

# UTM Key Site Operational Evaluation

## Operator Consortium Listening Session



September 2023

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



**Federal Aviation  
Administration**

# Agenda

Time (CDT)	Topic	Presenter
9:00 – 9:15	Welcoming Remarks	FAA, NASA
9:15 – 10:00	<ul style="list-style-type: none"><li>UTM Overview</li><li>Key Site Operational Evaluation Overview</li></ul>	Program Team (ANG/AUS, NASA)
10:00 – 10:30	Policy and Exemption Considerations	AUS, AFS
10:30 – 12:00	Operator Presentations	UAS Operators
12:00 – 1:30	LUNCH	
1:30 – 5:00	Operator Presentations	UAS Operators
5:00 – 5:30	Closeout and Next Steps	All

# Welcoming Remarks

# UAS Traffic Management (UTM) Overview

# UAS Traffic Management 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

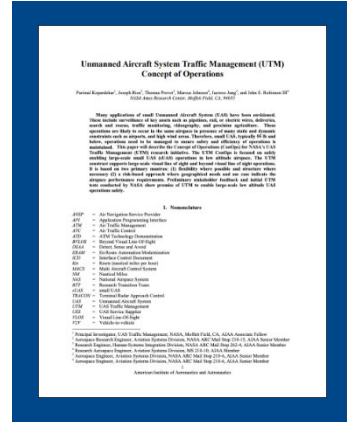
- Objective to enable drone operations at scale conducted beyond visual line-of-sight (BVLOS) and below 400 ft AGL, where air traffic services are not provided
- Maintaining FAA's regulatory authority while leveraging industry's ability to supply services supporting drone operations
- Information Centric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



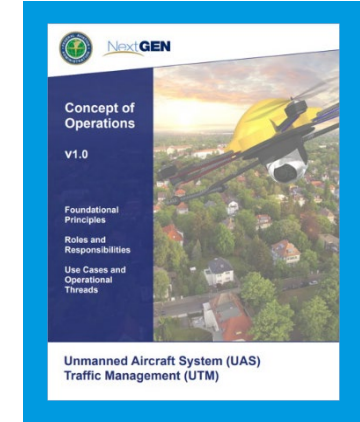
# UTM Development Milestones

- NASA UTM Technical Capability Level (TCL) 1 Activities

## 2015



- FAA/NASA UTM Research Transition Team (RTT) established
- UTM RTT TCL 3 Activities



## 2016

<p><b>CAPABILITY 1</b></p> <ul style="list-style-type: none"> <li>• Airspace volume use notification</li> <li>• Over unpopulated land or water</li> <li>• Minimal general aviation traffic in area</li> <li>• Contingencies handled by UAs pilot</li> <li>• Tracking, vehicle-to-vehicle, internet connected monitoring</li> </ul>	<p><b>CAPABILITY 3</b></p> <ul style="list-style-type: none"> <li>• Beyond visual line of sight</li> <li>• Over moderately populated land</li> <li>• Some interaction with manned aircraft</li> <li>• Tracking, vehicle-to-vehicle, internet connected</li> <li>• Public safety, limited package delivery</li> </ul>
<p><b>CAPABILITY 2</b></p> <ul style="list-style-type: none"> <li>• Beyond visual line-of-sight</li> <li>• Tracking and low density operations</li> <li>• Sparsely populated areas</li> <li>• Procedures and "rules-of-the road"</li> <li>• Longer range applications</li> </ul>	<p><b>CAPABILITY 4</b></p> <ul style="list-style-type: none"> <li>• Beyond visual line of sight</li> <li>• Urban environments, higher density</li> <li>• Autonomous vehicle-to-vehicle, internet connected</li> <li>• Large-scale contingencies mitigation</li> <li>• News gathering, deliveries, personal use</li> </ul>

- 14 CFR Part 107 Established
- NASA UTM ConOps Released
- NASA UTM TCL 2 Activities

