



KONGSBERG

AUV SYSTEMS

.....

COMMERCIAL APPLICATIONS

HUGIN
MUNIN
SEAGLIDER
REMUS



KONGSBERG MARITIME

KONGSBERG Maritime is one of the largest suppliers of high-quality marine electronics in the world, with product lines that include underwater sensor systems; complex ship and process control systems for commercial vessels and oil rigs; sonars and instrumentation systems for fishery and scientific research vessels; and autonomous underwater vehicles (AUVs). All KONGSBERG products are designed, tested and manufactured with one goal in mind: Reliable performance in the challenging and unforgiving marine environment over long periods of time.

KONGSBERG Maritime along with its subsidiaries – KONGSBERG UNDERWATER TECHNOLOGY, Inc. and HYDROID, Inc. – manufacture commercial off the shelf (COTS) Autonomous Underwater Vehicles (AUVs) and AUV-related equipment under the HUGIN, MUNIN, SEAGLIDER AND REMUS brand names. As AUV industry leaders, these three companies combined, have fielded over 300 vehicles world-wide.

As COTS manufacturers, KONGSBERG, KONGSBERG UNDERWATER TECHNOLOGY, Inc. and HYDROID, Inc. offer 24/7/365 support focused on ensuring that its AUVs are always operational.

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INTELLIGENT MARINE ROBOTS YOU CAN RELY ON

AUVs have revolutionized marine and ocean exploration. What was once an expensive, limited endeavor completely reliant on surface vessels is now accomplished by AUVs, or self-powered undersea robots that gather high-resolution remote spatial and temporal measurements.

AUVs offer a nimble, flexible alternative to traditional surface vessels. They can glide close to the surface, dive to depths of more than 6000 meters, explore shallow waters or hover in hazardous areas where navigation is difficult. The benefits are numerous. AUVs have reduced the high costs of ocean exploration and sampling while increasing the availability, quality and quantity of scientific marine data.

Advantages

The strength of KONGSBERG and HYDROID AUVs is the seamless integration of sophisticated instrumentation into flexible, highly modular vehicles that provide the operator the highest quality data and positioning available in the market today. The vehicles are easily transportable and can be operated from vessels of opportunity almost anywhere in the world. Both companies' AUVs feature customizable payloads that have the flexibility to accommodate multi-beam sonars, high-resolution cameras, synthetic aperture sonar and more, giving the operator the flexibility to meet many mission scenarios with a single vehicle. With vehicles ranging from shallow, coastal water surveyors to 6000 meter ocean water workhorses, our AUVs can operate in approximately 98% of the world's ocean.

Sensors can be placed close to the area of interest. Coupled with high quality navigation solutions this ensures the data is both meaningful and accurate.

They are quick and easy to deploy around the world, and most units require minimal installation and calibration, thereby reducing ship time and commercial assets.

The endurance of an AUV allows the vehicle to investigate a larger area for a longer period of time. In addition, the potential to network multiple AUVs together can increase productivity to levels never seen before in commercial applications.

R&D Efforts

The R&D efforts of KONGSBERG and HYDROID have focused on enabling AUVs to operate multiple payload sensors simultaneously, as this is the real advantage AUVs offer over traditional survey methods. In addition, researchers have spent more than 15 years on lowering the platform's signature (electrically, acoustically and magnetically), as well as carefully selecting payload sensor frequencies and managing their synchronization. The result: Marine or fresh, pelagic or benthic, photic or aphotic, both companies' AUVs are uniquely equipped to gather high-quality data in a wide range of ocean environments.

AUV Models

Both AUVs offer flexible configuration options for adding new sensors and back seat driver solutions as well as an open interface.

The HUGIN AUV is recognized as the most successful commercial AUV in operation. In total, HUGIN vehicles have completed more than 600,000 line kilometers of contracted commercial survey. The vehicle is modular with a wide array of payload sensors including traditional geophysical acoustic sensors but also geochemical and environmental sensors. HUGIN is powered by swappable batteries that are easily changed out between dives, minimizing on deck turn-around time and maximizing productivity. It is available in depth ratings of 3000 and 4500 meters.

MUNIN brings all of the successes of HUGIN to the low logistics survey environment. It is a modular vehicle that is easy to transport around the world and doesn't sacrifice data quality or positioning accuracy. The MUNIN AUV has the same navigation and positioning equipment, control software and high quality sensors as HUGIN. It is the only low logistics vehicle that carries a comprehensive sensor suite capable of performing IHO-grade surveys.

