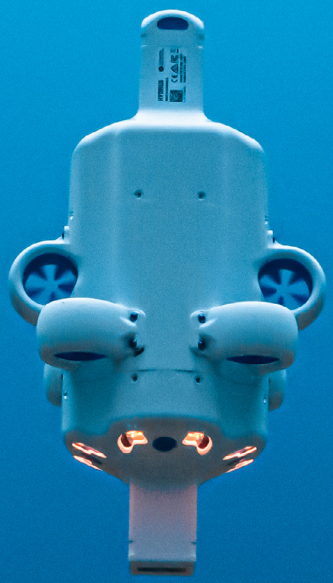
THE DRONE REVOLUTION UNDERWATER

How Hydrus makes underwater data capture easy and affordable

ADVANCED NAVIGATION

WHAT'S INSIDE



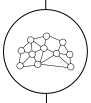
REVOLUTIONISING
UNDERWATER DATA CAPTURE

From aquaculture and reef management to subsea infrastructure inspections, the demand for **high-quality underwater data** is critical for commercial and environmental goals. Yet, the journey to gather this data has been costly and logistically complex – until now.

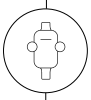
Introducing Hydrus, the industry game-changer

Meet **Hydrus**, the autonomous underwater drone revolutionising underwater data collection by eliminating the barriers to its entry. Designed to make subsea operations **simple, affordable and accessible**, Hydrus ensures that even users with limited resources can execute precise and regular subsea missions to meet their data requirements.

KEY FEATURES

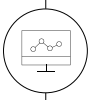


Onboard AI features includes obstacle detection for collision avoidance and object identification for targeted data capture.



Compact and lightweight, measuring 484 x 264 x 216 mm and weighing only 6.7 kg, Hydrus is designed for easy transport and single-person operation.

Acoustic navigation and communications are reliable with the use of a Subsonus acoustic positioning system, a GNSS compass and an integrated inertial navigation system.



Mission planning software allows for precise task programming and stores georeferenced data from previous missions, facilitating easy site revisits and mission repetition.

4K 60FPS camera provides high-quality imagery, essential for creating detailed 3D photogrammetry models of underwater sites.

SINKING BARRIERS TO ENTRY

Hydrus' compact and user-friendly design reduces the need for specialised equipment and expertise, lowering costs and making underwater data collection accessible to a wider audience.

HIGH-QUALITY DATA

Equipped with advanced sensors and a 4K camera, Hydrus delivers **accurate, geo-referenced** video and imagery, ideal for 3D surveying and photogrammetry. Hydrus also excels in gathering underwater data in environments too dull, dirty and dangerous for conventional methods.

REDUCED COSTS

Hydrus can lower operational costs by up to **~75%** (see table, page 08) compared with traditional, resource-intensive methods involving divers and ROVs, making seabed exploration and surveying much more **affordable**. As an added benefit, it is also very easy and economical to maintain.

EASE OF USE

Hydrus eliminates the need for costly large vessels, complex launch systems (e.g. A-frames and davits), and professional diving teams. Its compact design allows for **easy, single-user deployment and retrieval**, making processes more efficient and freeing up time for data capture.

HOW HYDRUS COMPARES
WITH DIVERS AND ROVS

Using Hydrus, users can collect advanced underwater data at lower costs and streamline their subsea operations. Below is a comparison of Hydrus's performance against traditional methods that rely on divers and ROVs for seabed site verification at 60m.

ASPECT/SURVEY METHOD	TETHERED ROV	TECHNICAL DIVERS	AUTONOMOUS DRONE
ADMINISTRATION • Planning and scheduling	High	Moderate	Low
LOGISTICS • Equipment • Hire cost	High High	High High	Moderate Low
PHYSICAL RISK • Diving • Operation of equipment and machinery	N/A High	High Low	N/A N/A
COST • Total Cost	High	High	Low
OPERATIONAL • Time and staff • Time for decompression	Moderate N/A	High High	Low N/A
MISSION EXECUTION AND RELIABILITY • Data precision and consistency	Medium	Low	High
ADDITIONAL CONSIDERATIONS • Training and Expertise • Mobilisation/Demobilisation Time	High High	High High	Low Low

HYDRUS CASE STUDY
EXPLORING SHIPWRECKS

Hydrus showcased its remarkable capabilities in an impressive mission exploring the Rottnest ship graveyard off the coast of Western Australia. The objective was to pinpoint the exact location of an unidentified shipwreck and capture detailed imagery for the creation of a digital twin.

MISSION OVERVIEW

Objective
The mission aimed to precisely locate and 3D map the shipwreck.

Location
Rottnest ship graveyard off the coast of Western Australia (WA).

Team
A three-person crew operated from an 8.7m recreational vessel.

PHASE 1 | Determine wreck site perimeters

As part of the strategic reconnaissance phase, **Hydrus** was guided on a spiral flight path from the wreck's last known coordinates. Programmed to maintain a 3 m altitude above the seabed, Hydrus used **integrated systems** to stay stable amidst moderate currents, without anchoring to safeguard the site and its surroundings. This initial phase was completed in just 90 minutes.

PHASE 2 | Detailed site scanning

After analysing the initial data to confirm the wreck's location, the team employed Hydrus' **user-friendly mission planning software** to organise a comprehensive survey. Hydrus was redeployed, utilising a "lawn mower" pattern over the wreck site for extensive coverage. This phase highlighted its **autonomous** functionality, enabling precise data capture of the area without needing manual control.

