Unmanned Aircraft System
Traffic Management (UTM) Project

June 6, 2018
Why is UTM Needed?

- FAA small UAS forecast – 3.9 million total, 0.7 million commercial by 2022
  - Many use cases: package delivery, news collection, precision agriculture, infrastructure inspections, public safety, disaster response, etc.

- New entrants desire access and flexibility for operations

- Current users want to ensure safety and continued access

- Regulators need a way to put structure as needed
  - Current approach for air traffic control of manned aircraft won’t scale up for small UAS operations
  - Need to assure safe integration into the National Airspace
What is the UTM System?

- UTM is an “air traffic management” ecosystem for small UAS in low-altitude airspace
- UTM utilizes industry’s ability to supply services under FAA’s regulatory authority where these services do not exist
- UTM development will enable the management of large scale, low-altitude UAS operations
  - Address beyond visual line of sight UAS operations under 400 ft. AGL
  - Define roles/responsibilities of FAA, operators, and other stakeholders
  - Define information architecture, data exchange protocols, software functions
  - Recommend performance requirements
UTM Project Summary

Objective
- Develop and validate airspace operations and integration requirements to enable safe, large-scale UAS operations in low-altitude airspace.
- Provide prototype (software) UTM system for further FAA testing and development

Approach
- Partner with FAA, industry, and academia to design and develop prototype UTM system
- Develop Concept of Operations, Use Cases for anticipated operations and integration with ATM
- Field test UTM system and vehicle/ground technologies in progressively complex environments

Outcomes
- Validated system requirements and technology transfer to FAA and industry
- Inform regulators on beyond visual line of sight operations and operations over people to support future rulemaking
- Provide guidance to industry and standards organizations
- International promotion of UTM concepts and architecture
UTM Service-Based Architecture

NAS Data Sources
National Airspace System

Flight Information Management System

FAA Development & Deployment

Supplemental Data Service Provider

UAS Service Supplier

Public Safety
Public

UAS Operator
UAS Operator
UAS Operator

Shared responsibilities

Discovery Registration Data/Services
Authentication/Authorization

Constraints, Directives
Requests, Decisions
Operations, Deviations

Inter-data provider communication and coordination

Inter-USS communication and coordination

Terrain Weather Surveillance Performance

Color Key:
FAA Function
Operator Function
Other Stakeholders

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Technical Capability Levels (TCL) Progression for System Development and Testing

**TCL 1**
- Remote Population
- Low Traffic Density
- Rural Applications
- Multiple VLOS Operations
- Notification-based Operations

Completed 2015

**TCL 2**
- Sparse Population
- Low-Mod Traffic Density
- Rural / Industrial Applications
- Multiple BVLOS Operations
- Tracking and Operational Procedures

Completed 2017

**TCL 3**
- Moderate Population
- Moderate Traffic Density
- Suburban Applications
- Mixed Operations
- Vehicle to Vehicle Communication
- Public Safety Operations

Completed 2018

**TCL 4**
- Dense Population
- High Traffic Density
- Urban Applications
- Dense BVLOS Operations
- Large Scale Contingency Management

Planned 2019
TCL 3 Flight Demonstration Scope

- Demonstrate and evaluate the Concept of Operation, functional designs, and technology prototypes

- Test objectives
  - **Concept of Operation** for a range of applications
  - **Communication, Navigation, & Surveillance** where command signals and GPS services are impaired
  - **Sense and Avoid** other drones and manned aircraft
  - **Data Exchange** between system components in normal and contingency conditions.

- Tests conducted at six FAA designated UAS Test Sites from March-May 2018
- All sites connected to the UTM system and testing coordinated from the Airspace Operations Lab, ARC
UTM Project is successfully developing the framework for large scale, small UAS traffic management.

Completed TCL 1, 2, and 3 Demonstrations included many testing organizations, industry, and academia partners that are crucial to validating requirements and investigating technology solutions.

NASA and the FAA are closely collaborating to ensure appropriate regulatory and operational requirements are included and that technology transfers support the development of future operational systems.