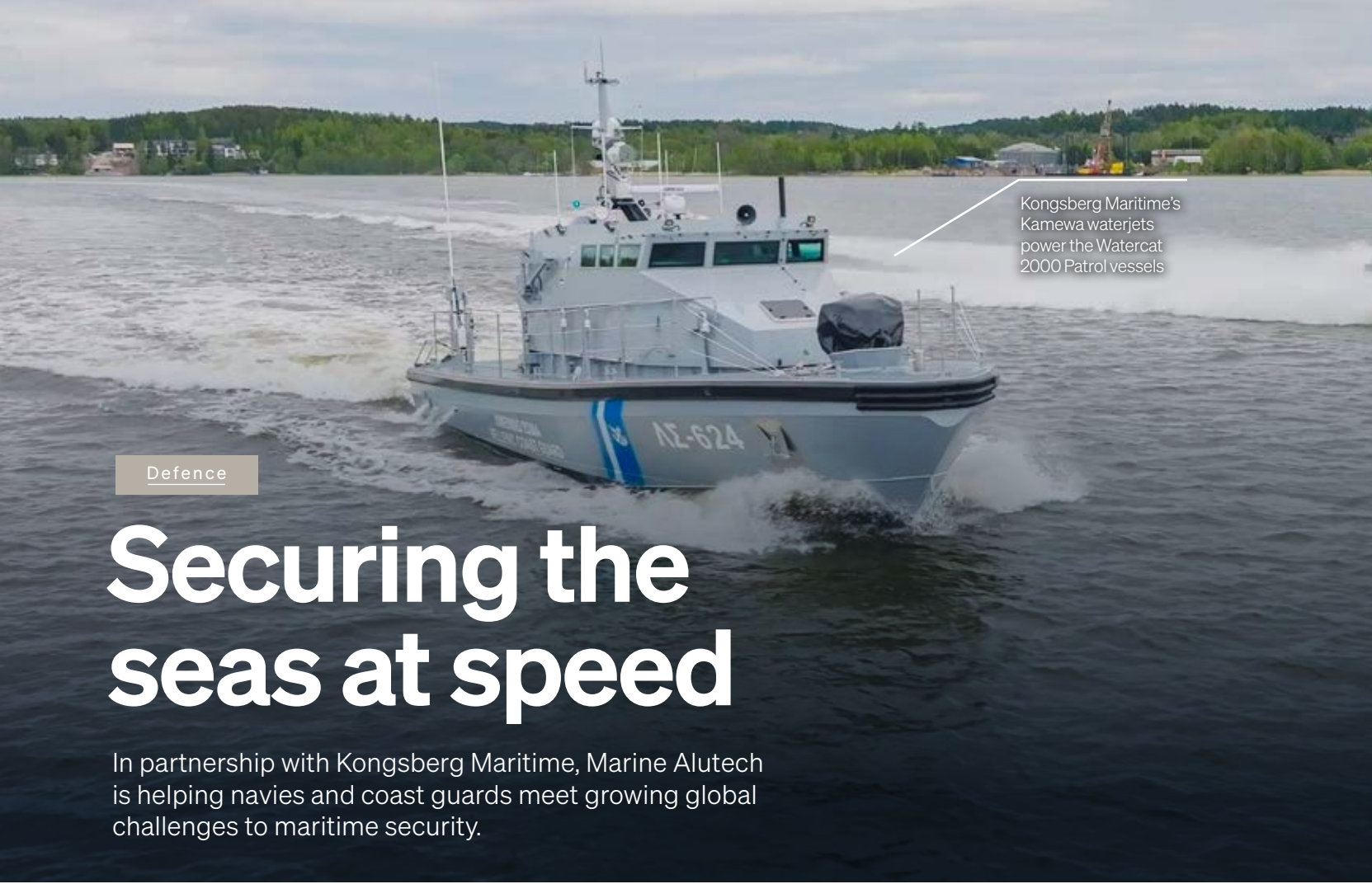
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Training under way in Aberdeen

Seal of approval

Feedback speaks volumes: "The facility itself was very nice... the staff were very friendly and helpful. The course was very informative and the instructor was very knowledgeable. All round, a great experience. I've been doing similar style training courses for over a decade and this was by far the best yet."



