

Department of the Navy SBIR/STTR Transition Program

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NAVSEA #17-550

Topic # N151-042

A Compact System for Shipboard Pipe Reinforcement

Creare LLC

WHO

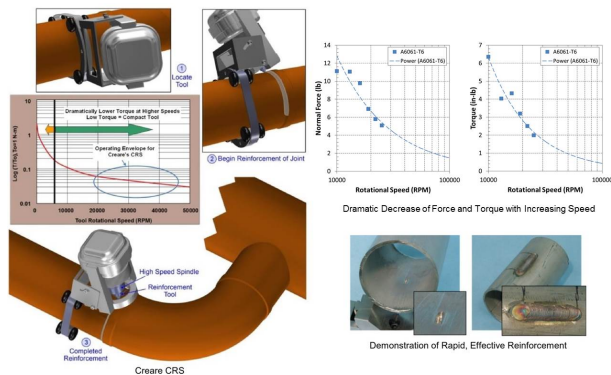
SYSCOM: NAVSEA

Sponsoring Program: PEO Carriers

Transition Target: CVN 77, Ford Class Carriers, Shipyards

TPOC:
(301)227-4121

Other transition opportunities: Aircraft repair of nicks, dings, and dents; in-space repair of micrometeorite damage; metallic fabrication processes.



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WHAT

Operational Need and Improvement: Thin-walled, Corrosion-Resistant Steel (CRES) 316L pipe has been used in JP-5 fuel systems. The thinness of these pipes may lead to poor weld quality at the pipe joints which could cause crevice that may create areas for corrosion (and potential leaks) to form within the pipe joint. Within the fleet there is a need to create an easily applied method to proactively reinforce the welded joints to preclude any leak that may result from possible crevice corrosion, without causing further damage to the pipe. In many instances, there is often limited access space surrounding the pipe joint.

Specifications Required: Any material and technique developed must be safe for use in fuel piping and applicable to pipe diameters ranging from 2 to 12 inches. Joint types include couplings, tees and elbows, which may be made using sockets or belled end fittings. The joint reinforcement method must be able to withstand internal pressures up to 190 psi and tolerate contact with JP-5 fuel without contaminating the fuel or weakening the reinforcement. The targeted goal for life expectancy of the joint reinforcement is the life of the ship (50 years) with a threshold life expectancy of 25 years.

Technology Developed: Our novel solution to reinforce weak areas in JP-5 fuel piping on board U.S. Navy aircraft carriers is our Compact Repair System (CRS). Our approach uses a novel tool and a high-speed, electrically driven spindle to reduce the normal force and torque for our Additive Friction Stir Welding (A-FSW) process making it ideally suited to shipboard repairs requiring a portable tool. Because our CRS is based on a solid state welding process, it eliminates the defects, the safety concerns, and the extensive training associated with conventional welding processes based on melting and solidification.

Warfighter Value: No component de-rating and a return of the system to field at full strength to meet the life expectancy requirements. The low-cost of the CRS as it is a single-tool solution requiring only periodic replacement of the pin tools. The system has been demonstrated on a wide variety of metals; hence, it has broad applicability. Finally, the CRS has a minimal logistical tail and can reinforce and repair a number of pipe diameters and shapes with a single tool.

WHEN

Contract Number: N00024-16-C-4050 **Ending on:** August 28, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Prototype Design	Low	Completion	3	March 2017
Prototype Fabrication	Low	Completion	3	June 2017
Performance Testing	Med	Completion	4	August 2017
Optimization/Certification	Med	Completion	5	August 2018
Manufacturing Planning	Low	Completion	6	January 2019

HOW

Projected Business Model: Our Phase II program is focused on technology development, exhaustive testing, and preparation for manufacturing and technology transition. Once the CRS is developed, it will be transitioned to our product-focused, affiliate company, Edare, where they will manufacture, sell, and support the CRS to the Navy and others. Our commercialization path will require us to work with the Navy and end users to develop our CRS and optimize it for shipboard applications. Creare has an established track record transitioning advanced manufacturing technologies.

Company Objectives: Creare was founded as an engineering service company in 1961. Its founding objectives include performing technically excellent work, focusing on results, providing an optimum environment for creative people, and commercializing innovations by the creation of autonomous product companies or licensing technology to existing organizations. Creare has extensive experience transitioning advanced manufacturing technologies to large DoD programs in partnership with major defense prime contractors including: Cryogenic Machining and Non-Contact Measurement Systems for F-35 production; Compact Swaging Machines for on-carrier arresting cable repair; and, several other key technologies currently transitioning.

Potential Commercial Applications: Repair of aircraft, ground vehicles, and support equipment could be facilitated by the CRS. There are approximately 160,000 automotive repair shops in the U.S. Many of these shops could offer non-cosmetic repairs with the CRS as a replacement for more difficult standard welding processes. The advantage of the CRS is that lower-cost, non-specialized labor could be used to complete such repairs. In-space or terrestrial repairs of space systems is another market segment for the CRS. These could be NASA systems or one of the many commercial companies now involved in space exploration.

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