

STEReO

combining NASA technologies and partnerships to transform
current-day emergency response operations

joey mercer

ASSC, 2020.02.20



STEReO

Scalable Traffic Management for Emergency Response Operations





- short history lesson
- UTM overview
- STEReO concept



NASA's research mission directorates:

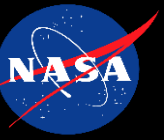
- aeronautics (ARMD)
- human explorations and operations (HEOMD)
- science (SMD)
- space technology (STMD)

ARMD

- air traffic management technologies
- vehicle design
- integrated aviation systems

airspace operations laboratory (AOL @ NASA Ames)

UTM overview



An aerial view of a city and rural landscape. In the foreground, a person stands on a green field, looking up at a drone flying in the sky. The drone is a quadcopter with a camera. In the background, a city skyline is visible, with several buildings and a large plume of smoke rising from the city. The sky is blue with some clouds. The overall scene is a mix of urban and rural environments, illustrating the integration of drone technology into various settings.

Introduction to UTM Services & communication

Lauren Claudatos, NASA

Overview

- UAS Traffic management (UTM)
 - Day in the life of a future UTM operator
 - Definition and key concepts
- UTM Research Effort
 - Technical Capability Levels
- Questions



Day in the life of a future UTM
operator

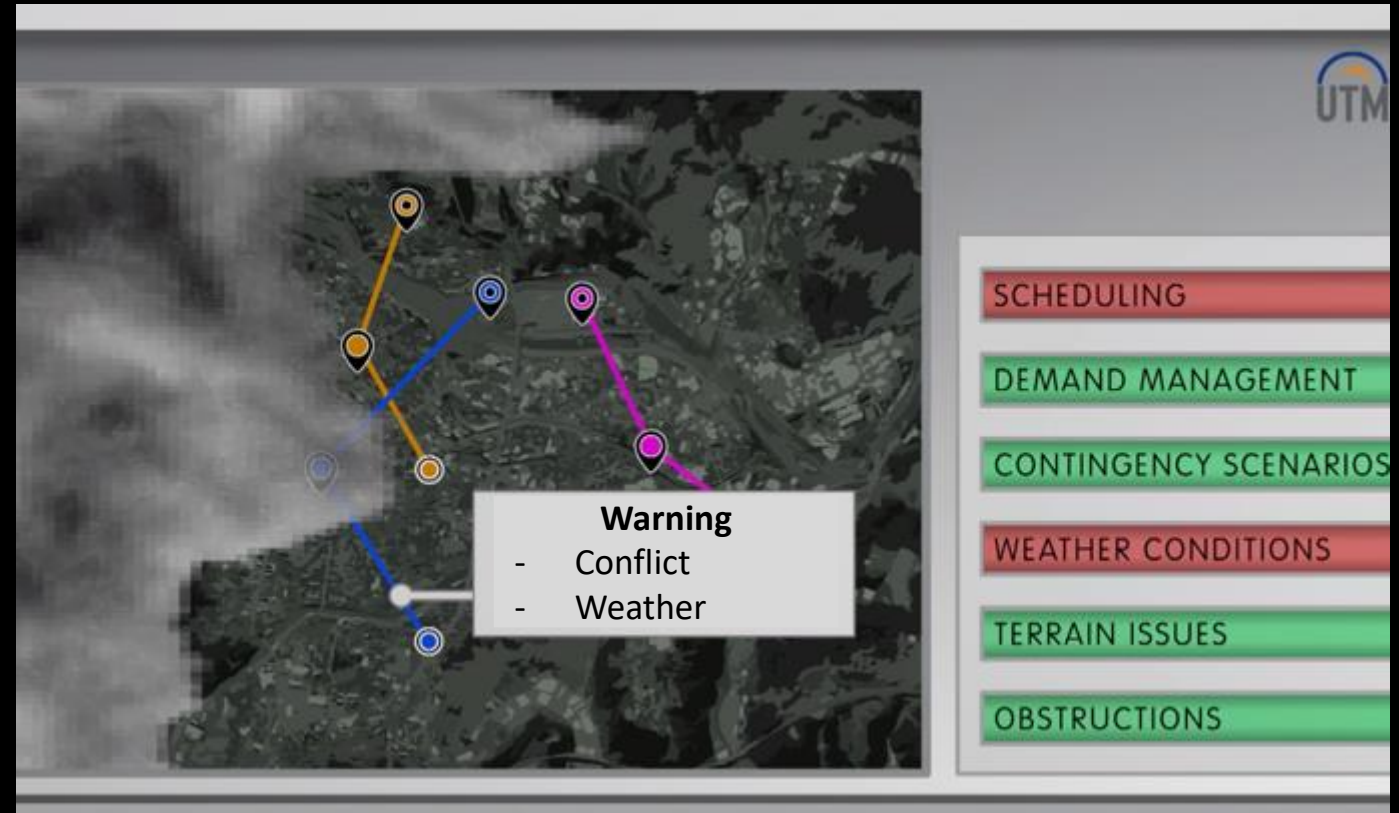
Day in the life of a future UTM operator