SEAGLIDER has revolutionized the collection of ocean data. A long endurance AUV capable of carrying a wide range of sensors, SEAGLIDER is a powerful tool for commercial applications. SEAGLIDER's highly efficient propulsion method and its unique design allow it to execute data gathering missions lasting many months and traversing thousands of miles. Its operational model and robust design enable it to perform in virtually any sea state and weather condition. This well proven technology has demonstrated its worth as a cost effective data gathering tool for commercial applications around the world.

The REMUS AUV is available in three models: REMUS 100, REMUS 600 and REMUS 6000. The lightweight and compact REMUS 100 is designed for shallow water work up to 100 meters; the mid-range REMUS 600 can operate in depths of 600 or 1500 meters; and the deep-water REMUS 6000 workhorse operates in water up to 6000 meters deep.

AUV MODELS



KONGSBERG

HUGIN

The HUGIN AUV program started in 1990 as a joint project between KONGSBERG, the Norwegian Defense Research Establishment (FFI), and Statoil. It has since evolved to be the most capable and successful commercial AUV in operation. HUGINs are traditionally equipped with HiSAS or SSS, MBE, SBP and camera, plus a range of environmental sensors that can all operate concurrently. Available with a range of modular payload and energy options, the HUGIN AUV can run for up to 80 hours at depths of 3000 or 4500 meters.

The vehicle is launched and recovered using a Stinger ramp system. The Stinger extends over the stern of the



HUGIN: Flexible System with Unmatched Performance

ship and can be operated in Sea State 4 on up to 5 meter freeboards.

HUGIN has seen commercial operation in Europe, Africa, the Americas, Asia and Australia. It is recognized as a proven survey tool by operators offering class leading data quality and area coverage rates not seen on any other underwater survey platform.

MUNIN

The MUNIN AUV brings together the commercial success of the HUGIN with the reliable modularity of the REMUS 600 vehicles in a single platform. MUNIN retains mission flexibility by having different payload sensor modules along with the capability of running SSS, MBE, SBP and camera together.

Designed to retain a high level of performance in a small platform, MUNIN has a comprehensive navigation and positioning capability that can tie the data to a meaningful georeferenced solution. The capability is further enhanced by the autonomous pipe tracking software, making survey and inspection work easy for operators.

After transport the vehicle is assembled and mobilization time is minimized by the configuration of the navigation and acoustic sensors. The IMU, DVL, MBE and SSS are located in the same module that is calibrated at the factory. This removes the need for calibration measurement during re-assembly and guarantees consistent data quality and position accuracy.

Vehicle status, location and real time data are transmitted to the operator during supervised missions via the cNODE transponder and surface HIPAP USBL system. This makes provides a level of quality control and mission confidence unique in the low logistics AUV world.

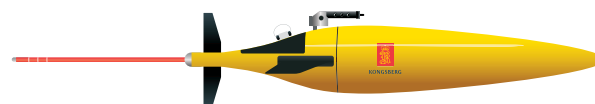


MUNIN: New Generation Low Logistics Offshore AUV System

SEAGLIDER

Rather than an electrically driven propeller, SEAGLIDER uses wings and small changes in buoyancy to achieve forward motion. This extremely efficient propulsion method results in the longest endurance of any commercial glider system. Instead of using external control surfaces to affect vehicle attitude, SEAGLIDER uses adjustable ballast. The SEAGLIDER moves through water in a saw-tooth like pattern, diving to depths up to 1000 meters. It surfaces periodically to determine its position, transmit collected data and receive commands via satellite telemetry.

Navigation is accomplished using a combination of GPS fixes while on the surface and internal sensors that monitor the vehicle heading, depth and attitude during dives. SEAGLIDER's design allows for a range of standard instruments and custom sensor packages to be developed for unique applications. SEAGLIDER's low capital cost, long deployment capacity and versatile payload capability allow collection of a wide range of high quality ocean data for a fraction of the cost of traditional collection methods. Satellite communications allow retrieval of most data in near real-time.



SEAGLIDER: Extreme Long Endurance, Low Cost AUV



REMUS

The REMUS AUV is the culmination of 15 years of leading-edge R&D and boasts a proven track record for highly reliable and consistent field operations in commercial applications utilizing a powerful and versatile suite of available high performance sensors. REMUS AUVs are offered in three vehicle classes: the lightweight, compact, man-portable REMUS 100; the highly versatile, modular REMUS 600; and the REMUS 6000, a deep-water workhorse.

