Unmanned Aircraft Systems Airborne Collision Severity Evaluation

Purpose

- The Unmanned Aircraft Systems (UAS) Airborne Collision Severity Evaluation study will provide data to help inform:
  - What are the severity criteria for Unmanned Aircraft System (UAS) collision with an aircraft in the air?
  - How can the design of a UAS minimize potential damage during a mid-air collision?
  - Can we classify a UAS collision impact in a similar manner to a bird strike?
  - Will a UAS collision affect an engine similar to bird ingestion?
  - Can we categorize the severity of a UAS mid-air collision with an aircraft into categories based on the UAS and what would those categories look like?

Background

- UAS airworthiness considerations require an understanding of the hazard severity and likelihood of airborne collision
- Hazard severity threshold characteristics will be addressed for UAS to include:
  - Traditional aluminum and various composite construction aircraft
  - Fixed wing and rotary wing aircraft
  - Flammable materials, such as fuel
  - Hazardous kinetic energies based on combinations of mass and speed
  - Hazardous components of the UAS such as motors, cameras, and batteries

Projected Benefit of Research

- Inform operational approval restrictions for small UAS based on collision risk to manned aircraft
- Inform small UAS design requirements to reduce the severity of collisions with manned aircraft
- Inform risk mitigation requirements for small UAS to reduce the likelihood of airborne collision
- Inform potential mitigation requirements to assure the safety of UAS operations beyond visual line of sight

Research Approach

- Utilize credible encounter scenarios with aircraft in the air to test UAS hazard severity characteristics
  - Encounters will include scenarios similar to bird strikes, including windshield and fuselage
  - The initial airframe types in the modeling will include a business jet and a narrow body
  - Engine impacts will include turbofan engines and nose cone impacts
- Develop minimum characteristic thresholds for which there is no relevant risk of damage
- Make recommendations for the range of hazard severities for each of the severity characteristics and determine how to group UAS together based on risk levels

Research Partners

- The FAA's Center of Excellence for UAS Research, Alliance for System Safety of UAS through Research Excellence (ASSURE): Wichita State University, Montana State University, Ohio State University, and Mississippi State University

Status

- Research began September 2015
- Research findings are set to undergo a peer review with NASA, DoD and Industry in May 2017
- Results are expected to be released Summer 2017

UASHELP@FAA.GOV