Your new ally on the bridge

by Dor Raviv, *CTO and Co-founder, Orca AI*

The Baltic Sea has long been a proving ground for maritime innovation – from pioneering ice-class vessel design to early adoption of e-navigation concepts such as digital traffic management. Small but intensely sailed, the Baltic links nine coastal nations through a dense network of short-sea routes. Its shallow waters, narrow fairways, and strict environmental rules have made it a living laboratory for efficient, low-impact shipping.

From ferry corridors between Helsinki and Tallinn to the approaches to Gdańsk and Klaipėda – and beyond the Danish Straits to Gothenburg and the North Sea routes – vessels of every size share limited space under shifting weather and visibility conditions (not to mention not unsuccessful attempts by malevolent parties to jam navigational signals…). In such an environment, situational awareness is not a luxury; it is a defining factor for safety, efficiency, and environmental performance.

As shipping in the Baltic becomes more automated and data-driven, artificial intelligence (AI) is emerging as a new ally on the bridge. Rather than replacing human judgment, AI-powered computer vision augments it – turning vast amounts of visual, radar, and navigational data into real-time insights that help crews operate more safely and confidently in complex waters.

A sea of constraints

The combination of high vessel density, complex geography, and strict environmental regulation within a confined basin represents a concentration of operational variables matched by few other regions. Thousands of ship movements each day mix with ferry traffic, offshore wind construction, fishing vessels, and leisure craft (and, again, a 'shadow fleet' that detrimentally blurs the picture…). Fairways are narrow and often shallow, with long winter nights and sudden fog.

Such conditions demand constant vigilance. Even experienced bridge teams can find the workload overwhelming when multiple small targets appear on the radar and the light fades early. According to statistics from the European Maritime Safety Agency, human error contributes to over 75% of navigational incidents in the waters of Europe. Fatigue, sensory overload, and misinterpretation of data are common precursors. For shipowners and ports under pressure to maintain punctual schedules and reduce risk, these constraints are increasingly hard to manage through traditional means alone.

That and the generational shift in how a crew member approaches navigation. While older officers rely more on 'feeling' how the ship behaves, an expert 'sense-memory' built by sailing thousands and thousands of miles with intentional focus, the younger generation bases its assessment more on technology – what the screen says rather than what's outside the porthole. This is not to judge whether the former is better than the latter; instead, it's a call to provide future crews with the best possible tech that makes them as proficient in navigation as those salty dogs who sailed according to their gut.

From incidents to intelligence

AI-enabled situational awareness addresses the problem at its root: perception. Our operational platform uses highly sensitive day- and night-vision cameras with an unmatched field of view to create a continuous visual record of the vessel's surroundings, detecting and classifying objects – from merchant ships to small fishing boats – in real time and in all weathers.

This information is fused with radar and AIS inputs to generate an enhanced display and predictive alerts. The system can flag potential collision risks earlier than the human eye could, tracking their evolution using COLREG-based logic. In the Baltic's dense approaches, this is not about taking control away from officers but clarifying the picture. AI becomes a second pair of eyes that never tires and can see in the dark. The result is earlier avoidance manoeuvres, smoother speed adjustments, and fewer near-misses – translating into measurable safety and fuel-efficiency gains.

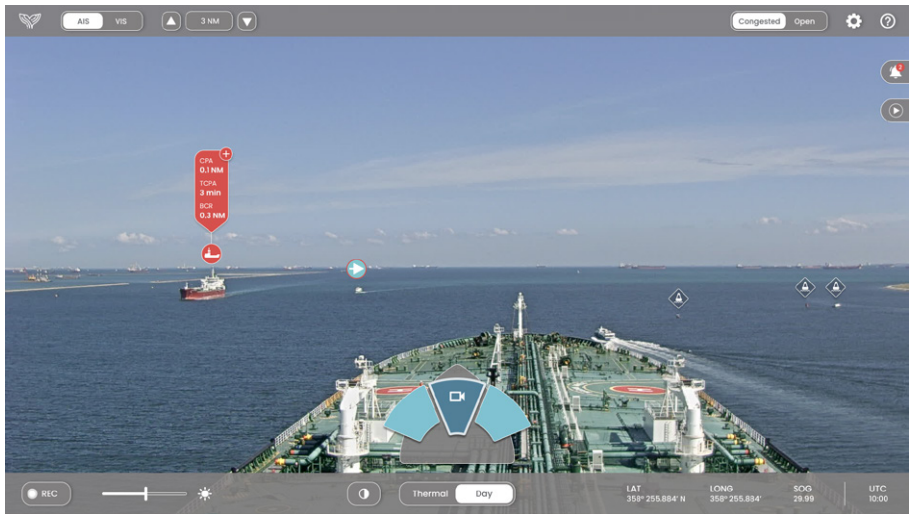
Each detection or alert becomes part of a continuously expanding record of how a vessel behaves in specific conditions. Fleet managers can review this data onshore to see where challenges occur, how watch teams react, and which areas correlate with higher alert rates. This shifts safety management from reactive to preventive.

