Operating UAS Beyond Line of Sight: Fact or Fiction?

Jon Standley

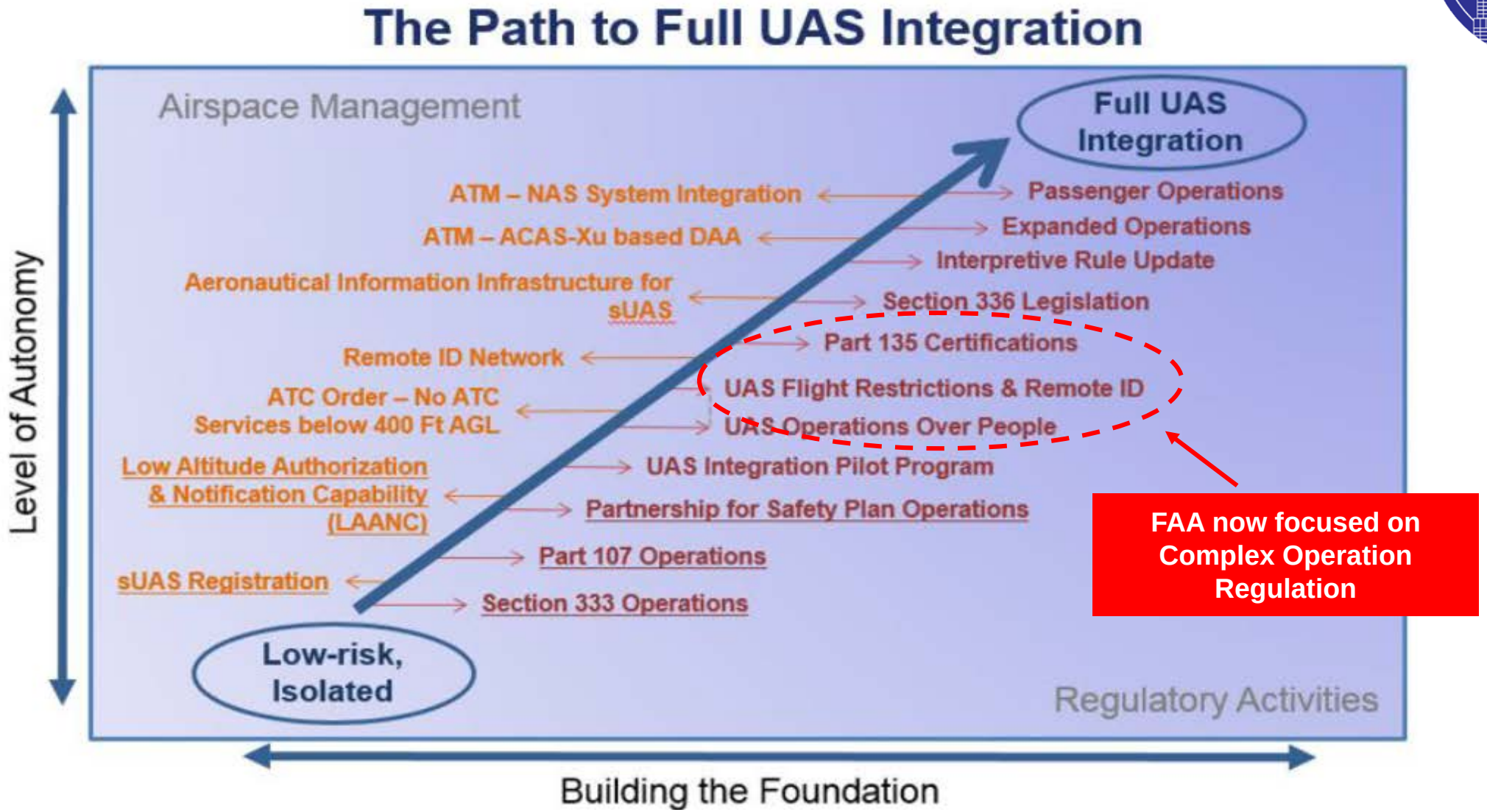
Business Development Lead, Commercial UAS Solutions, L3Harris