## 2017



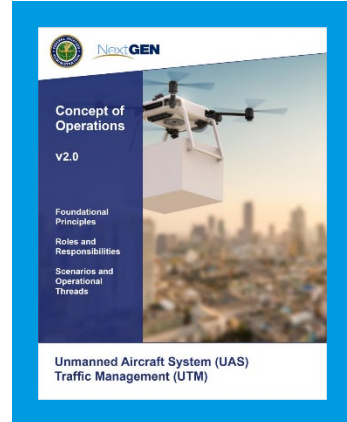
## 2018

- LAANC Airspace Authorization Services Available
- FAA UTM ConOps v1.0 Released

# UTM Development Milestones

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

2019



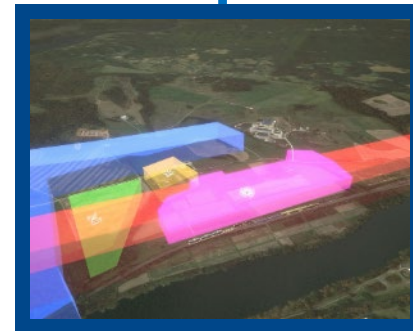
- Final Remote ID Rule
- UTM Field Test

2022



2020

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



2023

- UTM Key Site Operational Evaluation



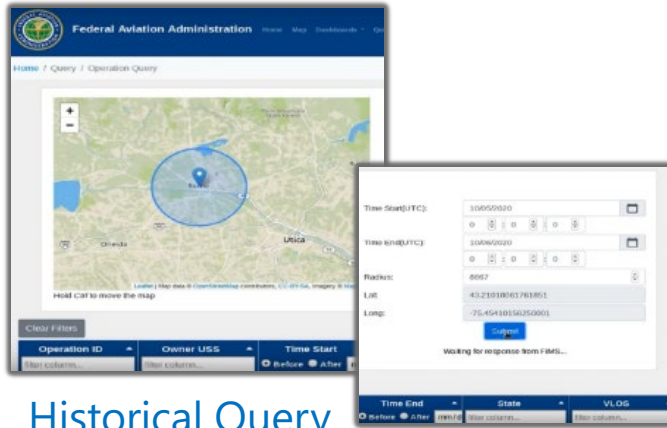
# UTM Services



- 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

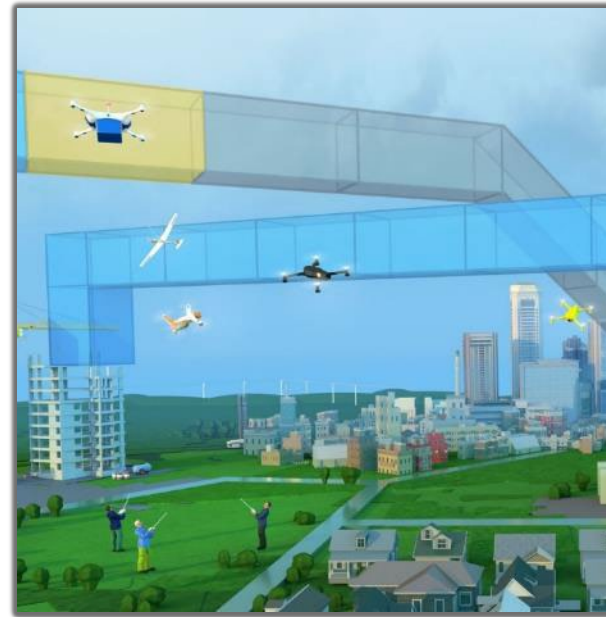


# Potential UTM Services



## Historical Query

Provides FAA with access to data from USS



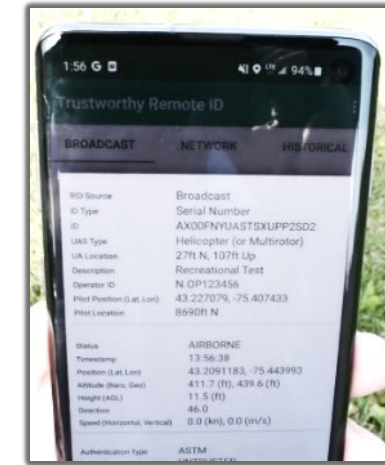
## Strategic Deconfliction

Scalable sharing of operating volumes using network connectivity with USSs



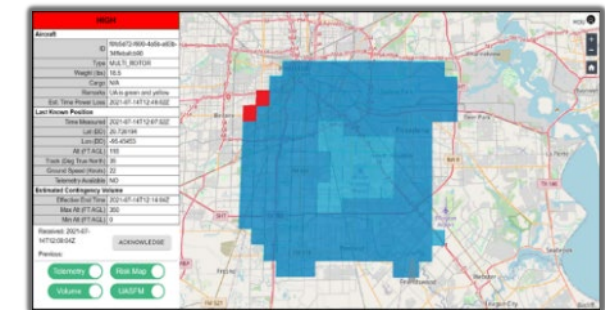
## Constraint Management

FAA may receive or distribute constraint information to/from stakeholders as necessary



