Navy STP Technology Guide

2021-22 Navy STP Cohort

Navy STP Projects at WEST 2022

Navy FST Showcase Booth in Main Exhibition Hall

At WEST 2022, the Navy STP will showcase 29 projects at the Navy FST booth (#1709) on the main conference exhibition hall. 15 projects will have display space on 16 February giving participants a chance to meet the experts one-on-one while the next 15 projects will have space the next day on 17 February.

Featured SBIR/STTR Technologies at the Navy FST Booth on 16 February

- Air Platform (5 Projects)
- Autonomy (2 Projects)
- Energy and Power (2 Projects)
- Ground and Sea Platforms (1 Project)
- Human Systems (1 Project)
- Sensors (3 Project)
- Space (1 Project)
- Sustainment (1 Project)

Featured SBIR/STTR Technologies at the Navy FST Booth on 17 February

- C41 (10 Projects)
- Cyber (1 Project)
- Electronic Warfare (1 Project)
- Modeling and Simulation (3 Projects)

Be sure to view Tech Talks prior to visiting our Booth
https://navyfst.com/events/west-2022

Navy FST
Showcase Booth

Showcase Day Breakdown

February 16, 2021 - 9:15 AM – 4:30 PM

Company	Topic Number	Tech Category
Materials Research & Design	N191-043	Air Platforms
SA Photonics, Inc.	N181-027	Air Platforms
SA Photonics, Inc.	N182-132	Air Platforms
Texas High Energy Materials, LLC	N181-019	Air Platforms
Quantum Ventura Inc	N193-A01	Autonomy
The Innovation Laboratory, Inc.	N193-A01	Autonomy
Continuous Solutions	N19A-T007	Energy & Power Technologies
Luna Innovations Incorporated	N161-047	Energy & Power Technologies
Boston Engineering	N191-024	Ground and Sea Platform
Learntowin, Inc	AF192-D001	Human Systems
Hood Technology	SB052-028	Sensors
SA Photonics, Inc.	N181-022	Sensors
SA Photonics, Inc.	N18A-T021	Sensors
SA Photonics, Inc.	N122-146	Space
Hy-Tek Manufacturing	N181-021	Sustainment

February 17, 2021 - 9:15 AM - 4:30 PM

Company	Topic Number	Tech Category
Adaptive Dynamics, Inc	NOAA161-844D	C4I
Carley Technologies, Inc.	N192-129	C4I
CesiumAstro, Inc.	N181-090	C4I
Daniel H. Wagner	N192-093	C4I
Holochip Corporation	N171-076	C4I
Intelligent Automation, Inc.	N181-089	C4I
Jove Sciences, Inc.	N193-A01	C4I
Perceptronics Solutions, Inc.	N192-131	C4I
Virtualitics	N193-A03-3	C4I
Redwall Technologies	N172-105	Cyber
Intelligent Fusion Technology, Inc	N182-138	Electronic Warfare
Cascade Technologies Incorporated	N14A-T005	Modeling & Simulation
Tagup, Inc.	N193-A01	Modeling & Simulation
Xiphos Partners, LLC	N193-A03-3	Modeling & Simulation

Company	Topic #	Project	SYSCOM
Materials Research & Design	N191-043	Analytical Design of Surface Porosity in 2D C/C to Delay Boundary Layer Transition for Hypersonic Aeroshell Applications	ONR
SA Photonics, Inc.	N181-027	AgileBeam RF Denied Free-Space Optical Communication System	NAVAIR
SA Photonics, Inc.	N182-132	EagleEye Multi-Aperture Airborne FSO Communication System	ONR
Texas High Energy Materials, LLC	N181-019	Innovative Material (and Application Method) for a Hydrophobic/Oleophobic Coating to an Aluminum-Bodied Heat Exchanger TxHiEnergy	NAVAIR

Department of the Navy SBIR/STTR Transition Program

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Topic # N191-043

Analytical Design of Surface Porosity in 2D C/C to Delay Boundary Layer Transition for Hypersonic Aeroshell Applications

Materials Research & Design

WHO

SYSCOM: ONR

Sponsoring Program: ONR Code 351: Basic and Applied Research in Hypersonics

Transition Target: The US Navy's Conventional Prompt Strike (CPS) program

TPOC:
Dr. Eric Marineau
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Other transition opportunities: This technology is specifically tailored to mid- or intermediate range boost glide hypersonic weapons which could benefit from a reduction in the second mode instability contribution to boundary layer transition, including Defense Advanced Research Products Agency's (DARPA) Tactical Boost Glide (TBG) program and the U.S. Air Force Advanced Rapid Response Weapon (ARRW) program.

Notes: The image shows an example of a carbon/carbon aeroshell on DARPA's Falcon Hypersonic Test Vehicle.
The aeroshell material being developed will delay or prevent boundary layer transition in hypersonic vehicles, reducing the thermal loading and resulting operating temperatures which will allow for reduced insulation weight and increased vehicle range.

https://asc.army.mil/web/news-alt-ond18-experiments-in-hyperspeed/

WHAT

Operational Need and Improvement: Progress has been made over the last two decades in predicting the growth of the flow instabilities that cause boundary layer transition (BLT) on hypersonic vehicles. However, the large uncertainties in BLT lead to conservative aeroshell designs that penalize flight performance. Boundary layer stabilization shows promise in ensuring laminar flow over an extended flight envelope, even under large uncertainties in the freestream disturbances. Hypersonic BLT delay strategies involving ultrasonically absorptive materials have been investigated using numerical modeling as well as bench tests and wind tunnel tests. For the second (Mack) mode instability, porous surfaces have been shown to stabilize the disturbances through ultrasonic absorption. However, this has not been demonstrated with candidate aeroshell materials. The objective of this effort is to design, fabricate, characterize, and test ultrasonically absorptive aeroshell materials that successfully damp the second mode instability to delay BLT on hypersonic boost-glide weapons.

Specifications Required: The porous material needs to offer mechanical properties, thermal protection capabilities, and surface roughness comparable to current aeroshell materials used on hypersonic boost-glide demonstrators. The material porosity needs to be tailored to the flight trajectory to attenuate the second mode instability over the range of velocity and altitudes achieved during pull-up and glide. Relevant Mach numbers are between 6 and 18 at altitudes between 90 and 130 kft. The porous surface must not have large protuberances that could trip the flow. Typical unstable frequencies range between 50 and 1000 kHz depending on the flight trajectory, vehicle angle of attack, and geometry. The ultrasonic absorptivity of the material will have to be characterized over this relevant range of frequencies.

Technology Developed: The technology being developed by Materials Research & Design, Inc. (MR&D) is an aeroshell material which has a prescribed surface porosity configuration (size and spacing of holes) intended to delay or prevent the boundary layer transition (from laminar to turbulent) resulting in reduced thermal loading. Thus far, MR&D has successfully fabricated test specimens with the desired surface porosity and conducted ultrasonic absorption testing which demonstrated the ability to significantly absorb the applied pressure wave.

Warfighter Value: Allows for feasibility of wider range of trajectories, as well as more controlled flight.

WHEN

Contract Number: N68335-20-C-0580   **Ending on:** June 24, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate feasibility that an aeroshell material with prescribed surface porosity could delay BLT	N/A	Stability analysis showed the inclusion of surface porosity effectively attenuated some frequencies and reduced the growth rate for others	2	1st QTR FY20
Proof of concept that surface porosity increases the absorption coefficient of representative aeroshell materials	N/A	Conducted laboratory ultrasonic absorption testing which demonstrated the ability to absorb up to two thirds of the applied pressure wave	3	3rd QTR FY21
Demonstration of the boundary layer transition delay	Med	Wind tunnel testing of 7 deg cone with representative aeroshell segment with prescribed surface porosity, along with a baseline (smooth) model to show the BLT delay	6	3rd QTR FY22
If option is awarded, measurement of material recession in flight-like conditions	Med	Arc jet testing under representative conditions	6	4th QTR FY23

HOW

Projected Business Model: As a service-based company, MR&D often does not retain ownership of the designs resulting from R&D work. Ultimately, the final designs are owned by the prime contractor who has provided the geometric envelope and design requirements to enable the component design. This requires a close working relationship with such companies to ensure that the final design blends with current operational requirements. For this reason, MR&D has included one of the vehicle prime contractors as a subcontractor on this effort. This technology would most likely need to be sold to a prime/system integrator for insertion into a program of record. It is MR&D's intention to be able to show feasibility of the technology and functionality of the design methodology within the SBIR effort. MR&D could then perform the design work needed to determine the proper surface porosity for the vehicle of interest and coordinate the fabrication and testing of prototype test articles for a prime/system integrator.

Company Objectives: MR&D seeks to discuss current needs relative to hypersonic aeroshells with both ceramic matrix composite (CMC) fabricators and prime contractors. In addition, MR&D is also looking to discover new opportunities and potential customers who could benefit from MR&D's design and analysis expertise in high temperature composite materials.

Potential Commercial Applications: Commercial space companies, such as SpaceX, Generation Orbit and Virgin Galactic are gradually developing vehicles capable of hypersonic flight. As operational needs for these vehicles increase, there may be a need to develop aeroshells with the appropriate surface porosity to delay boundary layer transition, reduce thermal loading and associated insulation weight, and expand the performance of the vehicle.

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Topic # N191-043
Analytical Design of Surface Porosity in 2D C/C to Delay Boundary Layer
Transition for Hypersonic Aeroshell Applications
Materials Research & Design

ABSTRACT

The technology being developed is an aeroshell material with prescribed surface porosity intended to delay or prevent boundary layer transition resulting in reduced thermal loading, reduced insulation weight, and potential for increased range. The target application is mid- or intermediate range boost glide hypersonic weapons. Thus far, MR&D has successfully fabricated test specimens with the desired surface porosity and conducted ultrasonic absorption testing which demonstrated the ability to significantly absorb the applied pressure wave. MR&D is a small business that specializes in the efficient design and analysis of high temperature composite materials for the aerospace community, with a long history of successful fabrication and testing of composite components. The ultimate goal is to integrate this technology into a prime contractor hypersonic aeroshell system.

THUMBNAIL

The technology being developed is an aeroshell material with prescribed surface porosity intended to delay or prevent boundary layer transition resulting in reduced thermal loading, reduced insulation weight, and potential for increased range. The target application is mid- or intermediate range boost glide hypersonic vehicles.

KEYWORDS

Laminar Flow Control; Boundary Layer Transition; Hypersonics; Second-mode Instability; Ultrasonically Absorptive Material; Carbon-carbon (C/C) Aeroshell; Porous Material; Tactical Boost-glide

CONTACT

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Topic # N181-027

AgileBeam RF Denied Free-Space Optical Communication System

SA Photonics, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program:

Transition Target: PMA 265 F/A-18 Hornet/Super Hornet

TPOC:
(301)757-0725

Other transition opportunities: Other DOD components (USAF, Army, Marine Corps, SOCOM, etc.) could benefit from an AgileBeam™ application aboard air and ground assets.

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WHAT

Operational Need and Improvement: RF Interference (RFI) generated either by adversaries or fratricide (friendly jamming) has significantly degraded aircraft tactical communications. Recent advancements in free space optical (FSO) communications technologies can be used to provide an anti-jam, low probability of interception and detection (LPI/LPD) communication alternative to RF. An airborne FSO communication solution is needed that can operate on airborne platforms, can compensation for atmospheric effects such as absorption, scattering and scintillation, has a conformal aperture, and has low cost/low SWaP.

Specifications Required: A digital data link, operating at EO/IR frequencies, that supports 2-way communications with an effective range >100 nmi and data rates >100 Mbps.

Technology Developed: AgileBeam™ is an FSO communications system that utilizes SA Photonics' innovative closed-loop tracking and signal processing techniques to provide robust and reliable communication through a wide variety of atmospheric conditions, while maintaining a simple and low-cost system architecture. Furthermore, AgileBeam includes internal optical beam stabilization that allows the terminal to be directly attached to an aircraft.

Warfighter Value: The primary advantages of AgileBeam's communication system include its covertness, lack of RFI from any RF sources, immunity to jamming, lack of frequency allocation requirements, and high bandwidth. These benefits serve to provider safter and more reliable communications to Warfighters.

WHEN

Contract Number: N68335-19-C-0569   **Ending on:** September 30, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
System Design Review	Low	Completed review	3	December 2020
Full System Integration	Low	Successful integration of all subsystems	4	July 2021
Lab Validation Tests	Med	Successful tests demonstrating readiness for flight testing	5	December 2021
Outdoor and flight tests	Med	Successful demonstrations during testing	6	September 2022

HOW

Projected Business Model: SA Photonics intends to undergo production of the AgileBeam engineering model, qual units, and flight terminals using our in-house manufacturing capability. The company has a history of successful small-scale production for commercialized SBIR products. For larger quantity manufacturing, we would work with our contract-manufacturing partner currently used for our commercial terrestrial/space FSO system manufacturing.

Company Objectives: The AgileBeam system is positioned to be a cost-saving and performance-improving communication system not just for U.S. Navy combat aircraft fleet, but with military communications across the DOD. As a result, we are excited to present the product to a range of program offices at the FST, as well as a number of prime contractors, specifically those who work with airborne platforms.

Potential Commercial Applications: Outside of military applications there are many potential commercial transition opportunities. These include other Government applications within the Drug Enforcement Agency and the Intelligence Community, where non-RF, covert communication is also a consideration. Private sector use in telecommunication and local, urban communication would benefit from this technology due to its high bandwidth.

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Topic # N181-027
AgileBeam RF Denied Free-Space Optical Communication System
SA Photonics, Inc.

ABSTRACT

Free space optical (FSO) communication systems have many desirable attributes for Navy aircraft and surface vessels; particularly the ability to operate without RF emissions, the immunity to RF interference and jamming, and inherent LPI/LPD operation. SA Photonics is developing its AgileBeam™ FSO system, that includes internal optical beam stabilization which allows the terminal to be directly attached to aircraft, greatly reducing the cost to deploy and allowing use even on small UAVs.

With the resulting compact size and robust and reliable performance, combined with SA Photonics' patented and field-proven technology to communicate through a wide variety of atmospheric conditions, AgileBeam promises to enable widespread FSO communication transition to the Warfighter. SA Photonics, which specializes in the development of advanced photonics systems to solve demanding problems for military and commercial customers, envisions its own small-scale production as well as teaming with well-known primes, as it has on past product developments.

THUMBNAIL

AgileBeam™ is a free space optical communication system that includes internal optical beam stabilization to allow the terminal to be directly attached to an aircraft, greatly reducing the cost to deploy and allowing use on the smallest of aircraft.

KEYWORDS

free space optical, RF denied, LPI/LPD, FSO, optical beam stabilization, airborne communications, UAV communication

CONTACT

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ONR Approval #43-8606-21

Topic # N182-132

EagleEye Multi-Aperture Airborne FSO Communication System
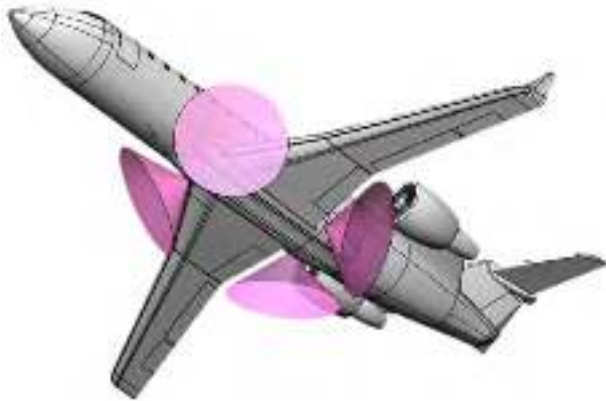
SA Photonics, Inc.

WHO

SYSCOM: ONR
Sponsoring Program:
Transition Target:
TPOC:
Santanu Das
santanu.das@navy.mil

Other transition opportunities: SA Photonics' EagleEye™ Free Space Optical (FSO) Communication System provides benefits to a wide range of platforms across the DOD. As FSO communication is becoming more of a critical need, this technology will allow for enhanced operation in all terrestrial, air and space applications.

WHAT

Operational Need and Improvement: Free space optical (FSO) communications provide fiber-optic-like data rates in low SWaP-C terminals. Their extremely narrow beamwidths, directionality, and operation in the invisible near infrared (IR) region (optical C-band) facilitate naval military communications in contested warfighting environments. USN has a need for a multi-beam, airborne-layer FSO component to expand potential Navy FSO implementations to include cooperating Carrier Strike Groups. The system should be a modular, integrated airborne multi-beam FSO relay node, capable of multiple, simultaneous beams—in one or multiple optical apertures—that can provide robust connectivity to ships.

Specifications Required: Requirements include a fully stabilized multi-beam (minimum 3 beams full-duplex) optical head that provides 360 degrees azimuth and 105 degrees elevation coverage on manned and unmanned aerial platforms. Link distance will be 50-75 km at 100 Mbps.

Technology Developed: The EagleEye™ system makes use of the architecture from SA Photonics' ongoing MultiEye™ shipboard Navy FSO program, and applies it to airborne platforms. EagleEye consists of a fully stabilized optical head, a dedicated wide field-of-view acquisition sensor, and dedicated acquisition beacon that together allow operation on airborne platforms and supports rapid, autonomous acquisition. EagleEye is compatible with MultiEye, and will enable a wide variety of ship-to-air communications needs to be met.

Warfighter Value: The primary advantages of EagleEye's communication system include its covertness, lack of RFI from any RF sources, immunity to jamming, lack of frequency allocation requirements, and high bandwidth. These benefits serve to provider safer and more reliable communications to Warfighters.

WHEN

Contract Number: N68335-20-C-0066   **Ending on:** December 2, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Critical Design Review	N/A	Detailed Design Complete	3	2nd QTR FY20
System integration & test	Low	Performance validation	4	4th QTR FY21
Outdoor Testing	Med	Successful test	5	4th QTR FY21
Airborne Testing	Med	Successful test	6	1st QTR FY22

HOW

Projected Business Model: SA Photonics intends to undergo production of the EagleEye terminals using our in-house manufacturing capability. The company has a history of successful small-scale production for commercialized SBIR products. For larger quantity manufacturing, we would work with our contract-manufacturing partner currently used for our commercial terrestrial/space FSO system manufacturing.

Company Objectives: The EagleEye system is positioned to be a cost-saving and performance-improving communication system not just for U.S. Navy aircraft, but with military communications across the DOD. As a result, we are excited to present the product to a range of program offices at the FST, as well as a number of prime contractors, specifically those who work with airborne platforms.

Potential Commercial Applications: Eye-safe, high data rate, airborne FSO communication links also have notable dual use commercial applicability. FSO systems can flexibly operate in closer proximity and exploit longer periods of time to close links, thereby allowing near all-weather operation. Increasing use of UAVs in commercial markets may result in RF spectrum allocation conflicts and the need for ubiquitous low-cost, communications-on-demand. Additional applications may evolve into a high-altitude, balloon-to-balloon relay with hybrid optical-RF cellular networks.

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Topic # N182-132
EagleEye Multi-Aperture Airborne FSO Communication System
SA Photonics, Inc.

ABSTRACT

Free space optical (FSO) communication systems have many desirable attributes for Navy aircraft and surface vessels; particularly the ability to operate without RF emissions, immunity to RF interference and jamming, and inherent LPI/LPD operation. SA Photonics is developing EagleEye™, an airborne version of our shipboard MultiEye™ FSO communication system. EagleEye includes additional functionality to support operation on airborne platforms, including a fully stabilized optical head, a dedicated wide field-of-view acquisition sensor, and a dedicated acquisition beacon. Together these features allow operation on airborne platforms and supports rapid, autonomous acquisition. EagleEye is compatible with MultiEye, and will enable a wide variety of ship-to-air communications needs. SA Photonics, which specializes in the development of advanced photonics systems to solve demanding problems for military and commercial customers, envisions its own small-scale production as well as teaming with well-known primes, as it has on past product developments.

THUMBNAIL

EagleEye™ is a free space optical communication system for ship-based aircraft. EagleEye features functionality to support airborne operation, including a fully stabilized optical head, a dedicated wide field-of-view acquisition sensor, and dedicated acquisition beacon, thus enabling a wide variety of ship-to-air communications needs to be met.

