

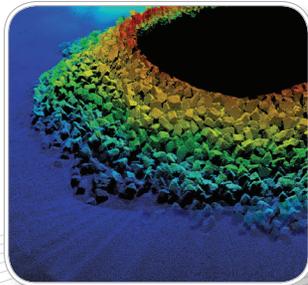
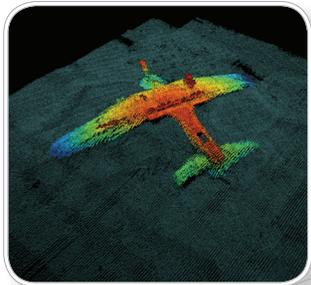
Gavia

Autonomous Underwater Vehicle

Complete Survey Solution in Four Depth Options



- AUTONOMOUS
- LOW LOGISTICS
- MODULAR
- COMMERCIAL
- DEFENSE/SECURITY
- SCIENTIFIC



SeaRaptor™ (3000m & 6000m)



Gavia AUV (500m & 1000m)

Gavia AUV 500M & 1000M

Complete Survey Solution in a Low Logistics AUV

THE GAVIA AUTONOMOUS UNDERWATER VEHICLE (AUV) is a self contained, low logistics, modular survey platform capable of delivering high quality data while operating from vessels of opportunity or from the shore.

The AUV's modularity makes it easily reconfigurable, even between dives. The vehicles' ease of use and versatility sets it apart from other systems on the market. The Gavia AUV system can serve a multitude of purposes without sacrificing performance or data quality.



Image courtesy NCS Survey.

COMMERCIAL APPLICATIONS

The Gavia AUV can be a productive asset to any commercial survey operation and has been proven in real world environments, providing cost effective data when compared to traditional means using surface vessels and ROVs. Multiple sonar options provide the customer with a full suite of survey sensors including side scan, swath bathymetry, sub-bottom profiling, and gap fill.



Side scan image of a mine-like object captured at 900 kHz.

DEFENSE AND SECURITY APPLICATIONS

The Gavia AUV can carry a variety of sensors that are especially well suited for military and security applications. The system is field proven for applications that include MCM, SAR, and ASW training. The field-changeable and easily transportable modules make it well suited for rapid response to emerging requirements.



Wreck of a small fishing boat captured on a 900kHz side scan.

SCIENTIFIC APPLICATIONS

The Gavia AUV has the ability to carry both user designed payload modules and an array of typical scientific standards, which makes it the ideal tool for researchers gathering a variety of data in depths up to 1000m. The Science Bay Module allows easy integration of common science sensors.

TECHNICAL SPECIFICATIONS

Length:	1.8 - 4.5m (configuration dependent)
Weight in air:	50 - 130kg (configuration dependent)
Diameter:	200mm
Depth rating:	500m or 1000m
Battery module:	1.5kWh lithium ion rechargeable cells per module. Up to 3 battery modules can be used on the vehicle for enhanced endurance.
Max speed:	> 5.5 knots
Endurance:	Dependent on speed and exact configuration. Typical Defence or Scientific configuration 7-8 hours at 3 knots per rechargeable battery module. Typically 5-6 hours at 3 knots per rechargeable battery module with all sensors (including swath bathymetry). Vehicle can be operated with up to 3 batteries for increased endurance or batteries can be field swapped for continuous operations.

Communication

Wireless LAN:	IEEE 802.11g compliant
Satellite communications:	Full global coverage via Iridium link
Acoustic modem:	For tracking and status updates

Navigation

High accuracy DGPS ready receiver

High-precision DVL-aided Inertial Navigation Systems (INS) from iXBlue and Kearfott with Teledyne RDI Doppler Velocity Log (DVL) and direct sound velocity meter.

Positioning accuracy can be maintained over longer duration deployments by utilizing Ultra Short Baseline (USBL) or ranging to bottom-moored Long Baseline (LBL) transponders (optional).

