Note: this presentation was delivered in September 2023 and some content may no longer be current.
# Agenda

<table>
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<th>Time (CDT)</th>
<th>Topic</th>
<th>Presenter</th>
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<tr>
<td>9:00 – 9:15</td>
<td>Welcoming Remarks</td>
<td>FAA, NASA</td>
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<td>9:15 – 10:00</td>
<td>• UTM Overview • Key Site Operational Evaluation Overview</td>
<td>Program Team (ANG/AUS, NASA)</td>
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<td>10:00 – 10:30</td>
<td>Policy and Exemption Considerations</td>
<td>AUS, AFS</td>
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<td>10:30 – 12:00</td>
<td>Operator Presentations</td>
<td>UAS Operators</td>
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<td>12:00 – 1:30</td>
<td>LUNCH</td>
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<td>1:30 – 5:00</td>
<td>Operator Presentations</td>
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<td>5:00 – 5:30</td>
<td>Closeout and Next Steps</td>
<td>All</td>
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Welcoming Remarks
UAS Traffic Management (UTM) Overview
UAS Traffic Management (UTM) is a community-based, cooperative ecosystem that is separate from, but complementary to, the FAA's Air Traffic Management (ATM) system

- Objective to enable drone operations at scale conducted beyond visual line-of-sight (BVLOS) and below 400 ft AGL, where air traffic services are not provided
- Maintaining FAA’s regulatory authority while leveraging industry’s ability to supply services supporting drone operations
- Information Centric approach with distributed information network and data exchanges to mitigate operational risks and improve operational efficiencies
UTM Development Milestones

- **NASA UTM Technical Capability Level (TCL) 1 Activities**
  - 2015
    - 14 CFR Part 107 Established
    - NASA UTM ConOps Released
    - NASA UTM TCL 2 Activities
  - 2016
    - 2017
    - FAA/NASA UTM Research Transition Team (RTT) established
    - UTM RTT TCL 3 Activities
    - LAANC Airspace Authorization Services Available
    - FAA UTM ConOps v1.0 Released

Credit: NASA
UTM Development Milestones

2019
- FAA UPP Phase 1 Activities
- UTM RTT TCL 4 activities

2020
- FAA UTM ConOps v2.0 Released
- FAA UPP Phase 2 Activities

2022
- Final Remote ID Rule
- UTM Field Test

2023
- UTM Key Site Operational Evaluation
UTM Services

- UAS Service Suppliers (USSs) provide services to:
  - Connect Operators and other entities to enable information exchanges and enable the USS network
  - Key to providing shared situational awareness among UTM participants
- Services are modular and discrete, allowing flexibility for implementation
- Framework enables FAA to provide oversight while allowing industry innovation
Potential UTM Services

**Constraint Management**
FAA may receive or distribute constraint information to/from stakeholders as necessary.

**Historical Query**
Provides FAA with access to data from USS.

**UAS Data Correlation**
Provides authorized access to FAA-held drone data.

**Strategic Deconfliction**
Scalable sharing of operating volumes using network connectivity with USSs.

**Risk Message**
USS assesses possible drone interfering with ATC-controlled aircraft, shares appropriate info with ATC.
UTM Key Site Operational Evaluation Overview
Envisioned UTM Architecture

- Operators and Service Suppliers leverage a distributed information centric USS Network for safe operations.
- USS Network enables services to mitigate operational risks and increase efficiency:
  - Operator-to-Operator, Vehicle-to-Vehicle, and Operator-to-FAA
- Regulator (FAA) has on-demand access to UTM operational information, when needed.
UTM Operational Evaluation Overview

- Consortium of industry operators convened to facilitate preparations and execution of overlapping BVLOS operations in the Dallas-Fort Worth, Texas area
- Precedent-setting exemptions for BVLOS, where operators can leverage UTM services as operational risk mitigators
- UTM services leverage USS interoperability standards to manage and mitigate UA-to-UA conflicts
- Deployed ecosystem will be the basis for routine operations in Dallas-Fort Worth
- Evaluation will define common requirements to enable routine BVLOS operations in other locations
UTM Key Site Operational Evaluation Goals

