The Autonomous Aerial Cargo/Utility System (AACUS) is an Office of Naval Research Innovative Naval Prototype (INP) program with a FY2012 start. The need for AACUS stems primarily from USMC requirements for “an alternate means to provide time-sensitive logistics support to greatly dispersed locations. Cargo UASs can provide a solution to move tailored ammunition, supplies, fuel/water, or weapons packages in adverse weather from the sea or ashore over harsh terrain as required (24/7)”.

**Universal Needs Statement (UNS) for the Cargo UAS**

While rotary-wing aircraft have significant advantages over other means of resupply and evacuation, including avoidance of improvised explosive devices and greater speed over trucks, manned rotary wing aircraft are often limited by weather, hostile conditions, and manning constraints, which can be mitigated by using unmanned aircraft. Recent progress has been made in unmanned rotary-wing aircraft cargo drops and deliveries. However, such advances rely upon the presence of prepared, obstacle-free landing sites as well as trained operators with some level of control over flight parameters.

AACUS represents a substantial leap over both present-day operations as well as other more near-term development programs, as it is focused on autonomous obstacle avoidance and unprepared landing site selection, with precision landing capabilities including contingency management until the point of landing. AACUS includes a goal-based supervisory control component such that any field personnel can request and negotiate a desired landing site. Moreover, this system will communicate with ground personnel for seamless and safe loading and unloading.

Another unique aspect of AACUS is its portability—this system is designed to be platform agnostic with an associated open architecture framework that allows it to be integrated into either manned or unmanned rotary-wing aircraft.

**Research Challenges and Opportunities:**
- Landing autonomously in unprepared terrain
- Static and dynamic obstacle avoidance
- Real time supervisory control by field personnel
- Aggressive no fly-over approach to landing
- Autonomous in-flight mission re-planning

**WHAT IS IT?**
The Autonomous Aerial Cargo/Utility System (AACUS) program explores advanced autonomous capabilities for reliable resupply/retrograde. AACUS technologies will be platform agnostic and be transferable to both new and legacy manned and unmanned rotary wing aircraft.

**HOW DOES IT WORK?**
The AACUS system will command autonomous approaches and landings for unmanned or optionally piloted VTOL platforms, using a low-cost, multi-sensor suite. The system will provide real time mission management with advanced route planning and trajectory planning to unprepared landing sites designated by field operators. The field operators will supervise the aircraft using a tablet-like device and will have no special training.

**WHAT WILL IT ACCOMPLISH?**
The AACUS system will reduce workload and training requirements by reducing human error and implementing an intuitive field user device for mission management and supervisory control. AACUS will also expand the envelope of operation for both manned and unmanned aircraft. AACUS will be integrated across a variety of rotary wing aircraft using an open architecture approach.

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