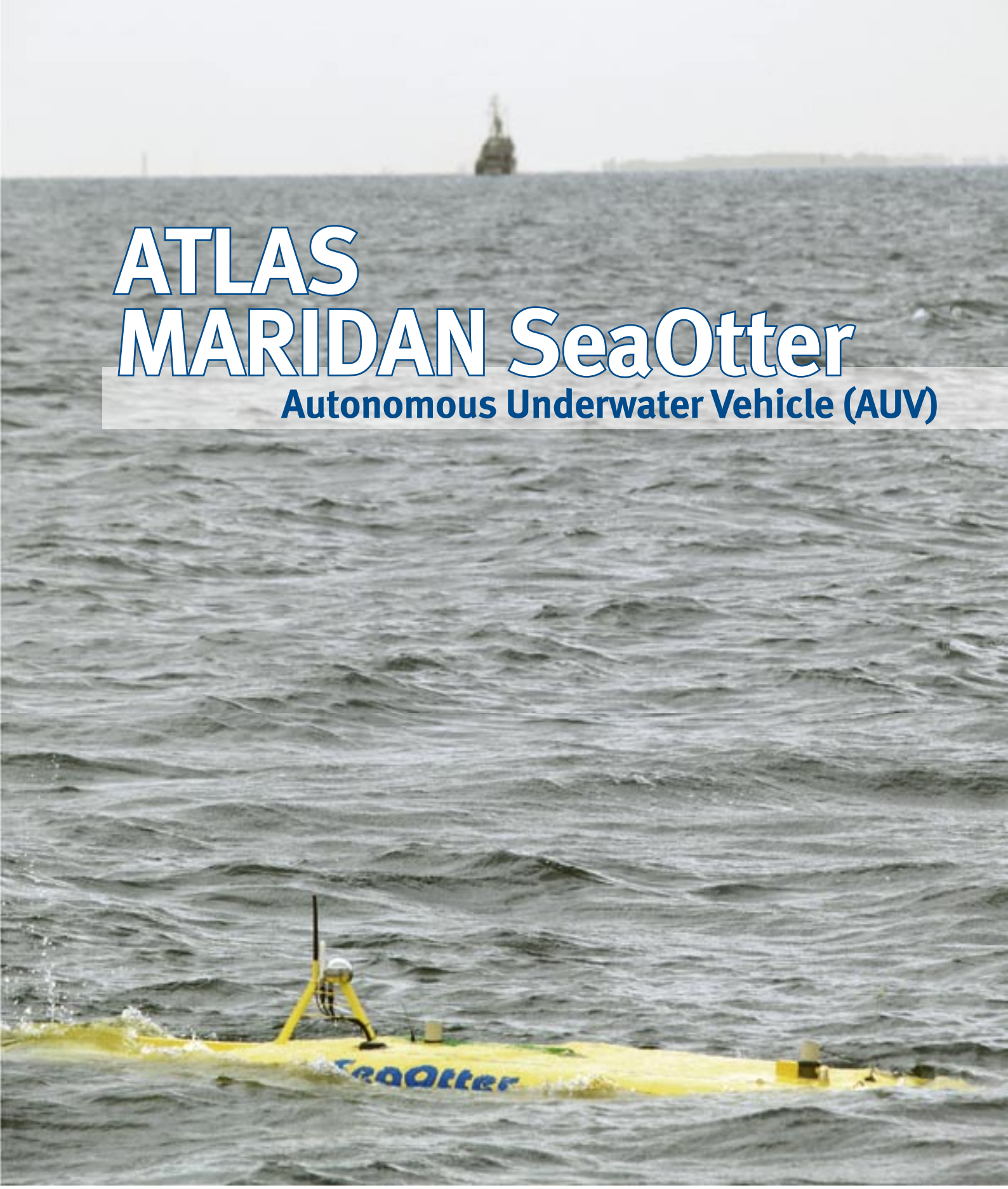
ATLAS MARIDAN SeaOtter

Autonomous Underwater Vehicle (AUV)



ATLAS MARIDAN

ATLAS MARIDAN – we provide operational AUV technology

With more than 30 years of experience in the development and manufacture of military unmanned underwater vehicles and more than 10 years experience in autonomous underwater vehicles, ATLAS ELEKTRONIK and ATLAS MARIDAN have combined their forces to offer the modular SeaOtter Autonomous Underwater Vehicle.

