

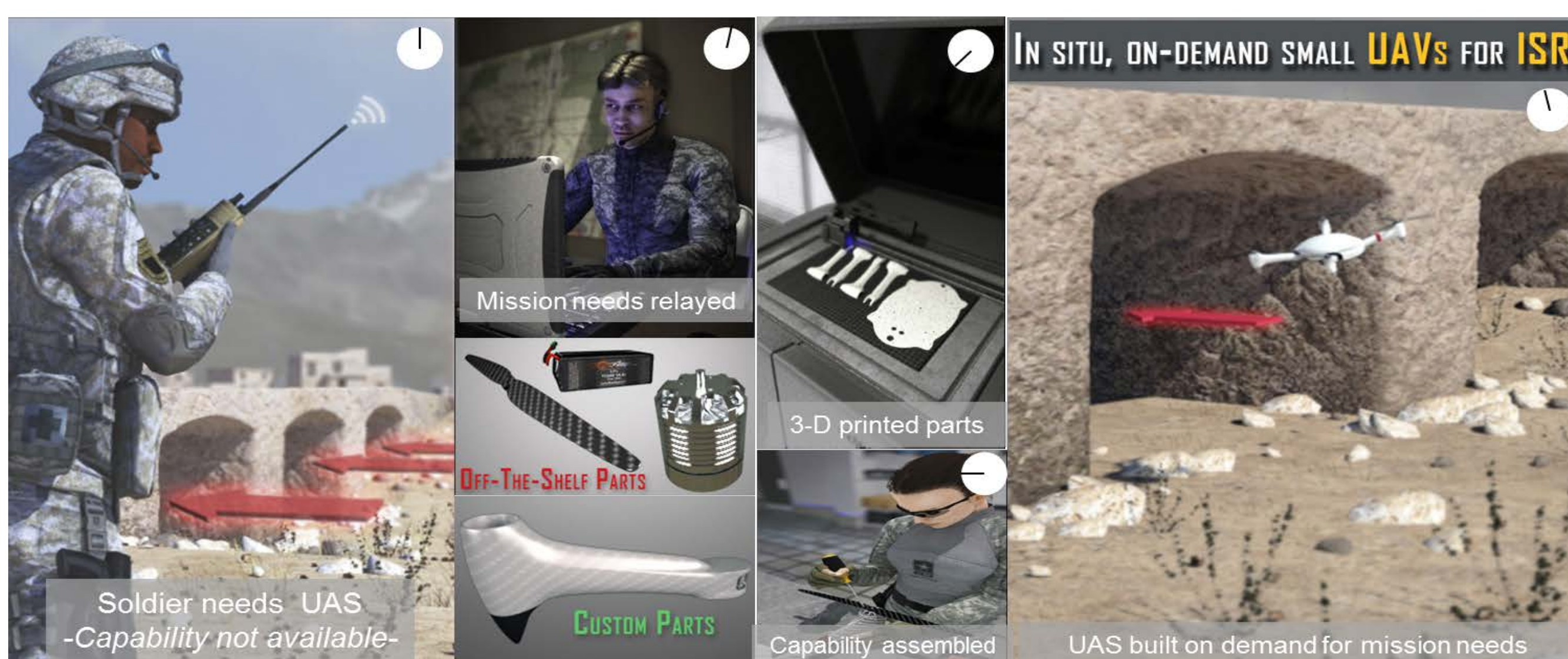
S&T Campaign: Sciences for Maneuver Platform Mechanics

Nate Beals, (410) 278-8882, nathan.e.beals2.ctr@mail.mil
John Gerdes, (410) 278-8735, john.w.gerdes.civ@mail.mil
Eric Spero, (410) 278-8743, eric.spero.civ@mail.mil

Research Objective

Create process for rapidly designing and deploying mission-specific small UAS near the point of need

- Fill knowledge gaps in integrated performance and mission models of small UAS
- Explore how to scale a common vehicle platform and integrate with parts from component library



Rapidly design and assemble Soldier-borne sensors at point of need using mission information

Challenges

- Reduce design-print-assemble-fly process cycle time
- Creation and validation of physics-based expressions for components and full system
- Inherent variability in components and environmental conditions reduces model accuracy
- Lack of standardization across printers, materials, and manufacturing techniques



ARL Facilities and Capabilities Available to Support Collaborative Research

- Access to multifidelity SUAS conceptual design tools and techniques
- Access to SUAS rotorcraft and flapping wing technology subject matter experts
- Access to ARL Sensors and Autonomous Systems Experimental Facility

Status

- An automated sizing and selection process and tool have been developed
- Vehicles manufactured and flown outdoors in laboratory environment
- Recommendations from Soldiers and Marines have reduced part count and number of fasteners

Related Publications and Presentations

- Beals, N. Design of Small Mission-optimized Rotors for Multicopter UAS, AHS 73rd Annual Forum; 9-11 May 2017; Fort Worth, TX.
- Fisher, Z et al. ADAPt Design: A Methodology for Enabling Modular Design for Mission Specific SUAS. ASME IDETC/CIE; 24-26 August 2016; Charlotte, NC.
- Cheng, et al. A Model-Based Approach to the Automated Design of Micro-Autonomous Multirotor Vehicle Systems, AHS 72nd Annual Forum; 17-19 May 2016; West Palm Beach, FL.
- Mangum P et al. An Automated Approach to the Design of Small Aerial Systems Using Rapid Manufacturing. ASME IDETC/CIE; 2-5 August 2015; Boston, MA.
- Mian Z, Mavris DN. Mission Effectiveness Quantification and Assessment of Micro Autonomous Systems and Technologies. IEEE Systems and Information Engineering Design Symposium; 26 April 2013; Charlottesville, VA: IEEE; 2013.

Complementary Expertise/Facilities/Capabilities Sought in Collaboration

- Development of interactive, web-based applications
- Application of statistical analysis techniques to quantify technology impacts based on empirical data
- Multiple stakeholder interactions and value negotiation
- Parameterization of computer-aided design (CAD) models
- Agent-based modeling and simulation
- Immersive, 3-D representation of environment, physical objects, and microsystem vehicles
- 3-D printing of embedded electronics