Kongsberg Maritime's Kamewa waterjets power the Watercat 2000 Patrol vessels

Defence

Securing the seas at speed

In partnership with Kongsberg Maritime, Marine Alutech is helping navies and coast guards meet growing global challenges to maritime security.

For more than 30 years, Marine Alutech has been synonymous with advanced naval craft designed for demanding missions worldwide.

From its base in Teijo, Finland, the company has grown into a global specialist in high-speed aluminium and composite boats for defence, security and safety authorities.

Today, as a major customer for Kongsberg Maritime's Kamewa waterjets, Marine Alutech is a trusted partner for navies and coast guards, delivering versatile Watercat® vessels that combine proven performance with cutting-edge technology, true to its ethos of *Securing Seas. Together.*

Marine Alutech's transformation over the past decade is striking. Since 2015, the company has increased its workforce fivefold and achieved an annual turnover of around €50 million. Export accounts for roughly 60 per cent of business, supported by Finland's NATO membership, which has opened up new opportunities and improved collaboration.

"Being part of NATO changes the dynamic," says CEO Niko Haro. "We have greater openness in discussions and access to programmes across allied nations. It's a two-way street. Finland benefits from shared expertise, and we contribute our experience in specialised craft for coastal defence."

Global naval priorities have shifted rapidly since Covid-19 and the war in Ukraine. Defence budgets are rising, but resources, especially skilled personnel, remain

tight. Customers want proven designs delivered fast, with enhanced performance and integrated technology.

"Navies aren't asking for radical new concepts," Niko explains. "They need vessels quickly, based on platforms that work. At the same time, requirements are increasing – more electronics, more automation and higher speeds."

Speed is a critical factor, particularly in regions such as the Mediterranean, where smugglers often operate at 60 knots using high-powered outboard engines. "Coast Guard vessels at 50 knots can't catch them," Niko notes. "Surveillance and interdiction strategies are evolving, but speed remains a decisive capability."

This demand drives innovation in hull design, propulsion systems and weight management. "Every kilo matters," Niko says. "Customers add more gear, ballistic protection and electronics, which impacts upon displacement and speed. Balancing these factors is a constant challenge."

“Navies aren’t asking for radical new concepts. They need vessels quickly, based on platforms that work”



A Watercat M12 vessel on patrol



Marine Alutech's production reflects a major shift in naval architecture: the rise of electrical and automation systems. "Ten years ago, boats were purely mechanical," he says. "Today, if you lose electricity, nothing works. We now employ more electricians in production and our design team is focused on electrical and automation. The balance has changed."

This expertise in combining aluminium hull construction with advanced electrical systems is a core strength.

At the heart of Marine Alutech's high-speed craft is the waterjet, a core technology where Kongsberg Maritime plays a vital role. "The Kamewa waterjet is a proven product," Niko says. "But every programme demands optimisation. We work closely with Kongsberg Maritime on hydrodynamics to achieve the speed and performance our customers expect."

Collaboration extends beyond product selection. "We plan the entire life cycle," Niko explains. "Corrosion resistance, reliability and cost-effectiveness are critical. Customers compare life cycle costs, so we need to present the most sustainable solution."

Speed requirements continue to rise. Niko says: "Customers want more speed, but it's not just about raw power. We look at hull design, displacement and propulsion efficiency. Increasing engine power doesn't always mean a bigger jet, it's about matching power and displacement to achieve the right balance."

As vessels become more complex, life cycle support is essential. "Customers need more than maintenance, they need upgrades and technical assistance," he says. Marine Alutech provides service agreements and works with Kongsberg Maritime to ensure global support for waterjets.