## UAS Data Correlation

Provides authorized access to FAA-held drone data

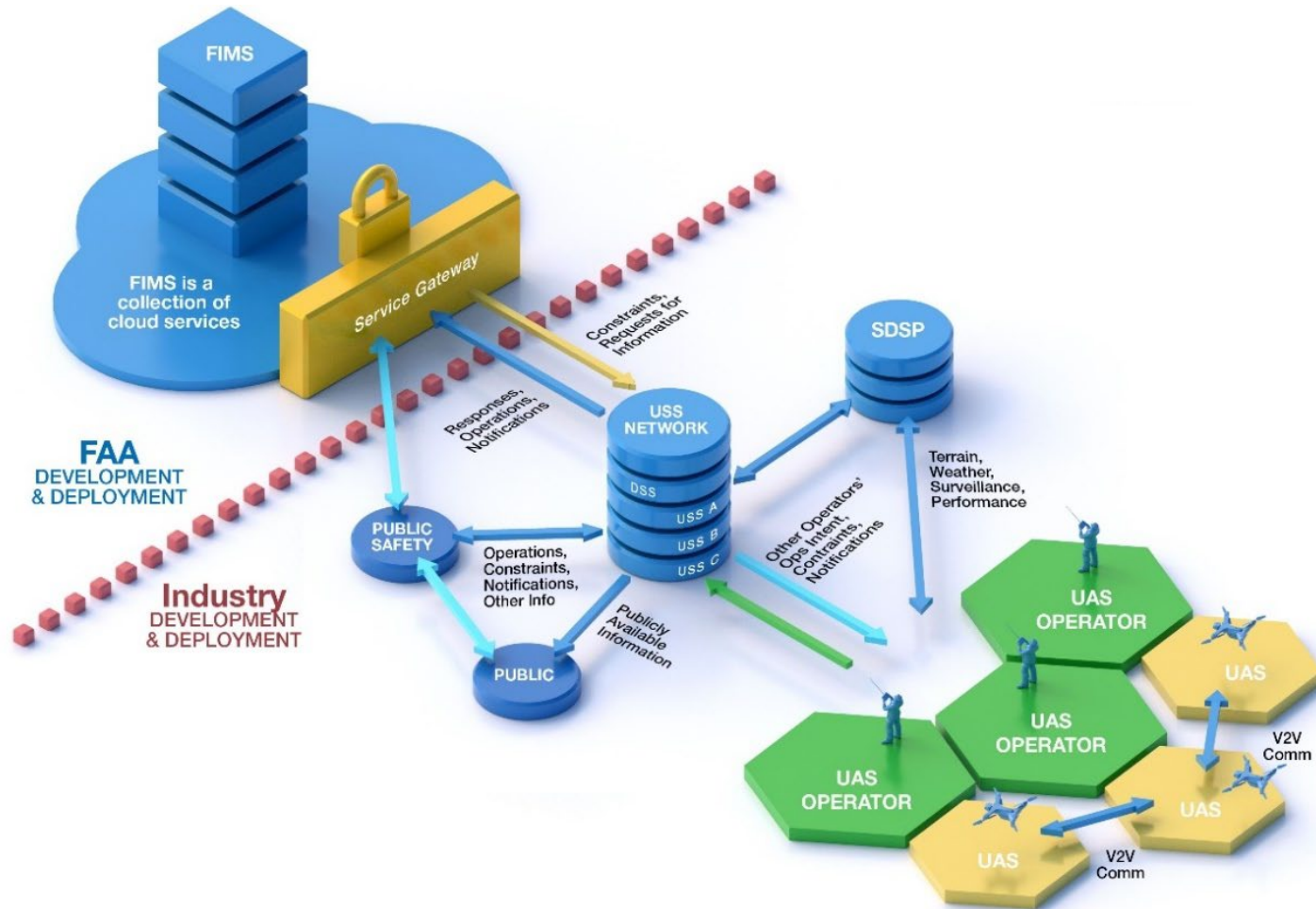


## Risk Message

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



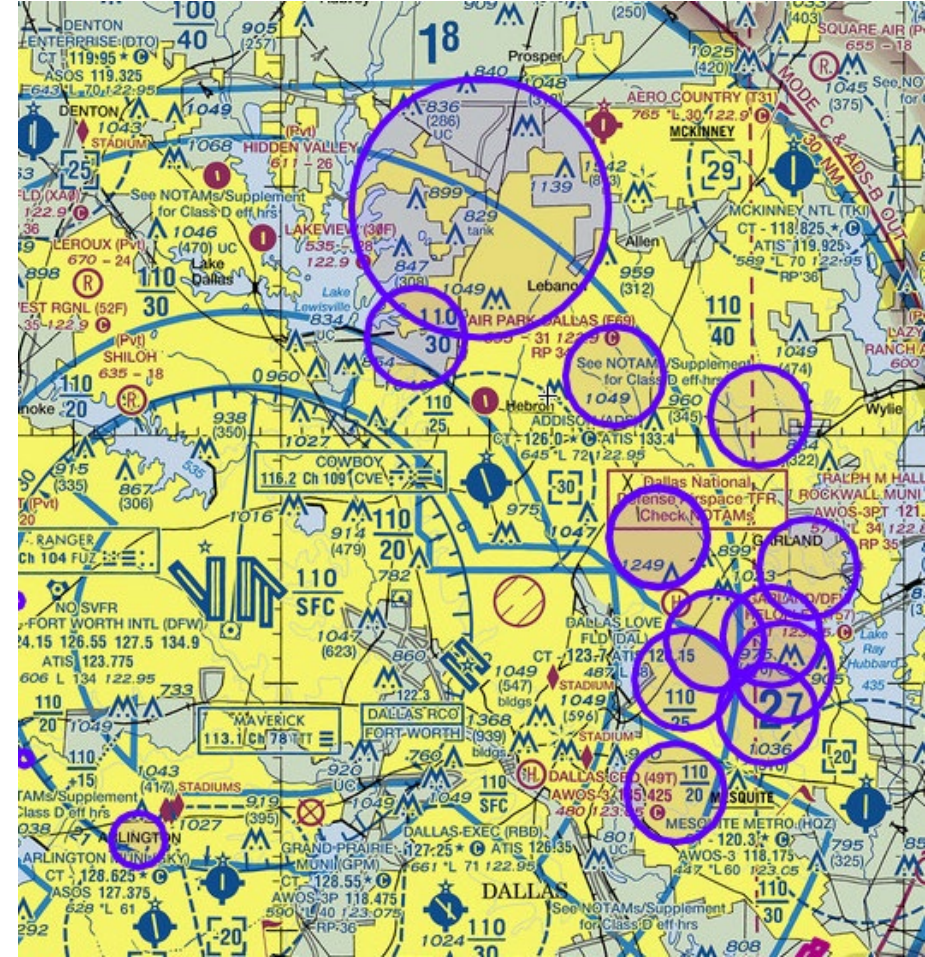
Influence Future Policy through Data and Findings



