Topic: AF083-097

AVID LLC

Morphing Actuation System for Unmanned Aircraft Systems

Piezoelectric morphing actuator replaces servos in existing Unmanned Aircraft Systems (UAS) platforms. AVID provides a control system kit, which includes; the control and electronic driver boards necessary for vehicle control with the piezoelectric actuator. This technology keeps the vehicle in the fight longer, without needing to replace servos after landing. AVID has successfully demonstrated equivalent or increased performance in flight with increased reliability over servos during an Air Force Phase 2 Small Business Innovative Research (SBIR) project. The technology was then sponsored by the Air Force for an enhancement that demonstrated successful integration of the morphing flight control (MFC) actuation on a production micro-UAS. The technology garnered further funding from the Navy for its capability to withstand the marine environments. AVID has developed the morphing technology to be advantageous on folding wing canister launched systems in the 100 lb weight class, and ducted fan vertical take-off-and-landing (VTOL) unmanned aircraft vehicle (UAV) system to enhance controllability.

Technology Category Alignment:

Fixed Wing Vehicles (includes UAS)
Guidance, Navigation & Control (GN&C) and Data Links

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SYSCOM: NAVAIR
Contract: N68335-18-C-0594

Booth: 3
Room: FST at NAVSEA HQ - Room 1
Presenting: Jan 29th at 10:00 AM
Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-18-C-0594

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2019-858

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WHO

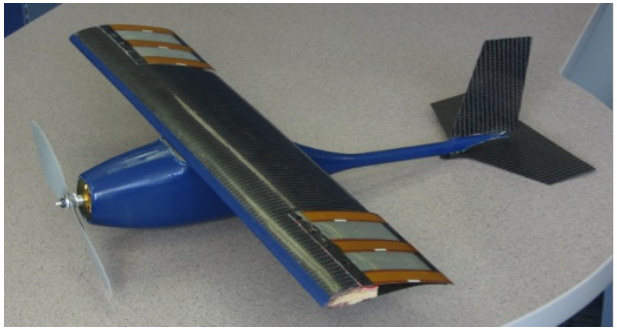
SYSCOM: NAVAIR

Sponsoring Program: Program Executive Officer, Unmanned Aviation and Strike Weapons - PEO U&W

Transition Target:

TPOC:
(760)939-3243

Other transition opportunities: Small unmanned aerial vehicles (UAS) on various Department of Defense programs.



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Notes: By adding battens to the wings and replacing tail servos; the small UAS (sUAS) capabilities are enhanced for flight control responsiveness, increased operational range by reducing drag, and effectiveness by increasing reliability and robustness.

WHAT

Operational Need and Improvement: Needs include improving flight authority and small unmanned aviation asset characteristics. Enhanced maneuverability is achieved by adding flight actuation, flight control devices and removing servo motors. This allows the vehicle to perform tight right angle turns within 2-fifty foot urban canyons while intersecting at right angles.

Specifications Required: Key technology specifications for the AVID Control system, proven in this project, include having the same or better control authority and weight as similarly sized servos.

Technology Developed: AVID has developed a Morphing Control System for small UAVs. Starting as an Air Force Phase 1 in 2009, this is now being developed for a canister launched UAV and a tethered vertical take-off and landing (VTOL) ducted fan for deployment from vehicles. This enhancement further develops the morphing flight control actuation technology (MFC) control system. This morphing control acts like a muscle to move the wing and tail after electricity is applied to it. AVID's piezoelectric controller increases reliability by reducing part count and moving parts, while decreasing the life-cycle cost of UAS platforms by eliminating the need for servos, thus keeping the vehicle in the fight longer, increasing the operational envelope by placing control surfaces in places conventional servos cannot go.

Warfighter Value: The resulting sUAS with this technology integrated will have increased platform performance for equal cost and weight. Each vehicle's custom integration results in increased system reliability. The ultimate impact of AVID's piezoelectric morphing actuator keeps the vehicle in the fight longer, without needing to replace servos after landing. This results in increased reliability over servos, decreasing the life-cycle cost of the system while providing the equal or greater performance.

WHEN

Contract Number: N68335-18-C-0594 **Ending on:** October 31, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Small VTOL First Test Flight	Low	Improved control over conventional system	6	November 2019
Lab test of Group 2 UAS Actuation	Low	Improved aerodynamics performance at same weight and power	6	April 2020
Larger VTOL First Test Flight	Med	Full flight control actuation with MFC	7	September 2020
Flight Test of Group 2 UAS with full MFC actuation	High	Full flight control with MFC demonstrating endurance and life testing	8	September 2021

HOW

Projected Business Model: AVID will develop a customized Morphing Control System for various integrators and their specific sUAS. AVID will provide each vehicle integrator a kit for a particular tail number to be integrated/sold with a Morphing Control System. Each UAS-Specific Morphing Control System Kit includes:
- AVID Control Board
- Electronic Driver Board (AMPS power Systems)
- Number of Piezoelectric specified for vehicle
- Drawings for Vehicle Integration

Company Objectives: AVID has already had success selling Morphing Actuator boards to various universities doing research in piezoelectric controllers. As our Morphing Control System for small UAVs matures from the initial integrator, AVID will expand the kit production to other integrators interested in the technology. AVID will further develop the technology to become a leading piezoelectric controller provider which can expand to other industries.

Potential Commercial Applications: Organizations requiring enhanced flight control characteristics in order to achieve their objective of better tactical or situation awareness data can apply this technology to their small unmanned aircraft systems. DoD, Department of Transportation (DoT), and their Prime integrators with a need to survey large areas efficiently and effectively by air while having to control operational cost provide an additional potential application.

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