- Leverage Public-Private Partnership for UTM Implementation
- Show UTM is Safe and Effective
- Build Public Acceptance for UTM-Enabled BVLOS
- Advance UAS Integration Efforts
- Catalyze a Durable and Enduring Ecosystem
- Influence Future Policy through Data and Findings
UTM Key Site OE Considerations

- Operators and UAS Service Suppliers (USS) have signed Letter of Intent to enable shared airspace through data sharing.
- Industry is deploying network of services using consensus standards.
- Limited to Class G operations up to 400’ AGL.
- Validates use of UTM services to mitigate UA-UA collision risk for BVLOS operations.
  - Services may include strategic conflict detection, conformance monitoring for situational awareness, and constraint processing.
- FAA's BVLOS rulemaking will be informed by policy decisions based on data collected.
  - Leads to regulatory approval path for BVLOS operations using UTM services.
Media and Public Communications Strategy

- Prior to issuing any press releases or public statements about this evaluation, please coordinate with the FAA UTM Key Site Operational Evaluation Team.

- FAA Office of Communication will be engaged throughout FAA UTM Key Site Operational Evaluation activities.
Validation of UA-to-UA Deconfliction Service

Operators may use different USSs

- Multiple operators coexist in one area, each using a different USS to share flight intent.
- Common framework of capabilities is outlined in ASTM USS Interoperability Standard.
Strategic Conflict Detection

- **Strategic Conflict Detection**
  - USS service that determines if there are conflicts between operational intents

- **Operators’ uses of USS**
  - Receive notification of airspace constraints
  - Share intent with other operators in near real-time
  - Detect conflicts with other operators
  - Shares information about operator deviation

- **Operational Intents**: Volume-based representation of a UAS operation, defines airspace and time bounds intended to contain the flight
  - Consists of one or more contiguous or overlapping 4D volumes
  - 4D volumes are constructed based on the performance of the UAS
NASA Role

USS Network

- Ensure Discovery and Synchronization Server (DSS) is in place
- Ensure Authorization Server (oAuth) is in place
- Deploy and manage API(s) for data collection
  - Analyze the technical data and recommend changes / updates / enhancements
  - Monitor network health (resiliency) and network security (cybersecurity)
- Develop and deploy test harness
- Develop tech transfer strategy

For more information, please visit nari.arc.nasa.gov/ussnetworkingrfi
Data Exchanges as Potential Data Sources

- Data management plan to be developed collaboratively
- Conflict resolution data will be valuable to FAA during evaluation

ASTM UTM USS Interoperability API

- Potentially used to collect data that is exchanged within the USS network
FAA Assumptions for Operator Participation

• Must be one of the following:
  – Certified under 14 CFR Part 135
  – Active applicant for 44807 exemption for §91.113 or §107.31 (BVLOS)
• Must have the ability to obtain, maintain, and adhere to a BVLOS exemption
• Must be able to utilize UTM services to manage UA-to-UA conflicts
• Must be able to connect, transmit, and receive data via a data exchange provided by the USS, operators must share data such as:
  1. **Operational Intent** – Volume-based representation of a UAS flight, defines airspace and time bounds intended to contain the flight
  2. **Off-Nominal Operating Information** – Information that may result in nonconforming or contingent states of operational intent
  3. **Position Data** – Vehicle telemetry such as latitude, longitude, altitude, and velocity
FAA Assumptions for USS Participation

• Must validate compliance with “Standard Specification for UAS Traffic Management (UTM) USS Interoperability” (ASTM F3548-21)
• Should have ability to interface with operator(s) and exchange information between USS, UAS operators, and FAA to provide services:
  – Strategic Conflict Detection
  – Conformance Monitoring
  – Constraint Processing
• Must have the ability to obtain, maintain, and adhere Near-Term Approval Process (NTAP) third-party service recognition
• Must address cybersecurity using features such as tokens (identity and access), message signatures, encryption, and certificates
FAA Assumptions for SDSP Participation

• Must have the ability to interface with operator(s) and/or USS in order to share supplemental data in accordance with the requirements of an applicable industry standard
• Must have the ability to obtain, maintain, and adhere NTAP SDSP service recognition
Airspace Overview
NAS Operations Considerations

• The focus of the UTM Key Site Operational Evaluation is to assess the maturity and operational suitability of UTM strategic coordination and conformance monitoring services.