When aggregated across fleets, AI navigation data reveals where navigational challenges occur most frequently and under what conditions. Shared with port or coastal authorities, these insights could reliably inform improved traffic management and safety measures. This kind of data aggregation aligns closely with the digitalisation agendas of Baltic ports, providing a foundation for data-driven discussions on pilotage procedures, harbour entry protocols, and risk assessment.

Few regions test human perception like the Baltic in winter. Northern darkness extends bridge watches over long hours, while snow and spray can potentially degrade radar returns. AI vision systems mitigate these challenges by detecting moving or static targets even when visibility is poor. The psychological effect is significant. Knowing that the system will alert them to unseen risks allows officers on watch to focus on higher-order decisions rather than constant scanning. This reduces cognitive load and fatigue, especially on night passages.

Linking ship and shore (in many a way)

AI-supported navigation also acts as a bridge between onboard and onshore



perspectives. With secure cloud connectivity, fleet managers can monitor live or recorded data – for example, to assess whether a vessel can safely enter port during reduced visibility or to validate a near-miss report.

This supports the region's smart port strategies, which integrate vessel-traffic management, environmental monitoring, and predictive maintenance. Over time, shared situational awareness between ships, shore, ports, and even insurers can improve collective decision-making and reduce disputes.

Speaking of which, safety at sea is both operational and financial. Traditionally, insurance premiums were set on static factors such as vessel age and claims history. AI-derived performance data changes that equation. Through partnerships with leading insurers, like NorthStandard, Orca AI is helping to build dynamic risk models that reflect how ships are actually operated. Real-world navigational behaviour – speed in congested areas, frequency of close-quarters encounters, adherence to COLREGs – can now inform insurance assessments. For shipowners, this means safer performance can translate into improved terms and faster claims resolution. For insurers, it enhances transparency and reduces disputes – a development likely to reshape the economics of maritime risk across the Baltic.

Improved situational awareness is also a decarbonisation tool. Fewer near-misses and better-planned avoidance manoeuvres mean smoother power profiles and lower fuel consumption. By helping navigators maintain optimal distances and speeds, AI indirectly cuts emissions and can help minimise wash impacts in sensitive coastal zones.

Several regional ports are developing green-corridor initiatives, with the world's very first green shipping corridor already online between Finland and Sweden in the Kvarken – that rely on digital data to monitor emissions and operational efficiency. As these projects mature, AI-derived performance data could provide an additional layer of transparency, linking navigational safety with sustainability outcomes.

A step towards autonomy (with humans in command)

The term "autonomy" may trigger unease in a region that values seamanship. In practice, it will emerge incrementally, through layers of intelligent assistance rather than crew replacement.

AI-assisted navigation enables ships to operate with greater precision and awareness while keeping humans firmly in control. For the Baltic, where digital infrastructure and regulatory maturity are high, the region could become a leading test bed for safe, human-centred autonomy.

And indeed, feedback from early adopters shows that watchkeepers quickly develop trust in the system once they see its consistency and accuracy. Instead of replacing judgment, it validates and supports it. Officers can review annotated video timelines during handovers or training, turning experience into verifiable learning.

This blending of technology and seamanship may prove the real legacy of AI on the bridge: redefining professionalism not as infallibility but as continuous learning supported by data and shared understanding.

Safer, smoother, smarter!

From the bone-freezing northern Nordic to the narrow Danish Straits, the Baltic maritime community has always combined practicality with innovation. Its dense traffic and demanding weather have driven advances in ice & e-navigation and digital port integration. AI-enhanced situational awareness is the next staple in that tradition.

As regulatory attention to safety and environmental performance intensifies, shipowners and port operators recognise that the next efficiency gains will come not from bigger ships or faster turnarounds but from better information; information that helps humans make the right decision at the right time.

The promise of AI on the bridge is simple: to make every voyage in the Baltic a little safer, smoother, and smarter. The technology is ready; the opportunity now lies in making it part and parcel of everyday navigation. ■

ORCA AI

Founded in 2018 by a team of Navy veterans, Orca AI, a maritime tech startup, empowers shipping companies to enhance their operational safety, efficiency, and sustainability through a single AI and computer-vision-based operations platform. In June 2025, over 1,200 vessels were already part of the platform. Sail to **orca-ai.io** to discover more.