

Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2019-0543

Topic # N161-048

Miniaturized Electric Actuation System
Continental Controls and Design, Inc.

WHO

SYSCOM: NAVSEA

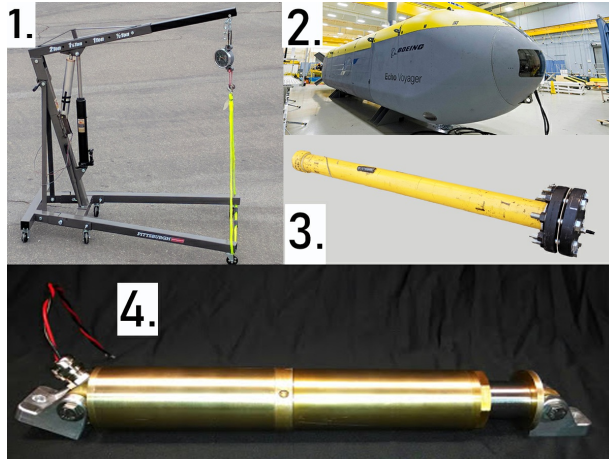
Sponsoring Program: PMS 394
Advanced Undersea Systems Program Office

Transition Target: Universal Launch and Recovery Module (ULRM)

TPOC:

Other transition opportunities: Self contained actuation could be applicable to many surface and submerged Navy applications including small craft ride control and hydrofoil assist, as well as the Large Diameter Unmanned Underwater Vehicle (LDUUV) and other Unmanned Underwater Vehicles (UUVs)

Notes: 1. Electric and hydraulic actuators tested in parallel, 2. Boeing's Extra Large Unmanned Undersea Vehicle (XLUUV) 3. Pressure vessel for deep submergence testing, 4. CCD's High power integrated Electromechanical Actuator (EMA). Boeing Echo Voyager image: <https://secure.boeingimages.com/archive/Boeing-Echo-Voyager-Unmanned-Undersea-Vehicle-2JRSXLJV94FC.html>



Images 1,3 and 4: Copyright 2019 Continental Controls and Design, Inc. (CCD) Image 2: Courtesy of Boeing

WHAT

Operational Need and Improvement: Current hydraulic actuators come with significant problems; oil needs vigilant servicing to fight off leaks while contamination and low system efficiency can cause thermal issues. A transition to more efficient electric actuation is needed in multiple applications, specifically for Unmanned Underwater Vehicles (UUV). The Navy is seeking to develop a miniaturized Electric Actuation System (EAS) to meet the demands of operating in a seawater environment while preserving the power densities available in comparably sized hydraulic actuators.

Specifications Required: The EAS should be of a scale and power density comparable to a 3 inch and smaller hydraulic piston operating at a nominal value of 2,500 pounds per square inch (psi). Stroke should be up to 3 inches but not less than 1 inch. The EAS must be capable of withstanding submergence pressures on the order of magnitude of 1,000 psi, and experience wet and dry actuation at temperatures ranging from 20 degrees Fahrenheit to 150 degrees Fahrenheit. The ability to provide a continuous force output for prolonged periods, up to 1 month, is also required.

Technology Developed: CCD provides state of the art proven integrated actuation solutions with unmatched force density. CCD's EAS is a miniature three-inch system that can produce 10,000 pounds of force in a completely integrated product, weighing about 11 pounds with continuous force capability equivalent to a hydraulic system. Two actuators are currently under test. Our pressure vessel demonstrator allows high fidelity endurance testing with arbitrary force, speed and pressure profiles with a back to back, push/pull actuator pair.

Warfighter Value: Our miniature three-inch EAS will alleviate the need for hydraulic maintenance, lowering mission cost while providing an actuation solution that can produce 10,000 pounds of force with minimal maintenance. Retrofitting is facilitated with this completely integrated 11 pound product.

WHEN

Contract Number: N00178-17-C-8006 **Ending on:** March 1, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Dynamic Optimization	N/A	Proof of concept and Model Completion	3	September 2017
Dry Load Testing and Validation	Low	Results Match Specs and Models tested	4	September 2018
Deep Sea Environmental Testing	Med	Leak Free and Thermal Compatibility	5	March 2020
Application Tailoring and Deep Sea Longevity Testing	Med	Detail Needs Met	6	March 2021

HOW

Projected Business Model: CCD's business development team will determine the best course of action for manufacturing our EAS product with input of the original equipment manufacturer (OEM) subcontractor, which will likely involve license of manufacturing and integration rights. Prior to licensing, CCD will provide specialized services to mitigate risk and deliver confidence to our target customers. The specific manufacturing licensee depends on the program, the market, the primes, and subcontractors involved.

Company Objectives: CCD's goal is to integrate and transition this technology into government and prime contractor systems for facilitating low cost and reliable actuation.

Potential Commercial Applications: Actuation is a broad category which is tending electric. The first commercial applications will likely be actuators with difficult requirements for force and power density. Potentially doubling their efficiency, range and shock attenuation, CCD believes that robust electromechanical actuation is the key to low cost hydrofoil assist and ride control for a vast array of commercial and military planing craft.

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