

Topic: N161-017

Texas Research Institute Austin, Inc.

Efficient On-Aircraft Composite Repair Process Requiring Minimal Support Equipment

This technology will streamline composite repair processes on aircraft and other vehicles. The approach could potentially transform additional composite fabrication areas. The majority of high performance thermoset resins have two-components and require thermal curing to achieve acceptable properties. The resin system developed by TRI/Austin can be supplied as a one component system that can be cured at ambient temperatures. Without post-cure the resin will provide a glass transition temperature in excess of 350 °F (177 °C). The implications of this development are significant in terms of the ease of use and elimination of procedural steps. While the resin system was developed specifically for vacuum bagging, it is expected to be viable for other composite fabrication methods including resin transfer molding (RTM) and vacuum-assisted resin transfer molding (VARTM). The resin system can be cured at ambient temperatures in approximately one hour. However, if higher cure speeds are desired it can also be cured thermally.

Technology Category Alignment:

Maintainability/Sustainability

Structures and Protection

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SYSCOM: NAVAIR

Contract: N68335-18-C-0012

Booth: 900

Room: Talon Club Room

Presenting: Apr 11th at 3:30 PM

Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.

NAVAIR 2018-751

Topic # N161-017

Efficient On-Aircraft Composite Repair Process Requiring Minimal Support Equipment

Texas Research Institute Austin, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: NAVAIR PMA-275

Transition Target: H-1 Helicopter, V-22

TPOC:

(301)342-2181

Other transition opportunities: The anaerobically curing composite material developed will have immediate applications in the repair of a large variety of DoD aircraft and other vehicles. Along with composite repair capabilities the resin system has potential for use in composite manufacturing applications.



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WHAT

Operational Need and Improvement: More efficient on-aircraft repair processes are needed for structural organic-matrix composite components. In response to this need, Texas Research Institute Austin (TRI/Austin) is developing new matrix resins that provide elevated Tg, and high fiber strength translation. Matrix resins have been formulated to achieve glass transition temperatures of > 330°F, and to restore structural capabilities of damaged aircraft components. The one-component ambient temperature curing system will eliminate mixing of multiple components and the need for heating equipment to achieve cure. The less labor intensive process will reduce costs currently associated with composite repairs.

Specifications Required: The program objective is development and demonstration of aircraft composite repair systems that will reduce training, labor, and ancillary equipment requirements. The developed process will be specifically designed for on-aircraft repair of organic-matrix composite materials to restore load-bearing and functional capabilities of structural components.

Technology Developed: TRI/Austin demonstrated a new composite matrix resin technology that will streamline composite repair processes on aircraft and other vehicles. Most high performance thermoset resins have two-components and require thermal curing to achieve acceptable properties. The resin system developed by TRI/Austin can be supplied as a one component system that can be cured at ambient temperatures. Without post-cure the resin will provide a glass transition temperature more than 350°F(177°C).

Warfighter Value: The resin systems developed during Phase I have the potential to achieve the desired rapid composite repair, with negligible support equipment required. The single bag materials and process eliminate the need for box or dome tools, heating blankets, and thermal control units (hot-bonders). The unique composite repair materials that TRI/Austin is developing can reduce repair times by 50 percent or more. The matrix resin technology demonstrated during the Phase I effort is based on an anaerobic curing approach that will potentially transform not only composite repairs, but several composite fabrication areas in general.

WHEN

Contract Number: N68335-18-C-0012 **Ending on:** January 1, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Final Resin Down select	Low	Resin meeting all properties required	5	January 2019
Validation Testing	Med	Resin meets all internal requirements	5	May 2019
Perform Simulated Repairs	Med	Meets repair guidelines	6	December 2019
Conduct in field repairs	Med	Satisfies end users expectations	8	April 2021
Commercialization	High	Industry acceptance	9	April 2022

HOW

Projected Business Model: TRI/Austin will both manufacture and sell the product directly through various distribution channels, independent Rep networks, and an interim sales force.

Company Objectives: TRI/Austin is looking for programs of interest, teaming partners, potential distributors, and end users of the Anaerobic composite repair resin.