- Grid flight path
 - Line of sight
 - Popular brand UAS
 - Mission planning platform of my choice



Day in the life of a future UTM operator

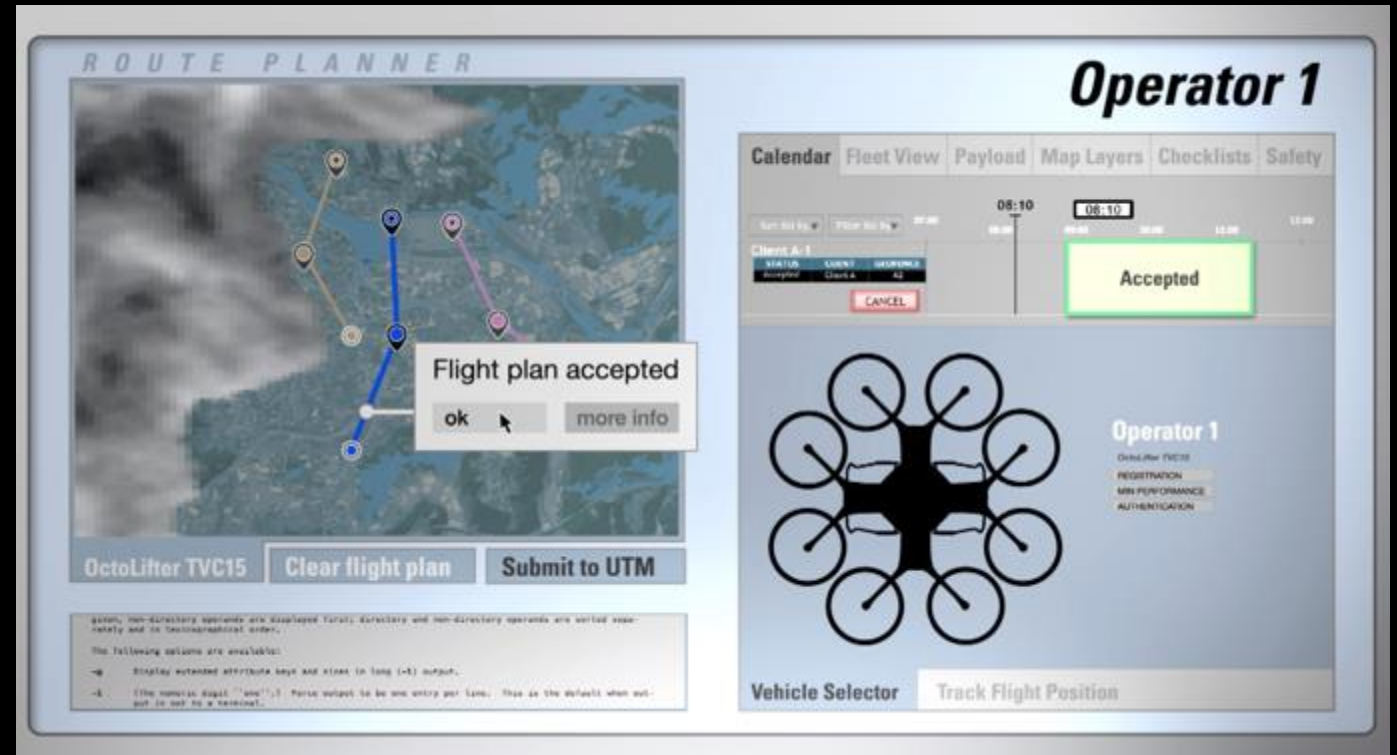
- Plan my operation
 - Warning:
 - Conflict with another operation
 - Expected weather exceeds vehicle capabilities
 - Deconflict by rescheduling



