Assessing Small UAS Operator Flight Behavior and Potential Interference with Aviation Operations in Controlled Airspace

Ryan J. Wallace Ed.D.  
Embry-Riddle Aeronautical University, ryan.wallace@erau.edu

Tom Haritos Ph.D.  
Embry-Riddle Aeronautical University, harit0aa@erau.edu

John M. Robbins Ph.D.  
Embry-Riddle Aeronautical University, robbinsj@erau.edu

Follow this and additional works at: https://commons.erau.edu/ntas
Part of the Aviation Safety and Security Commons
Assessing sUAS Operator Flight Behavior & Potential Interference with Aviation Operations in Controlled Airspace

Ryan J. Wallace, Ed.D.
Tom Haritos, Ph.D.
John M. Robbins, Ph.D.
Introduction: sUAS Interference in the NAS

See video on metadata page
Or
Click https://youtu.be/jzXmxjGbelk
Purpose

• Identify sUAS operator behaviors
  • Preferred Types of sUAS (DJI)
  • Date/time
  • Altitude
  • Location

• Evaluate potential aviation interference & safety hazards posed by sUAS
  • sUAS operating distance from aerodromes
  • Impact to local airport traffic patterns, approaches / departures, local airspace
  • Historical near midair collision (NMAC)/encounter analysis (DAB only)

• Determine effectiveness of geofencing
Method

- Applied, exploratory research methodology
- Detection sampling using DJI AeroScope
  - RF collection device that detects sUAS manufactured by DJI
  - ~10 SM detection range
- Data Collection (Convenient Sampling)
  - Tampa, FL (TPA), Class B, 19-day sampling
  - Daytona Beach, FL (DAB), Class C, 13-day sampling
- Analysis Tools & Reference Sources
  - Google Earth Pro (Data plotting)
  - EasyMapMaker (KML conversions)
  - AirNav (Heliport information)
  - FAA Raster Charts (Aeronautical information & overlays)
  - Google Maps (Location identification)
  - Symphony OpsVue (Historical aircraft tracking integrating ADS-B/Mode C, & Mode S data)
  - FAA UAS Facility Maps (UASFM) (Risk Analysis)
Operator Behavioral Indications

UAS Operation by Time of Day

UAS Detection Population

Average UAS Flights by Day of Week
Operator Behavioral Indications
Aviation Interference & Safety Hazards (TPA)
Aviation Interference & Safety Hazards (DAB)
Significant Findings (TPA)

• Several sUAS breaches into Class B surface area & surrounding shelf
• Geofencing areas sometimes offset from aeronautical hazard (heliports)
• Visual approach to Peter O. Knight (TPF), Runway 18 reveals sUAS collision hazard
Risk Analysis Using FAA UAS Facility Maps (DAB)

• FAA established UAS Facility Maps as risk management tool for automated sUAS flight authorization via Low Altitude Authorization & Notification Capability (LAANC)
  • LAANC not active in DAB area during data collection
  • LAANC UASFM segments / altitudes used for risk analysis only
• 93% of sUAS flights detected within UASFM segments
• 21.5% of sUAS flights exceeded maximum UASFM designated altitudes
Historical NMAC/Encounter Analysis (DAB)

- Coastline (likely banner towing)
  - A/C#1 at 650’ MSL @ 0.30 NM
  - A/C#2 at 475’ MSL @ ~0.50 NM
  - sUAS at 462’ MSL

- DAB Runway 7L
  - A/C#1 detected at touchdown point (30’ MSL)
  - sUAS at 90’ MSL 0.25 NM left of approach path
  - ILS RWY 7L Threshold Crossing Height is 88’ MSL
Geofencing Effectiveness
Recommendations

- Integrate geofencing design with LAANC
  - Impose geofencing restrictions on UASFM segments
  - Encode LAANC authorizations with a geofencing unlock code to access UASFM segments

- Create Pilot sUAS situational awareness tools
  - Leverage ADS-B Flight Information Service-Broadcast (FIS-B) and Aeronautical Exchange Model (AIXM) to provide pilots with awareness of active LAANC UAS Facility Map segments

- Codify operational restrictions within 14 CFR
  - Model Aircraft operators are required to operate in accordance with the safety guidelines and within the programming of a “nationwide community-based organization (CBO)”
  - Integrate operational CBO restrictions (such as those recommended by AMA) into 14 CFR 101
  - Establishes permanent operational rules & enables better enforcement for non-compliant operators
Questions?

Ryan J. Wallace, Ed.D.
(386) 323-5085
Ryan.Wallace@erau.edu