Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2023-0741

Topic # N191-036
Big Data Tools for High-speed Threat Detection and Classification
Black River Systems Company, Inc.

WHO

SYSCOM: NAVSEA

Sponsoring Program: PEO IWS 5.0 Undersea Systems

Transition Target: AN/SQQ-89A(V)15 Surface Ship ASW Combat System Program of Record

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Other Transition Opportunities:

Notes: PHILIPPINE SEA. Sonar Technicians aboard the Arleigh Burke-class guided-missile destroyer USS Benfold (DDG 65) monitor frequencies during an anti-submarine warfare (ASW) exercise during Pacific Griffin. When delivered, Fast Recognition of Naval Threats for Reducing Operator Workload (FRONT ROW) will reduce detect-to-engage times for high-speed threats as part of the AN/SQQ-89A(V)15 ASW Combat System.

U.S. Navy image 210626-N-FO714-1043, available at https://www.navy.mil/Resources/Photo-Gallery/igphoto/2002750711/

WHAT

Operational Need and Improvement: Automated detection and classification of targets is especially challenging in moderate to high interference environments. Operators can typically identify potential threats amidst surrounding interferers if they focus on a specific target's bearing, but this technique can introduce unacceptable delays in identifying potential threats. Automation that detects torpedo-like threats needs to be optimized to remove delays in identifying these threats in moderate to high interference situations.

Specifications Required: The technology should be capable of accurate classification while maintaining a reasonable false alert rate. This technology is expected to perform in a variety of semi-cluttered environments (e.g., presence of other surface vessels, and bathymetric features). Achieving a false alert rate of no more than one (1) per hour is especially important and will be a key metric in performance assessment.

Technology Developed: Novel end-to-end machine learning (ML) framework for high-speed threat recognition using innovative methods applicable to next-generation threats. Innovative architectures designed for rapid acoustic ML development to reduce response time and achieve high accuracy while realizing a low false alarm rate. Our technology also includes unique feature extraction algorithms for rotating machinery signatures.

Warfighter Value: Our FRONT ROW capability consists of an automated machine learning algorithm that detects and classifies signatures detected in sonar data. It provides highly accurate threat classifications with low false alarm rates for high-speed objects enabling shorter detect-to-engage timelines and reduced operator workload. Our neural-network-based classifier uses sequential analysis for time-varying output and was demonstrated on tactical data in FY22 and FY23.

WHEN

Contract Number: N68335-20-C-0833 **Ending on:** Sep 17, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase I	Medium	Accurate Threat Classification	3	1st QTR FY21
Phase I Option	Medium	Low False Alarm Rate	4	1st QTR FY22
Phase II	Medium	Prototype Exercised on Unclass Data	4	2nd QTR FY22
Phase II Option 1	Low	Initial Prototype Delivered for Tactical Data	5	2nd QTR FY23
Phase II Option 2	Low	Final Prototype Delivered for Tactical Data	6	4th QTR FY23

HOW

Projected Business Model: Black River Systems Company will explore business to government (B2G) and business to business (B2B) sales model options in an effort to establish a government-off-the shelf (GOTS) solution while asserting SBIR data rights, or a commercial off-the-shelf (COTS) solution available via a license agreement. Whether FRONT ROW is acquired as a GOTS or COTS capability, the technology will be provided with a base term operations, maintenance, and sustainment service plan with additional term service plans available for purchase. In both cases, our intent is to deliver an elastic solution that is flexible enough to meet the demands and acquisition models of our commercial, government, and government-centric industry partners.

Company Objectives: When complete, FRONT ROW will become a key component of the AN/SQQ-89A(V)15 Surface Ship ASW Combat System Program of Record and collaboration with the prime system integrator is critical to successful transition. Accordingly, we seek a partnership with Lockheed Martin upon completion of independent evaluation and demonstration during a Fleet level exercise.

Potential Commercial Applications: There are 36 Navy, Army, and Air Force labs throughout the DoD and many more across industry partners that can potentially use this technology including tens of thousands manned and unmanned sensing platforms in the emerging market through 2030. Additionally, FRONT ROW could benefit the Coast Guard, Homeland Security, and the Department of State by classifying and characterizing illicit activity in exclusive economic zones, along maritime boundaries, and for treaty monitoring. The Joint Interagency Task Force (JIATF) South can also benefit while conducting counter-narcotics operations against surface and self-propelled semi-submersible vessels.

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