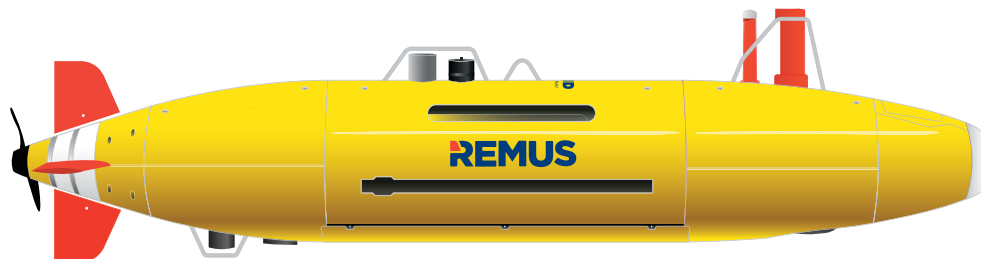
All REMUS AUVs are built on a common and proven technology base incorporating the intuitive Vehicle Interface Program (VIP). This keeps vehicle maintenance, mission planning, checkout, data analysis and cross-vehicle training seamless across the model line. The vehicles differ by size, depth, endurance and payload sensor configuration.



REMUS 100:
The Industry Standard Compact Man-Portable AUV



REMUS 600:
Full Capability in a Cost Effective System



REMUS 6000:
Deep-Water Workhorse

OFFSHORE (OIL & GAS) APPLICATIONS

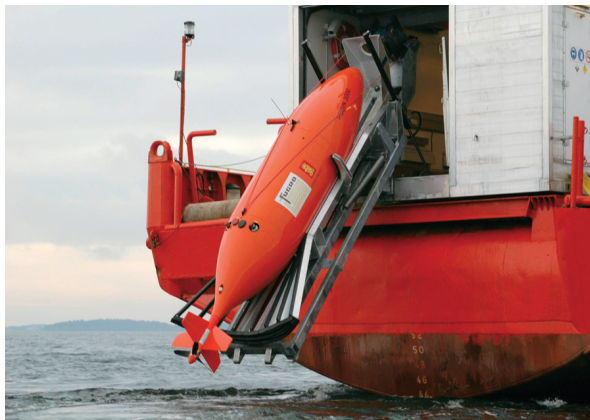
Baseline Environmental Assessment

The requirement to determine an environmental baseline is becoming more common. Whether they're detecting and quantifying natural seeps, classifying the seabed type or even mapping habitats, both companies' AUVs can get closer to the area of interest than any competing AUV, allowing them to collect more meaningful data and samples. Methane, dissolved oxygen and carbon dioxide detection can be combined with MBE water column data to detect bubbles in the water. These data can all be collected during a multipurpose mission by using both sidescan imagery and bathymetry, maximizing productivity from every single dive.

Geophysical Survey

Traditional site inspection, route surveys and hazard surveys are the mainstay of commercial AUV operations. Collecting data concurrently from many sensors provides a complete picture of the seabed and substrata that offers providing unrivalled data products prior to the commencement of geotechnical work. Because all data is collected by a common platform on a single mission, its value is enhanced and geo-referencing is straightforward.

Photo courtesy of Fugro GeoServices



Pipeline Survey

AUVs provide a rapid way to conduct pipeline surveys. Able to track alongside or overhead a pipe without intervention from an operator, KONGSBERG and HYDROID AUVs can collect HiSAS, SSS, MBE and SBP data to assess burial, freespan and buckling. During the overhead survey the on-board camera collects a mosaic of images for visual condition inspection of the pipe, junctions, sleepers and anodes. This data is quickly visualized in the Reflection post mission analysis tool that, for quality purposes, identifies areas of concern for further inspection.