Jon.standley@l3harris.com

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



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

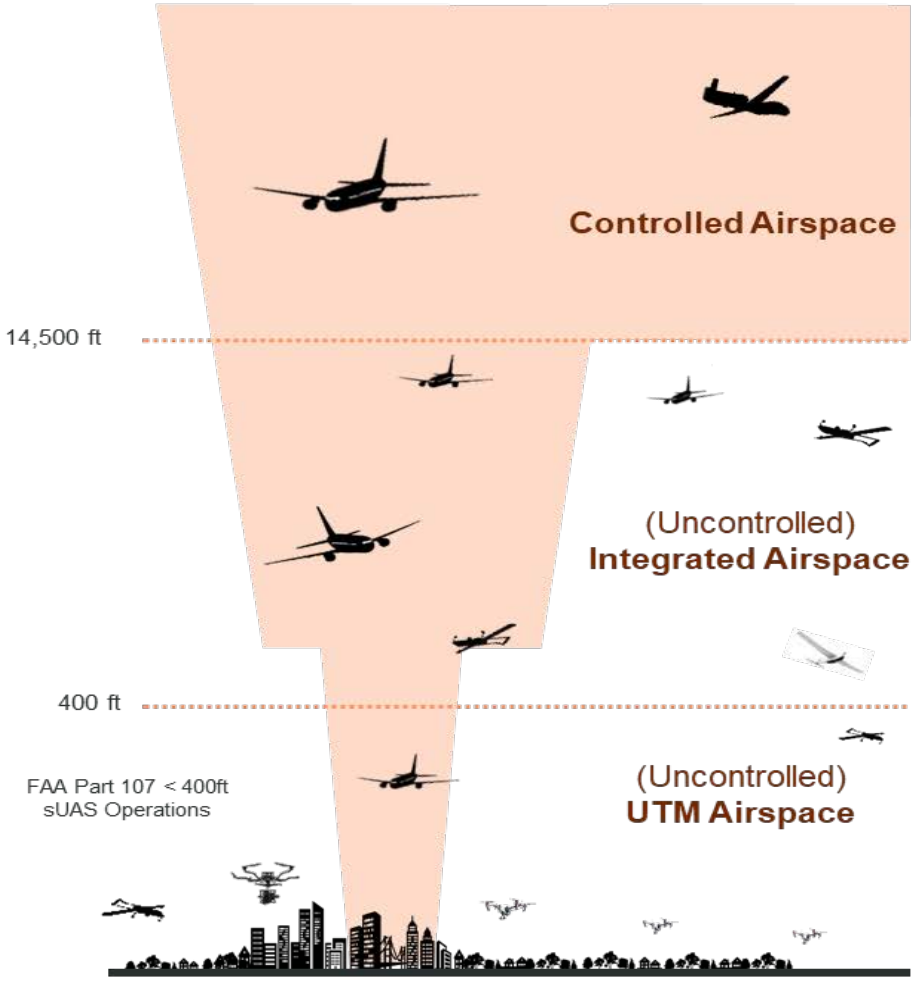
Routine Commercial Delivery and Complex Operations

Visual and Beyond Visual Line of Sight

Paving the future for Advanced Ops - ***UAM***

Solutions Tailored to Operations…Not Regulation

Emerging airspace segmentation



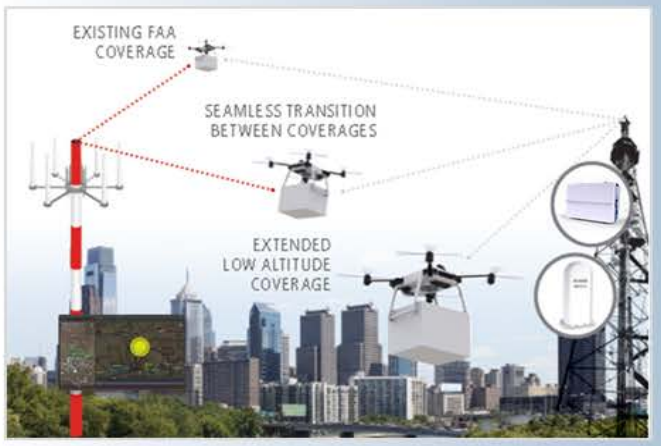
FAA policy	Overview
✓ Decisively moving towards aviation-grade	All UAV's operating in controlled airspace FAA regulation eliminating consumer-grade technologies
✓ Trending towards aviation-grade Some uncertainty	Both manned and unmanned aircraft operating in this airspace Expectations for high safety performance
? 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”

