

STP

NAVY SBIR TRANSITION PROGRAM

Innovative Technology Showcase 2023



Technology Guide

At the NAVAIR & NAVSEA Innovative Technologies Showcase 2023, the Navy STP will showcase 62 projects. 19 projects will have display space on 14 March giving participants a chance to meet the experts one-on-one. The next 22 projects will have space the next day on 15 March, and 21 projects will have space the last day on 16 March.

Featured SBIR/STTR Technologies at the Showcase:

14 March

Advanced Electronics
(2 Projects)
C4I (4 Projects)
Cyber (1 Project)
Electronic Warfare
(6 Projects)
Autonomy (4 Projects)
Energy & Power Technologies
(2 Projects)

15 March

Air Platforms (4 Projects)
Ground and Sea Platforms
(6 Projects)
Weapons Technologies
(3 Projects)
Sensors (5 Projects)
Engineered Resilient Systems
(2 Projects)
Human Systems (2 Projects)

16 March

Biomedical (ASBREM)
(3 Projects)
Materials & Manufacturing
Processes (10 Projects)
Modeling and Simulation
Technology (5 Projects)
Sustainment (3 Projects)

14 March 2023 0900-1400

Company	Topic Number	Tech Category
Envistacom, LLC	A16-032	Advanced Electronics
Systems Visions LLC	N20A-T021	Advanced Electronics
Innovative Defense Technologies	N191-019	C4I
Innovative Defense Technologies	N181-031	C4I
Colorado Engineering Inc.	N201-032	C4I
Pareto Frontier, LLC	N201-018	C4I
Amida Technology Solutions, Inc.	N171-054	Cyber
TIPD, L.L.C.	N19A-T009	Electronic Warfare (EW)
Continuum Dynamics, Inc.	N93-282	Electronic Warfare (EW)
Transient Plasma Systems	N201-074	Electronic Warfare (EW)

14 March 2023 0900-1400

Company	Topic Number	Tech Category
Vadum	N193-143	Electronic Warfare (EW)
Dymenso LLC	N20A-T013	Electronic Warfare (EW)
Pendar Technologies, LLC	N192-053	Electronic Warfare (EW)
ANDRO Computational Solutions, LLC	N192-062	Autonomy
Daniel H. Wagner, Associates, Incorporated	N192-117	Autonomy
Soar Technology, Inc.	N193-141	Autonomy
Weather Gage Technologies, LLC	N193-141	Autonomy
VISHWA ROBOTICS	N192-133	Energy & Power Technologies
Continuous Solutions LLC	N16A-T012	Energy & Power Technologies

15 March 2023 0900-1400

Company	Topic Number	Tech Category
TDA Research, Inc.	N181-019	Air Platforms
DE Technologies Inc.	N19B-T031	Air Platforms
BluEyeQ LLC	N202-105	Air Platforms
American Maglev Technology of Florida, Inc.	N201-023	Air Platforms
Force Engineering, Inc.	N193-138	Ground and Sea Platforms
LBI, INC.	NX19-002	Ground and Sea Platforms
Physical Sciences Inc.	NX19-003	Ground and Sea Platforms
Technology in Practice	NX19-003	Ground and Sea Platforms
Reaction Systems, Inc.	N202-132	Ground and Sea Platforms
United States Military Advanced Technologies	N202-130	Ground and Sea Platforms
Polaris Sensor Technologies, Inc.	N191-003	Weapons Technologies
NP Photonics, Inc.	N201-044	Weapons Technologies

15 March 2023 0900-1400

Company	Topic Number	Tech Category
McCormick Stevenson Corp.	N192-074	Weapons Technologies
NanoSonic, Inc.	N192-120	Sensors
Energy to Power Solutions	N192-122	Sensors
Luna Innovations Incorporated	N192-076	Sensors
Dual Sense Systems	N202-119	Sensors
IMSAR LLC	N201-070	Sensors
Karagozian and Case, Inc.	N201-053	Engineered Resilient Systems (ERS)
Simmetrix, Inc.	N20A-T004	Engineered Resilient Systems (ERS)
Soar Technology, Inc.	N172-117	Human Systems
Systems Technology, Inc.	N192-071	Human Systems

16 March 2023 0900-1400

Company	Topic Number	Tech Category
TDA Research, Inc.	N142-087	Biomedical (ASBREM)
TDA Research, Inc.	NX19-005	Biomedical (ASBREM)
Paxauris LLC	N201-005	Biomedical (ASBREM)
QuesTek Innovations LLC	N16A-T007	Materials & Manufacturing Processes
Texas Research Institute Austin, Inc.	N111-042	Materials & Manufacturing Processes
Applied Optimization, Inc.	N162-083	Materials & Manufacturing Processes
TDA Research, Inc.	N181-071	Materials & Manufacturing Processes
TDA Research, Inc.	N192-057	Materials & Manufacturing Processes
SenSigma LLC	N18A-T005	Materials & Manufacturing Processes
Composite Energy Technologies Inc	N204-A03	Materials & Manufacturing Processes
Microsphere Material Solutions, LLC	N181-058	Materials & Manufacturing Processes

16 March 2023 0900-1400

Company	Topic Number	Tech Category
American Technical Coatings, Inc	N191-026	Materials & Manufacturing Processes
MRL Materials Resources LLC	N192-072	Materials & Manufacturing Processes
Arorae Corporation	N193-A03-5	Modeling and Simulation Technology
ARiA	N191-016	Modeling and Simulation Technology
TIPD, L.L.C.	N19A-T008	Modeling and Simulation Technology
G2 Ops, Inc.	N191-030	Modeling and Simulation Technology
A-P-T Research, Inc.	N201-045	Modeling and Simulation Technology
CHI Systems, Inc.	N201-X02	Sustainment
Metis Design Corporation	N111-067	Sustainment
TurnAround Factor	N201-X02	Sustainment

Company	Topic	Project Title	SYSCOM
Envistacom, LLC	A16-032	Innovative X-Band Antenna Architecture for BFT 3	NAVWAR
Systems Visions LLC	N20A-T021	Hybrid Packaging of Cryogenic Electronics and Photonic Technologies	ONR

WHO

SYSCOM: NAVWAR

Sponsoring Program: PMW/A-170 Communications and GPS Navigation

Transition Target: Rapid Defense and Experimentation Reserve (RDER)

TPOC: (619) 524-2510

Other Transition Opportunities: Pursuing submarine and surface vessel programs within the Navy that need enhanced satcom capability.

Notes: ATG has been chosen to move the ATG Luneburg Lens antenna forward through the RDER program. The RDER program is designed to accelerate the development and deployment of technologies like this to fill existing technology gaps across the DoD. ATG is finalizing a contract to participate in the program and the Valient Shield program in 2024. Valient Shield is a joint exercise designed to accelerate the deployment of key technologies for DoD use. It will be held in the Indopacom region in 2024. ATG has been chosen to deploy this antenna to support both Army and Navy activities for Valient Shield.



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WHAT

Operational Need and Improvement: The new NGSO (Non-Geostationary Orbit) constellations significantly improve bandwidth, latency, and resiliency over current generation geosynchronous satellites. ATG has developed an antenna to allow access to multiple constellations and frequency bands while meeting DoD requirements for ruggedness, power, and form factor.

Specifications Required: The ATG antenna system is designed to be compliant with network requirements for emerging NGSO constellations such as Starlink, OneWeb, and Kuiper while meeting Military requirements such as MIL-STD-810x for ruggedization, MIL-STD-1275x for power, and FCC and ARSTRAT requirements for satellite communications.

Technology Developed: ATG has developed a Luneburg Lens-based antenna that allows simultaneous operation on multiple satellites and frequency bands, providing enhanced interference mitigation with low power draw and compact form factor.

Warfighter Value: The ATG antenna provides the ability to access multiple satellite constellations simultaneously, reducing the number of antennas needed to execute the mission. Additionally, the antenna meets requirements unique to the military, such as enhanced ruggedization and resilience against jamming and interference.

WHEN

Contract Number: N68335-20-C-0620

Ending on: Aug 31, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
RDER Effort Kickoff	Low	Successful demonstration of baseline capability to the RDER program management team	4	4th QTR FY22
RDER PDR	Low	Customer acceptance and sign off of PDR documentation	4	2nd QTR FY23
RDER CDR	Medium	Customer acceptance and sign off of CDR documentation and successful demonstration of a fieldable capability	5	1st QTR FY24
RDER Delivery	Medium	Delivery of 3 operational that meets environmental and performance criteria specified in program documentation	6	3rd QTR FY24

HOW

Projected Business Model: ATG intends to design, develop, and manufacture an antenna. The initial market for this antenna is military customers desiring access to NSGO satcom networks, but it is also applicable to commercial customers needing NSGO satcom capability.

Company Objectives: ATG's objective is to be a manufacturer and provider of ruggedized hardware and software solutions for military and commercial satcom applications. ATG will utilize a combination of in-house and contract capabilities to design, manufacture, support and sustain this antenna. ATG has established relationships with small and large prime contractors throughout the satellite industry to help deploy this technology, and several have already expressed interest in doing so. ATG would like to connect directly with both programs directly utilizing SATCOM and Beyond Line of Sight (BLOS) capabilities as well as programs that could benefit from adding BLOS to their system.

Potential Commercial Applications: Commercial satcom users such as maritime, railroad, and over-the-road trucking have similar requirements for antenna systems like this, both RF performance and ruggedization. ATG has extensive expertise in this market and intends to sell this product into the commercial sector.

WHO

SYSCOM: ONR

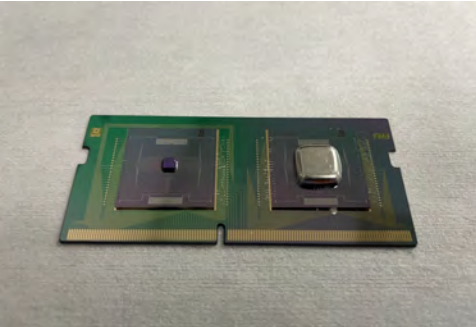
Sponsoring Program: Intelligence Advanced Research Projects Agency (IARPA) SuperCables

Transition Target: ONR and IARPA

TPOC: Deborah VanVechten
deborah.vanvechten.civ@us.navy.mil

Other Transition Opportunities: DARPA Microelectronics Technology Office (MTO) whole wafer multichip modules programs.

Notes: Custom M.2 assembly with superconducting multichip modules (SMCM) and superconducting electronic (SCE) chips . Right SMCM module includes the HIPCEMS shielding system for chip-scale magnetic isolation.



Superconducting multichip module with HIPCEMS shielding system and superconducting electronics chips.

WHAT

Operational Need and Improvement: Maturation of a scalable heterogeneous packaging plan which results in extreme energy efficiency information transfer at high clock rates and low bit error rate of digital data between superconducting and photonic technologies.

Specifications Required:

- Robust against thermal cycling (300 to 4K for a minimum of 2000 times)
- Photonic insertion loss of 0.2dB at data rates of 40 Gbps
- Compatibility with superconducting multichip modules (SMCM)

Technology Developed: The Hybrid Integration of Photonics and Cryogenic Electronics with Magnetic Shielding (HIPCEMS) technology developed provides a custom solution for magnetic shielding of superconducting electronics while allowing optical interconnects for energy efficient transfer of information. The technology provides a chip-level shielding and packaging solution to provide magnetic isolation at cryogenic temperatures. Magnetic isolation is critical for signal processing SCE chips based on a single flux quantum (SFQ) architecture since the information is stored in the form of magnetic flux quanta. The HIPCEMS technology provides a pathway for denser integration of SCE devices while still providing the required magnetic noise suppression.

Warfighter Value: As an enabling technology HIPCEMS can enhance the performance of signal processing systems that form the back-end of radar, signals intelligence and electronic warfare systems. The enhanced performance can allow faster decision making which provides the warfighter with a greater advantage in both offensive and defensive scenarios.

WHEN

Contract Number: N68335-21-C-0818

Ending on: Sep 20, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Fabrication of permalloy shields	Low	Component shields verified	3	3rd QTR FY22
mTSV plating	Medium	Initial plating through substrates	3	3rd QTR FY22
Integration of shields and plated substrates	Medium	Initial prototype complete	4	4th QTR FY22
Testing of initial HIPCEMS prototype	Medium	Prototype is characterized at cryogenic temperatures	4	4th QTR FY22

HOW

Projected Business Model: SYVI has historically been a research and technology development company with the ability to produce low-volume prototypes in house. We plan to leverage our existing collaboration with Auburn University to provide low-rate initial production while ramping up our internal manufacturing capability. We expect that most HIPCEMS-based solutions will be bespoke based on customer specifications and needs. We plan to partner with primes and other business to integrate our technology into their systems.

Company Objectives: SYVI would like to find business partners who are interested in integrating the HIPCEMS technology into their products.

Potential Commercial Applications: We expect that the HIPCEMS technology would benefit the quantum computing space since it has a similar set of problems. The technology could also be applied to astro-physics and particle physics applications. It could also have applicability to commercial room temperature settings such as within data centers.

Company	Topic	Project Title	SYSCOM
Innovative Defense Technologies	N191-019	High Performance Computing (HPC) for AEGIS Combat Systems Test Bed (CSTB)	NAVSEA
Innovative Defense Technologies	N181-031	AEGIS Combat System Optimization through Advanced Modeling of Software-Only Changes	NAVAIR
Colorado Engineering Inc.	N201-032	High-Efficiency Wideband Linear Power Amplifier	NAVSEA
Pareto Frontier, LLC	N201-018	Dynamic Digital Spatial Nulling Algorithms for Tactical Data Links	NAVAIR

Department of the Navy SBIR/STTR Transition Program

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Topic # N191-019

High Performance Computing (HPC) for AEGIS Combat Systems Test Bed (CSTB)
Innovative Defense Technologies

WHO

SYSCOM: NAVSEA

Sponsoring Program: PEO IWS 1.0, AEGIS Integrated Systems Program Office

Transition Target: AEGIS Combat System Test Bed

TPOC: (202) 767-2746

Other Transition Opportunities: A virtualization platform that enables a federation of application processes to scale to High Performance Computing environments has explicit application to DoD aviation systems, manned and unmanned vehicles, as well as sensor, weapons and control systems.

Notes: This new capability will provide a mechanism for managing scenario runs in a resource-efficient manner in addition to increasing development test turnaround and reducing result time in operational test. Our Machine Learning (ML) approach also enables an application agnostic platform in which little to no application information is required for the platform to perform. There is potential for support for cloud infrastructure, GPU configuration, and development of a DSM framework.



<https://www.navy.mil/Resources/Photo-Gallery/igphoto/2002746786/>

WHAT

Operational Need and Improvement: The Combat Systems Test Bed (CSTB), as an integrated model across the entire AEGIS Combat System, is computationally intensive to operate and functions in a time-managed environment. The CSTB will be integrating numerous models and when used in a simulation will produce a high-fidelity representation of the entire AEGIS Combat System. Unfortunately, currently available commercial off-the-shelf (COTS) solutions do not address unplanned events during a simulation or compensates for additional processing requirements and resource allocation.

Specifications Required: The Navy seeks scheduling software that allocates and monitors computing resources, as well as starts the simulations using High Throughput Computing (HTC). The software will start the simulations by dynamically allocating system resources to software processes, efficiently utilize the available resources, monitor resources to ensure effective execution of priorities, and enable reallocation of resources when required.

Technology Developed: This solution will provide dynamic resource management targeted at High Performance Computing environments by enabling the optimization of compute resources usage in response to unanticipated running simulation events across the CSTB federation of processes. Our technology aims to provide near real-time performance metric and resource visualization. This provides increased productivity within the development cycle via improved runtime through intelligent resource allocation and increased turnaround by yielding results faster than consecutive execution.

Warfighter Value: Support the Navy in transitioning the technology to Navy use in order to meet a critical Navy need to decrease the amount of time it takes to generate data required to answer engineering questions posed by the technical team.

WHEN

Contract Number: N68335-21-C-0157

Ending on: Feb 26, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Study Completion Time Decreased	Low	Final Demo	7	2nd QTR FY23

HOW

Projected Business Model: Bringing this technology to market will require proper coordination between IDT and other government entities. This may require some research into other simulation test beds as well.

Company Objectives: Engage with commercial (non-DoD) and non-commercial entities. IDT is pursuing an Amazon Web Services IL6 cloud environment where the DSM capability could be used for multiple DoD programs where multi-run/monte-carlo analysis is required.

Potential Commercial Applications: This scheduling software can be utilized in large industries that have intensive computational needs. Academia, the aviation industry, the weather industry, and the energy industry, could benefit from this technology. Additionally, the Commercial space offers many potential programs where this dynamic resource platform may be utilized such as utilities control systems and the automobile, manufacturing, and financial industries. We believe the DSM capability to support cloud infrastructure and GPU configuration would be attractive to prospective customers as these features are commonly featured among competing products in the marketplace.

Contact: Dylan Paetzold , Associate Program Manager
dpaetzold@idt.us (856) 533-0284

WHO

SYSCOM: NAVAIR

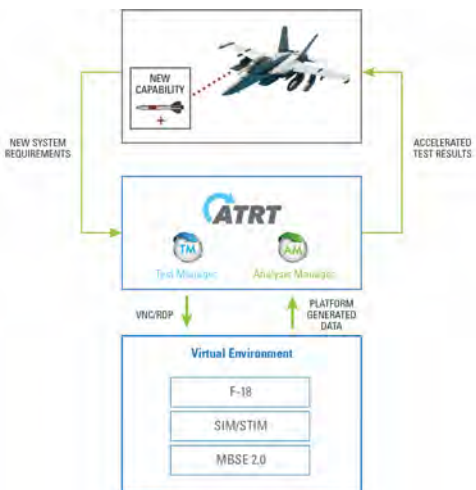
Sponsoring Program: PMA-201

Transition Target: F/A-18E/F

TPOC: (760) 939-1712

Other Transition Opportunities: Universal Armament Interface (UAI)-compliant systems and future weapons. Examples include Long Range Anti-Ship Missile (LRASM), Hypersonic Air-Launched Offensive Anti-Surface Warfare Missile (HALO)

Notes: IDT's Automated Test and Re-Test (ATRT) is an automated test and analysis product rated at TRL 9 and is currently used by DoD and commercial company personnel and has been applied to the following weapon systems: AEGIS, F-16, Minuteman III, F-35, AN/USQ.225, FA-18, E-2D, SM-6, SM-2, MQ-25, Tomahawk Land Attack Missile (TLAM), Joint Mission Planning System (JMPS), Tactical Tomahawk Weapons Control System (TTWCS), SQQ-89, Ship Self-Defense System (SSDS), Terminal High Altitude Defense (THAAD), SLQ-32, and Link-16.



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WHAT

Operational Need and Improvement: Automated test execution and analysis enables the Navy to verify weapon system performance accurately and expeditiously against warfighter mission requirements in the realistic volatility of an operational environment. An end-state vision of a fully implemented Test Modernization Strategy should include a Software Integration Lab with fully virtualized representations of F/A-18 Operational Flight Program (OFP) and weapon software wrapped with automated test and automated analysis capability to exercise complete mission threads.

Specifications Required: Identify and define the process by which updated weapon capability could be integrated, tested and deployed within 6 months. Recommend an Automated Test Strategy and Path Forward for the Advanced Weapons Laboratory (AWL).

Technology Developed: Automated analysis of UAI system threads as applied to an F/A-18 weapon store. SysML behavioral model of the UAI Platform/Store Interface Control Document (ICD) system threads. Automated test execution with the Desktop Test Environment (DTE). IDT's technology integrates cloud virtualization with separate test execution & analysis processes to deliver dramatic speed & reliability for tests, verification, & certification for the greatest ROI.

Warfighter Value: IDT's automated software test and analysis tools will provide the ability to upgrade software systems, and test, certify, and deploy new capability in months or weeks, not years.

WHEN

Contract Number: N68335-21-C-0246

Ending on: Apr 30, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Automated Analysis for Initiated Built-in Test (IBIT)	N/A	SysML behavioral model of IBIT, requirement verification for >10 IBIT actions	5	4th QTR FY21
Automated Test Executed Using DTE	N/A	Demo of automated execution of IBIT procedure within the DTE	5	4th QTR FY21
Automated Analysis for Mass Data Transfer (MDT)	N/A	SysML behavioral model of MDT, requirement verification for >10 MDT actions	5	1st QTR FY22
Automated Analysis for Launch Acceptability Region	N/A	SysML behavioral model of MDT, requirement verification for >5 LAR actions	5	3rd QTR FY22
Automated Test Strategy and Path Forward Recommendation Document	N/A	Summary of delivered technology, recommended path forward for AWL, PMA, PEO & SYSCOM	5	TBD

HOW

Projected Business Model: Model-based Systems Engineering (MBSE) across the aerospace industry typically applies to design, development, supply management, or interface management using a system model's physical and functional views. Alternatively, IDT's unique, patented methodology builds SysML models of the system's behavior and generates automated analysis for evaluation in an operational, mission-based context (i.e., close air support or long-range strike). This technology is applicable for all complex systems and IDT plans to extend the ATRT suite of tools to additional DoD and commercial programs.

Company Objectives: IDT is interested in adapting the automated test and analysis suite of tools to additional large, complex real-time defense systems. The UAI ATRT product is immediately applicable to any organization developing UAI-compliant weapons, and the behavioral model, automated analysis, and reports can be tailored to suit needs beyond the interfaces defined by a UAI ICD.

Potential Commercial Applications: IDT's ATRT product is extensible to commercial systems with mission critical requirements such as commercial aircraft, Oil & Gas infrastructure, autonomous vehicles, space launch systems, as well as power generation & distribution.

WHO

SYSCOM: NAVSEA

Sponsoring Program: OPNAV Sponsor: N2N6

Transition Target: NavAir Platform to be determined

TPOC: (202) 781-3014

Other Transition Opportunities: ONR is intending to test this for antenna applications

Notes: CAES AT&E has completed Phase I and is Phase II is currently in progress for SBIR N201-032



Image provided by CAES AT&E

WHAT

Operational Need and Improvement: DoN requires effective communications for Naval operations which provides simultaneous broadcast of RF across a wideband spectrum. Legacy Naval networks can only operate one beam at a time.

Specifications Required: DoN needs more effective communication. Simultaneous RF transmission is the next generation development building upon legacy technology. Developing a technology with more operational bandwidth will be a technological improvement.

Technology Developed: AT&E working with the University of Colorado Boulder has designed and manufactured an amplifier prototype capable of transmitting four simultaneous Orthogonal Frequency Division Multiplexing (OFDM) waveforms.

Warfighter Value: The value to the warfighter will be improved communication with simultaneous transmission across a wider RF spectrum. The increased data available to the warfighter will expand mission capabilities.

WHEN

Contract Number: N68335-21-C-0641

Ending on: Sep 24, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase 1	Low	Model and simulation are functional	2	4th QTR FY20
Phase 2	Low	Build and Test of proof of concept	4	1st QTR FY23
Phase 3	Low	Amplifier prototype tested and delivered	6	4th QTR FY23
				TBD

HOW

Projected Business Model: CAES AT&E has an existing amplifier solution in development. We intend to manufacture this product which has both commercial and military applications.

Company Objectives: Design and deliver a High Efficiency Wideband Linear Amplifier viable for both the military and commercial markets.

Potential Commercial Applications: Commercial Applications include 5G and future wireless communications platforms

WHO

SYSCOM: NAVAIR
Sponsoring Program: PMA101/PMW101
Transition Target: Technology to be incorporated within the Advanced Tactical Networking Waveform (ATNW) Platform
TPOC: (619) 252-8077
Other Transition Opportunities: There is an immediate opportunity to also incorporate this within the Tactical Data Link (TDL) Waveform on the same platform.

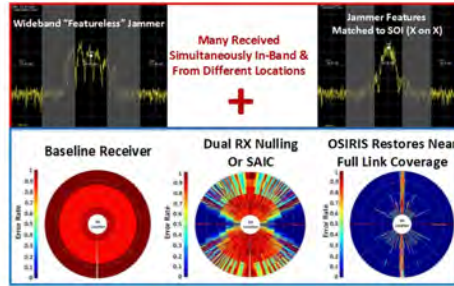


Image courtesy of Pareto Frontier 2022

Notes:

WHAT

Operational Need and Improvement: Pareto Frontier's interference mitigation systems have a track record of challenging conventional understandings of the limits of interference suppression. Our latest system, OSIRIS, targets interference faced by Tactical Communications, which use agile waveforms that pose a particular challenge to conventional mitigation systems. Pareto Frontier's solution incorporates robust signal-agnostic filtering techniques into extremely light-weight implementations scalable to fit even the smallest of platforms.

Specifications Required: Required specifications depend on the level of system integration. Applique solutions designed to operate external to the platform radio require little integration while solutions incorporated into the radio itself will require more extensive per-customer collaboration.

Technology Developed: The OSIRIS system suppresses multiple combinations of interference attacks against airborne systems. OSIRIS delivers superior mitigation performance in the most challenging scenarios, including the hardest case of "X-on-X" interference, with novel robust signal processing techniques for either multiple or single-antenna systems. Extremely lightweight and flexible implementations enable easy adoption of the system into most existing radio architectures.

Warfighter Value: OSIRIS helps the warfighter disseminate and received a common situational picture by:
 1) Improving tactical link resilience in contested environments against multiple interferers and jammers
 2) Increasing bandwidth in congested environments
 3) Enabling operational modes to defeat localizing threats

WHEN

Contract Number: N68335-22-C-0008 **Ending on:** Apr 26, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase 1 Feasibility Study	Low	Simulation Performance	3	1st QTR FY21
Initial HW Proof of Concept	Low	Measured HW Performance	5	2nd QTR FY21
Surrogate HW Applique Complete	Low	Measured HW Performance	6	1st QTR FY22
Core Design Integrated Within Target Platform	Medium	Design Utilization Constraints Meet Target	6	1st QTR FY23
Core Design Demonstrated on Final Target Platform	Medium	Measured HW Performance	7	3rd QTR FY23
Prototype Performance Characterization in Gov't Labs	Low	Measured HW Performance	8	1st QTR FY25
Successful Flight Test Operation	Medium	Measured HW Performance	9	1st QTR FY26

HOW

Projected Business Model: Dependent on specific application. On this specific contract model is to license technology core (FW/SW) to Prime platform OEMs. Self-contained hardware applique can also be sold directly to Government.

Company Objectives: Enable COMMS, SIGINT, GPS and radar system resilience in congested and contested environments with robust, low SWAP, tailored approaches.

Potential Commercial Applications: This technology can be applied to any platform that is susceptible to RF interference particularly within a wireless communications environment. There is potential application to commercial GPS, consumer WiFi, cellular LTE/5G, and aviation communications/telemetry.

Company	Topic	Project Title	SYSCOM
Amida Technology Solutions, Inc.	N171-054	Cyber Threat Insertion and Evaluation Technology for Navy Ship Control Systems	NAVSEA

WHO

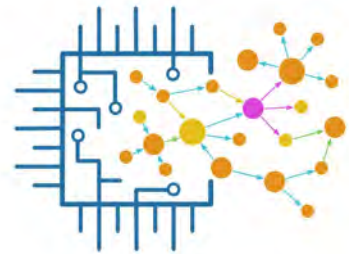
SYSCOM: NAVSEA

Sponsoring Program: Team Ships, Government Equipment Management

Transition Target: Navigational systems, surveillance systems, and targeting systems

TPOC: (215) 897-8297

Other Transition Opportunities: Industrial controllers, infrastructure controllers, information processing systems, communication systems, embedded devices, durable medical equipment



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Notes: This technology characterizes the threats and risks to custom microelectronic components (CMCs). Conventional approaches are platform-specific and rely on formal methods. Our solution reveals hidden vulnerabilities using a novel representation of the register-transfer-level (RTL) that graphically models the connections between signal and state. We have also developed a comprehensive suite of compact and self-tuning surveillance instruments and AI/ML monitors that detect anomalous behavior on deployed devices. The tool is fully applicable to field programmable gate array (FPGA)-based systems, as well as new, application-specific, integrated circuits (ASICs). The principal investigators are well-known for their prior contributions to cybersecurity and semiconductor test, while the board and senior advisors are similarly recognized for their work in national security.

WHAT

Operational Need and Improvement: The Navy and NSA have expressed the need for a structured approach to CMC assurance and risk assessment. We have developed a novel Design for Security and Trust (DFST) methodology that ensures CMCs are hardened to cybersecurity risks and capable of self-tuning operational surveillance. This new and patented technology allows manufacturers, integrators, and system architects to construct platforms that can automatically detect and identify chip-level cyberattacks in real time using embedded instrumentation and Machine Learning (ML) models. It addresses cybersecurity concerns across the entire CMC supply chain, from inception to fabrication, with: (1) analysis of the RTL for vulnerabilities, (2) embedded security in the hardware development life cycle (HDLC), (3) assurance of the integrity and performance of semiconductor devices during their design, and (4) verification that products are secure.

Specifications Required: Navy sought development of a hardware/software solution capable of running many tests using combinations of defense methodologies.

Technology Developed: Amida has developed a set of new analysis and evaluation tools that secure CMC-based devices. Pre-silicon, it identifies structural vulnerabilities to signal and state. In emulation and post-silicon, it uses sophisticated predictive analysis processes to identify behavioral anomalies, emulate the effects of attacks, and train ML models to recognize similar attack behaviors. Unlike current hardware security approaches that are primarily formal and forensic, this technology identifies likely attack vectors prior to device fabrication, integration, and field deployment.

Warfighter Value: Devices secured by our DFST methodology are cyber-hardened to be more resistant to new and unknown cyberattacks, including RTL-based zero-days. Instrumentation embedded into CMCs allows users and administrators to monitor system cyberhealth in real time and be notified with attribution and mitigation details upon observation of attack behavior within the chip.

WHEN

Contract Number: N68335-19-C-0259

Ending on: Jul 22, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstration of full DFST methodology prototype	N/A	Conducted a full test of the prototype DFST design loop, created and analyzed a realistic design. Tested ML models to detect novel hardware attacks.	5	4th QTR FY21
Completed MVP of our vulnerability analysis software product	N/A	Evaluated a commercial core. Explored and reported design vulnerabilities for an industry partner.	6	3rd QTR FY22
Cybersecurity vulnerability and instrument design tool	Low	Collection of real-time data from a CMC or FPGA-based device to train attack recognition through machine learning.	7	3rd QTR FY23
Release of attack emulation and characterization software for intrusion recognition model training	Low	Generally available real-time monitoring and attack-behavior recognition system. Fully productized software will be integrated into devices during system assembly.	7	3rd QTR FY24
Deployment of hardware-monitoring and attack-recognition appliance alongside evaluated component	Medium	An integrated software product for system evaluation and characterization. The attack-behavior recognition system will provide real-time surveillance. We will deploy the hardware assurance platform in a real-world system.	7	3rd QTR FY25

HOW

Projected Business Model: The product will be licensed to the end user. The pre-silicon design review will require limited training; we are also prepared to offer design evaluation as a service. This is a software solution, so there are no manufacturing considerations at this time. The post-silicon tool is also a software product and will be integrated into a system-administration dashboard. We will leverage DoD connections to identify additional target platforms and programs that are currently developing or updating CMC-based solutions. We will simultaneously increase awareness of our hardware assurance software products within the CMC design and manufacturing community. Additionally, we will continue ongoing research and development efforts to productize novel threat-modeling and recognition technologies.

Company Objectives: Use tools and services to identify and support DoD programs that rely on CMC-based systems. Develop relationships with industrial microelectronics providers and design organizations to apply the novel analysis and evaluation techniques to real-world CMC designs. Continue to develop commercially available software products, based on the prototype technology, that we can sell – directly or through channel partnerships – to microelectronics providers.

Potential Commercial Applications: We have productized the DFST technology as individual software components that will be available for purchase either as standalone modules or as a complete software suite. Semiconductor design groups, intellectual property (IP) vendors, and custom system integrators are target customers for the RTL vulnerability analysis tool that is currently available. Future software releases will productize instrument insertion, autonomous detection, and real-time monitoring solutions.