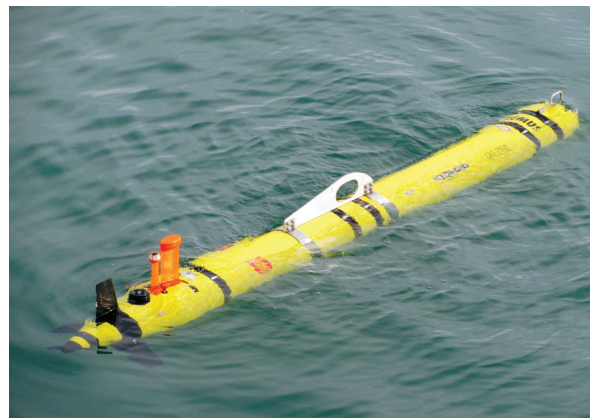
Debris/Clearance Survey

Debris assessment and site clearance with AUVs is faster than traditional methods and also offers the ability to collect much higher resolution data. Pre- and post-decommissioning assessments are good examples of AUV missions that can help quantify the impact of recent work on the sea floor.

Metocean Data Collection

In order to make informed decisions it is necessary to have as much information as possible regarding the area of interest. Long endurance AUVs can provide a very cost effective method of collecting a wide variety of metocean data. This information can be essential to the design, engineering and operational decision making process.

Photo courtesy of Woods Hole Oceanographic Institution





ENVIRONMENTAL MONITORING APPLICATIONS

Emergency Response

AUVs are an ideal tool for post-hurricane assessment of subsea infrastructure and the surrounding environment. They can also be utilized for oil spill missions to measure hydrocarbons in the water column. AUVs can be deployed rapidly from docks or ships of opportunity, making rapid response to any emergency situation simple.

Water Quality

KONGSBERG and HYDROID AUVs can record temperature, salinity, turbidity and current as part of their standard payload. They can also be equipped to detect various gasses and particles in the water. Much of this data is collected during every mission. Dives can be planned to map thermoclines and pycnocline in 3 dimensions, with return surveys for comparison providing temporal awareness.

Ecosystem Assessment

Larger AUVs are sometimes used for fish stock assessment surveys and can be equipped with acoustic sensors to detect and quantify fish, krill and plankton. The standard acoustic sensors and cameras can also be used for benthic habitat mapping. Volumetric calculations using synthetic aperture data provide a unique way to assess coral.





APPLICATIONS COMPARISON



KONGSBERG



3000/4500 M Operating Depth
Up to 80 Hours Mission Duration

- Most successful commercial AUV
- HiSAS or SSS, MBE, SBP, camera, turbidity and CTD sensors – standard
- Additional options available
- Sensors run simultaneously for multipurpose missions
- Comprehensive data sets obtained in a single dive
- Sensors tightly integrated with the vehicle's navigation systems
- Launched and recovered using a Stinger ramp system
- Operates in conditions up to Sea State 4
- Vehicle, equipment & LARS easily installed in ISO containers on ships of opportunity



600/1500 M Operating Depth
Up to 24 Hours Mission Duration

- Low logistics modular vehicle capable of IHO grade surveys
- Commercial market configured with SSS, MBE, SBP & camera
- Same operator interface as HUGIN
- Fly-away capability while retaining data and positioning quality found in larger AUVs
- Modular construction for maximum productivity, data quality and flexibility
- Swappable batteries with 24 hours endurance and all sensors running
- Navigation with multibeam echosounder and sidescan sonar
- Modular transport cases can be deployed from small ships
- LARS options include a Mini-Stinger ramp and an attachment for knuckle-boom cranes



1000 M Operating Depth
Up to 10 Months Mission Duration

- Low capital cost – a fraction of traditional methods
- Extremely long deployment time
- Versatile payload capability for collection of a wide range of high quality ocean data
- Robust design reduces the chance of missions being aborted before completion
- Large variable buoyancy allows for operation in a wider range of water densities without requiring constant adjustment of the static ballast
- Satellite communications provide retrieval of most data in near real-time
- Can be piloted from virtually anywhere in the world via satellite and Internet connection

OFFSHORE
(OIL & GAS)

Baseline Environmental Assessment
Geophysical Survey
Pipeline Survey
Debris/Clearance Survey

Baseline Environmental Assessment
Geophysical Survey
Pipeline Survey
Debris/Clearance Survey

Baseline Environmental Assessment
Geophysical Survey
—
Met-Ocean Data Collection

ENVIRONMENTAL
MONITORING

Emergency Response
Water Quality
Ecosystem Assessment

Emergency Response
—
Ecosystem Assessment

Emergency Response
Water Quality
Ecosystem Assessment

HYDROGRAPHY

Route Survey
Habitat Mapping
Deep Sea Mining
Charting
EEZ Survey
Pre/Post Dredging Survey