KEYWORDS

free-space optical, FSO, lasercom, communications, LPI, LPD, RF denied, anti-jam, laser communications

CONTACT

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NAVAIR Public Release 2021-957

Topic # N181-019

Innovative Material (and Application Method) for a Hydrophobic/Oleophobic Coating to an Aluminum-Bodied Heat Exchanger TxHiEnergy

Texas High Energy Materials, LLC

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA 275 V-22 Osprey

Transition Target: V-22 Osprey Nacelle Oil Cooler Assembly

TPOC:
(301)342-0865

Other transition opportunities: This technology could be used for other platforms for the same type of application, but the material could also be useful for other fouling concerns. V-22 appears to be unique for the severity of heat exchanger fouling.

Notes: We will execute Flight Qualification Tests at end of Phase II, after which we will seek parties interested in our patented, environmentally benign, self-cleaning binary coating technology system.

https://cdn.dvidshub.net/media/thumbs/photos/1902/5080095/1000w_q9
https://www.ametek.com/pressreleases/news/2014/november/hughes-treitler-awarded9-million-contract-for-v-22-osprey-nacelle-oil-cooler

WHAT

Operational Need and Improvement: The Navy occasionally faces issues with heat exchanger performance in mechanical systems due to the accumulation of dirt and debris on the thermal transfer surfaces. 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, would increase the available usage time of a mechanical system. This would result in a decrease in cost to the Government by removing the need to clean or remove components that have diminished heat-rejection capability.

Specifications Required: Heat Exchanger Requirements with Hydrophobic/Oleophobic Coating:
- Shed water, oils, hydraulic fluids, and other foulants
- Minimal loss of air flow, pressure drop, and heat rejection
- Durable enough to withstand sand and dust ingestion
- 10 hour extreme exposure (sandblast) endurance test
- Erosion resistant and durable for 840 hours
- Operating temperature range: -65°F to 420 °F
- Maximum operating pressure: 230 psig

Technology Developed: Through our novel Chemical Vapor Deposition process, Texas High Energy Materials deposits an ultra-thin, durable, self-cleaning, omniphobic coating onto complex parts utilized by combat aircraft. Our new coating technology has been evaluated for aluminum heat exchangers, found to completely eliminate debris build up in harsh environments without reducing heat exchanger cooling performance, and reduces costs by eliminating frequent depot-level maintenance.

Warfighter Value: A material (and application method) for a hydrophobic/oleophobic coating to an aluminum-bodied, air-cooled, fluid-managing heat exchanger, with the subject heat exchanger of the tube-and-fin configuration would result in a decrease in cost to the Government by removing the need to clean or remove components that have diminished heat-rejection capability.

WHEN

Contract Number: N68335-20-C-0851   **Ending on:** August 21, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Development of a durable self-cleaning coating	Med	Coating retains self-cleaning performance after Navy prescribed endurance test	4	February 2022
Application on representative heat exchanger	Low	Complete uniform coating coverage	4	April 2022
Evaluation of self-cleaning coating on representative heat exchanger complete	Low	Coating performs as intended without reducing heat exchanger cooling performance	5	June 2022
Self-cleaning coating application onto actual V22 heat exchanger	Med	Complete uniform coating coverage	6	September 2022
Flight qualification demonstration	High	Successful completion of flight qualification demonstration	6	December 2022

HOW

Projected Business Model: Texas High Energy Materials, LLC (THEM) develops innovative materials in a practical, collaborative approach for government and private industry applications. We transition our technological breakthroughs into commercial, state-of-the-art products for government and industrial applications. THEM will engineer and design coating equipment outfitted with the controls and loading fixtures as well as software programmed to make the system easy to use by Depot personnel in addition to developing and providing a comprehensive training program, users manual, and SOPs. THEM will work with commercial heat exchanger manufacturers to determine viability of licensing the process to an existing new-build manufacturer for future V22 heat exchanger installations (Ametek, BAE, Lockheed, etc.)

Company Objectives: Our new coating technology has been evaluated for aluminum heat exchangers, and found to completely eliminate debris build up in harsh environments. This translates directly to improved fleet readiness and mobility by maintaining optimum heat-transfer performance while reducing service and cleaning intervals. We seek parties interested in maximizing thermal transfer efficiency and operational lifetime through use of our patented, self-cleaning coating technology.

Potential Commercial Applications: Commerical applications for this technology include: oil refineries (crude pre-heater trains), waste-heat recovery systems used in power generation, naphtha hydrotreaters at petroleum refineries, and air pre-heaters at municipal solid waste incinerators. Other 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 day environments would benefit.

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Topic # N181-019
Innovative Material (and Application Method) for a Hydrophobic/Oleophobic
Coating to an Aluminum-Bodied Heat Exchanger TxHiEnergy
Texas High Energy Materials, LLC

ABSTRACT

Texas High Energy Materials develops materials and products designed to endure extreme operating conditions yet maintain compliance with strict environmental and safety regulations. V-22s are susceptible to fouling/debris buildup on critical aluminum bodied heat exchangers; consequently, a self-cleaning coating will enable the aircraft to function more efficiently and extend its operational range. Using a novel Chemical Vapor Deposition (CVD) process, we create a durable omniphobic self-cleaning coating. Our new coating technology, developed for aluminum heat exchangers, eliminates debris build up in harsh environments without reducing heat exchanger cooling performance, and reduces costs by eliminating frequent depot-level maintenance. We can tailor our patented self-cleaning coating system for other structures to meet the requirements of interested program or facility managers.

THUMBNAIL

Initially developed for the V-22, our novel Chemical Vapor Deposition (CVD) coating process deposits a uniform, ultra-thin, durable, self-cleaning coating on complex aluminum heat exchangers to eliminate debris build up in harsh environments.

KEYWORDS

heat exchanger, heat exchanger, hydrophobic, oleophobic, Aluminum, debris, Self-cleaning coating, Particulate Accumulation

CONTACT

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http://www.txhienergy.com

Company	Topic #	Project	SYSCOM
Quantum Ventura Inc.	N193-A01	Certificate of Robustness and Safety for AI (CORSI)	NAVWAR
The Innovation Laboratory, Inc.	N193-A01	Aircraft Intent Inference based on Real-Time ADS-B Data Processing	NAVSEA

WHO

SYSCOM: NAVWAR

Sponsoring Program: Naval Information Warfare Systems Command

Transition Target: Program Executive Office for Command, Control, Communications, Computers and Intelligence (PEO C4I)

TPOC:
(619) 553-2861

Other transition opportunities: Unmanned Underwater Systems, Unmanned Aircraft Systems, Safety-critical systems of Autonomy and Automation, Counter Artificial Intelligence, Cyber, Integration of Automatic Identification System (AIS) Data through AI/ML Applications, Integration of Automatic Dependent Surveillance

https://www.dvidshub.net/image/6623716/ford-strike-group-air-defense-exercise

WHAT

Operational Need and Improvement: To make well-informed, accurate and timely decisions, artificial intelligence/machine learning is often used; e.g., automatic target recognition, ship or airplane tracking, cybersecurity, etc. However, AI/ML systems are opaque, and the predictions are unexplainable. They can often be fooled by novel, unexpected or corrupted data. This could have disastrous effects on C4ISR, unmanned systems, cybersecurity, etc. CORSI focuses on evaluating the robustness, safety, validation and verification of AI/ML systems. CORSI evaluates both white box (where the source code and the ML models are available) and black box (where ML application structure and details are unknown) AI/ML models. We have also developed adversarial attacks to AI/ML systems as well as created defenses against those attacks.

Specifications Required: The solution requires primarily requires input and output data pairs used in AI/ML. E.g., AIS track from three previous timesteps for training, and one for prediction; images and labels, text documents and categories, etc. (This data can also be multisensor, multimodal, etc.) If AI/ML models, either as white or black boxes, are available, that is also helpful. Domain knowledge and expected performance criteria are useful but not necessary.

Technology Developed: CORSI produces verification and validation of AI/ML systems. This means testing and certifying AI/ML systems to certain changes in inputs. Furthermore, CORSI also defends against adversarial attack performed on AI/ML systems.

Warfighter Value: CORSI enhances AI/ML systems delivering results that can be trusted and validated. This will lead to quicker and more accurate decisions in variety of fields such as C4ISR, unnamed systems, cybersecurity, etc. As the Navy continues to use more machine learning within and across domains, CORSI's value will also increase.

WHEN

Contract Number: N68335-20-F-0589   **Ending on:** November 8, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Define detailed technical specs	Low	Design document	3	TBD
Enhanced CORSI-DNN (Deep Neural Network) toolkit	Med	Data Flow Successful	5	TBD
Prototype Demo	Med	Data Flow Successful	6	TBD
If Option exercised Prototype Demo	Med	Technology Integration with C4ISR Program	7	TBD

HOW

Projected Business Model: The business model for the advancement and transition of CORSI is a combination of license and services for both defense and industry application. The platform can be hosted in the Cloud or onsite locally. Implementation includes not only the base technology but add-on applications for specific customer needs. As part of the services provided with the platform, Quantum Ventura will work with customers to ensure secure data integrations to existing legacy systems. We are also exploring "AI in a box", a complete hardware/software implementation of CORSI.

Company Objectives: Along with our strategic partner Lockheed Martin, we will target DOD customers and identify additional partners and customers to both scale the existing offering across defense and industry organizations as well as to identify new opportunities for engagement.

Potential Commercial Applications: CORSI has wide applicability in many different commercial applications where AI/ML technologies are used, e.g., image/video recognition, cybersecurity, natural language processing (NLP), etc. The technology is a system with dual-purpose defense and industry applicability. The verification and validation and defenses against adversarial attack capabilities of this platform will benefit organizations with high value assets and mission critical need to consistently and reliably operate. Beyond Navy use, defense applications include UAVs, UUVs, etc. Private sector applicability includes areas such as aviation, transportation and manufacturing.

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ABSTRACT

CORSI is a suite of AI/ML robustness, safety, validation and verification tools to ensure unacceptable behaviors will not occur in AI/ML systems. CORSI evaluates both white box (where the source code and the ML models are available) and black box (where ML application structure and details are unknown) AI/ML models. Upon evaluation, CORSI generates a comprehensive report highlighting the areas of risk, concern and shortcomings. CORSI assigns safety/robustness ratings and defends AI/ML systems against adversarial attacks. Quantum Ventura Inc. specializes in Advanced AI/ML, ML verification, Cybersecurity, HPC and Neuromorphic Computing. CORSI technology has wide appeal since it covers a variety of Machine Learning networks. With direct participation from Lockheed Martin as our development partner, we can globally transition our technology into commercial and defense sectors.

THUMBNAIL

The CORSI AI/ML verification and validation tool evaluates areas of risk, concern, and shortcomings of targeted machine learning systems. These tools are necessary for verifying and validating the robustness and safety in AI/ML applications, ensuring unacceptable behaviors will not occur.

KEYWORDS

Artificial Intelligence, Machine Learning, Deep Learning, Verification, Validation, Safety, Robustness

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NAVSEA #2021-0353

Topic # N193-A01

Aircraft Intent Inference based on Real-Time ADS-B Data Processing

The Innovation Laboratory, Inc.

WHO

SYSCOM: NAVSEA

Sponsoring Program: PEO-IWS 6.0 Command & Control Networking (navigation and networking between platforms)

Transition Target: All CEC Platforms (CVN, DDG, CG, E2D, and Future)

TPOC:
(202) 781-3014

Other transition opportunities: DoD applications requiring the persistent, automated monitoring of air traffic for nominal, off-nominal, and anomalous behavior will benefit from this technology. Additional transition opportunities include: Department of Homeland Security (DHS) applications, Federal Aviation Administration (FAA) applications, or other Air Navigation Service Providers (ANSPs) around the world requiring the monitoring of air traffic in the United States or elsewhere. Commercial Airlines benefit from automated monitoring and flight tracking of their fleets, supporting airline dispatchers.

Notes: Currently slated for CEC Increment II, Future Capability Group in the FY30 timeframe. CEC is enhanced capability; how platforms communicate; brings in data from a variety of sensors, combining that data, and provide that information at the track to the appropriate weapons system; can make decisions based upon that data. The system design includes Intent Inference for Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) traffic.

Image Courtesy of The Innovation Laboratory, Inc.

WHAT

Operational Need and Improvement: The Department of the Navy is interested in the development of cutting-edge AI/ML technologies to obtain solutions to the following and related Navy Focus Areas:
1 - Readiness and Sustainment; 2 - Unmanned Aircraft Systems Autonomy and Automation; 3 - Predictive Maintenance; 4 - Cyber; 5 - Counter Artificial Intelligence; 6 - Streamline Business Operations; 7 - Integration of Automatic Dependent Surveillance; 8 - Integration of Automatic Identification System (AIS) Data through AI/ML Applications; 9 - C4ISR (Test/Certify).

Specifications Required: The Navy leverages Automatic Dependent Surveillance - Broadcast (ADS-B) data as a new passively collected surveillance data source. The Navy's goal is to develop behavior models and supporting data based on ADS-B and other data sources that will be used to (1) identify apparent air corridors and (2) detect anomalous behavior in support of determining aircraft intent.

Technology Developed: Artificial Intelligence techniques are implemented to learn from large quantities of historical data to create succinct knowledge representations that enable the real-time identification of anomalous aircraft and to infer pilot intent. Navy and Air Force applications requiring the persistent, automated monitoring of air traffic for nominal, off-nominal, and anomalous behavior will benefit from this technology.

Warfighter Value: This technology can reduce Navy operator workload by autonomously monitoring aircraft ADS-B surveillance data and alerting the user of anomalous or off-nominal events, communicating in a human-interpretable language the likely pilot intent. Users benefit from technology that is real-time, automated, human understandable inferences, and is modular and flexible for adapting to mission needs.

WHEN

Contract Number: N68335-20-F-0566 **Ending on:** November 1, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Derivation of Core Intent Models	N/A	Pilot/Controller/Engineer Approval	3	November 2020
Design Complete for IFR and VFR	Low	Pilot/Controller/Engineer Approval	3	March 2021
Proof of Concept System Developed	Med	Software System T&E	4	June 2021
T&E for IFR and VFR Intent Inference Scenarios	Med	Software System T&E	4	July 2021

HOW

Projected Business Model: The Innovation Laboratory specializes in advancing basic innovations to prototype demonstration systems ready to transition into government and commercial systems. This technology is ready for transition to DoD prime/system integrators. For DoD and DHS customers, there will be no license fees. In this case, The Innovation Laboratory is expected to fit into the Program of Record's (PoR's) funding cycle for installation of new, enhanced versions, or refinements of intent inference models. Life cycle software management is expected to be performed by the DoD prime/system integrator. For commercial customers, the software will be sold for a price dependent on the number of users accessing the software or information provided by the software. Commercial customers are expected to integrate the software into existing dispatcher workstations. Improved software models will be available for purchase on a yearly basis.

Company Objectives: The Innovation Laboratory is interested in meeting DoD prime/system integrators who can transition this technology into a PoR. The goal is to transfer the technology at the TRL5 or TRL6 level and provide guidance on the design, engineering, software, and scenarios so that the prime/system integrator can perform the maturation to higher TRL levels. The long term objective is for The Innovation Laboratory to design, build, and test additional intent models that are suitable for improvements to the deployed system, and repeatedly transfer those models over to the prime/system integrator at the TRL5 or TRL6 level.

Potential Commercial Applications: Airline Dispatch Workstations; Anomaly Detection; Diversion Management; Estimated Time of Arrival

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NAVSEA #2021-0353

Topic # N193-A01
Aircraft Intent Inference based on Real-Time ADS-B Data Processing
The Innovation Laboratory, Inc.

ABSTRACT

Artificial Intelligence techniques are implemented to learn from large quantities of historical data to create succinct knowledge representations that enable the real-time identification of anomalous aircraft and to infer pilot intent. Navy and Air Force applications requiring the persistent, automated monitoring of air traffic for nominal, off-nominal, and anomalous behavior will benefit from this technology. This technology has a proven Ph.D. thesis-level foundation, is scalable to the size of the surveillance problem (number of aircraft), exploits data representations that facilitate real-time applications, creates human-understandable inferences, and is modular and flexible for adapting to mission needs. The technology is ready for transition to DoD prime/system integrators. The Innovation Laboratory specializes in advancing basic innovations to prototype demonstration systems ready to transition into government and commercial systems.

THUMBNAIL

Artificial Intelligence techniques enable the real-time detection of anomalous aircraft and to infer pilot intent. Applications requiring the persistent, automated monitoring of air traffic for nominal, off-nominal, and anomalous behavior will benefit. The technology is ready for transition.

KEYWORDS

Aircraft Surveillance; Anomaly Detection, Intent Inference, Artificial Intelligence; Machine Learning;

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Company	Topic #	Project	SYSCOM
Continuous Solutions LLC	N19A-T007	Power-Dense Electrical Rotating Machines for Propulsion and Power Generation	NAVSEA
Luna Innovations Incorporated	N161-047	Universal Non-Intrusive Battery Monitoring and Failure Prediction System	NAVSEA

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NAVSEA #2021-0433

Topic # N19A-T007
Power-Dense Electrical Rotating Machines for Propulsion and Power Generation
Continuous Solutions LLC

WHO

SYSCOM: NAVSEA

Sponsoring Program: Guided-Missile Destroyer Program - PMS 460

Transition Target: Guided-Missile Destroyer Program - PMS 460

TPOC:
215-897-7627

Other transition opportunities: The Navy will be able to utilize these advances as well as the new solution that yields an increase in power density. Other transition opportunities for this technology include commercial ship and offshore systems that could benefit from reduced volume of mechanical equipment.

Notes: The Navy seeks to develop technology necessary to support design, construction, and qualification of affordable power-dense electrical rotating machines (motors and generators) for shipboard application. Rotating machines have not seen comparable improvement due to physics limitations, lack of business case for typical commercial applications, and limited industry base.

Image courtesy Continuous Solutions, LLC

WHAT

Operational Need and Improvement: The Navy is embarking on an aggressive and innovative Power and Energy Program for application on future surface ships and underwater vehicles. Enabling an Integrated Power and Energy System (IPES) on smaller surface combatants will allow smaller ship classes to implement high-power/energy weapons and sensors, such as larger directed energy weapons, sensors with further range and fidelity, and higher-speed operations. Navy is striving to distribute an order of magnitude increase in electrical power without increasing system space and weight, or reducing efficiency.

Specifications Required: The Navy seeks technologies to develop a high-power density rotating machine that features an increase in power density of at least 50% more than the present state of the art. A goal of this effort would be to deliver a system that provides 50% more power without an increase in weight or space requirements. This will enable high-energy weapons and sensors to be deployed on ship platforms that would otherwise not have sufficient margin to power these systems.

Technology Developed: Future Navy Ships will require more powerful rotating machines to fit within similar volumes as the current equipment to accommodate new high-power/energy weapons and sensor systems currently under development. This increase in power density will require new techniques for heat removal, increased magnetic flux densities, and increased mechanical stresses simultaneously. Advances in power electronics have allowed reductions in power converter size. Increased space availability is realized due to usage of a more power-dense machine. Continuous Solutions' has designed and built a scalable electric motor with over 50% increase in power density than state of the art.

Warfighter Value: The increase in power density may also produce spatial savings within the distribution and power conditioning equipment by improving power quality and reducing the amount of power conversion equipment needed to meet mission system power requirements. Increasing power density in the large rotating machines (generators, large motors) will make more space available for advanced weapons and sensor systems and the power distribution and conditioning equipment necessary to provide electrical power to them.

WHEN

Contract Number: N68335-21-C-0081   **Ending on:** November 20, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
10 kW Verification and Validation	Med	Testing completed	6	October 2021
100 kW Critical Design Review	Low	Approval from TPOC on design approach	6	September 2021
100 kW Preliminary Design Review	Low	Approval from TPOC on design approach	6	August 2021
100 kW Procure and Assembly	High	100 kW assembled on time	7	March 2022
100 kW Test Plan	Low	Submit Test Plan to TPOC with approval	7	May 2022
100kW Verification and Validation	Med	Testing completed	7	July 2022

HOW

Projected Business Model: The goal is to secure the IP for both the inverter and motor technology combined and separately if possible. We are able to low scale manufacture our units (sub 100 units), once we get orders above 100 units, we'll leverage our corporate partnerships to find line of credits on their manufacturing floor.

