

Unmanned Aircraft System Traffic Management (UTM) Project

Jeffrey Homola

Why is UTM Needed?

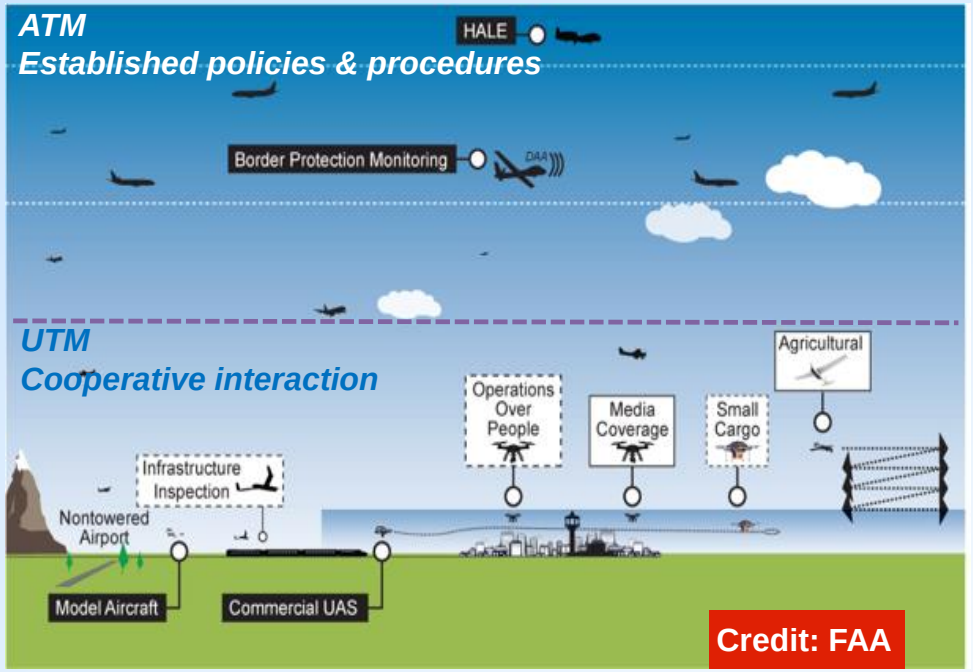
- FAA small UAS forecast – 3.9 million total, 0.7 million commercial by 2022
  - Many use cases: package delivery, news collection, precision agriculture, infrastructure inspections, public safety, disaster response, etc.
- New entrants desire access and flexibility for operations
- Current users want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

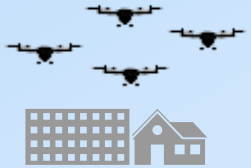
What is the UTM System?

