The UAS Traffic Management (UTM) Pilot Program (UPP) is developing new ways to maintain the safe and efficient use of our national airspace while promoting commerce and providing scalable and cost-effective services for the benefit of all.

*UTM is the manner in which the FAA will support UAS operating in low altitude airspace. It utilizes industry’s ability to supply services under the FAA’s regulatory authority where these services do not currently exist. UTM is a community-based, cooperative traffic management system, where the UAS operators and entities providing operation support services are responsible for the coordination, execution, and management of operations, with rules of the road established by FAA.*

UPP is a partnership with industry to test and evaluate technologies, standards, and procedures that will allow many drones to safely share airspace.
UAS Traffic Management (UTM) Ecosystem

**FAA & INDUSTRY CAPABILITIES**
- FAA CLOUD SERVICES
  - UAS Facility Maps
- FAA Authoritative Data Sources
  - Flight Information Management System (FIMS)
- UAS Registration
- Airspace Authorization
- Remote ID Correlation Services

**COMMERCIAL UAS SERVICE SUPPLIERS (USS)**
- USS 1
- USS 2
- USS 3

- Flight Planning
- Strategic UAS traffic de-confliction
- Weather
- UAS Volume Reservations

**FAA CLOUD SERVICES, COMMERCIAL UAS SERVICE SUPPLIERS (USS) and UAS operators work with each other**
Why UPP?

• To date, the FAA has enabled routine commercial and recreational visual line-of-sight (VLOS) operations.
  
  • Use cases that will enable expanding the economical benefits and services for UAS requires enabling routine beyond visual-line-of-sight (BVLOS) operations.

  Today, BVLOS UAS operations are enabled via COA/waivers.

• Stakeholders are at the FAA’s doorstep, asking what’s next.

  They need activities that bring them together to test their capabilities, learn lessons, and figure out what they need to do next in preparation for the implementation of UTM.

• The Remote ID (RID) rule was published in January 2021. BVLOS rulemaking is starting.

  • The FAA needs information to inform their internal activities to enable routine BVLOS operations.
UPP Phase 2 Objectives
from the FAA 2018 Reauthorization

• Work in cooperation with NASA and industry to test UAS prototypes that are designed for increasing airspace density.
  Refer to: section 44801 of title 49, United States Code.

• Test UTM systems at selected sites in Virginia and New York.
  Refer to: October 25, 2017, Presidential Memorandum entitled, “Unmanned Aircraft Systems Integration Pilot Program” and described in 82 Federal Register 50301.

• Test RID and tracking technologies.
  Refer to: Unmanned Aircraft Systems Identification and Tracking Aviation Rulemaking Committee.
UPP Phase 2 Awardees

- New York Unmanned Aircraft Systems (UAS) Test Site (NYUASTS)
- FAA Test Environment
- FAA Headquarters
- Virginia Tech, Mid-Atlantic Aviation Partnership (MAAP)

[Map showing locations]
Selected FAA UAS Test Sites provided the best value based on their industry partnerships and the capabilities they proposed.

Additional participants included UAS industry stakeholders and public safety partners.

UAS Industry:
- Aerodyne Measure
- Johns Hopkins Applied Physics Laboratory
- TruWeather Solutions
- Skyward (a Verizon company)
- Flytrex

Participating USSs included UPP1 partners and new partners. These partners bring a diverse set of expertise, technologies, and capabilities, as well as the ability to test to the RID and UTM standards.

Public Safety:
- City and county law enforcement
- Virginia Tech (VT) Department of Emergency Management
- Radford Army Ammunition Plant
UPP Phase 2 Capabilities
Demonstrations Completed Fall 2020

UPP Phase 2 demonstrated the following emerging UTM capabilities that will support BVLOS operations.

• The FAA Flight Information Management System (FIMS) prototype and infrastructure, which gives the FAA access to information from industry and other stakeholders.

• New technologies and data to validate the latest international standards for RID and support authorized users with specific operator data.

• Validated UTM standards for in-flight conflict management in high-density airspace.

• UVRs to notify drone operators of emergencies and make sure other UTM capabilities work properly in these scenarios.