# 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.



Purple circles: UAS NOTAMs



# Media and Public Communications Strategy

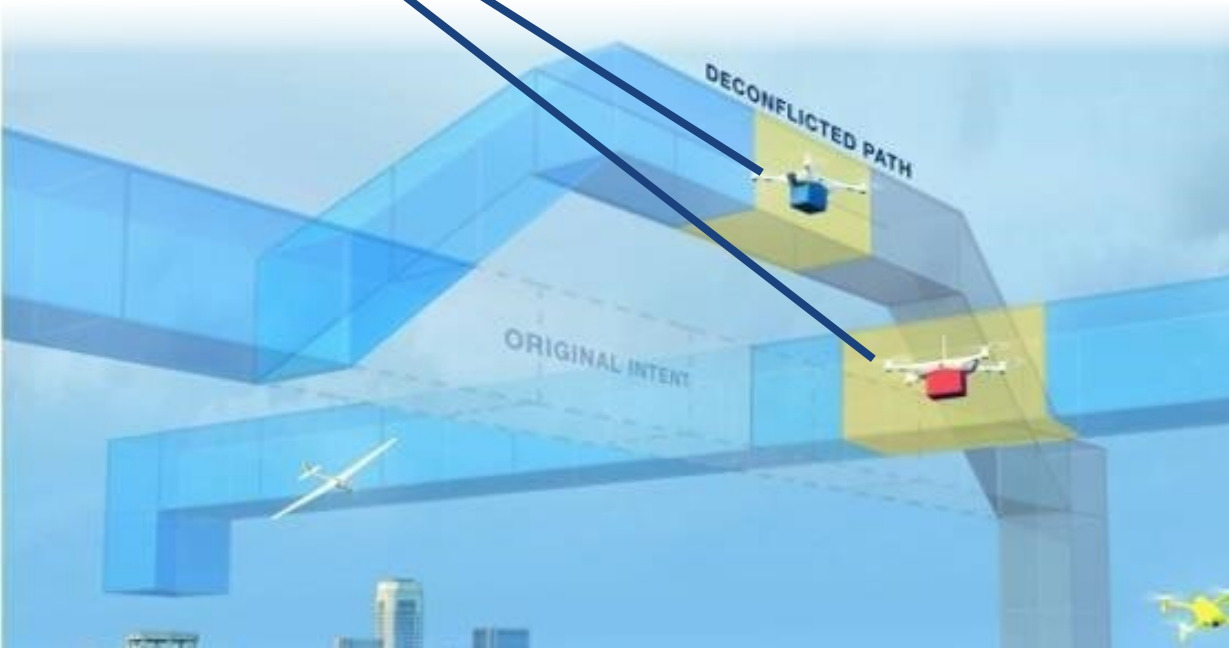
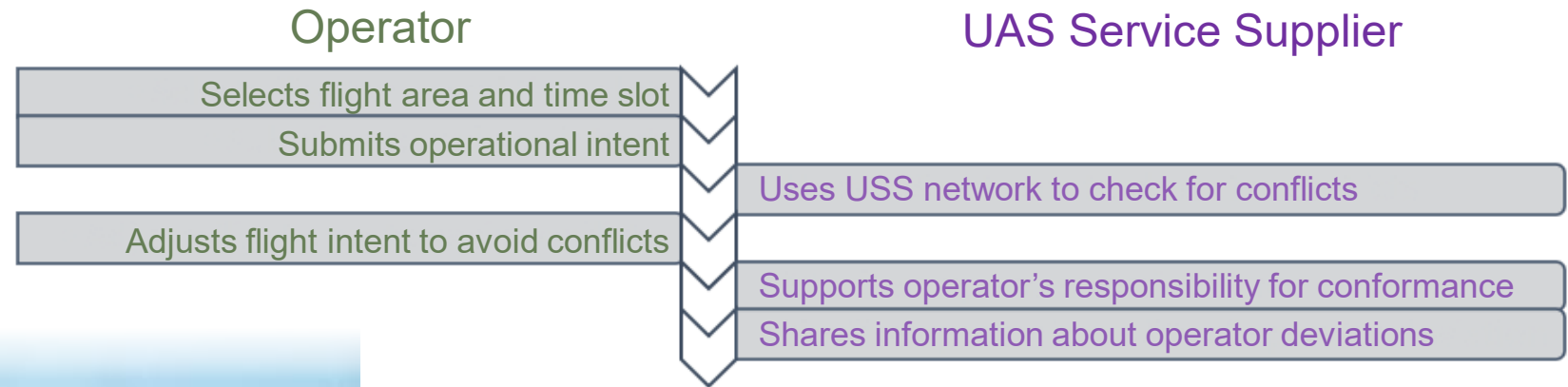


- Prior to issuing any press releases or public statements about this evaluation, please coordinate with the FAA UTM Key Site Operational Evaluation Team
- FAA Office of Communication will be engaged throughout FAA UTM Key Site Operational Evaluation activities



# Validation of UA-to-UA Deconfliction Service

Operators may use different USSs

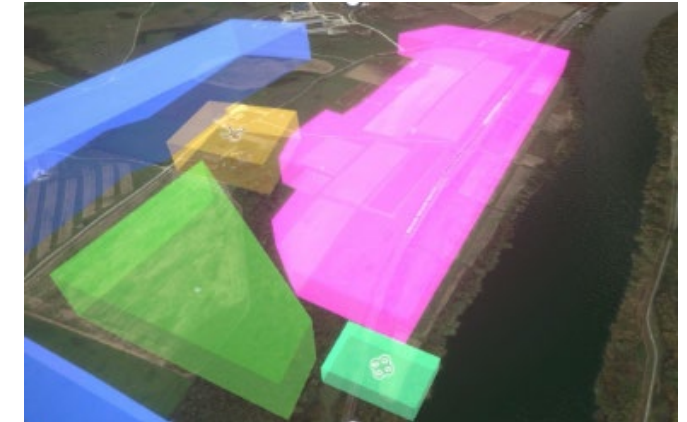


- Multiple operators coexist in one area, each using a different USS to share flight intent.
- Common framework of capabilities is outlined in ASTM USS Interoperability Standard.