Contact: Peter L. Levin, PhD, Co-Founder & CEO
peter@amida.com (617) 921-0471

Electronic Warfare (EW) (Navy FST Booth: 14 March)

Company	Topic	Project Title	SYSCOM
TIPD, L.L.C.	N19A-T009	3-Band PicoSecond High Energy Compact (SWaP) Laser System for Marine Wave Boundary Layer Atmospheric Characterization Instrument Development	NAVSEA
Continuum Dynamics, Inc.	N93-282	Extended Domain Chaff Release Modeling for Fixed- and Rotary-Wing Aircraft	NAVAIR
Transient Plasma Systems	N201-074	High Power Microwave (HPM) Waveform-enhancing Sub-nanosecond Semiconductor Pulse Sharpener	ONR
Vadum	N193-143	Defeating Cognitive Sensors	NAVAIR
Dymenso LLC	N20A-T013	Precision Alignment Techniques for Affordable Manufacture of Millimeter Wave Vacuum Devices	NAVSEA
Pendar Technologies, LLC	N192-053	Quantum Cascade Lasers Manufacturing 10X Cost Reduction	NAVAIR

Department of the Navy SBIR/STTR Transition Program

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 NAVSEA #2022-0346

Topic # N19A-T009
 3-Band PicoSecond High Energy Compact (SWaP) Laser System for Marine Wave Boundary Layer Atmospheric Characterization Instrument Development
 TIPD, L.L.C.

WHO

SYSCOM: NAVSEA

Sponsoring Program: NAVSEA

Transition Target: PMA-299 MH-60R/S, PMA-264 ASW

TPOC: (401) 832-6887

Other Transition Opportunities: TIPD's initial end customer would be the Navy (through PMA-272) or the Air Force. TIPD has working relationships with Lockheed Martin (Business Development) and Northrup Grumman (Unmanned Systems). TIPD is using the existing points-of-contact to identify groups working the laser systems. TIPD's initial products would either be prototype systems delivered to PMA-272 or alpha versions delivered to either Lockheed Martin or Northrup Grumman. Lockheed-Martin, Northrup Grumman, Raytheon, and Boeing all have the technical capabilities to design and manufacture high peak and average power pulse laser systems. The large defense contractor could also be potential collaborators in the development program.

Notes:



(left) System schematic showing AMLCS 3-band laser and detection system in test configuration, (right) Conceptual schematic of AMLCS system integrated with HEL system

WHAT

Operational Need and Improvement: Gaining a deeper theoretical and experimental understanding of maritime turbulence and laser light propagation in the marine boundary is required to optimize the performance of critical communication channels and high energy lasers. Increased understanding of beam propagation through the turbulent flows of the marine layer will help the US Navy improve the performance of optical beam directors, adaptive optics, and other turbulence mitigating techniques and improve the safety and security of the warfighters. Recent investigations have shown that there is a complex interaction between the turbulent structures in the ocean and atmospheric mixing layers. The lack of tools capable of providing the required millimeter-level spatial resolution hampers researcher's attempts to study the boundary layer.

Specifications Required: 3 co-linear wavelengths: UV, Visible, and IR
 Linewidth: Transform limited, Pulse duration: ~ps, Repetition rate: ~kHz, Energy per pulse in each band: ~few mJ, Total average power per band: high

Technology Developed: The 3-Band Picosecond High Energy Compact (SWaP) Laser System for Marine Wave Boundary Layer Atmospheric Characterization Instrument Development is a three color laser system that can be used to map the marine layer with the higher accuracy.

Warfighter Value: TIPD's Advanced Marine Layer Characterization Source (AMLCS) employs a three-wavelength pulsed laser that can be used to study the marine layer and enable several new avenues of research by providing high power pulses in the Deep Ultraviolet (DUV), the visible, and the near-IR (NIR). Additionally, this laser system can be used for many maritime mission tasks such as target marking, detection, and designation.

WHEN

Contract Number: N68335-21-C-0133

Ending on: Dec 20, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate 100W IR laser with 5 kHz repetition rate	Medium	Successfully completed	4	3rd QTR FY22
Final Design Review	Medium	Successful simulations	3	4th QTR FY22
Provide test data and deliver the AMLCS system to the Navy	Medium	On-going	6	2nd QTR FY24

HOW

Projected Business Model: Spin the 3-ban laser to system with lower SAWP-C. Develop the unit for testing in a Naval environment. License intellectual property and designs to Prime Contractors to be integrated in one of their already deployed systems.

Company Objectives: Our objective is the integration of novel state of the art technology onto several Naval platforms and to be used to increase warfighter readiness and success during tactical and ISR operations. The demonstration of the value of our advanced technology by enabling mission success. Another objective is to team with multi-disciplinary experts, subcontract, and license our intellectual property.

Potential Commercial Applications: The development of high average power ultrashort pulse lasers is important for many critical industrial and DOD applications such as material processing, sensing, IR counter-measure, and directed energy. Laser development experienced tremendous growth in the past two decades because of the recent revolutionary advances in fiber-based technologies. Fiber lasers are transitioning from instruments for research laboratories into key technologies for different industries for a wide range of applications including material processing, biomedical imaging and precision measurements.

Contact: Dr. Adoum Mahamat, Vice-President
adoum@tipdllc.com (520) 622-0804

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-272

Transition Target: Navy CRANE

TPOC: (812) 854-6251

Other Transition Opportunities: NAVSEA, USAF

Notes: Still images from simulated dynamic chaff release scenario for jet and rotorcraft showing wake and interacting chaff elements. Software includes flexible configuration features, quick-look dynamic signature estimation, and rapid turnaround to support tactics development of release/maneuver scenarios.

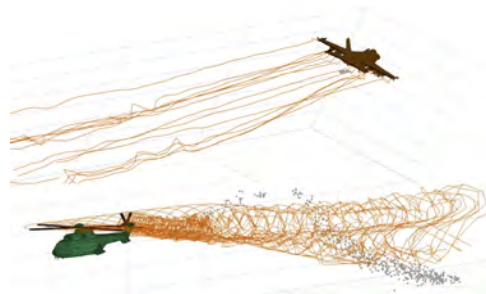


Image courtesy of Continuum Dynamics, Inc.

WHAT

Operational Need and Improvement: Successful deployment of advanced countermeasures requires sufficient modeling detail and fidelity to incorporate potential strategy and tactics to achieve aircraft survival from threats. Simulation software that can provide design guidance on effective countermeasure use is key to the development of techniques to subvert adversaries.

Specifications Required: Advanced chaff and countermeasures modeling tools should support the generation of physical effects known to be used in target discrimination and detection systems, and provide realistic transient data that can be used in engagement scenarios and weapons effectiveness analysis.

Technology Developed: CDI has coupled its state-of-the-art wake models for fixed- and rotary-wing aircraft to represent the multiple domains of countermeasure interaction following release for accurately modeling dispersion and settling behavior. The resulting dynamic time histories of release data can be used in signature analysis, weapons effectiveness analysis, and release and maneuver tactics development.

Warfighter Value: Improved modeling of dynamic countermeasure release physics will lead to increased survivability in threat environments, and better understanding of engagement scenarios and tactics.

WHEN

Contract Number: N68335-21-C-0242

Ending on: Oct 03, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Base software release	Low	Dynamic release demo	5	4th QTR FY22
Added component models	Medium	Initial comparison with test data	6	3rd QTR FY23
Coupled analysis features	Medium	Integration with DoD toolset	6	4th QTR FY23
Software completion	Medium	Final deliverable and tutorial	7	2nd QTR FY24

HOW

Projected Business Model: This software tool would see both continued development and spin-off application work, through the inclusion of additional aircraft models and features, and the exporting of the dynamic aircraft wake models for use in other weapons analysis and survivability software tools already used within DoD. The product is a natural extension of other CDI developed aerial particle tracking/release simulation tools that include aircraft pesticide deposition, icing accretion analyses, rotorcraft brownout operation, store release clearance, fuel jettisoning, and C/B hazard surface contamination.

Company Objectives: CDI supports DoD, NASA, FAA and industry aerospace engineering design and development work through the generation of cost-effective state-of-the-art analysis tools and software that generate timely and validated results for vehicle configuration and operational improvements.

Potential Commercial Applications: Dynamic countermeasure simulation and modeling support may be applied DoD-wide, and may be extended to include ship-borne and other survivability analyses.

Department of the Navy SBIR/STTR Transition Program

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ONR Approval #DCN#43-10637-22

Topic # N201-074

High Power Microwave (HPM) Waveform-enhancing Sub-nanosecond Semiconductor Pulse Sharpener
Sharpener
Transient Plasma Systems

WHO

SYSCOM: ONR

Sponsoring Program: Office of Naval Research

Transition Target: ONR Code 352: High Power Microwave (HPM) Basic Research

TPOC: Ryan Hoffman
ryan.hoffman@navy.mil

Other Transition Opportunities: Directed energy applications benefiting from ultra-wideband technology capable of generating high power (>1 MW) impulses with risetimes faster than 250 ps and durations from 500 ps and longer.

Notes: Transient Plasma Systems, Inc. is developing custom semiconductor devices and pulsed power systems that generate wideband and ultra-wideband electrical impulses with instantaneous powers that are 10s-100s of Megawatts. These solid-state systems are highly repetitive, featuring repetition rates up to 100s of kHz - MHz, and operate at high instantaneous power density, enabling compact and reliable systems ideal for directed energy applications that require robust, compact, broadband sources.



Transient Plasma Systems, Inc.

WHAT

Operational Need and Improvement: To develop an electrically driven, sub-nanosecond, semiconductor pulse sharpener to improve the performance of high power microwave (HPM) pulse generators by reducing/sharpening the rise time of a driving pulse, preserving the trailing edge of the pulse, and increasing the bandwidth of the output.

- Specifications Required:**
- Sharpen the 10-90% driving pulse rise time from 3-5 ns to < 200 ps, with minimal impact to peak pulse amplitude
 - Static Breakdown Voltage, $V_{br} = 3$ kV or higher
 - Dynamic Breakdown Voltage = 3 times V_{br}
 - Differential Voltage Objective: $dV/dt = 200$ V/ps
 - Differential Voltage Threshold: $dV/dt = 20$ V/ps
 - Diode Restoration Time < 2 μ s
 - FWHM Switching Time < 300 ps
 - Peak Current Rating > 1 kA

Technology Developed: Silicon Avalanche Shaping (SAS) closing switches are being developed by Transient Plasma Systems (TPS) to achieve the requirements described above. These switches are driven by wide-band pulses generated by drift-step-recovery-diodes (DSRDs) manufactured by Transient Plasma Systems (TPS), which are subsequently sharpened by the SAS closing switches to reduce pulse risetime from 1-2 ns to 200-300 ps.

Warfighter Value: Transient Plasma Systems (TPS) has previously demonstrated the capability of their Drift Step Recovery Diodes (DSRDs) to reliably generate 1-2 ns risetime pulses at repetition rates of 100s of kHz, with system designs capable of achieve MHz repetition rate. The development of silicon avalanche shaping (SAS), which is underway, will sharpen the risetime of these compact, reliable, high repetition rate systems to less than 300 ps. This level of performance will enable defensive directed energy systems that have not been previously possible with compact, highly repetitive, solid state impulse generators.

WHEN

Contract Number: N68335-21-C-0435

Ending on: Jul 31, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate Proof of Concept to Achieve Performance and Simulate Behavior in Phase I	Low	Simulation matches measured results	2	1st QTR FY22
Complete Device Design	Low	New devices designed based on previous simulation results and relevant literature review	3	3rd QTR FY22
Fabricate initial run of parts to achieve design specs	Medium	Testing of parts demonstrates initial targeting switching speed of ~500 ps	4	2nd QTR FY23
Refined design based on data from initial run	Medium	Testing of parts demonstrates initial targeting switching speed of less than 300 ps	4	3rd QTR FY23
Provide lab proven parts to relevant stake-holders to demonstrate system performance	Medium	Testing demonstrates expected performance specs	5	4th QTR FY23
Provide additional parts for system testing in end-use intended systems	Medium	Testing demonstrates expected performance specs	6	3rd QTR FY24
Continue on-going work to identify DOD	Medium	Transition beyond ONR funded R&D	7	1st

HOW

Projected Business Model: The first product for which this technology is intended is ultra-wideband pulse generating systems for directed energy applications. The silicon avalanche shaping (SAS) device made for this effort functions as an ultrafast high power output closing switch and reduces incident risetimes by more than 10x to achieve risetimes <300 ps. Based on previous conversations, TPS believes the existing customer demand for these devices may be on the order of 500-1000 pieces per year. Additional investment in capital equipment and facilities is required to supply larger part quantities. TPS sees potential in finding commercial markets outside of directed energy applications that would benefit from this technology as a dual use device to increase market size and de-risk the investment of capital.

Company Objectives: TPS possesses unique capability to design, prototype, and manufacture both optimized pulsed power specific semiconductor devices and compact solid-state pulsed power systems. TPS' goal is to leverage these capabilities to develop unique systems to meet the requirements of NAVY and other DOD sponsors, while also reaching out to industry partners and other government agencies to identify applications that may enable dual-use, where appropriate.

Potential Commercial Applications: Future commercial applications include UWB radar sensing for automotive and at home applications; medical devices that use sub-ns pulses for therapeutic treatments, including internal electroporation; and industrial plasma applications where highly reactive plasmas can achieve efficacy in atmosphere or by replacing expensive gases, like helium, with more affordable gases, like argon. Longer term commercial applications for this fast switching (<300 ps) device could also include advance ignition technology. TPS has developed working relationships with industry partners to demonstrate meaningful gains in engine efficiency gains and emissions reductions using plasma ignition technology based on DSRDs (1-10 ns), and it is expected that further improvements may be possible with the faster SAS technology that is being developed in this effort.

Contact: Dr. Jason Sanders, Chief Technology Officer
jason.sanders@transientplasmasystems.com (310) 212-3030

WHO

SYSCOM: NAVAIR

Sponsoring Program: NAVAIR CTO - AI Transformational Thrust Areas

Transition Target: Maritime Surveillance Radars; Airborne RF ISR across the DoD

TPOC: (301) 342-3482

Other Transition Opportunities: The U.S. Department of Defense fields thousands of radar systems, airborne as well as sea and land-based radar systems, each of which may be vulnerable to cognitive electronic attack and thus represents the largest market for the Vadum-developed Electronic Warfare Advanced Capability Estimation (EW-ACE) algorithms.

Notes: Vadum is a software supplier with Northrop Grumman on multiple advanced development efforts relating to electromagnetic maneuver warfare (EMW).



<https://publicdomainvectors.org/en/free-clipart/Radar-vector-image/3333.html>

WHAT

Operational Need and Improvement: A variety of approaches are being employed as the basis for the underlying machine learning. These cognitive systems train continuously while operational in an unsupervised fashion in an effort to gain maximum insight to a dynamic threat environment. For example, concepts for true cognitive electronic warfare systems envision a neural network-driven sensor that “should be able enter into an environment not knowing anything about adversarial systems, understand them and even devise countermeasures rapidly”. As our adversaries field these systems, we will seek methods to counter them and in the same vein as we develop the very adaptive systems, we must understand their vulnerabilities and take steps to mitigate threats.

Specifications Required: We must better understand how to exploit these fundamental blind spots in the training algorithms and system capability which adversary might utilize and how to protect our own system from such deception. Consider undetectable adversarial training techniques as well as other approaches when designing a solution. Develop innovative and operationally efficient approaches to exploit weaknesses in an adversary’s neural network-based cognitive sensing systems, and by association, techniques to protect our own systems from deception.

Technology Developed: Vadum is developing the Electronic Warfare Advanced Capability Estimation (EW-ACE) suite of algorithms to provide electronic protection against cognitive jammer systems. The EW-ACE algorithms on Pulse Descriptor Words (PDWs) or similar high-level descriptions of received emissions and consist of association, characterization and inference algorithms. These algorithms are connected by a Jammer Behavior Object (JBO) which serves as a hierarchical data structure for storing information about both jammer observations (i.e., incoming PDWs) and inferences made during the execution of the algorithm. The JBO is a persistent data structure capturing a description of jammer behavior sufficient for EW-ACE to suggest electronic protection measures. After the execution of electronic protection measures, EW-ACE will monitor the response of the jammer and assess the effectiveness of the measures. The results of the assessment will be captured within the JBO for post-mission analysis and dissemination to other platforms.

Warfighter Value: Cognitive electronic protection systems will counter the increasing complexity and capability of jammer systems allowing cognitive sensors to prosecute their missions successfully in the presence of advanced electronic attack.

WHEN

Contract Number: N68335-21-C-0508

Ending on: Sep 15, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
First Capability Drop	Low	Basic Functionality	4	4th QTR FY22
Second Capability Drop	Medium	Improved Adversary Capability	5	2nd QTR FY23
Third Capability Drop	Medium	High Adversary Capability	6	4th QTR FY23

HOW

Projected Business Model: Vadum will serve as an cognitive electronic protection algorithm provider supporting integration, test, improvement, and sustainment of cognitive electronic protection algorithms to developers of radar systems which must operate in contested environments.

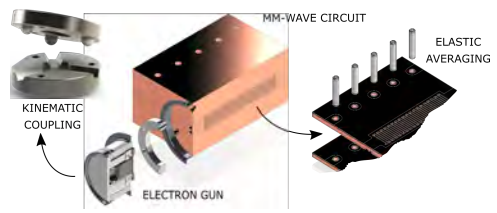
Company Objectives: Vadum's objective is to protect United States lives and assets by providing warfighters with the most capable cognitive electronic warfare solutions.

Potential Commercial Applications: Implement algorithmic approaches and concepts to defeat adversarial cognitive-based systems into Navy operation systems and concepts of operations. Incorporate methods to protect our own cognitive based sensors from exploitation. The same general techniques are applicable to a wide range of data-driven cognitive systems including commercial applications utilizing internet-based data mining.

Contact: Dr. Laura Tolliver, Business Area Lead
laura.tolliver@vaduminc.com (919) 341-8241 x175

WHO

SYSCOM: NAVSEA
Sponsoring Program: Program Executive Office Integrated Warfare Systems 2.0 (PEO IWS 2.0)
Transition Target: Integrate alignment techniques in W-band source development program.
TPOC: (202) 767-0033
Other Transition Opportunities: Future Electronic Warfare (EW) and countermeasures systems



Notes: The precision alignment technology allows for affordable vacuum electronic devices through improved assembly techniques processes. Higher precision alignment will provide improved device performance.

WHAT

Operational Need and Improvement: Navy requirement for affordable advanced mm-wave power sources.
Specifications Required: Improve RF power and bandwidth of mm-wave devices.
Technology Developed: The utilization of precision alignment techniques in the fabrication of mm-wave sources will provide improved alignment of the components and allow for generation of higher quality electron beams, these improvements will result in higher device efficiency and increased beam transmission through the mm-wave generating circuit. Increased beam transmission translates to reduced beam interception and reduced thermal loading on the circuit, decreased operating temperatures, improved device stability and increased operating efficiencies.
Warfighter Value: The development of improved manufacturing techniques will significantly reduce W-band source fabrication costs by reducing assembly labor costs and time, resulting in improvements to the microwave device manufacturing processes which have seen few innovations in the past decades. The resultant unit cost reduction will accelerate the adoption of W-band sources in defense applications and industrial processes, driving the development of new applications.

WHEN

Contract Number: N68335-22-C-0004 **Ending on:** Oct 15, 2023

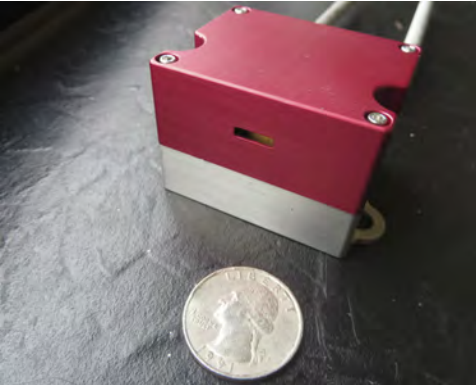
Milestone	Risk Level	Measure of Success	Ending TRL	Date
Application Elastic Averaging (EA) alignment technique over large aspect ratio circuit.	Medium	Align RF circuit periodic structure within one micron across 50 mm length	4	3rd QTR FY23
Apply Quasi-kinematic Coupling (QKC) and/or Kinematic Coupling (KC) to achieve high precision electron gun to circuit alignment with vacuum, temperature, and high-voltage compatibility	Medium	MM-Wave device assembly – Align components (gun, circuit) within one micron transverse alignment	5	4th QTR FY4
Apply QKC and/or KC to achieve high precision beam alignment.	Medium	MM-wave W-band device electron beam transmission >98%	5	4th QTR FY24

HOW

Projected Business Model: Dymenso seeks to license the developed precision alignment technology.
Company Objectives: Dymenso is seeking interested parties in the developed precision alignment technology.
Potential Commercial Applications: High precision alignment techniques will improve reproducibility between mm-wave sources, minimizing power and efficiency variations from device to device. The technology will allow for higher performance vacuum electron devices, such as traveling-wave tubes (TWTs) and klystrons radiofrequency (RF) sources for electronic warfare (EW), imaging and radar applications.

WHO

SYSCOM: NAVAIR
Sponsoring Program: PMA 272 Tactical Aircraft Protection Systems
Transition Target: Infrared Countermeasures (IRCM)
TPOC: (760) 608-3370



Other Transition Opportunities: Mid-wave and long-wave infrared (MWIR, LWIR) lasers coupled to imaging systems for military, law enforcement, and civilian applications including; target illumination, situational awareness (infrared scene illumination), industrial process control, remote sensing, obstacle avoidance, and selective etching, cutting, and marking of materials.

Notes: Our high power Quantum Cascade Lasers enable you to direct the power you need to fulfill the most demanding requirements. Key advances include high efficiency and irradiance, low M2, scalable beam-combined laser array technology, multi-watt output, and a compact form factor.

WHAT

Operational Need and Improvement: Pendar Technology LLC develops reliable, rugged, high brightness mid-infrared semiconductor laser sources for Infrared Countermeasure (IRCM) systems, that protects aircraft and other vehicles from threats such as shoulder-fired heat-seeking missiles. Our high brightness mid-infrared quantum cascade laser (QCL) systems combine established semiconductor technology with innovative new concepts to improve device reliability and yield, with the goal to significantly reduce cost of the devices.

Specifications Required: The goal of this program is to reduce the cost of current high-power mid-infrared lasers through innovative manufacturing strategies by addressing the 3 key process steps that add significant costs to QCL manufacturing: wafer epitaxy, regrowth, and assembly.

- Technology Developed:**
- Scalable and high yield wafer epitaxy
 - Innovative fabrication processes to improve manufacturing yield
 - Low-cost and scalable packaging solutions

- Warfighter Value:**
- High-power MWIR QCL emitter enable effective infrared countermeasure systems in a low SWaP package.
 - Narrow BH QCLs have inherently stable and excellent beam quality without beamsteering, enabling long distance propagation.
 - Innovative manufacturing strategies and device designs resulting in improved reliability and enabling low-cost fabrication, testing and burn-in, resulting in significant reduction of overall acquisition cost.
 - Affordable, high power MWIR QCL sources are a game changer for many military applications.

WHEN

Contract Number: N68936-21-C-0034 **Ending on:** Mar 28, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Watt-level single emitters demonstrated.	N/A	Prototypes tested	4	2nd QTR FY22
Laser fabrication and packaging for improved yield developed.	N/A	Prototypes tested	4	2nd QTR FY22
Automated test stations developed.	Low	Setup in use	4	2nd QTR FY23
Verification of high yield fabrication process	Medium	Delivery of high performance prototypes	4	2nd QTR FY23

HOW

Projected Business Model: There are aspects of the countermeasures technology chain that drive Pendar toward collaborative supply relationship with one or more Primes. Pendar alone cannot furnish a fully integrated IRCM system, including all steering and electronics. Pendar is actively pursuing opportunities to transition laser prototypes emerging from this and other SBIR/STTRs into next generation systems. Additionally, advances made in this program will more broadly benefit the commercialization of Pendar's IR platform, including spectroscopic instrumentation.

- Company Objectives:** To address the different markets in need for affordable, compact mid-infrared sources, Pendar has developed several infrared platforms which all share and leverage our proprietary QCL designs, beam-combining solutions, and system innovations:
1. Broadly tunable single-mode laser array as general spectroscopy tool.
 2. Compact, high performance IR spectrometers and sensors..
 3. Reliable high-power lasers and laser bars for IRCM, and other DoD applications.

Potential Commercial Applications: Pendar has developed several proprietary mid-infrared QCL platforms, which have unique features such as broadband spectral coverage, arrays with high optical power through power scaling, excellent beam-quality through rugged wavelength beam-combining, low laser noise , fast tuning speed, and low SWaP due to monolithic nature of laser source. These advantages enable a host of applications in IRCM, spectroscopy, medical device, pharma, laser processing, and scientific applications.

Autonomy

(Navy FST Booth: 14 March)

Company	Topic	Project Title	SYSCOM
ANDRO Computational Solutions, LLC	N192-062	Autonomous Unmanned Aerial Vehicle (UAV) Flight Without Supervisory Control	NAVAIR
Daniel H. Wagner, Associates, Incorporated	N192-117	Acoustic Counter-Detection Risk Management (ACDRM) Evolutionary Machine Learning (EML)	NAVSEA
Soar Technology, Inc.	N193-141	Resilient Autonomous Subsystems for Unmanned Air Systems (UAS)	NAVAIR
Weather Gage Technologies, LLC	N193-141	Resilient Autonomous Subsystems for Unmanned Air Systems (UAS)	NAVAIR

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA268 Navy Unmanned Combat Air System Demonstration

Transition Target: Small multi-rotor UAS e.g. Indago 3

TPOC: (301) 342-3728

Other Transition Opportunities: Other Group 1 & 2 UAS, such as fixed-wing (RQ-23 TigerShark, Boeing MQ-25 Stingray, MQ-4C Triton), multi-rotor (R80D SkyRaider, MQ-8 Fire Scout) and hybrid (Stalker VXE, V-BAT 128) models

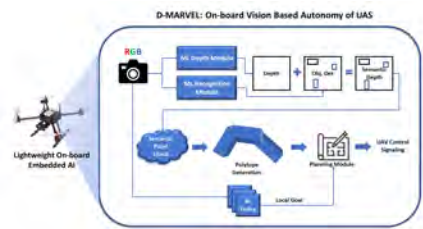
Notes: In the Diagram:

-Semantic point clouds are constructed from depth and object recognitions and used to create 3D semantic occupancy grids generating a common operating picture.

-The RL engine and planning algorithm jointly compute actions to be executed in the environment

-The characteristic efficient (low SWaP) sensor configuration and modular design of D-MARVEL allows for application to a variety of hardware platforms

About the Company: ANDRO Computational Solutions, LLC was the recipient of the prestigious Tibbetts Award in 2015 for excellence in conduct of the federal SBIR/STTR program. ANDRO has several successful Phase III, developed SBIR-based commercial products, and have licensed software to larger defense contractors.



WHAT

Operational Need and Improvement:

Lightweight autonomy framework for GPS-denied UAS which adapts to dynamic mission scenarios while enabling robust collision avoidance and seamless interoperability with human warfighters.

Specifications Required:

Provide unmanned aerial systems (UASs) with the capability to autonomously conduct flight from takeoff to landing, modifiable in real time by a human-in-the-loop or an Operations Center Supervisor (OCS) in real time without assuming a constant data link.

Technology Developed:

D-MARVEL offers a novel modular approach to autonomy for UAS, leveraging the best of both traditional autonomy approaches and machine learning based approaches. The developed framework provides robust autonomy from machine vision and perception avoiding the need for costly ranging sensors and long hover times.

Warfighter Value:

-The technology will provide autonomous resupply and exploration support in GPS-denied and broken data-link environments.

-The Natural User Interface will provide human-warfighter interactive control via physical body signals and will allow the warfighter to direct the UAS in a more natural way without the need for a dedicated data-link.

-D-MARVEL enables GPS-denied navigation via sensor fusion and machine vision, leading to increased mission survivability and efficiency.

-Machine vision used to perceive the environment onboard the UAS, producing depth maps and object detections, providing operational awareness.

WHEN

Contract Number: N68335-20-C-0964

Ending on: Oct 14, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Final ANDRO Demonstration	Low	Demonstration of Collision Avoidance & Navigation, NUI	6	4th QTR FY22
NAVAIR Test Facility or Representative Location Demonstration.	Medium	Demonstration of the technology in a military relevant environment	7	2nd QTR FY23

HOW

Projected Business Model:

Two-fold commercialization opportunity:
(i) D-MARVEL's modular software design allows for portability to a multitude of UAS platforms and
(ii) The sub-components of D-MARVEL, such as collision avoidance algorithms for standalone UGV or UAS, may be licensed for DoD or commercial unmanned systems.

Company Objectives: Transition the technology into a program of record and eventually offer as a standalone product.

Potential Commercial Applications:

- Infrastructure: Investment monitoring, maintenance, asset monitoring
- Insurance: Risk monitoring, risk assessment, and claims management and fraud protection
- Other: Transportation, media and entertainment, telecommunications, agriculture, security, and mining industries.

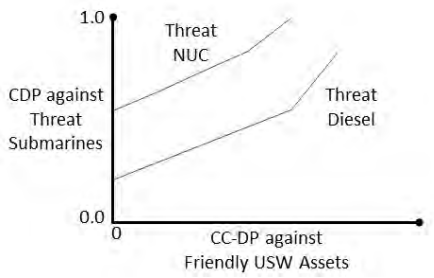
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 NAVSEA #2022-0408

Topic # N192-117
 Acoustic Counter-Detection Risk Management (ACDRM) Evolutionary Machine Learning (EML)
 Daniel H. Wagner, Associates, Incorporated

WHO

SYSCOM: NAVSEA
Sponsoring Program: NAVSEA IWS 5
Transition Target: AN/UYQ-100 Undersea Warfare - Decision Support System (USW-DSS)
TPOC: (301) 227-5218
Other Transition Opportunities: USW-DSS Foreign Military Sales (FMS) and Aircraft Carrier-Tactical Support Center (CV-TSC)
 DDG/CG/FFG (through ACB)
 PEO Sub (through APB)
 MH-60R Acoustic Mission Planner (AMP)



generated by Daniel H. Wagner Associates

Notes: Pareto Optimal Front (POF) for Friendly Cumulative Detection Probability (CDP) versus Threat Cumulative Counter-Detection Probability (CC-DP)

WHAT

Operational Need and Improvement: Improved planning tools that mitigate threat counter-detection capabilities when friendly assets are searching, screening, or maintaining a barrier (with or without acoustic advantage), and when friendly assets are transiting or patrolling are needed considering the increasing numbers of near-peer ASW threats. These tools will enhance existing capabilities, also developed by Wagner Associates, for evaluating and optimizing theater level USW planning and execution. These innovative tools will assist the fleet in mission success with balanced risk.

Specifications Required: Mitigation of threat counter-detection capabilities when friendly assets are searching, screening, or maintaining a barrier (with or without acoustic advantage), and when friendly assets are transiting or patrolling.

Technology Developed: Acoustic Counter-Detection Risk Management (ACDRM) Evolutionary Machine Learning (EML) will provide innovative algorithms, concepts, and planning tools that mitigate threat counter-detection capabilities when friendly assets are searching, screening, or maintaining a barrier (with or without acoustic advantage), and when friendly assets are transiting or patrolling.

Warfighter Value: (1) Reduced risk to friendly USW assets by reducing probability of counter-detection and successful attack by threat units, (2) Improved search effectiveness by accounting for threat sensor capabilities and evasion tactics, and (3) Reduced operator time-on-task.

WHEN

Contract Number: N68335-21-C-0121 **Ending on:** Feb 05, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Prototype ACDRM Components	Low	Successful tests in Wagner lab	5	4th QTR FY22
Prototype ACDRM System	Low	Successful tests in Wagner lab	6	2nd QTR FY23
Full Scale Prototype ACDRM System	Low	Successful demonstration in USW-DSS DevSecOps cloud testbed	6	4th QTR FY23
ACDRM Seminal Transition Event	Low	Successful transition into USW-DSS	7	4th QTR FY24

HOW

Projected Business Model: Since 1963 Daniel H. Wagner, Associates, has provided innovative and cost-effective technical solutions to complex problems in Naval Operations Analysis and commercial/ government applications, e.g.: custom resource optimization, decision support, multi-target tracking, and data fusion. Examples of successful transitions and deployments include:

- 1) Mission Optimization Configuration Item (MOCI) Web Service in Undersea Warfare Decision Support System (USW-DSS)
- 2) Acoustic Mission Planner (AMP) in MH-60R avionics system and shipboard Joint Mission Planning System (JMPS)
- 3) Computational components for evaluating and optimizing mine countermeasures (MCM) operations and estimating risk in MINEnet Tactical module within Mine Warfare and Environmental Decision Aids Library (MEDAL)
- 4) Net-Centric Data Fusion (NCDF) for USW-DSS
- 5) Data Fusion Engine (DFEN) in USW-DSS

ACDRM is targeted for direct integration into USW-DSS, although additional transition opportunities include other naval systems that could benefit from ACDRM technology and software components, and other defense applications with intelligent adversaries, such as Marine Corps, Army, and Air Force mission planning.