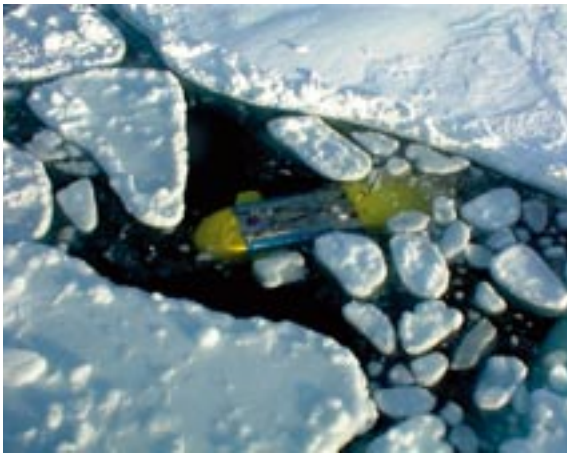
The SeaOtter System is based on the well proven MARIDAN 600 AUV which has been in operation throughout the world including trials for the South African Navy, the Royal Danish Navy and the German Navy.

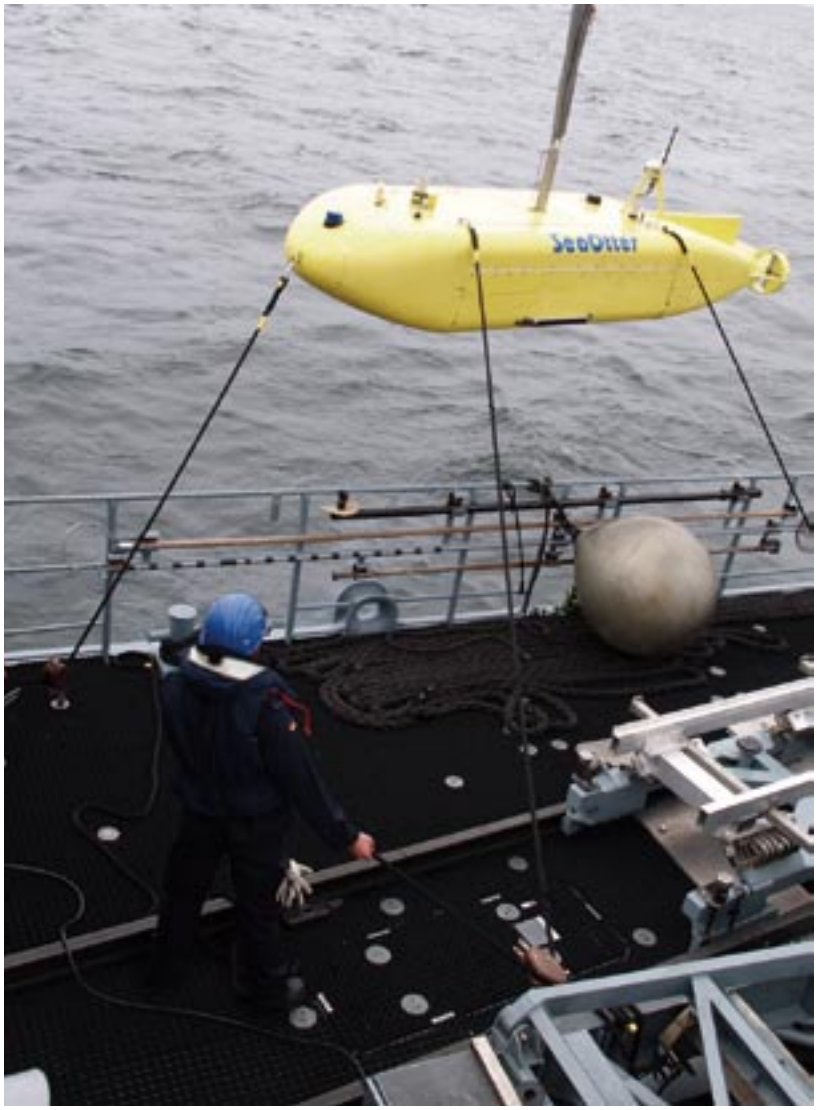
Due to the unique flatfish shape of the vehicle and the flexible payload principle of our design, the system is easily adaptable to various military missions, with an initial focus on mine countermeasures and related tasks.