"Our relationship with Kongsberg Maritime can be described as a partnership more than a supplier-customer role," adds Masi Määttä, Kongsberg Maritime's Sales Director – Waterjets. "We have been part of many projects and programmes together over decades, delivering more than 500 waterjets. Collaboration is a key part of our success."

Marine Alutech's order book reflects strong demand. The Finnish Navy remains a cornerstone customer, alongside significant programmes for the Dutch Navy and Hellenic Coast Guard. "We've expanded from four to seven production lines," Haro says. "We're delivering a record number of vessels this year."

Marine Alutech's success is rooted in collaboration, with customers and with technology partners such as Kongsberg Maritime. "Strong partnerships help us deliver proven solutions faster, meet demanding performance targets and support customers throughout the life cycle," Niko concludes. ●



Marine Alutech CEO Niko Haro

Innovation

Cool technology delivers polar performance

By collecting real-world data from embedded propeller sensors, Kongsberg Maritime aims to redefine global ice-class propulsion standards.

Operating in the world's harshest environments demands more than robust engineering – it requires innovation and collaboration. Kongsberg Maritime took both to new levels during a pioneering trial aboard the British Antarctic Survey's (BAS)-operated research vessel, *RRS Sir David Attenborough*, where a sensor-equipped propeller blade captured real-world loads as the ship worked in Antarctic sea ice.

Built to Polar Code standards and Polar Class 3, the vessel regularly operates in ice up to one-metre thick while maintaining a maximum draft of 7.5 metres to access remote polar stations. Silent operation is critical for scientific accuracy, so the hull form, twin skegs and bow design minimise bubbles and underwater noise. Inside, advanced

Sensor technology is embedded in a propeller



The RRS Sir David Attenborough

laboratories, container-ready decks and mission-support features, from anti-roll tanks to a hospital and gym, enabled complex science at the frontier.

At the heart of the propulsion system is Kongsberg Maritime's Promas solution, a five-blade controllable pitch propeller (CPP) optimised for ice milling and integrated with a hydrodynamic rudder profile. For the trial, engineers installed strain gauges inside one stainless-steel blade to measure forces encountered under true Antarctic conditions. The installation was carried out at Kongsberg Maritime's propulsion facility in Kristinehamn, Sweden, where recesses were milled, two gauges were embedded and welds were executed to withstand the rigours of repeated ice contact.

The programme focused on the Weddell Sea, with test sites around James Ross Island and the eastern Antarctic Peninsula, areas influenced by the Weddell Gyre's 'conveyor belt' of sea ice. Divers entered the water via a tethered cage lowered over the stern and connected to a port at the blade root to download data and recharge the instrumentation. With an eight to 10-hour battery window, dive operations took place twice daily. The ship was exercised in two principal regimes: level fast ice (attached to the coast and stationary) and large floes with pressure ridges formed by wind and current. Turning manoeuvres in fast ice and controlled "glancing blow" passes at floe edges added complementary hull-pressure data.