Potential Commercial Applications: There are many applications for these resins beyond the scope of DoD aircraft repair. Any situation that requires a quick curing polymeric patch or tooling fabrication could benefit from this product.

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Topic: N161-017

Luna Innovations Incorporated

Single Vacuum Bag Process for Rapid, On-Site Repair of Composites

For the repair of composite aircraft components, a Double Vacuum Debulk (DVD) process is commonly performed on a repair patch to reduce void volume, prior to application of the patch to the damaged structure. Luna Innovations Incorporated has developed an advanced single vacuum bag process utilizing a novel Breathable, Resin Barrier (BRB) which can be utilized to fabricate high quality aerospace laminates. The technology eliminates the dedicated equipment, complexity, and size limitations of the DVD tooling, while reducing process time by more than 50%. The developed out of autoclave process is applicable to legacy material systems and a wide variety of fabrication and repair applications, but the initial implementation target will be at Navy depots to simplify and more efficiently repair aircraft, such as the V-22.

Technology Category Alignment:

Fixed Wing Vehicles (includes UAS)

Rotary Wing Vehicles

Maintainability/Sustainability

Readiness

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SYSCOM: NAVAIR

Contract: N68335-18-C-0013

Booth: 903

Room: Talon Club Room

Presenting: Apr 11th at 3:20 PM

Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.

NAVAIR 2018-722

Topic # N161-017

Single Vacuum Bag Process for Rapid, On-Site Repair of Composites

Luna Innovations Incorporated

WHO

SYSCOM: NAVAIR

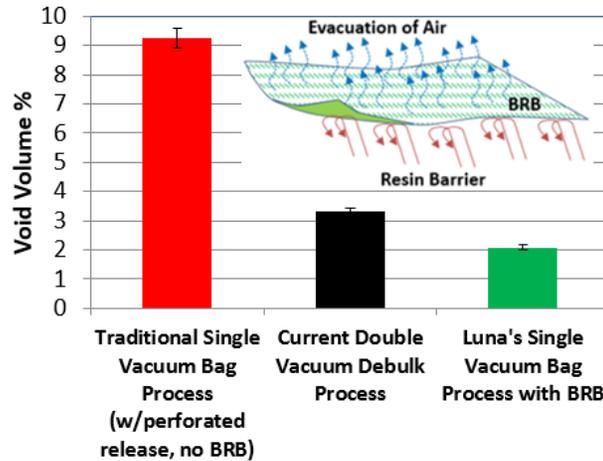
Sponsoring Program: PMA 276 H-1 Helicopter Program Office (Phase I), PMA 275 V-22 Program Office (Phase II)

Transition Target: V-22 Aircraft Repair

TPOC: (301)342-2181

Other transition opportunities: The technology will be directly implementable to virtually all Navy and other Department of Defense air, sea, and land platforms as an efficient and effective method for rapid, on-site repair and out of autoclave composite fabrication. The technology will be applicable to both wet-resin and prepreg composite processing and could be implemented throughout military and civilian composite sectors

Notes: The figure (above, right) demonstrates lower void volume percentage of identical composite panels fabricated with Luna's single vacuum bag process with Breathable Resin Barrier (BRB) over traditional single vacuum bag and baseline Double Vacuum Debulk processes



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WHAT

Operational Need and Improvement:

- Aerospace flush repairs require machining tapered cavity to remove damage, followed by bonding of mating (scarf) composite patch
- Double Vacuum Debulk (DVD) processes is currently utilized to fabricate patch for wet-resin composite repair
- DVD process requires special tooling, limits the size of the repair, is overly complicated and expensive, and creates logistical challenges when repairs are needed on aircraft in small detachments
- A repair process is desired that provides repair patches of the same or better quality [to current], but minimizes required support equipment and is less labor intensive

Specifications Required:

- Bonded repairs, requiring no additional support equipment, in uncontrolled environments
- Max patch preparation and cure time <8 h, with target of <4 h
- Repair patches of at least 15" x 15" and ≥ 0.120 in thick
- Porosity < 4% with Luna target of < 2%
- Complex curvature and shapes with radius of curvature ≤ 4 in
- Vertical or horizontal orientations; laminate and sandwich panel configurations

