Industry Challenge-Led Accelerator Challenge Brief: Artemis Technologies

UK Digital Twin Centre
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Object Detection and Collision Avoidance in Water

Background

Marine environments are inherently volatile and complex, characterized by unpredictable wave patterns, high turbidity, and erratic external conditions. This complexity makes it difficult for vessels to maintain comprehensive situational awareness and accurately detect static or moving objects, above or below the water's surface, especially along congested mission routes. While advanced object detection and collision avoidance technologies have matured in the automotive sector and for large commercial ships, a critical capability gap remains for smaller high-speed crafts, which lack efficient, real-time, long-distance detection systems.

This technology gap poses a health and safety risk to smaller vessels, their onboard assets, and surrounding entities like swimmers or marine life. Overcoming this challenge by leveraging real-time detection solutions will directly mitigate safety risks, safeguard vessel health, and reduce maintenance downtime through better asset assessments. Furthermore, empowering operators with real-time data regarding object classification and proximity enables proactive, data-driven routing decisions. Ultimately, overcoming these detection barriers will unlock safer, more reliable transit paths, delivering substantial commercial value to the broader maritime and logistics sectors.

Challenge

Artemis Technologies, in collaboration with the UK Digital Twin Centre, is seeking innovative solutions that combine real-time sensing capabilities and edge computing to capture and monitor complex marine environments and intelligently detect small objects above and below the waterline during small vessel operations. These capabilities will support asset health assessments, enhance operator decision-making, and improve safety and operational efficiency of smaller vessels.

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Key issues to address

- **Small object detection above and below waterline:** Reliably identify and track small, surface and subsurface objects that may present navigational or operational risks.
- **Capture and model complex marine environments:** Maintain effective situational awareness in dynamic conditions influenced by waves, reflections, clutter, weather, and varying water conditions.
- **Tracking of moving objects:** Accurately monitor the position, size, speed, and trajectory of detected objects relative to the vessel.
- **Intelligent object classification and prioritisation:** Distinguish between hazards including swimmers, marine life, manned vessels (e.g. kayaks) and small floating objects (e.g. debris and logs) to improve downstream classification, support appropriate operator responses and reduce false alarms.
- **Real-time vessel situational awareness:** Provide timely analysis of potential hazards to support decision-making during vessel operations.
- **Support for vessel safety assessments:** Generate actionable data and insights that can contribute to vessel safety, risk assessment, and operational planning.
- **Operational efficiency for smaller vessels:** Enhance the ability of smaller vessels to operate safely and effectively in challenging maritime environments.

Expected outcomes

The solution should demonstrate measurable technical and operational benefits for smaller vessels by delivering:

- Real-time onboard implementation and processing of sensor data, and accurate detection of relevant objects and hazards including object size, distance, speed, nature etc
- Extraction of insights from raw sensor data to support operational awareness and decision-making
- Compatibility and integration with existing vessel platforms, tracking systems and operational technologies where appropriate
- Onboard vessel data processing, analysis, visualisation and reporting capabilities leveraging point cloud data that reduce reliance on remote connectivity
- Secure handling, storage and transmission of data, with trusted and reliable outputs
- Generation of data outputs and intelligence to inform safety assessments, risk management and operational planning
- Enhanced awareness of the surrounding marine environment to support safer and more efficient vessel operations

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To note

- Vessel control logic and autonomous control functions are outside the scope of this challenge
- Multi-sensor fusion capabilities are outside the scope of this challenge
- NDAs may be required between Artemis Technologies and successful applicants, at Artemis' discretion

SME requirements and preferences

- Applicants must demonstrate expertise in sensing technologies including 3D sensors, point-cloud processing and the development of detection and classification solutions from raw sensor data
- Applicants must demonstrate expertise in Radio Frequency (RF) signal processing and the extraction of meaningful information from RF-based sensing systems
- Applicants should demonstrate experience deploying analytics and detection capabilities to edge-computing platforms operating in bandwidth-constrained environments
- Applicants with proposals and experience working with RADAR technologies, including the integration and processing of radar data streams in PCD (Point Cloud Data) format are preferred

About Artemis Technologies

Artemis Technologies is a world leader in high-performance maritime design and technology. Formed from Artemis Racing's 35th America's Cup design team, with experts from the fields of motor sport, aerospace and yacht design; we utilise world class skills in simulation, lightweight structure engineering, electronics, hydraulics, aerodynamics, and hydrodynamics to deliver real innovation to our customers through unique solutions and products. Artemis' vision is to lead in the decarbonisation of maritime through innovative, sustainable technologies and products.

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