# 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



Area-Based Intent

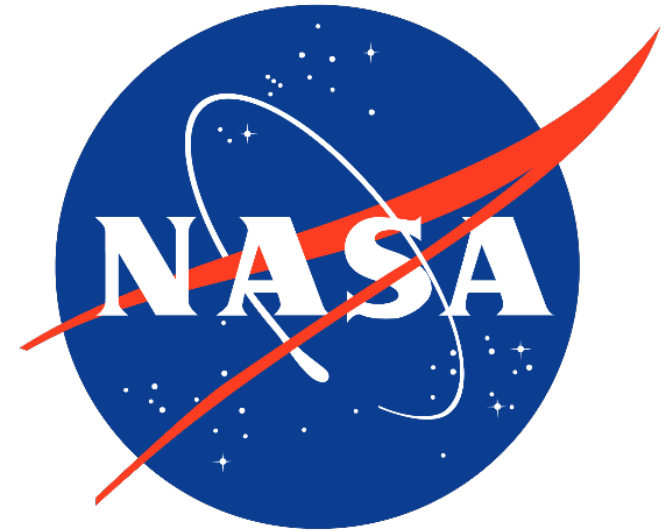


Trajectory-Based Intent

# 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](https://nari.arc.nasa.gov/ussnetworkingrfi)

# Data Collection



## 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

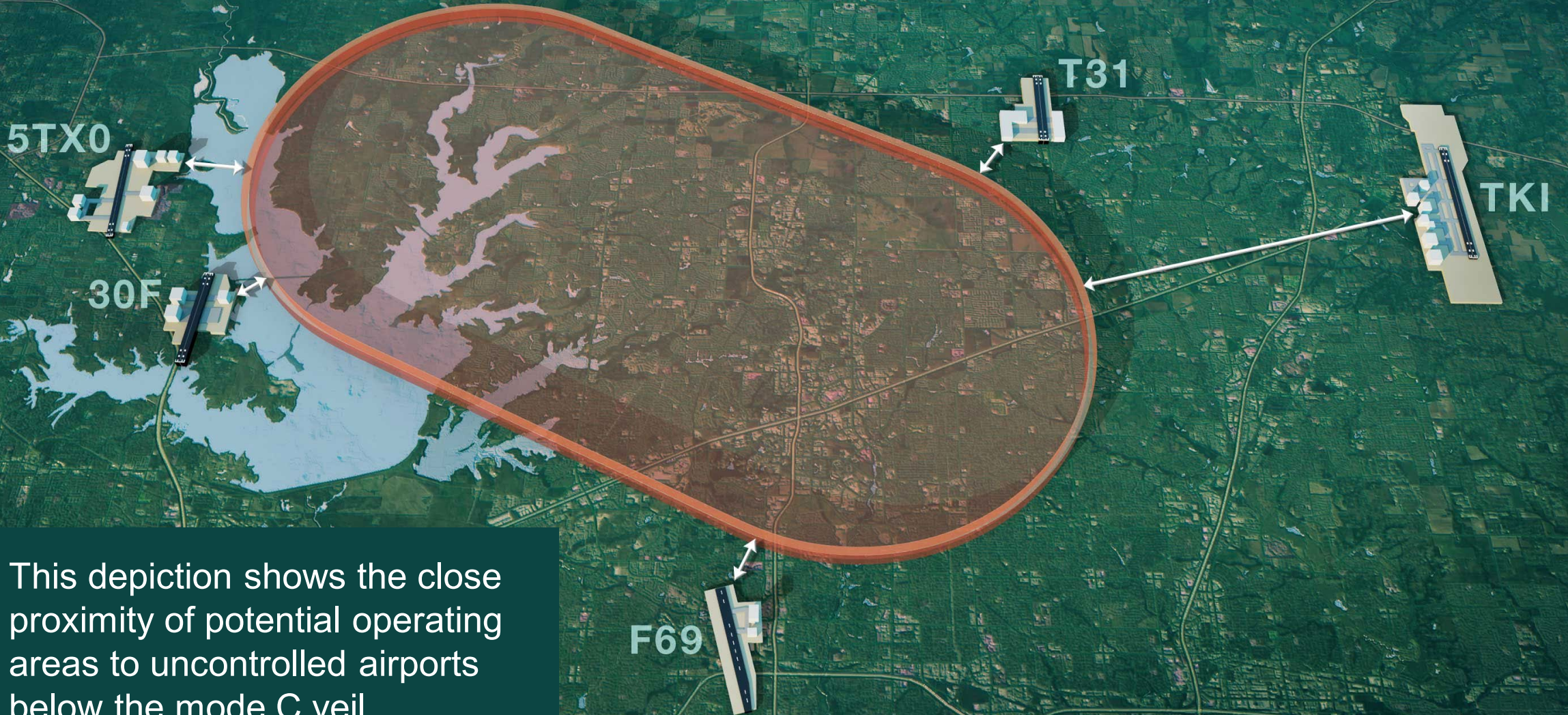
- Industry must take into consideration:

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

- Expectations:

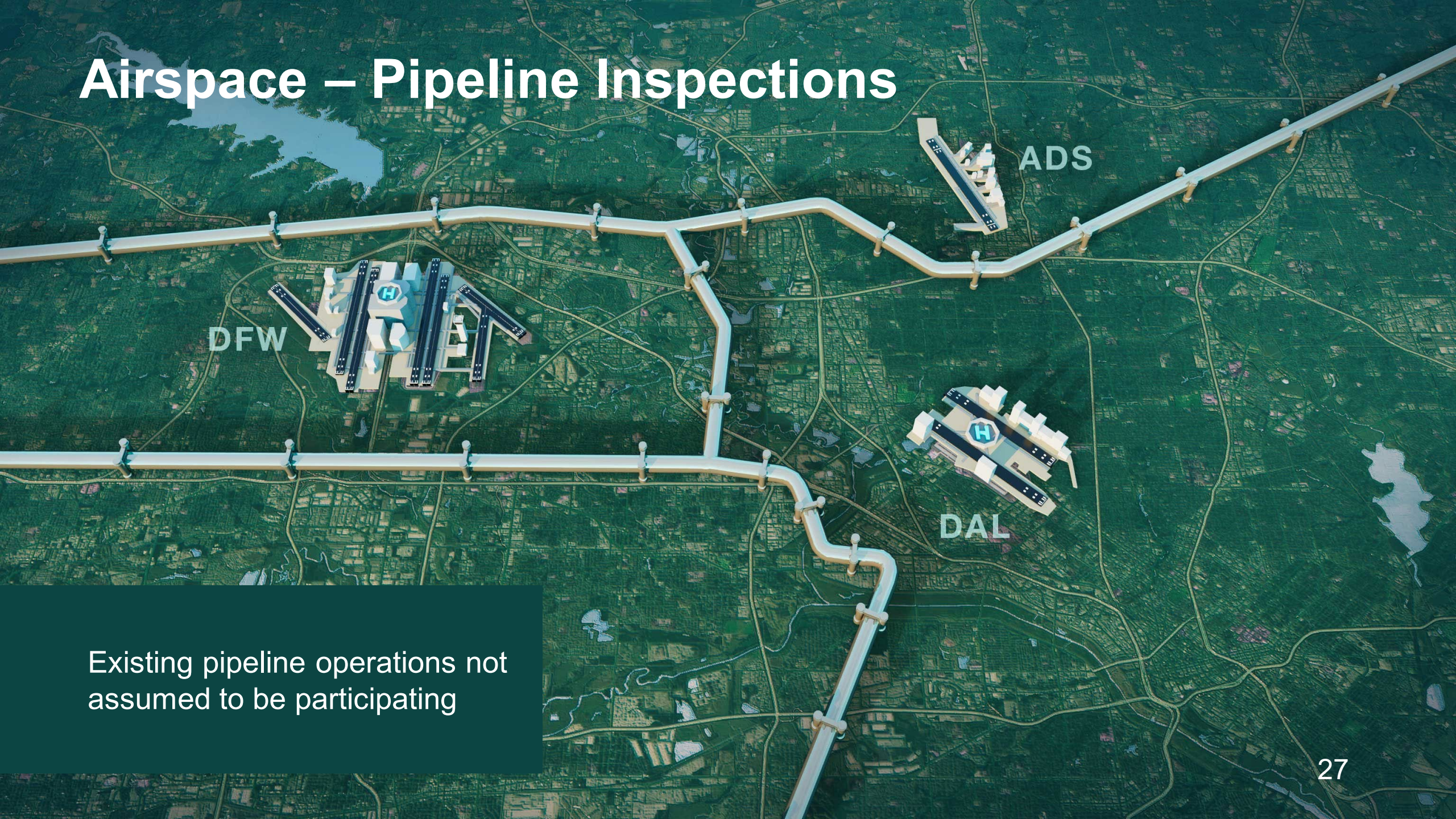
Industry to propose/present operating areas that include consideration of areas of concern listed above with emphasis on safety and ensuring public acceptance of UTM activity. Coordination with public safety officials, as necessary. FAA/Industry to revisit November 2023.

# Possible Operating Areas



This depiction shows the close proximity of potential operating areas to uncontrolled airports below the mode C veil