Company Objectives: Continuous Solutions will expand development for the inverter (motor controller) for applications in the Electric Vehicle market to be the number 1 manufacturer of WBG inverters for EV applications. Continuous Solutions will develop further the packaging and implementation of the larger power levels for commercial electric ship applications which will lead to military applications.

Potential Commercial Applications: Commercial shipping electrification efforts, Electric Vehicle applications, generators, HVAC systems.

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NAVSEA #2021-0433

Topic # N19A-T007
Power-Dense Electrical Rotating Machines for Propulsion and Power Generation
Continuous Solutions LLC

ABSTRACT

The Navy seeks technologies to develop a high-power density rotating machine that features an increase in power density of at least 50% more than the present state of the art. Continuous Solutions (CS) has designed an electric motor which is set to outperform the state-of-the-art propulsion motor's power density by over 50%. CS, founded in 2014, has been a leader in the power and energy field for designs state of the art power and energy devices. The targeted defense application is Next Generation Destroyer Program (DDGX) propulsion applications at 20MW, and power generation at reduced-scales 10kW, 100kW, etc. There is market demand for power-dense motors in and out of the navy applications. CS achieved a power density that will secure its competitive advantage in many applications. CS accomplished a reduced scale size electric motor at 10 kW and inverter to conduct in-lab proof of concept. CS is looking for defense customers and prime contractors to bring this technology to scale.

THUMBNAIL

Continuous Solutions' electric motor outperforms the current propulsion motor's power-density by over 50%. Targeted defense applications are DDGX propulsion at 20MW, and power generation at reduced-scales 10kW, 100kW, etc. Market demands for power-dense motors in and out of the navy applications.

KEYWORDS

Power dense, power generation, propulsion, rotating machines, electric motors, SWaP, torque density,

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NAVSEA #2021-0473

Topic # N161-047

Universal Non-Intrusive Battery Monitoring and Failure Prediction System

Luna Innovations Incorporated

WHO

SYSCOM: NAVSEA

Sponsoring Program:

Transition Target: DDG(X) / PMS 460

TPOC:
(215)897-1413

Other transition opportunities:
Military (Navy, Army, NASA):
Underwater vehicles, Surface Shipboard Energy Storage, Battery Testing and Qualification

Civilian:
Electric Vehicles and Charging Stations, Reusable Energy Storage, Aircraft Battery Systems

Notes: In addition to monitoring for faults on Navy energy storage systems, the system can be used in both government and civilian cases for damage propagation studies, thermal characterization of batteries, and structural health monitoring of battery enclosures. Testing has demonstrated fiber optic technology as a safe, effective, and efficient design and monitoring tool at the cell, module, and battery level.

This technology will serve as the fault detection system which is critical to the adoption of the high power energy storage necessary to supply future shipboard needs

WHAT

Operational Need and Improvement: Various reasons such as overcharge, impact, manufacturing issues, or defects as a function of cyclic fatigue can cause a fault in the batteries used on Naval systems. When a fault occurs, the battery releases toxic and flammable gases which can start and feed a fire or cause significant equipment damage and present catastrophic hazards to personnel safety. If detected early, valuable warnings of single or multiple cell issues can be provided before they evolve into bigger and more hazardous issues that may result in injury to personnel and equipment.

Specifications Required: A battery fault detection system is needed to provide operators with real-time audio and visual feedback of cell and battery faults that may lead to a battery casualty and failure. The threshold space, weight, and power requirements for some applications can be as small or low as 400 cm3, 1kg, 25 watts. The system needs the capabilities of being externally powered via an adaptor relevant for the deployed platform and ruggedized in order to withstand worst-case environments that exist prior to a failure. Similarly configurations will be needed such that it can monitor and detect a single cell event, or multiple events inside the battery enclosure with 100% probability.

Technology Developed: Luna Innovations, a global leader in optical sensing and network analysis, has developed and successfully demonstrated a high spatial density, early warning battery fault indication system that can rapidly detect single or multiple cell issues and will provide operators with real-time audio and visual feedback of cell and battery faults that may lead to a battery casualty/ failure

Warfighter Value: Early warning allows operators more time to complete required preventive and corrective actions, ensure personnel and platform safety, and reduce the probability of asset loss – increasing readiness.

WHEN

Contract Number: N68335-18-C-0227   **Ending on:** May 7, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrate Cell Temperature Measurements	N/A	Accurately Measure Cell Temperature	3	January 2017
Demonstrate Failure Detection	N/A	Validate Different Fault Type Detection	4	April 2019
Reduce System SWaP and Integrate into BMS	Low	Prototype SWaP and Complete BMS Integration	5	December 2021
Integrate Prototype System into Testbed Control Loop	Low	Perform Control with Improved Prototype	6	April 2022
Integrate and Test on a Navy Battery	Med	Detect Fault in an Operational System	7	July 2022
Shipboard Qualification	Med	Pass Applicable Mil-STD Testing	8	July 2023

HOW

Projected Business Model: Luna envisions a combination of direct sales and licensing of the battery fault detection system. The application for this technology builds on Luna's current product lines and expertise, providing a pathway for direct dales to DoD and Civilian test facilities and key applications. Customers such as electric vehicle and battery manufacturers, energy storage system companies, and testing laboratories are ideal candidates direct sales of a non-qualified version of the system. The shipboard qualified fault detection system would be licensed to a systems integrator or directly to a prime.

Company Objectives: Luna seeks to achieving "buy-in" from early adopters in the research, commercial, and defense industries. Luna has existing accounts with many prime defense contractors in this space who have had favorable experiences using our distributed sensing products. Luna will work to secure one of these industry players as a Phase III partner to aid in selecting the best method for demonstrating the system on a Navy battery or equivalent power system. Luna is also looking to the Navy for an opportunity to integrate into and test at one of their facilities to complete TRL 7 testing. Phase III funding will originate from an industry partner combined with funds from government stakeholders that will enable the qualification of the system for the shipboard environment. Once qualified, the technology can be transitioned to a Prime for deployment.

Potential Commercial Applications: There are numerous commercial applications for a civilian system within the automotive and energy industries. The development and adoption of electric vehicles is driving the need for new battery designs and chemistries. All of these will require extensive testing to ensure maximum safety. While deployment of a system onto every car will not be feasible, applications exist such as enabling rapid charging by including only the sensor on the car and a control system within the charger or enabling inspection after an accident. Within the energy industry the advancement of renewable energy sources that generate power during certain periods and require storage during others in order to stabilize the supply, have a need for autonomous fault monitoring to ensure energy security. Both of these markets are growing at a rapid pace and would be well severed by the technology.

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NAVSEA #2021-0473

Topic # N161-047
Universal Non-Intrusive Battery Monitoring and Failure Prediction System
Luna Innovations Incorporated

ABSTRACT

Luna Innovations has successfully demonstrated an early warning battery fault indication system that simultaneously monitors every cell within a battery. This system rapidly detects single or multiple cell issues, providing operators with real-time audio and visual feedback of faults that may lead to a battery casualty/failure. Early warning allows operators sufficient time to complete required preventive and corrective actions. This capability ensures personnel and platform safety and reduces the probability of asset loss – increasing readiness. Utilizing non-conductive optical fiber, the system is ideally suited to monitor the temperature of energy storage systems used for weapon systems and high energy, short pulse applications. Low SWaP, it can be easily and safely integrated into various types/configurations of batteries, configurable electronics, and legacy/future platforms.

THUMBNAIL

Using a single sensor to monitor an entire battery, Luna has successfully demonstrated a technology that enables early/rapid detection of cell and battery faults and will provide operators with real-time audio and visual feedback of conditions that may lead to a battery casualty/failure.

KEYWORDS

Battery Management, Thermal Runaway, Integrated Sensors, Fiber Optic, Temperature Sensors, Battery Monitoring

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Company	Topic #	Project	SYSCOM
Boston Engineering Corporation	N191-024	CONEXUS: Comms and Operation Node for Expeditionary Underwater Systems	NAVSEA

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NAVSEA #2021-0459

Topic # N191-024

CONEXUS: Comms and Operation Node for Expeditionary Underwater Systems

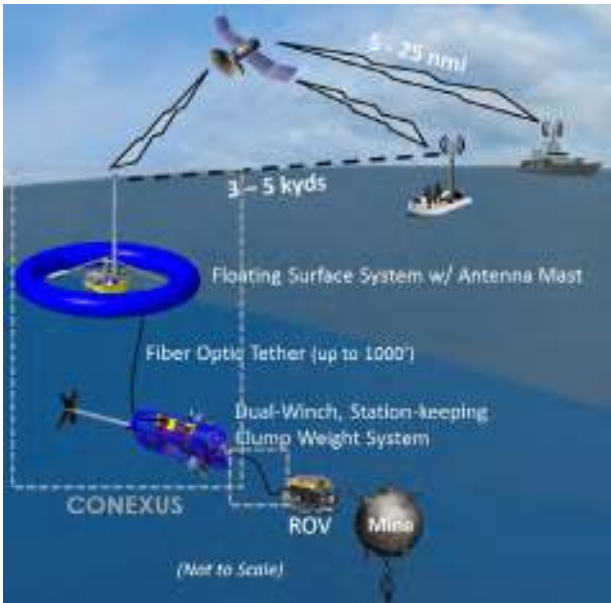Boston Engineering Corporation

WHO

SYSCOM: NAVSEA

Sponsoring Program: PEO USC / PMS 408

Transition Target: PMS 408

TPOC:

Other transition opportunities:

WHAT

Operational Need and Improvement: EOD operators need a fully integrated, expeditionary, autonomous tether management system to provide long range standoff operation of remotely operated vehicles (ROVs). Currently, operators that use ROVs need to remain relatively close for operations in maritime mine areas. A fully integrated intermediate system between operators and the ROV provides ROV operations at depth and supports safe separation of personnel.

Specifications Required: CONEXUS (Communication and Operation Node for Expeditionary Underwater System) must provide seamless command and control at standoff distances with sufficient communications quality and speed from operators to and from the ROV. This system must operate in a range of sea states and depths and must provide ROV operation without direct connection to an on site vessel (often an 11m RHIB). Overall, the system must be expeditionary and not inhibit operational tempo.

Technology Developed: CONEXUS is comprised of a "Clump ROV" (set of 2 winches with station keeping that connects to an EOD ROV, isolating it from tether forces) and a floating surface system that houses the antenna and mast to communicate with remote users. Tether management in challenging conditions, minimizing SWaP, and ROV localization are the main technical risks being addressed early in PH I and II.

Warfighter Value: CONEXUS supports the warfighter by extending surface lateral standoff range between EOD technicians and their ROVs to several thousand yards without compromising command and control capability. CONEXUS supports the warfighter by extending surface lateral standoff range between EOD technicians and their ROVs to several thousand yards without compromising command and control capability.

WHEN

Contract Number: N68335-21-C-0153   **Ending on:** December 15, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Initial communications and surface float system tests	Low	Test tank stability and littoral test execution	4	December 2019
Surface system and winch in water testing	Low	Tether tension and wind confirmation, surface system stability to Sea State 3	5	December 2021
Combined system testing	Low	Field winching and communications testing	5	December 2022
Full communications and operations test	Med	Full system test with ROV and standoff	6	December 2023

HOW

Projected Business Model: To refine the design and achieve a TRL 7/8 solution for the stated need, Boston Engineering is interested in exercising both the Phase II Option 1 and Option 2 components of the current contract. Acquisition beyond intermediate R&D funding would occur in alignment with PMS 408's 'Maritime Expeditionary Standoff Response System of Systems (MESR SoS)' Program of Record, possibly executed under a broader Phase III contract. Boston Engineering is expecting to produce the product itself, leveraging contract manufacturers as appropriate, and is targeting availability on FedMall (or similar) by 2023-2024.

Company Objectives: Boston Engineering's objective is to transition CONEXUS to support NAVSEA, PEO USC, PMS 408, and specific EOD units engaging with ROV operations. The current PH II SOW includes TTP and TTA development specifically working towards incorporating CONEXUS within the PMS408 'Maritime Expeditionary Standoff Response System of Systems (MESR SoS)' Program of Record with NIWC-PAC as Technical Design Agent (TDA). Boston Engineering continues to look for sponsors, teammates, testing, and other support to decrease transition risk and overall barriers for Navy adoption.

Potential Commercial Applications: CONEXUS's standoff capability is especially valuable for EOD personnel, however, it is also valuable in other fields, such as pipeline inspection, underwater infrastructure inspection, and other related Renewable Energy and Oil & Gas needs. Extended standoff could support less intrusive inspection of underwater ecosystems where vessels are prohibited. Boston Engineering is actively assessing commercial applications for the CONEXUS system as a whole and for its subcomponents. The surface communications system could support various ocean surface gateway communication needs including oceanographic, research, government, and military operations.

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NAVSEA #2021-0459

Topic # N191-024
CONEXUS: Comms and Operation Node for Expeditionary Underwater Systems
Boston Engineering Corporation

ABSTRACT

The Navy's continued pursuit of standoff in dangerous and high-risk environments is challenging for Navy Explosive Ordnance Disposal (EOD) operators due to ocean currents, operating at deep depths, and physics' limitations on underwater communications. Boston Engineering had developed the Communications and Operation Node for Expeditionary Underwater Systems (CONEXUS), an integration kit that provides 3-5kyds of standoff between expeditionary EOD team and the remotely operated vehicles (ROVs) they use to interrogate/neutralize mines. CONEXUS consists of a floating surface system, a station-keeping clump weight device, a pair of smart, collaborative submersible winches, and the needed interfaces to ROVs. The inflatable floating surface system keeps its antenna mast vertical and is designed to be expeditionary and easy to. The surface system is connected to a smart "clump weight" in the form of a station-keeping clump device with thrusters, a stabilizer, and dual winches to manage fiber optic tether lengths from the surface and to the ROV. CONEXUS integrates a range of ROV's from the currently used and in-evaluation, without impacting existing EOD operations, CONOPs, or training. This approach is supported by our highly experienced team, mission options for the future Navy, and high probability of productization and transition success.

THUMBNAIL

Boston Engineering had developed the Communications and Operation Node for Expeditionary Underwater Systems (CONEXUS), an integration kit consisting of a floating surface system and a station keeping clump device with winches to provide 3-5kyds of standoff operation of EOD teams and their ROVs.

KEYWORDS

EOD, ROV, Communications, Node, Safe Standoff, Fiber Optic, Winch, Tether Management, Expeditionary

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Company	Topic #	Project	SYSCOM
Learntowin, Inc	AF192-D001	Mobile Training Content Delivery Platform	NAVWAR

WHO

SYSCOM: NAVWAR

Sponsoring Program: PEO Manpower, Logistics, and Business

Transition Target: Naval Education and Training Command

TPOC:
808-471-0326

Other transition opportunities: NAVWAR, NAVSEA, NAVAIR, NAVSUP, NAVFAC

Notes: - Learn to Win technology is being leveraged across multiple Department of Navy use cases to include:
-- NAVWAR: NIWC LANT Model Based Systems Engineering, NAVWAR 6.0 Project Management, NAVWAR 5.0 Engineering, PMW 240 Agile/Scrum
-- NETC: Center for Navy Aviation Technical Training (CNATT), Submarine Learning Center (SLC), Afloat Training Group (ATG)
-- NAVAIR: CMV-22B Osprey squadron, HSC-3 Helo squadron
- This technology is also commercializing across the Air Force and Space Force in several operational and training units.

WHAT

Operational Need and Improvement: Need to enhance the warfighter effectiveness and efficiency through a transformed learning culture where anywhere, anytime access to tailored learning curriculum is required to ensure the warfighter is prepared for every scenario he/she faces. Learn to Win provides any subject matter expert (particularly those without software programming backgrounds) the ability to rapidly develop instructionally sound microlearning. Securely hosted on government servers with an accreditation up to CUI (controlled unclassified).

Specifications Required: Make learning and the development of instructionally sound learning curriculum accessible to the Navy total force regardless of educational/computer science background.

Technology Developed: Mobile first, active learning software platform that includes iOS, Android, and web applications students/learners as well as a web application for instructors/designers. This fully accredited training platform provides instructors with speed to develop content; learners with anywhere, anytime access to content; and course administrators with instantaneous feedback on course effectiveness, learner engagement, and outcomes.

Warfighter Value: Ensure that the warfighter is prepared and ready to meet the current and future needs of the fleet. The ability to iterate on learning through instantaneous feedback and immediate adjustments allows trainers of any background to develop tailored learning curriculum so that every student is ready to perform. Reduce or eliminate atrophy of knowledge and perishable skills by providing periodic, timely, 3-5 minute microlearning sessions to the warfighter, anytime, anywhere. Instructors will save 5x time developing content compared to alternative tools. Save/reduce astronomical TDY to school costs by bringing this mobile-first platform directly to the end-user. Whether in a Shore Command, System Command, in the Atlantic or Pacific Fleet as part a surface, air, or submarine force, Learn to Win brings the training when and where you need it!

WHEN

Contract Number: N68335-20-C-0691

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Use Case Prototyping & Validation	N/A	Decreased time to develop content, Reduced expense for delivering training, Better prepared / performing warfighters	TRL 7	July 2021
Phase 3 Transition	Low	Licenses procured by central office to kickstart the transition to Phase 3	TRL 8	August 2021
ATO up to IL6 (Secret)	Low	Ability to host up to Secret level information	TRL 8	October 2021
New Feature Development	Low	Product enhancements that better meet the needs of the DoN	TRL 8	January 2022

HOW

Projected Business Model: Annual software licensing subscription - per user (student) cost basis.

Company Objectives: To find customers/partners who will benefit from a revolutionized approach to teaching and learning - flipped classroom, on-command, on-demand learning, no-code content development, spaced repetition, active learning.

Potential Commercial Applications: This product was initially adopted by athletes needing a better way to learn playbooks and scouting reports. Since, it has expanded across a variety of commercial markets - medical device and pharmaceutical sales training, oil and gas safety training, manufacturing maintenance training, and fast food delivery training to name a few. We are in early discussions with a few defense prime vendors about better delivering their training/reference manuals for high-end products such as new aircraft.

Contact: Van East, Head of Strategic Initiatives
van@learntowin.us   615-972-7190

ABSTRACT

Reduce training time, enhance knowledge retention, and better prepare warfighters with Learn to Win. Traditional training disrupts Sailors' duties, productivity, and performance. The Learn to Win solution reduces cost, decreases training risk, and delivers better results to your command.

Learn to Win is a portable, agile learning platform designed to empower Sailors and Marines to become more efficient learners and more effective instructors. Rapidly create training content, push it out to users on any device (phone, tablet, desktop), and see instant results on how students are performing. Learn to Win is accredited to host controlled information (CUI) through NIWC LANT, and it only takes a MIPR to procure licenses. Whether you're on a ship, in a schoolhouse, or at a civilian office, Learn to Win can save you time and money on training.

THUMBNAIL

Reduce training time, enhance knowledge retention, and better prepare warfighters with Learn to Win. Traditional training disrupts Sailors' duties, productivity, and performance. The Learn to Win solution reduces cost, decreases training risk, and delivers better results to your command.

KEYWORDS

Active learning, anywhere/anytime access, advanced learning analytics, empowered subject matter experts, improved training quality, meeting warfighter at their time of need, transformed learning culture

CONTACT

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Company	Topic #	Project	SYSCOM
Hood Technology Corporation	SB052-028	Development of DSTS; a Digital Static Tracking System	NAVAIR
SA Photonics, Inc.	N181-022	Laser Periscope Detection	NAVAIR
SA Photonics, Inc.	N18A-T021	Triton: Active Imaging through Fog	ONR

Department of the Navy SBIR/STTR Transition Program

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Topic # SB052-028
Development of DSTS; a Digital Static Tracking System
Hood Technology Corporation

WHO

SYSCOM: NAVAIR

Sponsoring Program: IR/RF Countermeasures Div, WXRD, NSWC Crane

Transition Target: Phosphorous Decoy Flare Trajectory Mapping

TPOC:
(812)854-4065

Other transition opportunities: The Digital Static Tracking System is readily deployable to track any visible object in the electro-optical spectrum (or infrared if an IR imager is substituted). For example, mapping the trajectory of a terminal guidance ordinance for which GNSS data is not readily available due to the destructive nature of the target. Or tracking an adversarial aircraft through a roughly predetermined region of the sky.

