



The One Sea initiative aims to lead the way towards an operating autonomous maritime ecosystem by 2025

Source: ABB

Route to autonomous ship safety

ECOSYSTEM Autonomous ship technology can improve maritime safety according to One Sea, the industry grouping targeting 2025 as its target for the first autonomous maritime ecosystem. Some of One Sea's leading technology company members explain why, and how. One Sea is a 20-member consortium which includes international technology heavyweights such as ABB, Cargotec, Inmarsat, Kongsberg, Monohakobi Technology Institute (MTI) and Wärtsilä.

Safety is of paramount importance to the maritime industry, yet 75% of marine insurance claims point to human error as a main cause [1]. Autonomous vessels are regarded by some as integral to the future of shipping but tension persists when it comes to the degree to which operations should be automated, and the pros and cons of different human-machine interfaces.

The One Sea Ecosystem aims to lead the way towards an operating autonomous maritime ecosystem by 2025, and improving maritime safety is a key objective. For this

reason alone, One Sea Senior Ecosystem lead Paivi Haikkola explained, autonomous ship technology should not be seen as simply a precursor to unmanned vessels.

"It's important that as an industry, we understand how autonomous technology can be applied to improve operations and enhance safety – a key objective for One Sea and its members," said Haikkola. "While the end goal is to develop fully automated vessels, there are many stages to this process, and we can start exploiting the benefits of autonomous technology to improve maritime safety today."

Eero Lehtovaara, One Sea chairman, master mariner and head of Regulatory and Public Affairs at ABB Marine and Ports, suggested that autonomous technology can support crews by providing greater awareness of the vessel's overall situation and condition. Autonomous technologies improve situational awareness, both in terms of visible obstacles as well as hidden risks such as potential technical failures, and so provide critical data for ship operations, Lehtovaara said.

"People are good at perception, risk assessment and decision making, but what we

are not good at is focusing on several things at the same time. For example, when a person on the bridge focuses on a single obstacle that is perceived as a risk, this can easily overshadow everything else that is going on at that time.

"The perception of objects and fusion of navigational data can be improved significantly by technology so that a machine performs wide-angle continuous monitoring and sensor fusion. This would provide the human operator with a good overview of the actual situation and enable them to focus on the important items, instead of trying to focus on

everything at the same time,” Lehtovaara added.

The benefits of using technology to improve situational awareness becomes clear when discussing collision avoidance.

“Driven by improvements in sensor technologies, AI and computer power, the algorithms to identify possible upcoming collision scenarios improve both in accuracy and reliability as well as distance,” Lehtovaara said.

“Collision avoidance during manoeuvring in close range will significantly improve as the perception in close range is heavily dependent on deck crew’s manual observations and communication over radio,” he continued. “That is prone to human error and miscommunication. Autonomous technologies will enable continuous data-driven situational awareness in close and long range for all of the bridge crew members and therefore facilitates communication, common situational awareness and decision-making.”

While discussions have been initiated at the International Maritime Organization, and the Maritime Safety Committee completed its regulatory scoping exercise on Maritime Autonomous Surface Ships in May to assess next steps, no regulatory framework exists covering the use of autonomous technologies at sea. If technological advances can enhance maritime safety, lack of regulatory rigour would – at best – mean such advances are patchy.

“We have the technology; however, we don’t yet have the regulations. We urgently need a regulatory framework at both an international and national level, and it is our hope that One Sea will be there to represent autonomous technologies as the regulations are developed,” declared Lehtovaara.

The important role autonomous technology can play in navigation and the

need for new regulations also draws comment from Anton Westerlund, vice president Remote Operation Solutions, site manager at Kongsberg.

“The safety aspect is one of the most important drivers for different levels of autonomous shipping. Removing humans from hazardous working environments on board vessels, reducing the likelihood of human error by introducing smarter systems that are highly automated and autonomous to various degrees, improves both internal and external situational awareness,” he said.

“Collision avoidance is a vital part of the autonomous navigation system. Collision avoidance functionality can be used as an advisory system together with current onboard systems as soon as regulations allow for it. When it comes to collision avoidance and the related COLREGs [2], there is room for a lot of improvement on how the rules are interpreted and followed. Standardised collision avoidance advisory systems can benefit the current seagoing vessels.”

Awake.ai CEO and co-founder, Karno Tenovuo, agrees that new rules need to be implemented for autonomous vessels regarding COLREGs; he believes many collisions could be avoided by using autonomous technology because intended manoeuvres can be calculated in advance.

“Autonomous technology will make ships safer and has the potential to have the biggest impact on crew safety by removing or reducing the number of crew on board, because in most cases, when accidents happen it is the crew that gets hurt,” he said

Less contentious is the fact that autonomous technology is not susceptible to fatigue or lapses in concentration as it operates around the clock at 100% capacity. Maritime cargo and load handling specialist MacGregor has been taking >

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a systematic approach to developing autonomous technologies that will further contribute to raising safety and efficiency standards.