Day in the life of a future UTM operator

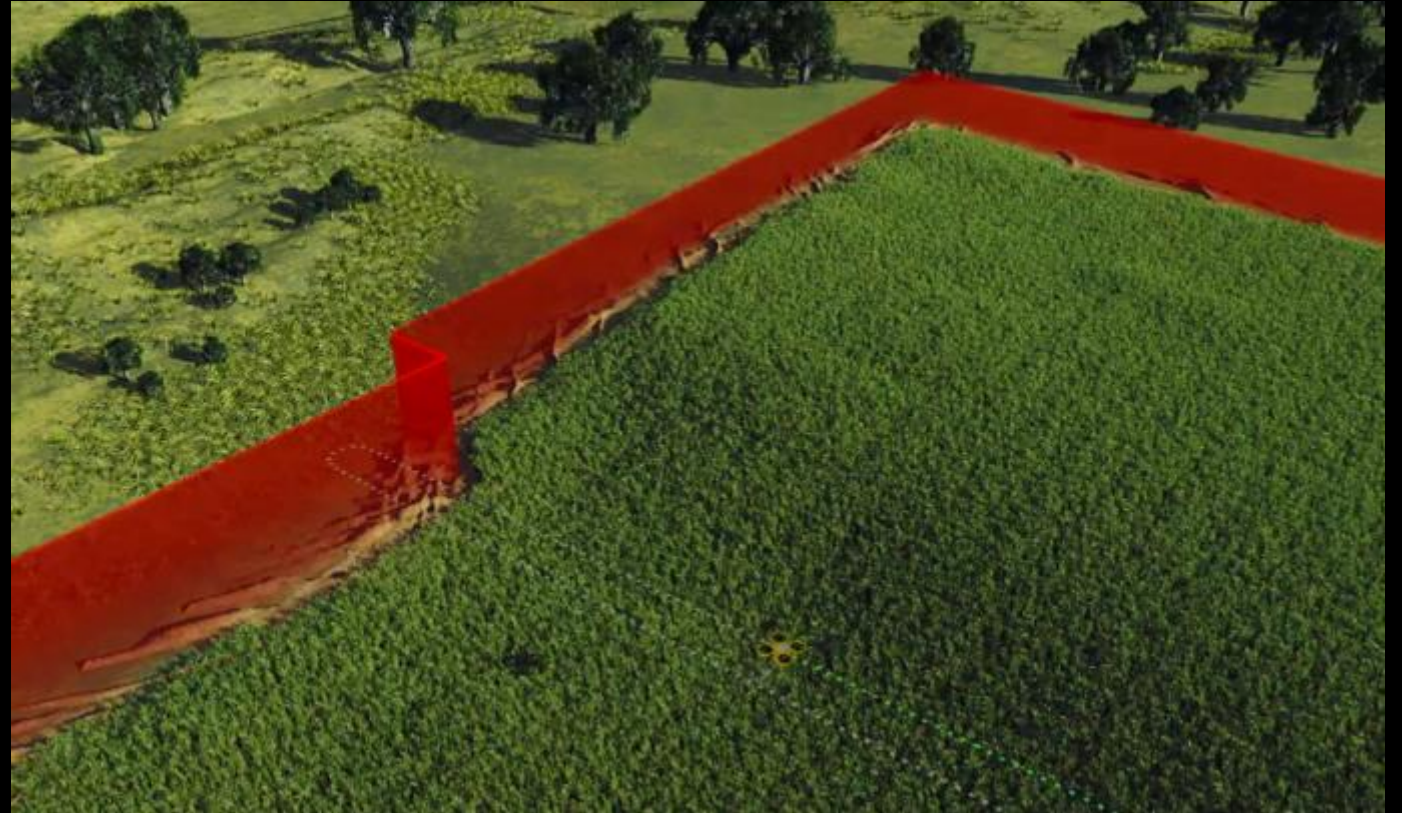
Pre-flight

- Frequented by manned aircraft
 - NOTAM
 - Contact information of nearby tower
 - Channels to monitor
- Offers to publish my contact information
- Bad coverage
 - moves satellite to provide coverage (SDSP-triggered)



Day in the life of a future UTM operator

- Fly the mission
 - Monitor conformance
 - Airspace changes
- Display of surveillance and ADS-B
 - All clear!



Day in the life of a future UTM operator

- High-priority delivery to nearby hospital
 - Notified of incoming operation
- Initiate contingency plan
 - Hoover in place as it passes through field
- All-clear – resume mission