Technology Developed:

- For rapid technology insertion, Luna's approach utilizes baseline composite repair materials with innovative process
- Luna's single bag process uses a Breathable Resin Barrier (BRB) which permits air permeability but prevents resin penetration
- Air is continually evacuated over the entire surface of the laminate and uniform vacuum compaction pressure achieved
- Simple single vacuum bag fabrication yields low void/high-quality composite parts

Warfighter Value:

Luna's BRB and single vacuum bag repair process eliminates special tooling, simplifies set-up, removes size restrictions, and can reduce repair time by more than 50%

WHEN

Contract Number: N68335-18-C-0013 **Ending on:** March 20, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Proof of concept demonstrated in Phase I	N/A	Achieved same or lower void volume % when compared to panels fabricated with DVD process	4	November 2016
Technology demonstrated with legacy repair materials	Med	Achieve same or lower void volume % than panels fabricated with legacy DVD tooling and process	4	November 2018
Technology demonstrated at Navy Depot	Med	Same or lower void volume % for Navy repair patch without need of DVD tooling	5	March 2019
If Phase II Option exercised, sub component repair and evaluation	Med	Equivalent or improved void volume percentage and mechanical strength when compared to identical component fabricated using DVD process	6	September 2019
If Phase II Option exercised, equivalency testing and full scale component repair and evaluation	Med	Equivalent or improved coupon mechanical properties and equivalent or improved component repair quality and strength	7	January 2021

HOW

Projected Business Model: Luna intends to manufacture via a toll producer or license the technology to a specialty fabric or composite fabrication material supplier for distribution to DoD platform integrators. Luna will provide technical assistance and production scale-up support.

Company Objectives: Luna seeks partnerships with DoD Prime integrators and composite fabrication material suppliers for dem/val assessment of the technology as applied to both out of autoclave composite repair and component fabrication for aircraft, ships, and/or ground vehicles.

Potential Commercial Applications: The initial focus of this program will be on the development of an efficient and effective method for rapid, on-site repair of composite aerospace structures for the Navy. The technology will be directly implementable to Navy and other Department of Defense platforms which utilize composite materials. However, the impact on the broad composite commercial market could be enormous. The technology is applicable to virtually every industry where composites are utilized as it covers a wide range of composite material systems, fabrication processes, and applications. It is anticipated that an advanced breathable resin barrier will be developed to produce high-quality composite materials from simple vacuum bag fabrication processes. This will enable the escape of air and reaction gasses while maintaining uniform compaction force to eliminate voids and processing imperfections without the need of specialized and size limiting tooling. The technology will have extreme impact for out of autoclave fabrication methods, although it will be of benefit to autoclave processing as well. The use of these systems will provide economical composite manufacturing and repair options by reducing fabrication costs and increasing production capabilities.

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Topic: N162-088

UES, Inc.

High Temperature, High Performance Wire Insulation (17-RD-964)

The H-60 requires flexible engine wiring harnesses to operate in continuous, high-temperature conditions exceeding 425 deg C; however, no suitable insulation currently exist that can withstand these conditions. Consequently, UES partnered with the University of Dayton Research Institute (UDRI) developed high-temperature wire insulation concepts enabling performance up to 450 deg C. Tests conducted after 50 hours of exposure at 425 deg C met all performance standards. One insulation concept lasted 50 times more cycles than the baseline in the needle abrasion test (SAE AS4373 Method 301) showing a dramatic durability improvement, the concepts may be applicable to legacy and current wiring, as a near drop-in replacement. UES, an employee-owned innovative science and technology company provides government and industry customers with superior research and development expertise, and world class support through on-site and in-house research.

Technology Category Alignment:

Power and Energy

Propulsion and Extreme Environments

Readiness

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SYSCOM: NAVAIR

Contract: N68335-18-C-0188

Booth: 904

Room: Talon Club Room

Presenting: Apr 11th at 3:40 PM

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-18-C-0188

Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.

