

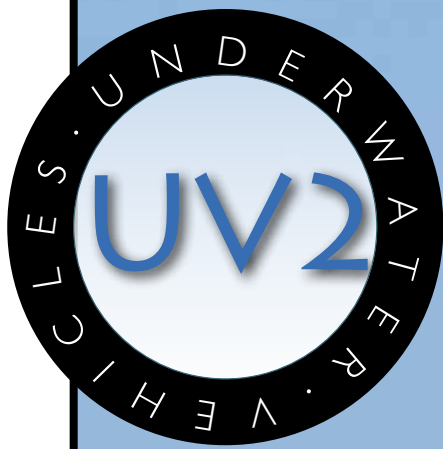
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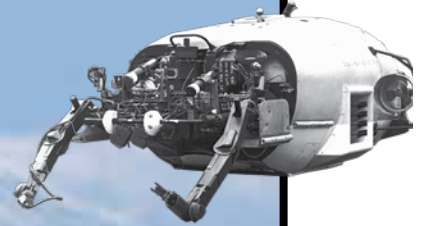
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APRIL 2021

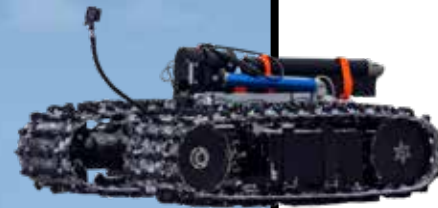
UNDERWATER VEHICLES



SUBMARINE ESCAPE



EARLY ROV



SEABED CRAWLERS



UNDERWATER GLIDERS

UNMANNED AMPHIBIOUS SURVEY SOLUTION FOR ARMY



Ultrabeam Hydrographic, specialist in high-resolution 3D marine asset survey, recently designed, built and successfully demonstrated an amphibious unmanned survey platform for the British Army.

The proposal was developed in response to a MoD Defence and Security Accelerator (DASA) funded project, *'Map the Gap'*, run on behalf of the Defence Science and Technology Laboratory (Dstl). Ultrabeam Hydrographic, in conjunction with subsidiary Foundry Cub, was awarded one of five contracts to develop a remotely-operated reconnaissance aid to help British Army troops safely and stealthily advance across water obstacles in enemy territory.

CROSSING CHALLENGE

Currently, the only way of identifying suitable water crossing points is to send Royal Engineer reconnaissance troops to survey both banks of the river, exposing them to danger which also risks compromising the operation by signalling interest in that location to the enemy. The ultimate aim is to remove personnel from these dangerous tasks with a remote system that allows more crossing locations to be surveyed, increasing the choices available to commanders and giving an opportunity to surprise the enemy.

CUSTOM DESIGN

Ultrabeam Hydrographic specialises in high-precision hydrographic survey capability for marine assets including harbours, bridges, oil and gas platforms and offshore renewable energy installations.

It designs and custom builds its own vessels and platforms to carry technology including multibeam sonar, laser scanner, high resolution cameras and imaging sonar. Its range of vessels built to date are compact and highly manoeuvrable due to a unique vectored thrust propulsion system providing a stable platform for optimal performance of survey equipment, even in difficult or hazardous conditions.

AMPHIBIOUS VEHICLES

The company's Technical Director, Gabriel Walton, saw an opportunity with the Map the Gap industry call, to leverage its experience of on-water survey to develop an amphibious craft. The result was a high-spec, autonomous, hydrographic survey vehicle that could operate on land and on water and transition smoothly between these environments.

They named the vehicle the 'Argonaut'.

Walton commented: "The Project Argonaut team at Ultrabeam started the initial design work in September 2020, moving to 'build' within weeks. We brought in various partners including the Applanix

Corporation, who kindly granted us use of their inertial navigation system and Nortek, who supplied an Acoustic Doppler Current Profiler (ADCP).

"The Argonaut's control system was developed by Dynautics," Walton added, "who successfully adapted their MicroSPECTRE auto-pilot, traditionally used for marine vessels such as USVs, to drive the vehicle remotely both on water and on land."

BUILD DETAIL

By stripping back and customising an existing, proven off-road vehicle design, Ultrabeam created a

fully-electric off-road and on-water platform.

Two 5kW brushless motors were fitted to drive the vehicle on land, with Torqeedo brushless outboard motors providing on-water propulsion and Tesla lithium battery components providing the power.

The Argonaut platform was fitted with a survey payload including an engineering-grade laser scanner and a high-resolution multibeam sonar, coupled with the Applanix inertial navigation system. The system also incorporated a fully-portable ground control station, designed to fit inside a small Peli case, from which connections can be broken out to link up to a larger control site where available.

This mobile command centre enables access to onboard computers and the control of measurement equipment as well as giving the ability to control the vehicle and set its various autonomy modes.

SUCCESSFUL FIELD TRIALS

Field trials were completed in December 2020, with the 3m long, 450kg Argonaut successfully navigating difficult terrain as well as efficiently transferring to the water. The amphibious unmanned vehicle was designed to overcome several foreseen challenges, including ground bearing capacity, bank height and gap width issues as well as river flow- it successfully tackled everything in its path.

On land, the 8x8 wheel-drive vehicle reached a speed of 8mph at 3000rpm, with the motors capable of 6000rpm for 16mph speeds where necessary.

The Argonaut was also able to successfully scale a 45deg incline. In the water, the shallow-draft Argonaut reached a speed of 4mph with the bow thruster enabling accurate heading control and the ability to perform strafe movements.

Dynautics' auto-pilot provided auto heading, route following, position holding, auto speed and strafe movement tests.

Based on these field trials it is estimated that the endurance of the Argonaut amphibious vehicle is well over 12 hours, with an estimated range of 20-60 miles, dependent on terrain and speed.

With the second phase of the Map the Gap project now launched, Ultrabeam Hydrographic hopes to be able to further develop its solution for British Army troops. Meanwhile, the unique Argonaut has already been deployed commercially on various inshore survey tasks in hard-to-reach locations.