• While validating the safety benefits these services provide to UA-UA conflicts, non-participating operators must also be considered.

General Operating Environment:
Class G and below 400’ AGL – Minimized exposure to: densely populated areas, airport approach and departure areas, low altitude helicopter or pipeline operations, etc.
## UTM Key Site Airspace Overview

### Industry must take into consideration:

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Airparks</td>
<td>to include Recreational CBO's</td>
</tr>
<tr>
<td>Low Altitude Military Operating Areas</td>
<td></td>
</tr>
<tr>
<td>Potential Noise Impact and Community Engagement and Response</td>
<td></td>
</tr>
<tr>
<td>Airspace Restrictions for Security, Sporting Events, all TFR's, etc.</td>
<td></td>
</tr>
<tr>
<td>Nearby Airports Airspace and Patterns – Controlled and Uncontrolled</td>
<td></td>
</tr>
<tr>
<td>Aviation Health Care Providers Operations</td>
<td></td>
</tr>
<tr>
<td>Energy Distribution Services Power Plants and Pipelines</td>
<td></td>
</tr>
<tr>
<td>Low Altitude, Privately Owned Operations e.g., Pipeline Operations</td>
<td></td>
</tr>
<tr>
<td>Assessment of Services provided, and Business Model served</td>
<td></td>
</tr>
<tr>
<td>Public and Private Use Heliports</td>
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</tbody>
</table>

### Expectations:

Industry to propose/present operating areas that include consideration of areas of concern listed above with emphasis on safety and ensuring public acceptance of UTM activity. Coordination with public safety officials, as necessary. FAA/Industry to revisit November 2023.
Possible Operating Areas

This depiction shows the close proximity of potential operating areas to uncontrolled airports below the mode C veil.
Existing pipeline operations not assumed to be participating
Policy and Exemption Considerations
UTM Key Site OE

- Critical policy area for enabling BVLOS operations
- Builds on UFT & Part 135 approvals
- Focused region with multiple operators and service providers
- Leverage a federated network of services deployed by industry based on consensus standards
- Enables FAA and industry to validate use of UTM-based strategic deconfliction to mitigate UA-UA collision risk for BVLOS operations

Purple circles: Existing UAS operations
Exemptions Update

- FAA published notices in May 2023 for BVLOS drone operations
- August 2023: First exemptions issued to inform policy and rulemaking
- More BVLOS requests expected due to FAA's forward-leaning approach

Granted Exemptions

- PAU issued August 24, 2023
  - Infrastructure shielding for power inspections, with electronic observer (EO) for manned traffic
- UPS and uAvionix issued September 6, 2023, Zipline issued September 18
  - UPS: Ground-based radar supports DAA
  - uAvionix: Vantis 3rd Party services support DAA and C2 link
  - All: required to have a means to manage UA-UA conflicts
Managing Emergent Risk

UA-UA collision now as potential outcome to likely hazards of UAS Operations in FAA Order 8040.6A

| Deterioration of external systems supporting the UAS operation | Malfunction of any component that is not a part of the UAS but supports safe operations. | ADS-B signal degradation | GPS signal degradation | UAS Traffic Management (UTM) failure | Package delivery system failure | Procedures are in place to handle the deterioration of external systems supporting the UAS operation | UAS is designed to manage the deterioration of external systems supporting the UAS operation | External services supporting the UAS operation are adequate to the operation | Collision between UAS and a manned aircraft in the air | Collision between two or more UAS | Collision between a UAS and person on the ground or a moving vehicle | Collision between a UAS and critical infrastructure on the ground | Collision between a UAS and terrain (CFIT) | NMAC between UAS and a manned aircraft in the air | Manned aircraft making an evasive maneuver to avoid UA (proximity from UA remains greater than 500 feet) | Collision between UAS component(s) and persons and/or property | Collision between package/cargo and persons and/or property |
BVLOS Exemptions Benefits