NAVAIR 2018-697

Topic # N162-088

High Temperature, High Performance Wire Insulation (17-RD-964)

UES, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-299, H-60 Helicopter Program

Transition Target: H-60 Helicopter Program, MV-22

TPOC:

(301)342-2189

Other transition opportunities:

About 15% of the DoD operational rotorcraft fleet is based on the H-60 platform. Therefore, potential transition opportunities exist for the UH-60, SH-60, HH-60, MH-60, and VH-60. Also, aircraft and other systems where high temperature (425C) environments are unavoidable.

Notes: UES is striving to accelerate development and testing to make this solution available as soon as materials and processes can be down-selected and validated to meet all Key Performance Parameters (KPPs) required for Phase II.



http://www.navy.mil/management/photodb/webphoto/web_161020-N-WS581-081.JPG

WHAT

Operational Need and Improvement: Unique operating environments and conditions expose Navy systems and their components to extreme temperatures, moisture/humidity, altitude, fluids, vibration, and various other challenges. Unlike a majority of electrical/wiring applications that require harnesses and cables able to withstand temperatures up to 260C, a small number of Navy applications require flexible engine wiring harnesses to operate in continuous, high-temperature conditions exceeding 425C. While many options exist for high-performance wire insulations that can withstand up to 260C temperatures, currently no suitable insulations exist that can withstand continuous temperatures up to 425C while still complying with all the Key Performance Parameters (KPPs).

Specifications Required: Key Performance Parameter (KPP) Testing required: Wiring insulation will need to pass a 50-hour temperature endurance test (at two temperature extremes of -55C and +425C), a 500-hour temperature endurance test (at two temperature extremes of -55C and +425C) and ultimately endure a 5000-hour temperature endurance test meeting all of the KPPs: Mandrel wrap bend test (MIL-DTL-25028J, para 4.6.4.a and para 4.6.5); Wet dielectric (MIL-DTL-25038J, para 4.6.4 and 4.6.6); Insulation resistance; meet minimum requirement of 100 Megohms at 500V DC, per SAE AS4373 Method 504 after high-temperature endurance (MIL-DTL-25038J, para 4.6.6); Needle abrasion of 1500 cycles at ambient temperature per SAE AS4373 Method 301 after high-temperature endurance at 425C (MIL-DTL-25038, para 4.6.4); Insulation outer diameter not to exceed MIL-DTL-25038/1 requirement of 0.125", ±25% (including conductor); Concentricity of wire insulation over the conductor, may be no less than 70% (MIL-DTL-25038J, para 3.4.2.2 and 4.6.2).

Technology Developed: UES Inc. in cooperation with University of Dayton Research Institute (UDRI), has developed insulation approaches to enable a high-temperature wire capability. These include unique overcoating procedures to enable current mil spec wires (M25038/1-20) rated for 260C to perform up to 425C, new wire insulation concepts and a combination of both. Test results from phase I using laboratory prepared wiring insulation met the KPPs after exposure to 425C for 50 hours.

Warfighter Value: Reduce maintenance costs; increased mission readiness; wire fits all current connectors, brackets, etc.; enables wire routing as currently designed; weight neutral

WHEN

Contract Number: N68335-18-C-0188 **Ending on:** March 3, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Finalize Wiring Insulation Design	High	Short sample wiring Passes Wet dielectric test (MIL-DTL-25038J, para 4.6.4 and 4.6.6) as a screening tool for up to 500 hours exposure at 425C	TRL 3	January 2019
Mid-Scale Wire Production, 250 hrs endurance.	Med	Production produces uniform wiring insulation according to specifications. Wire insulation passes all KPPs after 250 hours exposure at 425C and -55C	TRL 4	April 2019
Mid-Scale Wire Production, 500 hrs endurance.	Med	Production produces uniform wiring insulation according to specifications. Wire insulation passes all KPPs after 500 hours exposure at 425C and -55C	TRL 5	August 2019

HOW

Projected Business Model: UES marketing staff is in place to facilitate commercialization by identifying markets, understanding customer needs, etc.. Additional effort beyond Phase II will be required to advance the technology towards transition and application. UES intends to work with ASTRO Industries to convert and transition the reel to reel process understanding to a production environment. The wire insulation produced in this production environment will need to be tested according to the specifications after up to a 5,000 hour exposure at 425C and -55C. The UES Inc. approach to commercialization will be to license the insulation technology to multiple wiring suppliers which service targeted markets, allowing them an exclusive license for a specific market application. We will work with the suppliers to transition the technology to their production facility based on the documented process developed at ASTRO Industries.