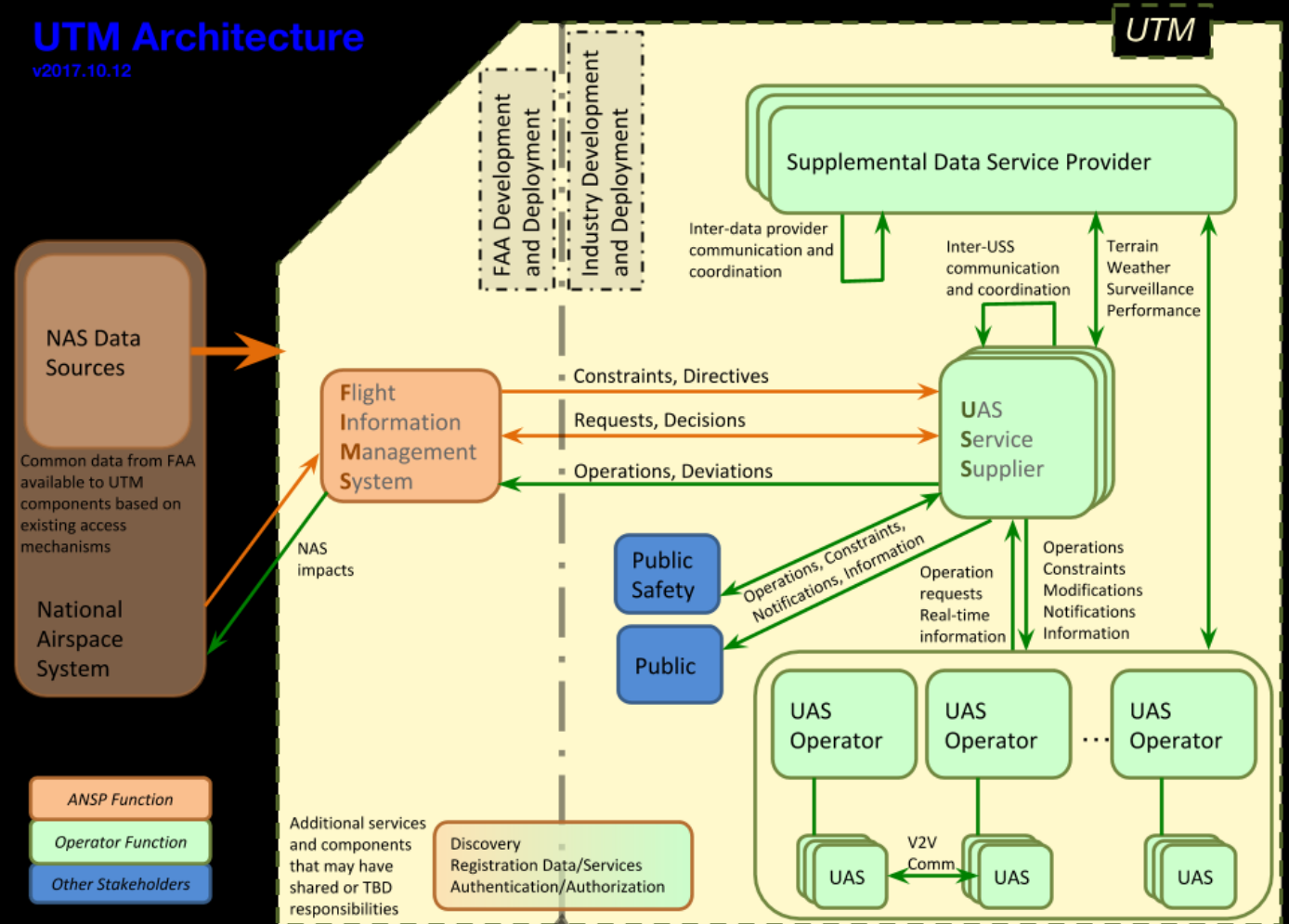


Definition and key concepts

UTM Network

- UAS Service Supplier (USS)
- USS Network
- UAS Supplemental Data Service Suppliers (SDSP)
- Flight Information Management System (FIMS)