Notes: The DSTS can also be used for surveying non-moving objects without the need for the persistent presence of a human operator.

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WHAT

Operational Need and Improvement: Offered as a portable, lower cost, simpler version of a legacy target tracking system currently in use on bombing ranges, the DSTS a good alternative for small teams to set up quickly. Storage and maintenance of the DSTS is minimal in comparison to mechanical tracking equipment. Training a team to use the DSTS takes a single day. Highly modular, the DSTS can be adapted to track a variety of targets in almost any environment. The entire DSTS can be transported in a pickup truck.

Specifications Required: The requirements of the DSTS were to track a ballistic decoy flare with greater accuracy than GNSS and greater precision than existing mechanical tracking equipment.

Technology Developed: The Digital Static Tracking System is a portable tracking system using multiple imaging nodes to track airborne objects through a pre-specified volume in the sky.

Warfighter Value: Using the DSTS will give weapon and countermeasure development teams more flexibility in conducting tests, especially on short timelines and with limited personnel in rugged environments.

WHEN

Contract Number: N68335-20-C-0396   **Ending on:** December 31, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Node Build and Test Report	N/A	Demonstrate preliminary design and build of prototype.	TRL 3. Completed prototype.	November 2020
Report of Imaging Flares and Algorithmically Tracking	N/A	Demonstrate feasibility of technology.	TRL 5. Tested prototype.	January 2021
First DSTS Field Evaluation	N/A	Demonstrate technology and shakedown technical problems.	TRL 6. First field deployment.	July 2021
Second DSTS Field Evaluation	Low	Demonstrate resolution of any problems.	TRL 7. Second field deployment.	July 2021
Third DSTS Field Evaluation	Low	Final, training deployment to on-board Prime Contracting Agency for handover of technology.	TRL 8. Third field deployment with training of end users.	September 2021
DSTS System Hardware and User's Manual	Med	Prime Contracting Agency takes possession of technology for field use.	TRL 9. Completed Phase II Product for handoff.	December 2021

HOW

Projected Business Model: Hood Technology Corporation is in the business of designing, validating, building and selling small, precision pointing devices. The DSTS is the first ground-based target tracking system from Hood Tech. Future sales of this product to the prime contracting group or to another group within the DoD would generate business for Hood Tech. Improving the DSTS or customizing the product for other uses would also generate business for Hood Tech.

Company Objectives: With regards to the DSTS project, Hood Tech is pleased to provide the engineering, testing, and logistical expertise to develop a custom solution for the DoN. This has been an interesting project which expands the company experience and perhaps opens the door to future projects through contacts made during implementation of the DSTS.

Potential Commercial Applications: Commercial uses of this technology could include tracking the trajectory of moving objects in any transparent medium. General survey work can also be accomplished with this equipment.

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Topic # SB052-028
Development of DSTS; a Digital Static Tracking System
Hood Technology Corporation

ABSTRACT

The portable Digital Static Tracking System (DSTS) uses multiple imaging nodes to track airborne objects. Hood Technology Corporation is an Oregon engineering business specializing in stabilized pointing. Successful deployment of the DSTS has been demonstrated at the Gila Bend bombing range using multiple A-10 aircraft dropping phosphorous decoy flares. The DSTS is a smaller, lighter, lower cost, and modular version of legacy equipment currently in use for tracking decoy flare trajectories. Other uses could include tracking the trajectory of moving object in any transparent medium. This technology has been demonstrated in the field and is being handed off to the prime contracting group for continued used as a product. Moving forward, several innovations could be implemented to improve this technology. Further funding is required.

THUMBNAIL

The Digital Static Tracking System is a portable multi-node imager to track airborne objects. Successful deployment of the DSTS has been demonstrated. The DSTS is a smaller, lighter, lower cost version of legacy equipment for tracking decoy flares.

KEYWORDS

Digital, static, tracking, portable, modular, theodolite, flares, photogrammetry, survey, imaging

CONTACT

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WHO

SYSCOM: NAVAIR
Sponsoring Program: PMA-299
Transition Target: MH-60 Helicopters
TPOC:
(301) 995-7098
Other transition opportunities: In addition to Navy Maritime Helicopters, Maritime Patrol and Reconnaissance Aircraft and U.S. Air Force integration is a possibility.
Notes: Prototype model of TRL6 HawkEye system is pictured at right.

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WHAT

Operational Need and Improvement: The need exists for improved periscope detection and better LIDAR target ID capabilities, to aid existing radar periscope / target detection. Combining data from different spectral bands increases the LIDAR probability of target detection, and reduces the probability of false alarms. A laser periscope detection system is needed that can be used with or without radar queueing, and can be integrated with existing or planned future platforms, for maximizing deployment capability.

Specifications Required: The key threshold performance objectives of the laser periscope detection are: (1) Range 8 – 22 km (post-Phase II); (2) Laser beam quality M^2 <2; (3) Probability of periscope detection >0.9; (4) Probability of False Alarm 1E-6; (5) Field of Regard 360°, gimbal/pod limited.

Technology Developed: SA Photonics is developing our HawkEye™ LIDAR system to address the need of long stand-off range target detection and identification in maritime conditions. HawkEye utilizes a unique, high power yet eye-safe supercontinuum fiber laser and a multispectral detection system that enables high probability of detection, discrimination from the surface return and the ability to scan a larger region of interest. The HawkEye system is a complete LIDAR detection system with built-in beam direction control, real time data display and standardized gimbal control capabilities. HawkEye will have SWaP versions adjusted to platforms/deployment modalities, such as MH-60 and P8.

Warfighter Value: The HawkEye system will greatly improve the Warfighter ability to detect and identify maritime targets of interest at long range, facilitating defense against submarines and semi-submergibles. This will not only aid ASW missions, but improve overall warfighting / targeting capabilities of the modern fleet.

WHEN

Contract Number: N68335-20-C-0347   **Ending on:** June 16, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Critical Design Review	Low	Detailed Design Complete	4	December 2020
System Integeration & Test	Low	Successful system integration of all subsystems	5	February 2022
Outdoor Test and Characterization of the System Prototype	Med	Successful testing	6	June 2022
Platform Integration / Tests	Med	Successful testing	7	June 2023

HOW

Projected Business Model: SA Photonics intends to undergo production of the HawkEye engineering model, qual and flight units of the post-Phase II payload-integrated prototypes. The company has a history of successful small-scale production for commercialized SBIR products. For larger quantity manufacturing we will work with our contract-manufacturing partner currently used for our commercial FSO system manufacturing.

Company Objectives: SA Photonics' HawkEye system is positioned to be a key enabler of Navy long-range target ID capabilities while providing a cost-saving and performance-improving ASW system to DOD. As a result, we are excited to present the product to a range of program offices at the FST, as well as a number of prime contractors, specifically those who work with MH60 and P8 platform integration.

Potential Commercial Applications: The primary application for HawkEye is with periscope detection on Navy ASW airborne platforms. However there are many secondary markets we plan to pursue, including UAVs, ISR aircraft, Search & Rescue and commercial lidar.

Contact: Dave Pechner, Chief Technology Officer
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ABSTRACT

Detection and discrimination of periscopes at stand-off distances is an ongoing need of the Navy. Current airborne radar systems have limited detection range for small objects, reduces search capability in periscope detection mode and are ill-suited for smaller air vehicles due to their large footprint. SA Photonics HawkEye™ lidar system utilizes a Master Oscillator Power Amplifier (MOPA) fiber-based, wide band supercontinuum laser system that could be developed for high probability of detection, discrimination from the surface return and the ability to scan a larger region of interest. The HawkEye system is a complete lidar detection system with built-in beam scanning, gimbal control capabilities and high sensitivity digital receiver. The HawkEye system has low SWAP and is compatible with typical turrets deployed on MH-60 and P8.

THUMBNAIL

HawkEye™ is a wide band supercontinuum lidar ASW system that enables high probability of detection, discrimination from the surface return and the ability to scan a large region of interest. The system offers complete lidar detection with built-in beam scanning, gimbal control capabilities and a high sensitivity digital receiver.

KEYWORDS

Airborne, Anti-Surface Warfare, Periscope Detection, Maritime Environment, Anti-Submarine Warfare (ASW), Laser Detection

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Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-8600-21

Topic # N18A-T021

Triton: Active Imaging through Fog

SA Photonics, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: PEO IWS 2, PEO IWS 3

Transition Target: SEWIP; SPIER

TPOC:
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Other transition opportunities: In addition to USN ships needing active imaging, this technology has potential to transition to other DOD platforms in need of improved target identification and imaging in adverse visibility conditions.

Notes: The image at right shows Triton™, SA Photonics' active imaging system.
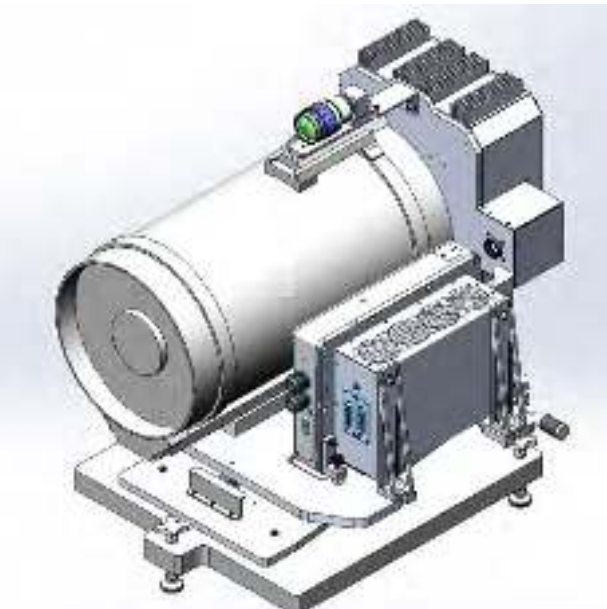
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WHAT

Operational Need and Improvement: The U.S. naval fleet is often present in congested waterways throughout the world for a variety of humanitarian and military purposes. EO/IR imaging systems are often employed in such settings to maintain SA as well as for target recognition, tracking, and identification. However, EO/IR imagery is highly susceptible to degradation caused by scattering from ubiquitous, water-based aerosols. Imaging through dense fog is the quintessential hard problem, as strong scattering generates a large, uninformative background, while information-carrying ballistic photons are severely attenuated. The goal of active imaging is to augment target illumination intensity, while selectively detecting returned ballistic photons against extraneous background.

Specifications Required: The primary requirement of this program is to increase the range of imaging through dense fog by 10X or greater. A design with minimized SWaP and mechanical robustness against shock and vibration is also necessary.

Technology Developed: SA Photonics' Triton™ system will enhance the ability to see through highly attenuated, highly scattering environments. Triton utilizes new eyesafe, hybrid fiber-bulk laser technology capable of high pulse energy at high repetition rate to produce a scanning imaging lidar system capable of enhanced range in fog. In addition, the Triton lidar system will be capable of operation in the midwave infrared spectral region by frequency conversion of the laser using new nonlinear materials, allowing the system to operate at wavelengths with reduced scattering by fog.

Warfighter Value: Triton improves the ability to detect and identify approaching, highly mobile maritime threats, greatly improving Warfighter safety. In addition, the laser technology to be developed may be applied in a range of applications requiring increased range transmission through the atmosphere, including standoff chemical detection and infrared countermeasures.

WHEN

Contract Number: N68335-20-C-0251   **Ending on:** March 4, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Preliminary Design Review	Low	Completed review	3	4th QTR FY20
1640 nm System Integration and Test	Low	Successful integration of all subsystems	4	4th QTR FY21
Naval Field Testing in Dense Fog	Med	Successful tests	5	3rd QTR FY22
MWIR Integration and Test	Med	Successful tests	6	1st QTR FY23

HOW

Projected Business Model: SA Photonics intends to undergo low rate production of Triton systems using our in-house manufacturing capability. The company has a history of successful small-scale production for commercialized SBIR products. For larger quantity manufacturing, we would work with our contract-manufacturing partner currently used for our commercial optical communication system production.

Company Objectives: The Triton system is positioned to be a critical performance- and safety-improving maritime imaging system, with potential application to a variety of platforms. As a result, we are excited to present the product to a range of program offices in the DoD, as well as a number of prime contractors.

Potential Commercial Applications: In addition to defense applications, Triton will have future uses with analogous commercial vessels navigating through fog. Also, Triton has the ability to aid autonomous systems' lidar/ladar hardware when used in dense weather environments.

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ONR Approval #43-8600-21

Topic # N18A-T021
Triton: Active Imaging through Fog
SA Photonics, Inc.

ABSTRACT

Naval vessels require early detection and identification of approaching maritime threats. Active imaging systems used in degraded visual environments, like those found in marine fog and other areas with a high level of attenuation and scattering from obscurants like rain, smoke and dust are still limited in range and resolution. SA Photonics is taking advantage of new eyesafe, hybrid fiber-bulk laser technology capable of high pulse energy at high repetition rate to develop a scanning imaging lidar system capable of enhanced range in fog. Our Triton™ lidar system will be capable of operation in both near infrared and the midwave infrared spectral region by frequency conversion of the laser using new nonlinear materials, allowing the system to operate at wavelengths with reduced scattering by fog.

THUMBNAIL

Naval vessels require early detection and identification of approaching maritime threats. Triton™ is a technology capable of high pulse energy at high repetition rate allowing lasers to propagate in dense fog and obscurants, providing an optimized lidar imaging system.

KEYWORDS

lidar, ladar, fog, imaging, high scattering, midwave infrared, nonlinear frequency conversion

CONTACT

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Company	Topic #	Project	SYSCOM
SA Photonics, Inc.	N122-146	SkyLight Free-Space Optical Terminal for Cubesats	NAVWAR

Department of the Navy SBIR/STTR Transition Program

Topic # N122-146
SkyLight Free-Space Optical Terminal for Cubesats
SA Photonics, Inc.

WHO

SYSCOM: NAVWAR

Sponsoring Program: Program Executive Office for Space Systems (PEO Space Systems)

Transition Target:

TPOC:

Other transition opportunities: This free space optical (FSO) technology is not limited to Navy space applications. In addition to space programs with other departments, SA Photonics is also pursuing uses with unmanned aerial vehicles (UAVs), littoral naval applications, and various ground communication systems.

Notes: The image at right shows SkyLight™, SA Photonics' 1.5U-sized cubesat FSO terminal.

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WHAT

Operational Need and Improvement: Small satellites, including cubesats, require a high data rate communication capability that is resilient to RF interference and jamming, is LPI/LPD and has extremely low SWaP. SA Photonics' SkyLight™ free-space optical communications system provides these capabilities and is suitable for both crosslink and space-to-ground applications.

Specifications Required: SkyLight is design to support a crosslink experiment between two 6U cubesats with a threshold requirement of providing 25 Mbps at 100 km link distance, with an objective to support 100 Mbps at distances up to 1,000 km.

Technology Developed: SkyLight is a fully integrated FSO communication system that includes modem, all optical sources and receivers, optical amplifiers, closed loop beam tracking control system, autonomous acquisition, and built-in beam steering system. The integrated beam steering provides +/- 50 degree two-axis beam steering allowing for communications without requiring satellite body pointing.

Warfighter Value: SA Photonics' SkyLight FSO system provides high data rate secure and resilient communications between small satellites as well as space-to-ground and space-to-air applications. The low SWaP of skylight will enable use on small platforms such as small UAVs and man-portable ground terminals. This new capability provides communications without RF emissions, allowing use during EMCON conditions. Additionally, the optical communications is immune to RF interference and jamming, and highly tolerant to optical jamming.

WHEN

Contract Number: N68335-20-C-0092 **Ending on:** November 12, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Qual Unit Delivery	Med	Unit(s) delivered	8	January 2021
Flight Unit Delivery	Med	Unit(s) delivered	8	April 2021
Satellite Integration	Med	Successful integration tests	8	June 2021
Launch	Low			September 2021
On-orbit testing	Low	Exceed threshold requirements	9	November 2021

HOW

Projected Business Model: SA Photonics intends to undergo production of the SkyLight engineering model, qual units, and flight terminals using our in-house manufacturing capability. The company has a history of successful small-scale production for commercialized SBIR products. For larger quantity manufacturing, we would work with our contract-manufacturing partner currently used for our commercial terrestrial FSO system manufacturing.

Company Objectives: The SkyLight system is positioned to be a cost-saving and performance-improving communication system not just for U.S. Navy satellite communications, but military communications across the DOD. As a result, we are excited to present the product to a range of program offices at the FST, as well as a number of prime contractors, specifically those who work with satellite communications.

Potential Commercial Applications: Applications include the military space and UAV sectors, as well as commercial satellites. With commercial satellites, there is a market for free space optical links for crosslink and ground links. Additional commercial applications include high altitude platforms (drones, aerostats), as well as small aircraft and UAVs. The SWaP benefits are equally beneficial to the commercial market as the military.

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Department of the Navy SBIR/STTR Transition Program

Topic # N122-146
SkyLight Free-Space Optical Terminal for Cubesats
SA Photonics, Inc.

ABSTRACT

SkyLight™ is a cost-saving and performance-improving free space optical (FSO) communication terminal for cubesat and small-sat applications. The system is fully integrated; including all data processing, optical transmitters and receivers, and integrated beamsteering in a 1.5U form-factor meeting the SWaP constraints of cubesat applications. This program will provide upgrades to SkyLight that deliver a unique architecture that is very robust to shock and vibration, and will support satellite integration and on-orbit operation of the FSO terminals. SA Photonics, which specializes in the development of advanced photonics systems to solve demanding problems for military and commercial customers, envisions its own small-scale production as well as teaming with well-known primes, as it has on past product developments.

THUMBNAIL

SkyLight™ is a cubesat free space optical communication terminal with fully integrated data processing, optical transmitters and receivers, and integrated beamsteering in a 1.5U form-factor. This program upgrades SkyLight with a unique architecture that is very robust to shock and vibration.

KEYWORDS

cubesat, free-space optical, FSO, communications, LEO, satellite communications, crosslink

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Company	Topic #	Project	SYSCOM
Hy-Tek Manufacturing Co. Inc.	N181-021	Enhanced Clamp Cushion	NAVAIR

Department of the Navy SBIR/STTR Transition Program

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Topic # N181-021

Enhanced Clamp Cushion

Hy-Tek Manufacturing Co. Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-265 (F/A-18 & EA-18G)

Transition Target: F/A-18 & EA-18G

TPOC:
443-534-5879

Other transition opportunities: U.S. Military, Foreign Military, U.S. and Foreign Military and Commercial Aircraft manufacturers i.e. Boeing, Lockheed Martin, Northrup Grumman, Gulfstream (General Dynamics), Airbus, Sikorsky, U.S. and foreign airlines and cargo carriers i.e. American Airlines, Delta airlines, United Airlines, Southwest Airlines, FedEx, UPS, etc.

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WHAT

Operational Need and Improvement: Hydraulic, fuel, and electrical line clamp integrity is paramount to aircraft flight safety and mission success. In particular, clamp loop and cushion failure can result in line abrasion and fatigue that jeopardizes normal aircraft operation and therein crew safety. Currently deployed Navy aircraft clamp cushions are fabricated of a nitrile elastomer that is not well suited for prolonged resistance to chemical, UV, and ozone exposure. Additionally, these clamp loops and integrated cushions tend to form an ovular shape around cylindrical lines that causes unnecessary mechanical shear stress and abrasion at the cushion/line interface, which results in rapid strain related cushion damage and failure. Enhanced Clamp Cushion (ECC) solves these problems with the combination of a geometrically engineered clamp loop and flourosilicone cushion that greatly reduces mechanical shear stress and the frequency of strain related cushion damage. ECC cushion material possesses great resistance to deterioration during prolonged UV light, Ozone, and chemical exposure.

Specifications Required: Once an aircraft line clamp fails, the hydraulic or fuel tube is no longer adequately supported, which could result in two immediate problems: the hydraulic tube might break or the hydraulic tube might chaff or abrade against another tube or structure. Either scenario creates a detrimental effect for the aircraft and flight crew, further increasing cost and decreasing fleet readiness. The ECC must satisfy the performance requirements as specified in MIL-DTL-85052/1C and MIL-DTL-85052B.

