

Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-8734-21

Topic # N201-X02

FOCUS AREA 9 COLD SPRAY SUSTAINMENT AND MODERNIZATION FOR NAVAL DEPOTS

(ES3) Engineering & Software System Solution, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: NAVSEA Naval Shipyards, NAVAIR Fleet Readiness Centers (FRCs), USMC Logistics Command (MARCORLOGCOM)

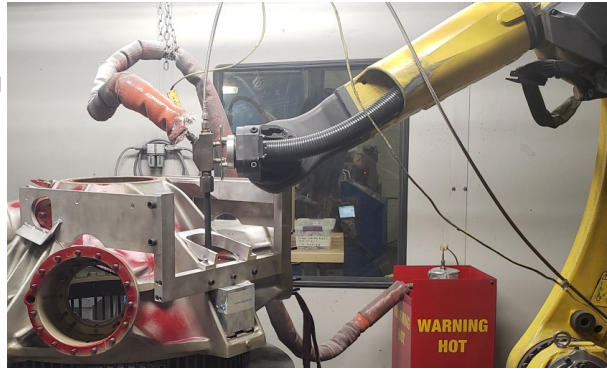
Transition Target: Various Fleet Readiness Centers (FRCs), Air Force Depots, and other locations that conduct maintenance, repair, and overhaul of military assets

TPOC:

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Other transition opportunities: The Corpus Christi Army Depot has used cold spray to repair magnesium gearbox housings. Such repairs led to the restoration of military rotorcrafts, such as the UH-60 Black Hawk, the AH-64 Apache, and the Sikorsky H-53 helicopter in addition to using cold spray to make repairs on aluminum castings and access panels possible.

Notes: ES3 successfully completed US Air Force SBIR topic AF131-190 Phase I and II 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. Additionally, ES3 conducted Demonstration/Validation on aircraft components and drafted a cold spray application specification in USAF format.



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WHAT

Operational Need and Improvement: NAVAIR aircraft and ground support equipment typically require restoration of structure and components damaged by corrosion, wear, and other surface defects. These aircraft structure and components are typically manufactured from aluminum substrates, as well as other alloys like magnesium, titanium, and low alloy, PH and CRES steels. Current repair techniques inspect, clean, and then apply Corrosion Preventative Compounds to prevent/reduce corrosion, but do not provide dimensional restoration. Additionally, these traditional repair techniques may utilize and/or produce hazardous materials and waste.

Specifications Required: One will meet with DON command stakeholders and operational end users to conduct pilot tests of fully functional prototypes in an operational environment. These tests are designed to be performed using DON operational personnel in real end user environments and scenarios. All testing will be coordinated with DON command and operational stakeholders. Results of this testing will inform stakeholders on the capabilities of the developed technology and the probability for its deployment in an operational environment. One will use feedback from DON users, systems integrators, and other potential defense and commercial beneficiaries and stakeholders to adapt their prototype to optimize defense operational and technical benefits and to provide optimal dual-use commercial market fit.

Technology Developed: ES3 has developed a gas mixing chamber that may be used in conjunction with cold spray systems which allows an operator to add helium to a nitrogen gas stream, increasing the gas velocity exponentially in comparison to pure nitrogen. This added velocity enables material deposition not feasible in low pressure cold spray systems. This Navy SBIR STP effort includes cold spray coating testing, processing and integration efforts of multiple cold spray systems with pure and mixed carrier gases, in order to develop required technical data for NAVSEA, NAVAIR and Marine Corp general authorization for sustainment.

Warfighter Value: The cold spray applications will facilitate dimensional restoration of damaged NAVAIR aircraft components, NAVSEA and Marine Corp land and amphibious vehicles from multiple programs/platforms in order to return them to service in a quick and efficient manner. This technology provides both depot and field level repair capability. In-situ repairs can be applied in the field without removing the aircraft, naval vessel or land/amphibious vehicles from service.

WHEN

Contract Number: N68335-21-C-0180 **Ending on:** June 24, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Develop Test Protocol	Low	Test plan approval by TPOCs	5	2nd QTR FY21
Design & Manufacture Enhanced Gas Mixing Delivery System	Med	Design approved by TPOCs after design review.	6	3rd QTR FY21
Parameter Optimization	High	Achieved OEM and/or Gov't specified coating requirements	6	4th QTR FY21
Procure/Manufacture Test Coupons	Low	Produced Coupons per approved test requirements	6	4th QTR FY21
Conduct Test Plan	Med	Complete testing per approved test requirements	7	3rd QTR FY22

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.

Company Objectives: Initially, the target market for this technology will be NAVAIR, NAVSEA, and USMC depots that are responsible for refurbishing and restoring worn or damaged surfaces of on any aircraft, ships, land vehicles platforms and/or ground support equipment. ES3 would like to meet with representatives to better understand their unique needs.

Potential Commercial Applications: Currently, the DoD has approved over 200 applications of cold spray repairs. In addition to the department of Defense, this technology would have applications in 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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