Company Objectives: To use our operational experience and technical skills to address challenging problems in defense analyses and provide solutions and computational components that enable warfighters to reduce their vulnerability and conduct successful and operationally effective military operations.

Potential Commercial Applications: ACDRM algorithms and methodology have potential applications to non-defense environments with intelligent adversaries, such as border surveillance and port/facility security.

Contact: Dr. W. Reynolds Monach, President
reynolds@va.wagner.com (757) 727-7700

WHO

SYSCOM: NAVAIR
Sponsoring Program: NAE Chief Technology Office
Transition Target: PEO(U&W) Navy unmanned aerial platforms (Group 1 – 3)
Other Transition Opportunities: Navy unmanned surface vehicles, loitering munitions, air launched decoys, aerial targets



<https://www.darpa.mil/program/gremlins>

Notes: Artist's rendition of Gremlins program showing air launched drone swarm.
 SwarmMATE is SoarTech's 4th generation swarm framework grounded in over 20 years of advanced research and hundreds of hours of live experimentation by experts in swarming systems and military tactics.
 UxS: Unmanned Vehicle Systems (Air, Ground, Surface, Undersea)

WHAT

Operational Need and Improvement: Current UxS require one or more operators to control each vehicle and reliable communications limiting the number and range of operations. SwarmMATE reverses that ratio allowing a single operator to control many drone with the intelligence to make tactical decisions in response to threats in denied environments.

Specifications Required: Satisfy operator objectives and rules of engagement without further operator involvement. Coordinate heterogenous teams of two to thirty UxS with varying payloads to respond to maneuvers and threats from as many as fifty adversaries. Operate in GPS and communications denied environments. Quickly and accurately geo-locate and identify emitters using passive RF sensors with limited communications between the UxS.

Technology Developed: SwarmMATE® is a transformative software capability that brings new levels of intelligence, autonomy, and performance to unmanned systems (UxS) teams. Its onboard intelligence makes tactical decisions, coordinates team behaviors, adapts to threats and attrition to meet mission objectives. It includes a range of missions from surveillance and patrol, to search, target localization and tracking, and coordinated strike.

Warfighter Value: SwarmMATE enables a single operator to manage or control tens to hundreds of UxS to overwhelm enemy defenses providing intelligence and delivering pinpoint effects deep in denied territory with remarkable efficiency and effectiveness. By swarming numerous, geographically dispersed UxS that can adapt their plans in milliseconds, SwarmMATE is able to overwhelm enemy defenses providing intelligence and delivering pinpoint effects deep in denied territory with remarkable efficiency and effectiveness.

WHEN

Contract Number: N68335-21-C-0510 **Ending on:** Nov 30, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Initial prototype RF localization swarm behavior	N/A	Software complete, tested in simulation	4	4th QTR FY20
Prototype SW with all Sensors	Low	Software complete, tested in simulation	5	1st QTR FY23
Flight Test	Medium	Flight test complete, metrics attained	6	4th QTR FY23

HOW

Projected Business Model: SoarTech operates on the product enabled services business model. We are developers of innovative artificial intelligence software technologies to enhance the capabilities of autonomous systems. We partner with systems integrators and DoD prime contractors to integrate our software with a military platform or system. SoarTech uses both a licensing and support services contracting model in working with our partners.

Company Objectives: Our goal for SwarmMATE is to build an innovative product and transition it into government programs and commercial systems. While we continue to pursue R&D contracts we are looking to develop relationships with companies developing unmanned vehicle systems for military or commercial markets who are interested in adding higher levels of intelligence and coordination to their systems.

Potential Commercial Applications: SwarmMATE has mission support for air and ground vehicle but can be applied to surface and underwater domains as well. Commercial applications include search and rescue, disaster relief, wildfire mapping/monitoring, facility security, and wildlife management.

WHO

SYSCOM: NAVAIR

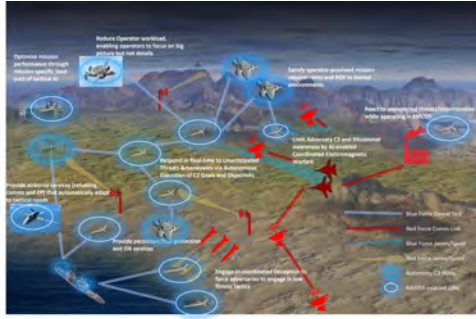
Sponsoring Program: PMA-201

Transition Target: Unmanned Air Systems operating in contested areas

Other Transition Opportunities: Manned unmanned teaming, unmanned system fault management, UAS planning systems

Notes: According to the Naval Research Advisory Committee (NRAC), "Autonomous systems are poised to revolutionize warfare as completely as have steel, gunpowder, electricity, aviation, and computers. If [America does] not radically change the path we are on, America's adversaries may soon be able to defeat us in several potential arenas because of their rapidly increasing military capacity combined with their more aggressive fielding of autonomous capability."

Sustaining US Naval Superiority will require that the US Navy develop the skills and infrastructure for rapidly developing, tailoring and fielding autonomous systems.



WHAT

Operational Need and Improvement: Autonomy fundamentally changes command and control (C2) by enabling machines to independently respond to changing environments and adversary actions. Allowing machines to make decisions improves mission effectiveness in several ways: first, "signal to shooter" time is reduced, second, unmanned vehicles under emissions control (EMCON) become capable of adapting to the unexpected, and third, unmanned vehicle combat resilience is improved by removing dependencies on communications and centralized controllers.

Specifications Required: Autonomy is software and, as such, is subject to the same life-cycle cost and development pressures as other complex software systems. Complex software time to market can be accelerated and development costs substantially reduced by facilitating re-use through software frameworks, architectures and standards. The Naval Air Warfare Center Aircraft Division (NAWCAD) has established a joint repository for autonomous systems software and tools called Research & Autonomy Innovation Development Environment & Repository (RAIDER). Rapid, cost-effective deployment of autonomous unmanned systems requires the RAIDER repository to be populated with reusable autonomy modules.

Technology Developed: Under this SBIR WGT developed highly resilient CODE-compliant autonomy modules that enhance unmanned vehicle mission effectiveness. Modules include: (1) multi-static search and track behaviors for over-the-horizon ISR in contested areas, (2) adaptive blue-force communications infrastructure for denied environments, (3) RF-geolocation support for GPS-denied, (4) distributed-delay-tolerant data fusion for blue force coordination in denied environments, (5) efficient task allocation for manned unmanned teams operating in denied environments, (6) intelligent fault management software that enable unmanned systems to predict, diagnose and manage internal system faults and (7) intelligent predictor that provides unmanned vehicles and operators with forward-looking situational awareness to facilitate planning.

Warfighter Value: WGT's autonomy components accelerate the unmanned vehicle decision-making process by allowing the vehicle to perceive, understand and react to operational change with a defined scope and in response to operator rules of engagement. Autonomy benefits the warfighter by enabling F-18/F-35 pilots to directly interact with unmanned systems at substantially reduced workload. Autonomy reduces reaction time, improving mission performance by accelerating the observe-orient-decide-act (OODA) loop.

WHEN

Contract Number: N68335-21-C-0549

Ending on: Jun 23, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Communicaitons Chain and Geolocation Behavior	Low	Simulation-based Demonstration	3	1st QTR FY21
Multi-static ISR	Low	Simulation-based Demonstration	3	3rd QTR FY21
Advanced Communicaitons Chain & Geolocation	Medium	CODE Integration Test	4	3rd QTR FY21
Advanced Multi-static ISR	Medium	CODE Integration Test	4	3rd QTR FY22
Task Allocation, Data Fusion & Prediction Module	Low	Simulation-based Demonstration	3	4th QTR FY22
AVATAR Integration	Medium	CODE+ Integration Test	5	1st QTR FY23
Flight Test	Medium	Coyote Flight Test	6	3rd QTR FY23

HOW

Projected Business Model: We have a two-pronged business plan. Our primary focus is to partner with platform integrators to incorporate our autonomy modules into future builds of unmanned air vehicle programs of record. Our secondary focus is to utilize our autonomy modules to support Navy engineering competencies in developing advanced autonomous system prototypes, developing RAIDER autonomy infrastructure and mission engineering.

Company Objectives: WGT is seeking a Phase III award to provide a contract vehicle to enable incorporation of WGT autonomy components into RAIDER initiatives. In addition, WGT is pursuing teaming agreements with platform integrators.

Potential Commercial Applications: Commercial applications include the improving the resilience of all forms of vehicles through WGT automation. The PI has experience in, and plans on exporting technology to the commercial automotive industry, commercial shipping, commercial aviation and class I railroads.

Contact: David Scheidt, Principal Investigator
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Energy & Power Technologies (Navy FST Booth: 14 March)

Company	Topic	Project Title	SYSCOM
VISHWA ROBOTICS	N192-133	Advanced Non-Electrochemical Energy Storage	ONR
Continuous Solutions LLC	N16A-T012	Medium Voltage Direct Current (MVDC) Grounding System	NAVSEA

WHO

SYSCOM: ONR

Sponsoring Program: ONR

Transition Target: Naval energy storage systems

TPOC: Mike Wardlaw
mike.wardlaw@navy.mil

Other Transition Opportunities: Any platform, vehicle or device that utilizes energy storage devices. This include consumer electronics, electric and hybrid vehicles, solar and wind power storage, railway operations, telecommunication systems, space platforms, and construction and mining processes.

Notes: Pictured: Vishwa Robotics' mechanical battery prototype.

- Battery features:
- Long cycle and shelf life
 - High power
 - High energy density
 - Supports constant or varying loads
 - Safe to use and store in operational platforms, buildings, and vehicles.



WHAT

Operational Need and Improvement: Navy systems often require energy storage that provides both high peak power and high shelf life in support of sustained operations. These two requirements are often difficult to achieve within the same battery technology. Current state of practice imposes considerable restrictions on safe storage and handling aboard operational vessels. Potentially harsh environments of surface and undersea battlespaces magnify the importance of battery safety (fire, environmental, and operating risks) and performance across a range of external environments.

Specifications Required: The Navy challenge is to develop an innovative, chemical free, rechargeable energy storage cell capable of high duty cycle, high discharge rates and long shelf life. The battery needs to be inherently safe, with no issues regarding thermal runaway, safe storage at no voltage for extended periods of up to one year, and environmentally neutral. The ideal energy storage cell will operate in a broad spectrum of environmental conditions, including temperature extremes of -40 to +105 degrees C at both sub-atmospheric and high pressure environments (or as defined in MIL-STD-810G). Cell-level technology should be electronically scalable and integration-capable.

Technology Developed: Vishwa Robotics has developed a flywheel prototype with innovative features that provide significant benefits over current designs. Our advanced energy and power system meets Navy requirements for long cycle and shelf life, high power, and high energy density that can support constant or varying loads and can be safely utilized and stored in operational platforms.

Warfighter Value: The introduction of advanced weapons systems with long endurance and pulsed power loads to existing and future warships and other DoD platforms could potentially outpace existing power and energy demands with existing power and energy sources.

Our solution satisfies a growing demand for safe, stored energy while working within the limited space available aboard ships.

WHEN

Contract Number: N68335-21-C-0167

Ending on: Apr 28, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Component demonstration	Medium	Demonstration supports scalability and capability projections	3	3rd QTR FY21
Demonstration of system and subsystem performance	Low	Analytics and modeling are within required parameters to meet performance goals	4	2nd QTR FY23
Delivery of SBIR Phase II Option I integrated prototype	Medium	Units ready for evaluation to determine capability in meeting performance goals	5	4th QTR FY23
Battery prototype test and evaluation	Medium	Completion of test cycle	6	4th QTR FY23
Conduct performance integration, risk assessment, and cost benefit analysis	Low	Finish SBIR SOW	6	1st QTR FY25

HOW

Projected Business Model: Vishwa Robotics would like to continue working with Lockheed Martin to demonstrate system performance through prototype evaluation test cycles, and when successful, partner to produce commercial transition opportunities.

Company Objectives: Develop a mechanical battery for the Navy and other DoD programs.

Potential Commercial Applications: Vishwa Robotics plans to partner with industry leads to develop battery systems in space vehicles, Large Displacement Unmanned Undersea Vehicles (LDUUV), UGV, robotics, marine sensors, propulsion systems, electronics, and grid scale back-up power systems for data centers, solar, wind and other renewable sources.

WHO

SYSCOM: NAVSEA
Sponsoring Program: PMS 460 - Guided Missile Destroyer
Transition Target: DDGX - Next Generation Guided Missile Destroyer
TPOC: (215) 897-1301
Other Transition Opportunities: PEO Submarines, PEO Ships, medium voltage distribution systems, cruise ships



Image courtesy of Continuous Solutions, 2022

Notes: Common Mode (CM) Interference
 Medium Voltage Direct Current (MVDC)
 Medium Voltage Alternating Current (MVAC)
 Integrated Power and Energy Systems (IPES)
 Common Mode Inductor (CMI) (See picture on right)
 Passive Line Impedance Stabilization Network (PLISN)
 Common Mode Shorting Network (CMSN)

Our technologies for mitigating CM interference on shipboard medium voltage distribution systems have been validated on the Purdue Reduced Scale Naval DC Microgrid (PRSNM), which replicates the next generation of Naval IPES

WHAT

Operational Need and Improvement: MVDC and MVAC zonal electrical distribution systems are being considered for future naval combatants to affordably achieve power and energy density sufficient to successfully integrate advanced high power electric weapon systems and electric propulsion. CM interference blocking, shorting, and characterization devices enables for increased efficiency of these distribution systems and lowers overall wear and required maintenance on interfaced equipment. Adaptable and customizable designs allows for use of these devices on multiple platforms and increased ability to integrate new equipment on pre-existing distribution systems.

Specifications Required: These technologies have been developed in conjunction with the drafting of MILSTD 1399 and IEEE 45-1 with each informing the other.

Technology Developed: Common Mode Inductor (CMI) for blocking CM current, the Common Mode Shorting Network (CMSN) for shorting CM current, and the Passive Line Impedance Stabilization Network (PLISN) for characterization of power electronics CM interference at various operating frequencies.

Warfighter Value: These technologies allow for medium voltage distribution systems with multiple, modular power electronics and converter devices, meeting the Naval Power Systems Technology Development Roadmap's call for IPES distribution schemes while lowering costs over equipment lifetimes by increasing efficiency of power converters while lowering resource allocation towards corrective and preventative maintenance. Allows for adaptability in distribution systems for integrating new equipment, such as weapons or sensor systems, in the future.

WHEN

Contract Number: N68335-21-C-0174 **Ending on:** Feb 24, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase II SBIR	Low	Computational Modeling in simulation	2	3rd QTR FY18
Phase II SBIR completion	Low	Component Build and test breadboard	5	3rd QTR FY19
Phase II.5 SBIR awarded	Medium	Purdue Testing in Reduced Scale Lab	6	2nd QTR FY21
Phase III	Low	FSU CAPS prototype testing	7	1st QTR FY24
Phase III	Medium	Adapted in Shipyards	8	4th QTR FY24

HOW

Projected Business Model: PLISN units can be used both on-board ships with existing distribution systems and in shipyards with power converters prior to installation to characterize CM interference. With this characterization, a network of CMI(s) and CMSN(s) is developed to specifically address the CM interference inherent in a particular distribution system or piece of equipment. Common equipment installed on ships can have mass produced CMIs and CMSNs.

Company Objectives: Currently, Continuous Solutions can meet low-rate initial production demands (LRIP), however we would need a manufacturing partner for full-rate production (FRP). Our intention is maintain ownership over the intellectual property behind these technologies, and enter into partnership with a manufacturer for FRP. We intend to bring these devices to market in commercial ship applications as well, driving up demand and allowing for more mass production to lower overall costs.

Potential Commercial Applications: Cruise ships have noted issues with CM interference as they have integrated medium voltage distribution systems on-board. These devices could be integrated into their power systems in a similar way to that in which they'd be integrated into Naval power systems. We expect more commercial ships will move to these types of distribution systems as part of electrification efforts and will require similar technologies as well.

Air Platforms

(Navy FST Booth: 15 March)

Company	Topic	Project Title	SYSCOM
TDA Research, Inc.	N181-019	Innovative Material (and Application Method) for a Hydrophobic/Oleophobic Coating to an Aluminum-Bodied Heat Exchanger	NAVAIR
DE Technologies Inc.	N19B-T031	Innovations in Production of Rotorcraft Airframe Components using Advanced 3D Braiding	NAVAIR
BluEyeQ LLC	N202-105	Digital Twin Technologies to Improve Mission Readiness and Sustainment	NAVAIR
American Maglev Technology of Florida, Inc.	N201-023	Alternate Sled Track Braking Mechanism	NAVAIR

Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.
NAVAIR SPR Number: 2022-844

Topic # N181-019
Innovative Material (and Application Method) for a Hydrophobic/Oleophobic Coating to an Aluminum-Bodied Heat Exchanger
TDA Research, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: NAVAIR PMA-275

Transition Target: V-22 Osprey

TPOC: (301) 342-0865

Other Transition Opportunities: Parties interested in licensing this product would include Off-Highway vehicles, mining equipment, and automotive applications intended for off-road use. Devices that use heat exchangers in austere and also wet or dry environments would benefit.

Notes: TDA Research, Inc. (TDA) has a history of commercializing SBIR projects. TDA develops and manufactures advanced materials, chemical processes and aerospace and military hardware. Privately owned and founded in 1987, TDA has annual revenues of \$26.6 million, with a staff of 104, mainly engineers and chemists, 26 of whom have Ph.D. degrees. We have licensed three major processes and manufacture ton quantities of sorbents; all with multi-million dollars of sales. We manufacture specialty chemicals and build flight-qualified hardware for the DoD and NASA. TDA and its partners have sold \$100,984,644 of products based on our SBIR work, and Phase III investments (which drive future sales) total \$261,855,223.



U.S. Marine Corps photo, Photo ID 360939, VIRIN 110112-M-#####-216.

WHAT

Operational Need and Improvement: Optimal heat exchanger (HX) performance in mechanical systems is achieved when the thermal transfer surfaces are maintained free of dirt and debris. Developing a cost-effective, innovative technology for a coating material and application method, designed to reduce the build-up of organic material on the thermal transfer surfaces of the heat exchanger and/or increase the surface cleanability, will increase the available usage time of a mechanical system. This would result in a decrease in cost to the Government by reducing the need to clean or remove components that have diminished heat-rejection capability. Longer periods of trouble-free use could also provide more remote usage of a device. Heat exchanger size could be reduced to account for higher resulting efficiency.

Specifications Required: The desired coating must be cost-effective and reduce the build-up of organic material on the thermal transfer surfaces of the heat exchanger, without affecting the efficiency of the HX. The application method of the coating material must provide even distribution coverage of the coating to the external surfaces that provide the thermal transfer capability. Specified performance should be maintained during and following exposure to a high/low temperature (-65F to 420F), a range of relative humidities (up to 95%), fresh and salt water immersion, and sea salt fallout of 200 parts per billion. The coating should be erosion resistant and durable to 40 mile per hour air flow with sand and dust concentrations up to 1.32 x 10e-4 pounds of sand and dust per cubic foot.

Technology Developed: TDA Research has developed a hydrophobic and oleophobic coating for the V-22 Osprey Nacelle Oil Cooler Assembly heat exchanger (HX). The coating is composed of commercial, off the shelf, products and is applied to the HX via electrodeposition, a commonly used industrial coating technique. This results in a thin, conformal coating that can evenly coat the complicated HX fin geometry and does not impede heat transfer. Compared to an uncoated aluminum body HX, our coated HX has a 50% reduction in initial soiling. When the HX is cleaned with a simple low pressure, high flow, water rinse, the coated HX has a better cleaning efficiency (72%) compared to only 47% for the uncoated HX. We have verified that our coating is abrasion resistant and can endure the environmental conditions that the HX is expected to encounter (high/low temperatures, thermal cycling, thermal shock, high humidity, water and salt water immersion).

Warfighter Value: An effective hydrophobic/oleophobic coating will increase the maintenance intervals and decrease time spent cleaning the heat exchanger, thus decreasing the burden on the warfighter. Additionally, our coating will prevent overheating and ensure safe HX operation. Finally, this technology will save money by reducing maintenance currently required to clean heat exchangers surfaces.

WHEN

Contract Number: N68335-20-C-0089

Ending on: Jul 11, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Down select to lead coating candidate and demonstrate coating performance on flat coupon	Low	Coating passes physical property and performance requirements	3	3rd QTR FY22
Demonstrate small scale application on heat exchanger geometry	Low	Coating is uniform, conformal, and passes physical property testing	4	4th QTR FY22
Demonstrate application on representative heat exchanger	Medium	Coating is uniform, conformal, and passes physical property testing	4	3rd QTR FY23
If Option exercised, validation testing of coated HX by NAVAIR	Medium	Coated HX passes NAVAIR testing	6	3rd QTR FY24

HOW

Projected Business Model: This coating would be commercialized via licensing of the coating formulation and application technologies to the prime contractors. Our solution is composed of commercial, off-the-shelf products, but TDA has developed unique expertise in the formulation and application of the coating.

Company Objectives: We are interested in identifying a prime contractor that would apply this coating to heat exchangers during manufacture. This could either be a prime contractor specifically for the V-22 Osprey heat exchanger, or another heat exchanger manufacturer that is interested in our coating solution. Alternatively, a maintenance contractor could apply our coating during routine heat exchanger maintenance.

Potential Commercial Applications: TDA's coating could be used to reduce heat exchanger fouling for a variety of applications. In particular, our solution is well suited to any environment in which the heat exchanger would encounter abrasive/erosive conditions. Due to our unique application method, our coating is ideal for complicated parts and geometries. The coating could be applied to any metal surface for which a self-cleaning functionality is desired.

Contact: Dr. Lauryn Baranowski, Senior Engineer
lbaranowski@tda.com (303) 261-1167

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-276

Transition Target: Primary targeted platforms are rotorcrafts used in demanding and/or hostile environments such as USMC light/attack helicopters and heavy lift helicopters.

TPOC: (240) 561-5734

Other Transition Opportunities: This technology can be applied to commercial sectors including mid-class business helicopters. Other areas of potential interest include uses in aerospace structural components, for ballistic protection, and high temperature environments such as jet engine components.

Notes: Novel fiber composite preform fabrication process allows the near-net-shape manufacturing of a variable cross-sectional composites. Customizable fiber distribution is used to maximize the prioritized properties according to need such as tensile, shear or torsional properties. This technology is suitable for composite stiffeners with high axial fiber content and ceramic matrix composites (CMC). DE Technologies, Inc. was previously awarded a SBIR Phase II program to develop a 3-dimensionally braided CMC fastener for high temperature applications.



<https://www.marines.mil/Photos/igphoto/2003014753/>
(Top, helicopter image); Copyright 2022 DE Technologies, Inc. (Bottom, component images)

WHAT

Operational Need and Improvement: Composite structural components are typically manufactured by putting down layers of pre-impregnated unidirectional tapes then followed by curing them in an autoclave. The cured composite is then machined to the final dimensions. Depending on the complexity of the component, this operation can be time consuming and produce significant amounts of scrap, leading to high manufacturing costs. Conventional 3-dimensional (3D) braided composites are inherently damage tolerant and can produce constant cross-section. The 4-StepPlus 3D braiding technology allows near net-shape components to be produced with minimal machining. Its ability to incorporate high axial fiber content in combination with integral off-axis or through the thickness fibers leads to high damage tolerance and stiffness. It has been demonstrated that the fabricated composite has tensile and shear properties comparable to the composite material used in current flexbeam. Unique features of 4-StepPlus 3D braiding concept include near-net-shape fabrication and design flexibility. The parameters can be varied to meet the desired properties according to specific need.

Specifications Required: Design and develop methodologies to fabricate three-dimensional (3D) braided rotorcraft components, specifically those with high axial fiber direction and complex geometries with improved damage tolerance without stiffness penalty.

Technology Developed: The developed technology, 4-StepPlus 3D braid, is for the manufacturing of net or near-net-shaped continuous fiber reinforced plastic having a large percentage of the fiber in the axial direction. This fiber arrangement, referred to as a preform, has a smaller percentage of the fiber dedicated for the through thickness reinforcement to increase the toughness, fatigue life and reduce crack propagation. This technology results in higher fatigue life, lower manufacturing costs due to minimal machining and waste reduction.

Warfighter Value: The new technology produces fiber composite at lower cost but with higher fatigue life and impact resistance as a result of the 3D reinforcement fiber network. An aircraft operating in hostile environments will have a higher chance of survival with fiber composite that is inherently tougher and less prone to impact damage from ballistic fragments.

WHEN

Contract Number: N68335-21-C-0320

Ending on: Mar 24, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Concept demonstration (Phase I)	N/A	Subscale prototype 3D braided composite flexbeam	4	2nd QTR FY21
Material design, development, and evaluation	Medium	Developed material has properties comparable or improved in some aspects	5	4th QTR FY22
Braiding equipment expansion	Low	Expansion of Phase I prototype equipment to produce full-scale prototype tail rotor flexbeam	5	1st QTR FY23
Flexbeam design and structural analysis	Low	Computational Model for full-scale prototype tail rotor flexbeam	5	2nd QTR FY23
If Option Exercised				3rd QTR FY23
Flexbeam performance optimization	Medium	Finalizing Flexbeam design and modeling	5	4th QTR FY23
Flexbeam fiber preform braiding	Low	Full-scale near net-shape 3D braided flexbeam preform	5	2nd QTR FY24
Resin transfer molding of flexbeam preform	Low	Prototype of full-scal composite flexbeam	5	3rd QTR FY24

HOW

Projected Business Model: DET in combination with Benny Ong, developer of the technology and equipment, will manufacture braided composite structural components in-house using the 4-StepPlus 3D braiding process in our 30,000 square foot facility. We are also open to discussions for the potential licensing of the braiding machine for specific applications.

Company Objectives: DE Technologies is seeking to talk with DoD programs and prime contractors that have an interest in using 3D braided composite components for rotorcrafts. Opportunities to design, manufacture and test prototype braided composite components in actual systems are sought.

Potential Commercial Applications: The concept is applicable to both military or commercial applications due to flexibility in this specific 3D braiding process. Success in the Phase II program will open opportunities in commercial applications such as aerospace structural components, ballistic protection, and other applications requiring high damage tolerance, cyclic loading, or high temperature resistance.

Contact: Hoa Lam, Senior Research Engineer
lam@detk.com (610) 337-2800 x157

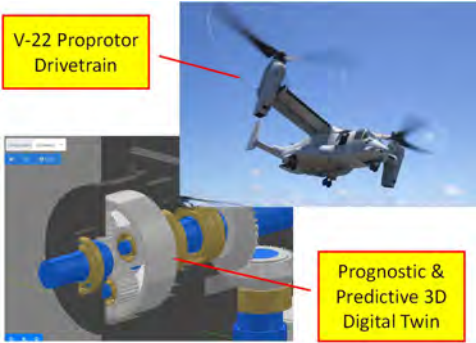
WHO

SYSCOM: NAVAIR
Sponsoring Program:
Transition Target: V-22 Osprey, H-1 Huey, H-60 Seahawk, other proprotor aircraft

TPOC: (301) 757-4831

Other Transition Opportunities:
 - Surface ship, submarine condition-based maintenance
 - Industrial rotating equipment applied to bearings, gearboxes, pumps, motors
 - Army, Air Force, Marines, DHS, Coast Guard

Notes:
 - Commercially fielded systems in Steel, Amusement Parks, Aluminum, Plastics, Automotive
 - Life-Cycle loop closed through interactive Bill of Material and course of action recommendations



<https://www.navy.mil/Resources/Photo-Gallery/igphoto/2003050922/>; BluEyeQ Internal 3D CAD model

WHAT

Operational Need and Improvement:
 - Reliability, safety, and total cost of ownership drive life-cycle cost of Naval assets
 - Sustaining maintenance cost 60-80% of total cost of asset ownership
 - Warfighter Safety - unpredictable asset failure
 - Sustainable fleet readiness

Specifications Required:
 - Virtual model-based representation of a physical system
 - Physics-based model responds to real-time or simulated operating data to predict / foresee potential outcomes

Technology Developed:
 - Artificial Intelligence algorithms form a virtual “Digital Twin” of machine operation
 - Prognostic intelligence of machine component loading, lubrication, and operational telemetry data
 - Predictive technologies monitor machine current state for advanced notification of potential failure conditions
 - 3D modeled components and equivalent load calculations feed targeted diagnostic analysis
 - Simulated “what-if” scenario development enables algorithm training for robust conclusions

Warfighter Value:
 - Operational foresight
 - Planned and predictable maintenance
 - Reduced sustainment cost
 - Safety

WHEN

Contract Number: N68335-22-C-0847 **Ending on:** Dec 04, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Yr 1 Progress Demonstration	Low	Function Digital Twin framework	3	1st QTR FY23
Yr 2 Demonstration	Low	Standalone Digital Twin software release	4	1st QTR FY24
Digital Twin Release 1.0	Medium	Initial demonstratable release	4	1st QTR FY24
Digital Twin Release 2.0	Medium	Multiple assets, interative improvements	5	1st QTR FY25

HOW

Projected Business Model:
 - Demonstrate value on existing fleet aviation assets, e.g. V-22, H-1, H-60, platforms
 - Additional Navy assets - surface ship, submarine condition based maintenance
 - Identify Program of Record and Prime Contractor adoption

Company Objectives:
 - Substantial value in Life-Cycle sustainment management
 - Dual-use technology for both Navy/Government and Commercial deployment
 - Expand model database and algorithm robustness

Potential Commercial Applications:
 - Technology elements currently fielded in multiple Industrial vertical markets
 - Digital Twin technology evolves and improves as more data is introduced to the model

WHO

SYSCOM: NAVAIR

Sponsoring Program: Naval Air Warfare Center Aircraft Division (NAWCAD) China Lake

Transition Target: Tomahawk Weapons System Program Office (PMA-280)

TPOC: (760) 939-4367

Other Transition Opportunities: NAWCAD Lakehurst; 846th Test Squadron of the 704th Test Group of the Arnold Engineering Development Complex at Arnold Air Force Base (Holloman High Speed Test Facility); Eglin Air Force Base Test Facility; Hurricane Mesa Test Facility; Sandia National Laboratory

Notes: More than 1 million pounds of thrust is produced in about 0.9 seconds to push a test item down the Supersonic Naval Ordnance Research Track (SNORT) at Naval Air Warfare Center Weapons Division China Lake at Mach 1.0. Test articles are stopped by a water brake, which is fraught with costly maintenance issues. To keep pace with the Navy's rapidly advancing testing requirements, a passive brake with no consumables and minimal maintenance is sought as a replacement.



U.S. Navy photo, https://www.navair.navy.mil/node/20261.

WHAT

Operational Need and Improvement: The Navy seeks the development of a replacement sled braking mechanism that requires less setup time and does not have the associated regulatory compliance and recurring cost issues as the existing water braking system at SNORT. As ground testing requirements become more sophisticated and approach hypersonic speeds, replacement of the already obsolete water braking system is a high priority for the Navy.

Specifications Required: The braking system should be passive with no outside inputs, such as electricity, water, fuel, or coolant. A maximum of 21,600 feet of braking length is permitted, with equal or lower weight and drag penalties compared to existing probe designs. The brake should fit into or around the existing track foundation and operate in a desert climate without severe performance penalties. Adjustments to the braking profile should be possible without precision equipment and completed by two personnel in less than two hours per mile of braking length.

Technology Developed: American Maglev Technology of Florida (AMT) Inc. has developed a passive eddy current braking system that accomplishes the same results of the current water-braking system and fits in the existing allocated spaces, while offering higher reliability, shorter setup time, lower maintenance and lifecycle costs, and minimal calibration setup. The system requires the integration of permanent magnets on the test sled, which react with steel braking trusses at the end of the track to stop the sled with minimal braking distance. No consumables or outside inputs are required for operation.

Warfighter Value: The eddy current brake eliminates the need for many of the present auxiliary systems, including the diesel-powered pump. Regulatory burdens will be lightened, and the degree of safety will increase with a reduced likelihood of hazardous braking events. Annual operation, maintenance, and calibration costs for the brake will be eliminated.

WHEN

Contract Number: N68936-22-C-0012

Ending on: Dec 19, 2023

Table with 5 columns: Milestone, Risk Level, Measure of Success, Ending TRL, Date. It lists four milestones: low-speed testing to verify centering, low-speed brake testing, objective speed brake testing, and full demonstration test at SNORT.

