

# CELLULA ROBOTICS

Detect, Inspect, and Protect  
with integrated subsea robotic  
systems



Changing the paradigm for subsea survey, science  
and security through modular, persistent and  
autonomous platforms.

# About Cellula Robotics

Founded in 2001, Cellula Robotics Ltd. was created to develop and deliver collaborative robotic solutions for the subsea domain. Our senior leadership team has more than 300 years of combined experience delivering capable subsea robotic systems.

Headquartered in British Columbia, Cellula Robotics Ltd. is at the forefront of marine technology, specializing in cutting-edge Autonomous Underwater Vehicles and marine robotic solutions. As one of Canada's largest privately owned marine specialist companies with over 80 skilled professionals across Canada, the US and the UK, the company's expertise spans engineering, design, and technical domains.

Cellula Robotics Ltd. is driven by a mission to redefine the paradigm of subsea survey, science, and security through the use of long range Autonomous Underwater Vehicles (AUVs) and robotic solutions. Our hydrogen-powered AUVs meet changing needs, guiding us towards a more sustainable future aligned with the UN's sustainable development objectives.

Unwavering in our pursuit of excellence, our long-standing ISO 9001:2015 accreditation showcases our steadfast dedication to exceeding our clients' expectations through consistently exceptional service.

Our values reflect who we are and how we work. We take pride in our **collaborative** approach to solving problems through **innovation** and **adaptability**. We stand by what we say and do; it's not only our products that are **reliable**.

At Cellula Robotics, we cultivate a culture of sharing social values, and we are proud to be a partial employee owned stock trust company.



# Key Defence Applications

Our solutions are designed to add capability to several key defence applications. These include:

- Critical Undersea Infrastructure
- Seabed Intelligence, Surveillance and Reconnaissance
- Surface Intelligence, Surveillance and Reconnaissance
- Anti-Submarine Warfare
- Battlespace Preparation
- Maritime Domain Awareness
- Maritime Mine Countermeasures
- Harbour and Port Security

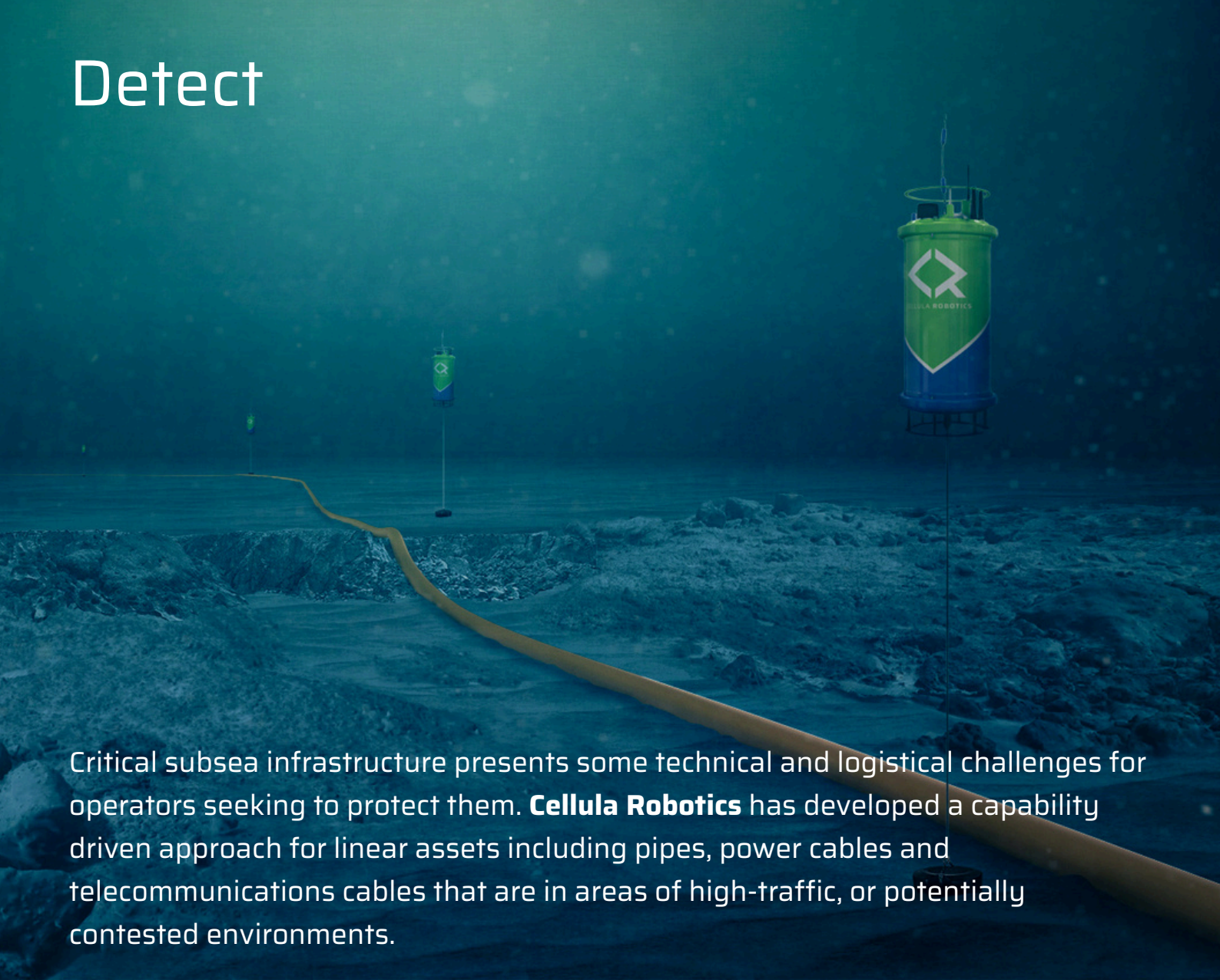
Our systems have many things in common, not least a shared architecture with open interfaces making interoperability a reality from the outset.

