Operating UAS Beyond Line of Sight: Fact or Fiction?

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Background

• Licensed manned aircraft pilot
  • Single and Multi-engine airplane
  • Balloons

• Background in NAS Air Traffic Operations and Systems

• Project Manager at FAA for 8 years
  • Office of NextGen Technology Development
  • Air Traffic Organization PMO

• Business Development Lead for L3Harris
  • Commercial UAS Solutions
  • FAA Customer Engagement
  • Emerging Markets and Technologies
The Pathway to Integration

The Path to Full UAS Integration

FAA now focused on Complex Operation Regulation
Evolution of Operations and Regulation

2016

Part 107
Small UAS Commercial Operations
Visual Line of Sight
Short duration, low altitude operations

2016 - Present

Part 107 Waiver
Part 91 Exempt
Small to Midsize Commercial UAS
Only means of achieving BVLOS today
Catering to more complex operations requiring additional levels of safety

2019

Part 135
Routine Commercial Delivery and Complex Operations
Visual and Beyond Visual Line of Sight
Paving the future for Advanced Ops - UAM
Solutions Tailored to Operations…Not Regulation

Emerging airspace segmentation

- **FAA policy**
  - Decisively moving towards aviation-grade
  - FAA regulation eliminating consumer-grade technologies
  - Trending towards aviation-grade
  - Some uncertainty

- **Overview**
  - All UAV’s operating in controlled airspace
  - Both manned and unmanned aircraft operating in this airspace
  - Expectations for high safety performance

- **Notable Points**
  - No FAA BVLOS policy
  - Multiple technologies likely to compete
  - Only UAV operating in this airspace
  - Policy will be developed based on industry proof of safety performance
Adapting “Manned” for “Unmanned”

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<th>L3Harris Relevant Experience</th>
<th>UAS Service</th>
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<td>Automatic Dependent Surveillance-Broadcast (ADS-B)</td>
<td>Detect-and-Avoid service to monitor airspace and keep aircraft separated</td>
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<tr>
<td>Data Communications (DATACOM)</td>
<td>Command &amp; Control air-to-ground data link for pilot to operate vehicle</td>
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<td>CSS-WX</td>
<td>Aviation Weather service supporting safe operations planning and execution</td>
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<td>OASIS</td>
<td>UAS Traffic Management (UTM) services enabling safe operations of drones in the airspace</td>
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<td>System Wide Information Management</td>
<td>Aeronautical Information gateway giving pilots access to critical FAA data</td>
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<td>Data Comm and FAA Telecommunications Infrastructure</td>
<td>Safety Critical Communication between pilots to FAA Air Traffic Controllers enabling integrated airspace</td>
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Aviation Grade Infrastructure to Enable Access

**Detect-and-Avoid**
- Multi-user, multi-sensor, wide-area network
- Builds on existing assets for NAS-wide capability
- FAA-authorized, RTCA-compliant system for BVLOS operations
- Advantaged by Harris access to SBSS (NextGen) data

**Target needs of safety critical operations:**
- BVLOS operations
- Flight over people
- Controlled airspace
- Multiple UAS size classes
- Passenger-carrying UAS (Air Taxi)

**Command & Control**
- Multi-user, wide-area network
- Builds on existing assets for DAA service (above)
- FAA-authorized, RTCA-compliant system for BVLOS operations
- Using FCC-protected UAS spectrum

**Aligned with FAA Policy and Standards Development:**
- FAA’s Technical Standard Order for C2 link incorporates RTCA MOPS
- Non-cooperative and NextGen data DAA requirements
- Aircraft systems certifications
- Aviation spectrum assignment
- Security, reliability, and availability requirements
Integrated, Harmonized Operations
Deploying the Future...Today!

