

Topic: N08-218

## White River Technologies

Compact, Lightweight Magnetic Sensor for Small Unmanned Undersea Vehicles (UUV)

White River Technologies (WRT), a small business focused on magnetics detection applications, in collaboration with Naval Sea Warfare Center Panama City Division (NSWC-PC) is developing "MAGNUM," a magnetic sensing confirmation module for the MK18 family of unmanned undersea vehicles (UUVs). MAGNUM significantly improves Navy capabilities to locate, classify, and neutralize undersea explosive threats. This technology addresses the challenges of high clutter, target burial, and heavy marine growth environments where detection and classification is difficult. Extending integrated acoustics for mine countermeasures (MCM), MAGNUM fuses low-noise magnetic sensors for improved performance. This innovative magnetometer approach provides acoustic target clutter rejection via a single-axis gradiometer configuration (M1XG). MAGNUM consists of a nose-cone module housing miniaturized magnetometer, data interface module, integrated DSP, and data archival/exfiltration modules.

### Technology Category Alignment:

Sensors, Electronics and Photonics

Acoustic, Seismic and Magnetic

### Contact:

Jack Foley, Ph.D.

[foley@whiterivertech.com](mailto:foley@whiterivertech.com)

(978) 479-9519

<http://www.whiterivertech.com>

**SYSCOM:** NAVSEA

**Contract:** N00024-16-C-4033

 Corporate Brochure: [https://navystp.com/vtm/open\\_file?type=brochure&id=N00024-16-C-4033](https://navystp.com/vtm/open_file?type=brochure&id=N00024-16-C-4033)

**WHO**

**SYSCOM:** NAVSEA

**Sponsoring Program:** Naval Sea Warfare Center Panama City Division (NSWC-PC)

**Transition Target:** MK18-MOD-1 Unmanned Underwater Vehicle (UUV)

**TPOC:**  
(850)636-6028

**Other transition opportunities:** MAGNUM technologies have strong transition potential in the NAVY or other Department of Defense (DOD) services for detection of ferromagnetic targets. Applications include improvised explosive device (IED) detection, where inferior magnetic field detection capabilities have been used previously for covert and automated detection of person-borne IEDs. Magnetometers have been used for unexploded ordnance (UXO) detection, in both marine and terrestrial settings. MAGNUM could be used with limited augmentations as a highly capable mapping system for UXO remediation sites. MAGNUM is a UUV-based magnetic detection system for advanced mine counter-measure (MCM) applications. The M1XG is single-axis gradiometer system and M3XG a 3-axis device.



Copyright White River Technologies 2017

**WHAT**

**Operational Need and Improvement:** White River Technologies (WRT) is developing MAGNUM, a magnetic confirmation technology for MK18 UUVs. MAGNUM improves capabilities to detect, locate, classify, and neutralize explosive threats in challenging environments with high clutter, buried targets, and heavy marine growth. Extending integrated acoustics for MCM, this approach fuses low-noise magnetics for improved performance. MAGNUM provides clutter rejection via a single-axis gradiometer (M1XG), via a nose-cone module with mini-magnetometers, data interface module, integrated Digital Signal Processing, and data archival / exfiltration modules. The Navy Explosive Ordnance Disposal Program Office PMS-408 supports the sensor system effort.

**Specifications Required:** MAGNUM will include at least two magnetometer physics packages and associated electronics to demonstrate sensitivity better than 15 picoTesla/meter/root-Hertz at frequencies from 0.1 to 5 Hz. The goal is to ultimately integrate four physics packages into MAGNUM's housing and measure the local total field and the three axis vector gradients of local magnetic fields. Additionally, the sensor subsystem must be neutrally buoyant, not exceed 1 meter in length.

**Technology Developed:** MAGNUM, a modular add-on unit to the MK18 MOD-1 sensing toolkit, includes a hardware interface, data collection, processing, power and control, and data communications, exfiltration, archival capabilities for the modular unit. The M1XG is a single-axis magnetic gradiometer detection and localization system that is under Navy acceptance testing.

**Warfighter Value:** MAGNUM delivers an advanced system to aid MCM missions. MAGNUM provides advanced capability for clutter rejection when acoustic / optical imaging are not effective due to clutter, target burial, and heavy marine growth characteristic of shallow water environments. MAGNUM will confirm acoustic / optical mine classifications and reject acoustic clutter or poor optical imagery in low-visibility waters. Co-registration of magnetic signatures with imagery enables improved object classification. Self-contained for autonomous sensor control MAGNUM houses an embedded computer for autonomous, in-stride target detection and classification as data are collected.

**WHEN**

**Contract Number:** N00024-16-C-4033 **Ending on:** April 8, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Concept Design and Alternatives Analysis	Med	Determine required MAG sensitivity and UUV noise mitigation	3	April 2016
Prototype sensor design and testing	Med	Develop single axis MAG gradiometer: M1XG	4	October 2016
Noise mitigation software	Med	Tailor MAG / UUV Noise Mitigation Software	4	January 2017
Laboratory and controlled bench-top testing	Med	Evaluation of collected data against control items	5	April 2017
M1XG acceptance testing	Med	Evaluation at government facility	6	July 2017

**HOW**

**Projected Business Model:** WRT's business model involves license of MAGNUM manufacturing rights. Prior to licensing, WRT will provide highly specialized services to mitigate risk and deliver confidence to our target customers. The specific manufacturing licensee depend on the program, the market the primes and subcontractors involved. WRT's team is capable of manufacturing low-rate initial production (LRIP) and can provide critical support to our target customer. At the same time, WRT's manufacturing license-based business model will serve to clearly signal willingness to partner with a favored manufacturer or vendor at the appropriate time.

**Company Objectives:** WRT's objective is to license hardware, software and systems designs to DoD Prime contractors and related subcontractors. These hardware, software and system design products are based on WRT's world class, innovative, high barrier to entry, core technologies in the field of applied magnetics. By successfully executing a licensing model in the DoD market, WRT maximizes its focus on innovation and technology development and while eliminating development of redundant skill sets provided by large established companies.

**Potential Commercial Applications:** Beyond NAVY MCM missions, core MAGNUM technologies have numerous commercial applications. MAGNUM will consist of configurable, low-noise, high performance magnetometer payloads on various unmanned underwater vehicle (UUV) platforms integrated with optical and acoustic sensors. Commercial applications include underwater mineral and oil and gas exploration, pipeline / infrastructure mapping, UXO detection, and many other uses for detection, mapping and surveillance. As a defense applications expert, WRT focuses on commercialization of integrated sensor systems on military platforms, while large integration partners such as Hydroid / Kongsberg may be interested in licensing technology for integration into other defense product solutions. WRT also anticipates US-allied Foreign Military Sales (FMS) supporting MCM missions and expects sales in this arena.

**Contact:** Jack Foley, Ph.D., Vice President of Operations  
[foley@whiterivertech.com](mailto:foley@whiterivertech.com) (978) 479-9519