GUARDIAN and ENVOY operating in close proximity.





# Detect



Critical subsea infrastructure presents some technical and logistical challenges for operators seeking to protect them. **Cellula Robotics** has developed a capability driven approach for linear assets including pipes, power cables and telecommunications cables that are in areas of high-traffic, or potentially contested environments.

The first element of our approach is the ability to detect activity, anomalies and changes throughout the life of the asset. This can be done in conjunction with routine asset integrity management surveys and inspections.

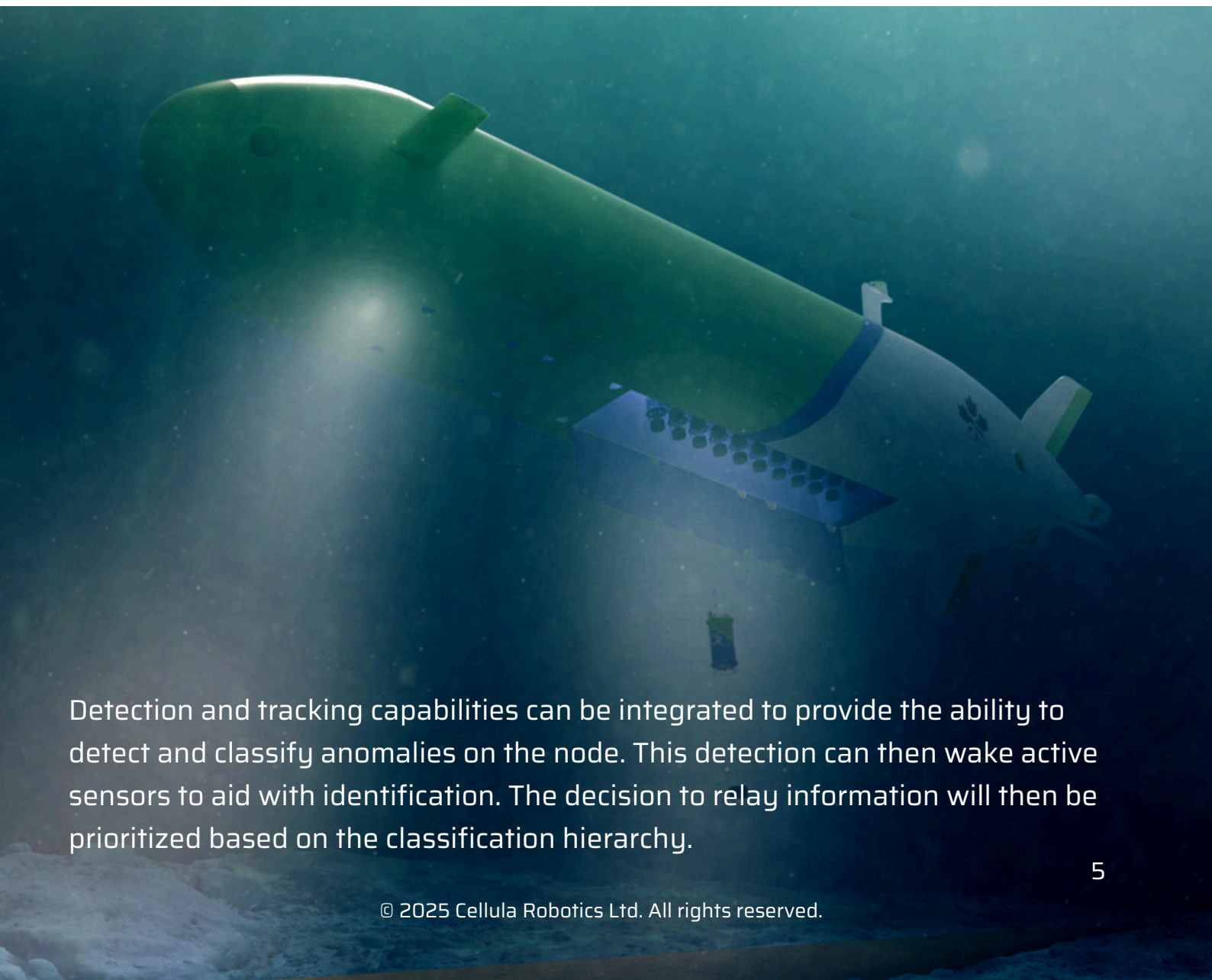
**SUBSEA SENTINEL** is a sensor-agnostic seabed node. With a design battery life of more than twelve months, Subsea Sentinel can be deployed alone or in a network of nodes to provide all sorts of data including pattern of life, marine mammal monitoring, noise monitoring and oceanographic information.