HOW

Projected Business Model: AMT will sell this initial sled braking systems as well as further additions, modifications, and improvements by executive sales directly to US Armed Forces customers. As the need for higher-speed hypersonic missile testing increases, AMT anticipates that the company will be well positioned to provide track improvements and new product offerings that will meet or exceed expectations.

Company Objectives: AMT's objective is to fully develop, demonstrate, and qualify a passive eddy braking system for delivery to the Navy for evaluation to determine its capability in meeting the defined performance goals. Through this process, AMT will demonstrate performance through subscale and full-scale prototype evaluation and testing over numerous deployment cycles to verify models, simulations, and initial test results.

Potential Commercial Applications: Aside from the multiple transition opportunities at the government's test facilities, this passive braking topology has the potential to replace friction braking systems for large-scale systems and devices in transportation, industrial, utility, space and aerospace.

Ground and Sea Platforms (Navy FST Booth: 15 March)

Company	Topic	Project Title	SYSCOM
Force Engineering, Inc.	N193-138	Lightweight Run-flat Tire/Wheel Assemblies for Marine Corps Wheeled Vehicles	MARCOR
LBI, INC.	NX19-002	On Demand Structures Submarine Launch of UUVs	ONR
Physical Sciences Inc.	NX19-003	Flow Conditioning for Improved Piping Arrangement	ONR
Technology in Practice	NX19-003	Flow Conditioning for Improved Piping Arrangement	ONR
Reaction Systems, Inc.	N202-132	Novel Methods to Mitigate Heat Exchanger Fouling	ONR
United States Military Advanced Technologies	N202-130	Cold-water Diving Wetsuit	ONR

Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.
MCSC-PRR-4452

Topic # N193-138
Lightweight Run-flat Tire/Wheel Assemblies for Marine Corps Wheeled Vehicles
Force Engineering, Inc.

WHO

SYSCOM: MCSC

Sponsoring Program: PEO LS, Amphibious Combat Vehicle (ACV)

Transition Target: Amphibious Combat Vehicle (ACV)

TPOC: sbir.admin@usmc.mil

Other Transition Opportunities: USMC Mine Resistant Ambush Protected (MRAP) vehicle, USMC and US Army Joint Light Tactical Vehicle (JLTV), US Army Stryker and Armored Security Vehicle (ASV), USMC and US Army High Mobility Multi-purpose Wheeled Vehicle (HMMWV), USMC and US Army Combat Support and Combat Service Support trucks.

Notes: Composite Run Flat Inserts (CRFI) adapts proven materials technology from aerospace and automotive markets to military tires and wheels. Composite materials are inherently corrosion resistant and ballistic and blast protective. Prototype CRFI's have already been fabricated, installed in ACV wheels, and static load tested to validate their structural integrity and weight savings. Force Engineering has presented this technology to vehicle prime contractors for vehicles using 16R20 wheels. We have also presented this technology to the Army PM Light Tactical Vehicles and are beginning work on a CRFI for the High Mobility Multipurpose Wheeled Vehicle (HMMWV). We have already submitted a patent application for CRFI technology.



<https://media.defense.gov/2018/Jun/20/2001933605/1-1/0/180619-M-ZZ999-1203.JPG>

WHAT

Operational Need and Improvement: The Marine Corps needs lightweight run-flat tire and wheel designs for military vehicles that increase the survivability and mobility of tactical and combat vehicles on/off paved roads and in water. CRFIs provide run-flat operational capability at less than one-half the weight of existing system. Novel CRFI materials and designs provide improved bead-lock traction and rigidity. Composite materials provide buoyancy even when tires are flat or damaged.

Specifications Required: Test Operations Procedure (TOP) 02-2-698 Run Flat Testing. Society of Automotive Engineering (SAE) J2014 Pneumatic Tire/Wheel/Run flat Assembly Qualifications for Military Tactical Wheeled Vehicles.

Technology Developed: Composite materials wheel and run flat insert technology that integrates the run flat function and the tire bead lock function into a single part. CRFI design maximizes the stiffness and spring properties of composite materials. Innovative one-step manufacturing technology creates a net-shape part with all features molded in using additive manufacturing tooling techniques.

Warfighter Value: Increased vehicle survivability and mobility expands capabilities. Reduced system weight extends range and payload capacity and reduces fuel consumption.

WHEN

Contract Number: M67854-21-C-6513

Ending on: Jul 01, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate CRFI Concept	Medium	Meet Proof Test Load	4	4th QTR FY20
Fabricate Full-Size Part	Low	Fitted to ACV Wheel	5	2nd QTR FY21
Proof Load Prototype CRFI	Medium	Load Test on ACV Wheel	5	3rd QTR FY21
Create Preliminary Design	Low	Bolt Together on ACV Wheel	6	2nd QTR FY22
Full Wheel & Tire Proof Test	Low	Installed on ACV Wheel	6	4th QTR FY22
Roll Test Wheel/Tire	Medium	Contractual SOW/TOP 02-2-698 Run Flat Testing	7	1st QTR FY23
Ballistic Test	Medium	TOP 02-2-698 Run Flat Testing	7	1st QTR FY23
On-Vehicle Test	Medium	SAEJ2014/TOP 02-2-698 Run Flat Testing	8	3rd QTR FY23

HOW

Projected Business Model: Complete product development activities internally (design, first article production, test) and create a Technical Data Package (TDP) and Intellectual Property (IP) portfolio using our own resources. Build the first production tooling and productionize the CRFI fabrication process internally to augment IP portfolio and create a licensable product and technology. Conduct Low Rate Initial Production (LRIP) internally and sell CRFIs to DOD/primes to demonstrate production viability. License CRFI technology for full-rate production/co-production and license/partner for export sales to NATO partners to create business base that generates annual \$15MM EBITDA, then sell technology/product/company to Private Equity or IPO.

Company Objectives: The ultimate goal is to productionize this technology for product sales to prime contractors and DoD vehicle fleets. Our current objective is to complete CRFI design and testing and obtain First Article Test (FAT) approval and safety release or 16R20 wheels to enable product sales to DoD and prime contractors. FAT approval is a trigger to initiate marketing and sale and capital raise activities.

Potential Commercial Applications: Run flat tire insert for commercial automotive application for improved safety and weight reduction by eliminating spare tire.

Contact: William Perciballi, President
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Department of the Navy SBIR/STTR Transition Program

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ONR Approval #DCN 0543-163-23

Topic # NX19-002
On Demand Structures Submarine Launch of UUVs
LBI, INC.

WHO

SYSCOM: ONR
Sponsoring Program: Office of Naval Research
Transition Target: Submaine Fleet, Littoral Combat Ship, Navy Oceanographic Research
TPOC: Kelly Cooper
kelly.cooper1@navy.mil
Other Transition Opportunities: Oceanographic Research, Oil and Gas survey and exploration,



Notes: The UUV Launch system has been developed with the ability to launch and recover UUVs. The system is adaptable to be used on platform other than a submarine. These include surface ships such as the Littoral Combat SHIP (LCS), Underwater Docking/Charging Stations, and ROVs.

WHAT

Operational Need and Improvement: Currently, there isn't an integrated launch system for UUVs from a submarine torpedo tube. The UUVSS fulfills this need and provides the UUV launch operator with sensor information for command and control of the UUV during the launch evolution.
Specifications Required: The UUVSS was developed to interface with submarine torpedo room and 21" torpedo tube power and communication systems.
Technology Developed: LBI developed a system to launch UUVs (Underwater Drones) from submarine utilizing inflatable structures, sensors, and software to control and protect the UUV during the launch process. We have used extensive CFD analysis and evaluation to develop a rugged and reliable system to safely launch UUVs from a submarine or other underwater platforms.
Warfighter Value: The UUVSS provides protection of the UUV during loading onto the submarine. It provides for the UUV a self contained storage, handling, maintenance cradle.

WHEN

Contract Number: N00014-19-9-0008 **Ending on:** Jun 01, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
UUVSS prototype development including design, CFD analysis, material and component analysis, systems engineering, and bench testin and analysis	Low	Successful development and bench testing of system and preparation for testing in a relevant in-water environment	4	1st QTR FY23
Vortex UUV Submarine launch simulated in water test launches froma mock torpedo tube shutterway	Low	Successfully prepared for in water tests with Electric Boat	6	2nd QTR FY23
Bluefin 12 UUV Submarine launch simulated in water test launches froma mock torpedo tube shutterway	Low	Successfully developed a test plan fort the Bluefin 12	6	2nd QTR FY23
Test Evaluation and hages to prototype UUV Submarine Launch System	Low	Successfully developed a plan for modifications and improvements to the operational system	8	2nd QTR FY23

HOW

Projected Business Model: Our business model is to develop systems, manufacture and sell directly to the NAVY or Government. This includes selling or teaming with UUV manufacturer that is currently selling to the Navy.
Company Objectives: The company objective is to obtain approval for operational use on a submarine. LBI will use our long-standing relationship with Electric Boat, NUWC Newport and NUWC Carderock to assist us with this process just as they are supporting the UUVSS testing with Electric Boat, and General Dynamics Mission Systems.
Potential Commercial Applications: Oceanographic Research, Oil and Gas survey and exploration,

Contact: Peter Legnos, President
plegnos@lbicorp.com (860) 857-4433

WHO

SYSCOM: ONR
Sponsoring Program: Office of Naval Research
Transition Target: SSN(X) - Next-Generation Attack Submarine
TPOC: Maria Medeiros
maria.g.medeiros.civ@us.navy.mil
Other Transition Opportunities: Navy surface ships.

Notes: Space comes at a premium onboard a submarine, and as the Navy moves towards faster, deeper, and more capable vessels at lower cost, that may force piping system design innovation. It will be necessary to employ more compact piping systems that can affect profile sensitive equipment like pumps and flow meters. The De-Correlator will reduce the straight pipe length requirement for this equipment to maintain operational efficiency and enable such compact system designs.

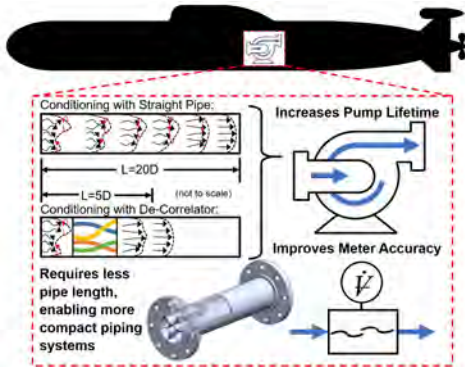


Image courtesy of Physical Sciences, Inc, 2022

WHAT

Operational Need and Improvement: Pumps and flow meters require a consistent, developed flow profile to function properly. Typically, this is achieved after flow disturbances through a minimum required length of straight pipe. This length requirement creates a packaging challenge as ship arrangement space is extremely valuable. An enabling technology is needed to reduce this length requirement to allow for more compact piping designs without inducing a significant pressure drop.

Specifications Required: Straight pipe lengths to achieve uniform, swirl free flow profile shall be decreased by approximately 50% from the baseline non-conditioned flow profile. The device shall not induce significant drops in flow pressure or affect suction inlet positive pressure in pumps located higher in the ship.

Technology Developed: Physical Sciences Inc. (PSI) has developed the De-Correlator, a device that reduces inlet distortion by re-arranging a distorted flow into a fully developed pipe flow. The device works on a volumetric flow (stream tube) basis rather than introducing turbulent mixing, thereby allowing it to operate over a wide range of flow conditions to reduce distortions for minimal pressure drop. PSI has prototyped and tested the De-Correlator, finding it capable of removing more than 90% of incoming swirl and reducing the straight pipe length requirement from 20x to 5x pipe diameter.

Warfighter Value: The De-Correlator will improve the reliability and lifetime of flow sensitive equipment such as pumps and flow meters. This will help ensure the accuracy of flow monitoring systems, reduce maintenance requirements, and enable more compact piping systems. Less arrangement space required for piping opens up room for additional equipment to be deployed on the Navy vessel.

WHEN

Contract Number: N00014-19-9-0010 **Ending on:** Sep 30, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Round I Completion	Low	Preliminary proof of feasibility testing	3	2nd QTR FY20
Round II Completion	Medium	Design optimization, comprehensive performance testing, manufacturing and integration outlined	4	1st QTR FY21
Round III Completion	Medium	Design for manufacturing, CFD and FEA simulations, experimental demonstration of distortion removal in 5D	4	4th QTR FY21
Round IV Completion	Low	Identification of prime use case and technology transition strategy, prototype demonstrated in prime use case, preliminary qualification testing	5	4th QTR FY22

HOW

Projected Business Model: The commercialization strategy is to first address the needs for flow conditioners in the submarine community. PSI has engaged with General Dynamics Electric Boat, the primary designer and producer of submarines for the Navy, to better understand their flow conditioning needs and the pathway forward to technology implementation. Given the timescales needed to mature the De-Correlator design to achieve approval for use from the NAVSEA Technical Warrant Holders, the Next Generation Attack Submarine program, SSN(X), is the initial technology insertion program. Once the path to meet the needs of the submarine community is well established, PSI will expand the commercialization activities to include the needs of the Navy surface ships.

Company Objectives: The objective of the technology transition is for PSI to become a supplier of flow conditioners for primes such as General Dynamics Electric Boat. The De-Correlator would be a valuable asset in their toolbox that could be implemented to overcome spacing challenges as these primes go through the process of designing piping systems for next-generation Navy vessels. PSI plans to manufacture in-house at our facilities in Haverhill and Wilmington MA. These facilities have been specifically set up for aerospace and military-grade structures development and fabrication. In our 4,000 sq. ft. facility in Haverhill, PSI produces production runs of specialty equipment for Army and Marine special forces, Air Force airborne and spaceborne antennas, and hypersonic vehicle parts. Our 24,000 sq. ft. Wilmington facility is outfitted with additional capacity for larger/longer parts, greater production runs, and responsive product development.

Potential Commercial Applications: The oil and gas industry is likely one of the largest commercial markets for flow conditioning where the De-Correlator could provide significant benefits. Due to the sheer volume of fluid handled by typical oil and gas system, small errors in flow meter accuracy can propagate to significant, and costly, errors in total volume estimates. Removing distortion in the pipe flow is a critical step in ensuring these inaccuracies are minimized.

Contact: Sean Torrez, Principal Research Engineer
storrez@psicorp.com (978) 738-8176

WHO

SYSCOM: ONR
Sponsoring Program: Columbia Class Submarine
Transition Target: Future Submarine Platforms
TPOC: Maria Medeiros
maria.g.medeiros.civ@us.navy.mil
Other Transition Opportunities: Surface Ships and Air/Spacecraft

Notes: The image shows flow stream on the outlet end of a 90 degree pipe elbow flowing liquid water with an inlet nominal velocity of 10 ft/sec. The upper flow visualization is a standard elbow and the lower visualization shows the straightening effect of our technology.

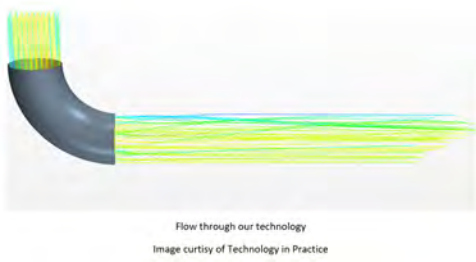
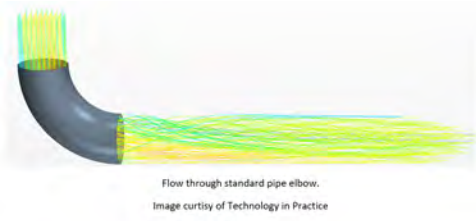


Image provided by Technology in Practice LLC

WHAT

Operational Need and Improvement: In order to minimize straight pipe length requirements, a technology is sought that can expedite the establishment of a fully-developed flow profile after non-straight pipe sections such as elbows and bends. The solution should readily integrate with existing piping and should produce minimal pressure drop. Furthermore, it is required that the solution does not induce cavitation and does not produce excessive vibrations.

Specifications Required: Straight pipe lengths to achieve uniform, swirl free flow profile shall be decreased by approximately 50% from the baseline non-conditioned flow profile.

Technology Developed: Straightening vanes are typically found in the straight section of pipe. Since the pipe bend or elbow is the cause of the flow disturbance we developed straightening vanes within the pipe elbow itself.

Warfighter Value: Significantly reduces the length of piping arrangements thereby allowing more room inside a submarine. Flow meters can be grouped together in one room, by reducing the straight pipe length requirements of flow meters, this room can be significantly smaller.

WHEN

Contract Number: N00014-19-9-0012 **Ending on:** Oct 04, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
CFD analysis	Medium	50% pipe length reduction to establish fully developed flow to	2	2nd QTR FY20
PIV validation	Medium	Physical demonstration validating CFD analysis	3	1st QTR FY21
Flow Loop Testing	Medium	Performance testing in flow loop	4	3rd QTR FY21
Environmental testing	Medium	Shock, Dynamic, and structure borne noise testing	5	3rd QTR FY23

HOW

Projected Business Model: Our business model is to work with a prime or system integrator to advance the TRL level, then produce units for production

Company Objectives: Our objective is to mature the manufacturing of the technology then license the technology to a prime or system integrator.

Potential Commercial Applications: Examples of industrial applications include; waste water treatment plants, power plants, refineries, chemical processing plants, and any application where space is limited such as a space launch vehicles.

WHO

SYSCOM: ONR
Sponsoring Program: Office of Naval Research
Transition Target: New-build US Navy ships (e.g. FFG, CVN, LHA class etc)
TPOC: Mark Spector
mark.spector.civ@us.navy.mil

Other Transition Opportunities: In addition to the current transition targets, the system could be used as a retrofit on any existing US Navy ship. Beyond the Navy, USCG Cutters, military support vessels, commercial ships, and other platforms that make use of seawater heat exchangers can benefit from this technology. As it fits in the footprint of the current electrochlorination system, the system can be swapped out easily.

Notes: Stainless steel coupons were exposed to port-representative waters, then removed and stained for biofilm analysis. Deep red coloring indicates the presence of biofilm. One coupon was removed prior to treatment and one after a one hour cleaning process. The before coupon was stained dark red, indicating healthy biofilm growth. The post-cleaning coupon shows effective removal of biofilm.

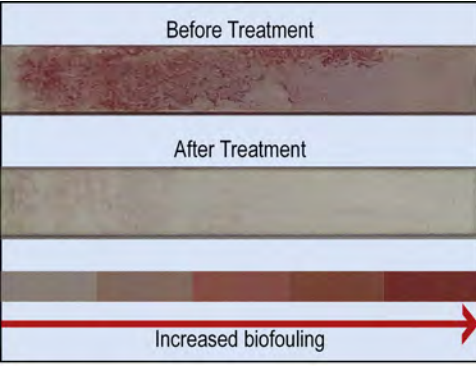


Image courtesy of Reaction Systems, Inc 2022

WHAT

Operational Need and Improvement: RSI has developed a new heat exchanger cleaning system that is environmentally friendly and has less maintenance than electrochlorination. The cleaning process uses an agent that will be rendered inert at discharge and thus can be used at higher levels and more often without running into port discharge requirements. Furthermore, this simple system has fewer parts and no moving parts compared to electrochlorinators. All while fitting in the same footprint as current cleaning systems.

Specifications Required: Seawater surface temperatures are rising, changing the biome and resulting in turf-like algae growing on heat exchanger surfaces. There is a need for a stronger biocide that can meet port-regulations and international treaty limits on discharge rates of harmful chemicals. RSI developed a cleaning system that is an effective biocide at these higher temperatures, indiscriminate of organism, and dissipates quickly. With this cleaning system, RSI can remove any biofouling from heat exchanger tubes.

Technology Developed: RSI has developed a method for cleaning a heat exchanger that is more effective at the elevated water temperature, will remove any organic growth, and does not leave behind any residue. Furthermore, there are fewer parts to the new system resulting in less maintenance and downtime.

Warfighter Value: RSI's cleaning process can be swapped in for any existing electrochlorination system. The system uses the same or less power than current systems. As there are fewer parts and no moving parts to the system, it will result in less time spent by the crew on cleaning heat exchangers by hand, less maintenance on the cleaning system, and no restrictions on where and how much cleaning is performed.

WHEN

Contract Number: N68335-22-C-0060 **Ending on:** Apr 28, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Dosage testing for up-scaling the system to a representative system	High	Measuring dosage levels and comparing biofilm removal on coupons	2	1st QTR FY21
Ensure there are no impacts to the strength or performance of the substrate material	Medium	SEM and Auger analysis of the material	2	1st QTR FY22
Benchtop testing to establish proof-of-concept	High	Ability to remove built-up biofilm from coupon surfaces	3	3rd QTR FY21
Testing in a representative heat exchanger in a laboratory setting	Medium	Ability to remove built-up & prevent biofilm from HEX tubes	4	4th QTR FY22
Testing in a representative heat exchanger in a port setting	Low	Ability to remove built-up & prevent biofilm from HEX tubes while operating in an adverse environment	5	3rd QTR FY23
Qualification testing of the system for ship deployment	Low	Ability to remove built-up & prevent biofilm from HEX tubes while operating in an adverse environment	6	3rd QTR FY25

HOW

Projected Business Model: RSI will develop initial prototype models in-house. When orders increase, RSI plans to partner with an experienced manufacturer to help streamline the production of units and reduce costs. We are currently in talks with suppliers and industry members to develop partnerships for manufacturing and distribution.

Company Objectives: RSI's objective is to develop this cleaning system and package it as a turnkey system. Our company is a technology innovator utilizing various pathways to commercialization, including consulting with end users, rapid prototyping of systems for research purposes, and licensing technologies to third parties.

Potential Commercial Applications: This technology could be applied to any commercial ship that makes use of and thus requires regular cleaning of a seawater heat exchanger. Beyond shipboard shell and tube heat exchangers, seawater cooling is used on oil rigs, seaside power plants, and even for deep water source cooling, such the Sydney Opera House utilizes. All of these represent further opportunities to commercialize this process.

Contact: Sibylle Walter, Principal Investigator
walter@rxnsys.com (303) 807-3070

WHO

SYSCOM: ONR
Sponsoring Program: Office of Naval Research
Transition Target: Lakehurst
TPOC: Reggie Beach
Reginald.beach@navy.mil
Other Transition Opportunities:

Notes: The developed technology leverages existing wetsuit manufacturing techniques to allow the wetsuits to be created on any wetsuit manufacturing line. The thin and easy to produce material provides 17 times the insulation of neoprene at the surface and almost 70 times the insulation of neoprene at depths of 100ft. The significantly improved insulation is achieved while also drastically increasing flexibility allowing the divers to expend less energy overcoming the resistance of the wetsuit. Associated with these features comes improved donning and doffing.

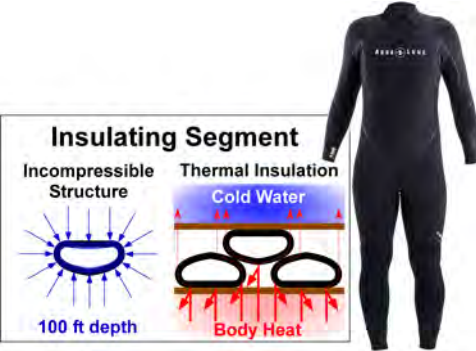


Image courtesy of USMAT 2020

WHAT

Operational Need and Improvement: Current wetsuits rely on small bubbles of air integrated into the wetsuit material (such as neoprene) for their insulating properties. At depth, the pressure compresses these bubbles resulting in a compressed wetsuit materials with related loss in thermal insulation. This puts divers at an elevated risk of hypothermia and limits the duration of the dives.

Specifications Required: The wetsuit is targeted to have a thermal insulation equivalent to R=5 insulation with a maximum loss of 10% of the surface insulation value at a depth of 100 ft. Simultaneously, the developed wetsuit should have improved flexibility, reduced flushing volume, and improved donning and doffing.

Technology Developed: USMAT has developed small, incompressible units with high insulating value. The units form a highly-flexible material which is both highly-insulating and highly-conformable to the body of the diver.

Warfighter Value: The technology provides an ultra-thin diving wetsuit with an R-value of approximately 5 both at the surface and at depth. This enables the diver to remain at depth for extended periods of time without any supplemental heating with a minimized risk of hypothermia.

WHEN

Contract Number: N68335-21-C-0738 **Ending on:** May 20, 2024

Milestone	Risk Level	Measure of Success	Ending TRL	Date
prototype wetsuit made	Low	complete wetsuit made and worn in water	7	4th QTR FY22
wetsuits made for delivery and testing at ONR	Low	testing of wetsuits by ONR	8	2nd QTR FY23
If option exercised, material manufacture in larger volumes	Medium	high-throughput production of material	8	2nd QTR FY24

HOW

Projected Business Model: The material will be developed by USMAT and provided to a contract manufacturer of wetsuits to create the wetsuits. It is anticipated that the wetsuits will be branded with the name of a well-known wetsuit brand and sold through their distribution network.

Company Objectives: Develop advanced technologies to improve the technical advantage of the armed forces while also generating commercially viable and successful products.

Potential Commercial Applications:
 wetsuits
 building insulation
 water/air/space craft insulation



Weapons Technologies (Navy FST Booth: 15 March)

Company	Topic	Project Title	SYSCOM
Polaris Sensor Technologies, Inc.	N191-003	Optically-Aided, Non-Global Positioning System (GPS) for Aircraft Navigation Over Water	NAVAIR
NP Photonics, Inc.	N201-044	2 micron Wavelength Kilowatt Class High Energy Laser/Amplifier	NAVSEA
McCormick Stevenson Corp.	N192-074	Flow Forming Bomb Bodies	NAVAIR

Department of the Navy SBIR/STTR Transition Program

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NAVAIR #2022-712

Topic # N191-003
Optically-Aided, Non-Global Positioning System (GPS) for Aircraft Navigation Over Water
Polaris Sensor Technologies, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-266

Transition Target: MQ-8C Fire Scout

TPOC: david.kyser7.civ@us.navy.mil

Other Transition Opportunities: Alternative programs: PMA-263. Alternative platforms: RQ-21 Blackjack, Unmanned Logistic AV, MQ-9 Reaper, or Far Target Locators such as MDUSA, JETS II, or ASURES.

Notes: Polaris is currently developing and implementing algorithms to determine position using SkyPASS Gen3 hardware with two optical channels for sun/moon and sky polarization tracking. SkyPASS Gen3 hardware has been used to test SkyPASS heading capability on both dynamic and static platforms as well as in high-latitude environments. External testing using ground-vehicles has been completed by testing partners in Huntsville, Alabama and at Auburn University. A Gen3-N sensor with three optical channels for sun/moon, sky polarization, and star tracking has been previously designed and tested for heading. Accuracies less than 2 mil were observed. Lessons learned from that effort are being used to optimize the sensor design for dynamic operation and position capability during the day and at night. Algorithms developed for position are compatible with both Gen3 and Gen3-N hardware.



Images Courtesy of U.S. Navy (DVIDS: 7145823, 3240985, 6356575, 285206, 5858852, 6565838)

WHAT

Operational Need and Improvement: Failure of the Global Positioning System (GPS) is becoming a reality and a critical risk for navigation, localization, and targeting applications due to GPS jammers and other forms of signal denial becoming increasingly cheap and effective. Without GPS, the position estimate derived solely from an inertial navigation system (INS) will drift and accumulate errors quickly, degrading the position estimate until the system is rendered unusable.

Specifications Required: Low-SWaP for Unmanned and Manned Applications

Technology Developed: Celestial-based sensor that provides highly accurate heading with course position that bounds inertial drift during the day and at night for aircraft navigation.

Warfighter Value: Navigation, localization, and targeting confidence in GPS-denied environments.

The SkyPASS position and heading sensor is a passive, celestial-based sensor that will allow the US military to develop and maintain awareness of its location on the Earth's surface without using GPS. It is a complementary solution to use when GPS and visual-aided solutions fail. SkyPASS offers the following benefits: it is low-cost, it has a small enough SWaP (Gen3: 3.5 x 1.9 x 2.4 in; 8oz; 4.1W; Gen3-N: 4.1 x 3.9 x 3.2in; 20oz; 4.1W) to fit almost any military platform, it can operate in various cloud conditions, it cannot be spoofed or jammed in day-to-night operation; and since it is passive, it does not increase the probability of detection. This position and heading technology utilized by SkyPASS is not affected by magnetic disturbances, it provides a drift-less position solution, it can operate anywhere on Earth (including at high altitudes and near the North and South poles), and it has 24-hour functionality making it valuable navigation solution when GPS is lost or is entirely denied.

WHEN

Contract Number: N68335-21-C-0003

Ending on: Mar 08, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Simulated landing an aircraft on a ship in a GPS-denied region with 1 nmi accuracy for different mission profiles.	Low	Provided proof of concept that SkyPASS' celestial-based position algorithm bounds inertial errors.	3	1st QTR FY20
Implemented and tested celestial position algorithms developed by Polaris using SkyPASS Gen3 hardware.	Low	Test data	5	4th QTR FY22
Improve SkyPASS' dynamic mode operation by restructuring SkyPASS' embedded software architecture.	Medium	Test data; System design	5	1st QTR FY23
Build, calibrate, and test two SkyPASS Gen3-N sensors with sun/moon, sky polarization, and star tracking.	Medium	Test data; System design	6	1st QTR FY23
Demonstrate SkyPASS Gen3-N on a fixed-wing aircraft.	Low	Test data	7	2nd QTR FY23

HOW

Projected Business Model: Polaris would like to remain an integrator, application developer, and a creator of new sensors and technologies. We would like to manufacture SkyPASS through a contract manufacturing license to lower the price of the system, ensure consistent quality, and leverage sales and distribution channels that are established in the market. Our hope is to license SkyPASS' technology to a Prime Contractor with a presence in the market to speed the adoption and integration of SkyPASS. Polaris can meet low-rate initial production and is open to supporting a spin out of the sensor as an investment; however, a manufacturing partner is needed for full-rate production. Two commercial vendors have been vetted for large scale manufacturing; however, we found that the optical system skillset was less than required.

Company Objectives: Commercialization of leading-edge technologies is a major business objective for Polaris who has dedicated years to developing polarization-based imaging systems for military, commercialization, and scientific entities. These systems provide daylight detail in the dark and visibility in low contrast conditions with real-time image processing. Our passion in meeting customer needs with unique sensing solutions has successfully led to a variety of technologies that are ready for and are currently transitioning to full production. Polaris is committed to commercializing our unique products and technologies developed under federally funded programs.

Potential Commercial Applications: Shipping, Aviation, Autonomous Vehicles and Robots, First Responders, and Law Enforcement

Contact: Dr. Laura Eshelman, Director of Product Development
Laura.Eshelman@PolarisSensor.com (256) 562-0087 x3743

WHO

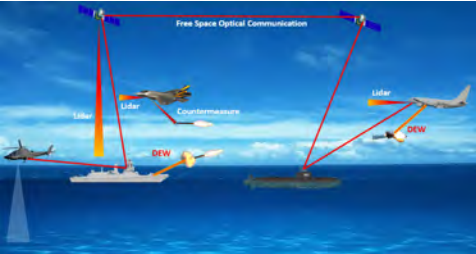
SYSCOM: NAVSEA

Sponsoring Program: NAVSEA

Transition Target: SUB 073

TPOC: (401) 832-6887

Other Transition Opportunities: Boeing, GE Aviation, L3Harris, Lockheed Martin, Northrup Grumman, Raytheon Intelligence & Space, and Sierra Nevada Corporation.



Notes: The laser system will be deployed ultimately in a submarine or other Navy platform to advance the future Navy warfighting capability. Both the power specifications and wavelength of operation and electrical to optical (EO) efficiency will be tested at a NSWC Dahlgren, Navy High energy laser (HEL) test facility.

WHAT

Operational Need and Improvement: Fiber lasers offer the best combination of output power, beam quality, and wall plug efficiency compared to any alternate technologies such as semiconductor lasers or solid state lasers.

Specifications Required: Highly efficient kW class fiber lasers operating in the 2-micron transmission window are useful as high energy lasers in Directed Energy applications.

Technology Developed: The objective is to develop scalable high-efficiency kW-class Ho3+-doped germanate fiber laser that can be used to achieve 10's kW continuous-wave laser source at 2um via spectral beam combining.

Warfighter Value: Lower electrical requirements and reduced heat generation/simplified thermal management the laser system.