Features

- 2-man portable/deployable
- Greatest depth rating in its class - rated to 1000m
- Operations from vessels of opportunity
- Compact, optimized for overnight shipping
- Modular construction, maximum flexibility
- High-accuracy survey-grade INS navigation with USBL and LBL aiding (non-ITAR configurations available)
- Chart-based graphical user interface
- Wide array of additional sensors available
- No installation or calibration of peripherals required
- Over the horizon communications through Iridium

MARKET	COMMERCIAL (Recommended Vehicle Configurations)				DEFENSE AND SECURITY (Recommended Vehicle Conf		
APPLICATIONS	Pipeline and Platform Inspection	Bathymetric/sub-bottom	Construction Support	Post Hurricane inspection	Mine countermeasures (MCM)/Port Security	Anti-Submarine Warfare (ASW) Training	Rapid Environmental Assessment (REA)
BASE VEHICLE - 500M & 1000M							
Base Vehicle Includes: Nosecone module, Battery Module, Control Module, Propulsion Module	X	X	X	X	X	X	X
SONAR OPTIONS							
Klein Side Scan (separate module)	X	X	X	X	X		X
Edgetech Side Scan (on Control Module)	X	X	X	X	X		X
Interferometric Geoswath/ Klein	X	X	X	X	O		X
Sub-bottom Profiling Module	O	X	X	O			O
BlueView MB-2250 Micro Bathymetry Module	X	X	O	O	O		O
POSITIONING							
DVL-Aided INS Module (various options)	X	X	X	X	X	X	X
USBL/LBL	O	O	O	O	O		O
SCIENTIFIC OPTIONS							
Science Bay w/ science sensor options	O						
CTD/SV (various options)	O						
Dissolved Oxygen	O						
ECO pucks (various config)	O						
ADCP							
Custom payloads							
COMMUNICATIONS Iridium & LAN/WLAN included on all systems							
Acoustic Modem	X	X	X	X	X	O	X
MISC OPTIONS							
Camera option	X	X	X	X	X		X
Magnetometer					O		
Sonar Training Module						X	
RECOVERY AIDS							
Nosecone release	O	O	O	O	O	O	O
LARS Cage	O	O	O	O	O	O	O
POST MISSION ANALYSIS							
Teledyne Caris	O	O	O	O			
SonarWIZ	O	O	O	O			
SeeByte SeeTrack					O		
SeeByte AutoTracker	O						

X = Recommended O = Optional

Gavia

Autonomous Underwater Vehicles

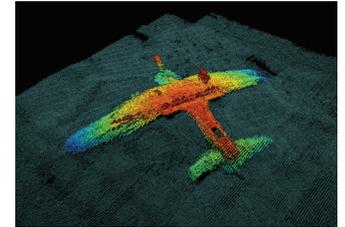
Configurations)	SCIENTIFIC (Recommended Vehicle Configurations)			
	Oceanography, habitat assessment	Hydrography, bathymetric surveys, bottom classification	Archeology, wreck location & mapping	Current profiling & under ice surveying
X	X	X	X	X
X		X	X	X
X		X	X	X
O		X	O	X
O		X	O	O
O		X	O	O
X	X	X	X	X
O	O	O	O	O
	X	X		X
	X	O		X
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	X	O		X
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O	O	O	O	O
O	O	O	O	O

Northrop Data Sets

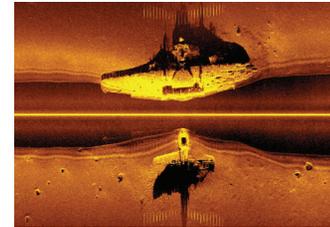
Crashed by Reykjavik Airport during WW2



Northrop N-3PB.



BlueView MBES image of target.



1800 kHz Side Scan Sonar image of target.



Detail of bottom hatch from the Gavia camera system.