**SUBSEA SENTINEL** nodes can be configured to record or relay data if it meets the detection threshold for an object of interest. There is also an optional deterrence function. This causes the network to become acoustically active, transmitting on all available frequencies, making it obvious to anyone operating in the vicinity that activity has been detected.

**SUBSEA SENTINEL** can be deployed by ship or by the **GUARDIAN AUV**. This provides a deployment method where a surface presence is either not possible, or the installation of the network is in an ice-covered or congested area with a lot of surface traffic.

Connected by an acoustic mesh network, anomalies can be transmitted to shore or surface over the network to provide low-latency notification to users. Installations may be across a natural choke point or along a linear asset like a cable or pipe.

**SUBSEA SENTINEL** nodes include passive acoustic hydrophones as a standard sensor package. These can be augmented by turbulence sensors, echosounders, magnetometers and more. Not only is **SUBSEA SENTINEL** sensor agnostic, but it is also algorithm agnostic.



Detection and tracking capabilities can be integrated to provide the ability to detect and classify anomalies on the node. This detection can then wake active sensors to aid with identification. The decision to relay information will then be prioritized based on the classification hierarchy.



# Detect: Vessel Sense

For deployed operations **SUBSEA WARDEN** offers an extended capability as a hovering, or station keeping AUV. It brings mobile signature measurement to the theatre of operations. Working alone, or as a swarm, **SUBSEA WARDEN** enables vessels to record and assess their magnetic and acoustic signatures in the open ocean or littoral waters without needing to sail through a fixed range. Equipped with acoustic and magnetic sensors, **SUBSEA WARDEN** can also be configured for visual inspection.



SUBSEA WARDEN operating with the Royal Canadian Navy

Acoustic, magnetic, and electric signatures of navy vessels, both surface and submarine can be used by smart naval mines for targeted detection, creating an effective asymmetric area denial capability. The underwater measurement of a vessel's acoustic and magnetic signature is therefore of critical importance to remain undetected.

New sensing technologies have continued to advance the capabilities of naval mines. Acoustically triggered mines originally utilized broadband hydrophones; however, the latest generation use narrow-band sensors, which are more sensitive and selective to a ship's signature. Advancements in magnetometer technology have similarly progressed to total-field magnetometers, detecting the change in magnetic field instead of just the magnitude.

