

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2019-765

Topic # N172-116

Miniature Oriented Tri-Axial Fluxgate Magnetometer Sensor  
QUASAR Federal Systems, Inc.

WHO

**SYSCOM:** NAVAIR

**Sponsoring Program:** NAVAIR PEO A

**Transition Target:** NAVAIR

**TPOC:**  
(301)342-2094

**Other transition opportunities:**  
Various opportunities in the Department of Navy (DON) in NAVAIR and NAVSEA, as well as Salvage and Mine Detection.

**Notes:** Our technology is scalable to fit on Group 2 and above Unmanned Aerial Systems as in picture.



Source: U.S. Navy

WHAT

**Operational Need and Improvement:** The U.S. Navy wants to expand its use of miniature Unmanned Vehicles (UVs) for a variety of surveillance and reconnaissance applications. Recent developments in smaller and more sensitive magnetic sensing devices have made mounting on UVs feasible. However, motion-induced noise of conventional scalar magnetic sensors compromises the sensors' capabilities. The Navy has a need for a miniature oriented tri-axial fluxgate magnetometer with motion tolerance that can be implemented aboard miniature UVs. Having this capability will allow the use of increased sensitivity magnetic sensors and other devices on low cost, expendable unmanned vehicles.

**Specifications Required:** Weight constraint: 2.0 lbs. (Objective)  
Length constraint: 8.0 in (232 mm) (Objective)  
Magnetic noise (<30pT/vHz spanning DC to 100 Hz)  
Drive Frequency: 1650-1700 Hz  
Low vibration (isolation mounting system)  
Digitization: 24 bits  
Vehicle Motion compensation included

**Technology Developed:** QUASAR Federal Systems' tri-axial fluxgate sensor meets the required specifications and offers onboard motion cancellation. The compact, sensitive fluxgate magnetometer is suitable for mounting on an unmanned aerial vehicle. The sensor can also be adapted to ground and underwater unmanned vehicles.

**Warfighter Value:** Unmanned Systems provide substantial advantages to the US Navy and other DOD agencies. However, their small size means they can't carry large sensing systems and they tend to experience a lot of motion that interferes with sensors. The magnetic sensing system developed under this project is small and light enough to mount on a mid-size UAS while offering onboard motion cancellation that allows it to perform as well as systems on larger, manned platforms. Applications for the system include Intelligence, Surveillance and Reconnaissance, Anti Submarine Warfare, Salvage and Mine Detection.

WHEN

**Contract Number:** N68335-19-C-0148 **Ending on:** November 7, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Detailed Sensor System Requirements/Prototype Design	Low	Sponsor approved design	3	November 2019
Functional Prototypes: Hardware & Software	Low	Meet requirements in lab	4	February 2020
Passive & Active Motion Cancellation	Low	Meet sensor noise requirements during motion	5	May 2020
Initial Field Test	Med	Outdoor performance meets requirements	5	May 2020
Confirm System and Algorithm	Med	Via system demo	6	October 2020
Test on Platform	Med	Operates to specs on a platform	7	November 2021

HOW

**Projected Business Model:** After the Enhancement Phase of the project, we plan to license the technology to a large defense contractor that is developing UV technology and markets. They will certify the software, and manufacture the product according to product manufacturing quality control standards and specifications from the US Navy. QUASAR Federal Systems can provide low volume manufacturing but will require a larger contractor for bulk manufacturing and platform integration. The technology is currently under development for a platform defined by the Phase II sponsor but, with some adaptations, it could be appropriate for a variety of platforms if desired.

**Company Objectives:** Our objectives for the Forum are to inform potential customers in the DoD and also in large defense contractors about our system's capabilities. Our overall goal is to continue developing unique, high precision electromagnetic sensing systems for Department of Defense applications.

**Potential Commercial Applications:** There are potential commercial applications in Geoscience and Near Surface Geophysics. The new sensor is suitable for mounting on a small drone and mapping magnetic properties of an area quickly. A typical survey contract ranges from a few \$k to a few hundred \$k. In addition, deepwater oil drilling makes extensive use of Unmanned Underwater Vehicles and electromagnetic sensing devices and this sensor, with some adaptations to function underwater, would be appropriate for that industry.

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