Company Objectives: UES is a research and development company, developing advancements across a broad spectrum of specialties, including materials & processes, aerospace power & propulsion technologies, biological & nanoscale technologies, surface engineering, photonics & electronics, modeling & simulation, and integrated health and human performance. The maturity and value of each technology is tracked and periodically evaluated for potential product maturation. UES has successfully leveraged the Small Business Innovation Research (or SBIR) program to develop cutting edge technologies; we are a recent winner of a 2015 R&D 100 Award for a product developed through SBIR efforts. UES continues to invest its own funds to commercialize our products and services using in-house laboratories to mature and advance technologies for internal production or licensing. Our long-term goal is to generate 50% of revenues from commercial ventures.

Potential Commercial Applications: There is a potential need for this type of insulation within the commercial engine applications as well. This capability will allow for the use of high-temperature, flexible harnesses in current and future military and commercial engine applications in addition to foreign platforms such as the Mitsubishi H-60 and Sikorsky H-70.

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Topic: AF131-190

(ES3) Engineering & Software System Solution, Inc.

Dimensional Restoration of Aircraft Components Damaged by Corrosion

ES3 a high-end engineering firm specializing in engineering and design of aircraft components and advanced material coatings for aerospace applications has been developing cold spray repair coatings and application techniques, robotic and handheld, MIL-Spec approved, that provide dimensional restoration using environmentally-friendly, corrosion resistant coating applications. ES3 successfully completed a similar effort with the US Air Force Phase I/II; development, demonstration and validation required for future implementation of the low-/mid- pressure (up to 250 psi) cold spray repair applications where lessons learned will be leveraged. Initially, the target market for this technology will be the USAF and USN depots that are responsible for refurbishing and restoring worn or damaged surfaces of on any aircraft platforms and/or ground support equipment manufactured from aluminum and magnesium substrates.

Technology Category Alignment:

Fixed Wing Vehicles (includes UAS)

Rotary Wing Vehicles

Corrosion

Readiness

Structures and Protection

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SYSCOM: NAVAIR

Contract: N68335-18-C-0201

Booth: 901

Room: Talon Club Room

Presenting: Apr 11th at 3:10 PM

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-18-C-0201

Department of the Navy SBIR/STTR Transition Program

DISTRIBUTION STATEMENT A. Approved for public release. Distribution is unlimited.

NAVAIR 2018-735

Topic # AF131-190

Dimensional Restoration of Aircraft Components Damaged by Corrosion (ES3) Engineering & Software System Solution, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: Commander, Fleet Readiness Centers (COMFRC)

Transition Target: Fleet Readiness Centers (FRCs) at Cherry Pt, North Carolina, Jacksonville, Florida, and North Island, California

TPOC:
(619) 545-3057

Other transition opportunities: The technology will also be applicable to all Department of Defense (DoD) services for any aircraft component, landing gear component, or ground support equipment component manufactured from 2XXX, 6XXX, 7XXX aluminum alloy, or ZE41A Magnesium alloy.

Notes: ES3 successfully completed similar effort with the US Air Force Phase I and II SBIR efforts meeting its primary goal of development, demonstration and validation required for future implementation of the low-/mid- pressure (up to 250 psi) cold spray repair applications for typical aluminum and magnesium substrates; lessons learned per the U.S. Air Force effort will be leveraged for this U.S. Navy effort. The technology can provide restoration of damaged components manufactured from any substrate type with multiple types of coatings for dimensional restoration while also providing corrosion and wear protection.



