



Unmanned Aircraft System Traffic Management (UTM) Project

June 6, 2018



Why is UTM Needed?

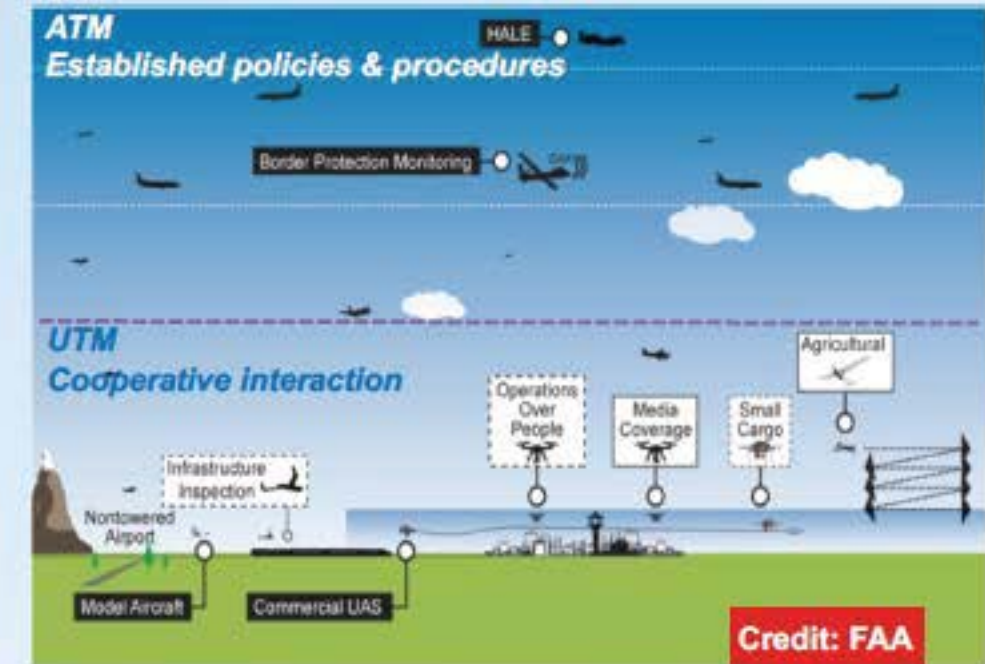
- FAA small UAS forecast – 3.9 million total, 0.7 million commercial by 2022
 - Many use cases: package delivery, news collection, precision agriculture, infrastructure inspections, public safety, disaster response, etc.
- New entrants desire access and flexibility for operations
- Current users want 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

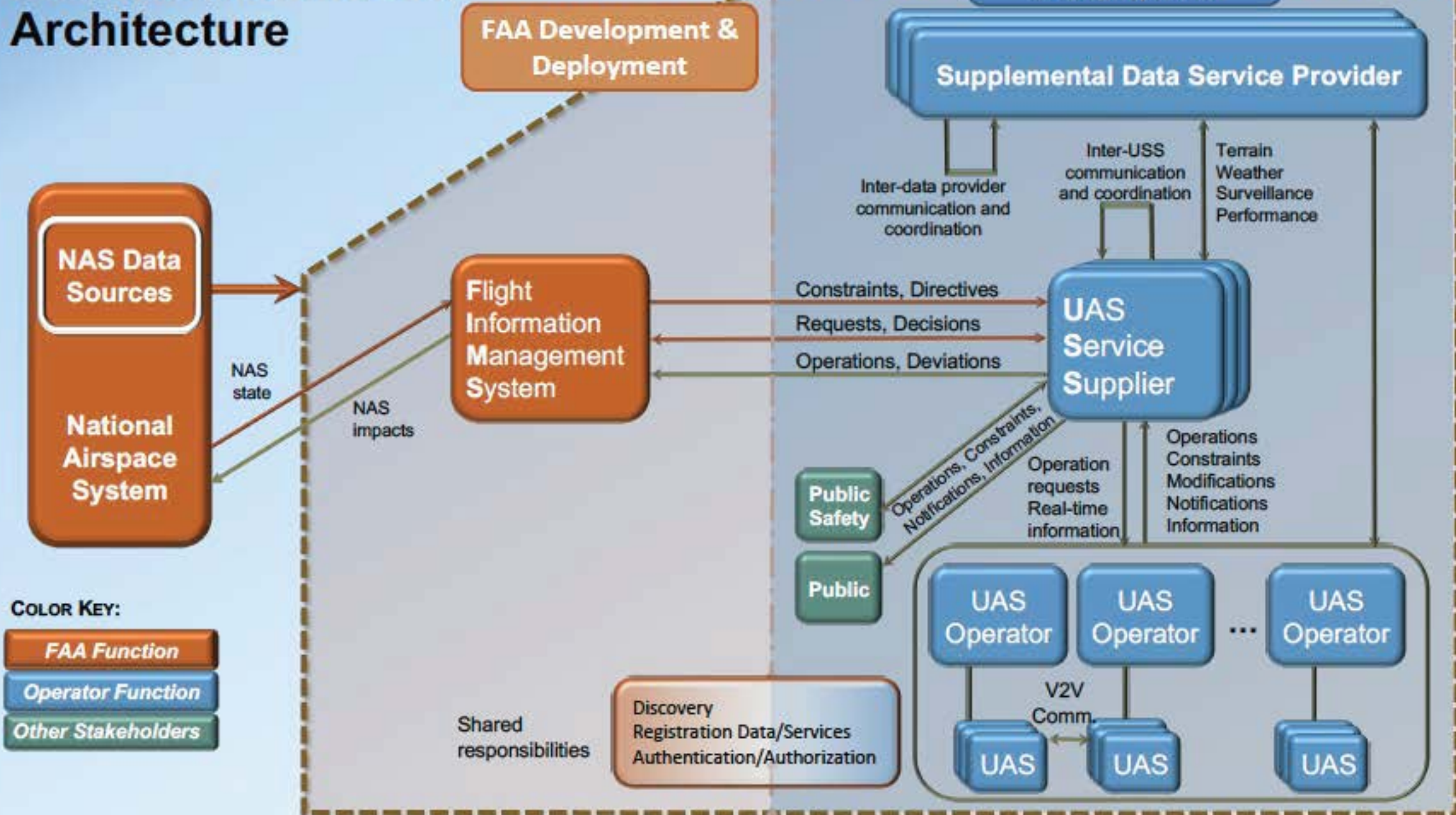
➤ Approach

- 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





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



TCL1

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



Summary



- **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