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SBIR INVESTMENT: \$2,769,931

DEPARTMENT OF THE NAVY

NAVY SBIR/STTR SUCCESS STORY



COLD SPRAY TECHNOLOGY

Dimensional Restoration of Aircraft Components Damaged by Corrosion, Wear, or Abrasion

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THE CHALLENGE

The Navy has an interest in practical repair methods after removing corrosion products, to build back worn areas and dimensionally restore damaged aircraft structures, components, and ground support equipment (GSE). Therefore, there was a need to expand current Cold Spray capabilities and provide corrosion and/or wear resistance that is portable for in-situ repairs. On-site dimensional restoration for these components at depot and field level sites were also required.

THE TECHNOLOGY

Cold Spray technology is a thermal spray process that uses a "Gas Dynamic Spray (GDS) Process" to apply kinetically sprayed powders to a variety of metallic substrates. This involves using nitrogen or helium gas to accelerate metal particles to supersonic velocity, and producing coatings by solid-state deformation of powder particles impacting onto the substrate at much lower temperatures than conventional thermal spray processes. This technology can repair damaged metallic components back to dimensions while the applied coating will also provide corrosion and wear protection. The Cold Spray technology has been demonstrated to repair and dimensionally restore parts manufactured from aluminum, magnesium, and steel for the U.S. Air Force and Naval Air Systems Command (NAVAIR).

THE TRANSITION

The Navy's primary focus has been to further evaluate and validate Cold Spray coatings with three widely used Cold Spray systems, both robotically and handheld spray applications for insertion into industrial operations at FRC-Southwest, FRC-East, and FRC-Southeast. This effort will include developing the test protocol with the U.S. Navy for validating all Cold Spray applications, coating development/optimization of the Cold Spray coatings, and subsequent testing in order to develop required technical and demonstration data for NAVAIR certification and general authorization for Cold Spray repair of aerospace structures and components.

THE NAVAL BENEFIT

For Cold Spray repairs, the Navy typically approves repairs on a part-by-part basis through the cognizant engineering authority. The SBIR Phase II.5 effort will result in a general class-based approval of Cold Spray repairs for applications that will restore aircraft and parts. This will quickly expand the number of parts authorized for repair using Cold Spray resulting in greater cost savings, reduced process turn-around-time (TAT), and increased operational readiness.

THE FUTURE

NAVAIR's effort is directed to address Cold Spray coating certification concerns for full-scale production at FRCs in Cherry Pt, NC, Jacksonville, FL, and North Island, CA. However, the technology is applicable to all Department of Defense (DoD) services for any aircraft component, landing gear component, or ground support equipment manufactured from 2XXX, 6XXX, 7XXX Aluminum alloys, or ZE41A Magnesium alloy. In addition to the DoD, this technology would also have applications in the commercial aircraft, ship, automotive, petroleum, natural gas, and electric power generation industries to repair turbines, wind power generating equipment, pumps, and other mechanical components.

"THE COLD SPRAY TECHNOLOGY, FUNDED THROUGH SBIR AND OTHER PROGRAMS, HAS BENEFITTED NAVAIR AND USMC TREMENDOUSLY. SELECTED COMPONENTS THAT HAVE OTHERWISE BEEN SCRAPPED ARE NOW APPROVED FOR REPAIR RESULTING IN TREMENDOUS COST AVOIDANCE, COST SAVINGS, AND HAS INCREASED FLEET READINESS. COLD SPRAY IS APPROVED FOR OVER 16 DIFFERENT REPAIRS WITH OVER 250 PARTS HAVING BEEN RETURNED TO SERVICE AT FRC-SOUTHWEST ALONE. THIS REPAIR TECHNOLOGY HAS CREATED A SPARE PARTS POOL THAT HASN'T EXISTED FOR A LONG TIME OR HAS NEVER EXISTED."

Luc Doan
Materials Engineer
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