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WHAT

Operational Need and Improvement: Currently, there are no practical repair methods after removing corrosion products, to build back worn areas and dimensionally restore damaged (corrosion, wear, tooling damage, etc.) aircraft structure and components and GSE equipment, including hard-to-reach areas in a relatively quick manner. Therefore, there's a need to expand current cold spray capabilities, providing corrosion and/or wear resistance that's portable and can provide quick corrosion removal and on-site dimensional restoration for these components at depot and field level sites.

Specifications Required: Cold spray technology process specifications will be implemented into the FRC repair depots, as well as field applications with both robotic and hand held applications for many types of substrates (aluminum, magnesium, titanium, etc.) with applicable coatings (i.e. multiple powder types). Three cold spray systems have been identified for coating development throughout the overall program, these are the Centerline, Inovati and VRC Gen III systems, which each have their own performance ranges for various coating properties, performance characteristics and economic considerations. The coatings developed must be able to meet the applications' fit, form and function characteristics to return the part to service, meeting all corrosion, wear, performance, mechanical property, etc. requirements.

Technology Developed: Cold spray technology, a thermal spray process that uses a "Gas Dynamic Spray (GDS) Process" to apply kinetic sprayed coatings to a variety of substrates, which involves using a gas jet to accelerate metal particles to supersonic velocities, producing coatings by solid state deformation of powder particles impacting onto the substrate – all at much lower temperatures than conventional thermal spray processes. Coatings will be developed for multiple cold spray systems, including low and high-pressure systems.

Warfighter Value: This technology can deposit metallic and non-metallic materials onto a variety of surfaces and substrates at much lower temperatures than traditional thermal spray, avoiding any thermal effects such as oxidation, metallurgical transformations or residual stresses. As a result, this technology has great promise in refurbishing (i.e. restoring worn or damaged surfaces) high dollar, complex, long lead time parts that cannot be repaired by traditional thermal spray processes, or other technologies.

WHEN Contract Number: N68335-18-C-0201 **Ending on:** September 15, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Identify Test Requirements & Draft Test Requirements Technical Report	Low	Test Plan Approved by FRC	N/A	July 2018
Parameter Optimzation	Med	Meet OEM Powder Specifications	N/A	December 2018
Quality Testing (i.e. Metallurgical and XRD Testing)	Low	Meet OEM Powder Specifications	N/A	March 2019
Structural Mechanical Testing (i.e. Tensile, Fatigue, and Triple Lug Shear Testing)	Med	Meet test criteria	N/A	March 2020

HOW

Projected Business Model: ES3 is a high-end engineering firm specializing in engineering and design of aircraft components, Systems, and Subsystems; advanced material coatings for aerospace applications; specialized metallurgical, hydraulic, and mechanical custom testing; computational methods for structural dynamic analysis; maintenance repair and overhaul; and development of environmentally preferred material processes. We provide an array of services and products to commercial and government entities. ES3 engineers provide advanced coatings for a variety of specialized applications which encompass goals such as improved component performance, reduced environmental impact, improved reparability, and improved life cycle costs for the warfighters.

ES3 will provide the testing and data required to transition and implement the technology in order to build organic capability within the DoD. As part of the implementation, ES3 will provide engineering services to develop additional repair applications, as well design and manufacture tooling & fixturing new for these applications.

Company Objectives: Initially, the target market for this technology will be the USAF and USN depots that are responsible for refurbishing and restoring worn or damaged surfaces of on any aircraft platforms and/or ground support equipment manufactured from aluminum and magnesium substrates.

Potential Commercial Applications: In addition to the department of Defense, this technology would have applications in the Commercial Aircraft, Ship, Automotive, Petroleum, Natural Gas, and Electric Power Generation industries to repair turbines, wind power generating equipment, pumps & other mechanical components.