- 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



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

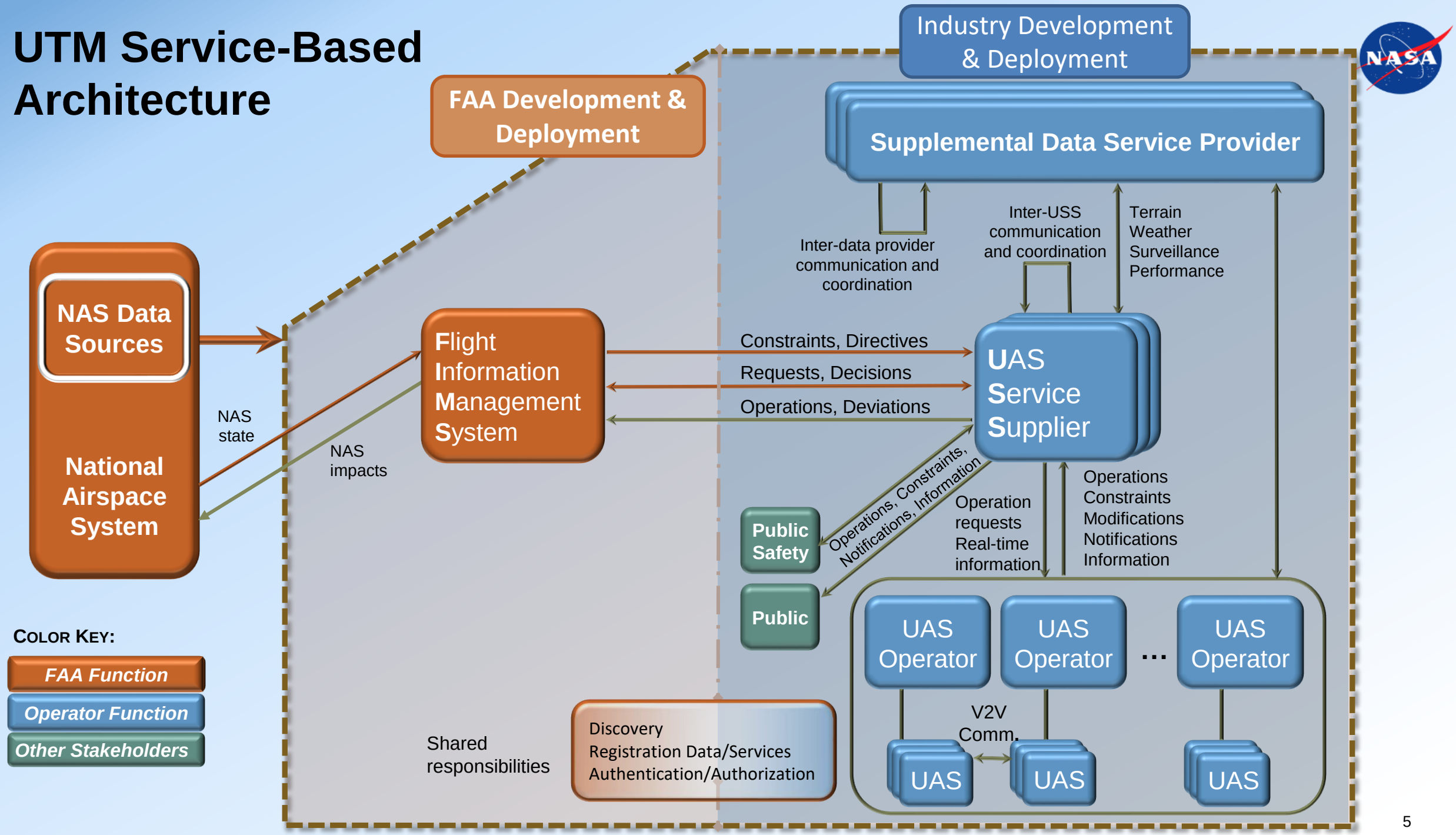
Completed 2018

TCL 4

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

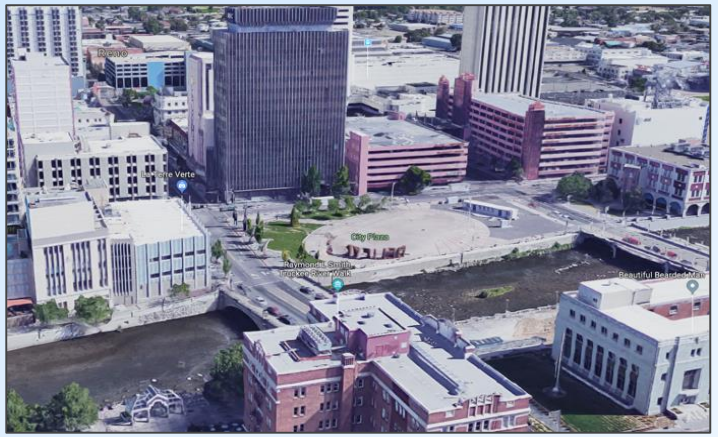
Completed 2019

UTM Service-Based Architecture



TCL 4 Objectives

- Test UTM in true urban environment
- Industry to provide all UAS Service Suppliers for traffic management
- Test several UAS on-board technologies for separation, collision avoidance, communication, identification, navigation, safe landing
- Investigate system response to real world events
  - UAS to UAS encounters
  - UAS to manned aircraft encounters
  - Static and dynamic obstacle avoidance
  - Loss of communication links and navigation source
  - Weather events
  - Dynamic airspace constraints
  - Emergency priority operations



Reno test range



Corpus Christi test range

Four Drones Flying Over Reno, NV, June 18, 2019



2 of 3 Drones Over Urban Canyon, Corpus Christi



3 Drones Flying Over Waterfront Area



The Impact of NASA UTM Research

Fielded Systems

- FAA LAANC use UTM concept
- UTM Pilot Program (UPP)
- UAS Integrated Pilot Program (IPP)

UAS Rule Making

- Part 107 & Beyond
- Remote Identification
- Operational Approvals using UTM

Industry Guidance

- Safety Case Development
- Data Exchange and Protocols
- Industry Standards

International Harmonization

- UTM Construct and Architecture
- Use Cases

- **UTM did not exist prior to NASA involvement**
- UTM has developed a market for Airspace Services
- FAA has adopted the UTM architecture and is continuing development on UTM service

- **FAA has been using NASA research to inform UAS policy and rulemaking**
- The FAA recent reauthorization places sizable investment on the deployment of UTM

- **Industry UTM Standards Development is ramping up**
- NASA research has accelerated the development of industry standards (e.g. Remote ID Standard)

- **NASA UTM concepts and architecture has been internationally embraced**
- The NASA UTM architecture promoted commerce which has enabled US domestic UTM airspace services companies to lead internationally