Gavia AUV Modularity

The modular construction of the Gavia AUV allows the user to conduct a variety of missions with field-changeable modules. Additional modules can be purchased at later dates to increase capability as mission requirements dictate.



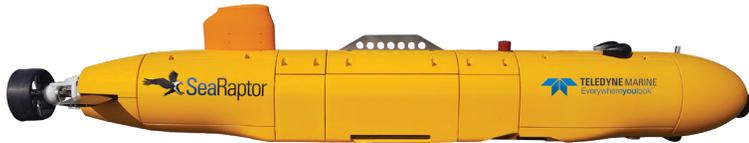
SeaRaptor AUV 3000M & 6000M

High Resolution Survey for Deep Sea Applications

The SEARAPTOR™ is a survey grade deep water autonomous underwater vehicle (AUV) designed to operate at abyssal depths. A wide range of sensors allow the SeaRaptor™ to complete several types of missions including: broad area search with side-scan sonar, hydrographic survey with multibeam and sub bottom profiler, and high resolution inspection survey with camera and acoustic sonar. These surveys support a variety of applications, such as search and recovery, salvage, exploration, construction support, marine archaeology, and oceanography.

The SeaRaptor AUV is depth rated to 3000m or 6000m.

Modularity - The vehicle offers several payload ports that provide serial communication, Ethernet, and power. These ports can be used for field-swappable sensors. In addition, removable batteries and data storage enable rapid turn-around to maximize operating time.



Payload sensors

The vehicle can be customized to include other sensors in addition to the standard payload listed:

- Teledyne Benthos Sub bottom profiler (SBP)
- Teledyne RESON Multi-Beam Echo Sounder (MBES)
- EdgeTech dual frequency side scan sonar (SSS)
- CathX high resolution camera, laser scanning, and strobes
- Teledyne RD Instruments Conductivity Temperature Depth sensor (CTD)
- Teledyne BlueView forward looking sonar for advanced obstacle avoidance

Emergency systems

The vehicle is equipped with multiple safety systems, providing improved redundancy by including multiple devices both for recovery underwater and on the surface.

- Acoustic pinger
- Acoustic drop weight release
- Satellite locator beacon
- Radio Frequency (RF) beacon

TECHNICAL SPECIFICATIONS

Length:	~5.5m
Weight in air:	~1000 kg - 1200 kg (configuration dependent)
Diameter:	~0.63m
Depth rating:	3000m or 6000m
Battery module:	Standard 13kWh Extended 16kWh
Speed:	> Nominal: 3 Knots, Maximum: 4 Knots
Endurance:	~24 hrs at 3 Knots
Range Standard Capacity Battery:	130km @ 3 Knots with Side Scan Sonar

Communication

Wireless LAN:	IEEE 802.11g compliant
Radio Frequency (RF):	User selectable from 400kHz - 2.4GHz
Satellite communications:	Full global coverage via Iridium link
Acoustic modem:	For tracking and status updates, >10 km range)
Strobe Light:	For visibility at the surface

Navigation

The vehicle is equipped with all the necessary navigation sensors and support for acoustic aiding required for accurate deep water navigation.

- Inertial navigation system (0.1% DT accuracy)
- Doppler Velocity Log (DVL) and depth sensor
- Global Navigation Satellite System (GNSS)
- Positioning accuracy can be maintained over longer duration deployments by utilizing Ultra Short Baseline (USBL) or ranging to bottom-moored Long Baseline (LBL) transponders (optional).

Vehicle Software

The vehicle software is based on the proven software used on the Gavia AUV for over a decade. The mission planning software features a chart based planning tool that allows the user to easily program a wide range of missions for the vehicle. The same software is used for operations, data retrieval, and post mission analysis

Topside Equipment

The vehicle can be delivered with extensive topside equipment that aid in vehicle operations and recovery including:

- Containerized (ISO) storage and operation facility
- Ruggedized operation stations
- Industry standard launch and recovery system allowing safe recovery in high sea-state



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