Department of the Navy SBIR/STTR Transition Program
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Topic # N131-030

Multi-Static Processing Using Sonobuoys as Opportunistic Receivers

Signal Systems Corporation

WHO

SYSCOM: NAVSEA

Sponsoring Program: Program Executive Office Integrated Warfare System Undersea Warfare Command and Control (PEO IWS 5E)

Transition Target: AN/SQQ-34 Aircraft Carrier Tactical Support System (CV-TSC) Build 9
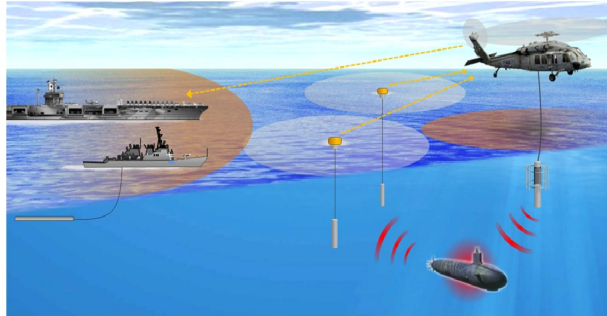
TPOC:
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Other transition opportunities:
Littoral Combat Ship (LCS) Anti-submarine Warfare (ASW) Mission Package
AN/AQS-22 Airborne Low Frequency Sonar (ALFS) MH-60R "Romeo"
PMA-299 Multi-Mission Helicopters
P-8A Poseidon ASW Aircraft, PMA-264 Air Anti-Submarine Warfare Systems
PMA-290 Maritime Patrol Aircraft

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WHAT

Operational Need and Improvement: Improve the MH-60R ASW mission package by supplementing the MH-60R's AN/AQS-22 Airborne Low Frequency Sonar (ALFS) dipping sonar with sonobuoy receivers for active processing. Correct placement of Directional Frequency Analysis and Recording (DIFAR) sonobuoys can increase the areas with signal excess, improving the system's probability of detection (Pd). With improved Pd, ASW missions can be successfully completed quickly, enabling a more secure water space around the carrier's battle group both in transit and in loiter.

Specifications Required: Employment of DIFAR receivers to receive data from MH-60R ALFS
Employment of MAC multi-static signal data to support real-time ASW signal processing
Mission spacing showing Improved Pd
Integration of real-time signal processing software into CV-TSC

Technology Developed: The software developed by this project enables true multi-static processing, including the detection of unknown waveforms and pings. The system captures Multi-Static Active Coherent (MAC) direct blast coherent pulses, finds appropriate processing parameters and creates necessary matched filters for signal processing. An environmental based mission planner will be developed to create the tools required for the operator to correctly plan and implement the mission, enabling the use of this system in various environments across the world.

Warfighter Value: This system has the capability to enable the warfighter to better perform ASW missions, by effectively reducing enemy submarine detect-to-engage timeline, and increasing target detection opportunities. The system will be paired with likelihood ratio tracker software to allow for Bayesian tracking and detection of the targets in the multi-static field, which will reduce the operator's workload by prioritizing the contacts and locations that are important for the operator to review. The improvement in the ASW system performance for detecting enemy submarines will improve the security of the carrier battle groups.

WHEN

Contract Number: N00024-15-C-4018   **Ending on:** February 7, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
MATLAB Prototype Software	Low	Detection of known targets on real data	TRL-3	February 2016
C++ Real Time Software	Low	Matches prototype software and functional with CV-TSC interface	TRL-5	September 2016
Environmental Mission Planner Prototype	Med	Mission spacing showing Pd Improvement	TRL-3	September 2016
At Sea Demonstration	Med	Operation & Target Detection	TRL-6	November 2016

HOW

Projected Business Model: The rights to the signal processing software are already owned by the Navy, as they are used in other Navy programs of record. Signal Systems Corporation (SSC) will work with the Navy to integrate the software into the CV-TSC Build 9.

Company Objectives: SSC desires to continue to improve the Navy's multi-static active signal processing across platforms and programs. While SSC has worked with PMA-264 for years, SSC's technology and expertise can improve the ASW capabilities across the Navy which could potentially culminate with battle group wide shared ASW processing and tactical picture. Such a system would utilize the active sources from destroyers, sonobuoys, helicopters and other platforms along with the native platform sensors, including towed arrays, hull arrays and sonobuoys to create a group-wide undersea tactical picture.

Potential Commercial Applications: Underwater robotics systems, designed to support salvage and oil exploration
Acoustic Surveillance Underwater Intruder Detection Sonar for harbor protection
Autonomous Underwater Vehicles (AUV) to support guidance, control, collision avoidance

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