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Topic: N162-097

CAMX Power LLC

Non-Contact Torque Sensor for Unmodified Composite Shafts and Non-Ferrous Metal Shafts

CAMX Power Optical Torque Sensor is a non-contact sensor that measures the torque, speed and position of a variety of unmodified rotating shafts. The torque sensor is in development through a Navy SBIR contract in support of the Navy F/A-18 Hornet/Super Hornet program but has broad applications across the DoD and commercial systems with rotating shafts. These sensors enable predictive maintenance and optimization to reduced operating cost, increased performance and improved safety and reliability. CAMX Power, with our sister company TIAX, seek to partner with a major Defense, Aerospace, Transportation, Energy or Manufacturing Equipment company to demonstrate this capability in an operational environment.

Technology Category Alignment:

Maintainability/Sustainability

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SYSCOM: NAVAIR

Contract: N68335-18-C-0272

Booth: 902

Room: Talon Club Room

Presenting: Apr 11th at 3:50 PM

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-18-C-0272

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-265

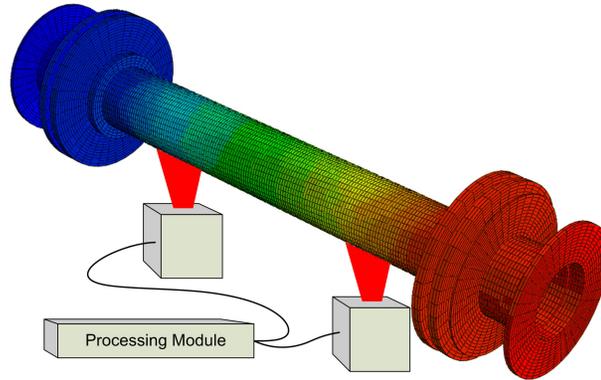
Transition Target: F/A-18
Hornet/Super Hornet

TPOC:
(301)757-2504

Other transition opportunities: While the proposed program targets utility in the F/A-18, CAMX Power expects the flexible and easily adaptable nature of the Non-Contact Torque Sensor technology to provide value in wide ranging rotating shaft applications.

Part of our transition strategy will be to look for applications with lower transition risk to prove out the technology in an operational setting.

Potential applications include ground-based and shipborne turbomachinery, in addition to general-purpose rotating machinery testing.



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WHAT

Operational Need and Improvement: An easily integrated, non-contact torque monitoring capability would allow precise monitoring of torque on rotating shafts in equipment that is ubiquitous across the Navy. Data from these sensors across a range of systems that could number in tens of thousands would enable predictive maintenance and optimization of rotating shaft equipment.

Specifications Required:

- Accommodates shafts between 2 and 5 inches in diameter, rotating at up to 18,000 RPM
- Achieves accuracy of 2% full scale, data rates of 5 kHz
- Operates at temperatures -25C to +80C

Technology Developed: The Non-Contact Torque Sensor measures the torque, speed and position of rotating shafts, enabling predictive maintenance and optimization to reduce operating cost, increase performance and improve safety and reliability.

Warfighter Value: The Non-Contact Torque Sensor would enable predictive maintenance and optimization of rotating shaft equipment resulting in cost savings in predictive maintenance, increased efficiency resulting in fuel savings, and improved safety and reliability by monitoring out-of-tolerance performance and taking mitigation steps to avoid potentially catastrophic failures.

WHEN

Contract Number: N68335-18-C-0272 **Ending on:** April 11, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Integrated benchtop demonstration of concept	N/A	Demonstrate feasibility of concept	4	January 2018
High fidelity breadboard system tested on high speed spin rig at CAMX Power	Low	Demonstrate functionality of concept	5	April 2019
Final form factor prototype tested on drive shaft test stand at Navy	Med	Demonstrate functionality of concept	6	April 2020

HOW

Projected Business Model: License technology to industrial sensor and/or rotating shaft machinery systems manufacturers.

Company Objectives: CAMX Power is interested in licensing this technology to a sensor manufacturer for joint marketing to manufacturers of rotating shaft equipment. We would also welcome the opportunity to work with an aircraft original equipment manufacturer to incorporate the technology into new or existing aircraft designs.

Potential Commercial Applications:

- Commercial ground-based, shipborne and airborne turbomachinery
- General purpose industrial and laboratory torque measurement