Janne Suominen, manager, Offering Development at MacGregor, explains that no isolated development will secure a safer, more efficient environment. The key lies in many smaller advances that will be integrated together. The process will depend on stakeholder collaboration.

“The success of partial or fully autonomous operations will rely on greater connectivity between systems. The important part will be to standardise connection protocols so that a system, comprising a number of components, can work effectively.

“Ship safety connects closely to port operations, as there are multiple physical and digital touch points when a vessel arrives at/departs from the port and while loading/discharging operations are being carried out. Autonomous technologies can be used during port calls to increase safety by having sys-

tems that allow working in safe conditions such as the control room of the terminal.”

However, Suominen stresses that crews still have a vital role to play in an automated environment.

“Automation will deliver increases in safety by removing human errors, but it will not automatically be like that,” he explained. “Without a crew on board or at the port to solve a problem, an autonomous vessel would need either to be extremely robust or to offer greater levels of redundancy than traditional vessels. Today, the crew plays a vital role in effective redundancy capabilities, a factor that should not be underestimated when considering a more automated future.

“Responsive, expert service teams will need to be available to provide support, together with advanced remote monitoring systems, so that the integrity of the autonomous vessel is continuously supervised.”

The call for the industry to start utilising autonomous technologies to improve safety and efficiency has been ex-

plored in detail by Wärtsilä in a recent white paper. Here too, the company suggests that the journey towards fully autonomous vessels could prove to be of more importance to the industry, as autonomous technologies can provide solutions to current challenges.

“The pursuit of autonomous operations is already leading to smarter systems that can enhance the safety, cost-efficiency and environmental performance of today’s vessels; in practice this means reducing collisions or incidents – especially in busy ports – assisting with docking, saving fuels through optimised speed profiles, reducing associated emissions and optimising crew numbers,” the paper says.

Accelerated digitalisation has been one of many unexpected outcomes from the Covid-19 pandemic and, in a maritime context, the trend has additional implications for autonomous ships, according to Juhani Hupli, One Sea Vice-Chairman and Vice-President, Transformation Programs and Strategy at Wärtsilä.

“Covid-19 created new demands for a more coordinated response to ensuring safe crew changes and the mental and physical wellbeing of sailors aboard,” he explained.

“The pandemic increased the need for solutions that minimise the number of people who need to be aboard — for example, remote guidance systems for vessels as well as remote support and monitoring systems that allow for troubleshooting and issue resolution without the need to send maintenance personnel aboard.”

In this context, external pressures as well as the industry’s own operational challenges are driving the adoption of autonomous technologies as a route towards safer ship operations, through the continuous monitoring and decision-making support it enables, and through the ship efficiency that enhances crew competence.

References

- [1] 2021, Wärtsilä, The Future of Smart Autonomy is Here, retrieved from <https://www.wartsila.com/insights/whitepaper/the-future-of-smart-autonomy-is-here>
- [2] Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS)

Marine robotics training centre to be set up in UK

MEZ | Autonomous ship operations will take a significant step forward in the UK with the establishment of a maritime operations and training centre for robotic vehicles in Southampton. The National Centre for Operational Excellence in Marine Robotics is the result of collaboration between the UK’s Royal Navy (RN), the National Oceanography Centre (NOC), and SeaBot XR, an autonomy specialist focusing on transport and energy.

The parties are all members of the Solent Maritime Enterprise Zone (MEZ) and all have specialisms in Maritime Autonomous Surface Ship (MASS)

operations as well as sub-surface operational training. They recently signed a memorandum of understanding setting out plans for the new training entity and a set of standards that are to be implemented at the NOC.

The initiative fulfils a growing requirement in the autonomy sector – training facilities required for MASS operations do not currently exist in the UK or Europe, the partners said in a statement. Now, third-party companies can test their own developments in autonomy, as well as making use of the training for personnel in both civil and military contexts. Users of

the facilities will have access to a remote operations centre as well as various surface and sub-surface vessels with a range of features and capable of operating in different weather and tidal conditions.

The RN’s deputy director, Future Training, Commodore Andrew Cree, commented: “This initiative is testament to the Solent MEZ’s enterprise approach. The new centre of excellence ... marks a pivotal change in maritime as the RN constantly seeks way to optimise technology to support RN operations and to prepare our people with the skills required to operate new technol-

ogies, surface and sub-surface autonomous vessels being a priority.”

Seabot XR founder and CEO, Gordon Meadow, said: “Current training available for seafarers of crewed vessels has served the industry well for decades, but many of the training methods and much of the curriculum cannot be applied to autonomous and remote vessel operations. Digitalisation is the next frontier in shipping and so requires a fresh approach to workforce training. It is vital that training is developed alongside the technology so that it serves humans to their advantage.”