Topic: N162-087

Creare LLC

A Novel System for On-Site Structural Restoration Methods for Aircraft Components

Navy rotorcraft components sustain damage from flight operations, logistics handling, and removal and replacement during maintenance. Blending away the damages to reduce stress risers may cause fatigue cracking, and blending lowers thickness in the repair location reducing the ability for future repair capability. Damage that exceeds design tolerances generally cause the component to be scrapped. Creare has developed a compact repair system for full dimensional and strength restoration of aircraft components to enhance the logistics and maintenance of Navy aircraft. Our Compact Repair System miniaturizes additive friction stir technology using compact, high speed spindles and additive tools to facilitate repair of such damage and to return the component at or above its original strength.

Technology Category Alignment:

Readiness

Structures and Protection

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SYSCOM: NAVAIR

Contract: N68335-18-C-0664

Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-18-C-0664

Tech Talk: https://atsi.adobeconnect.com/prp34077eh9m/

Department of the Navy SBIR/STTR Transition Program

Pending SYSCOM Review

Topic # N162-087

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WHO

SYSCOM: NAVAIR

Sponsoring Program:

Transition Target: Fleet Readiness Centers (FRCs)

TPOC:
(301)757-9639

Other transition opportunities:
Military Depot-Level Repairs. Repair of aircraft, ground vehicles, and support equipment. Each service operating 20 depots, each needing 50 Compact Repair Systems (CRSs).
Non-Cosmetic Automotive Repairs. There are approximately 160,000 automotive repair shops in the U.S. Many could offer non-cosmetic repairs with the CRS to replace high-skilled welding processes with, non-specialized labor to complete such repairs.
Space-Based Repair Applications. This market segment consists of in-space or terrestrial repairs of space systems. These could be NASA systems or one of the many commercial companies now involved in space exploration.

Image, courtesy of Creare LLC (2019)

WHAT

Operational Need and Improvement: A miniaturized adaptation of conventional friction stir welding using compact, high speed spindles and additive tools to facilitate the repair of aircraft damage returning the component at or above its original strength. Our CRS will provide a depot level repair capability robust repair of the nicks, dings, and dents in Navy rotorcraft and components.

Specifications Required: Restore dimensional and structural capability and reduce the process time for the disposition and repair of Ti-6Al-4V aircraft components. The restoration method should result in a component with the same strength capability as an original non-damaged component. The restoration method should be environmentally friendly, not require the use of hazardous materials, and should not generate or require the disposal of hazardous wastes, such as chromate containing primers and coatings.

Technology Developed: Creare's unique approach uses miniaturized, high-speed Additive Friction Stir (AFS) to complete the repair of damaged titanium components on Navy helicopters. The compact size of our CRS facilitates repairs on curved parts, brackets, and intersections. We have demonstrated a compact tool for in situ repair of Ti-6Al-4V. Our ability to precisely deposit material in the damaged region minimizes the secondary processing needed to complete the repair. However, should secondary machining be required, our CRS can have replaceable tooling to facilitate the blending of the repair.

Warfighter Value: Our CRS represents the unique opportunity to develop a single, highly flexible tool to repair multiple types of damage on Navy helicopters, without having to send the components back to the depot. Moreover, development of the CRS on this program can be leveraged by the greater Navy community to repair, reinforce, and restore aircraft and ships during routine service intervals and even while in use. The compact size of our CRS will enable its use on complex shapes, corners, and other difficult geometries. The use of a single handheld system for multiple applications dramatically reduces the training, logistics, and cost associated with the repair of various Navy rotorcraft components.

WHEN

Contract Number: N68335-18-C-0664 **Ending on:** July 14, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Set Component and Sub-system Specifications	Low	Complete Prototype Design	2	May 2019
Fabricate Prototype	Med	Operable for Testing	3	July 2019
Test and Evaluate	Med	Performance Testing Complete	3	December 2019
Refine and Retest	Med	Demonstrate Revised Prototype	4	June 2020

HOW

Projected Business Model: Our plan is to transfer/license this technology to our affiliate, Edare Incorporated, which was created specifically to commercialize Creare developed SBIR technologies. Because of their ability to form a cohesive transition and commercialization team with Creare and other companies, Edare can accelerate the transition of technologies from the innovation stage to a commercial product. Edare Incorporated has its own in-house fabrication, assembly, and engineering capabilities in a 20,000 square foot facility in Lebanon, New Hampshire. Edare has focused its initial efforts on advanced manufacturing systems integration, as well as direct product manufacturing using advanced manufacturing techniques.

Company Objectives: The ultimate objective of this effort is to develop and transition a technology that enables safe, effective, and high-quality repairs for Navy helicopters. To achieve this our efforts are focused on: (1) designing a CRS prototype based on the Navy specifications results; (2) fabricating the prototype from custom and commercially available components; (3) testing and evaluating the prototype which will include both functional and performance testing; (4) refining the CRS based on lessons learned; and (5) completing a key demonstration of the CRS for the Navy.

Potential Commercial Applications: This program will enable a new paradigm for the repair of damaged components on Navy rotorcraft. It will eliminate the logistical tail associated with current solutions and provide a more effective method to complete long-term repairs. We expect that our compact CRS will become standard equipment at forward operating locations and Navy repair depots. In its current form, the product will be comprised of a compact weld head to enable handheld repairs. In addition, material rods to complete AFS will also be part of the kit. The most expensive portion of the cost associated with a CRS repair is the capital cost associated with the device itself. After this initial purchase, this initial capital cost is amortized over each repair, and the only additional cost, apart from periodic maintenance, is the minimal cost associated with the filler rod.

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