- Different DAA technologies and consensus standards used
- Recognition of UTM services to meet operational risk
- Reference Condition and Limitation 41 of uAvionix exemption for LOA process
- Expect more exemptions and rapid approvals in the future
- Providing insight into future BVLOS regulations
The Need for Near-Term Approvals

Section 377 of the 2018 FAA Reauthorization Act requires the Agency to:

- Develop a process to permit, authorize, or allow the use of UTM services
- Develop a review process for UTM services that ensures NAS safety and reduces UAS risk – prior to rulemaking
- Expedite (third-party service supplier) approvals in low-risk areas

Risk mitigation evaluation of UTM 3PSP in low-risk areas utilizing existing FAA processes.
## NTAP Criteria for USSs

1. Sign MOU to engage with FAA
2. Complete updated evaluation matrix
   - Matrix posted as guidance on FAA website
3. USS receives FAA recognition, with applicable limitations

### Type of Service

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Example Demonstration</th>
<th>Means of Demonstration (Including alternative means of compliance or demonstration)</th>
<th>Criteria is Satisfied?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documentation of the expected role and responsibilities of the operator and the SPISP</td>
<td>Service-level agreement (SLA) and Concept of Use (CONOPS)</td>
<td>Click or tap here to enter text.</td>
<td></td>
</tr>
<tr>
<td>The SPISP has version controls and a defined software upgrade process.</td>
<td>QMS or service provision manual, ISO 9001 certificate</td>
<td>Click or tap here to enter text.</td>
<td></td>
</tr>
<tr>
<td>If the service conforms to a design assurance standard, evidence of design and process.</td>
<td>Requirements document matrices (RTM) is responsive to the appropriate and selected level of design assurance</td>
<td>Click or tap here to enter text.</td>
<td></td>
</tr>
<tr>
<td>A formal analysis of the service has been conducted.</td>
<td>Pattern Analysis and Safety Analysis (PASA) and Functional Hazard Analysis (FHA)</td>
<td>Click or tap here to enter text.</td>
<td></td>
</tr>
<tr>
<td>A deployed instance of the service exists.</td>
<td>API or use interface credentials</td>
<td>Click or tap here to enter text.</td>
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</table>

### Any Service

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Example Demonstration</th>
<th>Means of Demonstration (Including alternative means of compliance or demonstration)</th>
<th>Criteria is Satisfied?</th>
</tr>
</thead>
<tbody>
<tr>
<td>The SPISP provides information to the applicant in an agreed-to message format and at an agreed-to schedule.</td>
<td>SLA</td>
<td>Click or tap here to enter text.</td>
<td></td>
</tr>
<tr>
<td>The SPISP indicates any specific equipment the applicant is required to use.</td>
<td>SLA</td>
<td>Click or tap here to enter text.</td>
<td></td>
</tr>
<tr>
<td>The SPISP prevents an interruption of normal operation.</td>
<td>SLA</td>
<td>Click or tap here to enter text.</td>
<td></td>
</tr>
<tr>
<td>The SPISP immediately alerts the applicant operator of any malfunction, degradation, or failure condition.</td>
<td>SLA</td>
<td>Click or tap here to enter text.</td>
<td></td>
</tr>
<tr>
<td>The SPISP keeps all service data, including surveillance information and data related to the operation of the service, for at least 45 days. The SPISP makes this data available to the FAA within 5 business days of receiving a request from the FAA.</td>
<td>Summary of data retention and retrieval policies</td>
<td>Click or tap here to enter text.</td>
<td></td>
</tr>
<tr>
<td>The service alerts the operator of any malfunction, degradation, or failure condition during the operation.</td>
<td>Assessment (certification) or SLA</td>
<td>Click or tap here to enter text.</td>
<td></td>
</tr>
<tr>
<td>The equipment used for the operation, including both the SPISP's equipment and the operator's equipment, is fully interoperable to meet the functional and performance requirements of the service.</td>
<td>Description of relevant equipment and summary test results (e.g., expansion testing output) used to verify proper interoperability or SLA</td>
<td>Click or tap here to enter text.</td>
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</table>