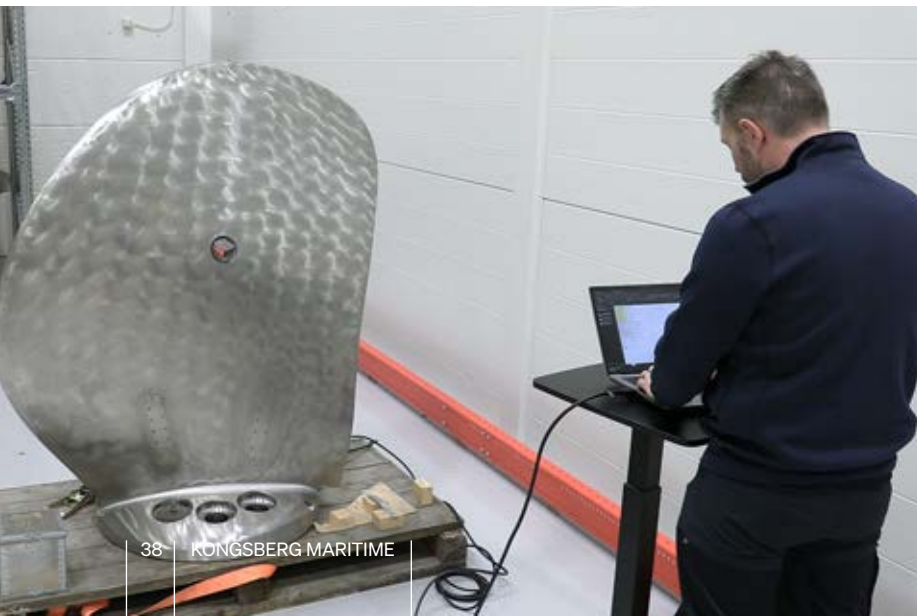




Image © Jenna Plank, British Antarctic Survey



Chris Hall

BAS and partner teams combined multiple measurement streams. In addition to the instrumented propeller and strain gauges on the propeller shafts, borescopes captured imagery of ice moving under the hull, and hull-mounted pressure sensors logged contact events. Aker Arctic Technology led the ice trials, drawing on its experience in polar vessel performance. Lloyd's Register provided strain-gauge and borescope systems, while the American Bureau of Shipping (ABS) Canada contributed lidar, camera and thermal imaging to characterise ice conditions in real time. BAS specialists coordinated operations, using satellite and drone imagery to select optimal sites and quantify ice properties – thickness, salinity, temperature and crushing strength – before, during and after transits.

The objective was to validate propeller performance under representative ice loads and to understand whether operating approvals could, in the future, be extended to higher ice classes. The measurements also informed optimal pitch strategies in varying ice types, promising gains in

“There was excellent collaboration from all parties to plan and execute this trial, in very challenging conditions”