• Secure information exchanges between the FAA, industry, and authorized users to ensure data integrity.
Deconfliction/Shared Intent

Tested in high-density airspace throughout UPP Phase 2

- Automated and highly scalable
- Communicates 4-D operating volumes
- Supports strategic deconfliction among UTM participants
- Extensively tested through NASA TCL1-4 and UPP Phases 1 & 2
- FAA test infrastructure supports UTM network connectivity with UAS Service Suppliers (USS)
UAS Volume Reservation (UVR) Capability

Technology allowing public safety partners to quickly disseminate information to UAS Operators

• Warns UAS operators about a specific volume of airspace
• Activated in short period of time
• Automated process
• Can be enabled through government-qualified USS
• Prototype tested well with multiple USSs and operators in UPP Phases 1 & 2
FAA UTM Data Correlation Capability - IDIAS

- The UPP Team developed a correlation capability to support authorized queries for information.
- This capability is known as the Integrated Drone Identification Automated System (IDIAS).
  - Demonstrated with external stakeholders during UPP Phase 2 as part of the testing of Remote ID technologies and support services.
  - This capability is part of the UTM Flight Information Management System (FIMS) and is integrated into FAA test infrastructure at the NextGen Integration and Evaluation Capability (NIEC) lab for test and demonstration activities.
- The following assumptions guided the development of IDIAS:
  - The FAA authorizes public safety and security entities to use data request/correlation services.
  - The FAA provides access for authorized users to submit requests.
  - These services support queries of internal FAA data stores.
International Aviation Trust Framework (IATF)

- Transformation occurring in both Aviation and Information Technology
  - New technologies
  - Digital transformation
  - Growth and new entrants in aviation
- Interoperable approach to trusted and secure information exchange
  - Identity/Authentication
  - Data Integrity
- Includes all international aviation stakeholders including aircraft, airlines, ANSPs, systems, and services
- UTM Pilot Program Phase 2 used IATF compliant security measures*
  - UPP participants were among earliest to achieve preliminary IATF compliance

*IA TF policies and guidance are currently in draft form

UPP2 Message Security Objectives

- Secure UTM communications between UTM participants and partners for situational awareness, de-confliction, and remote identification

<table>
<thead>
<tr>
<th>Security Objective</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In Transit:</strong></td>
<td>Protect from one endpoint to another endpoint</td>
</tr>
<tr>
<td><strong>Authentication:</strong></td>
<td>Verify the identity of the message sender</td>
</tr>
<tr>
<td><strong>Non-Repudiation:</strong></td>
<td>Provide proof of origin for message sender</td>
</tr>
<tr>
<td><strong>Data Integrity:</strong></td>
<td>Protect against (un)intentional modification</td>
</tr>
<tr>
<td><strong>Encryption:</strong></td>
<td>Protect from disclosure to unauthorized entities</td>
</tr>
<tr>
<td><strong>Authorization:</strong></td>
<td>Resources accessed only by authorized entities</td>
</tr>
</tbody>
</table>

**Objective #1** Achieved through use of typical **SSL/TLS Certificates** for each USS. An SSL/TLS connection will be required for all message exchanges.

**Objective #2, #3, #4, #5** Achieved through use of separate **UTM Certificates** for each USS managed by a **public key infrastructure (PKI)**. Messages exchanged in the UTM may be signed and/or encrypted using these certificates.

**Objective #6** Achieved through access tokens per **OAuth 2.0 framework**.
UTM Technology Transfer

UTM artifacts developed and demonstrated in UPP are being transferred to key stakeholders to support UAS implementation strategies.
ASTM Alignment

UPP Phase 2 data models align with ASTM APIs and Data Models

- Remote ID standard
  Developing to version 1.0
- USS-to-USS standard
  Developing to version 0.3.5
  USSs adding an endpoint to handle historical queries from FAA
- Features not included in current ASTM APIs
- USS Negotiation
- Message Signing
- Priority Operation preemption
- Constraint whitelist
Use Case Videos Available via FAA YouTube

- Use Case 1 - Demonstrate high-density operations and strategic deconfliction by operators through a US
- Use Case 2 - Demonstrate in-flight modifications to intent in a high-density airspace utilizing 1) broadcast Remote Identification for rogue UAS and 2) Supplemental Data Service Provider services for detection, alert, and avoidance of manned and unmanned traffic

- Use Case 1 - Demonstrate high-density USS operations and exercise various technologies including USS intent publishing, USS information sharing, Advanced Collision Avoidance System for UAS (ACAS Xu) Detect and Avoid, obstacle avoidance technology, and strategic deconfliction
- Use Case 2 – A continuation of Use Case 1, demonstrate in-flight modifications to intent in a high-density airspace due to non-conforming or rogue UAS operators