WHEN

Contract Number: N68335-22-C-0189

Ending on: Feb 04, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop a 100-W Ho-doped germanate fiber laser at 2050 nm with efficiency > 60%	Low	> 100-W 2050 nm laser was measured	4	2nd QTR FY23
Develop a 250-W Ho-doped germanate fiber laser with efficiency > 70%	Medium	Output power > 250 W, Laser efficiency > 70%	4	2nd QTR FY24
Develop a 1 kW Ho-doped germanate fiber laser at 2050 nm with efficiency > 80%	Medium	Output power > 1 kW, Laser efficiency > 80%.	4	2nd QTR FY25

HOW

Projected Business Model: Partnership with prime/system integrator is the most direct path for transition. NP Photonics laser is essential element in the system – but operational system will need beam director and advanced thermal management to fully take advantage of this technology. This part is more naturally developed by prime.

Company Objectives: Transitioning NP Photonics fiber laser technology to Navy applications is a primary pillar of our growth strategy and an element of how we identify and develop commercial applications.

Potential Commercial Applications: There is a potential for dual use of this system for cutting/welding, optical communication and use in space or airborne platforms. One of the most important characteristics of this wavelength is that it will be less affected by the atmospheric operation near marine wave boundary layer (MWBL) and its eye-safe operation from scattered light.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PEO (U&W)

Transition Target: Bomb Casings

TPOC: (760) 939-7061

Other Transition Opportunities: Artillery casings, missile bodies, pressure vessels, launch tubes, high strength tube, and shaped charge liners

Notes: Spinning (as shown) of a notional, half scale penetration bomb casing. Spinning is currently being used to manufacture bomb and artillery casings in Europe and Asia. Where deployed, the TRL is at a minimum of 8. McCormick Stevenson is developing methods for the manufacturing of these casings in the United States.

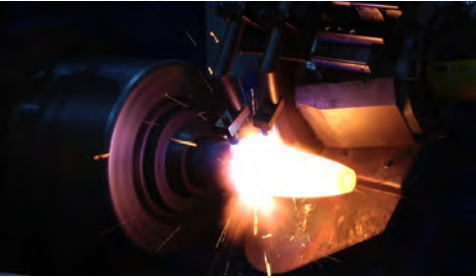


Image provided courtesy of Leifeld Metal Spinning GmbH, used with permission

WHAT

Operational Need and Improvement: Develop an alternate manufacturing process capable of producing comparable cost, improved bomb casings that exhibits higher performance than the current methods, while increasing the supplier base and manufacturing technology options.

Specifications Required: Prototypes shall meet the existing dimensions. In addition, prototypes must meet or exceed the tolerances, mechanical properties, penetration, and lethality metrics of the incumbent process. No defects are allowed after non-destructive ultrasonic inspection.

Technology Developed: McCormick Stevenson is developing methods to employ Flow Forming and/or Hot Spinning into the production of bomb and artillery casings. Hot Spinning can be used to form completed bomb casings using welded or seamless tube. Spinning a bomb casing is expected to yield improvements in dimensional uniformity and performance. Flow formed tubing can also be utilized as a feed stock to a spinning operation using a forged blank for additional improvements in tolerances. An alternative method is being evaluated to form bomb ogives with flow forming and to form the tail end the the casing with hot spinning. Flow forming and/or spinning can produce different benefits depending on how used. Flow forming (cold working) can improve mechanical properties and tolerances. spinning (hot) can improve tolerances.

Warfighter Value: America’s warfighters will experience the value of the manufacturing process improvements through increased tactical precision and enhanced penetration performance. The tolerance control improvements will enable bomb casings fabricated through flow forming and hot spinning to be more consistent, and therefore more predictable and accurate, when coupled with precision guidance systems. Variable wall thickness control and – depending on the process chosen for implementation – material property optimization will contribute to increased penetration performance compared to the legacy bomb casings. This technology also offers a rapid response production method that can be utilized to alleviate supply chain shortages or enable surge capacity.

WHEN

Contract Number: N68936-21-C-0035

Ending on: Apr 26, 2024

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Evaluate manufacturing methods and the equipment it would required	Medium	Method is established that meets the design requirements and the required equipment is available.	2	2nd QTR FY21
Manufacture a 50% scale model of a notional penetration bomb casing	Medium	Validating the selected method with a physical prototype that meets dimensional requirements.	4	1st QTR FY21
Manufacture full sized MK82 bomb casings	Medium	Meeting established dimensional requirements, mechanical properties, and passes quality metrics.	4	2nd QTR FY23
Complete MK82 bomb casing assemblies	Medium	Meeting established dimensional requirements, mechanical properties, and passes quality metrics.	5	TBD
Performance test bomb assemblies	Medium	Meeting or exceeding existing metrics for penetration, precision, and lethality.	6	TBD

HOW

Projected Business Model: The objective is to demonstrate capability to manufacture bomb casings using flow forming and hot spinning which meet or exceed manufacturing tolerances and performance metrics for penetration and lethality. McCormick Stevenson will work with the Navy, other DoD entities, and prime contractors to implement flow forming and hot spinning in the manufacture of bomb and artillery applications where there is a mission need.

Company Objectives: McCormick Stevenson’s goal is to offer the warfighter improved flexibility and performance in future weapon designs. McCormick Stevenson will work with DoD and prime partners to develop applications which use flow forming or spinning.

Potential Commercial Applications: Flow forming: Flag poles, pressure vessels, accumulators, rocket fuel tanks, rocket motor housings, hydraulic cylinders (aircraft door, landing gear), jet engine drive shafts, compressed air tanks, filter housings, disk carriers, automotive wheels, and automotive pulleys
Spinning: compressed air tanks, hydraulic cylinders, pressure vessels, fuel tanks, filter housings, aircraft engine lip skins

Sensors

(Navy FST Booth: 15 March)

Company	Topic	Project Title	SYSCOM
NanoSonic, Inc.	N192-120	Small-Scale Velocity Turbulence Sensors for Undersea Platforms	NAVSEA
Energy to Power Solutions	N192-122	Spatially Integrating Magnetometer	NAVSEA
Luna Innovations Incorporated	N192-076	Fiber Optic Pressure Sensing for Military Aircraft (MIL-Aero) Environments	NAVAIR
Dual Sense Systems	N202-119	Cross Deck Pendant Health Monitoring	NAVAIR
IMSAR LLC	N201-070	Sensors and Autonomy for Unmanned Maritime Missions	ONR

WHO

SYSCOM: NAVSEA

Sponsoring Program: SEA073, Advanced Submarine Systems Development

Transition Target: Navy submarines and Unmanned Undersea Vehicles (UUV) are the primary target platforms for this type of sensor

TPOC: (401) 832-7096

Other Transition Opportunities: The sensors can be applied to new or existing undersea platforms for real-time velocity analysis.

Notes: NanoSonic is developing high speed, miniaturized nanomembrane based travel-time sensors (inset) for small-scale velocity turbulence measurements. Such sensors are implemented using a pair of serial-mounted high frequency pressure wave sensing elements and supporting data acquisition and signal processing electronics in conformal skins. The developed sensor skins are thin, flexible, mechanically and chemically robust thus can be patterned in two dimensions to create multi-sensor element arrays that can be embedded into undersea system structures.



Image Courtesy of NanoSonic

WHAT

Operational Need and Improvement: The Navy currently is looking for a permanent way of measuring small-scale ocean turbulence from submerged platforms for extended periods. Traditional techniques for the undersea turbulence detection are fragile, noise-susceptible, scale-limited and are not suitable for high-speed applications.

- Specifications Required:**
- o Improved turbulence sensing response
 - o Conformal sensor installation
 - o Small size and weight
 - o Low cost
 - o Robust operation

Technology Developed: High speed, miniaturized nanomembrane based travel-time sensors for small-scale velocity turbulence measurements. Such travel-time-based velocity sensors will be implemented using multiple high frequency pressure wave sensing elements and supporting data acquisition and signal processing electronics. Such sensors exhibit frequency response significantly higher than state-of-art products and that improved frequency response is the basis of our turbulence sensor approach and can be applied to new or existing undersea platforms for real-time velocity analysis. The performance in terms of small-scale turbulence detection of the sensors has been experimentally demonstrated through multiple laboratory-based tests.

Warfighter Value: Accurate measurement of undersea small-scale velocity turbulence will provide the user with additional situational awareness capabilities.

WHEN

Contract Number: N68335-21-C-0262

Ending on: Sep 26, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Build breadboard-level miniaturized sensors for undersea velocity measurements	N/A	Completion of in-house validation	3	2nd QTR FY20
Characterize the breadboard-level sensors using equipment available at Virginia Tech	N/A	Completion of initial water tunnel testing at Virginia Tech	4	3rd QTR FY20
Standardize the sensor design and fabrication process	Low	Completion of water tunnel testing at Virginia Tech	5	4th QTR FY22
Develop and optimize a data acquisition interface to allow interconnection to data recording systems	Low	Completion of tunnel testing at Navy	5	4th QTR FY23
Use developed sensors in cooperation with the Navy program through in-water bay testing	Medium	Completion of bay testing at Navy	6	4th QTR FY24
Develop product transition plan	Medium	Completion of demonstration of sensor elements in multiple research testbeds	6	4th QTR FY24

HOW

Projected Business Model: NanoSonic specializes in the design and manufacture of innovative materials, especially new materials that are currently unavailable in the commercial market. We design and manufacture materials with novel engineering behaviors with the overall goal to develop environmentally benign processes and techniques for these new materials. The sensor products developed through this Navy SBIR program build on our established capabilities in both the nanomaterials and sensors and systems areas, where we already have commercialized products, have licensed multiple technologies, and hold multiple issued U.S. patents.

Company Objectives: NanoSonic envisions use of developed technology first by the Navy programs, and then by the broader research community, as well as the developers and users of aerospace, hydrospace, land vehicle, civil structure, and biomedical flow systems. There is a very wide spectrum of applications of this technology. Any application requiring a turbulent velocity measurement (air or sea) or long term deployment can benefit. The oceanographic community (universities and research institutes) are good examples of organizations that would benefit from the technology. We seek discussions with interested parties.

Potential Commercial Applications: To maximize use of the velocity sensor technology, this sensor technology could be commercialized for use by the oceanographic community at large for scientific and research uses. Organizations interested in oceanographic research and data collection such as universities will find high value in these sensors.

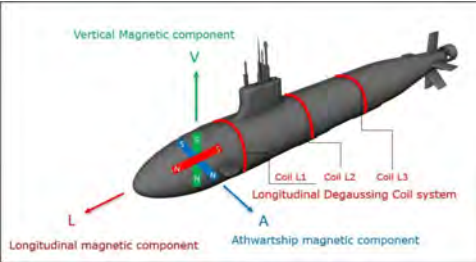
The commercialization potential of the velocity sensor technology lies in three areas - 1) sensors for the measurement of high frequency pressure profiles, 2) travel-time sensors for the measurement of high frequency velocity profiles, and 3) data processing modules.

Contact: Hang Ruan, Director of Engineering, Vice President of Sensors and Systems
hruan@nanosonic.com (540) 626-6266

WHO

SYSCOM: NAVSEA
Sponsoring Program: Team Subs
Transition Target: Existing and Future Submarines
TPOC: (301) 227-7030
Other Transition Opportunities: Other Navy vessels that use Degaussing Systems (DG)

Notes:



WHAT

Operational Need and Improvement: Degaussing Systems require the accurate measurement of magnetic fields even in the presence of localized magnetic perturbations and anomalies. Existing magnetic measurement systems use multiple sensors, which are costly and complex to install, cumbersome, and require constant calibration and maintenance.

Specifications Required:

Technology Developed: Spatially Integrating Magnetometer synergistically combined with two other independent measurement systems.

Warfighter Value: A spatially integrating magnetometer provides an accurate measurement of the integrated magnetic field even in the presence of localized magnetic perturbations and anomalies. The proposed system offers lighter weight, lower capital cost, lower OEM costs, than traditional measurement systems.

WHEN

Contract Number: N68335-21-C-0313 **Ending on:** May 10, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Task 1: Design Requirements	N/A	Design Requirements Document	2	3rd QTR FY21
Task 2: Unit 1 Fabrication	Medium	Functioning Unit 1	4	4th QTR FY22
Task 3: Unit 2 Fabrication	Medium	Functioning Unit 2	4	1st QTR FY22
Task 4: Combine Units 1 & 2	Medium	Combine both Units 1 & 2M	4	2nd QTR FY23
Task 5: System sensor Evaluation	High	Investigate alternate sensors	4	3rd QTR FY23

HOW

Projected Business Model: After successful development of a spatially integrating magnetometer suitable for placement within the hull of a Navy ship, sell the system to a large system integrator or ship builder for use with current and future Degaussing systems.

Company Objectives: To develop a low cost, lightweight, magnetic field measurement system capable measuring the integrated magnetic and gradient fields along a contoured surface.

- Potential Commercial Applications:**
1. Dept. of Energy accelerator magnets
 2. Commercial Fusion Energy magnets
 3. Magnetic Resonance Imaging magnets

WHO

SYSCOM: NAVAIR

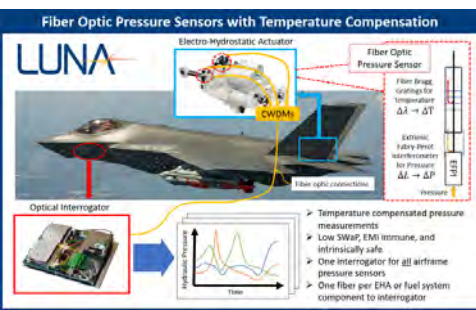
Sponsoring Program: PEO-JSF

Transition Target: F-35, F-18, V-22

TPOC: (240) 309-5720

Other Transition Opportunities: Hydraulic pressure sensing, pneumatic pressure sensing, nuclear, oil & gas, industrial

Notes: The accompanying image depicts Luna's new fiber optic pressure sensors integrated in the electro-hydrostatic actuator (EHA) used in the F-35 to position the flight control surfaces. The Hyperion interrogator will be integrated in the airframe and interfaced to the flight control system.



Copyright, 2022, Luna Innovations Incorporated, background photograph U.S. Navy <https://www.navy.mil/Resources/Photo-Gallery/igphoto/2002289426/>

WHAT

Operational Need and Improvement: Pressure sensors are required to enable detection of failures prior to launch and during flight. Hydraulic systems are critical for military aircraft such as the F-35. Traditional pressure sensors for these systems are complex, expensive, and prone to reliability issues. Luna is developing a fiber optic pressure sensor with built-in temperature compensation that solves these problems and increases mission-readiness.

Specifications Required: Robust to pressure spikes (6,000 psi)
 Low SWaP-C (size/weight/power/cost)
 Reliable (30-year operation, 8,000 flight hours)
 Immune to EMI

Technology Developed: The hydraulic pressure sensor will be a drop-in replacement for legacy sensors used in Electro-Hydrostatic Actuators (EHAs). Many fiber optic sensors can be multiplexed together for signal processing by a single interrogator, thereby saving weight for the aircraft. Luna will demonstrate sensor performance in laboratory and relevant environments to meet TRL 6 in Phase II.

Warfighter Value: Increase safety, aircraft uptime, mission readiness, and reduce maintenance costs. U.S. Navy fixed wing and rotary wing aircraft subsystems will directly benefit from this innovation.

WHEN

Contract Number: N68335-21-C-0727

Ending on: Aug 02, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Project Kickoff	N/A	Requirements established	4	4th QTR FY21
System architecture for integration in aircraft	Low	Installation location and interfaces defined	4	3rd QTR FY22
Sensor design complete and calibration procedure established	Medium	Accuracy, temperature, and pressure requirements met	5	1st QTR FY23
System demonstration in relevant environment	High	Navy and OEM witness of system performance	6	3rd QTR FY23
	Medium	Environmental tests (810G) and flight test	7	3rd QTR FY24

HOW

Projected Business Model: Luna will partner with OEM manufacturers and prime contractors to integrate robust fiber optic pressure sensors in aircraft hydraulic systems and actuators. The patent-pending technology can be licensed or manufactured in-house for new product lines that would be disruptive in the market.

Company Objectives: To enhance the safety, security and connectivity of people by leveraging our expertise in fiber optic-based technology and the information it provides.

Potential Commercial Applications: The hydraulic sensor will have significant potential applications beyond advanced aircraft. The hydraulic sensor with thermal compensation, along with a high-speed interrogator, can provide extremely useful information in extreme environments. Rocket testing facilities, oil & gas operations, industrial systems control, and nuclear power plant monitoring applications will all benefit from this advancement.

WHO

SYSCOM: NAVAIR

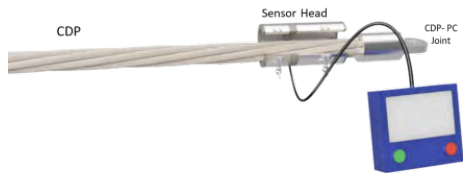
Sponsoring Program: PMA-251

Transition Target: PMA-251

TPOC: (732) 323-7032

Other Transition Opportunities: Monitoring wire ropes used in ship mooring, towing, hoists, hangars, and other civilian applications including wire-ropes used in the construction of bridges, elevators, cranes, overhead hoists, ski-lifts, and off-shore oil rigs.

Notes: The Dual Sense CDPH sensor will fill a Navy's need for automated inspection of an in-service CDP in a complex operational environment with grease, EMI, contact with metal deck/leaf springs, and in all weather conditions.



Graphics Copyright 2022, Dual Sense. Image Courtesy of U. S. Navy, National Archives Identifier (NAID) 6517672

WHAT

Operational Need and Improvement: Cross Deck Pendant is a critical part of the aircraft arresting gear cable system and monitoring its readiness, while in service, is very important. Solicitation states "Automated inspections of the CDP have proven to be problematic to implement due to the challenging operating environment of aircraft carrier flight decks (i.e., steel deck with a stationary steel wire rope). Current inspection procedures take approximately two minutes, requiring sailors to visually inspect, and slide a gloved hand looking for broken wires on the arresting cable. This method is subjective and relies on the expertise of the maintainer to ascertain the health of the cable."

Specifications Required: Automated inspection of a 1-7/16" diameter 6x30 right hand lang lay steel wire rope with a polyester core. "GO / NO-GO" inspection indicator device based on four broken wires in one cable lay.

Technology Developed: Cross Deck Pendant Health (CDPH) sensor, under development, is based on detecting ultrasonic guided wave echoes arising from any broken wires by quickly attaching the sensor and inspecting the CDP. The technique works on a metal rope, on a metal deck, with preservative, and in presence of EMI.

Warfighter Value: The CDPH sensor will automate the inspection process removing any operator dependent, subjective or guess work during otherwise manual inspection process with the goal to achieve very high probability of detection for broken wires. The CDP does not need to be taken out of service, and the grease on the CDP need not be cleaned for the inspection process, enabling ease of use.

WHEN

Contract Number: N68335-22-C-0058

Ending on: Feb 15, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
(Phase-1) Initial Concept and Ultrasonic Guided Wave (UGW) Phenomenology	N/A	Feasibility of using UGW	2	3rd QTR FY21
(Phase-1) Laboratory proof of concept-1	N/A	Proof of concept experiments on 5ft cable	3	1st QTR FY22
Laboratory proof of concept-2	Medium	Experiments on 30ft cable in the lab	4	1st QTR FY23
Prototype-1	Low	Demonstration on several CDP cables. Automated detection.	5	3rd QTR FY23
Prototype-2	Low	Improved compact, man portable sensor. Demonstration on full length cables.	6	3rd QTR FY24
Prototype-3	Low	Rugged for environment. Demonstrations	6	3rd QTR FY25

HOW

Projected Business Model: Dual Sense's core business is to develop innovative sensors and sensors systems for dual use applications. CDPH sensor is planned to be developed into a product by the end of the contract, in 2025, with the goal of delivering a test prototype unit to NAVAIR. On successful completion of Phase-II, Dual Sense plans to work on product qualification tests for environmental ruggedness with the help of funding from NAVAIR/Aircraft Launch and Recovery Equipment Program (PMA-251). Beyond this, initial acquisition and funding would occur through PMA-251 directly.

Company Objectives: Dual Sense has ties with partners for low volume manufacturing and seeks partners with high volume product manufacturing experience. If necessary, Dual Sense plans to transition the product to a partner who can take the technology to full production for a program of record. Dual Sense continues to look for new opportunities, additional funding, and partnerships, to decrease transition risk and improve chances for Navy adoption.

Potential Commercial Applications: Wire ropes are commonly used in several civilian and industrial applications including in the construction of bridges, elevators, cranes, overhead hoists, ski-lifts, ship moorings and off-shore oil rigs. Regular inspection and determination of health of these ropes is vital in many of these applications. The technology developed here can be readily adopted for applications other than CDP. Successful development of the product can have significant benefits for monitoring and inspection of wire-ropes.

Department of the Navy SBIR/STTR Transition Program

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Topic # N201-070
 Sensors and Autonomy for Unmanned Maritime Missions
 IMSAR LLC

WHO

SYSCOM: ONR

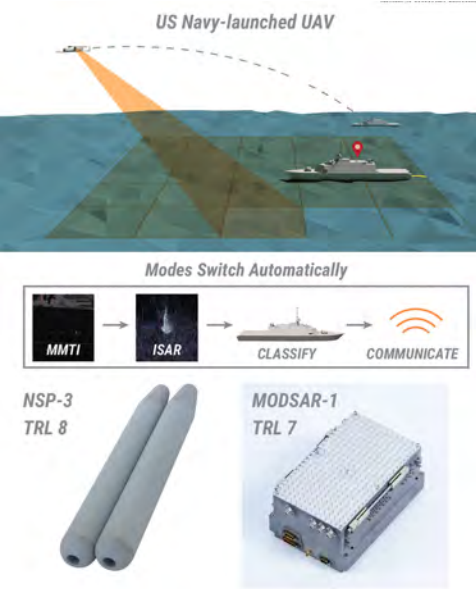
Sponsoring Program: NAVAIR

Transition Target: Navy Innovative Naval Prototype: Full Spectrum Undersea Warfare. The transition target platform is yet-to-be-determined by the Navy.

TPOC: Michael Vaccaro
michael.vaccaro@navy.mil

Other Transition Opportunities: IMSAR has a direct path to transition the capabilities of a low-SWaP autonomous maritime sensor:
 - Navy/USMC RQ-21A Blackjack UAS (AN/DPY-2(V) Radar)
 - OGA Counter-Narcotics Operations (Manned Platforms)
 - Army Futures Command Air Launched Effects (ALE) Platforms
 - International: Nordic Unmanned European Maritime Safety Agency (EMSA) Services Contract

Notes: IMSAR develops high-performance, low Size, Weight, and Power (SWaP) radar systems for both manned and unmanned airborne platforms. All of our radars have open standards in terms of inputs and outputs, which allows for interoperability with various platforms and mission systems. We are currently developing a maritime radar, leveraging components from our existing NSP-3 and MODSAR-1 systems. The maritime radar will be capable of integration on a Group 2 Navy-launched Unmanned Aerial Vehicle (UAV) and will perform autonomous all-weather anti-surface search.



IMSAR Copyright 2022

WHAT

Operational Need and Improvement: The US Navy is interested in the employment of UAV sensor payloads on Group 2 UAVs to provide capability of autonomous all-weather anti-surface search and is seeking a sensor and autonomy solution that will
 - Support timely and effective use of Group 2 UAVs to locate specific targets, such as surface ships
 - Conduct all-weather search, location, and identification missions
 - Transmit Intelligence, Surveillance, and Reconnaissance (ISR) data to a remote operator.

Specifications Required: Autonomous behaviors to support Anti-Surface Search from a Government-selected, medium- to large-diameter UAV. The sensor is to perform all-weather search, locate and identify a target, and transmit the information to a remote operator. IMSAR will track the following metrics during the final demonstration:
 - Sensor SWaP
 - Detection range
 - Probability of correct classification
 - Sensor coverage

Technology Developed: IMSAR is leveraging the components of our low-SWaP/Low-Cost (SWaP-C), high-performance NSP radar systems to develop a Synthetic Aperture Radar (SAR) and Maritime Moving Target Indicator (MMTI) sensor to provide anti-surface search capability from a low-observable Group 2 UAV. The SAR/MMTI radar sensor will be integrated with a machine learning classification processor and a mission autonomy engine to provide autonomous search, detection, identification, and communication capability.

Warfighter Value: The expeditionary autonomous surface search radar sensor will provide the warfighter with:
 - All-weather sensing capabilities
 - Autonomous search and detection of maritime targets
 - Maritime target identification and classification
 - Reporting of maritime target location
 - A low-SWaP sensor system that is low cost in terms of both procurement and maintenance
 - A solution that is scalable to Group 1-3 and manned aircraft

WHEN

Contract Number: N68335-22-C-0130

Ending on: Feb 14, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Collect Radar Data over Maritime Targets	Low	Radar data usable for classification	6	3rd QTR FY22
Improve ISAR Data Processing	Low	Increased radar data compatibility with classification algorithms	6	4th QTR FY22
Integrate ISAR with Target Classifier	Low	Radar data ingested and processed by classifier	6	1st QTR FY23
Improve PCC of Maritime Targets	Medium	Probability of Correct Classification (PCC)	6	1st QTR FY23
Automate Radar Mode Switching and Target Classification	Low	Switch modes and classify targets without operator in the loop	6	3rd QTR FY23
Integrate Radar System onto Group 2 UAV	Medium	Complete hardware and software integration	6	4th QTR FY23
Transfer Autonomy and Classification Algorithms to Onboard Processing	Low	Successfully run algorithms onboard the radar system	6	1st QTR FY24
Final Government-Witnessed Demonstration	Low	Successfully demonstrate capabilities on surrogate platform	7	2nd QTR FY24

HOW

Projected Business Model: At the conclusion of Phase II, IMSAR will provide a low-SWaP radar that can be integrated into small, long-endurance Group 2-3 airborne platforms, providing autonomous classification of targets.

Other services, including the US Army, Department of Air Force, US Marine Corps, as well as Department of Homeland Security and State border patrol units have expressed interest in an autonomous low-SWaP sensor and will benefit from the developed technology.

Company Objectives: IMSAR's initial objective is to successfully demonstrate autonomous maritime surface search radar capabilities from a surrogate platform and to transition the radar to a Government-selected Group 2 UAV. IMSAR will work with Arete' Associates to further refine advanced maritime classification algorithms, enabling the automatic identification of a target.

Potential Commercial Applications: In addition to transitioning the technology to the Navy fleet onto a Government-selected medium- to large-diameter UAS, IMSAR also plans to transition the technology to several other current and potential customers, including:
 - United States Marine Corp, for deployment with a Marine Expeditionary Unit on a Group 2-3 UAS
 - Army Futures Command, for integration onto an Air Launched Effects (ALE) platform
 - Other Government Agency (OGA), for deployment on manned aircraft for counter-narcotics operations
 - Department of Homeland Security, for maritime border patrol operations
 - European Maritime Safety Agency (EMSA), for performance of a services contract by Nordic Unmanned
Contact: Ryan Bartley, VP of Business Development
ryan.bartley@imsar.com (801) 798-8440 x168

Company	Topic	Project Title	SYSCOM
Karagozian and Case, Inc.	N201-053	Development of New Generation Earth Covered Magazine (ECM) Structure Design using Composite Materials	NAVSEA
Simmetrix, Inc.	N20A-T004	Hexahedral Dominant Auto-Mesh Generator	NAVAIR

Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2022-0363

Topic # N201-053

Development of New Generation Earth Covered Magazine (ECM) Structure Design using Composite Materials
Karagozian and Case, Inc.

WHO

SYSCOM: NAVSEA

Sponsoring Program: Naval Ordnance Safety and Security Activity (NOSSA)

Transition Target: Naval Facilities Engineering Systems Command (NAVFAC)

TPOC: (301) 744-6032

Other Transition Opportunities: U.S. Army Corps of Engineers (USACE), Air Force Civil Engineer Center (AFCEC), Department of Defense Explosives Safety Board (DDESB), U.S. Army Technical Center for Explosives Safety (USATCES), Air Force Safety Center (AFSEC), Defense Contractors (e.g., Lockheed Martin, Raytheon, Northrop Grumman, etc.), Magazine Manufacturers (e.g., Armag Corporation, CoverSix, Secureall, etc.)

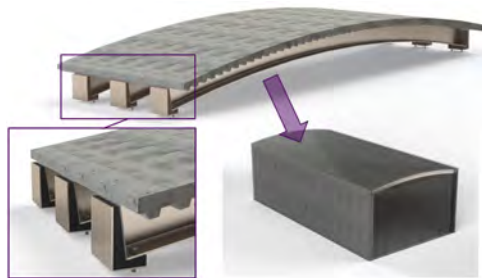


Image courtesy of Karagozian & Case, Inc.

Notes: The graphic above is a three dimensional rendering of a Lightweight Foam Composite (LFC) earth-covered magazine (ECM). The LFC ECM is comprised of modular, prefabricated roof panels that can be lifted by a standard forklift. Karagozian & Case, Inc. (K&C), the developer of the LFC ECM, is a leader in the design of innovative structural designs for the blast and impact load space. Past SBIR efforts have resulted in Phase III awards and the extensive use of the developed technology by the targeting, survivability, and explosives safety arms of the Department of Defense.

WHAT

Operational Need and Improvement: Earth covered-magazines (ECMs) used by the DOD and its contractors to store ammunition and explosives (AE) are scheduled to be replaced in the coming years. Current designs for new ECMs are almost exclusively constructed using reinforced concrete (RC). Although robust and ductile, RC is also heavy (i.e., difficult to lift and ship, and prone to form hazardous fragments in the event of an explosion), susceptible to corrosion and degradation, and reliant on sand, an increasingly scarce commodity.

Specifications Required: The Whole Building Design Guide (WBDG) provides a list of approved ECMs for new construction (<https://wbdg.org/building-types/ammunition-explosive-magazines/ecm-approved-new-construction>). Other ECMs must comply with the protective construction requirements defined in Unified Facilities Criteria (UFC) 3-340-02.

Technology Developed: The Lightweight Foam Composite (LFC) ECM incorporates lightweight glass fiber reinforced polymer (GFRP) composite and foam materials into modular prefabricated panels. The roof panels in an LFC ECM take the form of a slight arch to leverage the mass of the surrounding earth cover for blast resistance. The LFC ECM constituent components are specifically designed to minimize the number and complexity of connections requiring field installation.

Warfighter Value: The LFC ECM offers the potential for enhanced blast energy absorption, reduced secondary fragmentation hazard, expedited construction timeline, and reduced life-cycle cost benefits when compared with existing RC ECM designs. By utilizing lightweight materials, the fragment hazard posed by an LFC ECM is lower than that associated with a RC ECM. The use of modular pre-fabricated constituent components with a minimum amount of welding limits field erection times considerably. Finally, the GFRP and rigid polyurethane foam materials that constitute the bulk of the LFC ECM are stable under the harshest temperature and humidity conditions.

WHEN

Contract Number: N68335-22-C-0126

Ending on: Dec 08, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop Analytical Model for LFC ECM Concept	N/A	Compliance with allowable strength and deformation performance requirements mandated by explosives safety regulations	2	1st QTR FY21
Quasi-Static Testing of Half-Scale LFC ECM Roof Panels	Low	Verification that analytical model is capable of predicting LFC ECM roof panel response	4	1st QTR FY23
Dynamic Testing of Half-Scale LFC ECM Roof Panels	Medium	Verification that LFC ECM roof panel does not exhibit an unforeseen detrimental response under dynamic loading conditions	6	1st QTR FY24
100% Drawings, Specifications, and Calculations for an LFC ECM	Medium	DDESB approval (pending successful full-scale blast demonstration test)	6	1st QTR FY25
Blast Demonstration Testing on Full-Scale LFC ECM	Medium	Verification that LFC ECM response under design basis explosion protects A/E from sympathetic detonation	8	TBD

HOW

Projected Business Model: A primary objective of this work is to have the LFC ECM listed as an approved magazine by the DDESB. It is anticipated that this approval will be provided following full-scale blast demonstration testing. Having this approval will release K&C to promote the LFC ECM as a viable alternative to existing RC ECM designs to the DOD commands responsible for constructing AE facilities (i.e., NAVFAC, USACE, and AFCEC). Promotional efforts would highlight the results of the full-scale blast demonstration testing as well as the benefits inherent in the LFC ECM system (i.e., enhanced blast performance, reduced secondary fragmentation hazard, expedited construction timelines, and minimized life-cycle costs). The LFC ECM would be manufactured by K&C's manufacturing arm, Karagozian and Case Manufacturing (KCM). KCM plans to assemble all of the half-scale and full-scale LFC ECM panels created under the Phase II effort and beyond. KCM will work procure the constituent components of the LFC ECM from its list of suppliers (e.g., Fibergrate, General Plastics) accrued over the course of the SBIR effort.