In best ATLAS MCM tradition, this MCM variant is fully compatible with the ATLAS Integrated Mine Countermeasure System IMCMS including comprehensive functional integration.
The SeaOtter MCM package also offers the distinctive benefit of a VDS capability with real-time data to a mother platform through the fibre-optic link option.

AUV Technology

AUVs belong to the often generalised category of UUVs – Unmanned Underwater Vehicles. This UUV categorisation also includes vehicles towed by surface craft and vehicles connected to a mother platform by means of an umbilical cable the so called ROVs (Remotely Operated Vehicles). Both the towed body and the ROV require a mother platform to be closely attendant in the vicinity, while Autonomous Underwater Vehicles are unmanned, self-powered vehicles with no cable connection to the surface.

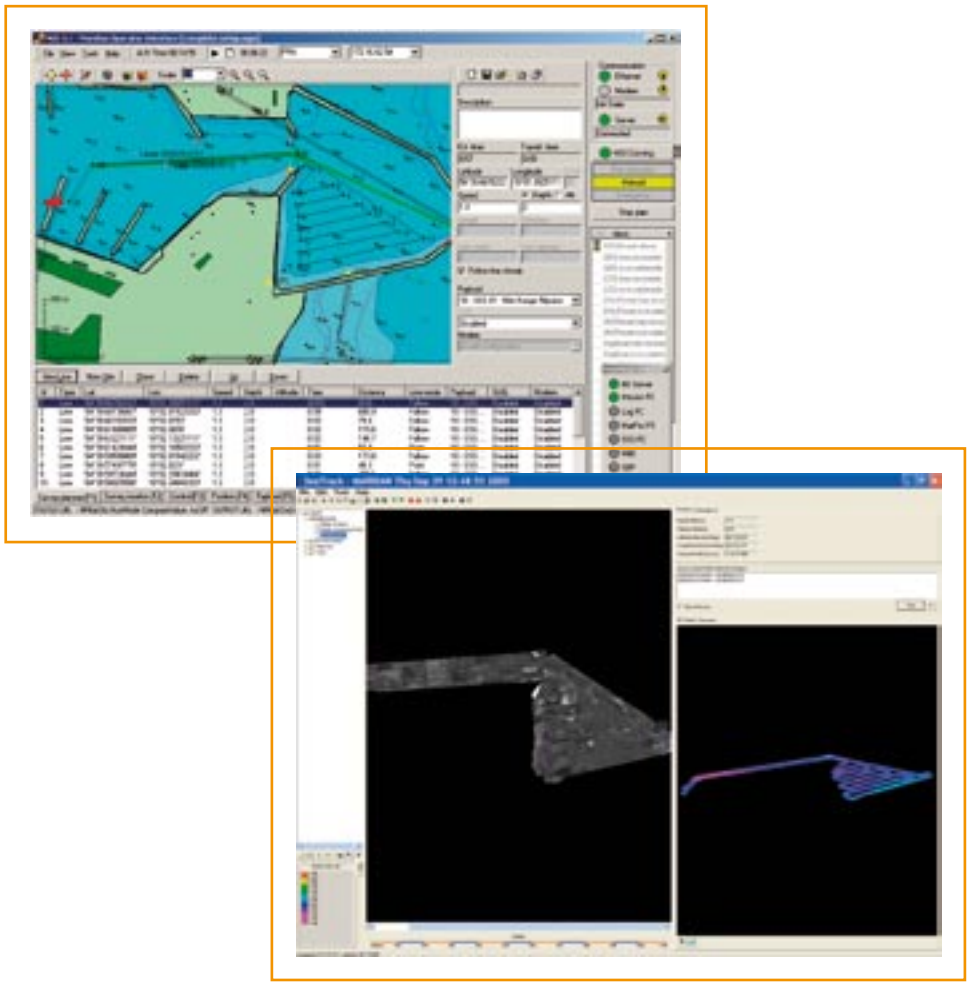


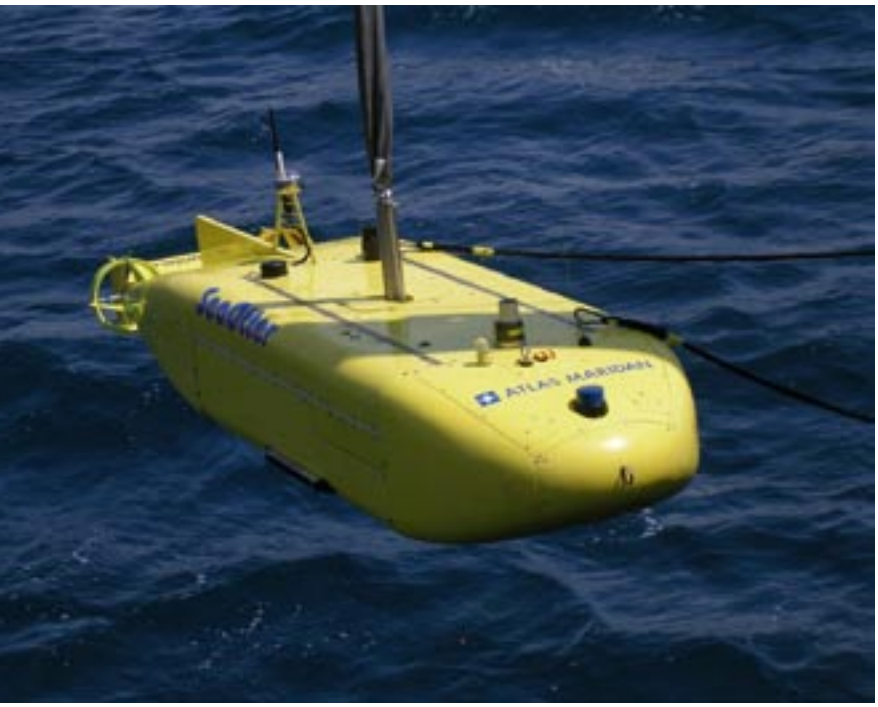


AUVs are able to operate completely independent from a surface platform with minimum technical or logistic support and no externally applied signals or tracking systems required. They can operate at variable depths for lengthy periods of time, including operation in areas which are inaccessible to towed bodies or ROVs be it because of geographic constraints or because of the necessity to operate covertly. Because of these unique capabilities, AUVs are a highly valuable asset in the underwater battlespace.

Available Today: SeaOtter MkI

The vehicle is an improvement of the well proven MARIDAN 600 AUV which has been in operation throughout the world for several years. It has been upgraded with improved navigation capabilities and mission management features, including an obstacle avoidance function. The flatfish, hydrodynamic shape of the vehicle provides a large deck area for downward-looking sensors and enables exceptional stability and manoeuvrability for optimal sensor performance with accurate data acquisition. This feature permits direct implementation of raw data mapping without post-processing for survey mosaic correlation. A SeaOtter MkI vehicle is currently in use by the German Armed Forces Technical Center for Ships and Naval Weapons.





