

# Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2021-0354

Topic # N191-029

Adaptive Radar Algorithms for Next Generation Surface Search Radar

The Probitas Project, Inc.

## WHO

**SYSCOM:** NAVSEA

**Sponsoring Program:** AN/SPS-73(V)18 Next Generation Surface Search Radar (NGSSR)

**Transition Target:** AN/SPS-73(V)18 NGSSR

**TPOC:**

(202) 781-2976

**Other transition opportunities:** Other radar systems that perform Periscope Detection and Discrimination (PDD) including the MH-60R Seahawk's AN/APS-153 Multi-Mode Radar, AN/SPQ-9B Radar, and the AN/SPY-6(V)2 Enterprise Air Surveillance Radar (EASR), as well as other Department of Defense (DoD), Department of Energy (DOE), and Department of Homeland Security (DHS) sensor processing systems that are required to make high-stakes decisions.

**Notes:** The team at The Probitas Project, Inc. has expertise with Navy Surveillance Radars including the AN/SPS-74 Periscope Detection Radar (PDR), AN/SPS-73(V)18 Next Generation Surface Search Radar (NGSSR), and AN/BPS-17(V)1 Submarine Navigation Radar Management Software.



USS John C. Stennis (CVN 74) operates in the Philippine Sea in February 2016 while deployed to U.S. 7th Fleet. (U.S. Navy/MCSN Cole C. Pielop) [https://www.cpf.navy.mil/news.aspx/110246]

## WHAT

**Operational Need and Improvement:** The AN/SPS-73(V)18 NGSSR is an X-band radar that is being developed to update the current AN/SPS-73(V)12 radar and replace AN/SPS-67(V)3/5 and commercial navigation radars on U.S. Navy Surface Combatant ships. In Standard Tactical Mode, the NGSSR simultaneously performs Navigation, Surface Search, and PDD missions. PDD is a high-stakes decision process where false target declarations are very costly and missed detections are potentially fatal. Current PDD methods require a human operator to aggregate radar classifier predictions with environmental data to achieve acceptable performance. Rapid NGSSR fielding will significantly increase the number of PDD-capable ships, resulting in significant Manpower, Personnel, and Training (MPT) costs required to train and deploy PDD operators.

**Specifications Required:** The Navy seeks a coherent suite of algorithms suitable for the NGSSR that tangibly enhance radar performance and utility. In this case, "coherent" means that the multiple algorithms are organized and can be integrated to act in conjunction with each other to realize broad areas of performance enhancement in the radar. A set of algorithms that address disparate radar functions piecemeal is not needed. Furthermore, because the radar development program will already be delivering software implementing basic radar functions, such as fundamental search modes and surface contact tracking, they should not be considered in the solution. Algorithms should be designed for modularity to facilitate easy update and compatibility with the existing NGSSR software.

**Technology Developed:** The Probitas Project, Inc. has developed a fully automatic Target Classifier that combines modern Artificial Intelligence/Machine Learning (AI/ML) technology with enhanced environmental awareness to accurately make high-stakes PDD decisions, removing the need for human oversight and significantly reducing lifecycle MPT costs.

**Warfighter Value:** Removing the PDD operator will significantly reduce MPT lifecycle costs. Ever-vigilant ML algorithms continuously learn from new data and new environments, allowing the system to keep pace with undersea threats without requiring expensive development, data collection, and test evolutions.

## WHEN

**Contract Number:** N68335-21-C-0135 **Ending on:** November 25, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase I: Proof-of-Concept	N/A	AI/ML Target Classifier Performance using Legacy Data Sets	3	January 2020
Phase II: Algorithm Analysis using NGSSR Data (Unclassified)	Low	Completed Data Pipeline	5	December 2021
Phase II: Algorithm Analysis using NGSSR Data (Classified)	Low	Radar Signature Performance Analysis Report	6	September 2022
Phase II Option: NGSSR Comparative Performance Test	Low	Comparable or Better Performance than Baseline NGSSR System	6	June 2023
Phase III: NGSSR Program of Record Integration	Low	Phase III Transition	7	December 2023

## HOW

**Projected Business Model:** The Probitas Project, Inc. is a systems engineering and development company focused on complex sensor and data processing systems. We develop innovative solutions for automated systems providing Detection, Estimation, and Classification capabilities. Our solutions span multiple applications and we have expertise in modern Machine Learning techniques applied to challenging classification processes.

The Probitas Project, Inc. will implement the Target Classifier AI/ML technology in software that we will deliver directly to the U.S. Navy or license to the NGSSR Original Equipment Manufacturer for integration with the NGSSR software baseline.

**Company Objectives:** The initial transition of this technology is focused on the AN/SPS-73(V)18 NGSSR system, but the AI/ML technology is applicable to a variety of other Navy sensors and data analytics areas. We are establishing a base capability with PEO IWS 2 that can be easily extended to other programs that involve challenging high-stakes decision processes.

**Potential Commercial Applications:** Our Target Classifier with a modern, data science pipeline provides a robust capability to detect and classify targets embedded in sea clutter. This technology is applicable to DOD, DOE, DHS, and other sensor processing programs that can benefit from an agile solution provider with robust capability across data science, physical science, and sensing domains.

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