DEPARTMENT OF THE NAVY
SBIR/STTR TRANSITION PROGRAM

SUCCESS STORY

TOPIC NUMBER: N05-059 | **SBIR INVESTMENT:** $2,848,114 | **PHASE III FUNDING:** $30,714,438

HIGH FIDELITY FRONT END SIMULATION FOR COMPLEX PHYSICS-BASED PROCESSING SYSTEMS

Sedna designed and implemented an advanced sonar simulator/stimulator suite for current and future systems with fidelity comparable with recorded at-sea data.

Sedna Digital Solutions

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THE CHALLENGE

Sedna developed a high-fidelity front-end simulation system to stimulate complex physics-based sensor systems to supplement real-world data collections and field tests for the U.S. Navy. Additionally, the system can potentially substitute for real-world data in efforts to help engineers build and test physics-based marine sensors, such as sonar, lasers, and electro-optical sensors, in a laboratory at a lower cost, rather than in the actual acoustic environment.

THE TECHNOLOGY

Sedna's design of an advanced sonar simulator/stimulator suite brings together existing simulator designs to provide high fidelity simulation data for system certification and algorithm development, as well as development of high-fidelity training system scenarios. Two systems, All World Environment Simulation (AWESIM) and Common Acoustic Simulation Environment (CASE), were developed to provide physics-based sensor level high fidelity simulation interfaces and open architecture solutions including common processing across multiple sensors and combat systems.

THE TRANSITION

The original contract is one of three Phase III contracts awarded to Sedna for this topic. This Phase III award through PEO IWS 5.0 and PEO Attack Subs, is a cost-plus-fixed-fee contract for electric and electronic components and parts. Currently, the award amount is $43.3 million with a $51.6 million potential award amount. Additionally, NAVSEA awarded Sedna a $9,624,297 cost-plus-fixed-fee contract modification to the contract to exercise options for engineering design development services, supporting material and travel procurements. Initially, SBIR-developed solutions were incorporated into the AN/SQQ89A(V)15 Combat System. This technology transitioned via Phase III funding from the AN/SQQ89 program for surface anti-submarine warfare (ASW) Synthetic Training (SAST) production. Currently, SAST supports all shipboard sensors including hull-mounted; towed array; pulsed (PAS) and constant (CAS) active; and Light Airborne Multi-Purpose System (LAMPS) sensors. In a similar manner, the Integrated Computer Program Training Device (ICPTD) was developed for the SURTASS community.

THE NAVAL BENEFIT

Advanced phenomenology-based simulation provides the ASW mission with a physics-based model that represents targets, sensors, the ocean environment, and the propagation and reverberation of sound energy in seawater. Principal benefits to the warfighter include the design and development of mission capabilities that result in higher probabilities of detections, and lower false alarm rates, and enhanced training capabilities, which increases fleet readiness in the ASW domain.

THE FUTURE

The simulated environment could be used to further build quantitative measures, such as performance of the simulation relative to the currently collected data. SAST, with continued enhancements, will be part of all current and future surface combatant sonar systems. Additionally, this open architecture supporting front-end capability development and human-in-the-loop training on the back end is actively transitioning to the submarine community. This effort has provided high-value capabilities to the fleet at speed. Through an open sensor-agnostic approach, the developed architecture will provide the required agility to respond to fleet ASW requirements for great power competition against increasingly capable adversaries.

"High Fidelity Simulation, originally developed under SBIR funding, has facilitated Navy's ability to conduct realistic undersea training in fleet synthetic training events without impacting marine species. The quality and extensibility of the simulation has also made it possible to conduct realistic multi-platform evaluations of prototype capabilities in simulated combat situations for which we do not have recorded data."

Pete Scala, Advanced Development Director, PEO-IWS5 Undersea Systems, PEO-IWS5A Advanced Development

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