Technology Developed: ECC is comprised of a geometrically and structurally engineered clamp core and cushion that, when integrated together, provide enhanced line fit, cushion shear stress reduction, and line stability. The ECC metal core and cushion are mechanically joined using "mohawk" structures that prevent the cushion and core from moving, shifting, or vibrating independently. This feature prevents the metal core from applying geometrically induced shear stress to the cushion and strain related cushion damage. Importantly, when assembled, the engineered metal core and cushion structure forms a matching concentric shape when installed on cylindrical aircraft lines. This concentricity significantly improves ECC line stabilization and diametral retention performance while reducing potential line abrasion and damage. When these features are combined with UV, ozone, and chemical resistance flourosilicone cushion material, ECC becomes a high performance, high longevity line clamp producing significant cost avoidance and a positive ROI for the U.S. Navy.

WHEN

Contract Number: N68335-20-C-0053   **Ending on:** October 14, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
ECC cushion material selection and performance validation	Low	Satisfy Navy Material performance specs	TRL 4	August 2021
ECC structural and geometry optimization and performance validation	Low	Satsify Navy ECC performance requirements through prorotype testing	TRL 5	January 2022
ECC Cushion Extrusion Mass Fabrication	Low	Satisfy all details of ECC fabrication drawings through dimensional analysis and testing	TRL 6	March 2022
ECC Performance testing on-board Navy Aircraft	Med	Satify Navy material and performance requirements through prorotype testing on Navy Aircraft	TRL 7	October 2022

HOW

Projected Business Model: HMC plans to use in-house manufacturing personnel and resources to manufacture deliver ECC and ECC variants to U.S. Navy and other military clients. HMC possesses experience in manufacturing parts and assemblies for commercial clients including Caterpiller and AGCO as well as military clients including U.S. Navy and U.S. Army. HMC currently manufactures the High Load Roller Bearing (HLRB) for U.S. Navy DDG helicopter bay doors under a NSN and has experience in marketing and selling its material and mechanical innovations across multiple sectors. HMC plans to begin full-scale ECC fabrication under a well-developed manufacturing plan after successful TRL 8 prototype performance and longevity validation on U.S. Navy aircraft. That plan will include inital low rate ECC production within 1-month after TRL 8 validation. HMC's analysis validates ECC as a cost effective, reliable, and high longevity alternative to currently deployed line clamps capable of generating substantial cost avoidance and positive ROI for U.S. Navy.

Company Objectives: HMC's objective for FST include technical discussions and Demonstration of the ECC technology to U.S. Navy and prime contractor stakeholders. These events will reinforce the great value that ECC technology brings to those stakeholders having unsatisfied aircraft line stabilization, line clamp longevity and line clamp cost requirements. HMC expects that FST will reveal addtional military and commercial capability gaps that can be filled through development and demonstration of application specific ECC variants. HMC will request that Navy provide introductions to prime contractors with these interests as well as help identify Navy programs having similar capability gaps.

Potential Commercial Applications: HMC's goal is to market and sell ECC fo use across all salient U.S. Navy, USMC, Army, and Coast Guard aircraft platforms including Combat aircraft, Trainer aircraft, Electronic Warfare aircraft, Tanker aircraft, Rescue aircraft and Helicopters. Commercial applications include ECC design variants for private, commerical, and cargo aircraft manufactured by Boeing, Airbus, Lockheed Martin, Sikorsy, Bell, Northrup Grumman and Gulfstream (General Dynamics). HMC expects DOD to be an important initial customer for mature ECC variants and provide performance validation and sales revenue with which HMC can pursue other commercial markets.

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Topic # N181-021
Enhanced Clamp Cushion
Hy-Tek Manufacturing Co. Inc.

ABSTRACT

Navy aircraft line clamps are comprised of nitrile cushions fitted to steel loops. Nitrile however, rapidly degrades when exposed to UV light and atmospheric ozone, while the metal loop exerts damaging shear stress on the cushion. The Enhanced Clamp Cushion (ECC) solves this problem with structurally engineered loops and cushions made from a chemical, UV, and ozone resistance elastomer. ECC geometry reduces mechanical shear stress on the cushion, eliminating cushion strain damage and facilitating greater in-service longevity. Designed for easy installation using standard hardware, ECC prototype testing verified cost-effective performance and longevity. HMC aims to deliver value to government/prime contractors that integrate ECC into all aircraft platforms. HMC designs and fabricates mechanical and material technology solutions for critical problems in the military and private sectors.

THUMBNAIL

ECC technology is a direct replacement for currently deployed Navy Aircraft line clamps that have relatively short in-service longevity. The easily and rapidly installed ECC provides excellent line clamping performance without succumbing to UV, ozone, or material strain damage.

KEYWORDS

Aircraft line clamp, Enahnced Clamp Cushion, (ECC), UV resistance aircraft line clamp cushion, ozone resistance aircraft line clamp cushion

CONTACT

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www.hytekmfg.com

C4I Projects at WEST 2022

Company	Topic #	Project	SYSCOM
Adaptive Dynamics, Inc	NOAA161-844D	*RF IM Filter*	NAVWAR
Carley Technologies, Inc.	N192-129	*Detecting Adversarial BENDs in the Information Environment*	ONR
CesiumAstro, Inc.	N181-090	*Rapidly Integrated Tactical Communications Payload*	NAVWAR
Daniel H. Wagner, Associates, Incorporated	N192-093	*Theater Anti-Submarine Warfare (TASW) Multi-Objective Threat Prioritization (TMTP)*	NAVSEA
Holochip Corporation	N171-076	*A Holographic and Light-field Processor for Extreme Multi-View Displays*	NAVSEA
Intelligent Automation, Inc.	N181-089	*LAKE: Large-Scale DAta Storage for Knowledge DiscovEry*	NAVWAR
Jove Sciences, Inc.	N193-A01	*Machine Learning (ML) to Develop Capabilities to Track AIS Ships Worldwide and Detect Anomalous Behavior to Impact Mission Success*	NAVSEA
Perceptronics Solutions, Inc.	N192-131	*Persistent AI based Threat Detection (PAIT)*	ONR
Virtualitics	N193-A03	*Data Enabled Photogrammetry*	ONR

WHO

SYSCOM: NAVWAR
Sponsoring Program: PEO-T
Transition Target: NAVAIR aircraft
TPOC:
Other transition opportunities: The technology developed for this project has wide applicability to all surface, subsurface, land based, and satellite tactical communications systems that must provide assured communications in degraded tactical interference environments

https://media.defense.gov/2017/Jan/05/2001684337/-1/-1/0/161017-N-ZZ999-009.JPG

WHAT

Operational Need and Improvement: Adaptive Dynamics, Inc (ADI) has developed a highly effective interference mitigation filtering capability for a variety of DoD systems. In this contract, ADI is modifying previous versions of our filter to operate successfully in specified tactical aircraft. The development is occurring in two stages. ADI will first develop, integrate and test a single channel version of the filter for the specified system and then expand the capability of that filter to handle multiple channels simultaneously. A multi-channel filter is required for operational use.

Specifications Required: Our solutions must meet specific system requirements for available digital signal processing resources and operate within the thermal specifications for that system

Technology Developed: ADI has developed resource efficient interference mitigation techniques that can surgically remove multiple dynamic interfering signals within the communications bandwidth with minimal to no distortion of the communications signals of interest. These techniques have been developed up to a TRL level 8 for a variety of system applications for the Navy and the Army for satellite, airborne, surface and ground based communications networks. In this project, these capabilities are being extended to provide improved performance for specific airborne systems.

Warfighter Value: The system improvements that ADI will provide under this contract will assure that communication links remain open, even under focused tactical interference attacks. This will increase standoff ranges for individual aircraft and for the integrated task force it will assure that important nodes in the network are not lost from the integrated operations.

WHEN

Contract Number: N68335-19-C-0258 **Ending on:** February 1, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop, Test and Integrate Single Channel Filter	Med	highly successful test results for prototype filter	7	June 2020
Develop Multi-Channel Filter	Med	highly successful test results for prototype Multi-Channel Filter	7	February 2021
Integrate and Test Multi-Channel Filter with Prime Contractor	High	Successful integration and test	8	January 2022

HOW

Projected Business Model: ADI will develop firmware for integration into specific Field Programmable Gate Arrays (FPGAs) that are implemented in the specific systems of interest. ADI will then sell licenses for the firmware that is developed on this contract.

Company Objectives: Expand the set of tactical applications for our innovative reference-free anti-jamming technology and become a leading supplier of interference mitigation systems to the DoD.

Potential Commercial Applications: Interference is a pervasive problem in both commercial and military communications systems. The technology that ADI is developing for military applications can be adapted to a number of commercial systems to minimize the interference that degrades performance in congested environments.

Contact: Dr. Brandon Zeidler, President and Chief Technical Officer, Adaptive Dynamics, Inc.
brandon@adaptive-dynamics.com   (858) 705-2781

ABSTRACT

Military operations can be executed only if theater information is communicated effectively to the warfighting units assigned to the operation. However, communication system capabilities can be severely degraded by interference from competing wireless users, electronic counter measures, hostile jammers and other sources. Consequently, there is an urgent need to mitigate interference in tactical networks, even when there is no available reference for the sources of interference. Starting in 2003, Adaptive Dynamics has developed innovative techniques for remote, reference-less interference mitigation (IM) techniques for RF signals. They have completed over 60 DoD contracts to develop a TRL level 8 IM technology for different applications. Under this contract, ADI will develop, integrate and test VHDL IM filter solutions for specified tactical aircraft radios.

THUMBNAIL

Adaptive Dynamics is developing multi-channel IM filtering solutions for tactical aircraft. These solutions remove interference without a reference signal and without distortion of the desired signal, thus maintaining full network connectivity and maximum throughput in challenging tactical interference environments

KEYWORDS

reference-less interference mitigation; digital signal processing; hostile jamming, self-interference, enhanced throughput and increased capacity networks; assured communications, airborne operations in degraded tactical environments;

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Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.
ONR Approval #43-8745-21

Topic # N192-129

Detecting Adversarial BENDs in the Information Environment

Carley Technologies, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Marine Corps Information Groups, Deputy Commandant of Information, the Joint Information Warfighter

Transition Target: Phase III contract leading to incorporation into a Program of Record

TPOC:
Dr. Rebecca Goolsby
rebecca.goolsby@navy.mil

Other transition opportunities:
Marine Corps Information Groups, Deputy Commandant of Information, the Joint Information Warfighter;
Distributed Common Grounds System - Army (DCGS-A);
Intelligence services in general; e.g., DIA, CIA, NSA, etc.;
Law Enforcement Agencies;
State Department - GEC, DHS, other US Government Agencies;
Insurance Companies;
Healthcare Providers;
Brand Management;
City and State Governments
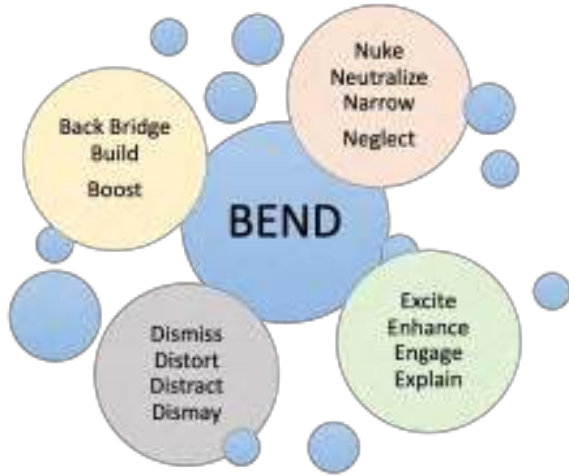
Dividing Social Media Influence Campaigns into 16 Types

WHAT

Operational Need and Improvement: A system for detecting adversarial information campaigns that target the emotions of anger, hate, fear, and disgust; classifying them as to the type of influence campaign being waged and its over-time evolution; assessing their potential impact and offering potential options for counteracting them. Existing approaches using simple sentiment models and/or bot detectors to identify adversarial agents and are not sufficient to detect sophisticated "cyborg" information actors. New systems capable of operating against hybrid, "cyborg" information actors, backing, aiding, and amplifying human networks distributing propaganda and highly charged messages are needed.

Specifications Required: Need scalable system for identifying, characterizing and countering adversarial activity. System must identify state-backed adversaries using artificial intelligence (AI) and data mining technologies to craft sophisticated "botnet armies" and other similar manipulations of social media platforms. System also needs to identify the type of information maneuver, assess the impact of the information maneuver and provide guidance for counter-measures against the information maneuver.

Technology Developed: Automated system that: (1) detects adversarial information campaigns, (2) characterizes actor intent in terms of 16 distinct information maneuvers (BEND taxonomy), (3) assesses strength/impact of information campaigns and (4) evaluates potential countermeasures. The technologies developed include analysis of social media content using new high-dimensional network analytics combined with theory-based machine learning; new cyborg, troll and bot detectors; improved stance assessment; and improved theory for how actor is employed and coordination mechanisms.

Warfighter Value: Our System offers improved reliability for predictions about emotionally laden social media channels in order to detect adversarial information campaigns. It can help the warfighter / information analyst by automatically identifying potentially important adversarial information campaigns buried in a mass of social media data. Further, it provides the Information Analyst with an analytical taxonomy for classifying and communicating the type of information campaign being observed (the "BEND" taxonomy). In addition, the system offers an analytical framework for assessing the potential impact or importance of the maneuver. Finally, the system offer suggestions for strategies to block the information maneuver and predictions for the impact of various blocking strategies. All of the above these capabilities will dramatically improve the effectiveness of the Warfighter / Information Analyst.

WHEN

Contract Number: N68335-20-C-0665   **Ending on:** June 30, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Initial System Demonstration of BEND classification	Med	Demonstration carried out	TRL 6	3rd QTR FY21
New Local stance assessment algorithm	Low	> 90% correct assessment of message stance	TRL 6	4th QTR FY22

HOW

Projected Business Model: Operate as subcontractor under a Prime responsible for delivering C4I user interface.
SBC delivers and supports the software developed under this contract.

Company Objectives: Phase III effort leading to Incorporation of Technology into Program of Record

Potential Commercial Applications: Law enforcement agencies
Healthcare Providers
Insurance Carriers
Brand Management
City and State Governments

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ONR Approval #43-8745-21

Topic # N192-129
Detecting Adversarial BENDs in the Information Environment: Phase 2
Proposal
Carley Technologies, Inc.

ABSTRACT

Accurate automated systems for detection of adversarial information campaigns in human social media channels, classification of type of campaign, assessment of impact of campaign and prediction of efficacy of strategies for countering campaigns have the potential to greatly leverage the limited resource of trained human analysts. Our solution uses enhanced analysis of social media content; new high-dimensional network algorithms for automatically classifying maneuvers; new cyborg/troll/bot detectors; stance assessment and an improved theory of which actor is employed and the means of coordination. Adversarial information maneuvers are classified using BEND framework of 16 social media information maneuver types encompassing influencing topic groups through content or through social network manipulation. Our solution is configured to make use cyber-mediated emotional sensors (CUES) to improve analysis of information maneuvers.

THUMBNAIL

We are developing accurate automated systems for detection of adversarial information campaigns in human social media channels, classification of type of campaign using BEND taxonomy, assessment of impact of campaign and prediction of efficacy of strategies for countering campaign

KEYWORDS

Network science, artificial intelligence, social media, information operations, sentiment, stance, topic analysis

CONTACT

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Department of the Navy SBIR/STTR Transition Program

Topic # N181-090
Rapidly Integrated Tactical Communications Payload
CesiumAstro, Inc.

WHO

SYSCOM: NAVWAR

Sponsoring Program: PEO Space

Transition Target: Mobile User Objective System (MUOS)

TPOC:
(619)553-1020

Other transition opportunities: Space Development Agency - National Security Space Architecture

Notes: The 36 element L-Beam AESA provides tactical communications payloads for small commercial satellites that enables communications with tactical users without the need for new radio terminals or modifications on ships, aircraft, or other platforms. The multiple beams make possible pointing and tracking of multiple users simultaneously.
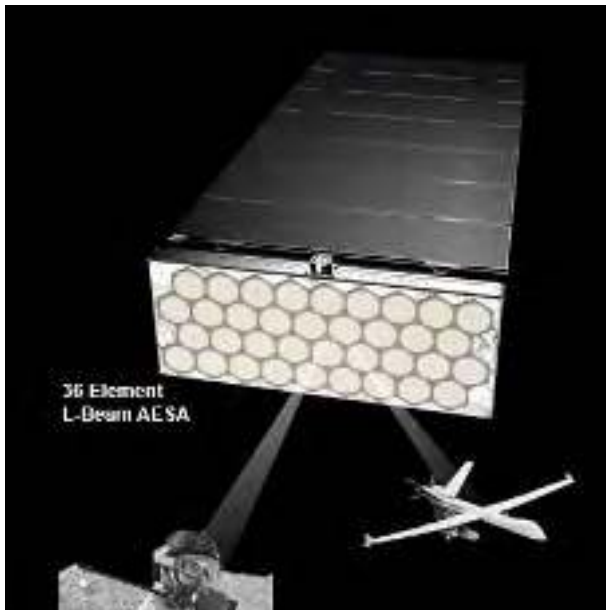

Image courtesy of CesiumAstro

WHAT

Operational Need and Improvement: The Navy has expressed a need for a tactical communications payload for small commercial satellites that enables communications with tactical users without the need for new radio terminals or modifications on ships, aircraft, or other platforms.

Specifications Required: Achieving constellation-wide deployment of tactical payloads in low-Earth orbit (LEO) requires design simplicity compatible with large-scale production, along with typical constraints on size, mass, and power consumption.

Technology Developed: Cesium's solution is a small reconfigurable payload offering the right balance between performance, size, weight, and power consumption utilizing AESA technology. Modular antenna elements combine to create any size array supporting both space and airborne deployment.

Warfighter Value: Multi-beam L-Band AESA technology enables communications with tactical users using existing communications infrastructure on ships, aircraft, or other platforms. The solution enables increased quality of service, improved wireless security, and greater immunity to jamming. Beams can be pointed without physical movement of the spacecraft and fewer satellites needed to cover the theatre than traditional directional antenna approaches.

WHEN

Contract Number: N68335-19-C-0640 **Ending on:** April 1, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
L-Band AESA Technical Concept	N/A	Report with analysis	1	November 2018
AESA Design Design Trade	N/A	Predicted performance, mass and power	2	June 2020
AESA Element Prototyping	N/A	Fabrication	3	October 2020
AESA Performance Analysis	N/A	Actual vs Simulated Results	4	April 2021

HOW

Projected Business Model: CesiumAstro is looking to the Navy or another government customer to partner in a small satellite flight test of the technology, ideally in 2022 on the path to building a full payload that can be hosted on any bus in 2023.

Company Objectives: CesiumAstro is connecting with additional government customers that can benefit from the L-Band AESA technology. The array can then be customized to meet specific mission requirements and provided either directly to the government customer or integrated into satellites through a prime. The L-Band AESA is part of a family that includes S-Band, C-Band, X-Band, Ku-Band, and Ka-Band AESA to support a wide range of missions.

Potential Commercial Applications: The L-Band AESA technology benefits a wide range of commercial applications including commercial telecom, public safety and emergency response, and global navigation services (GNSS). As the number of AESA produces increases and the costs drop we expect them to be very attractive for higher end mobility applications across land, sea, air, and space.

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Department of the Navy SBIR/STTR Transition Program

Topic # N181-090
Rapidly Integrated Tactical Communications Payload
CesiumAstro, Inc.

ABSTRACT

CesiumAstro's tactical communications payload for small commercial satellites enables communications with tactical users without the need for new radio terminals or modifications on ships, aircraft, or other platforms. The L-Band AESA is the first of its kind and provides the right balance between performance, size, weight and power consumption. It was developed by CesiumAstro, the only dedicated active phased array payload company in North America. The solution enables increased quality of service, improved wireless security, and greater immunity to jamming. Beams can be pointed without physical movement of the spacecraft thus fewer satellites are needed for theatre coverage than traditional directional antennas. Cesium is well poised to transition the technology to a program of record where it can be deployed to benefit the warfighter.

THUMBNAIL

CesiumAstro's L-Band AESA for small satellite tactical communications enables multiple users simultaneous connectivity without the need for new radio terminals or modifications to ships, aircraft or other platforms. SWaP-C optimized, the AESA electronically steers the antenna vice moving the satellite.

