

# AUVS FOR MARINE EXPLORATION AND SURVEY

## Hydroid: From Shallow to Deep

Being detached from a vessel increases the range for surveying, making it possible to access deeper and more difficult areas of the sea and oceans. Hydroid LLC develops and manufactures Autonomous Underwater Vehicles (AUVs), building on research and practical use of its REMUS range.

As the need for information and surveillance continues to increase, so does the demand for technology that constantly collects data and monitors change in our environment. This has spurred a growing industry in unmanned underwater, air and ground systems capable of continuous collection of data to help people better understand their surroundings and make informed decisions. Nowhere is this need to understand the “unknown” greater than in the 70% of the earth’s surface covered by water. While underwater vehicles have for years been used to explore the seas, these vehicles were traditionally tethered to larger surface vessels, limiting their mobility and applications. The introduction of untethered AUVs has opened up a world of possibilities for underwater research and surveillance in both the public and private sectors. Among other applications, AUVs are currently being used by scientists to study the ocean and its floor, by navies around the world to search for undersea mines, and by oil & gas companies to map the seafloor for sub-sea pipelines. While hundreds of different AUVs have been designed over the past two decades, today only a few companies produce a significant number of vehicles. A pioneer in the AUV industry, Hydroid LLC produces the most widely used vehicle and continues to expand its technology to meet the unique needs of its customers.

### REMUS

Hydroid’s flagship AUV, the Remote Environmental Measuring UnitS (REMUS) 100, is a lightweight, low-cost AUV. The REMUS technology was originally designed by the Woods Hole Oceanographic Institution (WHOI), the world’s largest private, not-for-profit ocean research, engineering and education organisation. In 2001, after fifteen years research and development, REMUS inventors founded Hydroid to provide continual product development and allow this technology to reach a broader market. While REMUS was originally developed to conduct coastal surveys in support of science it was later, with support from the Office of Naval Research, modified for military use. This military organisation recognised the benefits that untethered undersea vehicles could bring to its operations, especially in searching for underwater mines in hostile waters.

### Growing Company

Over the past six years Hydroid has continued to produce AUVs that fulfil the needs of military organisations, research institutes and commercial companies. The company has grown at an amazing rate and has relocated its operations to a state-of-the-art facility in Pocasset, MA, uniquely designed to support its growing product offerings and more than forty employees. Commercial success has followed the company since its inception. It has and continues to deliver a continual stream of products through an efficient and well-organised manufacturing system that consistently produces quality products. Hydroid now boasts over 150 AUV system sales to a variety of domestic and international customers, and offers a sales and support network spanning nearly thirty nations around the globe. With an unprecedented number of systems delivered and thousands of mission hours to its credit, the REMUS vehicle has become the autonomous tool of choice for environmental monitoring, mine countermeasures and hydrographic survey.

### Shallow to Deep

Hydroid offers a full range of REMUS vehicles designed to meet customer needs from coastline to the deepest corners of the ocean. The original compact, lightweight REMUS 100 remains the cornerstone of the product line. Built for operations in coastal environments up to 100 metres in depth, the REMUS 100 can be configured to include a wide variety of standard and/or customer-specified sensors and systems. Hydroid’s most versatile AUV, the REMUS 600 is designed to support operations requiring extended endurance, increased payload capacity and greater operating depth. To support very deep-water missions Hydroid recently introduced the REMUS 6000, which allows users to explore up to 93% of the depth of the world’s oceans. With the same proven software and electronic subsystems found in the REMUS 100, both the 600 and the 6000 offer the depth rating and increased capabilities to take autonomous operations to the next level.

### Opportunities Ahead

Hydroid is experiencing aggressive growth as REMUS technology is chosen by navies around the world for shallow-water mine hunting and port and harbour security applications. With systems widely in use in the United States, NATO countries and Australasia, the REMUS 100 is becoming the de facto standard for MCM operations. The addition of the REMUS 600 and REMUS 6000 systems complement, as described above, the established product. By allowing four vehicles in the same water space REMUS offers a force multiplier for covert operations conducted from a remote site, thus removing people from hostile environments.

### Setting the Course

AUVs have traditionally been custom-designed, expensive systems. Hydroid has redefined this market model by offering a range of AUVs as commercial off-the-shelf (COTS) solutions. Based on its development at WHOI the utility of the full range of REMUS vehicles is maximal. Interoperability between members of the REMUS family of vehicles enables autonomous operations that were virtually impossible to achieve only a few years ago.

### Exports

REMUS technology is export controlled by both the US Bureau of Industry and Security in the Department of Commerce and in certain configurations by the US State Department. During 2007 Hydroid received its first export licences from the State Department to deliver a REMUS 100 and a REMUS 600 to the Office of Defence Science and Technology in Australia, and to the Royal Australian Navy.

### The Horizon

Looking to the future, Hydroid hopes to increase its presence in the larger-vehicle category, increase international sales for the entire product line of REMUS vehicles and expand into new commercial markets. Delivery of REMUS 600s in 2007 and contracts for systems to be delivered in 2008 demonstrate the company's capacity to expand into the larger-vehicle marketplace.