

Department of the Navy SBIR/STTR Transition Program

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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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