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DEPARTMENT OF THE NAVY

NAVY SBIR/STTR SUCCESS STORY

INTEGRATION OF PALACE AND TOUCHDOWN PLANNING METHODS FOR LANDING CUAS AT UNPREPARED SITES

AACUS, controlled by a tablet or other mobile device, enables fully autonomous rapid cargo delivery without any specialized operator training

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THE CHALLENGE

Develop advanced autonomous capabilities to enable safe, affordable and reliable rapid cargo delivery to forward-deployed, distributed small units in demanding austere locations and environments at unprepared landing sites by unmanned (and potentially optionally-manned) Vertical Take-Off and Landing (VTOL) systems.

THE TECHNOLOGY

Autonomous Aerial Cargo/Utility System (AACUS) is a mission planning perception software and sensor suite designed to autonomously operate full-scale rotary wing aircraft into and out of unprepared, austere landing zones. Precision Autonomous Landing Adaptive Control Experiment (PALACE), an existing 3D environment decision-making and navigation tool developed by the U.S. Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC), was combined with AACUS.

THE TRANSITION

AACUS is an Innovative Naval Prototype (INP) sponsored by the Office of Naval Research (ONR), a requirement first appeared in an ONR broad agency announcement in December 2011, and a Phase III was awarded in September 2012 (Phase I direct to Phase III) of $13.4 million to Aurora. A sensors and perception software package, AACUS, is integrated into rotary-wing aircraft to provide safe, reliable and rapid cargo delivery. The system provides real-time mission management with advanced route and trajectory planning, in-flight obstacle detection and avoidance, and the capability to land in unprepared landing sites autonomously – simplifying the logistics train for supplying critical supplies to forward-deployed troops in high threat environments. System capabilities were successfully demonstrated during flight tests and using PALACE conducted for/by the Marine Corps Warfighting Laboratory in December 2017 at Quantico, VA (see https://youtu.be/qLEwyquia9I). In May 2018, system capabilities were successfully demonstrated under operational conditions during Integrated Ground Training Exercise (ITX) 3-18 at Marine Corps Air Ground Combat Center (MCAGCC), 29 Palms, CA.

THE NAVAL BENEFIT

AACUS enables revolutionary autonomous capability to the Fleet and Force. It can be integrated into any rotary-wing aircraft to enable fully autonomous, unmanned flight from takeoff to landing and to detect and avoid obstacles (i.e. power lines, other vehicles or large ground objects) in unfavorable weather conditions and degraded visual environments such as “brownout” or “whiteout”. Platform agnostic, it’s open architecture and self-contained mission computer and sensor unit configuration allows rapid integration with minimal intrusion into aircraft systems – reducing integration costs.

THE FUTURE

The Marines envision using this autonomous capability for the Assault Support mission, again noting it is platform agnostic. Successfully tested by the Marines in an operational environment in their Sea Dragon experiment conducted during ITX 3-18, AACUS represents a major leap in autonomy. Lt. Col. Daniel Schmitt, Marine Corps Warfighting Laboratory, stated “This technology will allow us to distribute forces further, spreading smaller units over greater distances with the offense that bigger units have at their fingertips” and “systems like AACUS fit exactly in line with experimental designs for Future Force 2025”. This technology is dual use, i.e., viable for commercial applications. In 2017, Aurora Flight Sciences Corporation became an independent operating subsidiary of Boeing.

> "THIS IS ONE CAPABILITY THAT WE ARE MOVING OUT ON VERY QUICKLY. THIS GIVES US THAT CAPABILITY TO DISTRIBUTE AND MOVE LOGISTICS FORWARD IN AN AUTONOMOUS WAY."
>
> Lieutenant General Robert Walsh, USMC (Dec 2017, Quantico, VA)
> Commanding General
> Marine Corps Combat Development Command

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