Company Objectives: K&C's mission is to provide state-of-the-art scientific and engineering services to quantify and manage risks, design protective solutions, and develop technology for the construction, defense, manufacturing, space, and energy markets. We do this by quantifying system vulnerabilities to a variety of man-made and natural threats, developing novel and cost-effective engineering designs to mitigate them, formulating and employing state-of-the-art analytic methods and software, and conducting applied research and testing.

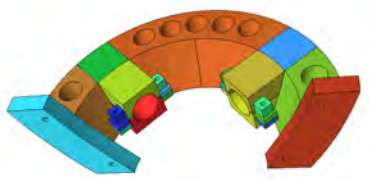
Potential Commercial Applications: Given Government's restrictions on mass storage of ammunition and explosives, it is expected that direct commercial applications for this technology are limited. With that said, the rate effects testing on GFRP and plastic foam materials conducted as part of this effort could be applied to the innovative solutions to protect people and structures in the event of earthquakes, hurricanes, and terrorism.

Contact: Mark Weaver, Principal
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WHO

SYSCOM: NAVAIR
Sponsoring Program: NAE Chief Technology Office
Transition Target: NAE Chief Technology Office
TPOC: (301) 342-8508
Other Transition Opportunities: Many commercial transition opportunities in a wide range of industries.

Notes: Computer Aided Engineering (CAE) is used in the design, development and maintenance of virtually all engineered components. Improvements to the efficiency and ease-of-use of CAE software can contribute greatly to improve the size, weight, power and cost of any component.



Decomposed geometry of structural bracket.

WHAT

Operational Need and Improvement: Need to reduce time for mesh generation in the Computer Aided Engineering (CAE) process. Needed for all platforms as a part of the design, development and maintenance process.
Specifications Required: Reduce time for generation of hexahedral dominant meshes on CAD geometry from weeks down to minutes.
Technology Developed: New robust procedures for creation of hex dominant meshes. New techniques to rapidly guide the user to what parts of the CAD model they can be applied to and to also do this automatically based on Machine Learning (ML) algorithms.
Warfighter Value: Better designs for the systems they rely on. More rapid and reliable repairs for equipment damaged in the field.

WHEN

Contract Number: N68335-22-C-0132 **Ending on:** Dec 04, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Geometric Reasoning-based Feature Detection	Medium	Successfully detects portions of geometry that are extendable and suggests options to modify geometry to make them so.	7	1st QTR FY23
Initial version of artificial neural network (ANN) implemented	Medium	Predicts reasonable sequence of geometry decompositions for simple models.	3	1st QTR FY23
Enhanced structured meshing functionality	Low	Creates quality hex dominant meshes in extrudable geometries	7	2nd QTR FY23
Additional hex meshing algorithms	Medium	Creates hex dominant meshes on more general geometries	7	1st QTR FY24
Final version of ANN implemented	Medium	Predicts reasonable sequence of geometry decompositions for more complex models.	4	4th QTR FY23

HOW

Projected Business Model: Licensing mesh generation software to both end users and CAE software companies for integration into their own products.
Company Objectives: Develop contacts with engineering groups in DoD facilities and Primes to work with them to demonstrate our capabilities to enable more efficient and sophisticated computational simulations.
Potential Commercial Applications: Many commercial applications in a wide variety of areas ranging from aerospace to electronics. The types of meshes generated here are desirable for simulations in structural mechanics, fluid dynamics, electromagnetics and other areas.

Human Systems (Navy FST Booth: 15 March)

Company	Topic	Project Title	SYSCOM
Soar Technology, Inc.	N172-117	Mishap Awareness Scenarios and Training for Operational Readiness Responses	NAVAIR
Systems Technology, Inc.	N192-071	Innovative Methods for Correlating Physiological Measures of Pilot Workload to Handling Qualities	NAVAIR

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA205

Transition Target: Navy Medicine Operational Training Command (NMOTC), Naval Survival Training Institute

TPOC: (407) 380-4773

Other Transition Opportunities: Naval Safety Centers; Army, Air Force, Marine Corps, and Coast Guard aviation training and safety; commercial civil training programs as well as commercial, cargo, and on-demand flight schools, both fixed- and rotary-wing

Notes: Wing Mishap Awareness Narratives (WingMAN) allows a user to create both real and notional scenarios in order to illustrate a variety of mishaps, including Spatial Disorientation. Narratives can be shared as videos, embedded instructional media, and immersive 360-degree videos.



Image generated from Soar Technology's WingMAN software.

WHAT

Operational Need and Improvement: Spatial Disorientation (SD) is cited as a contributing factor in five to ten percent of all aviation incidents; however, when SD does occur, over ninety percent of those incidents prove to be fatal (Heinle & Ercoline, 2002), and SD is believed to be under-classified. SD impacts both fixed- and rotor-wing aviators, and SD can and does impact pilots at every skill level, from low-flight-time general aviation pilots through to the most experienced high-performance military pilots.

To combat SD, aviation instruction provides exposure to SD materials at multiple points in the training process, with varying levels of fidelity. Enhancing classroom-based SD education with more engaging and dynamic formats, even without vestibular cues, is a potential solution to augment the SD training objective, particularly if scenarios can be created at the point of need without requiring a lengthy lead time.

Specifications Required: WingMAN allows the user to input specific scenario criteria to recreate actual mishap events as well as notional mishap events. The user can use the software to specify basic aircraft parameters (aircraft type, altitude, attitude, pitch/roll/yaw, etc.), geolocation, environment weather and atmospheric conditions (create clouds, whiteout/brownout, lighting/lux, haze, etc.), and mimic peripherals in-scenario such as a Heads-Up Display (HUD) and Night Vision Goggles (NVGs). Narrative scenarios can also contain audio and supporting materials, such as flight deck / Air Traffic Control (ATC) audio, instructional points, graphics, etc. Scenarios can be delivered via classroom briefing material, as embedded instruction, and as immersive 360-degree videos, as well as shared across authors as low-size xml files.

Technology Developed: Soar Technology, Inc. (SoarTech), along with partners Dr. Eric Muth of Clemson University and BGI, LLC, have designed and developed a playback-generation tool for Training Wing Mishap Awareness Narratives (WingMAN). WingMAN allows an instructor to quickly input available data from multiple sources to create a visual first-person playback of any mishap or incident for which data is available, including editing existing playbacks and creating their own notional mishaps. WingMAN also supports the automatic ingest of flight data such as black box data in order to automatically generate scenarios.

Warfighter Value: WingMAN provides a license-free, low-cost, authorable and low barrier to entry training system that puts the creation of compelling mishap narratives in the hands of the instructor (or Safety Center).

WHEN

Contract Number: N68335-19-C-0224

Ending on: Dec 13, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase I Outbrief	Low	Prototype - Building Mishap Narratives from Black Box Data	3	2nd QTR FY18
Phase I Option Outbrief	Low	Prototype - Building Custom Scenarios Manually	3	2nd QTR FY19
Phase II Downselect Outbrief	Medium	Prototype - Narrative Generation with Atmospheric, and Formation Flying	4	4th QTR FY19
Phase II Option I	Medium	Prototype - Narrative Export to 360 Video, Advanced Maneuvers, Rotary Wing Support, Embedded Instruction, Sandbox Environment (supports 12 classes of SD scenario), effectiveness evaluation	5	2nd QTR FY21
Phase II Option II	Medium	Prototype - Refined Usability, Additional Aircraft Model(s), Refined Maneuvers	6	1st QTR FY23

HOW

Projected Business Model: Wing Mishap Awareness Narratives (WingMAN) is license-free for government use, with SBIR data rights. SoarTech also envisages teaming with larger flight training organizations to bring WingMAN to a larger audience and grow the capability.

Company Objectives: Soar Technology, Inc. (SoarTech) strives to support the Warfighter by tackling the Department of Defense's most challenging problems. In this, SoarTech's objective is to identify potential Defense users for WingMAN so that they can evaluate the utility of the software. SoarTech would also like to partner with other organizations to continue to develop WingMAN as needed, and provide WingMAN to the civilian community.

Potential Commercial Applications: Civilian aviation including on-demand flight, hobbyist flight, and cargo flights are all highly susceptible to Spatial Disorientation (SD), however they do not have Federal Aviation Administration (FAA) requirements for SD training. Feedback from participants in efficacy studies have indicated a desire by these pilots to have exposure to this kind of training in order to broaden their knowledge; this could be commercially leveraged by any number of flight schools or organizations to disseminate safety critical information and continue to remind their pilots of the potential for SD and other mishaps to occur.

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Department of the Navy SBIR/STTR Transition Program

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NAVAIR SPR Number: 2022-846

Topic # N192-071
Innovative Methods for Correlating Physiological Measures of Pilot Workload to Handling Qualities
Systems Technology, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-275 V-22 Osprey

Transition Target: DoD flight test centers (e.g., NAS Patuxent River and Edwards AFB)

TPOC: (301) 757-5613

Other Transition Opportunities: PMA-261 H-53 Heavy Lift Helicopters, PMA-268 Unmanned Carrier Aviation, PEO F-35 Lightning II Program, military test pilot schools (e.g., UASF TPS and USNTPS), private test pilot schools, and military and commercial aircraft prime contractors including new eVTOL companies

Notes: The diagram shows how the Pilot Assessment Scaling System (PASS) embodies task performance measures that reflect aircraft characteristics, pilot-vehicle system measures that reflects physical workload, and physiological measures that reflect mental workload to characterize and ultimately predict test pilot assigned Levels of Handling Qualities and Ratings.



WHAT

Operational Need and Improvement: The U.S. Navy seeks to develop a test-enabling technology that allows quantitative measurement of pilot workload via physiological characteristics for the purposes of handling qualities evaluation and tuning and demonstrating the technology in both simulated and flight test environments. Self-assessed pilot workload is qualitative but highly dependent upon the pilot, task, conditions, etc. Correlation of physiological response to pilot workload with qualitative handling qualities remains elusive. PASS serves to fill this void by integrating disparate measures to predict handling qualities ratings.

Specifications Required: A sensor suite and software that can measure physiological response to pilot workload in a way that can be correlated to qualitative handling qualities. The sensor suite and associated software must:

- Allow near real-time measurement of pilot workload
- Be capable of being deployed in both pilot simulation and flight test settings without negatively impacting the pilot's ability to control the aircraft
- Not require significant additional support or planning on the part of the test team for incorporation into handling qualities tests
- Be designed to address issues such as electromagnetic noise, packaging constraints, ease of use, and compatibility with aircraft gear
- Have an option to be self-powered though it may use instrumentation power if available
- Be removeable such that there is no lasting modification to the test aircraft once testing is complete

Technology Developed: Systems Technology's PASS seamlessly integrates EEG/ECG and other physiological data gathered via commercially available hardware and software that provides validated measures of workload, distraction, and high/low engagement with task performance measures and pilot-vehicle system measures to predict Levels of Handling Qualities and Ratings.

Warfighter Value: A validated PASS will enhance the effectiveness and reduce costs associated with flight test verification of handling qualities for new and modified aircraft by limiting requirements for repeated evaluation sorties with multiple test pilots.

WHEN

Contract Number: N68335-21-C-0304

Ending on: Mar 17, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Feasibility study with in-house data	High	Initial development of PASS software and proof of concept of approach	4	2nd QTR FY21
Piloted simulation data gathering and algorithms/process development	Medium	Rich data set and successful assessment of the effectiveness of the approach	5	4th QTR FY22
Algorithm refinement and software development	Medium	Algorithm improvement and beta version of the software delivered to NAVAIR personnel	5	1st QTR FY25
Considerations for fixed-wing applications	Low	Process expansion to account for fixed-wing cockpit environment, test environment, MTEs, and software interface features	6	2nd QTR FY25
Flight test and software refinement	Low	Sensor integration and flight test to validate software and process	7	1st QTR FY26

HOW

Projected Business Model: STI expects to generate revenue through sales of the PASS software toolbox and by providing expert consulting services on the application of the handling qualities methods defined and validated in this proposed program to the aircraft marketplace including the exploding Urban Air Mobility market. It may be expected that the exposure to industry through stakeholder meetings will naturally generate interest in purchasing the software technology and will also increase the likelihood of gaining future consulting revenue for STI by providing expert consulting services in related fields.

Company Objectives: With a 65-year history, STI is an industry leader in flight dynamics, flight control systems, handling qualities, human pilot modeling, piloted simulation, and flight test. This includes handling qualities evaluations of transports, fighters, and rotorcraft. The company objectives for the Forum for SBIR Transition event are to enhance visibility for the emerging PASS toolbox and technology beyond NAVAIR to the DoD flight test centers and military test pilot schools, such that a Phase III commercialization pathway can be identified and pursued.

Potential Commercial Applications: The initial applications for PASS are the US military aviation markets that develop and evaluate piloted aircraft. This market includes DoD flight test centers (e.g., NAS Patuxent River and Edwards AFB), military test pilot schools (e.g., UASF TPS and USNTPS), and prime and Tier 2 aircraft manufacturers. Secondary markets will be identified from these same entities in US allied countries. PASS will also find utility in the commercial marketplace where handling qualities assessments are an important part of the civilian certification process. Here, an emphasis will be placed on commercial transports, business jets, and the rapidly emerging urban air mobility market.

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Biomedical (ASBREM) (Navy FST Booth: 16 March)

Company	Topic	Project Title	SYSCOM
TDA Research, Inc.	N142-087	Expeditionary Portable Oxygen Generation System	MARCOR
TDA Research, Inc.	NX19-005	Cool Suits	ONR
Paxauris LLC	N201-005	Wireless In-Ear Sensors for Warfighter Monitoring	NAVAIR

WHO

SYSCOM: MCSC
Sponsoring Program: Logistics Combat Element Systems (LCES), Supply & Maintenance Systems (SMS)

Transition Target: Forward Resuscitative Surgical System

TPOC: sbir.admin@usmc.mil

Other Transition Opportunities: U.S. Army Medical Units
 The expeditionary portable oxygen generation system can be used in medical facilities of various sizes, emergency management agencies, disaster aid and humanitarian aid agencies, and municipal fire and rescue squads.

Notes: LPM: Liters Per Minute
 PSIG: Pounds Per Square Inch Gauge
 FRSS: Forward Resuscitative Surgical System
 EPOGS: Expeditionary Portable Oxygen Generating System
 SWaP: Size, Weight and Power



Photo provided courtesy USMC, VIRIN: 160801-MQM580-126

WHAT

Operational Need and Improvement: The objective is to develop a portable oxygen generation system that consumes less electrical power, has a compact cube/size, and reduced weight. This objective is in support of the expeditionary medical requirements of the Marine Corps. This will allow simplification of equipment deployment and use, while improving system reliability.

- Specifications Required:**
- Smaller, lighter, man-portable (2-4 personnel)
 - More energy efficient (requiring less electrical and mechanical power)
 - Can produce medical-grade oxygen (United States Pharmacopeia (USP) 93% oxygen)
 - Flow rate of 10-15 Liters Per Minute, produce 2200 PSIG
 - Total weight does not exceed 350 pounds, volume does not exceed 20 cubic feet
 - Maximum power should not exceed 1200 Watts
 - Ability to be transported in all tactical/medical vehicles including helicopters
 - Operate in all climates with no degradation at temperatures between -40°F and 125°F
 - Resistant to the effects of salt/water spray, and extreme sand and dust conditions

Technology Developed: The size and power reduction of the EPOGS are made possible through the incorporation of a more selective oxygen/nitrogen separation sorbent and by the implementation of innovative adsorption/regeneration cycling schemes.

- Warfighter Value:** SWaP improved thereby reducing logistical burden
- Reduced power requirements by 33% (from 1800 Watts to 1200 Watts)
 - Decreased size by 40% (from 34.5 cubic feet to 20 cubic feet)
 - Decreased weight by 61% (Goal from 644 lbs. to 250 lbs.)
- No longer requires 208-240VAC power source to produce O2 in the field

WHEN

Contract Number: M67854-21-C-6507

Ending on: Oct 20, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Evaluation of new O2 compressors	Low	Meet power and flow requirements	5	1st QTR FY22
Integration of new O2 compressors	Low	Integration complete, meet MIL-STD-810H testing	6	1st QTR FY22
Evaluation of integrated EPOGS	Low	Meet flow/purity/power requirements and successful testing against MIL-STD-810H	6	4th QTR FY22
Develop manufacturing plan	Low	Plan development	6	1st QTR FY23
Production-type prototypes fabricated & delivered	Low	Meet flow/purity/power requirements and successful testing against MIL-STD-810H	7	1st QTR FY23
Attain FDA approval	Low	FDA approval attained	8	1st QTR FY24
Begin manufacturing & sales	Low	All fabrication hurdles solved	8	2nd QTR FY24

HOW

Projected Business Model: TDA will contract a third party medical device manufacturer to produce the EPOGS which will be sold directly to the USMC.

Company Objectives: TDA Research, Inc. is a technology developer that uses various pathways to commercialization. Depending on the technology and manufacturing process, we will manufacture products in-house and sell directly to customers or we will license the technology to a third party.

Potential Commercial Applications: The potential for commercial application and dual use is high. The proposed system would be easily portable and well suited in areas where limited power is available. The expeditionary portable oxygen generation system can be used in medical facilities of various sizes, emergency management agencies, disaster aid and humanitarian aid agencies, and municipal fire and rescue squads.

WHO

SYSCOM: ONR

Sponsoring Program:

Transition Target: Cooling Garments for Navy Shipyard Welders

TPOC: Lore-Anne Ponirakis
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Other Transition Opportunities: Cooling garments for other Navy personnel who wear personal protective equipment (PPE) including shipyard painters

Notes: This shows the reduction in core body temperature of a sweating thermal manikin at the National Personal Protective Technology Laboratory (NPPTL) while wearing a full welding ensemble and engaging in simulated strenuous physical activity (metabolic rate = 5 METS). Without TDA's cooling garment (the red "control line"), the user would have suffered severe heat exhaustion within 1 hour (core body temperature exceeding 104 F). With TDA's cooling garment, core body temperature was significantly reduced and the wearer never reached a core body temperature of 104 F, even after 90 minutes in a hot and humid environment, while wearing heavy personal protective equipment, and exercising strenuously.

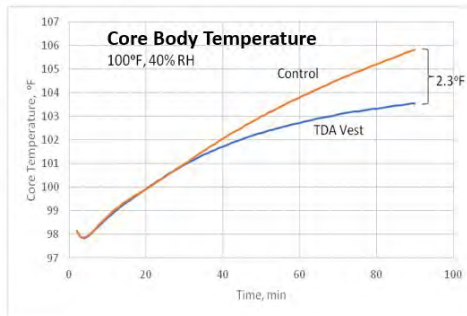


Image courtesy of TDA Research Inc (2020)

WHAT

Operational Need and Improvement: Shipyard welders frequently work in hot and humid environments. Worse still the welding torches produce additional heat, and the metal plates need to be preheated to over 150 degrees Fahrenheit, radiating heat onto the workers. These welders must wear personal protective equipment (PPE) which severely restricts sweat evaporation, one of the body's most effective methods for rejecting heat. These shipyard welders must take frequent breaks to avoid heat exhaustion. TDA is developing a cooling shirt that is worn beneath the PPE and drastically improves sweat evaporation efficiency to keep these workers cool.

Specifications Required: Any cooling garment that will be adopted in an industrial setting such as a US naval shipyard needs to be comfortable, lightweight, long lasting, and durable. It cannot overcool the wearer (leading to discomfort) and it must not be tethered or restrict the wearer's motion in any way. It needs to be effective over a wide range of relevant temperatures and relative humidities that welders might work in, and it needs to be fire resistant or protected by the welder's PPE.

Technology Developed: TDA has developed a battery powered cooling garment that pulls ambient air into the PPE and blows it through small channels built into the garment. The small channels drastically improve seat evaporation efficiency, even on hot and humid days. Unlike shirts that rely on phase change materials (PCMs), TDA's cooling garment is lightweight, long lasting, has a high cooling capacity, and the battery can be quickly swapped out so that the shirt can continue working indefinitely.

Warfighter Value: There are a huge range of scenarios where warfighters are subjected to extremely hot conditions and they are at risk of heat related illness. This possibility is particularly acute when they are wearing personal protective equipment (PPE) which prevents sweat evaporation, one of the body's most effective methods for heat rejection. PPE might include explosive ordnance disposal (EOD) suits, welding gear, shipyard painting disposal coveralls, body armor, etc. TDA's cooling garment is a lightweight, comfortable, durable, and mobile garment can protect these warfighters, even while they are wearing their PPE, and only requires a battery, which are readily available on the front lines.

WHEN

Contract Number: N00014-19-9-0015

Ending on: Oct 18, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
In depth calculations	Low	finalized calculations	3	4th QTR FY19
Swatch testing on sweating hot plate	Medium	Successfully demonstrate cooling improvement from small air channels	4	1st QTR FY20
Cooling garment testing on sweating manikin	Medium	Demonstrate effective cooling for full garment using a sweating thermal manikin	6	2nd QTR FY20
Produce 12 cooling garments for the Navy	Medium	Produce garments and get positive feedback from Navy	6	1st QTR FY23

HOW

Projected Business Model: TDA's cooling garment keeps the wearer cool and comfortable, even in hot and humid environments and when worn under heavy personal protective equipment (PPE). TDA is starting with the Navy Shipyard welder market, but we will also branch out to the civilian welding market and other civilian workers wearing PPE in hot environments. TDA is working with a local, Berry Compliant garment manufacturer to scale up production for small scale demonstrations and to supply our cooling garments to DoD customers.

Company Objectives: TDA's cooling garment fills a vital need for the armed forces, protecting personnel in hot environments (especially those wearing personal protective equipment). TDA's cooling garment is light weight, durable, comfortable, and uses very little consumables. We are currently developing it for naval shipyard welders, but based on talks with other DoD personnel, there appears to be considerable interest in this technology to protect all sorts of workers including shipyard painters, EOD personnel, and anyone else at risk of heat related injury. TDA's goal is to expand our garment manufacturing capabilities so that we can supply cooling garments to the DoD as demand increases. We are interested in licensing our garments to PPE suppliers to expand our potential markets. Expanding into the civilian market will help TDA supply cooling garments to the DoD at lower cost per unit due to economies of scale.

Potential Commercial Applications: TDA's cooling garment has enormous potential commercial applications. The first is expanding into the civilian market for workers in hot environments, especially those wearing PPE. Civilian shipyard welders are just as susceptible to heat related injury as naval welders. In fact, welders in general and other outdoor workers, such as construction workers, will also significantly benefit from TDA's cooling garments. TDA is also interested in breaking into the "athleisure", cooling people who are biking, climbing, running, or hiking in hot or humid climates. TDA's cooling garment will make these activities more enjoyable by increasing wearer comfort and safety.

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WHO

SYSCOM: NAVAIR

Sponsoring Program: NAVAIR Chief Technology Office

Transition Target: Aircrew Systems Program Office (PMA-202)

TPOC: (240) 434-1244

Other Transition Opportunities: Program Executive Office, Aviation Common Systems and Commercial Services (PEO(CS))
Program Executive Office - F-35 Lightning II
Program Executive Office, Tactical Aircraft Programs (PEO(T))

Notes: Paxauris Health Monitoring Hearables may be worn with standard foam or flanged eartips or with Paxauris's patent-pending fluidic eartip, as shown in the image. Rather than attaching an eartip to the hard shell's acoustic port, our comfortable eartip envelops the shell in silicone. Our fluidic earplug or eartip is easy to insert to the correct depth, comes in sizes for all ear canals, and is reusable and replaceable. The soft silicone stem easily slides past the second bend. The user then presses the bulb on the outside of the earpiece to seat the eartip's shoulder against the ear canal opening and inflate the tip, creating a deep, stable seal at a comfortable pressure. Pulling the tab attached to the bulb deflates the seal allowing the user to easily withdraw the earplug.



Image courtesy of Paxauris 2022, photo credit - Anthony Dietz

WHAT

Operational Need and Improvement: Warfighters operate and train in dangerous environments with extreme levels of noise and taxing climates, while under stress and during strenuous activity. Biometric monitoring of potentially harmful exposures will enable the military to take actions to protect warfighters' health and ensure their readiness by evaluating protective equipment and structuring training and operations to avoid damaging overexposures. The ear canal offers an accessible window into the body. It is the path for noise exposure, it is highly vascularized aiding blood oxygenation and heart rate measurements, and the deep ear canal closely tracks the body's core temperature. For these reasons, earplugs are an attractive platform for health monitoring sensors.

Specifications Required: Instrumented earplugs should: be easily fitted and comfortable for extended wear; be inserted deeply and repeatably for effective protection and accurate dosimetry and core temperature measurements; fit securely; and be wireless so as not to compromise existing hearing protection.

Technology Developed: Paxauris's Health Monitoring Hearables (HMH) are instrumented earpieces that sense binaural continuous and impulse noise exposure and other biometrics deep in the ear canal, where measurements are most accurate. The hearables may be worn with foam or flanged eartips, or preferably, for better compliance, they may be worn with Paxauris's innovative fluidic eartips, which are easy to fit and remove and remain comfortable for extended wear. The hearables provide level-dependent hear through for communications and situational awareness and use a robust, covert wireless modality to transmit biometric data to a helmet- or body-worn monitor.

Warfighter Value: For the US military, who lose valuable personnel to noise-induced hearing loss and spend a billion dollars a year on disability payments, our hearables will improve hearing protection in the field by providing in-ear noise dose data with hearing protection in an as-worn condition. Additional biometric data such as core temperature will improve personnel safety by monitoring physiological risk and enable the in-field evaluation of other personal protective equipment (PPE). When worn with Paxauris's innovative fluidic eartips, our hearables will increase hearing protection compliance because unlike foam eartips, our eartips are easy to use, comfortable, and cannot be inserted incorrectly.

WHEN

Contract Number: N68335-21-C-0710

Ending on: Feb 09, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Near-Form-Factor Hearable	Low	Components fabricated and functional	4	3rd QTR FY22
Gen I System Build	Medium	Hearable fabrication and assembly complete	4	1st QTR FY23
Gen I System Qualification	Medium	Laboratory qualification testing complete	5	2nd QTR FY23
If Option Awarded - Validation Test	Medium	Human subject testing and field demonstration complete	6	TBD

HOW

Projected Business Model: Paxauris was founded to bring innovative hearing protection products to market. We perform mechanical and acoustic design, prototype assembly, and qualification testing in house. We have contracted a Silicon Valley acoustic product development firm to develop the hearables' rigid-flex sensor and processing circuits. We are outsourcing fabrication of all components to specialist manufacturing houses and will likely also outsource assembly, kitting, packaging, and distribution until we achieve sufficient scale to bring these operations in house. Our initial business model is to sell our hearables to the Navy through IDIQ acquisitions, initially for research and development and hearing conservation studies. In the long term, we plan to transition to the GSA with a goal of providing every warfighter with Health Monitoring Hearables.

Company Objectives: Paxauris is Latin for peaceful ear. Our goal is to end the worldwide noise-induced hearing loss epidemic with a new type of earplug: one that is comfortable and easy to use and reuse. What we sell, is quiet, whenever, wherever you want.

Potential Commercial Applications: Hearing loss is the number-one workplace injury in the US, where some 22 million workers operate in hazardous noise environments. The result is \$242 million in annual workers' compensation claims and an incalculable loss of quality of life for those injured. Our Health Monitoring Hearables will improve hearing conservation compliance in high-noise occupations such as manufacturing, mining, and transport. Our hearables will also offer valuable hearing protection and biometric monitoring capabilities to first responders, musicians, hunters, and all consumers wishing for a bit of quiet.

Contact: Anthony Dietz, President
tony.dietz@paxauris.com (602) 396-8566

Company	Topic	Project Title	SYSCOM
QuesTek Innovations LLC	N16A-T007	Optimized High Performance Stainless Steel Powder for Selective Laser Melting Additive Manufacturing (AM)	NAVAIR
Texas Research Institute Austin, Inc.	N111-042	Improved Accelerated Life Testing	NAVSEA
Applied Optimization, Inc.	N162-083	Rapid, Low Cost, High-quality Component Qualification Using Multi-scale, Multi-physics Analytical Toolset for the Optimization of Metal Additive Manufacturing Process Parameters	NAVAIR
TDA Research, Inc.	N181-071	Eliminating Adverse Impact of Copper Contamination in Jet Propellant 5 (JP-5) Fuel	NAVSEA
Microsphere Material Solutions, LLC	N181-058	Next Generation Buoyancy Material	NAVSEA
SenSigma LLC	N18A-T005	Innovative Processing Techniques for Additive Manufacture of 7000 Series Aluminum Alloy Components	NAVAIR
Composite Energy Technologies Inc	N204-A03	Deployable Systems Manufacturability	ONR
TDA Research, Inc.	N192-057	Advanced Alternative Gun Lubricant	NAVAIR
American Technical Coatings, Inc	N191-026	Antennas and Antenna Radomes with Extreme Thermal Shock Resistance for Missile Applications	SSP
MRL Materials Resources LLC	N192-072	Nondestructive Characterization of Microstructure and Grain Orientation on Large, Complex Parts	NAVAIR

Department of the Navy SBIR/STTR Transition Program

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NAVAIR SPR Number: 2022-832

Topic # N16A-T007
Optimized High Performance Stainless Steel Powder for Selective Laser Melting Additive Manufacturing (AM)
QuesTek Innovations LLC

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA 261 (H-53)

Transition Target: Primary supporting PMA: PMA261

TPOC: (301) 342-9359

Other Transition Opportunities: Others interested PMA: PMA242

Notes: Integrated computational materials engineering, 17-4 print and go AM alloy, meets wrought properties for strength, fatigue and corrosion without post build heat treatment.

Acronyms: Additive Manufacturing (AM)
Integrated Computational Materials Engineering (ICME)
Selective laser melting (SLM)



QuesTek image

WHAT

Operational Need and Improvement: Lack of comprehensive powder feedstock and AM process specification to support production of AM 17-4 parts for Naval applications. Additionally, current 17-4 AM material demonstrates large variation in as-built properties and requires expensive post-processing to achieve wrought structure and property targets.

Specifications Required: Improve Navy capabilities for use of additive manufacturing (AM) technology of high performance stainless steel (i.e. 17-4) with improved processability, part quality, and performance equivalent or better than conventional (i.e. wrought) 17-4PH parts.

Technology Developed: QuesTek Innovations LLC has applied an Integrated Computational Materials Engineering (ICME) modeling approach combined with experimental validation and robust process development to design a stainless steel powder feedstock optimized for selective laser melting (SLM) powder bed AM processing with reduced production cost, enhanced as-built properties, and improved reliability for naval aviation components.

Warfighter Value: Incorporation of processing at forward locations to better facilitate bringing warfighters and their equipment home.

WHEN

Contract Number: N68335-18-C-0020

Ending on: Aug 11, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Program end	Low	completed	7	4th QTR FY22
corrosion validation	Medium	completed	6	3rd QTR FY22
fatigue validation	Medium	completed	5	3rd QTR FY22
mechanical properties	Medium	completed	5	4th QTR FY20
AM printability	Low	completed	6	4th QTR FY19
alloy chemistry	Low	completed	6	3rd QTR FY21

HOW

Projected Business Model: License of the alloy powder to Am powder producers and OEM equipment mfgs.

Company Objectives: To establish this alloy as the go to alloy for industry and the DoD when considering a high strength corrosion resistant AM alloy application

Potential Commercial Applications: Replace the existing 17-4 AM powder with a Print and Go alloy that meets or exceeds wrought 17-4 alloy performance.

Contact: Abhinav Saboo, Sr. Engineer
asaboo@questek.com (847) 328-5800

WHO

SYSCOM: NAVSEA

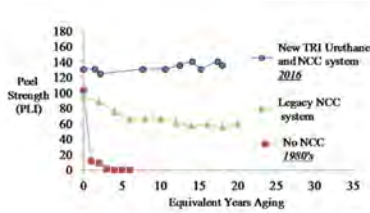
Sponsoring Program: PMS450E

Transition Target: Virginia Class Submarines, Columbia Class Submarines, and other Subsea applications.

TPOC: (401) 832-5111

Other Transition Opportunities: TRI has begun to commercialize PU-189 as both a tie-coat layer for subsea parts, and a two-part quart kit. Samples have been sent to prospective customers, with good feedback. There has been a number of commercial kits sold and numerous parts have been tie-coated to date.

Notes:



Internal

WHAT

Operational Need and Improvement: Currently approved materials have been around for a number of years some dating back to the early 1970's. The two currently approved Navy materials have either performance related issues or environmental issues that currently leave the Navy very few quality options for Polyurethane overmold materials.