Route Survey
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Pre/Post Dredging Survey

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SEARCH &
RECOVERY

Asset Location
Marine Archaeology

Asset Location
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REMUS 100



100 M Operating Depth
Up to 12 Hours Mission Duration

- Low logistics, two-man portable
- Size and weight allows for economical overnight shipping
- Simple deployment/recovery
- Full suite of standard sensors for almost any subsea application
- New sensors being integrated on a continuous basis
- Modularity provides for multiple missions from the same vehicle
- Proven ten year track record of reliability
- Intuitive, Easy-to-learn Vehicle Interface Program (VIP)

REMUS 600



600/1500 M Operating Depth
Up to 45 Hours Mission Duration

- Industry's leading mid-weight AUV
- Built on success of REMUS 100
- Increased size & power capacity allow power-hungry payloads to meet customers' increasing mission demands
- Increased depth rating allowing for greatly increased operational scope
- Fully modular for a wide variety of customer-configured payloads.
- Hull sections designed for ease of separation for vehicle reconfiguration, maintenance and/or shipping
- Thousands of mission hours logged to date

REMUS 6000



6000 M Operating Depth
22 Hours Mission Duration

- A deep-water workhorse at depths up to 6000 meters
- Versatile design allows long mission durations in shallow littoral areas
- Configurable to include a wide range of customer-specified sensors
- In-field configurable to meet specific and varied mission requirements
- Simple to operate with the same leading-edge technology as the REMUS 100
- Roll on/off Launch and Recovery System (LARS) designed to be installed easily off the stern or midship of a vessel of opportunity

Baseline Environmental Assessment
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Pipeline Survey
Debris/Clearance Survey

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Emergency Response
Water Quality
Ecosystem Assessment

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Emergency Response
Water Quality
Ecosystem Assessment

Route Survey
—
—
Charting
—
Pre/Post Dredging Survey

Route Survey
—
—
Charting
EEZ Survey
Pre/Post Dredging Survey

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—
Deep Sea Mining
—
EEZ Survey
—

Asset Location
Marine Archaeology

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HYDROGRAPHY APPLICATIONS

Route Survey

Route surveys for pipeline and subsea cable installation corridors require a flexible, multi-sensor platform. AUVs are uniquely capable of providing the integrated sensor and navigation payloads needed to produce high resolution, highly accurate data to support route surveys. Using our Reflection post-processing software, operators will produce a geophysical dataset that will allow them to identify safe route corridors in the most efficient manner.

Habitat Mapping

Overfishing, climate change and other factors have led to a decline in fish stocks around the globe. Scientists are searching for a better understanding of fish habitats and their associated environmental characteristics in order to reverse this trend. Combining KONGSBERG's vast experience with fisheries sonars and mapping sonars, these AUV product lines can offer fully integrated solutions. Policy makers, scientists and researchers use the resulting benthic maps to make informed decisions that help protect fragile coastal areas.

Deep Sea Mining

Both companies' AUVs support the growing deep sea mining industry by offering vehicles that operate in the desired depths of 1000 to 6000 meters. The AUVs carry industry-leading geophysical survey instrumentation that produces high-resolution digital terrain maps of the ocean floor. When compared to traditional surveying methods, KONGSBERG and HYDROID AUVs provide the deep sea mining industry with more detailed imagery of ocean floor structures and surface texture to aide in the identification of mineral deposits.

Charting

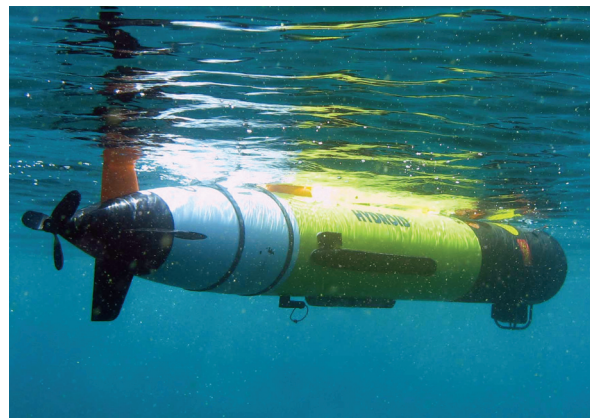
KONGSBERG and HYDROID AUVs are used to perform underwater survey missions, such as detecting and mapping submerged wrecks, rocks, and obstructions, that help ensure the safety of commercial and recreational vessels. The AUVs are equipped with KONGSBERG's industry leading multibeam sonar and inertial navigation processor (NavP) to provide high-resolution hydrographic data. The combination of KONGSBERG's sensors and both lines' AUVs have proven their ability to deliver IHO Special Order surveys to support charting efforts around the world.