PHASE 3 | Complementary survey for data

Our experts have identified several areas that require further exploration. Utilising the **mission planning software** along with the captured **geo-referenced** data enables the accurate replication of follow-up missions to these specified areas of interest.

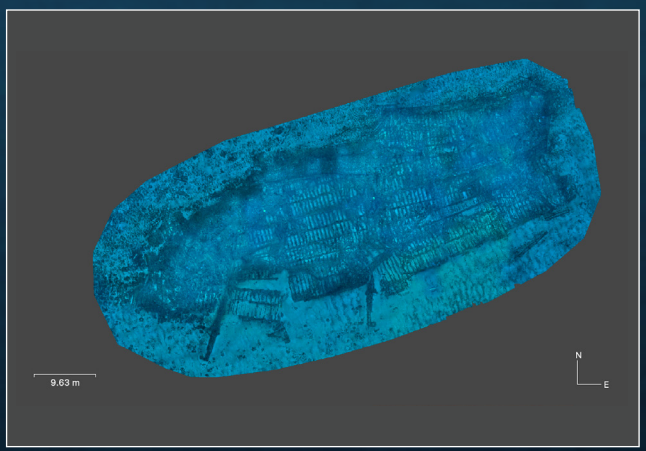
CONCLUSION | Cost-effective, high-quality data collection

This case study highlights the **effectiveness** of Hydrus in accurately capturing data and coordinates of a shipwreck, while also presenting a sustainable approach for the continuous monitoring of the wreck and its environment.

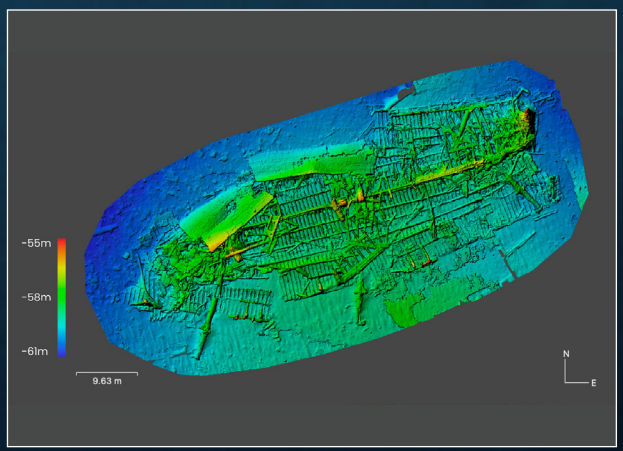
The data collected enabled the generation of high-fidelity 3D photogrammetry models, providing a **detailed examination** of the shipwreck within its ecological context and offering insights into its history. The study also showcases the versatility of Hydrus across various applications, including geohazard surveys and site investigations.

Hydrus proves to be an invaluable tool for collecting **high-quality data** and assessing underwater sites and infrastructure. Its ease of use and affordability not only improve accessibility for all users, but also promote more comprehensive and frequent surveys. This not only leads to better decision-making but also supports the sustainable management of marine environments, benefiting both commercial interests and environmental conservation.

3D photogrammetry model provides a detailed and colour corrected visual representation of the shipwreck.



2D Orthomosaic, created from numerous overlapping images, presents a detailed overview of the area.



Digital elevation model (DEM) maps the site's geographical features and elevation across the terrain.

COST ANALYSIS
FOR SITE INVESTIGATION

The Rottnest ship graveyard case study highlighted Hydrus' significant cost advantages over other underwater investigation methods. Below is a table comparing the investigation costs of using Hydrus with the estimated costs of employing professional divers or ROVs. These estimates are based on local pricing in Australian dollars.

Underwater site investigation cost estimate

- 60m water depth
- 100m x 50m site "Size of a football field"

COSTS	DIVING	ROV - AVERAGE	HYDRUS
Vessel Charter (Day rate)	~$5,000	~$15,000	~$1,000
Vessel Size	~16m	~30m	~9m
Diver Hire (Day rate)	~$15,000	N/A	N/A
Equipment (Camera hire, photogrammetry)	~$1,000	~$1,000	N/A
Georeferencing equipment (Day rate)	~$1,000	~$1,500	N/A
ROV mobilisation cost (Fixed)	N/A	~$15,000	N/A
Subtotal (Day rate)	**~$22,000**	**~$17,500**	**~$1,000**

Vessel pax	~3	~3	~2
Diver/ROV/Hydrus operator Pax	~6	~3	~1
Total Pax	**~9**	**~6**	**~3**

DAYS REQUIRED			
Mobilisation/demobilisation	N/A	~1	N/A
Recon/initial site investigation	~1	~1	~1
Detailed mapping	~2	~1	~1
Total days	**~3**	**~3**	**~2**

Total cost of data acquisition	**~$66,000**	**~$67,500**	**~$2,000**

JOIN US IN THE DRONE REVOLUTION UNDERWATER

Advanced Navigation is a world leader in AI-based robotics and navigation technologies across land, air, sea and space applications.

Founded on a culture of research and discovery, **our mission** is to be the catalyst of the autonomy revolution. Our fields of expertise include artificial intelligence, sonar, GNSS, radio frequency systems, inertial sensors, robotics, quantum sensors and photonics.

Hydrus, our cutting-edge autonomous underwater drone, integrates several of these technological advancements to open new frontiers in ocean exploration while making underwater data capture more simple, accessible and affordable for everyone.

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