Specifications Required: Both currently approved Navy systems are approved to both NAVSEA PRO20 and MIL-STD 24041, the PRO20 specification is specific to wet area connectors within the submarine fleet and the focus of this project. MIL-STD 24041 is very broad and covers overmolded products across numerous platforms, both wet and dry.

Technology Developed: TRI Austin devoted significant effort to scaling the production process for PU-189 and produced a total of 50 gallons of Part A and part B components. Connectors were also potted using the material and additional testing was performed on the mechanical and acoustic properties of the PU-189. TRI Austin has also continued to prepare product documentation, including revising the branding of the safety data sheets, and developing labels for the boxes used to ship the scaled-up batches of PU-189.

Warfighter Value: The resulting material TRI PU 189 is intended to enhance the Navy's capabilities by allowing subsea connectors to operate in a cathodic environment for up to 20 years, while simultaneously improving the health and environmental characteristics of the potting materials.

WHEN

Contract Number: N68335-18-C-0231

Ending on: Aug 06, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Scale Production	Low	50 gallon production batch	6	2nd QTR FY22
Qualify to NAVSEA PRO20	Low	Approval	7	1st QTR FY23
Qualify to MIL-STD 24041	High	Approval	8	2nd QTR FY23

HOW

Projected Business Model: TRI will both manufacture and manage sales for the new TRI PU 189, sales have already begun in both the military and commercial markets.

Company Objectives: We are interested in additional applications for the product outside of the Navy both within the DoD and commercial markets. We are also looking for sales and distribution networks for the TRI PU 189 both domestically and globally.

Potential Commercial Applications: TRI is in the process of testing to satisfy the requirements for PU-189 use as an encapsulant material for Navy subsea connectors in cathodic environments. However, this is not the only foreseeable application as several others are anticipated. These applications include sonar transducer and electrical hull penetrator cable connectors, elastomeric boots, and other outboard equipment as identified by NAVSEA. PU-189 could also be used to coat components in transducers and hydrophones that are exposed to water to reduce water permeation, and for potting image intensifier tubes.

Department of the Navy SBIR/STTR Transition Program

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NAVAIR #2022-789

Topic # N162-083

Rapid, Low Cost, High-quality Component Qualification Using Multi-scale, Multi-physics Analytical Toolset for the Optimization of Metal Additive Manufacturing Process Parameters Applied Optimization, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: NAVAIR

Transition Target: V-22, H-1, H-53

TPOC: (301) 342-9359

Other Transition Opportunities: PMA 275, PMA 276, PMA 261 for the Additive Manufacturing (AM) of structural parts subject to dynamic loading

Notes: Additive Manufacturing Parameter Predictor (AMP2) is the multi-scale, multi-physics analytical toolset, developed by Applied Optimization, Inc. (AO). AMP2 predicts AM processing parameters to optimize the quality of AM material, with the purpose to attain lower cost and time to perform Integrated Computational Materials Engineering (ICME) for the qualification of AM structural parts. AMP2 brings together the analytical methods developed by AO with support from SBIR programs by NAVAIR, ONR, NASA and Air Force. Using the results generated by AMP2, AO has received five awards in open competitions sponsored by DARPA, NIST, Air Force, and America Makes. AO has used AMP2 to support our various commercial projects for the last ten years.



3D printed metal part aboard a US Navy Carrier - Photo courtesy of the U.S. Navy. www.navy.mil

WHAT

Operational Need and Improvement: The Navy operational need is to enable rapid qualification of AM structural parts. The multi-scale, multi-physics analytical toolset is needed to reduce the cost and time needed for ICME to optimize the AM process, and produce high-quality, as-built materials for complex geometry structural parts. Widen the supplier base to AM structural parts.

Specifications Required: Demonstrate ICME models to support rapid qualification of AM structural parts produced using legacy alloys (e.g., Ti-6Al-4V) and new alloys (e.g., Scalmalloy).

Technology Developed: AO has demonstrated analytical toolset, simplifying and streamlining the procedures, to reduce the cost and time needed for ICME to produce a higher-quality Ti-6Al-4V AM structural part with no surface-connected defect indications and significantly reduced defects in the interior of the part. AMP2 demonstrated procedures to analyze the experimental data and determine the process corrections to be applied to enhance part quality. The current work is to apply the analytical toolset to produce a Scalmalloy AM structural part with higher mean and lower variance for its fatigue limit.

Warfighter Value: Ability to attain consistent, high fatigue properties for AM structural parts for the sustainment of existing Navy systems, and for the demonstration of new-generation of AM structural, complex parts of legacy and novel alloys.

WHEN

Contract Number: N68335-19-C-0299

Ending on: Nov 28, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate higher quality AM structural part, produced using alloy Ti-6Al-4V	N/A	Completed	6	1st QTR FY21
Demonstrate higher quality AM structural part, produced using Scalmalloy	Low	In progress	5	1st QTR FY23
Demonstrate higher mean and lower variance for fatigue limit of the AM structural part produced using Scalmalloy	Medium	In progress	4	3rd QTR FY23

HOW

Projected Business Model: There are four elements to the business model: (1) Use Simulation to Optimize AM process and Estimate Fatigue Limit, (2) Demonstrate consistent and higher fatigue strength, prepare fatigue testing plan, (3) Demonstrate ability to reduce the testing required for AM part qualification, (4) Demonstrate ability to enlarge the supplier base to produce higher-quality AM parts

Company Objectives: Reduce the time and cost for the qualification of AM structural parts by a third using ICME to attain higher mean and lower variance for fatigue limit of AM structural parts.

Potential Commercial Applications: ICME to produce smaller, intricate structural parts, with a requirement for durability while subject to dynamic loading at elevated temperatures (e.g., parts in industrial machinery subject to vibratory loads)

Contact: Anil Chaudhary, Scientist
anil@appliedo.com (937) 431-5100

WHO

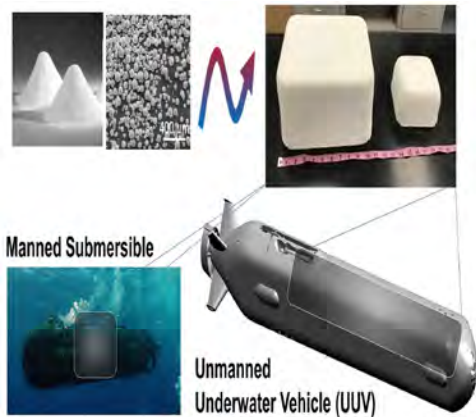
SYSCOM: NAVSEA

Sponsoring Program: PEO USC, PMS340

Transition Target: Manned or unmanned submersibles

Other Transition Opportunities: Any manned or unmanned vehicle where buoyancy materials are used and can benefit from significant improvement in strength/weight and lower density to increase payload without compromising speed or range to maintain US military superiority.

Notes: Manned or unmanned submersible use buoyancy materials to maintain buoyancy during operations. MMS buoyancy materials have up to 10-20x the strength of current materials at lower densities and are a drop-in replacement for currently used buoyancy materials.



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<https://www.navy.mil/Resources/Photo-Gallery/igphoto/2002339927/>;
<https://media.defense.gov/2021/Aug/06/2002824245/1920/1080/0/210722-N-AA999-001.JPG>

WHAT

Operational Need and Improvement: The utility of a submersible is enhanced by maximizing speed, range, and endurance/payload. Increasing a submersible’s payload at its maximum operating depth, without compromising speed or range is of high interest to the U.S. Navy. Increased payload improves operational flexibility and mission capacity as additional warfighters and/or equipment can be delivered to a target area. Currently used buoyancy materials are costly and lack the technical characteristics (e.g., high strength, resilience, stiffness, and low density) to increase payload at maximum depth and speed.

Specifications Required: Low density - < 0.05g/cm³; High strength - uniaxial compression failure stress > 2MPa (in the lowest strength loading direction); High stiffness - Young’s modulus > 100MPa, and Bulk modulus > 30MPa; High resilience - creep rate < 3x10⁻¹¹ s⁻¹ for uniaxial loads of 1MPa (in the lowest stiffness loading direction) applied in the temperature range 4°C to 30°C.

Technology Developed: Microsphere Material Solutions has developed new high-strength hollow microspheres and foams for buoyancy materials that are up to 10-20x stronger than current materials with tunable material properties to meet the high strength, resilience, stiffness, and low density requirements to maintain US Naval superiority. MMS has matured fabrication of the high-strength hollow spheres and large buoyancy foams along additive manufacturing evaluations.

Warfighter Value: Increased payload without compromising speed or range improves operational flexibility and mission capacity as additional warfighters and/or equipment can be delivered to a target area. A buoyancy material that can be additively manufactured will increase operational capacity, decrease manufacturing costs and material waste, while streamlining maintenance actions during the operations and sustainment phase.

WHEN

Contract Number: N68335-20-C-0554

Ending on: Sep 28, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Analytical Modeling / Computational FEM of Buoyancy Foam unit cells complete	Low	Candidate feedstock materials selected, buoyancy material performance assessed; feedstock materials selected, buoyancy material performance assessed	2	2nd QTR FY19
Initial Additive Manufacturing (AM) demo approach defined	Low	Initial approach developed. AM approach developed.	2	2nd QTR FY19
Multi-material fabrication system and AM system prototype design complete	Low	Multiple iterations of multi-material fabrication system and AM system prototype designs with vendor feedback	3	1st QTR FY20
Multi-material fabrication system assembled and tested, targeting 3-5x stronger materials. Large foam fabrication started.	Medium	Multi-material fabrication system assembled and tested with multiple feedstock materials. Initial buoyancy foams fabricated.	4	1st QTR FY22
Up to 10-20x stronger hollow sphere fabrication approach developed/matured and prototypes fabricated. Large buoyancy foam samples developed. AM approach refined.	Medium	Initial high strength hollow spheres fabricated and tested. Large foam fabrication process matured and buoyancy foam samples fabricated. Engaged with multiple Additive Manufacturing companies on AM approach.	5	4th QTR FY22

HOW

Projected Business Model: Microsphere Material Solutions (MMS), a materials manufacturing and R&D company, is a small batch manufacturer of multi-material hollow spheres, single-material foams, and composite materials with interim capacity to support low-rate initial production (LRIP) for applications such as buoyancy. MMS is also engaging with potential contract manufacturers as manufacturing partners to scale manufacturing capacity to support full-rate production (FRP). MMS is actively engaging with and seeking partnerships with vehicle prime contractors and vehicle system integrators of manned and unmanned submersibles.

Company Objectives: MMS is seeking partnerships with vehicle prime contractors and vehicle system integrators of manned and unmanned submersibles to integrate our buoyancy materials.

Potential Commercial Applications: There are multiple commercial applications for both our high strength hollow spheres and foam materials. For our high strength foam materials, we have engaged with submersible vehicle manufacturers developing Autonomous Underwater Vehicles (AUVs) and Unmanned Underwater Vehicles (UUVs) looking for enhanced buoyancy to increase payload capacity while maintaining and improving range and endurance. We have also engaged with safety manufacturers seeking enhanced strength and energy absorption such as helmet manufacturers, vehicle and body armor manufacturers, and vehicle manufacturers looking for enhanced occupant protection.

For our high strength hollow spheres, we have engaged with syntactic foam manufacturers as little additional engineering is required to integrate into their product lines. We have also engaged with Automotive and Aircraft Plastic Compounders looking to reduce weight and improve fuel efficiency and range, and Oil and Gas Servicers looking for lightweight fillers for use in concreting wells and for use reducing the density of cement slurries.

Contact: Matthew DeMay, Chief Executive Officer
matthew@microsphereresolutions.com (240) 428-4667

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA201 Precision Strike Weapons

Transition Target: 3D Printing Support Facility

TPOC: (301) 342-9359

Other Transition Opportunities: PHASE III DUAL USE APPLICATIONS: Fully develop an AM process to fabricate naval aircraft components that can be integrated into the fleet. Conduct final component level testing to demonstrate the mechanical and microstructural properties of the AM components meet or exceed traditionally manufactured components. The process developed through this effort will improve the quality of additively manufactured 7000 series aluminum parts. The process will be directly applicable to a wide range of commercial applications, due to the high amount of usage of 7000 series aluminum in the commercial/private aerospace industry. The proposed process will allow industry to apply the benefits of AM technology to many critical aircraft components.



<https://www.navy.mil/Resources/Photo-Gallery/>

Notes:

WHAT

Operational Need and Improvement: Naval aircraft components are commonly produced with 7000 series aluminum alloys due to its weight, strength, and fatigue properties. Current AM methods fall short of successfully producing 7000 series aluminum alloys due to the reflective nature of the material. In the laser AM process of 7000 series Al alloys, defects such as a) porosity, b) cracking, c) inclusions and d) loss of alloying elements, are anticipated due to high cooling rate, large solidification temperature range, high coefficient of thermal expansion, large solidification shrinkage, and selective vaporization of alloying elements.

Specifications Required: Fully develop the novel AM process to fabricate a series of coupons and naval aircraft components. Perform coupon level testing, in accordance with ASTM E8, to fully characterize the resulting mechanical properties and non-destructive inspection (NDI) to verify microstructural properties, such as grain size and orientation, achieved through the AM process. Demonstrate the capability of printing geometrically accurate aircraft components with complex geometry, per pre-existing tolerances, and verified by a laser scan.

- Technology Developed:**
- (1) Improvement of SOMS accuracy and calibration methodology
 - (2) Design and optimization of In-process monitoring/control system
 - (3) Fabrication of a series of coupons and property evaluation
 - (4) Demonstration of the capability of 3D printed generic component
 - (5) current and expected final TRL: TRL 6 to TRL 8

Throughout the previous quarters, improvement of SOMS technology has been carried out and further works focus on design/optimizing, and implementation of in-process control system for upcoming quarters.

Warfighter Value: Not specified

WHEN

Contract Number: N68335-20-C-0662

Ending on: Aug 01, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Review Meeting	Medium	PASS/FAIL	6	4th QTR FY21
Review Meeting	Medium	PASS/FAIL	7	4th QTR FY22
Review Meeting	Medium	PASS/FAIL	8	4th QTR FY23

HOW

Projected Business Model: We think the potential customers come from:

- (a) Metal manufacturing product providers, such as robot and system provider ABB Inc., Laser and system provider Trumpf, Heavy machinery and system provider Caterpillar, arc welding system provider Lincoln Electric,
- (b) System integrators for a solution to end users, such Toolmen,
- (c) End users such as General Electric.

Company Objectives: SenSigma focuses on Sensing and Quality control by developing reliable, in-situ optical monitoring and feedback system to maintain high quality, defect free weld by analyzing lights associated with the process. Our product is the Smart Optical Monitoring System (SOMS).

Potential Commercial Applications: Our focus will be on target marketing. Our best customers could be from Arc welding industry that has already an established worldwide market exceeding \$23 Billion. That will be our initial Focus. A target market list of companies is being created.

WHO

SYSCOM: ONR

Sponsoring Program: The Navy and Marine Corps seek to develop and demonstrate advanced deployable system manufacturing capabilities, including sensors and effectors, and the related technology innovation necessary to maintain the competitive industrial advantage.

Transition Target: Unmanned Vehicle (UxV) manufacturability: define and develop modular UxV system fabrication and assembly technologies and conduct related materials research for UAVs, USVs or UUVs. This includes use of low cost additive manufacturing technologies and abilities to fabricate close to the point-of-need. This includes manufacturing technologies that support full ocean depth capable UUVs, expendable and reusable UxVs, as well as short and medium endurance UAVs and payloads. These systems must be rapidly reconfigurable to enable conversion of payloads to meet time critical mission needs.

TPOC: Maria Medeiros
maria.g.medeiros.civ@us.navy.mil

Other Transition Opportunities: Unmanned/Autonomous underwater and surface vessels made from advanced materials. Rapid prototype and deployment of sensors/effectors housed in carbon fiber pressure vessels. 3D printed foundations and bracketry allows for rapid reconfiguration of payload in an existing UXV. Composite midbody sections for UUVs that have no detectable magnetic properties.

Notes: The 19.5" long X 7.25" OD pressure vessel was 3D printed and has been tested to 900M. The two bonded endcaps provide anti-tamper protection and are designed as an expendable option. Removable end caps are also available for payload recovery and changeout for a rapidly reconfigurable option.

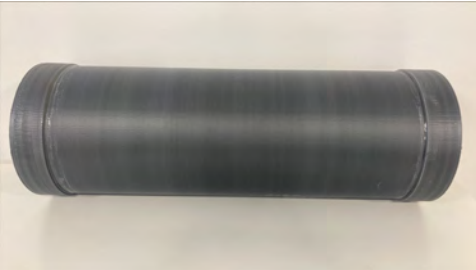


Image courtesy of Composite Energy Technologies

WHAT

Operational Need and Improvement: Sustainment of industrial capacity for technology innovation necessary for next generation deployable Naval systems is at increasing risk due to global pandemic impacts. The Navy and Marine Corps intend to aggressively continue their modernization strategy for the evolving security environment by increasing the rate of technology innovation and adoption. As the Navy moves forward with this modernization strategy, deployable and autonomous systems that extend the reach of our capabilities and offer man-on-the-loop alternatives are required for the maritime domain. It is essential to develop options for full spectrum competition and deployable systems are an element of this strategy. Strategic advantage comes from institutional capacity to develop and field new capabilities faster than our adversaries. The Navy and Marine Corps seek to develop and demonstrate advanced deployable system manufacturing capabilities, including sensors and effectors, and the related technology innovation necessary to maintain the competitive industrial advantage.

Specifications Required: The primary specifications that will drive the development of solutions will be the interior and exterior dimensions of the vehicle/vessel/structure, the operational depth for the package, the duration of the mission, the end-state of the mission e.g. leave-behind or recover and any special requirements such as anti-tamper or timed/triggered implosion.

Technology Developed: Designed pressure vessels rated to 600 meters with a factor of safety of 1.5 that are printed using a commercial 3D printer that is portable and readily serviced worldwide. Through a multitude of testing and analysis, we have determined what material works in the marine environment, and how best to control the printer to achieve repeatable results. We have also determined what material does not meet the specifications the manufacturers promise in their marketing information, greatly reducing the risk of fielding units that do not perform as designed.

Warfighter Value: To dramatically reduce the timeline from concept to deployment of advance structures that house or deliver critical capability to the warfighter in the undersea and littoral domains. Manufacturing at the point of need will allow for rapid delivery of sensors and effectors that can be placed in the maritime environment through multiple means. Reach back for reconfiguration of existing designs allows for new items to be printed with delivery of computer files, rather than physical objects. This approach will support a rapid, iterative process that will result in critical equipment being fielded in hours/days as opposed to months/years.

WHEN

Contract Number: N68335-21-C-0346 **Ending on:** Apr 27, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Complete Phase I of SBIR	Low	All Phase I deliverables met	3	1st QTR FY21
Phase II SBIR Start	Low	Acceptance of Phase 1 Deliverables	3	3rd QTR FY21
Environmental Testing of Materials	Medium	Material suited for ocean environment	4	1st QTR FY22
Tested 3D printed PV to 600m working depth	Medium	PV tested beyond 900m	5	2nd QTR FY22
Secured agreement to develop advanced AM techniques using advanced composites with ORNL	Medium	CRADA in process with Oak Ridge National Lab executed	5	4th QTR FY22
Cyclic testing of PV with removable endcaps to 600m working depth	High	Pass cyclic testing of a 3D printed PV with removable endcaps at 600m	6	1st QTR FY23

HOW

Projected Business Model: CET will produce a library of printable structures that are designed with exterior dimensions consistent with common methods of deploying pressure vessels, small UxVs and other devices. With exterior dimensions fixed by deployment method, the interior diameter required by the payload and material chosen will determine the depth rating of each device. The library will include various endcap designs including bonded endcaps with or without penetrations and removable endcaps with various standard fittings that can be configured based on mission need. Each design will be printed by CET to confirm the print files and material selected will result in the required characteristics. Once validated, the print files, along with a step-by-step procedure will be made available to the various commands needing this capability. Reach back to CET will be provided so any questions that arise from the field are addressed as soon as practical.

CET will also provide custom engineering and design services that will allow for rapid development and deployment of vessels/structures meeting unique or mission-specific design requirements. The process of defining new requirements, validating the new design and providing print files for use by forward deployed units will take a matter of days or weeks in comparison to the typical design/delivery cycle.

Company Objectives: To improve the speed at which structures and vessels made with advanced composites can be designed, produced and deployed at or near the point of need for the military, or the growing commercial market.

Potential Commercial Applications: Housings for cable or pipeline monitoring systems. Cost effective/light weight hulls for autonomous surface and underwater survey vehicles.
Contact: Patrick Enright, Vice President of Business Development and Strategy
pat.enright@usacet.com (401) 332-8042

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA242

Transition Target: Aircraft Gun Systems; M197 rotary cannon

Other Transition Opportunities: Greaseless guns, hard chrome replacement, pumping equipment, metals or alloy components, turbines, bearings.

Notes: Medium caliber aircraft guns like the M197 rotary cannon experience multiple points of friction and therefore need frequent preventative maintenance to address wear and corrosion (see accompanying picture).



U.S. Navy photo,
<https://www.defense.gov/Multimedia/Photos/igphoto/2001321866/>

WHAT

Operational Need and Improvement: Grease currently provides most of the wear and corrosion protection to the moving parts of gun systems. However, high wear parts must be regularly cleaned or replaced because the grease collects sand, dust, and carbon, increasing wear on the part. For example, the rotor tracks and breech bolt assembly on the M197 rotary cannon are cleaned, inspected, and repaired/replaced at regular maintenance intervals. An alternative to grease-based lubricants is needed to reduce these maintenance burdens and provide cost savings.

Specifications Required: The coating must be 5 um (0.2 mil) thick, prevent wear beyond current maintenance intervals at operational temperatures (200 F), and subsequently prevent corrosion for 168 hours of salt spray exposure per ASTM B117.

Technology Developed: Solid lubricant coatings are applied once and extend the lifetime of moving parts. TDA's two-part coating system combines active corrosion protection (demonstrated in ASTM B117 salt fog testing) with long-term durability and lubricity. Additionally, the coating is easy to apply by soaking and hand spraying, and does not require sophisticated and expensive equipment such as vapor deposition chambers.

Warfighter Value: This technology will reduce the maintenance burden, increase part lifetime. Specifically, it will reduce parts that must be frequently inspected and increase the time to inspection threshold of O-Level (post-fire) and I-Level maintenance. It will also result in cost savings by increasing the replacement interval of high-wear parts, reduce man-hours requirement for M197 Maintenance, and reduce cannon failures that occur before depot overhaul.

WHEN

Contract Number: N68335-21-C-0353

Ending on: Aug 09, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Coating prototype locked down	Low	Passes equivalent of 30,000 rounds on wear simulator	4	1st QTR FY23
Physical properties comparison	N/A	Comparative performance of experimental coating to current coating system, WRT corrosion (ASTM B117), adhesion (ASTM C1624), hardness, friction/wear	3	2nd QTR FY20
Dry cycle endurance test #1	Medium	Endures 15k simulated rounds and 168 h salt fog	5	4th QTR FY23
Dry cycle endurance test #2	Medium	Endures 30k simulated rounds and 168 h salt fog	6	4th QTR FY24

HOW

Projected Business Model: This coating would be commercialized via licensing of the coating formulation and application technologies to the prime contractors. Our solution is composed of a combination of proprietary and commercial, off-the-shelf products, and TDA has developed unique expertise in the formulation and application of the coating.

Company Objectives: We are interested in identifying a prime contractor that would apply this coating to medium-caliber guns during manufacture. This could either be a prime contractor specifically for the M197 gun, or another gun manufacturer that is interested in our coating solution.

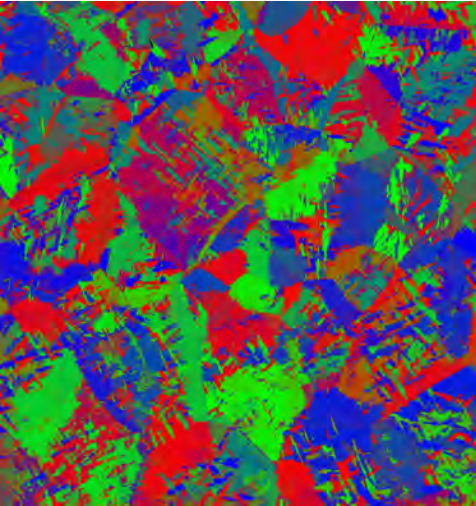
Potential Commercial Applications: TDA's coating could be used to reduce wear and corrosion for a variety of applications. In particular, our solution is well suited to any environment in which a part would encounter abrasive/erosive conditions. Due to our unique application method, our coating is ideal for complicated parts and geometries. The coating could be applied to any metal surface for which a self-lubricating functionality is desired.

WHO

SYSCOM: NAVAIR
Sponsoring Program: JSF (Joint Strike Fighter)
Transition Target: Component inspection for quantification of abnormal beta grain growth and microtextured regions
TPOC: (301) 342-8017

Other Transition Opportunities: Multiple engine platforms (quantification of microtextured regions), Air platform structural components (quantification of abnormal grain growth), Materials RDT&E (processing science, novel alloys, additive manufacturing)

Notes: The image at the right shows the output of TiPolar for a beta-annealed Ti6Al4V plate coupon sample. This data was collected using MRL's production model TiPolarS hardware at a speed more than 100 times faster than EBSD. This dataset, which is approximately 12mm x 12mm, took less than 20 minutes to complete while maintaining an available resolution of 0.6um. More than 20 such scans can be completed by a single instrument in a single shift with minimal operator training requirements and a total acquisition cost less than 20% of SEM/EBSD.



MRL Materials Resources LLC, 2021

WHAT

Operational Need and Improvement: This new technology would replace an existing capability to spot check microstructure in small areas using acid etching and visual examination. It would provide a much faster, more accurate, and safer inspection to assess the material before investing the full cost of production.

Specifications Required: There is an increasing realization of the need to address macro-scale orientation phenomena (e.g. microtexture and abnormal beta grain growth) for critical components beyond the existing standards. Full assessment of the occurrence of such phenomena throughout the processing history of components is hampered by the lack of quantitative techniques that can cost-effectively match the scale of the features of interest (10s-100s of mm). Likewise, quality control standards will require measurement techniques that can keep up with production (i.e. minutes per scan, not hours). TiPolar is poised to provide a solution to both.

Technology Developed: MRL has fully developed hardware and software for automated data acquisition and data analysis of very large orientation imaging datasets. This first release, TiPolarS, is capable of scanning coupon samples up to 2" x 3" in a research or production laboratory environment. Upcoming models will be capable of looking at larger planar surfaces, cylindrical fatigue specimens, and ultimately arbitrary contoured surfaces.

Warfighter Value: The safe life of titanium engine and structural components is increasingly being linked to macro-scale orientation phenomena. Implementation of TiPolar for advanced research and quality control will help to increase readiness and decrease sustainment costs by maximizing time between inspection/overhaul increments.

WHEN

Contract Number: N68335-21-C-0681 **Ending on:** Jul 31, 2024

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Transition of TiPolarS system to an external laboratory	N/A	Completion of manufacturing, transportation, installation, and training at customer location	6	4th QTR FY22
Demonstration of orientation imaging of the outside surface of cylindrical fatigue sample (TiPolarMT)	Low	Validated data using large-grained sample with known orientations	4	1st QTR FY23
Demonstration of orientation imaging over contoured surface (TiPolarM)	Medium	Quantification of microtexture over surface of engine disk component	5	4th QTR FY23
Orientation mapping of complex structural component	Medium	Quantification of abnormal grains in complex structural component	7	4th QTR FY24

HOW

Projected Business Model: MRL has produced multiple units for evaluation of coupon samples in the laboratory environment (TiPolarS) and provides characterization services for a diverse range of government, academic, and industrial customers. MRL intends to expand the model lineup through this program to include equipment capable of larger components, contoured surfaces, and portable scanning at the component level, as well as providing toll service at each level.

Company Objectives: The goal of TiPolar is to become the de-facto standard for quantification of titanium microstructure and microtexture, providing quantitative metrics for quality control from ingot-breakdown to complex multi-pass forgings to additively manufactured (AM) components. This fits the broader vision of MRL to provide microstructure informed solutions to materials and manufacturing challenges including forging, joining, and additive manufacturing.

Potential Commercial Applications: Potential applications involve quality control of titanium material and components in the commercial aerospace, medical, and oil and gas sectors and well as research and development.

Company	Topic	Project Title	SYSCOM
Arorae Corporation	N193-A03-5	NAVY TECHNOLOGY ACCELERATION - 5. Shared, sensed, distributed undersea and atmospheric simulation environment for use in maritime LVC training at sea - Advanced Technologies (including AR/VR) for Manpower, Personnel, Training, and Education	ONR
ARiA	N191-016	Clustering and Association for Active Sonar Tracking and Classification	NAVSEA
TIPD, L.L.C.	N19A-T008	Optical Emulator of Complex Electromagnetic Maneuverability (EM) Systems with Nanophotonics	NAVSEA
G2 Ops, Inc.	N191-030	Risk Reduction and Resiliency Modeling Software for Industrial Control Systems	NAVSEA
A-P-T Research, Inc.	N201-045	Development of a Debris Prediction Method for Hardened Structures	NAVSEA

Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.
ONR Approval #DCN# 43-10617-22

Topic # N193-A03-5

NAVY TECHNOLOGY ACCELERATION - 5. Shared, sensed, distributed undersea and atmospheric simulation environment for use in maritime LVC training at sea - Advanced Technologies (including AR/VR) for Manpower, Personnel, Training, and Education Arorae Corporation

WHO

SYSCOM: ONR

Sponsoring Program: Office of Naval Research (ONR)

Transition Target: United States Navy (USN) Live and Virtual Constructive (VC) Training Enterprise

TPOC: Natalie Steinhauser
natalie.b.steinhauser.civ@us.navy.mil

Other Transition Opportunities: PMA-205, PMA-265, Foreign Military Sales (FMS)

Notes: With the goal of enabling a common underwater LVC training environment, the Training Sonobuoy (TSB) introduces a platform agnostics means to inject simulated underwater targets to Anti-Submarine Warfare (ASW) capability ships and aircrafts, without changes to the platforms themselves. This has the advantage of enhanced LVC training opportunities at a potential overall cost savings to the Navy when including the cost of deploying live ASW targets

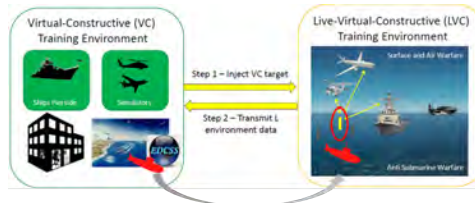


Image courtesy of Arorae Corporation 2022

WHAT

Operational Need and Improvement: Navy Anti-Submarine Warfare (ASW) capable aircraft cannot receive and process a simulated scenario for combined Live Virtual Constructive (LVC) training; all ASW training requires live targets. The Training Sonobuoy (TSB) was developed to enable constructive underwater target signatures to be included in the actual live sensed data of sonobuoys, via the modification of the Navy standard sonobuoys (to receive and process the LVC scenario) vice modification of the aircraft themselves. This provides a platform agnostics approach to enable LVC ASW training, removing the need and costs involved in deploying and managing live targets. It also enables the opportunity for rapid training enhancements that LVC can bring.

Specifications Required: Navy Interoperability Standard (NIS), Navy Continuous Training Environment (NCTE), AN/SSQ-53 Directional Frequency Analysis and Recording (DIFAR)

Technology Developed: TSB -- a modified AN/SSQ-53 DIFAR buoy -- capable of receiving an LVC scenario over a satellite network and injecting simulated underwater acoustic signatures into the actual live, sensed underwater environment. This device was integrated and tested within the current Navy LVC enterprise to ensure interoperability with the NCTE and will allow combined ASW training during traditionally live training events such as Composite Training Unit Exercise (COMPTUEX).

Warfighter Value: The utilization of TSB will afford the warfighter more opportunities for LVC training, removing the need and potential high costs of deploying and managing live underwater targets. Where the TSB has currently focused on the DIFAR, the concept and design approach can be extended to other types of sonobuoys and weapon deployment for a complete LVC ASW kill chain.

WHEN

Contract Number: N68335-20-F-0550

Ending on: May 01, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase I completion	High	Concept developed	2	3rd QTR FY20
First hardware-software integration test at company facility	High	Begin bench testing hardware and software	4	3rd QTR FY21
In-water test in Honolulu	Medium	Constructive signal input into live environment	5	2nd QTR FY22
Final test and demonstration in San Diego	Medium	Validate and demonstrate integrated solution to fleet LVC stakeholders	6	3rd QTR FY22

HOW

Projected Business Model: The business model can take multiple dimensions:

1. Obtain a follow-on Phase II, II.5 or III to further develop the ASW LVC capability, including procuring TSB devices and integration engineering services.
2. License the technology to Original Equipment Manufacturer (OEM) manufacturers for sale through existing sonobuoy procurement contracts

Company Objectives: Develop solutions and demonstrate company capability and expertise in military LVC training.