EEZ Survey

As part of the United Nations Convention on the Law of the Sea (UNCLOS), nations must complete surveys of their Exclusive Economic Zone (EEZ) in order to claim jurisdiction. AUVs provide detailed hydrographic charts and geophysical information that help nations fulfill the requirement to evaluate their subsea national assets and define international maritime boundaries.

Pre/Post Dredging Survey

Dredging in ports and coastal areas requires knowledge of seafloor characteristics and potential hazards prior to the commencement of operations. Both companies' AUVs offer an integrated solution to efficiently survey the operational area without the need for a large survey vessel. After dredging is complete, the AUVs can also verify that the clearance depth of the area has been achieved and that there are no remaining hazards to navigation.



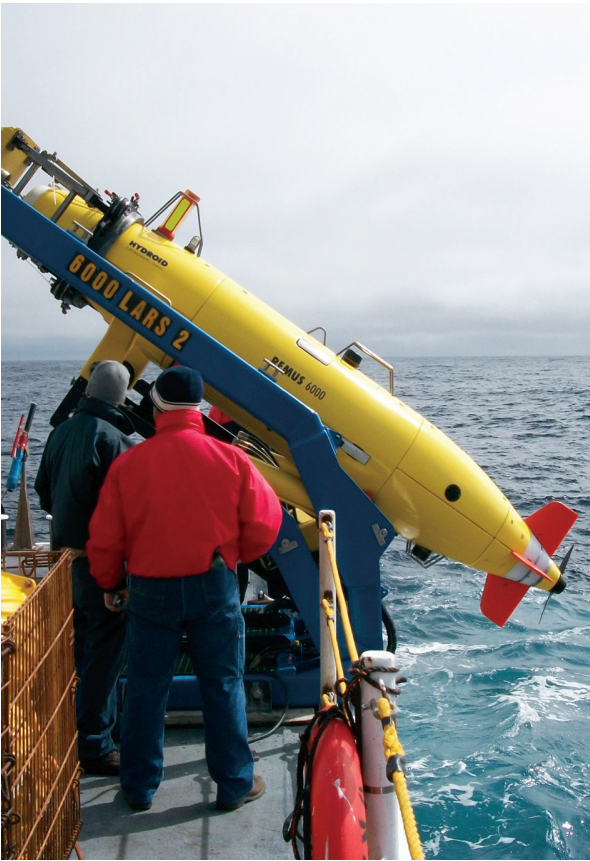
SEARCH & RECOVERY APPLICATIONS

Asset Location

KONGSBERG and HYDROID AUVs have been used in subsea asset location surveys for over a decade. Operations have included searches for downed aircraft, sunken vessels and marine forensic investigations. These AUVs carry state-of-the-art sonars that efficiently map vast areas of the seafloor and allow users to identify objects of interest in both shallow coastal water and the dark depths of the open ocean. After identifying objects with sonar, the AUVs can be programmed to get visual confirmation using cameras that are co-located with the sonars on the AUV. With vehicles that can survey from 0 to 6000 meters, combined, both companies' AUVs can effectively search 98% of the world's oceans.

Marine Archaeology

Marine archaeology at depths beyond the capabilities of scuba divers was a difficult proposition before the development of AUVs. Today, AUVs are cost-effective tools for locating, identifying and surveying archaeological sites in water depths up to 6000 meters. AUVs that integrate sonar and optical instrumentation are ideal for conducting high-resolution bottom surveys and producing photomosaics of an archaeological site with exceptional detail. AUVs give archaeologists both a wide area and fine detail perspective of sites that would be unimaginable using traditional methods.



VEHICLE SAFETY FEATURES

Health Monitoring

Both companies' AUVs have core systems designed to monitor the status and operation of essential components. Health monitoring includes batteries, motors, sensors and communications as well as conditions such as depth or water ingress.

If an abnormality is detected, then an alarm is raised. During supervised missions this will be transmitted to the operator enabling them to decide if the vehicle should return from its mission. When the vehicle is operating autonomously, the response to an alarm is determined by the preselected response listed in the mission plan. This could include an emergency abort to preserve vehicle security.

