

## Integration of ACAS-X into Sense and Avoid for Unmanned Aircraft Systems

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### Purpose

- The research for Integration of Airborne Collision Avoidance System (ACAS-X) into Sense and Avoid (SAA) for Unmanned Aircraft Systems (UAS) will answer the following question:
  - What are the requirements/standards for UAS airborne Collision Avoidance Systems (CAS) to operate with other airborne CAS?

### Background

- SAA for UAS incorporates both self-separation and collision avoidance functionality that provides maneuvering to remain well clear from, and avoid collision with, other conflicting air traffic
- RTCA Special Committee (SC)-228 Phase I Detect and Avoid (DAA) Minimum Operation and Performance Standards (MOPS) set requirements for active Mode S interrogation/reply that are identical to those found in Traffic Alert and Collision Avoidance System (TCAS) MOPS (DO-185B), however, those requirements are intended for large transport aircraft

### Projected Benefit of Research

- Establish criteria for CAS interoperability requirements within the National Airspace System
- Establish criteria for interfaces and transition criteria between separation and collision avoidance maneuvers
- Examine active surveillance antenna requirements with UAS in mind, considering the size, weight, and power limitations of the particular UAS included in the SC-228 scope
- Establish performance categories and surveillance requirements for non-cooperative sensors
- Support SC-228 DAA MOPS development

### Research Approach

- Determine necessity for and level of independence between separation provision and collision avoidance
- Validate concepts, displays, and procedures for implementing SAA maneuvers
- Demonstrate the interoperability of SAA with ACAS-X based on lessons learned
- Develop surveillance requirements necessary for SAA/CAS to track cooperative and non-cooperative aircraft

### Research Partners

- National Aeronautics and Space Administration (NASA)
- FAA William J. Hughes Tech Center

### Status

- Technical report summarizing encounter model and analysis, simulation to estimate unmitigated safety, initial well clear definition characteristics, and demonstration results detailing recommendations completed
- Technical report briefed to SC-228 detailing results of SC-147's interoperability efforts
- White paper on Alternative Antenna Equipment Safety and Performance Assessment for Cooperative Sensors delivered
- Technical report detailing initial cooperative surveillance sensor requirements analysis
- Research tasking completed March 2017