**North Dakota HubNet Corridor**

3 tower sites with C2 Radio and ADS-B
1 ground primary radar at middle site
1 Local Control Station at middle site

**Field Deployment Summary**

- **DEC**: 1st flight performed testing surveillance
- **JAN**: Aircraft C2 integration and site functional testing
- **FEB**: C2 functional bench testing and surveillance data collection
- **MAR**: C2 ground range testing & manned flight surveillance coverage testing
- **APR**: C2 airborne functional testing and C2 airborne range testing
- **AUG**: BVLOS waiver submission target
Shaping Policy through Operations

FAA BVLOS Pathfinder
BVLOS inspections in rural and remote areas
Harris providing Detect-and-Avoid solution replacing visual observers

FAA’s first BVLOS PSP
BVLOS inspection of transmission lines in remote areas
Harris providing an integrated CNPC+DAA solution

FAA extended visual line-of-sight Pathfinder
Operations in rural areas for precision agriculture
Harris supplying live manned aircraft data from the FAA

FAA UAS Integration Pilot Program (IPP) with North Dakota DOT
Harris UAS Network enabling remote and urban BVLOS operations

Large UAS flying BVLOS in Controlled Airspace
Harris Detect-and-Avoid solution replacing chase planes by integrating primary radar with RangeVue display

August 2015 field testing of operations in agriculture, firefighting, and infrastructure
Harris providing ADS-B Xtend and FAA live surveillance data feeds

April 2016 testing of operations in remote areas
Harris providing ADS-B Xtend and FAA live surveillance data feeds

April 2018 testing of collision avoidance and operations in populated areas
Harris providing ADS-B Xtend and FAA live surveillance data feeds

January 2019 award: Harris supporting NIAS (Nevada Test Site) team
Harris providing ADS-B Xtend and FAA live surveillance data feeds

January 2019 award: FAA testing of UTM concepts and solutions
Harris providing integrated ADS-B Xtend, RangeVue and FAA live surveillance data feeds
Standards-Based Approach to Integration

- **RTCA SC-228 / Working Group 1.1**
  - Operational assumptions for DAA MOPS
  - Interface requirements between DAA and other systems

- **RTCA SC-228 / Working Group 1.2**
  - Radar
  - Technical requirements for Air-to-Air Radar (ATAR) and Ground-Based Radar (GER) systems as parts of DAA systems

- **RTCA SC-228 / Working Group 1.3**
  - Display/Alert/Guidance
  - Defines Technical Requirements for Display/Alert/Guidance for Basic DAA and TCAS (Class 1 & 2 UAVs)

- **RTCA SC-228 / Working Group 1.4**
  - EOIR
  - Develop EOIR Sensor MOPS and passive ranging algorithms

- **RTCA SC-228 / Working Group 1.5**
  - Modeling & Simulation
  - Develop Technical Performance Metrics and Modeling & Simulation Models to verify and validate DAA Systems

- **RTCA SC-228 / Working Group 1.6**
  - Automation
  - Developing UAS Automation Models for DAA Systems validation

- **RTCA SC-228 / Working Group 2**
  - C2 Networking & SatCom
  - Technical requirements for networked CNPC and Satcom systems

- **F38 Committee on UAS**
  - C2 Systems for sUAS
  - Specification and design of the C2 systems for small UAS (F3002)

- **F38 Committee on UAS**
  - Remote ID and Tracking
  - Developing a practice for Remote ID and Tracking (WK27055)

- **F38 Committee on UAS**
  - Acoustic-based DAA
  - Develop specification for acoustic-based DAA (WK60936)

- **F38 Committee on UAS**
  - DAA Spece & Methods
  - Performance specs for DAA requirements (WK62668)
  - Test methods for DAA (WK62669)

- **FCC**
  - Spectrum licensing
  - Access to spectrum through engagement of FCC and FAA
  - Monitoring of emerging regulation and policies

- **Aviation Spectrum Industry Committee**
  - Monitoring and support AIA activities to ensure continued alignment with Harris’ UAS Spectrum objectives

- **Unmanned Aircraft Systems Standardization Collaborative**
  - Developing standards to facilitate the integration of UAS in the National Airspace (Working Groups 1-4)

- **JARUS**
  - Developing international single standards for UAS
Unmanned Traffic Management refers to a separate system from the FAA for low altitude air traffic management of UAS.

Target altitude of < 500 ft. to avoid conflict with manned aircraft.

Focus on managing airspaces and traffic flow management.

Summary of UTM Capabilities:

**Identification**
Database of operators and UAS

**Flight plan / operation management**
Submission of flight plans and validation

**Flight permissions and directives**
Restrictions, notices, geo-fences etc. issued automatically

**Weather**
Alerts and guidance based on impact

**Situational awareness**
Reporting of positions

**Conformance monitoring**
Checking operations according to plans

**Conflict detection**
Report and advise de-confliction

**Emergency management**
Recording and playback
BVLOS: Fact or Fiction?
Questions?