Communication and Tracking

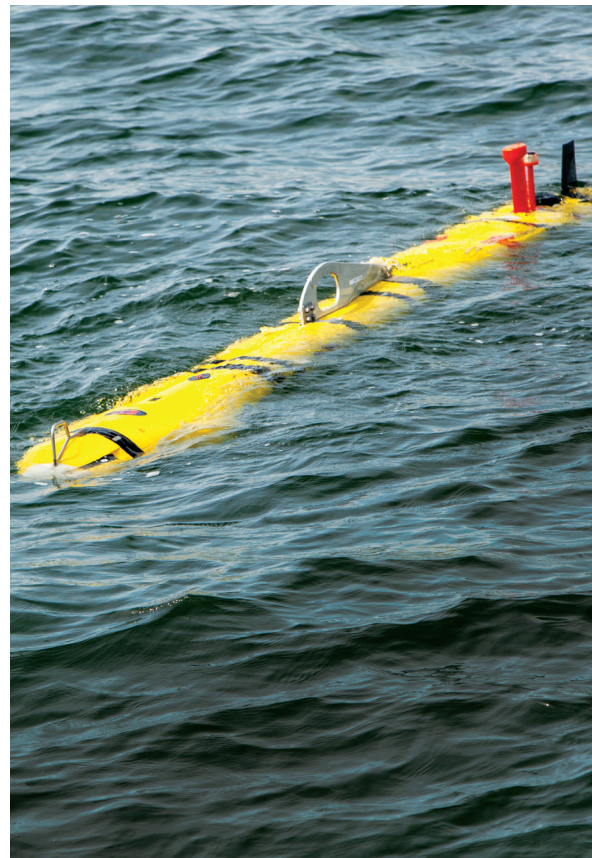
Operators can monitor the AUV's progress and status via an acoustic or satellite link. This also enables amendments to the mission plan to be sent to the vehicle along with position updates if required. Many of our AUVs can be equipped with acoustic positioning systems that can aid the on-board IMU and DVL equipment to make the real time position solution as accurate as possible.

Some KONGSBERG and HYDROID AUVs also transmit real-time sidescan and bathymetry data back to the operator acoustically. This data is displayed on the payload computer screen to give the operations team confidence that the mission is progressing as planned and there are no gaps in the data.

When the AUVs are on the surface, they can communicate via Wi-Fi or radio with the operator. They are also equipped with GPS receivers to update the IMU position with the most accurate information available.

Emergency Localization

To assist with emergency localization and recovery operations, the AUVs can be equipped with emergency radio beacons, strobe lights and satellite communications. In the event of an emergency ascent, the position and status of the vehicle can be sent via the Iridium network to the operators and home base simplifying post-emergency localization. If two-way satellite communication is enabled, a revised mission plan can be sent to the vehicle from anywhere in the world.



LAUNCH & RECOVERY SYSTEMS

The launch and recovery of an AUV is critical, as many AUV operations take place in rough, open seas. Two LARS (Launch and Recovery Systems) are offered that can meet a variety of parameters.

KONGSBERG LARS

The HUGIN AUV is normally launched and recovered using the Stinger ramp system. Capable of operating in Sea State 4, the Stinger can be installed either on an open deck, or more commonly in a container or workshop. The Stinger system is available in two lengths for freeboards of either 3 or 5 meters.

The Mini-Stinger ramp system is a modular transportable stinger designed to be used on vessels of opportunity. The bottom section of the Mini-Stinger is flexible and has flotation built into it, providing some compensation for wave action during recovery.

Cranes can be utilized for launch and recovery with either a hydraulic or electric saddle attachment. MUNIN can also be operated from a HUGIN Stinger with an adaptor plate fitted.

HYDROID LARS

The HYDROID LARS is designed to function off the stern or midship of a vessel and is field proven with the REMUS 600 and REMUS 6000 AUVs. The self-contained LARS can extend the operational weather window of the AUV by allowing launch and recovery in sea states up to Sea State 5 while retaining the flexibility to operate from any vessel of opportunity. When mounted on the stern of a ship, the LARS has a 5.5 ft. x 10 ft. footprint, and requires less than 15 Hp when operational.