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

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

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

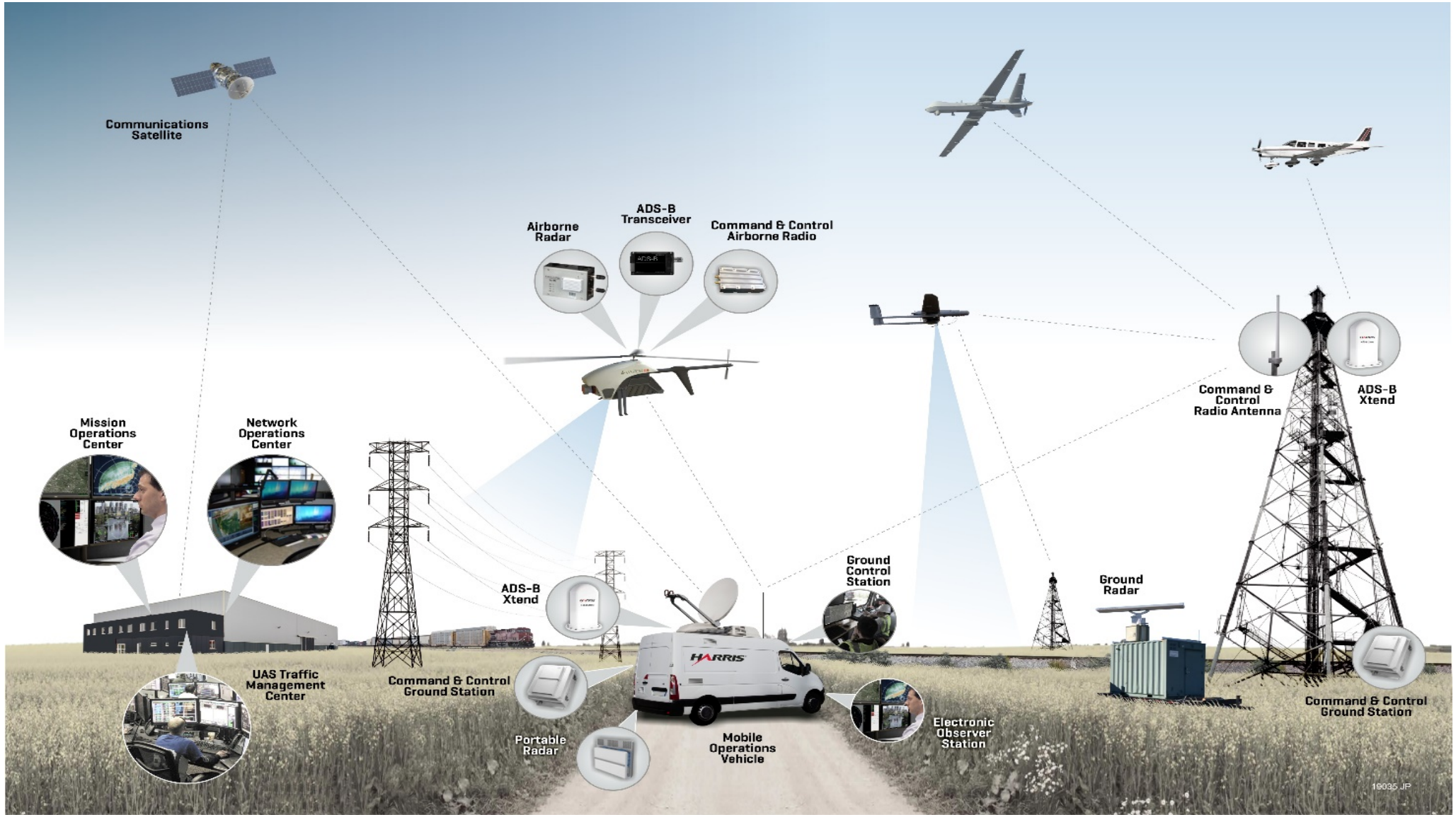
Target needs of safety critical operations:

- BVLOS operations
- Flight over people
- Controlled airspace
- Multiple UAS size classes
- Passenger-carrying UAS (Air Taxi)

Aligned with FAA Policy and Standards Development:

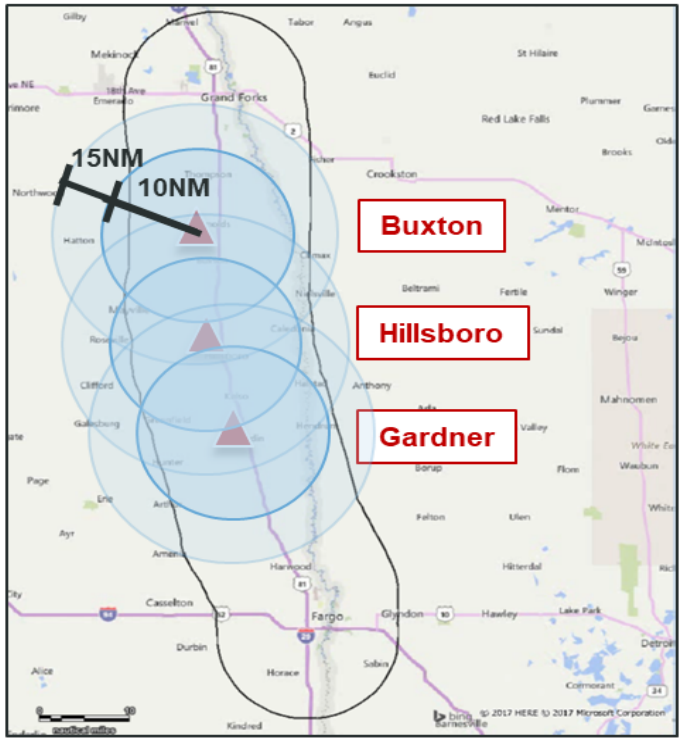
- FAA's Technical Standard Order for C2 link incorporates RTCA MOPS
- Non-cooperative and NextGen data DAA requirements
- Aircraft systems certifications
- Aviation spectrum assignment
- Security, reliability, and availability requirements

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

First Surveillance UAS Network
Press Release December 27, 2018

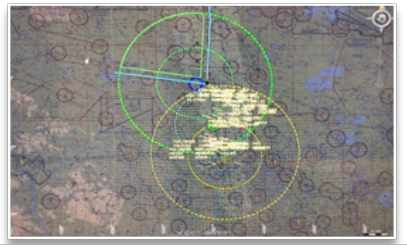
JAN Aircraft C2 integration and site functional testing

FEB C2 functional bench testing and surveillance data collection

First C2 UAS Network
Press Release April 11, 2019

MAR C2 ground range testing & manned flight surveillance coverage testing

APR C2 airborne functional testing and C2 airborne range testing



Grand Sky and Harris BVLOS "Super Corridor"
Press Release April 29, 2019

AUG BVLOS waiver submission target

Shaping Policy through Operations

BNSF

FAA BVLOS Pathfinder

BVLOS inspections in rural and remote areas

Harris providing Detect-and-Avoid solution replacing visual observers

Xcel Energy

FAA's first BVLOS PSP

BVLOS inspection of transmission lines in remote areas

Harris providing an integrated CNPC+DAA solution

PRECISIONHAWK

FAA extended visual line-of-sight Pathfinder

Operations in rural areas for precision agriculture

Harris supplying live manned aircraft data from the FAA

NDDOT North Dakota Department of Transportation

FAA UAS Integration Pilot Program (IPP) with North Dakota DOT

Harris UAS Network enabling remote and urban BVLOS operations

GRANDSKY

Large UAS flying BVLOS in Controlled Airspace

Harris Detect-and-Avoid solution replacing chase planes by integrating primary radar with RangeVue display

NASA *UTM Technical Capability - 1*

August 2015 field testing of operations in agriculture, firefighting, and infrastructure

Harris providing ADS-B Xtend and FAA live surveillance data feeds

NASA *UTM Technical Capability - 2*

April 2016 testing of operations in remote areas

Harris providing ADS-B Xtend and FAA live surveillance data feeds

NASA *UTM Technical Capability - 3*

April 2018 testing of collision avoidance and operations in populated areas

Harris providing ADS-B Xtend and FAA live surveillance data feeds

NASA *UTM Technical Capability - 4*

January 2019 award: Harris supporting NIAS (Nevada Test Site) team

Harris providing ADS-B Xtend and FAA live surveillance data feeds

FAA UTM Pilot Program (UPP)

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
OSED and Operations

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 (GBR) systems as parts of DAA systems

RTCA

SC-228 / Working Group 1.3
Display/Alert/Guidance

Defines Technical Requirements for Display/Alerting/Guidance for Basic DAA and TCAS (Class 1 & 2 UAV's)