# Airspace – Pipeline Inspections



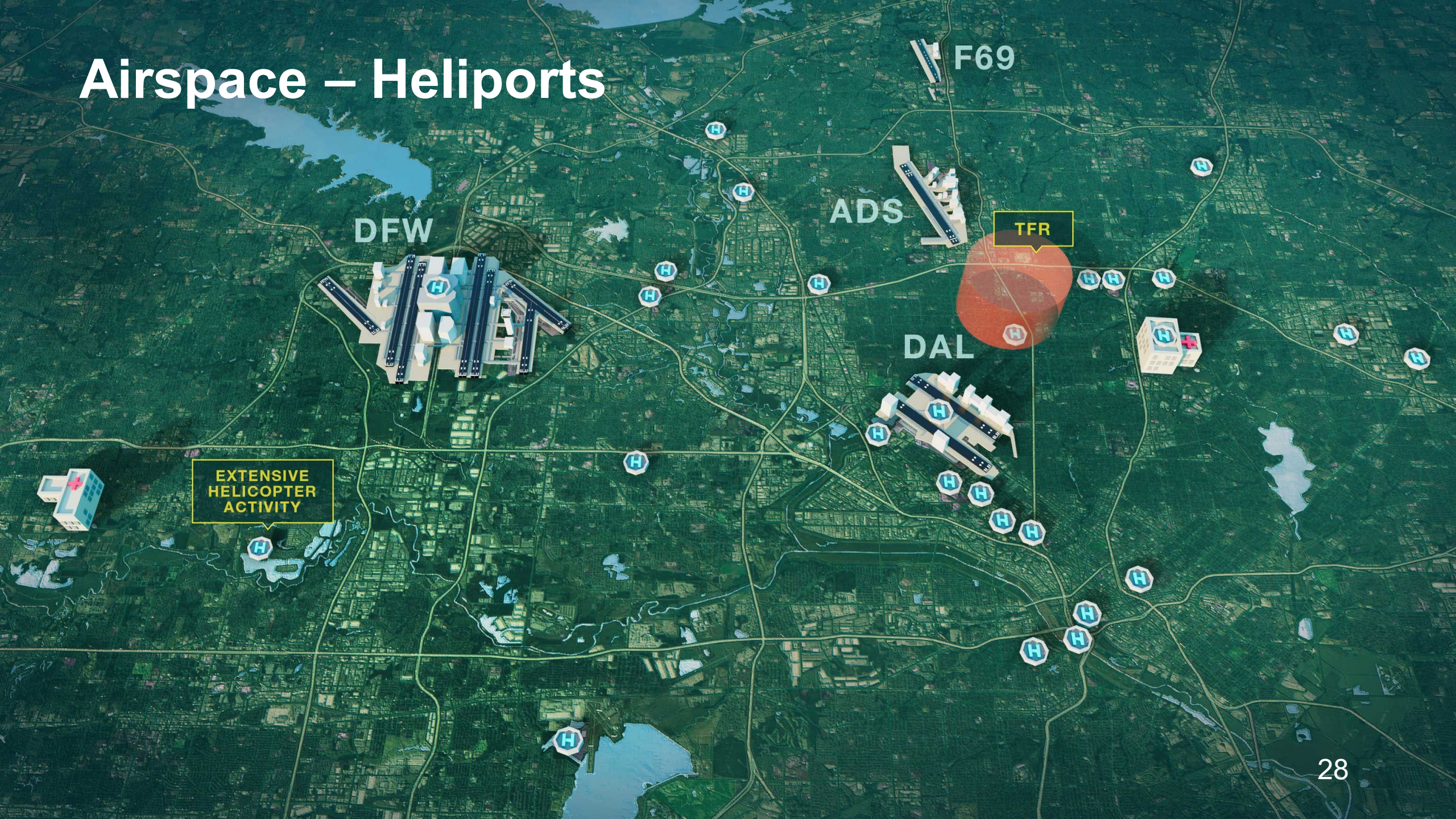
DFW

ADS

DAL

Existing pipeline operations not assumed to be participating

# Airspace – Heliports



# Policy and Exemption Considerations



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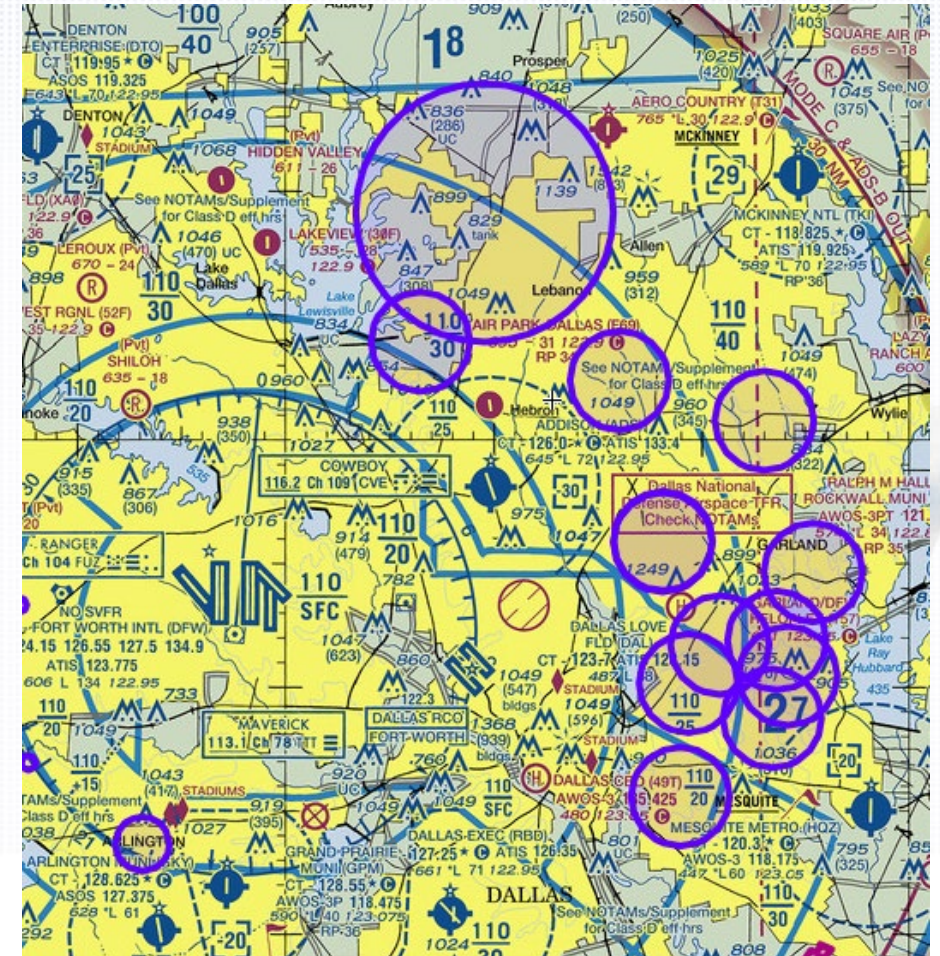


