

Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2021-0437

Topic # N193-A02

Unmanned Surface Vehicle (USV) and Unmanned Underwater Vehicle (UUV)
Autonomous Behavior Development
Trident Systems Incorporated

WHO

SYSCOM: NAVSEA

Sponsoring Program: PMS-406

Transition Target: Mark 18, Mod 2

TPOC:
(619)553-2670

Other transition opportunities: UxVs,
UxV prime platform OEMs, UxV
Autonomy OEMs



US Navy photo: <https://www.navy.mil/Resources/Photo-Gallery/igphoto/2002480811/>

WHAT

Operational Need and Improvement: Autonomous vehicles present a number of benefits to the DoD. Initial development of these vehicles has focused on achieving specific mission sets, and only minimal internal health monitoring. Enhanced autonomy development for either an Unmanned Surface Vehicle (USV) or Unmanned Underwater Vehicle (UUV) (collectively UxV) would greatly benefit from increased self-awareness and health monitoring.

To address this need, and provide greater situational awareness to UxV platform autonomy, the UVHMS is designed to provide Machine Learning (ML) based pattern recognition and anomaly detection so that a UxV can autonomously respond to the present conditions.

Specifications Required: A system to improve situational awareness which:

- *Processes streaming data,
- *Utilizes machine learning (ML) to identify to recognize patterns as well as anomalies,
- *Interface with existing platform systems and autonomy, and
- *Provides outputs which enable the USV/UUV to more closely approach that human capability regarding platform health.

Technology Developed: The Unmanned Vehicle Health Monitoring System (UVHMS) is a health prognostic and diagnostic system with ML-based health monitoring at its core, which processes platform data to provide prognostic and diagnostic insights to autonomy and operators regarding potential platform degraders and remaining useful life.

Warfighter Value: The UVHMS system increases the decision making capabilities for command leadership, integrates directly with existing autonomy infrastructure to drive mission behaviors, and provides scalability to accommodate transition to a range of UxV platforms.

WHEN

Contract Number: N68335-20-F-0454

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Hardware-in-the-Loop Demonstration	N/A	Demonstration of system prototype in a controlled environment	4	July 2021
Demonstration and Testing	Low	Demonstration of system prototype connected to platform	5	November 2021
Field Demonstration and Testing	Low	In field demonstration of system prototype	6/7	March 2022

HOW

Projected Business Model: Trident's established business model for successful commercialization of SBIR technology would both sell directly to the government and to Prime contractors. The direct to government route would be employed for retrofits of existing CBM technology. In these cases Trident would handle any test and evaluation (T&E), low rate initial production (LRIP), and full production as the Prime utilizing existing vendor relationships.

To integrate within new platforms, Trident is prepared to perform as a subcontractor under the Program of Record Prime contractor. The same capabilities are brought to bear on the contract and Trident is able to work with existing technical data packages (TDPs) and technologies to integrate the UVHMS.

Company Objectives: As a world-class team that delivers technology solutions that make a difference, Trident's goal for UVHMS is to integrate it directly into Program of Record platforms to streamline autonomous health decisions for UxV platforms, increase self-awareness and boost operational uptime for these platforms. This would be achieved both as new platforms are produced and also be used to augment existing platform autonomy packages.

Potential Commercial Applications: Commercial UxV platforms, typically used for scientific and hazardous environment tasks, have the same health monitoring requirements. UVHMS provides capabilities which integrate within existing autonomy packages and can produce results within commercial UxVs and autonomy packages just as easily as the DoD packages. Refinement of RUL and platform insights increases platform reliability, platform availability, and objective completion.

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