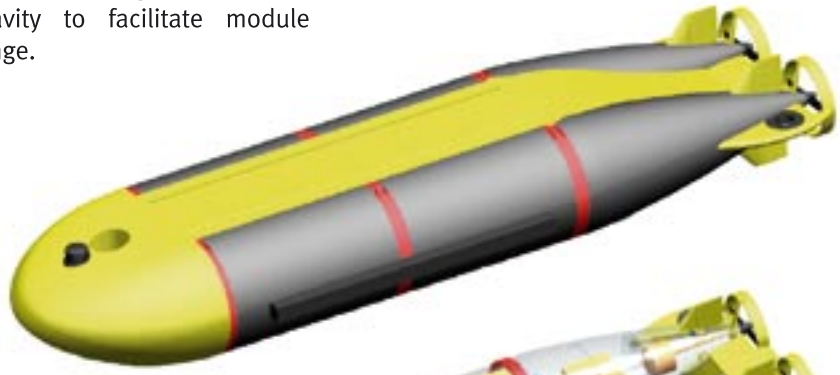
The standard version of the vehicle is equipped with a commercial-off-the-shelf side scan sonar, a multi-beam echosounder and a sub-bottom profiler. The modularity of the AUV has been achieved by designing a hull, in which emergency drop weight, navigation system, batteries, computer systems, payload, launch and recovery system, propulsion system and Power Conversion are located. The electronics are housed in sealed compartments connected with wet combined power and signal cables, this allows the vehicle to survive a partial flooding. SeaOtter MkI is equipped with a high-performance Doppler-inertial positioning system known as MARPOS. MARPOS provides high accuracy position and attitude data as a robust and self-contained system.

Specification Summary SeaOtter

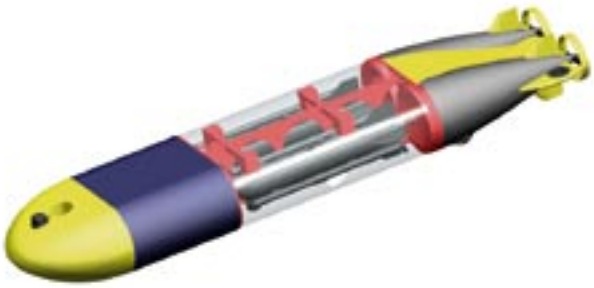
	SeaOtter MkI	SeaOtter MkII
Dimension (l x w x h, weight)	4.5 m x 1.2 m x 0.6 m, 1500 kg	3.45 m x 0.98 m x 0.48 m, 1100 kg
Speed Range	0.5 - 5.0 kts	0.0 - 8.0 kts
Optimal Survey Speed	3.0 kts	4.0 kts
Current range	2.0 kts	3.0 kts
Turn Radius	10 m (adjustable)	< 10 m @ 4 kts
Maximum Operational Depth	600 m	
Operational Depth Range	5 m- 600 m	
Survey Endurance	7 hours (lead-acid batteries) 15 hours (NiMH batteries)	24 hours @ 4 kts
On-deck turn around time	1 hour	1 hour by exchange of complete module 4 hours by charging 36 kWh
Primary Navigation System	MARPOS Inertial Navigation System (INS) coupled with Doppler Log (DVL), DGPS, CTD and Pressure Sensor	MARPOSII Inertial Navigation System (INS) coupled with Doppler Log (DVL), DGPS, CTD and Pressure Sensor
Backup Navigation System		Built-in redundancy in Hardware/Software/Algorithms to prevent single point of failure
Optional Navigation Sensors	LBL, USBL and Synthetic LBL • Forward Looking Sonar	LBL, USBL and Synthetic LBL • Forward Looking Sonar, SLAM Navigation
Accuracy	Site survey: 0.03 % of travelled distance • Line survey: 0.1 % of travelled distance	
Altitude Keeping	+/- 0,5 m	
Data Transfer	Submerged: Acoustic Modem – 12 kHz, Surface: WLAN – 2 Mb/s, On-Deck: Fast Ethernet	
Operating Modes	Remote Controlled, Autonomous	Remote Controlled, Autonomous, Direct Autonomous, In-Mission Replanning, Obstacle Avoidance
Mechanical Layout		Modular
Emergency Systems	ARGOS Pinger, Strobe & VHF Beacon, Emergency Pinger, Drop-Weight	ARGOS Pinger, Strobe & VHF Beacon, Emergency Pinger, Radar Transponder (Optional), Emergency Ballast System
Handling System	Two Standard 20 feet containers for AUV and Operator/Technician Station	
Support	24 hours hotline, on site upon request	
Payload	According to Customer Requirements	
	Standard: Klein 2000 Side Scan Sonar Reson 8125 Multi Beam Echosounder GeoAcoustics Sub-Bottom Profiler GeoChirp	Standard: ATLAS Multi-Beam/Multi Aspect Side Looking Sonar SONARTECH ATLAS Fansweep 30