RTCA

SC-228 / Working Group 1.4
EO/IR

Develop EO/IR Sensor MOPS and passive ranging algorithms

RTCA

SC-228 / Working Group 1.6
Modeling & Simulation

Develop Technical Performance Metrics and Modeling & Simulation Models to verify and validate DAA Systems

RTCA

SC-228 / Working Group 1.7
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

ASTM

F38 Committee on UAS
C2 Systems for sUAS

Specification and design of the C2 systems for small UAS (F3002)

ASTM

F38 Committee on UAS
Remote ID and Tracking

Developing a practice for Remote ID and Tracking (WK27055)

ASTM

F38 Committee on UAS
Acoustic-based DAA

Develop specification for acoustic-based DAA (WK60936)

ASTM

F38 Committee on UAS
DAA Specs & Methods

Performance specs for DAA requirements (WK62668)
Test methods for DAA (WK62669)

FAA FCC

FCC and FAA Spectrum
Spectrum licensing

Access to spectrum through engagement of FCC and FAA
Monitoring of emerging regulation and policies

AIA

Aviation Spectrum
UAS Industry Committee

Monitor and support AIA activities to ensure continued alignment with Harris' UAS Spectrum objectives

ANSI

Unmanned Aircraft Systems
Standardization Collaborative

Developing standers to facilitate the integration of OAS in the National Airspace
(Working Groups 1-4)

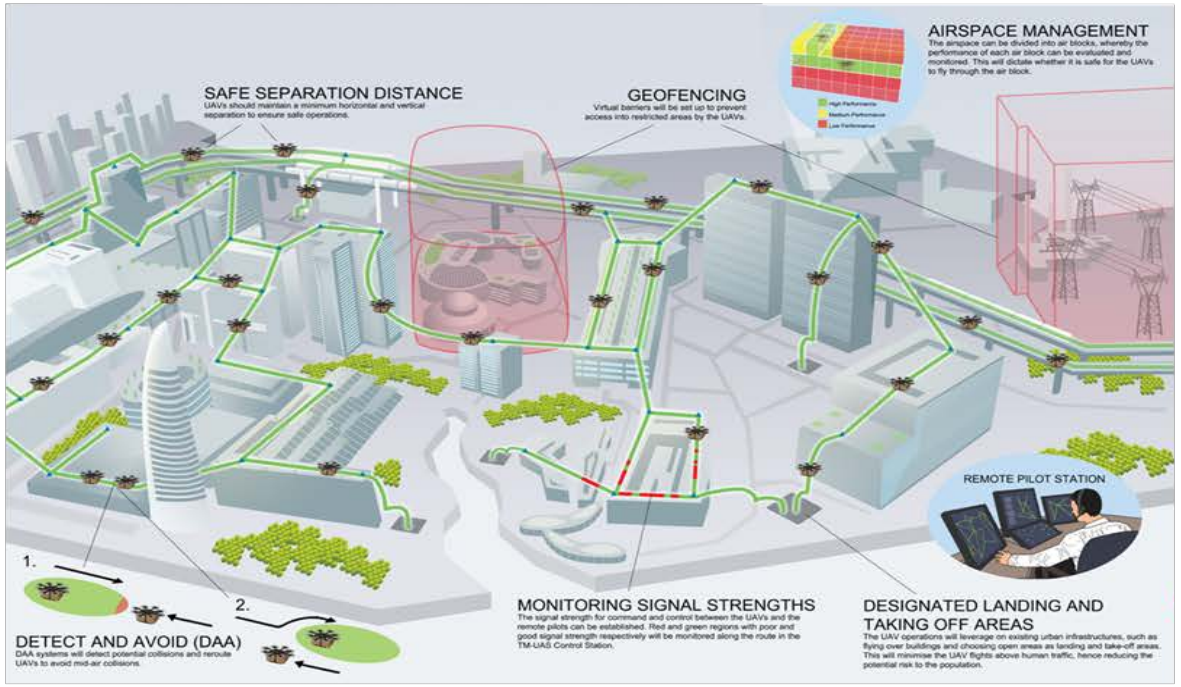
JARUS

Joint Authority for
Rulemaking on UAS

Developing international single standards for UAS

UAS Traffic Management (UTM)
The Future of Low Altitude Traffic Management

Visualization of Unmanned Traffic Management



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?