### USS

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Example Demonstration</th>
<th>Means of Demonstration (Including alternative means of compliance or demonstration)</th>
<th>Criteria is Satisfied?</th>
</tr>
</thead>
<tbody>
<tr>
<td>The service processes operational intent requests based on FAA guidance on priority levels, if applicable.</td>
<td>Averment and RTM</td>
<td>Click or tap here to enter text.</td>
<td></td>
</tr>
<tr>
<td>The requirements in Sections 5.1-5.7 and 5.9 of ASTM F1544-21, Standard Specification for UAS Traffic Management (UTM) UAS Service Supplier (USS) Interoperability, dated March 9, 2012, are satisfied.</td>
<td>Averment, RTM and <a href="#">link</a> test suite results</td>
<td>Click or tap here to enter text.</td>
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NTAP is FAA’s process to evaluate 3PSP, supporting UTM OE and other efforts.

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<thead>
<tr>
<th>Near Term Approval Process (NTAP)</th>
<th>Key Site OE</th>
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<tbody>
<tr>
<td>Approval process</td>
<td>Operational outcome/USS approval process</td>
</tr>
<tr>
<td>Validate FAA business rules</td>
<td>Validate standards</td>
</tr>
<tr>
<td>Oversight policies</td>
<td>Operational policies</td>
</tr>
<tr>
<td>One SP and operator at a time</td>
<td>Multiple services and operators</td>
</tr>
<tr>
<td>Low-risk areas &amp; operations</td>
<td>Increasing complexity and tempo</td>
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</table>
## Critical Policy Areas

<table>
<thead>
<tr>
<th>Area</th>
<th>Address in Dallas-Fort Worth</th>
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<tbody>
<tr>
<td>Strategic conflict detection</td>
<td>Yes – validate safety case</td>
</tr>
<tr>
<td>Conformance monitoring (aggregate and/or CMSA)</td>
<td>Yes – define safety benefit</td>
</tr>
<tr>
<td>Prioritization and conflicts at same priority level</td>
<td>Yes - as business rules based on what’s expected by the ASTM standard</td>
</tr>
<tr>
<td>Contingent operations</td>
<td>Desired – possibly as test scenarios</td>
</tr>
<tr>
<td>Historical query and real-time data</td>
<td>Desired – safety assurance functions, possible traffic awareness for ATC</td>
</tr>
</tbody>
</table>
Success Criteria 1 and 2

• **What:** Validate that services can manage UA-UA collision risk on behalf of operators – safely, efficiently, and at scale
  • **How:** At least two USSs, each managing at least one operator.
  • **How:** Attain and analyze data with an eye toward determining useful metrics, not just collecting and storing data

• **What:** Give industry the means to deploy additional services based on demand and demonstrated readiness, not under predefined scenarios
  • **How:** Approve qualified SDSPs via NTAP
  • **How:** Ensure key site requirements and criteria are accurately documented to enable a repeatable process for future operators and service providers
Success Criteria 3 and 4

• **What:** Validate that FAA can approve/recognize services with a defined process (NTAP)
  • **How:** Consistent decision-making on NTAP process steps *and* individual service determinations
  • **How:** Track how long it takes to process approvals (months and total staff hours), then set targets

• **What:** Show how operator exemptions and service recognition fit together
  • **How:** Assist AFS in processing new exemptions that use approved services
  • **How:** Develop checklist/process to verify an operator is complying with SLA
These initiatives are shaping the future of drone operations and safety

- Inform future operations - exemptions informing the FAA as we are currently in rulemaking
- Collaboration between industry and government is crucial for success
Questions?