

Industry Challenge-Led Accelerator

Challenge Brief: Thales

Health monitoring of uncrewed vessels

Background

As the adoption of Uncrewed Surface Vessels (USVs) expands across defence and maritime operations, particularly for short-duration and high-risk missions, there is consequently growing demand for effective monitoring, diagnostics, and maintenance solutions. Maintaining vessel health and mission assurance becomes more complex as size, autonomy, and operational range increases, especially as defence vessels often remain in service for multiple decades.

While advances in machine learning, predictive maintenance, and digital twin technologies offer significant opportunities, there are currently limited commercially viable solutions for monitoring complex integrated defence systems. Solutions must also operate securely alongside existing systems without introducing unacceptable cyber or operational risks. The sector is seeking standards-based approaches to support interoperability and avoid vendor lock-in, while also exploring transferable learning from industries such as automotive, aerospace, offshore wind, UAVs, and commercial maritime operations.

Challenge

Thales, in collaboration with the UK Digital Twin Centre, are looking for solutions that enable the remote monitoring of USVs (Unmanned Surface Vessels) in order to track vessel health, detect faults as they occur, and understand the appropriate actions to take when issues are identified. The aim is to improve reliability, reduce maintenance burden, improve decision-making capabilities, and enhance the operational resilience of uncrewed vessels.

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Key issues to address

- **Operation in low-connectivity environments:** Ensure reliable operation, data collection, storage, and transmission in areas with limited or intermittent connectivity, or communications dead zones
- **Environmental resilience of onboard systems:** Sensors and other supporting technologies should operate effectively across wide temperature ranges and challenging maritime operating conditions without degradation in performance
- **Secure integration of technologies:** Enable integration of multiple systems, platforms, and technologies while minimising security vulnerabilities and avoiding unmitigable risks to the wider operational environment
- **Fault traceability and system assurance:** Provide clear traceability, diagnostics, and identification of faults across complex integrated systems to support maintenance, reliability, and operational assurance
- **Cost-effectiveness and scalability:** Solutions should demonstrate a pathway to commercial viability, and implementable at a cost that supports a credible business case for investment and deployment
- **Secure handling and exploitation of sensitive data:** Support the secure collection, storage, accumulation, and interpretation of data in security-sensitive domains, while maintaining appropriate access controls, integrity, and confidentiality safeguards

Expected outcomes

The solution should demonstrate measurable operational and technical benefits for uncrewed vessel operations by delivering:

- Standardised outputs in recognised formats (e.g. STANAG) to support future interoperability across systems and platforms
- Integration across selected systems and data sources
- Scalable monitoring capabilities that enable effective monitoring at vessel, fleet and mission level
- Clear identification and traceability of faults within integrated systems
- Intelligent analytics and generation of actionable insights to support operational decision making
- Synchronised, accurate and consistent timing protocols across distributed networks
- Secure handling, sharing and protection of operational data
- A credible route towards scalable operational adoption and deployment. For this accelerator, applicants are expected to focus on multiple data points for an individual vessel at a minimum, and demonstrate ability to scale to fleet monitoring
- Ability to leverage privacy-enhancing technologies to unlock the value of mixed-classification data without triggering blanket highest-tier security restrictions

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To note

- All work and discussion will be at an Unclassified level of security unless otherwise specified
- NDAs may be required between Thales and successful applicants, at Thales' discretion
- The expected level of autonomy for this accelerator is human-in-the-loop, but applications and solutions should demonstrate their approach to progressing to human-out-of-the-loop and full autonomy
- Monitoring may include factors such as: battery status, fuel status, temperature, hull integrity, shock levels, and engine vibrations
- Use of Wi-Fi enabled sensors is not in scope
- The vessels vary in size and materials, with an example being a sub-24 metre vessel made of steel, aluminium, or composite
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SME requirements and preferences

- Applicants must demonstrate deep digital twin expertise, particularly in technologies including IoT and sensors, decentralised and centralised data distribution and the ability to bring this data together
- Applicants must demonstrate experience in time drift and synchronicity, across a variety of disparate sensors
- Applicants must demonstrate they would be able to develop a solution without access to real/representative data
- Applicants with experience in Classified work are preferred

About Thales

From aerospace, space and defence to security and transportation, Thales helps its customers to create a safer world by giving them the tools they need to perform critical tasks. Thales is a global leader in advanced technologies within three domains: Defence & Security, Aeronautics & Space, and Digital Identity & Security. It develops products and solutions that help make the world safer, greener and more inclusive. Thales in the UK is a team of over 7,000 experts, based across 16 sites.