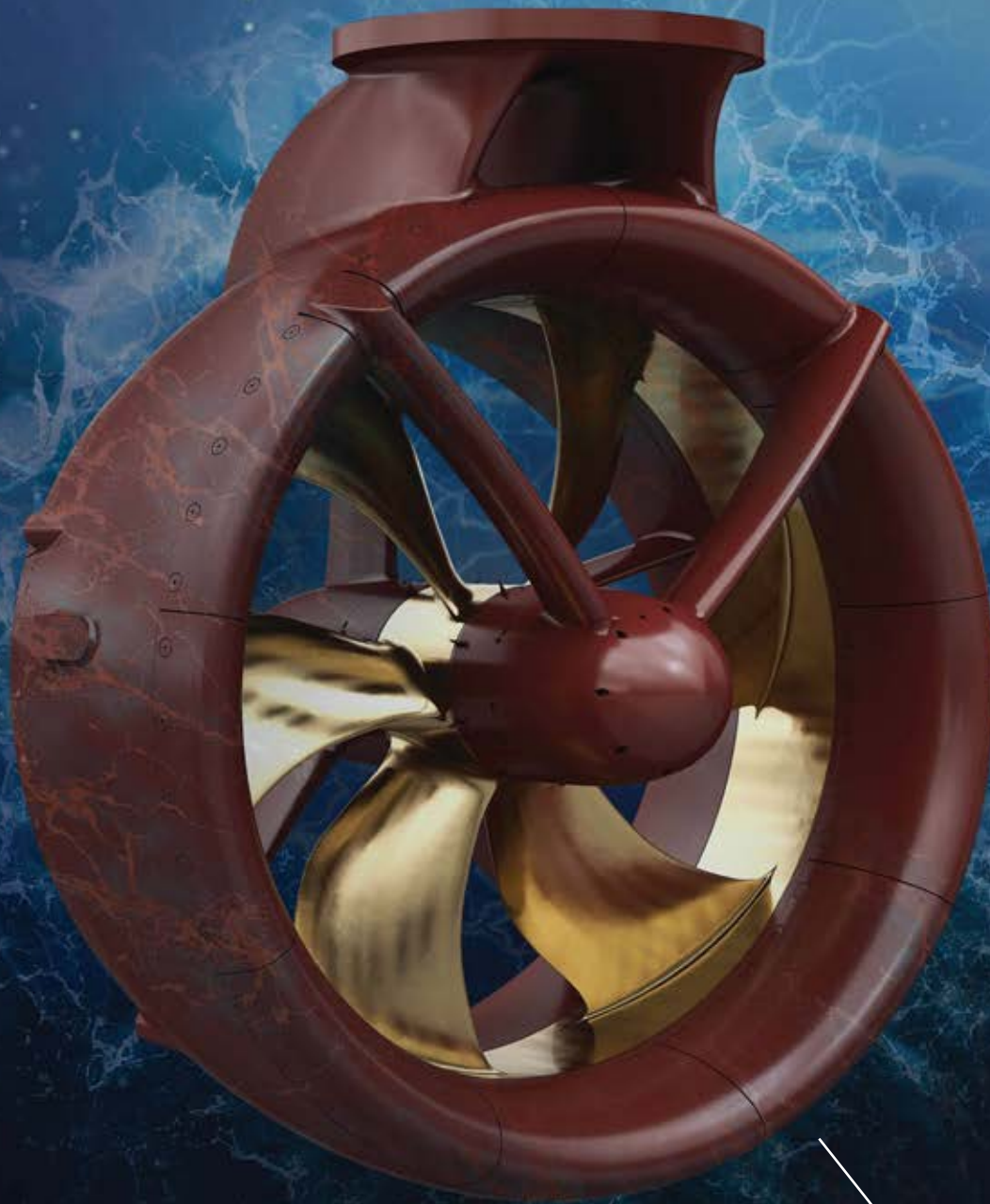
safety, efficiency and fuel use. For BAS, the potential benefits included shorter transits, wider operating windows and more resilient science scheduling.

Chris Hall, Kongsberg Maritime's Senior Hydrodynamicist, was onboard and analysed datasets daily. He says: "We've spent decades refining ice-class propulsion systems, and this trial aboard the [RRS] *Sir David Attenborough* was a unique opportunity to validate that expertise in some of the most demanding conditions on Earth. By capturing real-world data on how propellers interact with sea ice, we can push the boundaries of vessel performance and safety in polar regions. The insights gained here could transform how ships operate in ice, improving efficiency and resilience for future generations of polar research and commercial vessels."

From BAS's perspective, location and timing were pivotal. Andrew Fleming, its Head of Mapping and GIS, notes: "The area we selected to conduct the trials is the Weddell Gyre, a circular ocean current. This creates a conveyor belt of sea ice that moves northward along the coast. This area typically has sea ice year-round and provided good conditions for testing. The timing was crucial – we needed fast ice, ideally first-year ice, and around one-metre thick with approximately 20 centimetres of snow cover. The sea ice conditions are extremely variable, so we looked for the perfect ice conditions for our tests using a combination of satellite imagery and drones."

The project demonstrated how Kongsberg Maritime supports customers wherever they operate in the world. Chris adds: "There was excellent collaboration from all parties to plan and execute this trial in very challenging conditions. We were proud to have supplied the instrumented blade, hydrodynamic analysis and propulsion domain knowledge, and for me, it was the chance of a lifetime. This type of trial is unusual, but I'm sure the findings will provide a much better understanding of just what's possible for manoeuvring through heavy ice."

Whatever the final outcomes of the post-voyage analysis, the trial strengthened the evidence base for ice-class propulsion and will inform future designs, operational guidance and training. ●



In focus

Innovative rim-drive thruster technology has reached important milestones that are worth celebrating. Find out more on page 4

Kongsberg Maritime

kongsberg.com/maritime