KEYWORDS

AESA ,Space, Satellite, Link-16, L-Band, Array Antenna, Payload

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Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.
NAVSEA #2021-0419

Topic # N192-093
Theater Anti-Submarine Warfare (TASW) Multi-Objective Threat Prioritization (TMTP)
Daniel H. Wagner, Associates, Incorporated

WHO

SYSCOM: NAVSEA
Sponsoring Program: PEO IWS 5E
Transition Target: USW-DSS
TPOC:
(360)315-0729
Other transition opportunities: USW-DSS Foreign Military Sales (FMS)

Aircraft Carrier-Tactical Support Center (CV-TSC)

FFG(X)

Maritime Tactical Command and Control (MTC2)

Distributed Common Ground Station – Navy (DCGS-N)

PEO Sub (through APB)

Commander Undersea Surveillance (CUS) (through ASB)

Notes: Picture Note 1: Friendly unit name is highlighted in red if risk is above operator specified threshold.
Picture Note 2: Prioritized risk is sorted by severity (computed based on threat capability) then by range.

generated by DHWA

WHAT

Operational Need and Improvement: Current methods to produce prioritized Watch Lists and monitor the operational situation are cumbersome and include significant latency. TMTP automatically and continuously creates prioritized Watch Lists —a high priority for the Navy given the increasingly large number of near-peer submarines. These services will enhance existing capabilities, also developed by Wagner Associates, for evaluating and optimizing theater level USW planning and execution. These innovative tools are needed by the fleet and are mission critical.

Specifications Required: Need to automatically prioritize threat targets based on risk to friendly assets and monitor operational situation in order to minimize risk to friendly assets.

Technology Developed: TMTP automatically and continuously creates prioritized Watch Lists based on detailed, accurate risk computations that account for all relevant factors; and that also continuously monitors the operational situation, issuing alerts and recommending responses when necessary.

Warfighter Value: The expected benefits of TMTP are: (1) Reduced risk to friendly assets, and (2) Reduced operator time-on-task.

WHEN

Contract Number: N68335-21-C-0139   **Ending on:** December 16, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Prototype TMTP Components	Low	Successful tests in Wagner lab	5	December 2021
Prototype TMTP System	Low	Successful tests in Wagner lab	6	June 2022
Full Scale Prototype TMTP System	Low	Successful demonstration in USW-DSS DevSecOps cloud testbed	6	December 2022
TMTP Seminal Transition Event	Low	Successful demonstration of operational capability in USW-DSS DevSecOps cloud testbed	7	October 2023

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 modules for evaluating and optimizing mine countermeasures (MCM) operations and estimating risk in MINEnet Tactical
4) Net-Centric Data Fusion (NCDF) for USW-DSS
5) Data Fusion Engine (DFEN) in USW-DSS
TMTP is targeted for direct integration into USW-DSS, although additional marketing opportunities include other naval systems that could benefit from TMTP technology and software components.

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: TMTP algorithms and methodology have potential applications to border surveillance and port/facility security, which need to prioritize targets for investigation; and also for mitigating risk to marine mammals from Naval operations.

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NAVSEA #2021-0419

Topic # N192-093
Theater Anti-Submarine Warfare (TASW) Multi-Objective Threat
Prioritization (TMTP)
Daniel H. Wagner, Associates, Incorporated

ABSTRACT

Theater Undersea Warfare (TUSW) Multi-Objective Threat Prioritization (TMTP) Decision Aid automatically and continuously prioritizes threats, accounting for the ability of threat submarines to adversely affect probability of friendly mission success. TMTP will offer significant operational benefits to TUSW Commanders/Watch Standers such as: (1) Reduced time to react to a threat submarine, (2) Improved situational awareness and threat assessment, and (3) Reduced Watch Officer time-on-task. Daniel H. Wagner Associates (DHWA)has over 58 years of experience in developing and transitioning complex software components to many of the U.S. Navy's USW systems, including the Operational Route Planner (ORP) in the USW Decision Support System (USW-DSS) (TMTP's first planned transition), and the MH-60R Acoustic Mission Planner (AMP). DHWA has a working prototype and is looking for additional transition partners.

THUMBNAIL

Theater Undersea Warfare (TUSW) Multi-Objective Threat Prioritization (TMTP) Decision Aid automatically and continuously prioritizes threats, significantly: (1) Reducing time to react to a threat submarine, (2) Improving situational awareness and threat assessment, and (3) Reducing Watch Officer time-on-task.

KEYWORDS

Theater Undersea Warfare (USW), Anti-Submarine Warfare (ASW), Situational Awareness, Threat Prioritization, Command Center

CONTACT

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NAVSEA #2021-0417

Topic # N171-076

Agnostic Display Environment (ADE)

Holochip Corporation

WHO

SYSCOM: NAVSEA

Sponsoring Program: IWS 1.0

Transition Target: Future Combat System

TPOC:
(240)412-8095

Other transition opportunities: • NAVAIR –MFS (AR for flight simulators) • NAVAIR –PMA-260 (AR for maintenance) • USAF 12th Flying Training Wing (VR flight training) • USAF Air Education and Training Command (virtual aircraft maintenance) • USAF Virtual Enhanced Reality Training 58th Airlift Squadron (VR training) • USAF Global Strike Command and 307th Bomb Wing (VR B-52 training)

Notes: ADE - Agnostic Display Environment for virtual collaboration and 3D display

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WHAT

Operational Need and Improvement: As the available information provided to C2 centers increases, 3D displays can improve situational awareness and response time as well as reduce the potential for human error. Navy needs: i) render and display massive volumes of information, (e.g. Future Combat System); ii) collaboration between remote operators over many different display types

Specifications Required: SWAP-C reduction in hardware, Ingest / display complex and massive quantities of data, Collaboration in a shared 3D environment, Support for most types of display hardware

Technology Developed: ADE - Agnostic Display Environment for virtual collaboration and 3D display. Performs real-time light field rendering without additional processing requirements, Compatible with any type of display, 60 FPS refresh rate, Integration with Unity, Conformant to OpenXR, Rendering API compatible with any rendering engine, Enables multiple operators to collaborate in same environment

Warfighter Value: Decreased risk of error, faster response times, Increased situational awareness, Collaboration and rendering on all display devices (Commercial AR/VR/MR headsets, IGs for flight simulators, Commercial light field displays (e.g., Looking Glass Factory, Leia Inc., etc.)

WHEN

Contract Number: N68335-19-C-0212   **Ending on:** November 3, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
75% reduction in SWAP-C requirements for light-field-rendering computation components with synthetic Data	Low	Demonstrate real-time parallel multi-view rendering with stated reduction in computation requirements in a relevant environment	TRL 6	April 2022
75% reduction in SWAP-C requirements for light-field-rendering computation components with Operational AEGIS Data	Low	Demonstrate real-time parallel multi-view rendering with stated reduction in computation requirements in an operational environment	TRL 7-8	November 2022
Capable of performing real-time rendering on stereo HMD, volumetric and extreme multi-view light-field displays	Low	Demonstrate stated interoperability with numerous display types in operational environment	TRL 7-8	November 2022

HOW

Projected Business Model: Transition Paths:
- Provide ADE (OpenXR) software for virtual collaboration/training
- Provide ADE/OpenXR HW and SW development services
- Work with Navy IWS / Primes on AEGIS Display System upgrades
- Provide light field displays for Future display consoles and C2 applications

Company Objectives: Provide ground-breaking solutions for advanced 3D collaborative visualization environments which support next-generation AR/VR, light field, volumetric, holographic, variable collimation and other display technologies.

Potential Commercial Applications: - Information display consoles, Air traffic control and other C2 applications
- Light Field Display - petro/geo chemical, pharmaceutical, virtual prototyping, architecture
- Remote Collaboration Tools - ADE provides API + framework for custom apps. API licenses and custom apps development services available

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NAVSEA #2021-0417

Topic # N171-076
A Holographic and Light-field Processor for Extreme Multi-View Displays
Holochip Corporation

ABSTRACT

Holochip is developing an Agnostic Display Environment (ADE) software solution to enable collaborative viewing of complex 3D visualizations such as weapons-targeting pairing, potential threats, air traffic control, and other applications. Conformant to OpenXR open standard, ADE enables multiple users to simultaneously work in the same environment and view information on glasses-free 3D light field displays (ala "Avatar"). ADE also supports any number of users and any display device (e.g., AR/VR headset, stereoscopic display, 2D monitor, etc.). Holochip is working to integrate ADE with Future Combat Systems.

THUMBNAIL

As the available information provided to C2 centers increases, 3D displays can improve situational awareness, response times, and the potential for human error. Holochip's ADE enables real-time rendering of complex data, collaboration in a data-rich 3D environment, and compatibility with any display.

KEYWORDS

C4I, Control Communications Computer and Intelligence, Combat Information Center, CIC, Augmented Reality, Virtual Reality, Shared Environment, Situational Awareness, C2

CONTACT

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WHO

SYSCOM: NAVWAR

Sponsoring Program: PEO C4I, PMW 130

Transition Target: Distributed Control Ground Station - Navy (DCGS-N).

TPOC:
(619)221-7810

Other transition opportunities:

Notes: Combat Information Center of USS Germantown underway in the East China Sea as part of the America Expeditionary Strike Group, as a ready response force to defend peace and stability in the region.

U.S. Navy photo by Mass Communication Specialist 2nd Class Taylor DiMartino) https://www.navy.mil/Resources/Photo-Gallery/igphoto/2002573555/.

WHAT

Operational Need and Improvement: To maintain maritime supremacy, the U.S. Navy must collect, understand, and leverage ever-increasing volumes, variety, variability, velocity, and veracity of sensor and intelligence information to ensure proper force application across greater distances under ever compressing time constraints. To this end, Navy's Information and Intelligence Platforms must quickly aggregate, correlate, and fuse "All Domain/All Source Intelligence" to produce current and predictive, operational to tactical, battlespace awareness required to make better decisions faster.

Specifications Required: The volume and velocity of data coming into the information platforms varies widely; the IAI LAKE system must dynamically adjust to the changes in data delivered, with the data provisioning goal not to exceed 30 seconds after ingest to consumer availability. It is also critical the LAKE mechanism enable rapid retrieval (within 2 seconds) of stored data to meet the demands of operators working in different security enclaves in a tactical environment.

Technology Developed: Large Scale Data Storage for Knowledge Discovery (LAKE) is a multi-domain streaming analytics framework enabling data distribution of multi-domain information analytics and products to users operating at different security levels following the Navy Multi-Domain Federated Query (MDFQ) architecture. Navy's development of LAKE provides an enhancement and extension to other data domains such as images, videos, and text-based products outside of the cyber domain. LAKE has been developed as a modular, extensible software suite of containerized RESTful services that leverages high-performance data pipelines for streaming analytics and data ingestion allowing for seamless integration into mission-critical applications.

Warfighter Value: LAKE will enable the automated combining of high volumes of data from differing intelligence sources and different intelligence community (IC) entities, National Technical Means (NTM) systems, and multi-domain network feeds to aid analysts and decision makers in building a more coherent and comprehensive view of the battlespace.

WHEN

Contract Number: N68335-19-C-0514   **Ending on:** March 31, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop Prototype for domain separation of video streams on each domain	Med	Rapid retrieval (within 2 seconds) of stored data and data provisioning goal not to exceed 30 seconds after ingest to consumer availability	4	March 2021
Demonstrate Enhanced Governance, provenance logging and exploration	Med	Show multi-domain data lineage at appropriate security level	4	March 2022
Produce a prototype data management virtual machine and/or containers	Med	Deliver unclassified software suite to Navy	5	March 2023

HOW

Projected Business Model: IAI will continue to maintain LAKE components and make them available for other tactical and commercial applications through contract engineering and licensing agreements. LAKE will be made available to multiple information and combat systems though integration with DISA's Unified Platform and Big Data Platform including those being piloted via the AEGIS Virtual Pilot Ship (VPS) program and other efforts to more rapidly deliver combat capability to the Fleet, e.g. the Virtual Twin (VT).

Company Objectives: Identify other Department of Navy and Department of Defense information and combat system stakeholders and other opportunities for additional LAKE evaluation and integration.

Potential Commercial Applications: LAKE is a Zero Trust based architecture providing streaming analytics framework to operate on disparate data lakes. LAKE provides discovery, subscription, and alerting services to allow users to watch and monitoring live video, audio, and publicly available data in near real-time.

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Department of the Navy SBIR/STTR Transition Program

Topic # N181-089
LAKE: Large-Scale DAta Storage for Knowledge DiscovEry
Intelligent Automation, Inc.

ABSTRACT

Large Scale Data Storage for Knowledge Discovery (LAKE) is a multi-domain streaming analytics framework enabling data distribution of multi-domain information products to users operating at different security levels following the Navy Multi-Domain Federated Query (MDFQ) architecture. Founded in 1987, IAI is a small business that solves challenging science and technology problems through a research institution-inspired R&D process. IAI develops and deploys technologies for federal agencies and corporations. A compilatory capability for cyber related workflows exists in the United States Air Force under Joint Cyber Warfighting Architecture (JCWA) and Joint Cyber Command and Control (JCC2) through DISA but not via Department of Navy. Navy's development of LAKE provides an enhancement and extension to other data domains such as images, videos, and text-based products outside of cyber domain. LAKE has been developed as a modular, extensible software suite of containerized RESTful services that leverages high-performance data pipelines for streaming analytics and data ingestion allowing for seamless integration into mission critical application.

THUMBNAIL

Large Scale Data Storage for Knowledge Discovery (LAKE) is a multi-domain streaming analytics framework enabling data distribution of multi-domain information products to users operating at different security levels following the Navy Multi-Domain Federated Query (MDFQ) architecture.

KEYWORDS

Multi-Domain Data Management, Streaming Analytics. Artificial Intelligence, Machine Learning, Deep Learning, All-Domain Intelligence, All-Source Intelligence, Navy Multi-Domain Federated Query (MDFQ), Large Scale Data, Big Data

CONTACT

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NAVSEA ##2021-0441

Topic # N193-A01

Machine Learning (ML) to Develop Capabilities to Track AIS Ships Worldwide and Detect Anomalous Behavior to Impact Mission Success

Jove Sciences, Inc.

WHO

SYSCOM: NAVSEA

Sponsoring Program: PEO-IWS 6.0

Transition Target: CEC (Cooperative Engagement Capability) Increment II, Future Capability Group
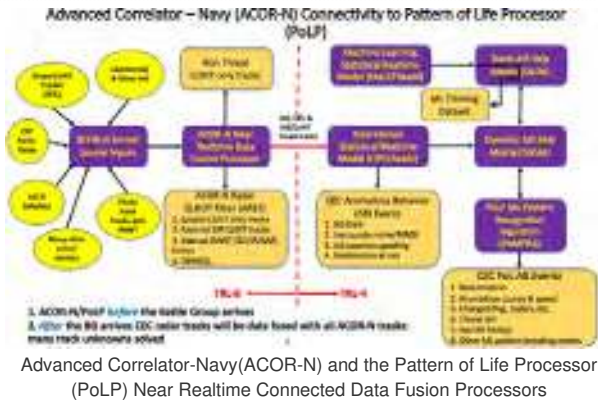
TPOC:
(202) 781-3014

Other transition opportunities: All CEC Platforms (CVN, DDG, CG, E2D, and Future);
AEGIS Combat Systems
Surface Ship Self Defense (SSSD) Combat System

Notes: Suitable for integration with AEGIS and SSDS combat systems, Distributed Common Ground System Navy (DCGS-N), MQ-4C Triton, P-8A Poseidon

Advanced Correlator-Navy(ACOR-N) and the Pattern of Life Processor (PoLP) Near Realtime Connected Data Fusion Processors

WHAT

Operational Need and Improvement: Integration of Automatic Identification System (AIS) Data through AI/ML Applications - AIS data are obtained from publicly available sources. The Navy seeks to develop models and algorithms using AI/ML processes to autonomously characterize behaviors of self-reporting maritime traffic using AIS data in order to use these behavioral models and data to (1) identify apparent shipping lanes and (2) detect anomalous behavior in support of determining surface vessel intent.

Jove Sciences' ACOR-N, a multi-INT ship data fusion processor, utilizing EO/IR and Synthetic Aperture Radar (SAR) Imagery Intelligence (IMINT) from national overhead sensors (NOS) and Full Motion Video (FMV) sensors from the MQ-9 Maritime Wide Area Surveillance (MWAS) Unmanned Aerial System with ACOR-N SIGINT (Signal Intelligence) tracks, enables the Warfighter to accurately identify (i.e., hull tech), track and target threats of high interest in real time.

Specifications Required: Capable of ingesting data from multiple sensor sources – to include National Overhead Sensors; Accurately predict and generate target tracks in near real time.

Technology Developed: The Advanced Correlator-Navy (ACOR-N) – a real time, multi-INT ship data fusion processor with the capability to accurately detect, track, classify and identify (DCTI) combatants operating under Emissions Control (EMCON) Silent or "dark" ship conditions and masquerading as commercial shipping in crowded shipping lanes.

Warfighter Value: ACOR-N enables Warfighters, in real time, to accurately detect, track, classify, identify, track and target, if appropriate, threats of high interest – to include combatants and their support ships operating under EMCON conditions and masquerading as commercial shipping – operating in crowded shipping lanes such as the East and South China Seas.

WHEN

Contract Number: N68335-20-F-0461   **Ending on:** December 31, 1969

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Detect, track, and classify exercise with adversary combatants using C3F as processing partner.	Med	Produce the track and verify classification with C3F	7	December 2021
Develop real time Java code for the PoLP modules.	Med	Process PoLP for known AIS ship names and MMSI numbers	5	March 2022

HOW

Projected Business Model: Sell directly to the Navy and other DoD and Government agencies

Company Objectives: Transition ACOR-N to PoLP connectivity and PoLP to CEC Increment II

Potential Commercial Applications: Ship routers, US Coast Guard, anti-pirate ship forces, countries impacted by illegal fishing, detection and tracking of self powered semi-submersibles for various intelligence agencies.

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NAVSEA ##2021-0441

Topic # N193-A01
Machine Learning (ML) to Develop Capabilities to Track AIS Ships
Worldwide and Detect Anomalous Behavior to Impact Mission Success
Jove Sciences, Inc.

ABSTRACT

The Advanced Correlator-Navy (ACOR-N) real time, multi intelligence data fusion processor has performed exceptionally well in the detection, tracking, and classification (DT&C) of threats of high interest. .ACOR-N has been tested and evaluated in five real time Trident Warrior experiments, as well as coprocessing WESTPAC data with COMPACFLT to DT&C threats of interest in an exercise called ACOR-N Harvest 20120. EO/IR and SAR IMINT from national overhead sensors (NOS) has been fused with ACOR-N SIGINT tracks to enhance the identification (i.e., hull tech) of threats of high interest. ACOR-N has ingested Lynx SAR, ISAR video, and FMV sensor sources from the MQ-9 Maritime Wide Area Surveillance (MWAS) Unmanned Ariel System, UAS), and then a fuse these invaluable PosReps with ACOR-N's SIGINT data. The ACOR-N Pattern of Life Processor (PoLP) is a near real time processor that ingests ACOR-N output tracks and outputs AIS ships exhibiting anomalous behavior (AB) . The AIS POLP consists of the Machine Learning Statistical Realtime Model (MaLSTReaM), Operational STReaM (OPSTReaM), the Static AIS Ship Matrix (SASM), the Dynamic AIS Ship Matrix (DASM), and a Knowledge Based Inductive Learning (KBIL) ML pattern of life anomalous behavior (AB) recognition algorithm. PoLP has been tested in the batch processing mode with commercial AIS data from a three-year, worldwide data set provided by US CG. ACOR-N is now being transitioned into a large NAVSEAvIWS-6 program of record called the Cooperative Engagement Capability (CEC) in addition, NAVAIR/Minotaur are processing a future Phase 2 SBIR to incorporate ACOR-N capabilities. POLP Will follow ACR in in this transition path.