Under Development Now: SeaOtter MkII

The extended modularity of SeaOtter MkII brings a further dimension of flexibility and versatility to the ATLAS UUVs. Based on the Mk I version, SeaOtter MkII is designed in accordance with our design philosophy of enhancing proven technology. The modular design enables the interchange of different modules for propulsion, energy packages, communications, navigation and payload as well as the capability to cope with modules of various dimensions. The vehicle hull is built up as a twin hull system with the possibility to change both the width and the length by using special interface connectors. The SeaOtter Mk II has four different middle section configurations, of which one will contain the Expendable Mine Neutralisation Vehicle SeaFox in the future. The different sections have a common standard in relation to weight and center of gravity to facilitate module exchange.



In its MCM Version the vehicle will be equipped with an ATLAS side-looking-sonar with multi-beam/ multi-aspect capability (SLS) with a synthetic aperture (SAS) function which is specifically designed for the detection and classification of naval mines in bottom conditions with a high density of minelike objects. In addition the vehicle will carry a multi-beam echosounder for high-resolution classification results.
Due to the modular nature of the vehicle, other sensor combinations can easily be integrated.



AUV Missions

The wide range of special features of Autonomous Underwater Vehicles enable them to contribute to a number of areas in naval warfare including

- Minehunting
  - Dedicated
  - Organic
  - Shore-Based
  - Air-Delivered
- Anti-Submarine Warfare
- Intelligence, Surveillance, Reconnaissance
- Rapid Environmental Assessment
- Anti-Terrorism/Force Protection
- Maritime Security
- Special Forces Support

Launch and Recovery

The Launch and Recovery System is designed for safe operation in rough weather without using dinghies or divers. It includes a single-point lifting spud on top of the AUV. A 40 m low-weight, high-strength recovery line stored in a cassette is fixed to the spud. After surfacing, the recovery line with a pop-up buoy is released from the vehicle. The pop-up buoy is recovered from the support vessel and the rope connected to the recovery system.

A variant of this Launch and Recovery system is currently in service with the German Navy and the Royal Netherlands Navy.

Photograph Courtesy DeBeers Marine

Rapid Deployment

The complete SeaOtter AUV including a crane for launch and recovery can be delivered in a containerised version based on standard 20' ISO containers for rapid deployment. This solution is particularly attractive for use on ships of opportunity and for shore-based operations.