# Proven Effectiveness

To counter these advancements, it is critical that the characterization of a Naval vessel's signature is updated on a regular basis. Measurements are required after planned or unplanned vessel maintenance, or when entering a new operational theatre. Measuring the magnetic signature allows for proper calibration and setting of the onboard degaussing system. Similarly, any repairs or adjustments onboard may affect the acoustic signature and require further adjustment.



SUBSEA WARDEN on the surface

As technology of threats continues to advance, the ability to quickly, easily, and accurately check the vessels' signature needs to similarly advance. Cellula's Warden check range system is designed to meet this challenge. Testing conducted by Defense Research and Development Canada concluded that Cellula's Warden hovering AUV "proved to be a good platform as portable magnetic sensor for ship ranging." "This signature proved to be quite accurate and even of better quality when compared to the baseline signature from the fixed range at [CFB] Esquimault." [1]

[1] Evaluation of mobile magnetic ranging with autonomous underwater vehicle (AUV) as host platform; Defence Research and Development Canada Scientific Report DRDC-RDDC-2024-R134, September 2024.

# Detect and Inspect

Routine survey and inspection aids with the detection of anomalies, especially for objects that may have been placed in close proximity to critical infrastructure. The **ENVOY AUV** is designed specifically for this type of role.

**ENVOY** is equipped with a payload sensor suite including synthetic aperture sonar for acoustic seabed imagery; a high resolution multibeam echosounder for bathymetry; a sub-bottom profiler for buried object detection; a camera and laser profiler for optical detection and a range of environmental sensors such as a magnetometer.

The biggest differentiator for **ENVOY** is its ability to deploy from ship or shore and conduct missions of more than 2000 kilometres, or 15 days. Powered by a hydrogen fuel cell, **ENVOY** is a long-range survey and inspection system in a mid-sized package.

Data is generated by the sensor suite, and can also be harvested from the **SUBSEA SENTINEL** network using an acoustic link. The same link can also be used to provide a position update to the AUV from the seabed network.

**ENVOY** is configured with in-situ signal processing tools to generate actionable information from the mission data during the dive. Object detection and classification in conjunction with change detection algorithms fuse the data from the many sensors to generate a list of anomalies. To mitigate any data latency challenges, these objects can be transmitted acoustically or via a sacrificial satellite communications node that can be released from the AUV when required.

Adaptive, in-mission autonomy enables **ENVOY** to alter its mission parameters without operator input. For example, objects detected in the sonar data can be re-acquired for optical inspection later in the same mission. This may include assessment of objects against a library of known targets, or more simply, the detection of something that was not there before.





In-mission detection and identification is only one example of advanced autonomous capabilities of **ENVOY**. Another element of long-range mission management is introspective health monitoring and graceful degradation. This prioritizes mission outcomes, only returning to base when it is not possible to achieve the objectives.