THUMBNAIL

The Advanced Correlator-Navy (ACOR-N) real time, Multi intelligence data fusion processor has performed exceptionally well in the detection, tracking, and classification of threats of high interest. ACOR-N has been tested and evaluated in five real time Trident Warrior experiments, as well as coprocessing WESTPAC data with COMPACFLT to DTC&I threats of interest in an exercise called ACOR-N Harvest 20120. The ACOR-N Pattern of Life Processor (PoLP) is a near real time processor that ingests ACOR-N output tracks and outputs AIS ships exhibiting anomalous behavior (AB) . ACOR-N is now being transitioned into a large NAVSEAvIWS-6 program of record called the Cooperative Engagement Capability (CEC) in addition, NAVAIR/Minotaur are processing a future Phase 2 SBIR to incorporate ACOR-N capabilities. POLP Will follow ACR in in this transition path.

KEYWORDS

Pattern of Life, Artificial Intelligence; Neural Networks; Big Data; Machine Learning (ML); Data Analysis; Sustainment and Readiness; Automatic Dependent Surveillance-Broadcast (ADS-B); Automatic Identification System (AIS); Testing & Evaluation; Certification

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ONR Approval #43-8761-21

Topic # N192-131

Persistent AI based Threat Detection (PAIT)

Perceptronics Solutions, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Minerva INP

Transition Target: Naval Maritime Command and Control Operations Center, Marine Corps Information Operations Center, U.S. Army Training and Doctrine Command

TPOC:
Dr. Allen Moshfegh
allen.moshfegh@navy.mil

Other transition opportunities: Force Protection organizations and Intelligence Community analytics

Notes: Builds on the OssaLabs computational social science toolset (www.ossalabs.com) Collaborating with K2 Solutions Inc. (K2SI.com) to incorporate warfighter expertise in high threat environments

WHAT

Operational Need and Improvement: SECNAV INSTRUCTION 3300.2C - Commanders should give special emphasis to reducing the vulnerability of personnel, family members, resources, facilities, and critical infrastructure under DON cognizance to terrorist acts

Specifications Required: A multidimensional machine learning and reasoning system that incorporates trend and sentiment analysis techniques and algorithms into a range of entity and behavior analytics for integration into a shared-networked environment for timely intervention and neutralization of harmful intents

Technology Developed: The PAIT system uses the power of artificial intelligence including machine learning to detect emerging threats and intent to harm by monitoring open source and security-related data sources. Information on potential threats as well as their associations is collected and synthesized from both structured and unstructured data. A library of machine learning-based classifiers that each search for different specific kinds threat factors (i.e., evidence of intent to harm). Each threat factor classifier is highly specialized and thus able to achieve very high accuracy without supervision. Multi-faceted machine learning techniques underly the threat factor classifiers and are used to examine all aspects of available data including text (using advanced NLP and deep-learning embeddings), image, temporal behaviors, and relationships. Patterns of threat factors that exist across the network of relationships are examined to "connect the dots" between disparate pieces of evidence and identify important threats

Warfighter Value: PAIT provides timely and relevant information to Force Protection personnel enabling the reporting and dissemination of information on threats

WHEN

Contract Number: N68335-20-C-0837   **Ending on:** September 9, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Complete primary algorithmic components	Low	Benchmark core text classification and image analysis algorithms against known data sets.	4	3rd QTR FY21
Fully integrated prototype	Low	Demonstration of data ingested, analysis including machine learned threat factor detectors are applied to data, results are rendered to user through user interface.	5	2nd QTR FY22
Exercise participation	Med	Use prototype in support of military training exercise where open source data is being analyzed to identify threats	6	3rd QTR FY22
Complete enhanced prototype	Med	Based on feedback from exercise, improve prototype performance and ready for evaluation	6	4th QTR FY22
Insertion with end user	Med	Insert prototype into transition partner environment and integrate with their data sources	7	TBD

HOW

Projected Business Model: Provide an open scalable software framework for AI-based multidimensional-trend analytics and learning methods that can exploit behavior analysis techniques and provide insight into threating behaviors. PAIT capability is being integrated into the commercial software product OssaLabs Version 4.0

Company Objectives: Provide artificial intelligence solutions to reduce cognitive overload with automated force protection and intelligence processing. Search vast amounts of data, reliably identify suspicious behavior in isolation, and recognize patterns of those behaviors to identify threats

Potential Commercial Applications: Commercial threat management and workplace violence prevention services

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Topic # N192-131
Persistent AI based Threat Detection (PAIT)
Perceptronics Solutions, Inc.

ABSTRACT

The Perceptronics Persistent AI-based Threat Detection (PAIT) system uses the power of artificial intelligence including machine learning to detect emerging threats and intent to harm by monitoring open source and security-related data sources. PAIT provides timely and relevant information to Force Protection personnel enabling the reporting and dissemination of information on threats to U.S. Government personnel, facilities and information. PAIT technology allows users to customize the analysis of open source and security data sources. Patterns of threat factors that exist across the network of relationships are examined to "connect the dots" between disparate pieces of evidence and identify important threats.

THUMBNAIL

The Persistent AI-based Threat Detection (PAIT) system uses the power of artificial intelligence including machine learning to monitor open-source and security-related data sources and provide timely information on emerging threats and intent to harm.

KEYWORDS

Threat, Force Protection, Artificial Intelligence, Machine Learning, Open Source, SIGINT, natural language processing

CONTACT

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ONR Approval #43-8752-21

Topic # N193-A03-3

Data Enabled Photogrammetry

Virtualitics

WHO

SYSCOM: ONR

Sponsoring Program: ONR 34

Transition Target: SOCOM: PM-ISS in PEO SR

TPOC:
Dr. Peter Squire
peter.squire@navy.mil

Other transition opportunities:
USMC: PM Intelligence Systems (PMM-160), PfM Command Element Systems, Marine Corps Systems Command; commercial shipping, energy, disaster recovery, urban planning, and telecommunications industries

Image courtesy of Virtualitics, Inc.

Notes: Virtualitics is an advanced AI-driven data analytics and 3D/VR visualization company, based on over 11 years of research at the California Institute of Technology (Caltech) and the NASA Jet Propulsion Laboratory (JPL), with a suite of existing commercial data analytic and visualization products. Virtualitics is composed of world-class researchers who are currently working closely with analysts and researchers at numerous government agencies such as the National Institutes of Health (NIH), US Special Operations Command (SOCOM), Office of Naval Research (ONR), and Air Force Global Strike Command (AFGSC) to transform their digital technologies.

Virtualitics has previously been awarded a Phase III contract from AFGSC for VIP software licenses and AI integration services. Similarly, VIP is slated to be a FY22 program of record within Program Executive Office Special Reconnaissance at SOCOM. Furthermore, Virtualitics' predictive maintenance solutions are under evaluation for transition to Air Force PEO Bombers.

WHAT

Operational Need and Improvement: Management of Naval Special Warfare and Marine units' signatures and exploiting the enemy's electronic signatures is critical to success against peer and near-peer adversaries. AI-enabled analysis and 3D + VR visualization of electronic emissions facilitates the planning and operations of missions which involve understanding Marine's ability to detect and exploit hostile signatures and to minimize their vulnerability to detection.

Specifications Required: Standard business or gaming laptop with 8GB+ of RAM and CPU Intel i5-8250U or greater.

Technology Developed: Virtualitics developed new capabilities and adaptation of Virtualitics' commercial software to enable users to analyze, visualize, and exploit electronic emissions and Radio Frequency (RF) signatures. Virtualitics developed a production-quality module to load 3D geo-rectified photogrammetry assets for visualization and overlay of ML data analytic routines. In addition, Virtualitics developed and deployed a Tactical AI-Driven Geospatial Data Insights module which allows users to select geospatial regions and automatically computes trends/anomalies for contained data. Virtualitics also developed an Electronic Warfare-Mission Insights Tool which automates data analytics and generates relevant visualizations around RF signature mission planning workflows. Virtualitics was contracted to provide licenses and training of our commercial software platform, VIP, for ONR, USMC, and NSW users.

Warfighter Value: Special operations forces can rapidly analyze and visualize SIGINT, EW, and RF Spectrum data in advance of executing missions (e.g. pre-mission planning) and post-mission (process, exploit, and disseminate). This significantly reduces time to plan and debrief on missions, enabling quicker turnaround time for operators. This also enables operators to achieve more effective and realistic mission planning, execution, and training by creating the ability to conduct advanced analysis in desktop and in a collaborative, immersive Virtual Reality environment.

WHEN

Contract Number: N68335-20-F-0544   **Ending on:** August 10, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Tactical Geospatial Insights Module	Med	End-users will confirm the models generate relevant predictions.	7	1st QTR FY21
Custom Mission Insights Module	Med	End-users confirm the utility of the plots and visualizations generated.	7	2nd QTR FY21
Photogrammetry Asset Pipeline	Low	End-users confirm the utility of prototype of photogrammetry asset management system.	7	2nd QTR FY21
Photogrammetry Real-Time Collab & VR	Low	End-users confirm the ability to use real-time collaboration through SVO for all new features.	7	3rd QTR FY21

HOW

Projected Business Model: Virtualitics plans to directly sell the technology developed in this project to the government. Virtualitics' business model consists of license sales of our core commercial software product VIP and custom builds of Virtualitics Predict. Our approach to selling software is augmented by also selling services. The Virtualitics SaaS capabilities include custom configuration of Predict and VIP, which include data consultations and tailored AI models, R&D services for commercial and government customers, and solution implementation support which includes documentation and training.

Company Objectives: Virtualitics was founded in 2016 to help commercial and government organizations better understand and visualize their data to make data-driven decisions. To better understand the overall market and how Virtualitics can continue to grow, Virtualitics currently employs a market research and solutions engineering team. This team is responsible for analyzing the current market space, developing go-to-market strategies, and applying that research to our product development initiatives. Our solutions engineers are directly involved in developing relationships with new and potential clients and are responsible for evangelizing our products and showing new users how to apply our products to their specific use cases. Virtualitics also holds four patents for its proprietary technology.

Potential Commercial Applications: Due to our past successful experience, Virtualitics has focused on specific target verticals within federal agencies including predictive modeling and maintenance, sensor data, and test and evaluation efforts. In addition, Virtualitics' commercial client base is composed of enterprises located in the US and other allied nations with big data challenges. Early traction with banking, automotive, manufacturing, and healthcare institutions indicates these verticals are particularly ready for the Virtualitics technology suite because of the massive amounts of data and large budgets for data analytics available in these verticals. Additionally, there is a nexus for the commercial shipping, energy, disaster recovery, urban planning, and telecommunications sectors with regards to how 3D photogrammetry can be applied in the private sector.

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Topic # N193-A03-3
Data Enabled Photogrammetry
Virtualitics

ABSTRACT

The ability to detect and exploit hostile electronic signatures and minimize vulnerability of detection is imperative for successful mission execution against peer and near-peer adversaries. Virtualitics' AI-enabled analysis and 3D + VR visualization software for electronic emissions, the Virtualitics Immersive Platform (VIP), improves the planning and operations of missions through data-enabled photogrammetry. VIP's photogrammetry module has been prototyped and is functionally verified through a completed Phase II project. Virtualitics is an advanced data analytics and visualization company that merges AI and immersive visualizations to empower users to quickly find insights in complex data. Our goal is to integrate and transition this technology into the government and prime contractor systems for facilitating data-enabled photogrammetry.

THUMBNAIL

Detecting hostile electronic signatures and minimizing vulnerability of detection is imperative for mission success. This data-enabled photogrammetry solution loads 3D geo-rectified photogrammetry assets for visualization and overlay of ML data analytic routines.

KEYWORDS

data enabled photogrammetry, machine learning routines, SIGINT data, 3D data visualization, mission planning

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Company	Topic #	Project	SYSCOM
Redwall Technologies LLC	N172-105	Data Integrity and Confidentiality Resilient Operating System Environment for Multi-Level Security	MCSC

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MCSC-PRR-4066

Topic # N172-105

Data Integrity and Confidentiality Resilient Operating System Environment for Multi-Level Security

Redwall Technologies LLC

WHO

SYSCOM: MARCOR

Sponsoring Program: PM Intelligence Systems

Transition Target: PM Intelligence Systems

TPOC:
sbir.admin@usmc.mil

Other transition opportunities: -
Department of Defense:
-- tactical communications,
-- logistics & maintenance operations,
-- flightline & electronic flight bags,
-- telehealth
- Humanitarian Aid and Disaster Relief
- Law Enforcement

Notes: Redwall Mobile has been fielded for over 5 years without being compromised or requiring a security

https://www.marines.mil/Photos/igphoto/2002278812/

patch greatly reducing information technology support workload and costs. This is especially valuable in austere environments.
1. Available on the Motorola Solutions NIAP-approved LEX L11 mission critical handheld.
2. Sold as part of the Tribalco Signal Fusion Platform - multi-level security solution, all CSfC components end-to-end, includes fully integrated radio, LTE, backhaul, and network (classified & unclassified).
3. Coming soon on multiple Zebra tablets and handheld computers.
4. Recently demonstrated at 2021 Naval Integration in Contested Environments (NICE) Advanced Naval Technology Exercise (ANTX).

WHAT

Operational Need and Improvement: Commercial smartphones and tablet computers bring computing and connectivity to the battlefield, flightline, cockpit, point of maintenance, depot, telehealth and other austere environments. However, these devices have inherent OS and application vulnerabilities that expose the DoD to significant risks, and impose unpredictable OS update & patch costs. Redwall's NIAP approved security solution addresses these deficiencies, while enabling a single device to securely operate on classified and unclassified networks. The ability to exchange, store, and utilize controlled and uncontrolled information on a single device reduces logistic costs and network security risks while increasing performance of both labor and systems. Redwall devices can be easily provisioned and reprovisioned to support any mission in any user role context.

Specifications Required: A Mobile device operating system that: provides protection against zero-day vulnerabilities, provides resilience for critical system resources, has low processing overhead and memory usage for resilience, the ability to switch between two different classification levels without requiring removal of the hard disk, and is National Information Assurance Partnership (NIAP) certifiable.

Technology Developed: Behavioral Analysis focuses on how a system should behave when not under attack or influence by an adversary and considers anything else a danger. This technique is effective against zero-day exploits. Even when the cause is completely unknown, the Redwall Mobile solution will still stop the threat. Critical system resources are monitored for corruption and immediately (< 2 seconds) restored to known state providing resilience and fight-through capabilities. Temporal and cryptographic isolation enable multilevel security on a single device.

Warfighter Value: - Multi-role, multi-mission, multi-level security on a single device (eliminates burner phones and BYOD)
- Inherent security that pre-empts zero day exploits to the Android OS and by applications
- Cyber-resilience with "fight-through-attack" capability to enable mission completion and countermeasures
- Rapid, policy-based device provisioning (via cloud or local network) to create custom, mission-specific device and application profiles
- Deployed on military grade, rugged hardware from Motorola Solutions and Zebra Technologies assures long term hardware support

WHEN

Contract Number: M67854-19-C-6517   **Ending on:** October 20, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Demonstrated Feasibility for Resiliency	Low	Proof-of-concept Implementation that could detect and restore a missing or corrupt critical system resource in under 2 seconds.	3	3rd QTR FY18
Completed Vulnerability Assessment (including zero-day attacks)	Med	During our testing, we found several Android exploits that do work against standard Android devices but were rendered either ineffective or irrelevant on a Redwall-protected device.	4	1st QTR FY20
Completed Full Resiliency Implementation	Med	Identified and implemented for critical system resources including critical address ranges of the in-memory operating system (kernel, interrupt handling code & tables, system call handling code & tables, scheduler, etc.), and critical files and daemons.	6	2nd QTR FY20
Prototype with All Topic Requirements Fullfilled	Med	Live demo of full device and server capabilities for potential DoD customers. Delivery of prototype devices.	7	4th QTR FY21

HOW

Projected Business Model: Market Redwall Mobile, Secure Persona, and Digital Bodyguard to end users, and sell through channel partners, including device manufacturers, wireless carriers, resellers, and systems integrators

Company Objectives: 1. Provide value-added cybersecurity software, solutions, and services that leverage Redwall's unique, patented Redwall Mobile® Security, Secure Persona®, and Digital Bodyguard® products
2. Expand rapidly into the smartphone and tablet computer cybersecurity markets by specializing in a) multi-level security, b) application certification, monitoring & control, and c) privacy monitoring and protection.
3. Expand into 5G and Internet of Things markets by providing device control, security and privilege for as-built, as maintained, and as-operated use cases.

Potential Commercial Applications: 1. Government – Redwall enabled mobile devices are capable of meeting the most stringent security requirements, while providing unrivaled device control, and role-based separation & privacy. Use cases include multi-level security, covert missions, diplomatic corps, military theatre of operations, telehealth, flightline maintenance, digital flight bags, and logistics operations.
2. First Responders – Federal, State, & local Law enforcement and emergency response organizations, including police, fire & rescue, and humanitarian and disaster relief organizations.
3. Commercial Enterprises – Security firms, Aircraft Maintenance and Airlines, Healthcare organizations and warehousing & logistics applications
4. Personal Use – Private citizens desiring greater autonomy, security, and privacy.

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Topic # N172-105
Data Integrity and Confidentiality Resilient Operating System Environment
for Multi-Level Security
Redwall Technologies LLC

ABSTRACT

Redwall Mobile® with Secure Persona® is a National Information Assurance Partnership (NIAP) approved secure mobile device operating system that preempts zero-day attacks and enables multiple digital roles (personal, classified, tactical, etc.) and multi-level security on a single smartphone or tablet. Redwall Mobile has been fielded for over 5 years without being compromised or requiring a security patch greatly reducing information technology support workload and costs. This is especially valuable in austere environments. Redwall enables complete device control and privacy. The number of roles and the security posture of each is completely configurable, and reconfigurable as mission needs dictate. Redwall Mobile is ideal to protect mobile devices in all areas of tactical communication, logistics and maintenance operations, flightline and electronic flight bags, and telehealth. It is Technology Readiness Level 7.

THUMBNAIL

Redwall Mobile® with Secure Persona® is a NIAP approved, secure mobile device operating system, that preempts zero-day attacks and enables multiple digital roles and multi-level security on a single smartphone or tablet computer. It is Technology Readiness Level 7.

KEYWORDS

secure mobility, cybersecurity, multilevel security, mobile device, zero-day, resilience

CONTACT

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| Company	Topic #	Project	SYSCOM
Intelligent Fusion Technology, Inc	N182-138	A Metadata Management and Visualization System for Radio Frequency Activity Modeling and Pattern Recognition	NAVWAR

WHO

SYSCOM: NAVWAR

Sponsoring Program: PMW 120

Transition Target: PMW 120

TPOC:
(619)553-2344

Other transition opportunities:
Distributed Common Ground Station (DCGS),
Protected Tactical Enterprise System

Notes: The Metadata Management and Visualization System (MDAMS) we have developed enables the processing of huge amount of RF metadata in real-time using machine learning methods. The system is able to automatically learn the patterns of RF activities that happen around the Navy ship, and detect anomalies. The results are displayed to the operators via a user-friendly GUI. This new technology enables the RF situational awareness capability of the Navy's SSEE and helps the operators to better understand the situation around them on the battlefield.

MDAMS
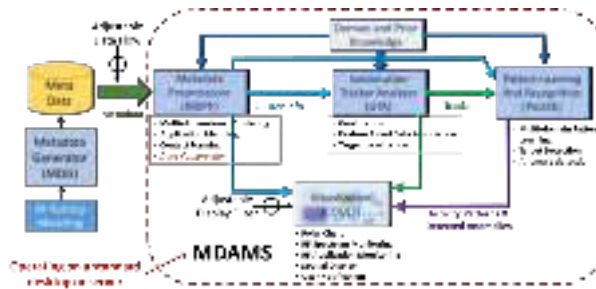
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WHAT

Operational Need and Improvement: The Navy SSEE operators demand software for their system to automatically analyze a huge amounts of metadata extracted from intercepted RF signals for RF situational awareness. The software should be able to learn the activity patterns from the metadata and detect anomalies in the metadata. The results should be displayed to the operators with a user-friendly GUI.

Specifications Required: It is required that the developed software should be able to automatically learn the RF activity patterns from the metadata stored in a database. The data processing should achieve real-time in order to finish the processing before the data is deleted from the database due to the storage limitation. The proposed algorithms should fit the performance of the hardware. The discovered information should be presented to the operators via a user-friendly GUI that follows the Navy's display standard.