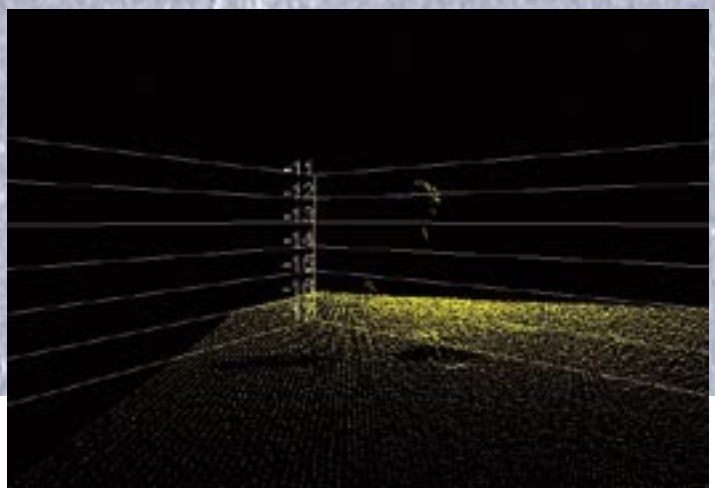
Examples of Military Missions

Minehunting

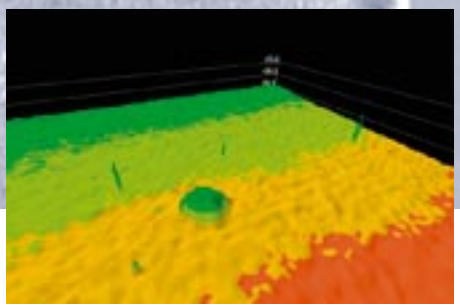
The SeaOtter AUV opens new perspectives in Mine Countermeasures. The vehicle can be operated from dedicated or non-specialized navy ships, crafts of opportunity including helicopters or directly from the shore. In all cases, the modus operandi is similar. Upon evaluation of the MCM Task Order and assessment of the minehunting conditions the mission plan is generated, taking into account required percentage clearance and coverage of the task area. Following the approximately 5 minute pre-launch check, the vehicle is sent off to its mission which can include a transit into the actual task area. During the mission the vehicle is capable of transmitting its position and vital status data via an underwater acoustic link. During the AUV mission the launching platform is free to execute other tasks in parallel. This can include but is not limited to identification and disposal of mines classified in previous AUV missions. Upon completion of the MCM Task, the data is retrieved either by the wireless Ethernet data link or by downloading the data after recovery of the vehicle, depending on the tactical situation.

This concept of operations provides unique benefits to the MCM Commander such as:

- Force multiplication
- Covert operation
- Increased safety for personnel
- Operational flexibility
- Very shallow water capability
- Operation in confined waters



Moored Mine

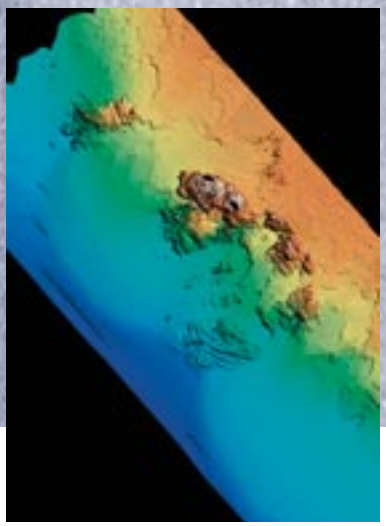


Manta Mine

Rapid Environmental Assessment

Taking into account the relevant environmental conditions which prevail in an area of interest is of vital importance in the estimate of the situation preceding a naval operation. The maritime commander needs to know in advance, what the influence of e.g. the weather, the sound velocity profile, the bottom conditions or the sea-state may be on the sensors and effectors under his command. It is important, that this assessment is carried out swiftly, safely and many times there is the requirement for covert execution in order not to compromise the planned operation.

These aims can be achieved with SeaOtter, taking into account its high-precision navigation, its endurance and its capability of carrying a variety of sensors. Again, the vehicle could be launched from any available ship, carrying out its REA mission completely autonomously.



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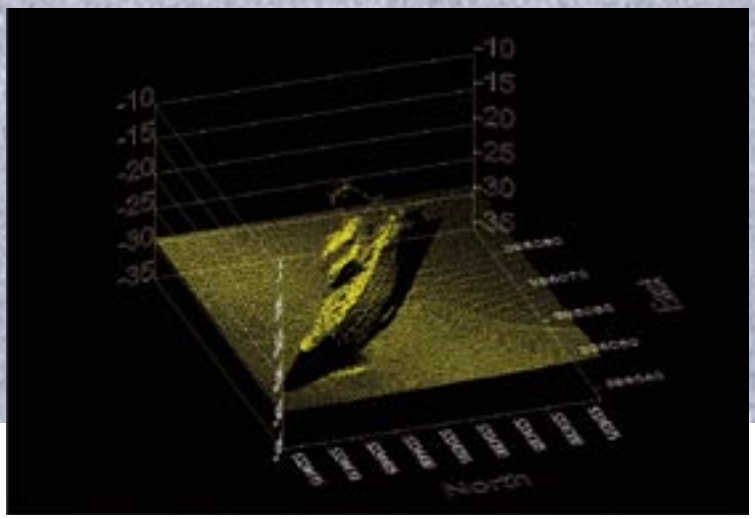

Ship Wreck

SeaOtter Advantages

- Proven Technology
- Available today
- Highly flexible due to modular approach
- Completely self-sufficient system with not external aid (e.g. acoustic transponders)
- Unique precision in navigation
- Full integration into the ATLAS IMCMS if desired
- Air transportable

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