Potential Commercial Applications: Foreign Military Sales (FMS), Underwater surveillance for both military and non-military use

Contact: Michael Weber, CEO
mweber@aro-corp.com (813) 261-5155

WHO

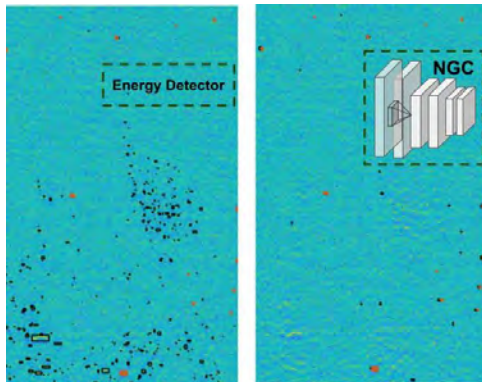
SYSCOM: NAVSEA

Sponsoring Program: NAVSEA PEO IWS 5.0

Transition Target: AN/SQQ89A(V)15 Integrated Undersea Warfare (USW) Combat System Pulsed Active Sonar (PAS) functional segment (PASFS) Echo Tracker Classifier (ETC)

TPOC: (401) 832-2752

Other Transition Opportunities: Sonar signal processing for: Arleigh Burke (DDG) class destroyers, and Ticonderoga (CG) class cruisers, the AN/SQQ-89A(V)15; Oliver Hazard Perry class frigate (FFG) fitted with the AN/SQQ-89F; Littoral Combat Ship (LCS ASW Mission Package (MP); Coherent Multistatic Acoustic Processor (CMAP) on the P-8A Poseidon; and the Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Integrated Undersea Surveillance Systems (IUSS) Integrated Common Processor (ICP).



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Notes: ARiA combines real-world experience with knowledge from subject-matter experts in acoustic signal processing and artificial intelligence to develop the Next General Clusterer (NGC), a robust, intelligent, low-latency system for clutter mitigation. The left subplot depicts clusters of contacts formed by energy detectors (the current state of practice), while the right shows clusters generated by NGC. Red boxes indicate true targets, and black boxes indicate clutter detections. NGC is able to consider contextual and structural information in acoustic data over an extended spatial region to achieve better clutter discrimination. Designed with flexibility in mind, NGC is highly modular, and capable of platform integration along many paths, including in parallel with existing components. This flexibility significantly mitigates integration risk by minimizing upstream or downstream changes in the current signal processing chain.

WHAT

Operational Need and Improvement: A crucial role of the active-sonar component of Anti-Submarine Warfare (ASW) is detecting and classifying submarines amid environmental clutter. Current methods apply a sequence of algorithms designed to detect, localize, and classify subsurface vessels; one of which consists of forming and classifying clusters of acoustic energy. An opportunity exists for development of detection and classification technologies, which leverage contextual and spatial information, to mitigate challenging environmental clutter. ARiA, leveraging extensive knowledge of deep learning, has developed a system which is able to reduce instances of single targets being split into multiple clusters and/or tracks; clutter tracks incorrectly classified as targets; and true tracks that are identified late or missed altogether due to corruption by clutter.

Specifications Required: The goal for improvements to the submarine detection segment of the active sonar signal and information processing chain is to reduce the false track rate by 50% while maintaining probability of true alert, thereby reducing operator workload and staffing requirements. Additionally, predictions made by this network cannot introduce any significant latency when compared to the baseline system. These improvements must be confirmed on real data, and require testing on a diverse collection of datasets, each containing active-sonar signals acquired in the field by the AN/SQQ-89.

Technology Developed: NGC is a convolutional-neural-network (CNN) based detector/classifier, designed using state-of-the-art computer-vision techniques. The network is best described in terms of two key components: the backbone feature extractor and the detection/classification head, each custom designed for subsurface object detection. The feature extractor, using multiple interconnected layers, is configured specifically to learn contextual features for target classification, as well as spatially compact features for target detection. The detector/classifier head divides the input image into a grid, and synthesizes these features to predict object location and shape, the probability that the object is a target, and, optionally, the type of target. Advantages of this network design include robustness to input size, built-in scalability, and low prediction time. One challenge for deep-learning development is overfitting to training data, which is why ARiA has also developed a robust test suite that examines detection and classification performance with partitioned data over many metrics, minimizing the possibility of delivering a model that performs well in the lab, but poorly in the field.

Warfighter Value: The primary goal of NGC is to remove spurious information presented to the active sonar operator, thus reducing overall operator workload. NGC reduces the number of clutter clusters consumed by downstream tracking algorithms, and thus the operator will have fewer irrelevant tracks to interrogate. NGC is also designed to operate within the current detection/classification regime, mitigating the need for additional operator training.

WHEN

Contract Number: N68335-21-C-0095

Ending on: Apr 13, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop Initial NGC Prototype	Low	Demonstrated initial detection and classification performance, clutter reduction	4	2nd QTR FY21
Mature prototype and demonstrate on operational data (Step 1 Evaluation)	Low	Demonstrated performance on operational data relative to existing SQQ-89 baseline.	5	1st QTR FY23
Submit algorithms for independent Step 2 evaluation	Low	Confirmed detection and classification performance on operational data	6	3rd QTR FY23

HOW

Projected Business Model: ARiA plans to retain the SBIR data rights for the developed signal processing algorithms, with Navy and large primes to integrate algorithms into tactical systems for fleet use. ARiA's algorithms are targets for initial transition into the AN/SQQ-89A(V)15 USW Combat System in ACB25 with transition to related tactical systems to follow.

Company Objectives: ARiA's objective is to further investigate and develop Navy and DoD applications of deep-learning algorithms for clutter mitigation. ARiA intends to integrate these algorithms into the AN/SQQ-89A(V)15 USW Combat System in ACB25 as the initial application of this technology to tactical sonar systems. ARiA is looking for programs and prime partners working with other tactical sensor systems that can benefit from improved detection and clutter mitigation.

Potential Commercial Applications: The algorithms that ARiA has developed are applicable to a wide range of sensing modalities including radar and sonar. Algorithms may be adapted most directly to commercial mid-frequency sonars, e.g., single-beam and multiple-beam (swath) bathymetry, acoustic seafloor characterization, and commercial fish-finding sonars.

Contact: Jonathan Botts ,
jonathan.botts@ariacoustics.com (540) 423-0323

WHO

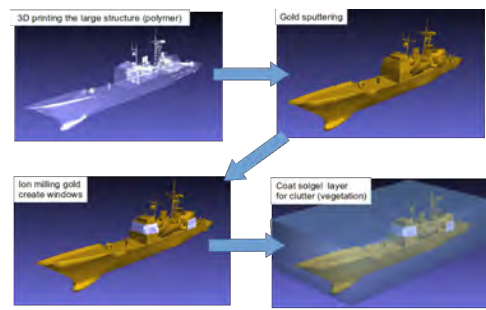
SYSCOM: NAVSEA

Sponsoring Program: NAVSEA

Transition Target: PMA-299 MH-60R/S, PMA-290, PMA-264 ASW, NAVSEA

TPOC: (401) 832-6887

Other Transition Opportunities: TIPD has previously developed relationships with defense system manufacturers including Lockheed Martin, Raytheon Missile Systems, Northrup Grumman, and Harris Corporation. We discussed the nanoRCS program with TIPD's defense contractor contact to understand the commercial opportunity for the nanoRCS system. TIPD used these contacts to identify key entry points for the nanoRCS system and the necessary testing required for expediting the system's transition into Navy programs and other applications. TIPD has already been in contact with Lockheed-Martin to gauge their potential interest. TIPD worked with Raytheon to further develop the nanophotonic RCS test system and that project could offer TIPD an alternate commercialization pathway.



A multi-material model is created in a multistep process. The 3D model is printed followed by metal sputtering, ion milling to remove the metal for aperture, and solgel coating to create clutter.

Notes:

WHAT

Operational Need and Improvement: The electromagnetic (EM) signatures of a platform, such as a ship or a submarine, is of particular importance for the Navy since it allows the detection and identification of the vessel. The vessel's passive EM signature, known as its radar cross section (RCS), is proportional to the reflectivity of the structure and varies with relative spatial orientation of the vessel and the radar source. Minimizing this reflection improves the stealth properties of the vessel making it more difficult for our adversaries to detect the ship using a radar system. The observed RCS can also be used to identify a target by comparing it with a database of RCS profiles.

Specifications Required: The goal of the NanoRCS effort is to design and develop a tabletop system capable of demonstrating performance comparable to the Navy current RF based simulation tools. Achieving this goal requires research in three major areas: optical system design and measurement algorithms, material development to mimic the permittivity and permeability characteristics at optical frequencies, and active component fabrication techniques to simulate radar sources.

Technology Developed: Developed the world-first benchtop NIR RCS/ISAR emulator measurement system with cross-range and time-of-flight (TOF) measurement capabilities.

Warfighter Value: TIPD's RCS system will provide the warfighter with a cheap, small, and readily available optical system with perform the same capability as the Navy's current large and expensive RF based RCS/ISAR simulators. Additionally, the development and availability of this system will increase technology and tactical readiness for the Warfighter.

WHEN

Contract Number: N68335-21-C-0114

Ending on: Dec 10, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Measure performance of test structures emulating seawater and glass	Low	Successfully Completed	4	TBD
Initial measurements of active nanoantennae	Medium	On-going	5	TBD
Provide test data and deliver the TOF RCS system to the Navy	Medium	Being Planned	5	TBD

HOW

Projected Business Model: Develop a production level lower SAWP-C RCS system. Deliver a few units for testing in several Fleet Support Team facilities. License intellectual property and designs to Prime Contractors.

Company Objectives: Field our novel efficient, low-cost, and small sized RCS/ISAR emulator measurement system into all the Naval depots, Fleet Readiness Centers, Fleet Support Team facilities, and the I-level squadron. Our main goal is to provide the Warfighter with all the tools necessary to help speed up their mission success as well as teaming up with multi-disciplinary experts, subcontract, and license our intellectual property major DoD prime contractors.

Potential Commercial Applications: As part of its marketing efforts, TIPD is working on identifying the requirements of other DoD branches for the RCS system. One potential application for the USAF and USA is to use our system for acquisition of RCS/ISAR signature of aircraft and tank. TIPD has scheduled a conference call with Lockheed Martin to identify potential next steps to discuss how the RCS system could be used in their development efforts. TIPD will also reach out to its contacts at Northrup Grumman and to the US Army's Redstone Arsenal to identify potential entry points. TIPD will also survey the industrial, scientific and medical markets to determine their requirements. While TIPD's design approach is capable of handling a wide wavelengths and powers, the RCS system may need to be customized for each of the markets. TIPD will begin to develop minimum viable products (MVP) for the other markets. TIPD will use the MVPs to gather feedback on the performance, pricing, packaging and market opportunity for the RCS system.

WHO

SYSCOM: NAVSEA

Sponsoring Program: NAVSEA

Transition Target: NAVSEA

Other Transition Opportunities: Industrial Control Systems (ICS)/Supervisory Control and Data Acquisition (SCADA) systems across National Security Systems (NSS), Critical Infrastructure such as manufacturing, water, electric, power industries, international maritime industry, and Hull, Mechanical, and Electrical (HM&E) integrated systems

Notes: IRIS utilized the Open Web Application Security Project (OWASP) Software Assurance Maturity Model (SAMM) framework for software security during development

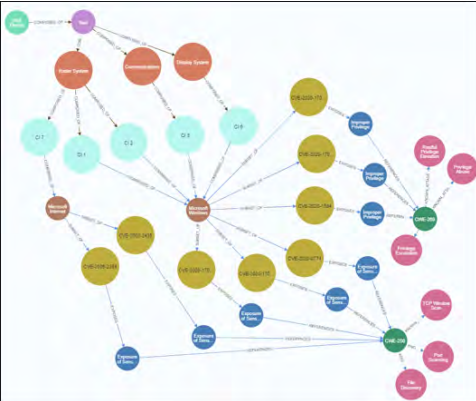


Image Courtesy of G2 Ops, 2022-08-12

WHAT

Operational Need and Improvement: The landscape between operational technology (OT) infrastructures and traditional informational technology (IT) presents challenges to cyber vulnerability analysis, especially for government-off-the-shelf (GOTS) and proprietary devices. Atypical IT environments and the complexity of control system design can limit an organization's ability to measure cyber resilience across integrated systems. Understanding how vulnerabilities, if exploited, can impact the resiliency of business operations, results in better system architectures and designs thereby reducing cyber-related acquisition and maintenance costs.

Specifications Required: A unified cybersecurity system model creation tool incorporating the key system attributes required for cybersecurity resiliency analysis of any NCS; portable to any NCS (tuned to correlate cyber posture to mission performance). Attributes include the physical architecture, data flows, and performance requirements, and deployed software components and operating environments. Other attributes include operational threads executed by the system and system component dependencies, system component partitioning, system cybersecurity protections, vulnerabilities, threats, and penetration pathways. The tool will allow graph-based exploration of resiliency scenarios in near real-time.

Technology Developed: Our graph analytics tool, Industrial Control System (ICS) Resiliency Information System (IRIS), evaluates the resiliency of an ICS in conjunction with processes and operations in a centralized repository. Using Model-Based Systems Engineering (MBSE), IRIS captures the sophisticated characteristics of complex systems and their external interfaces in a digital twin model—at any phase of its acquisition lifecycle, then maps the associated model's cyber assets attack vector space. Customized resiliency metrics allow the user to easily perform connectivity analysis of their system and understand cyber assets shared across their architecture. More than a dozen open-source cyber threat intelligence sources are curated and housed in IRIS's data repositories. Reusable libraries and classification schemas relate the system's architectural components to globally identified cyber intelligence to reduce the amount of time required to perform vulnerability and resiliency analysis.

Warfighter Value: Fielding more cyber-resilient systems reduces operational impacts due to cyber-attacks and improves system and warfighter effectiveness. IRIS's models enable optimization of cybersecurity architectures, driving up critical system operational resiliency while lowering maintenance and sustainment costs. IRIS's MBSE-based architectural models also speed the process execution and enhance the traditional Risk Management Framework (RMF). Customizable metrics and device classification schemes allow for broader measurements of the potential vulnerability of atypical IT environments that include ICS devices.

WHEN

Contract Number: N68335-21-C-0171

Ending on: May 25, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase I	Low	Near real-time data ingestion of public vulnerability sources	3	2nd QTR FY20
Phase II	Low	Measure impact of vendor and STIG support & obsolescence notices	4	3rd QTR FY21
Phase II	Low	On demand, dynamic threat simulation capability to provide candidate remediation strategies	4	1st QTR FY22
Phase II	Medium	Analyze network connectivity and pathways between hosts to define resiliency metrics	5	3rd QTR FY22
Phase II	Medium	Prototype Operational Demonstration	6	2nd QTR FY23

HOW

Projected Business Model: G2 Ops will provide customers direct access to IRIS processes and tools as well as provide technical assistance for setup.

Company Objectives: Utilizing our G2 Ops proprietary MBSE based Gold Standard Methodology (GSM) and developmental ecosystem, we identify cyber risks and provide system optimization resiliency. Our GSM practices reduce costs and risks associated with complex design evolution, integration, automation, cyber vulnerabilities, and sustainment operations.

Potential Commercial Applications: Any industry that relies on a complex network architecture can take advantage of the graph analytics envisioned for IRIS. This technology also has potential commercial transition to ICS/SCADA systems throughout National critical infrastructure. ITAR restrictions may be a factor if this technology is integrated into international maritime applications. The resiliency of ICSs is a cross-cutting, critical capability need. The insight provided by IRIS to aid in risk reduction and resiliency analysis is agnostic of military or commercial domains. Possible other uses include large industrial plants in the manufacturing, water, electric, and power industries.

Contact: Kevin Esser, Chief Business Officer
kevine@g2-ops.com (757) 578-9091

WHO

SYSCOM: NAVSEA
Sponsoring Program: NAVSEA – HQ & DIR
Transition Target: Navy bases' civil engineering and safety offices,
TPOC: (301) 744-6059
Other Transition Opportunities: NAVFAC EXWC, Other Service's engineers and safety offices, The DoD Explosives Safety Board (DDESB), The Defense Threat Reduction Agency (DTRA), The commercial explosives safety sector, International partner's defense and commercial explosives safety communities.

Notes: The Fast Running Models (FRMs) developed will be used for explosives safety site planning when ESQD criteria can't be met. Use of FRMs in site planning is non-existent at present, providing a clear competitive advantage.

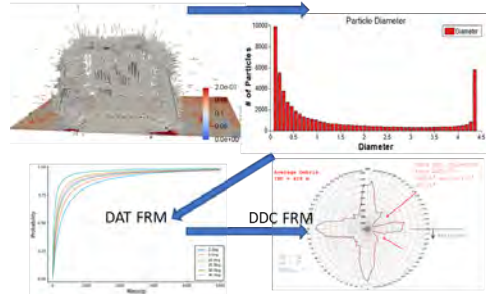


Image courtesy of A-P-T Research [2021]

WHAT

Operational Need and Improvement: Better fast running analytical models for explosives safety will enable explosives safety site planners to conduct realistic risk analysis based on physics.
Specifications Required: Fast running modeling tools to run on personal computers in minutes, calculate initial launch conditions of debris generated in accidental explosion of ammunition storage magazines, calculate debris trajectory and density of dispersed degree as a function range of azimuth from the magazine.
Technology Developed: Fast Running Models (FRM), including a Debris Analysis Tool (DAT) to better model the break-up and initial velocity conditions of all secondary debris from a detonation inside a magazine or operating building, and a Debris Density Calculator (DDC) to determine where the debris will land once lofted by DAT. DDC will be used to determine safe distances for exposed sites near explosives storage magazines and operating buildings.
Warfighter Value: Validated models enable navy base engineers to reliably assess debris hazard of existing munitions storage magazines and operating buildings as they are re-purposed for different storage or operations.

WHEN

Contract Number: N68335-22-C-0094 **Ending on:** Nov 09, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Complete and Validate Stochastic Coupled HFPB	Medium	Reasonable comparison with experimental data	3	4th QTR FY22
Select Parameters for Generating Magazine Response Data	Low	Parameter selection completed already	3	4th QTR FY22
Produce a Debris Generation (Synthetic) Database	Medium	Completion of 48 HFPB computations	3	1st QTR FY23
Develop Prototype DAT and DDC FRMs	Medium	Reasonable verification against experimental data	5	1st QTR FY23
Integrate Product (in LUI), with documentation	Medium	Preliminary integration of DAT in LUI	6	1st QTR FY23

HOW

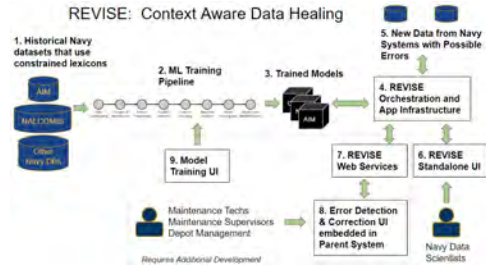
Projected Business Model: Multi-pronged commercialization strategy includes: Use the FRMs for direct sales of commercial and defense services, delivery of a synthetic database to the Navy for use in future R&D efforts, release of FRMs software to US Government entities through integration into Defense Threat Reduction Agency's lightweight user interface (LUI) platform that provides a software developer's toolkit (SDK) for expedient UI fielding 3-D, GIS M&S environment (for modeling, user interface, and visualization)
Company Objectives: The team members are active consultants in the fields of blast and explosives safety; the analytical research performed in this project will allow the APT team to expand consulting to government and private industry in the fields of blast effects and explosives safety
Potential Commercial Applications: The DAT and DDC software will transition to NOSSA and any U.S. government employee who meets access requirements. DAT and DDC will provide DON and DoD with analytical capabilities that do not currently exist.
 This software could be expanded for secondary debris modeling for:
 - collateral damage estimation during U.S. military offensive operations
 - allowing increased precision during military operations in urban terrain
 Implementation of DTRA and ARA's Lightweight User Interface (LUI) will have the added benefit of adopting a framework already approved for integration on IT systems across the Navy, Army, Air Force and several DoD Agencies.

Sustainment (Navy FST Booth: 16 March)

Company	Topic	Project Title	SYSCOM
CHI Systems, Inc.	N201-X02	ADAPT - Naval Depot Modernization and Sustainment	ONR
Metis Design Corporation	N111-067	Underwater Structural Health Monitoring of Composite Navy Propellers	ONR
TurnAround Factor	N201-X02	ADAPT - Naval Depot Modernization and Sustainment	ONR

WHO

SYSCOM: ONR
Sponsoring Program: The Office of Naval Research
Transition Target: The US Navy's Program Executive Office for Manpower, Logistics and Business Solutions (PEO MLB)
TPOC: Corey Countryman
corey.j.countryman.civ@us.navy.mil
Other Transition Opportunities: Program Executive Office for Manpower, Logistics and Business Solutions (PEO MLB), Naval Sea Systems Command (NAVSEA), Naval Air Systems Command (NAVAIR), and other program offices seeking to implement Model-Based Systems Engineering and Data Driven Decision making.



WHAT

Operational Need and Improvement: Data errors can have a direct impact on operational readiness. This is particularly true in maintenance and depot settings. REVISE provides context aware data healing functionality that can adapt your information environment to automatically train ML models that can identify potential errors and recommend corrections. This will dramatically improve data quality and increase the accuracy of analytics.

Specifications Required: Self-Healing Data Collection Using Artificial Intelligence (AI)/ML: Large swaths of data have been compiled and can provide invaluable insights if data entry errors can be corrected. Human correction of the errors (e.g., USS Abraham Lincoln to CVN72) is not efficient/effective nor predictive in nature. AI algorithms can groom or heal the (meta) data to make it more useful in trending deficiencies and corrective actions across multiple platforms. Navy seeks an automated self-healing data collection system to effectively correct inaccurate entry of parts numbers, and track/identify the root cause for repeated reports of faulty equipment.

Technology Developed: We have produced a system that can train ML models to understand the context of complex data sets. REVISE is particularly well suited for domains with cryptic and constrained lexicons used to describe complex logistical domains. The REVISE system provides web-application functionality to exercise these ML models, identify errors, utilize system recommendations to correct errors, and utilize explainable AI functionality to provide transparency into the model.

Warfighter Value: Errors reduce operational readiness and degrade the value of analytics and prognostics. REVISE can augment the data quality assurance process to drastically reduce errors and augment managerial and expert users. Impacts of error identification and mitigation can improve efficiency, readiness, and overall quality of an organization and its ability to trust analytics.

WHEN

Contract Number: N68335-21-C-0176 **Ending on:** Jun 25, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase I Kick Off	Low	Proposal Award	2	3rd QTR FY20
Phase I Demonstration	Low	Customer Evaluation	4	4th QTR FY20
Phase II Kick Off	Low	Customer Evaluation	4	2nd QTR FY21
Phase II Demonstration	Low	Customer Evaluation	6	4th QTR FY22

HOW

Projected Business Model: Software-enabled service: a business model whereby the engagement model is still time and expense, but related to the time and expense it takes to configure the REVISE software for their specific use case and data set. The go-to-market approach would be to sign up partners with existing relationships with IT customers that would want to participate in the consulting part of this business model.

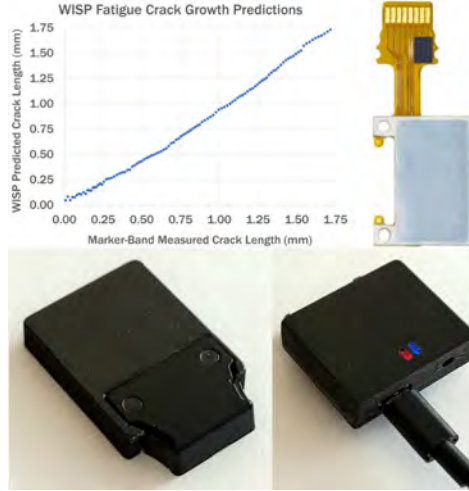
Company Objectives: The process of discovering meaningful patterns within the noise of large datasets is omnipresent in both military and business worlds. At CHI Systems, we believe that finding the patterns is only the first step. Our big data technologies, combined with our suite of visual analytics tools, help users make sense of the data.

Potential Commercial Applications: REVISE has great potential in commercial Maintenance, Repair, and Operations (MRO), Transportation, and Logistics markets. REVISE also holds commercial potential as a general IT product.

WHO

SYSCOM: ONR
Sponsoring Program: SSN(X) - Next Generation Attack Submarine
Transition Target: Future Attack Submarine
TPOC: Benjamin Grisso
benjamin.grisso@navy.mil
Other Transition Opportunities: Independence Class Littoral Combat Ship (LCS), Columbia-Class Submarine, Constellation Class Frigate

Notes: In addition to marine applications, there are several aircraft including military (F-15) and commercial applications



Example fatigue crack length tracking (top left), nanoengineered fatigue crack gauge (top right), WISP Solo standalone data acquisition unit (bottom left), WISP Reader wireless data/power transceiver (bottom right)

WHAT

Operational Need and Improvement: Present inspection of naval structure is only conducted on shore by qualified experts. This requires the complex logistics of taking the asset out of service, brining it to a port, flying-out the necessary inspection personnel and equipment, and often a tear-down procedure to allow access to the areas to be inspected. Improved methodologies are desired to make this process more efficient.

Specifications Required: A distributed integrated sensor network placed in strategic locations could allow much of the inspectors' duties to occur remotely without taking the asset out of service. The network must be durable and cost effective such that the additional cost burden does not exceed the sustainment costs being avoided. The inspection results must be at least as reliable as those conducted by traditional on-site inspectors.

Technology Developed: The Witness Integrity Sensor Platform (WISP) is a novel sensor network architecture. Lightweight (~10 g), small footprint (~10 cm²) microelectronic units can be distributed throughout key areas to be monitored, with minimal-to-no cables or connectors necessary for integration. A standardized interface provides data acquisition capabilities for many COTS analog & digital sensors, in addition to a line of advanced nanoengineered sensors for monitoring fatigue cracks, corrosion and erosion.

Warfighter Value: Conditional based maintenance (CBM) has the potential to reduce sustainment costs while improving asset availability.

WHEN

Contract Number: N68335-21-C-0290

Ending on: Mar 15, 2024

Milestone	Risk Level	Measure of Success	Ending TRL	Date
LA-Class Submarine Demo	Low	Installation of WISP hardware/sensors, collection of representative damage data	5	2nd QTR FY22
Self-Defense Test Ship Demo	Low	Installation of WISP hardware/sensors, collection of representative damage data	6	3rd QTR FY22
Environmental Qualification Testing	Medium	Pass all environmental testing requirements	6	4th QTR FY22
CNT-base Acoustic Emission	High	Demonstrate fatigue crack detection using CNT sensors	6	1st QTR FY23
Detection Sensitivity Study	Medium	Quantify detection reliability using CNT sensors	6	1st QTR FY24

HOW

Projected Business Model: Metis Design Corporation (MDC) focuses on the maturation of novel technologies from concept through field-testing. MDC has established a robust IP portfolio to protect our innovations, and have successfully licensed several products to large companies who can provide marketing, sales and manufacturing expertise. Specifically, the WISP technology has been licensed to Analog Devices Inc. (ADI), and MDC continues to provide engineering support for development and evaluation of advanced custom nanoengineered sensors.

Company Objectives: We are seeking additional program office support for evaluating, qualifying and deploying this technology, in addition to opportunities for development of new advanced application-specific sensors compatible with the system.

Potential Commercial Applications: Commercial aviation, marine and automotive applications, in addition to the potential for monitoring civil infrastructure and energy market assets.

WHO

SYSCOM: ONR

Sponsoring Program: ONR (NESTT - Naval Enterprise Sustainment Technology Team)

Transition Target: Navy Fleet Readiness Centers

TPOC: Corey Countryman
corey.j.countryman.civ@us.navy.mil

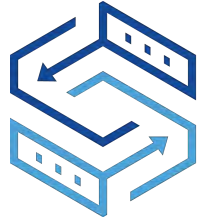
Other Transition Opportunities: Type Commands for shipboard use and Program Management Activity (PMA) use with specific diagnostic tools.

Notes: TurnAround Factor's (TAF) SME Connect solution allows sailors and marines shipboard or at remote locations to receive engineering assistance and remote support from engineers and artisans at the Engineering Support Activities (ESAs) and Fleet Readiness Centers.

TAF uses Commercial Off The Shelf (COTS) Augmented Reality (AR) devices to allow on-site users to interact with remote experts. The system provides remote access to specialized tools and diagnostics by the remote expert(s) while in use by the on-site user. TAF's flexible framework for the system allows new tools to be added easily and allow a range of maintenance processes further forward. This approach minimizes initial specialized equipment and allows the Navy to hit the ground running with immediate "wins" of new capabilities and operational efficiencies.

TAF used a combination of COTS tools and custom software built with COTS and open source libraries to build a remote work solution that is scalable to meet the Navy's future needs, sustainable to maintain and improve, and extensible to easily incorporate additional tools.

The concept of operations is simple: TAF uses existing networks and COTS hardware such as the Microsoft HoloLens AR headset and the Apple iPad, to connect folks shipboard and in OCONUS to engineers and artisans who use a web browser to join an AR video call. TAF can also connect tools such as borescopes, micrometers, and test sets directly into the call so that remote experts can help guide the sailor to use them and directly capture the output.



SME
CONNECT

WHAT

Operational Need and Improvement: As weapons systems have become more complex the number of repairs that can be performed at the Organizational and Intermediate level has decreased. These weapons systems are critical to readiness and mission success.

In peacetime we send tech reps and depot teams to assist troubleshooting and perform repairs, but against peer adversaries that disrupt our logistical tail and require ships to operate on their own the Navy will need the ability for organizational maintenance personnel to repair mission critical weapons systems.

Specifications Required: The Navy requires solutions that allow ships and units to operate independently and conduct diagnostics and repair while underway and in austere locations.

Technology Developed: TAF's SME Connect allows experts from the depots or vendors to directly interact with shipboard personnel to perform troubleshooting and repairs. Our SME Connect solution supports the Navy's need to perform maintenance operations underway and from austere bases while deploying complex weapons systems. Against peer adversaries that disrupt our logistical tail and require ships to operate on their own, SME Connect provides the embarked crew access to the best engineering resources to undertake complex repairs and create field expedient repairs that are safe and effective.

- Warfighter Value: * Increases the capabilities of shipboard personnel without additional training or complex repair manuals.
- * Provides expert advice without the lag time of travel to the site
 - * Operates in contested environments without requiring the ship or aviation asset to be reachable by support teams or tech reps
 - * Minimal onboard footprint that leverages existing tools and infrastructure
 - * Open architecture to support additional tools or interface with other systems

WHEN

Contract Number: N68335-21-C-0310

Ending on: Feb 03, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Integrated System Test	Medium	Connect all components	5	3rd QTR FY22
Shipboard Demonstration aboard Self-Defense Test Ship	Medium	Demonstrate operation of the system while underway and pierside shipboard	7	4th QTR FY22
Achieve Interim Authority To Test (IATT) Approved	Medium	Achieve Interim Authority To Test (IATT) Approved	7	1st QTR FY23
FRC-East On-Site Demonstration Complete	Medium	FRC-East On-Site Demonstration Complete	7	2nd QTR FY23

HOW

Projected Business Model: Hardware and Software as a Service

Company Objectives: TurnAround Factor (TAF) is a small business based in Richmond, Virginia that provides engineering consulting and R&D services. We are experts at developing new ideas and creating prototypes that can be tested with the user and ultimately transitioned to the field. We have an extensive team of engineers and developers that support a variety of Federal customers. Our team is evenly split between developers, electrical engineers, and mechanical engineers, allowing us to bring an effective multidisciplinary approach to produce complex systems. Over 80% of our staff are engineers or developers including most of our senior leadership. Our multidisciplinary team allows us to effectively deliver technologies from the lab to the field.

We currently support several DLA and Navy activities including DLA Troop Support Subsistence, DLA BATTNET (Battery R&D Network Program), and DLA Disposition Services. Our products have been used worldwide by DLA and support several Navy weapons systems.

Potential Commercial Applications: Regulated industries with high value assets such as commercial aviation share many commonalities with Navy maintenance activities.
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