Docking

Certain KONGSBERG and HYDROID AUVs can be configured with autonomous docking capability. The systems includes:

- Dynamic Docking
- Docking Stations
- Whisker Noses
- Automated Recovery

Photo courtesy of Fugro GeoServices



OTHER SENSORS & NAVIGATION

KONGSBERG and HYDROID AUVs contain a full suite of standard sensors, with additional specialized and custom sensors available to meet a broad range of customer requirements.

In addition to these vehicles being highly modular, they are also equipped with the industry's leading navigation package, which includes high-grade inertial measurement units (IMUs) and the Kongsberg Navigation Processing Suite (NavP). This combination allows the companies' AUVs to conduct missions that meet IHO Special Order survey requirements for positioning. NavP also allows the vehicle to achieve timing accuracy of 1ms or better and provide complete time synchronization of all onboard sensors. In addition to NavP, the Navigation Laboratory (NavLab) software package provides customers with a post-processing software suite designed specifically to improve AUV positioning. Finally, leveraging KONGSBERG's experience in underwater acoustics, AUV positioning can be aided by HiPAP USBL systems that allow the vehicle's inertial sensors to be updated in real-time during the mission. World-class sonar options include:

EM 2040 Multibeam Sonar

The EM 2040 is the first system to bring all the advanced features of deep-water multibeam to the near-bottom sounding environment. The EM 2040 comprises a transmit transducer, receive transducer and processing unit. To ensure data quality, the EM 2040 receives an input from both the on-board navigation equipment and a sound speed profile of the water column between the transducers and the bottom. Capable of operating between 200 and 400 kHz, the EM 2040 is suitable for a wide range of survey and inspection tasks. High resolution bathymetry, water column data recording and class-leading backscatter images make the EM 2040 the multibeam of choice for commercial AUVs. The EM 2040 can be integrated in HUGIN and REMUS 600 vehicles.



HiSAS 1030

(High Resolution Synthetic Aperture Sonar)

Synthetic aperture sonars combine a number of acoustic pings to form an image with up to 10 times higher resolution than conventional sonars. HiSAS is a wideband SAS sonar with a frequency range of 70-100kHz. It is capable of producing ultra high resolution acoustic images and co-registered bathymetry over the entire swath. Standard processing produces a resolution of 4 x 4 cm. The SAS image resolution is range independent, reaching as far as 300 meters on either side of the AUV. When combined with the EM 2040, the HiSAS offers a maximum area coverage rate of 2.6 square kilometers per hour. The latest generation HiSAS includes in-mission processing of SAS images and bathymetry, reducing post-mission processing requirements significantly. HiSAS data is stored on a removable storage device which can be swapped while the AUV batteries are replaced during the on-deck turn-around.

Other Subsea Sensors

- Side Scan
- Sub-bottom Profiler
- Interferometric Multibeam Sonar
- Echo Sounders
- Electronics Camera & LED Lighting
- Video Camera
- HiPAP (High Precision Acoustic Positioning)
- NavP (Inertial Navigation Systems Processing Suite)
- NavLab Post Processing Navigation Software (Navigation Laboratory)
- Acoustic Communications
- Environmental Package/Suite
- Customized Sensor Configurations Available

For more information, visit:

kongsberg.com/auv/sensor-configurations

GLOBAL CUSTOMER SUPPORT

We are always there, wherever you need us. Both customer service organizations are designed to provide high-quality, global support, whenever and wherever it is needed. We are committed to providing easy access to support and service, and to responding promptly to your needs. Support and service activities are supervised from our headquarters in Norway, with service and support centers at strategic locations around the globe – where you are and the action is.

As part of our commitment to total customer satisfaction, we offer a wide variety of services to meet individual customers' operational needs. Support 24 is a solution designed to give round-the-clock support. For mission-critical operations, Support 24 can be extended to include remote monitoring. We can adapt the level of support needs by offering service agreements, on-site spare part stocks and quick on-site response arrangements.



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HUGIN & MUNIN

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Global and Local Support

We provide global support from local service and support facilities at strategic locations world-wide. Service and support work is carried out under the supervision of your personal account manager, who will ensure that you receive high-quality service and support where and when you need it. Your account manager will ensure continuity and work closely with your personnel to improve and optimize system availability and performance. Under the direction of your account manager, and with a local inventory of spare parts, our well qualified field service engineers will be able to help you quickly and effectively.



km.kongsberg.com/auv



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