UTM Project Summary

• Objective
  – Develop and validate airspace operations and integration requirements to enable safe, large-scale UAS operations in low-altitude airspace.

• Approach
  – Partner with FAA and industry to design and test prototype UTM system
  – Develop Concept of Operations and software development for system components
  – Field test UTM system and vehicle/ground technologies for validation
  – Conduct real-time and fast-time simulations; system hazard analysis

• Outcomes
  - Tech transfer to FAA and industry
  - Inform regulators
  - Guidance to industry
  - International harmonization

• Schedule
  – FY15 - FY20
Why is UTM Needed?

- FAA small UAS forecast – 7 million total, 2.6 million commercial by 2020
  - 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 UTM?

- UTM is an “air traffic management” ecosystem for uncontrolled airspace
- UTM utilizes industry’s ability to supply services under FAA’s regulatory authority where these services do not exist
- UTM development will ultimately enable the management of large scale, low-altitude UAS operations
  - Operational concept will address beyond visual line of sight UAS operations under 400 ft. AGL, Class G airspace
  - Roles/responsibilities of FAA and operators
  - Information architecture, data exchange protocols, software functions
  - Performance requirements
UTM Principles (Things That UTM Will Help With)

SV
Key Operational Assumptions

- FAA maintains regulatory AND operational authority for airspace and traffic operations
- UTM is used by FAA to issue directives, constraints, and airspace configurations
- Air traffic controllers are not required to actively “control” every UAS in uncontrolled airspace or uncontrolled operations inside controlled airspace
- FAA has on-demand access to airspace users and can maintain situation awareness through UTM
- UTM roles/responsibilities: Regulator, UAS Operator, and UAS Service Supplier (USS)
- FAA Air Traffic can institute operational constraints for safety reasons anytime

Key principle is safely integrate UAS in uncontrolled airspace without burdening current ATM
Technical Capability Levels (TCL)

Risk-based development and test approach along four distinct TCL levels:

<table>
<thead>
<tr>
<th>TCL 1</th>
<th>TCL 2</th>
<th>TCL 3</th>
<th>TCL 4</th>
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<tr>
<td>Low Traffic Density</td>
<td>Low-Mod Traffic Density</td>
<td>Moderate Traffic Density</td>
<td>High Traffic Density</td>
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<td>Rural Applications</td>
<td>Rural / Industrial Applications</td>
<td>Suburban Applications</td>
<td>Urban Applications</td>
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<td>Multiple VLOS Operations</td>
<td>Multiple BVLOS Operations</td>
<td>Mixed Operations</td>
<td>Dense BVLOS Operations</td>
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<td>Notification-based Operations</td>
<td>Tracking and Operational Procedures</td>
<td>Vehicle to Vehicle Communication</td>
<td>Large Scale Contingency Management</td>
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TCL 1, 2 and 3 (in progress)

Nat'l Campaign 1: May 2016
- TCL 1 demo: August 2015

Nat'l Campaign 2: May 2017
- TCL 2 demo: Oct 2016
- TCL 3 First Responders
- TCL3 UAS towards controlled airspace

Nat'l Campaign 2: May 2017

Participating Orgs:
- TCL 1: 19
- TCL 2: 42
- TCL 3: 35
UTM and Public Safety

- Public safety operations using small UAS are becoming increasingly common
- Gaining perspective from the public safety community is important in understanding how UTM can best support operational needs
- Commercial and public safety operations need to be safely integrated
- UTM Principle: Provide priority access for public safety operations
Nominal UTM operations. Diverse set of concurrent missions and use cases.
Incident reported in the area that requires rapid response.
Fire department quickly plans and communicates intent for its UAS response to the network.
Affected operations are notified of the need for priority access to the airspace.
Public safety use cases and concept exploration are taking place in simulation and live flight demonstrations.

TCL 2 and 3 flight demonstrations included elements of public safety and plans are in progress for further incorporation in the TCL 4 demonstration.
• **UTM is successfully developing the framework** for large scale, small UAS traffic management. See UTM website for publications: [https://utm.arc.nasa.gov/documents](https://utm.arc.nasa.gov/documents)

• **TCL Demonstrations include 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

• **Ensuring that UTM supports public safety applications of small UAS** is a principle and active area of collaborative research