UTM Key Site Operational Evaluation

September 2023

# 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 3<sup>rd</sup> 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

<p>Deterioration of external systems supporting the UAS operation</p>	<p>Malfunction of any component that is not a part of the UAS but supports safe operations.</p>	<ul style="list-style-type: none"> <li>• ADS-B signal degradation</li> <li>• GPS signal degradation</li> <li>• UAS Traffic Management (UTM) failure</li> <li>• Package delivery system failure</li> </ul>	<ul style="list-style-type: none"> <li>• Procedures are in place to handle the deterioration of external systems supporting the UAS operation</li> <li>• UAS is designed to manage the deterioration of external systems supporting the UAS operation</li> <li>• External services supporting the UAS operation are adequate to the operation</li> </ul>	<ul style="list-style-type: none"> <li>• Collision between UAS and a manned aircraft in the air</li> <li>• Collision between two or more UAS</li> <li>• Collision between a UAS and person on the ground or a moving vehicle</li> <li>• Collision between a UAS and critical infrastructure on the ground</li> <li>• Collision between a UAS and terrain (CFIT)</li> <li>• NMAC between UAS and a manned aircraft in the air</li> <li>• Manned aircraft making an evasive maneuver to avoid UA (proximity from UA remains greater than 500 feet)</li> <li>• Collision between UAS component(s) and persons and/or property</li> <li>• Collision between package/cargo and persons and/or property</li> </ul>
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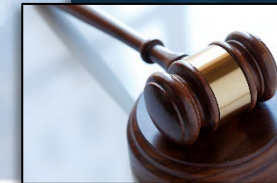
# BVLOS Exemptions Benefits

- ✈ 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	Criteria	Example Demonstration	Means of Demonstration (Including alternative means of compliance or demonstration)	Criteria is Satisfied?
Any Service	Documentation of the respective roles and responsibilities of the operator and the 3PSP.	Service-level agreement (SLA) and Concept of Use (CONUSE)	Click or tap here to enter text.	<input type="checkbox"/>
	The 3PSP has version controls and a defined software update process.	QMS or service provision manual; ISO 9001 certificate	Click or tap here to enter text.	<input type="checkbox"/>
	If the service conforms to a design assurance standard, evidence of relevant processes.	Requirements Traceability Matrix (RTM) is responsive to the appropriate standard and selected level of design assurance	Click or tap here to enter text.	<input type="checkbox"/>
	A hazard analysis of the service has been conducted	Failure Mode and Effects Analysis (FMEA) and/or Functional Hazard Analysis (FHA)	Click or tap here to enter text.	<input type="checkbox"/>
	A deployed instance of the service exists	API or user interface credentials	Click or tap here to enter text.	<input type="checkbox"/>
	The 3PSP provides information to the applicant in an agreed-to message format and at an agreed-to update rate.	<a href="#">SLA</a>	Click or tap here to enter text.	<input type="checkbox"/>
	The 3PSP indicates any specific equipment the applicant is required to use.	<a href="#">SLA</a>	Click or tap here to enter text.	<input type="checkbox"/>
	The 3PSP provides an indication of normal operation.	<a href="#">SLA</a>	Click or tap here to enter text.	<input type="checkbox"/>
	The 3PSP immediately alerts the applicant operator of any malfunction, degradation, or failure condition.	<a href="#">SLA</a>	Click or tap here to enter text.	<input type="checkbox"/>
	The 3PSP keeps all service data, including surveillance information and data related to the operation of the service, for at least 45 days. The 3PSP makes this data available to the FAA within 3 business days of receiving a request from the FAA.	Summary of data retention and retrieval policies	Click or tap here to enter text.	<input type="checkbox"/>
	The service alerts the operator of any malfunction, degradation, or failure condition during the operation.	Averment (declaration) or SLA	Click or tap here to enter text.	<input type="checkbox"/>
	The equipment used for the operations, including both the 3PSP's equipment and the operator's equipment, is fully interoperable to meet the functional and performance requirements of the service.	Description of relevant equipment and summary test results (e.g. regression testing output) used to verify proper interoperability requirements of the service.	Click or tap here to enter text.	<input type="checkbox"/>
USS	The service processes operational intent requests based on FAA guidance on priority levels, if applicable.	Averment and RTM	Click or tap here to enter text.	<input type="checkbox"/>
USS	The requirements in Sections 5.1-5.7 and 5.9 of ASTM F3548-21, Standard Specification for UAS Traffic Management (UTM) UAS Service Supplier (USS) Interoperability, dated March 8, 2022, are satisfied.	Averment, RTM and <a href="#">InterUSS</a> test suite result	Click or tap here to enter text.	<input type="checkbox"/>

# NTAP is Complementary to OE



✈️ NTAP is FAA's process to evaluate 3PSP, supporting UTM OE and other efforts.

<b>Near Term Approval Process (NTAP)</b>	<b>Key Site OE</b>
<b>Approval process</b>	<b>Operational outcome/US approval process</b>
<b>Validate FAA business rules</b>	<b>Validate standards</b>
<b>Oversight policies</b>	<b>Operational policies</b>
<b>One SP and operator at a time</b>	<b>Multiple services and operators</b>
<b>Low-risk areas &amp; operations</b>	<b>Increasing complexity and tempo</b>

# Critical Policy Areas

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

# 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



# Conclusion

- ✈️ 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?