Technology Developed: We have successfully developed a web-based software Metadata Management and Visualization System (MDAMS) that can achieve real-time metadata processing using machine learning methods to model the RF activity patterns and detect anomalies around the Navy ship. The results are displayed to the operators in various data visualization charts and tables to help the operator understand the situation around.

Warfighter Value: Our MDAMS is able to discover critical information about the RF activities that happen around the Navy ship, which can further reflect the threats and hidden targets in the mission area. With this capability, our product can support the Navy operators to achieve mission success.

WHEN

Contract Number: N68335-20-C-0306   **Ending on:** September 29, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Concept Design	N/A	Design Documentation	TRL 3	February 2020
Develop and evaluate full-scope prototype in simulated environment	N/A	Performance evaluation of MDAMS with Navy Users	TRL 5	September 2021
Field test prototype on Navy platform in an operational scenario	Low	Achieve the desired performance criteria in the field test with real data.	TRL 7	November 2022
Product Integration and Transition	Med	Satisfy all desired requirements proposed by the customer after deploying onto the target Navy platform.	TRL 8	December 2023

HOW

Projected Business Model: Intelligent Fusion Technology has over 10 years of steady growth providing innovative, cost-effective solutions through R&D. Over 50 IFT projects have produced a wealth of advanced-technology prototype software that can facilitate the rapid integration of critical technology into operational systems. IFT will license the MDAMS technology to large system integrators and integrate it into existing Navy platforms. The first near term DoD application target would be the Battlespace Awareness and Information Operations PMW 120, whose overarching mission is to deliver oceanographic and intelligence operational information, data, products, and services to sailors. Once integrated, IFT will provide users with full documentation on how to use the features of MDAMS and technical support on system maintenance and improvement.

Company Objectives: RF communication, signal processing, electronic warfare, and AI/machine learning are core business areas for IFT, making the success of this effort fall squarely within our corporate interests and competencies. IFT expertise will ensure the success of the innovations developed under the MDAMS program beyond the SBIR contract. In particular, IFT plans to pursue a multi-part plan to transition this technology to the U.S. Navy and other U.S. Government customers, as well as provide benefits to commercial markets and customers seeking to improve the operational readiness of electronic warfare systems with the capability of enhanced RF situational awareness and RF activity modeling.

Potential Commercial Applications: We expect the MDAMS to have immediate and tangible benefits for a number of commercial systems that require RF situational awareness, RF activity modeling, and anomaly detection in the signal domain, such as wireless technology, RF spectrum management, and RF device sectors. We will develop a broad commercial product to enable enhanced RF situational awareness and RF intelligence for both government and commercial partners in the RF communication-related areas.

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Department of the Navy SBIR/STTR Transition Program

Topic # N182-138
A Metadata Management and Visualization System for Radio Frequency
Activity Modeling and Pattern Recognition
Intelligent Fusion Technology, Inc

ABSTRACT

In this Navy project, our team has developed web-based software that can automatically process large amounts of RF metadata, extracted from intercepted signals, in real-time with high efficiency. This software enables RF situational awareness for the Navy Ships Signals Exploitation Equipment (SSEE), and provides a user-friendly graphic interface. For risk control, we have implemented a software prototype utilizing open-source software frameworks and software libraries. Our company, Intelligent Fusion Technology, Inc. is a US-owned and operated technology company founded in 2011. We have strong experience in the fields of signal and image processing, cooperative control and decision-making systems, artificial intelligence. We are working on transitioning our technology into products to enhance the RF situational awareness of existing Navy platforms.

THUMBNAIL

Intelligent Fusion Technology, Inc. has developed software that can automatically process huge amounts of RF metadata in real-time using machine learning methods. This software enables the RF situational awareness for the Navy's Ships Signals Exploitation Equipment (SSEE), and provides a user-friendly graphic interface.

KEYWORDS

Activity modeling, Machine learning, Pattern recognition, Radio frequency, Situational awareness, Pattern of Life, AI

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Company	Topic #	Project	SYSCOM
Cascade Technologies Incorporated	N14A-T005	Software Developments for Large-eddy Simulations On GPU-accelerated Systems	NAVAIR
Tagup, Inc.	N193-A01	LAV25 Logistics Optimization using Machine Learning	NAVAIR
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Topic # N14A-T005
Software developments for large-eddy simulations on GPU-accelerated systems
Cascade Technologies Incorporated

WHO

SYSCOM: NAVAIR

Sponsoring Program: NAWCAD Propulsion and Power; PEO (A)

Transition Target: NAWCAD Propulsion and Power; DoD High Performance Computing Modernization Program (HPCMP)

TPOC:
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Other transition opportunities: Aerospace Defense Industry OEM; Commercial Aerospace Companies

Notes: Colored oil smoke visualization on the outside of the CH-53K King Stallion and simulation of the engine flow performed by NAVAIR with Cascade's "CharLES" software. These efforts validated a modification mitigating Exhaust Gas Re-ingestion for the new Marine Corps aircraft.

Photo courtesy of US NAVY (https://www.navair.navy.mil/news/Joint-Team-Solves-Engine-Integration-Issues-CH-53K-King-Stallion/Tue-12172019-0903). Image courtesy of NAVAIR (AIAA paper 2021-0030, NAVAIR Public Release 2020-930. Distribution Statement A -

WHAT

Operational Need and Improvement: The US government continues to invest in high performance computing (HPC) systems to advance the nation's ability to perform scientific computing workloads. In recent years, the use of accelerated architectures, e.g., graphical processing units (GPU), has become a dominant feature of these new and future systems. However the development of GPUs or other accelerators (e.g., Google/'s Tensor Processing Units) has been driven in large part by the exponential increase in the computational requirements associated with machine learning (ML) and artificial intelligence (AI) applications at a rate that has far outstripped the growth of traditional scientific workloads, such as Computational Fluid Dynamics (CFD).

Specifications Required: To ensure the best return-on-investment for these procurements, CFD software must be rewritten to optimally leverage these new architectures and provide state-of-the-art computational modeling methodologies. A key requirement is to accelerate simulation throughput and cut down on time-to-solution in order to broaden the use of the predictive large eddy simulation (LES) technology for practical fluid mechanics problems relevant to government agencies and industrial OEMs.

Technology Developed: To provide fast and accurate simulation capabilities that fully leverage existing (and future) HPC-GPU systems accessible by NAVAIR, Cascade Technologies is developing a GPU-accelerated version of its flagship high-fidelity multi-physics large eddy simulation software "CharLES". The technology will be implemented in both static and moving-mesh flow solver and applied initially towards predictions of high-speed flows and rotorcraft aerodynamics and aeroacoustics. Compared to traditional HPC CPU-based approach, the reduction in computational cost (or increase in computational throughput) is expected to be more than an order of magnitude.

Warfighter Value: The developed GPU-accelerated simulation tools will enable the investigation of rotorcraft designs with increased performance, efficiency, and reliability at a much lower computational cost and shorter timeline. As more multi-physics capabilities are migrated into the GPU-accelerated LES framework over time, the use of the technology can expand to aircraft and engine component design studies to further reduce development schedules as well as sustainment costs.

WHEN

Contract Number: N68335-21-C-0270   **Ending on:** February 16, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Static-mesh GPU-accelerated flow solver	Low	Validation of prediction accuracy for canonical cases and high-speed flow applications; BETA-release of the static-mesh GPU-accelerated software to NAVAIR	5	September 2021
Moving mesh building on GPU architecture	Med	Implementation and testing of dynamic moving-mesh builder in the GPU-based framework. Verification of scalability and performance improvement with GPU-accelerated technology	4	May 2022
Moving-mesh GPU-accelerated flow solver	Med	Fast and accurate simulation of realistic rotorcraft configuration; Beta-release of the static and moving-mesh GPU-accelerated software to NAVAIR	5	February 2023

HOW

Projected Business Model: The business model is to license the developed GPU-accelerated LES software directly to the Navy/government and commercial customers (Aerospace and Automotive OEMs)

Company Objectives: The main objective is to transition the developed technology through software licensing, for a consistent and sustainable source of support for the software maintenance and future developments. A secondary objective is to open markets using similar moving-mesh technology adjacent to rotorcraft applications (e.g., turbomachinery) and connect to Aerospace OEM's working with the US Navy.

Potential Commercial Applications: In addition to rotorcraft simulations, there is a wide range of engineering applications of interest to both government and industry that would benefit from the significant reduction in computational cost and time-to-solution with the developed GPU-accelerated LES technology including aeroacoustics, external aerodynamics, turbomachinery and combustion dynamics applications.

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Topic # N14A-T005
Software developments for large-eddy simulations on GPU-accelerated systems
Cascade Technologies Incorporated

ABSTRACT

In recent years, the US government has aggressively increased investments in GPU-accelerated architectures for new and future high performance computing systems. To ensure researchers can optimally leverage these procurements, Cascade Technologies is developing GPU-accelerated support within its flagship large eddy simulation software "CharLES". This GPU-enabled version of the software will provide fast and accurate predictions of high-speed flows and rotorcraft aerodynamics, impacting programs such as the V-22 and CH-53K. This technology can be utilized in countless other applications including aeroacoustics, propulsion systems, turbomachinery, and combustion dynamics. We expect a reduction in computational cost (or increase in computational throughput) relative to traditional CPU-based systems of more than an order of magnitude. Ultimately, we will transition the technology into government and commercial customers through software licenses.

THUMBNAIL

Cascade Technologies is developing a GPU-accelerated version of its flagship large eddy simulation software "CharLES" that optimally leverages new GPU-accelerated architectures in recent high performance computing systems, for predictive, fast, and cost-efficient simulations of high-speed flows and rotorcraft aerodynamics.

KEYWORDS

computational fluid dynamics (CFD), large eddy simulation (LES), GPU-accelerated software, high-speed flow prediction, moving-mesh technology, rotorcraft aerodynamics & aeroacoustics, high-performance computing (HPC)

CONTACT

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Topic # N193-A01

LAV25 Logistics Optimization using Machine Learning

Tagup, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: EXPECTED: MARCOR I&L LP

Transition Target: EXPECTED: PEO EIS PMW-230 Global Combat Support System-Marine Corps

TPOC:
(407)381-8936

Other transition opportunities:
MARCOR Ground Equipment, DON legacy equipment, Army Ground Equipment (GCSS managed). alternative DOD Asset Managers.

Notes: Tagup machine learning capabilities were developed on the LAV using GCSS-MC maintenance records, and successfully scaled to the MTVR platforms. The predictive modeling capabilities are applicable to any asset platform with a similar maintenance data record.

US Marine Corps photo. Cpl. Dylan Chagnon

WHAT

Operational Need and Improvement: To improve MAGTF scenario planning capabilities, machine learning (ML)-based readiness and sustainment analytics augment the warfighter by identifying best available assets, evaluating historical unit/asset performance, and forecasting upcoming sustainment needs. The application of machine learning (ML) can drastically improve mobilization planning capabilities by taking advantage of historical O&M data readily available in GCSS.

Specifications Required: This ML technology is prototyped on AWS GovCloud and deployable to any authorized cloud environment (e.g., MCBOSS, McCEITS). A containerized architecture allows deployment via a robust continuous integration/ continuous delivery (CI/CD) pipeline that can flexibly integrate with existing ERP systems.

Technology Developed: New machine learning methods rapidly improve mobilization planning capabilities of commanders, maintainers, and supply personnel through unified data and intuitive dashboards. Prototyped alongside the warfighter, tools use ML-based analytics to present accurate forecasting of fleet readiness, asset availability, and unit sustainment needs.
Capabilities include:
- Data cleaning and restructuring sourced from multiple available systems, and rapidly scalable
- Comprehensive summary of any asset's O&M history
- Readiness forecasts out to 30 days, aggregated by unit or TAMCN
- Mobilization planner to optimize EDL specification and Class IX block building
- Depot-level operational logistics planner linking materiel posture to tactical unit activity

Warfighter Value: Lightweight, intuitive dashboards unify the mobilization process for Commanders, Maintainers, and Suppliers to evaluate best-available criteria on assets and sustainment needs using real-world operational data. Models are built to maximize mission success while minimizing operating cost via reduced customer wait time and logistics response time with an improved readiness posture.

WHEN

Contract Number: N68335-20-F-0459   **Ending on:** November 12, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
SBIR Phase II Prototype Complete	Low	Successful deployment of prototype using historical data to MAGTF workgroups, including onboarding and feedback	6 - Proof of Concept Success and model validation in simulated-ops environment.	November 2021
Phase II.5: Integration and Test	Low	Integration with live data sources (e.g. MDR, McBoss), and interoperability and secure API architecture development. Prototype validation with streaming data.	7 - System Prototype demonstration in an operational environment.	June 2022
Phase II.5 Field Deployment and Scaling	Low	Additional TAMCN data ingestion Integration with new data sources (e.g. telemetry, manufacturer data, and other logistics information systems)	8 - Integrated streaming software system in live-ops environment	December 2022
Phase III: Fleet Deployment	Med	Full Deployment. Software built and operated across TAMCNs to demonstrate performance in the actual operational environment		December 2023

HOW

Projected Business Model: Tagup offers licensed custom integration into enterprise software applications. System interfaces use a REST API, providing direct access to the data pipeline and analytics engine, including all data and forecasts. The analytics may be expanded to additional asset classes and data sources. Professional services are offered to support implementation, training, and sustainment.

Company Objectives: Tagup seeks to provide industry-leading machine learning algorithm development and custom applications, both as a Prime and to support joint-service warfighter mission readiness.

Potential Commercial Applications: Tagup provides industrial equipment owners and operators intuitive forecasting and planning tools to minimize operating costs without compromising safety, reliability, and efficiency. Current software deployments in general industry are with electric utilities, power generators, oilfield operators. All industry applications use AI to predict critical events, identify unusual operations, and optimize control decisions. Core product applications include procurement and inventory optimization for improved asset management.

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Topic # N193-A01
LAV25 Logistics Optimization using Machine Learning
Tagup, Inc.

ABSTRACT

New machine learning methods rapidly improve mobilization planning capabilities of commanders, maintainers, and supply personnel through unified performance criteria and intuitive dashboards. Prototyped alongside the warfighter, Tagup uses ML-based analytics to present accurate forecasting of asset availability, fleet readiness, and unit sustainment needs. Automated models consolidate and operationalize the wealth of digital maintenance and supply data already captured in existing ERP systems, mitigating installation of expensive sensor equipment. Capabilities include:
● Secure data pipeline deployed via AWS GovCloud, providing a complete summary of any asset's O&M history
● Readiness forecasts out to 30 days, aggregated by unit or TAMCN
● Mobilization planner to optimize EDL specification and Class IX block building
● Depot-level logistics planner linking materiel posture to tactical unit activity

THUMBNAIL

Tagup mission-based planning tools use machine learning to accurately forecast fleet readiness, visually investigate asset lifecycles, and identify demand-driven sustainment needs. Readiness and sustainment models operationalize existing digital records by powering scenario planning capabilities that unify Command-Maintenance-Supply performance criteria.

KEYWORDS

Machine Learning; Readiness Forecasting; Mobilization Planning; Failure Prediction; AI; CBM+; ERP

CONTACT

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Topic # N193-A03-3

Xiphos CallforFire Gaming Simulation NAVY TECHNOLOGY ACCELERATION - Advanced Technologies (including AR/VR) for Manpower, Personnel, Training, and Education

WHO

SYSCOM: ONR

Sponsoring Program: SBIR Navy Technology Acceleration

Transition Target: MARCORSYSCOM, PM-TRASYS, DVTE, SAVT, SOCOM J-3I

TPOC:
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Other transition opportunities: Organizations and units with remote training requirements for Joint Terminal Attack Controller (JTAC)/Joint Fires Observer (JFO) training in the joint, special operations, and allied partner spheres.

Notes: Top image: A close air support (CAS) attack as viewed from the instructor and debrief station as well as the geometry of aircraft flight paths, friendly and opposition ground forces, air space control measures (ACM), video down link (VDL), and 9-line attack brief. Bottom image: The product base kit with laser cut custom foam that houses and protects the virtual reality (VR) hardware, gaming laptop and accessories in a single highly durable and weather resistant Pelican case.

WHAT

Operational Need and Improvement: Joint Terminal Attack Controller (JTAC) simulator that provides a portable, immersive, tactically relevant fires training in a commercial gaming environment. Enables terrain ingestion, networking with legacy simulations, integration with program of record (PoR) equipment. Does not require contractor support to operate or update.

Specifications Required: Fits inside (1) man-portable mil-spec Pelican case, employing commercial gaming and VR software to provide immersive capability that sets up rapidly, is scalable, and meets or exceeds requirements outlined by the accreditations criteria in the Executive Steering Committee (ESC) Joint Terminal Attack Controller (JTAC) Memorandum of Agreement (MOA).

Technology Developed: Unique to the JTAC Virtual Trainer (JVT) is the multi-option Tactical Air Control Party (TACP) equipment interface: emulated within the sim, and functionally stimulated 3D printed models. The JVT is also interoperable with existing VBS family of systems, allowing the user to network with existing systems to build realistic scenarios. The JVT is designed to interface with existing Target-Hand off Systems (THSv2) systems allowing training on actual gear (stimulated).

Warfighter Value: The low cost, high transportability, and game-like user experience means that access to high quality training can be provided to units anywhere, complementing existing program of record simulations, and expanding training and proficiency opportunities by 100x. The collaboration of commercial video game developers, terrain, and Close Air Support (CAS) subject matter experts (SME) result in the most intuitive, high quality user experience for fires training and proficiency.

WHEN

Contract Number: N68335-20-F-0542   **Ending on:** November 9, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
S&T FITE Culminating Demo	Low	Training Community Support and Transition Criteria	6	TBD
Initial/Interim Accreditation	Med	Demonstrates adherence to JFS ESC MOA criteria	7	TBD
Phase III / Transition identification	Med	Low Rate Initial Production and Final Release Development	8	TBD
Program of Record Acquisition	Med	# of Kits and Instances Fielded by USMC and other services	8	TBD

HOW

Projected Business Model: US and Int'l partner fires training communities at the application level. We specialize in building next generation virtual worlds and virtual reality experiences using commercial gaming engines and easily updatable commercial VR equipment for immersion. Spatial, terrain, user interface (UI)/user experience (UX) tactical capabilities have application across multiple industries. We are interested in developing highly specialized and cost effective training solutions to enable 100x improvement in training and proficiency.

Company Objectives: The goal of this program is to establish JVT as an accredited program of record for the US Marine Corps, and provide highest quality immersive virtual training for the domestic and partner warfighters. More broadly, we hope to bridge the gap between commercial gaming quality and ease of use and to enable training communities across industries.

Potential Commercial Applications: Use in training fire supporters, Joint Fires Observers (JFOs) and Joint Terminal Attack Controllers (JTACs), Front end mission rehearsal, design and management, Terrain ingestion and digital assets and software modules for spatial, immersive, high quality gaming applications.

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Topic # N193-A03-3
Xiphos CallforFire Gaming Simulation NAVY TECHNOLOGY
ACCELERATION - Advanced Technologies (including AR/VR) for
Manpower, Personnel, Training, and Education
Xiphos Partners, LLC

ABSTRACT

The JVT (JTAC Virtual Trainer) is a portable, immersive, tactically relevant fires trainer. It fits inside (1) Pelican case, and employs commercial gaming and VR software to provide immersive capability that sets up rapidly. It's scalable, and about 90% compliant with established JTAC (Joint Terminal Attack Controller) simulator criteria established by the JTAC memorandum of agreement. The JVT can interface with existing Target-Hand off Systems (THSv2) systems allowing training on actual gear. Low cost, high transportability, and game-like user experience means access to high quality training can be provided to units anywhere, complementing existing PoR simulations, and expanding training opportunities significantly. Collaboration of commercial video game developers, terrain, and CAS SMEs result in the most intuitive, high quality user experience for fires training and proficiency.

THUMBNAIL

The JVT is a Virtual Reality (VR) is a JTAC VR simulator that offers commercial video game quality software in a tactically relevant and easily deployable kit. The JVT fits into one man-portable pelican case for ease of use.

KEYWORDS

Joint Terminal Attack Controller (JTAC), Joint Fires Observer (JFO), Virtual Trainer, Virtual Reality

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