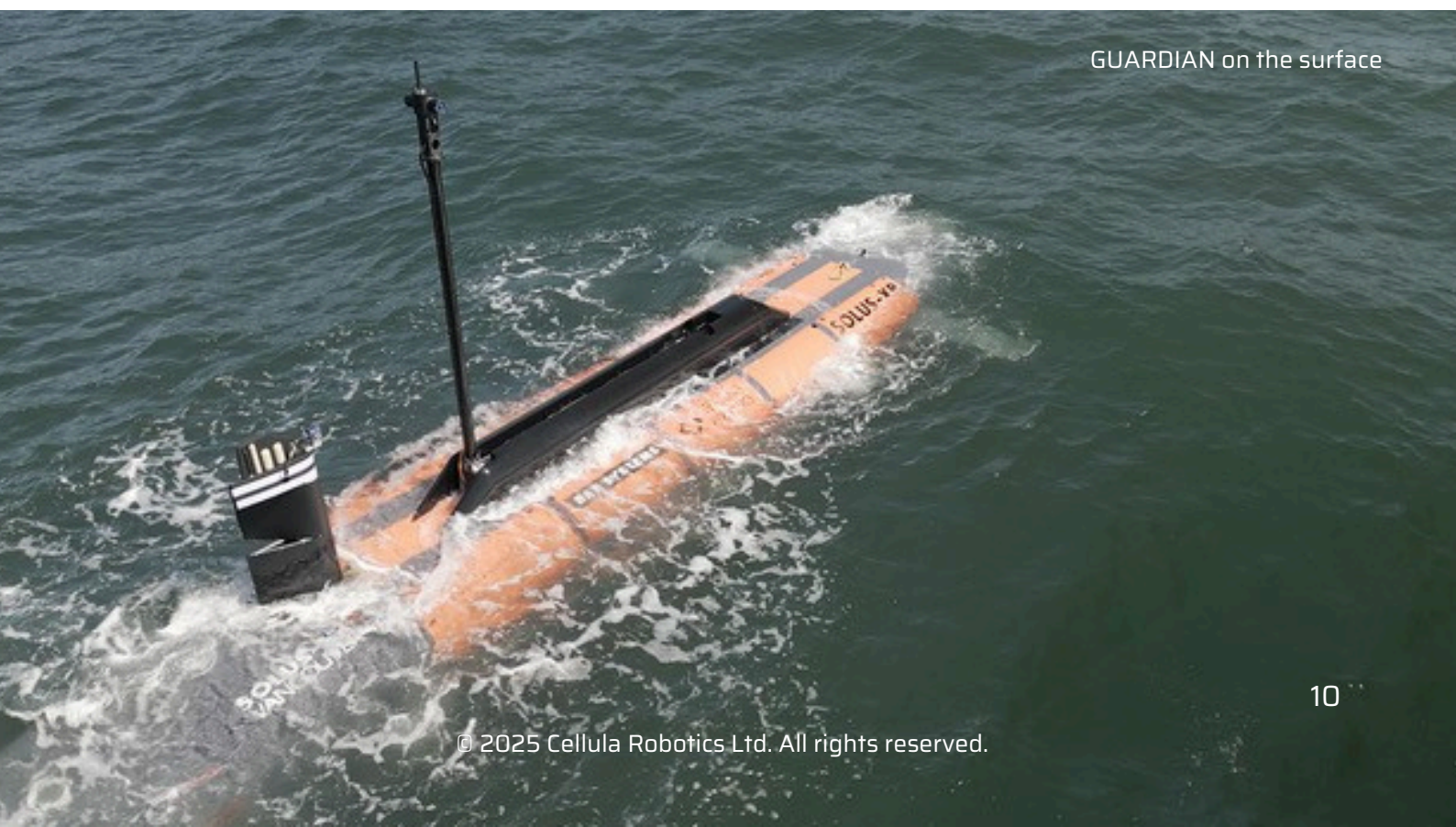
# Protect

Protecting subsea infrastructure is not easy, and rarely guaranteed. The persistent presence provided by **SUBSEA SENTINEL** as a network of seabed nodes, combined with the detection and inspection capabilities of **ENVOY AUV** provide a reasonable level of coverage.

Further capability is enabled by **GUARDIAN AUV** with ultra-long range mission endurance, and the ability to remain deployed for weeks at a time. **GUARDIAN** can deploy and recover off-platform assets for inspection and interaction with objects that may present a threat.

**GUARDIAN** has deployed an electric, observation class Remotely Operated Vehicle (ROV) for detailed inspection and light intervention. Recovery or neutralization of objects of interest is now possible with a minimal surface expression. This is only achievable due to **GUARDIAN'S** unique ability to come to a complete stop, hover and station keep.

Another key capability of **GUARDIAN** is being able to extend a mast above the surface without breaching, providing surface ISR capabilities from the same platform. Combined with a comprehensive sensor suite, **GUARDIAN** is a persistent multi-role capable system.



GUARDIAN on the surface



# Integrated and Interoperable

All of our systems are Commercial-Off-The-Shelf (COTS) products designed to solve many challenges across several market segments. As such, we have actively sought to make them productive and useful.



They share a common ROS2 control system architecture, with standard interfaces. Our AUVs have been used with third-party “back-seat drivers” providing mission-specific capabilities. The data collected, collated and processed on-board is recorded in native formats compatible with a range of post-mission processing and visualisation software tools.

Mission planning is conducted in a single COTS program for all platforms. This can also be completed in third-party planning tools and uploaded to the vehicles directly. In-mission updates, telemetry and post-mission outcomes are also made available for integration into tactical and strategic tools including Combat Management Systems.



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