Topic: N143-129

Charles River Analytics Inc.

Sensor system for Precise Automatic Relative-position Keeping (SPARK)

When escorting ballistic missile submarines (SSBNs), Type Auxiliary Combat General Escorts (T-AGSEs) maintain their relative position using their dynamic positioning (DP) systems, which rely on scanning lasers to measure positions of targets mounted on SSBNs. Laser sensors performance degrades with rain, snow, fog, smoke, bright lights/sun, and/or excessive vessel motion. Charles River Analytics, a leading provider of innovative R&D solutions for increasingly complex/important human-systems challenges developed Sensor system for Precise Automatic Relative-position Keeping (SPARK) using short-wavelength infrared (SWIR) and covert radiofrequency (RF) sensors to track surfaced SSBNs under all plausible environmental conditions, doesn't require Sailors to go on deck when underway, and meets regulatory standards for system redundancy by incorporating independent systems based on two different physical principles. Opportunities also exist for SPARK in the commercial maritime industry.

Technology Category Alignment:

Machine Perception, Reasoning and Intelligence
Broadband/Multispectral Components and Systems
Electro-Optical/Infrared (EO/IR)
Radio Frequency (RF) (non-EW)

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SYSCOM: SSP
Contract: N00030-17-C-0009

Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N00030-17-C-0009

Department of the Navy SBIR/STTR Transition Program

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SSP 2 Jan 2018

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WHO

SYSCOM: SSP

Sponsoring Program: Strategic Systems Programs - ACAT I

Transition Target: Type Auxiliary Combat General Escorts (T-AGSEs) escorting submarines

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Other transition opportunities: Precision, covert, jam-resistant radar, which could be used in covert air-to-air refueling, harbor defense, tracking traffickers/smugglers, covert underway replenishment. Computer vision capability that enables storing compact representations of 3-D objects, and enables re-creating 3-D objects from 2-D images. Useful for computer gaming, augmented reality, and computer-aided design (CAD).

Notes: We expect the full-scope SPARK system—and its RF and vision-based tracking and localization components—to provide immediate and tangible benefits for the Submarine Force.

http://www.navy.mil/management/photodb/webphoto/web N-FG395-055.jpg

WHAT

Operational Need and Improvement: T-AGSEs utilize a modified Dynamic Positioning (DP) software package to automatically maintain position during their escort mission where a key component is a Relative Reference Sensor System (R2S2) which provides the relative positioning data of the SSBN to the T-AGSEs DP Software which thereby adjusts the T-AGSE's control mechanisms to maintain position at a given set point. The components of a R2S2 typically consist of sensors (installed on the T-AGSEs), targets (installed on the SSBN) and other associated hardware (marine PCs, cables, etc.). However, there is an inherent safety risk in that sailors onboard the SSBN must go topside while underway to install/uninstall the targets (three 10' tall, stanchion-mounted reflector poles). The current system's performance is also unreliable in adverse weather conditions.

Specifications Required: The next generation R2S2 should meet the following system requirements: no equipment installed or stored on the SSBN; send data in a NMEA0183R data format to the DP System using a serial connection; have a redundant capability; be accurate within +/- 12 inches of true target vessel position; be accurate within +/- 0.5 degrees of the true target vessel bearing;provide updated data to the DP System once per second; be able to track the target vessel from a range of 10ft – 500ft; and have an all-weather capability and meet performance requirements in environmental conditions up to Sea State 4.

Technology Developed: Sensor system for Precise Automatic Relative-position Keeping (SPARK) uses novel short-wavelength infrared (SWIR) and covert radiofrequency (RF) sensors to precisely track surfaced SSBNs under all plausible environmental conditions. Includes precision, covert, jam-resistant radar and computer vision capability that enables storing compact representations of 3-D objects, and enables re-creating 3-D objects from 2-D images.

Warfighter Value: SPARK system -- and its RF and vision-based tracking and localization components -- does not require Sailors to go on the SSBN's deck when underway, helps safeguard operational security, and meets regulatory standards for system redundancy by incorporating independent systems based on two different physical principles.

WHEN

Contract Number: N00030-17-C-0009   **Ending on:** July 19, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Development of SPARK system prototype	Med	Operational test for static pier-side measurements	5	January 2018
Development of SPARK system simulator	Med	Test with dynamic positioning (DP) system simulator	6	May 2018

HOW

Projected Business Model: Since 1983, Charles River Analytics has applied computational intelligence technologies to develop mission-relevant tools to transform our customers' data into knowledge that drives accurate assessment and robust decision making. SPARK will serve as an effective relative reference sensor system, replacing the problematic scanning laser systems currently used to provide sensor inputs to the DP systems on Type Auxiliary Combat General Escorts (T-AGSEs).

Company Objectives: Charles River would like to meet with government agencies and companies involved in specialty radar systems, video gaming, augmented reality, and computer-aided design.

Potential Commercial Applications: This sensor system has private sector commercial potential by reducing the maintenance of sensor systems in offshore oil operations. This system also has the potential for use during underway replenishments. Other opportunities exist for organizations responsible for escorting ballistic missile submarines (SSBNs) transiting on the surface in restricted waters and in the commercial maritime industry for improving DP system functionality for precision station keeping in a variety of applications.

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