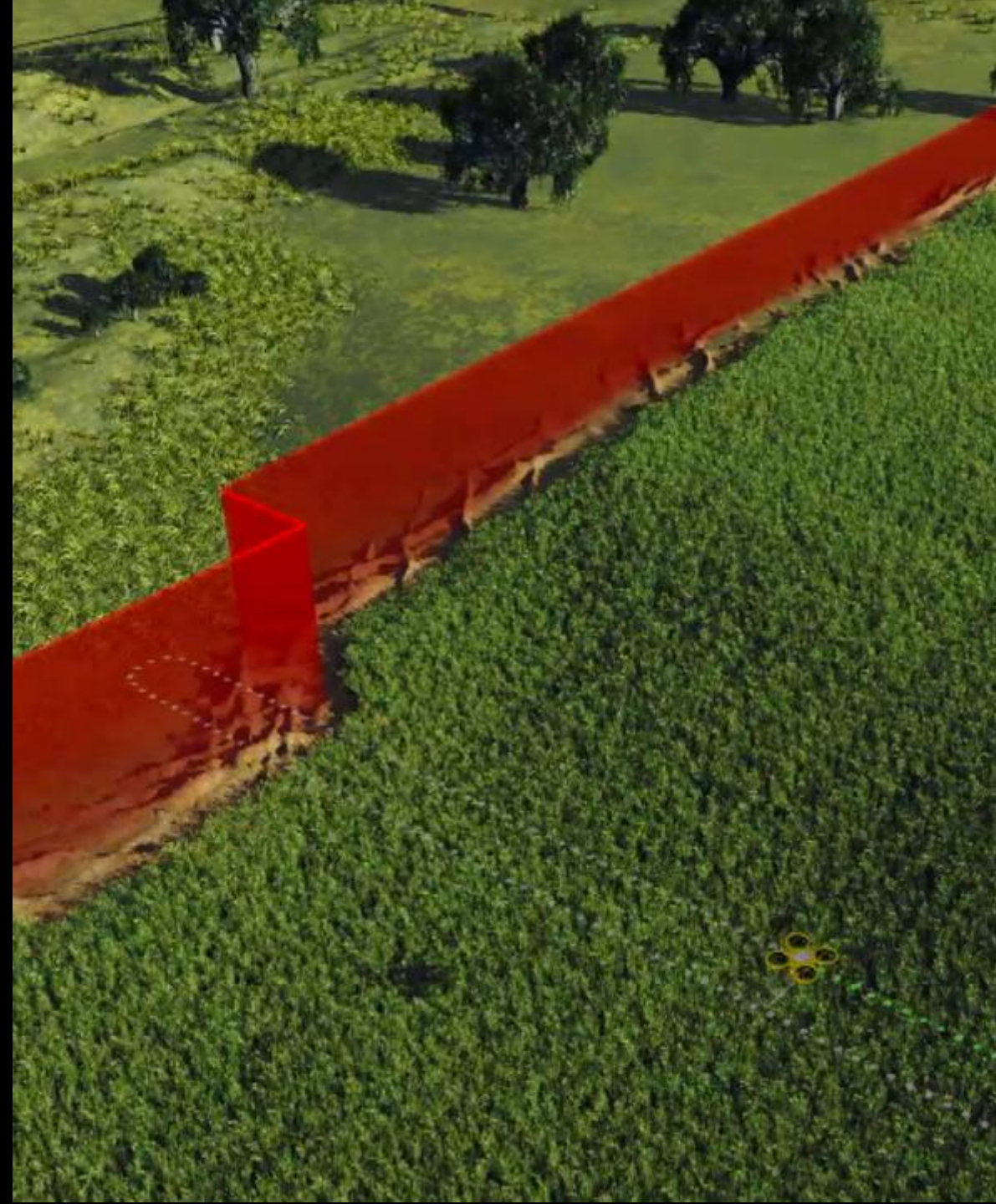
UTM Architecture v2017.10.12



UAS Service Supplier (USS)

“... support Operators’ abilities to meet the regulatory and operational requirements for UAS operations”

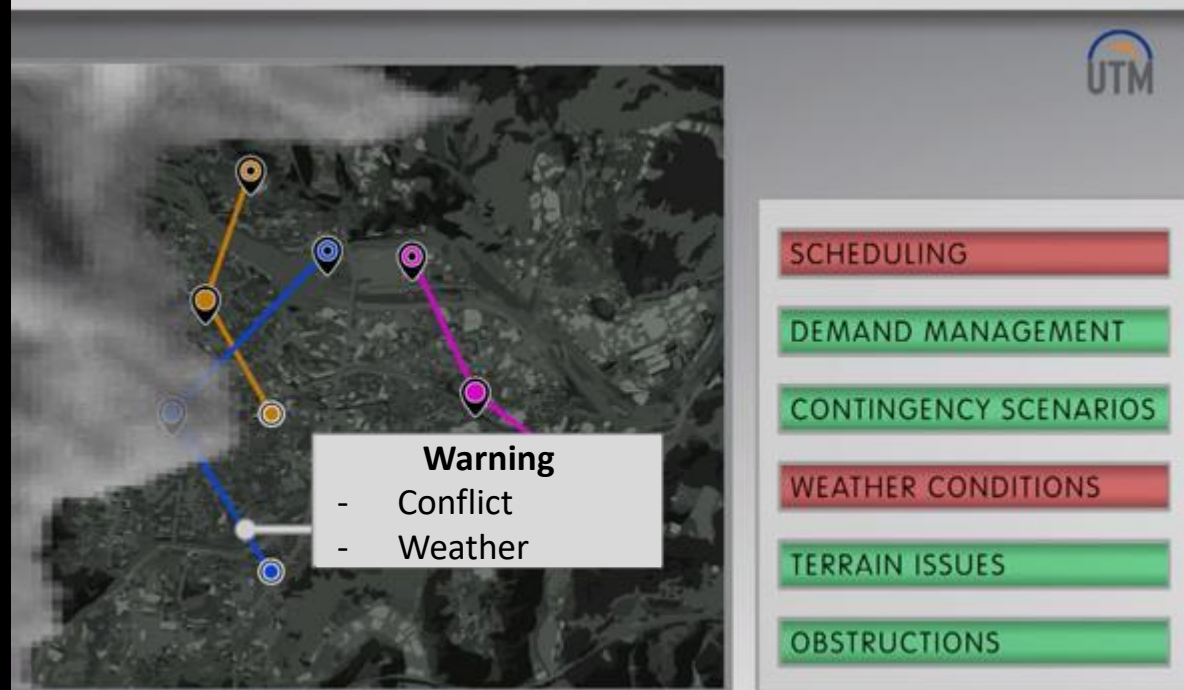
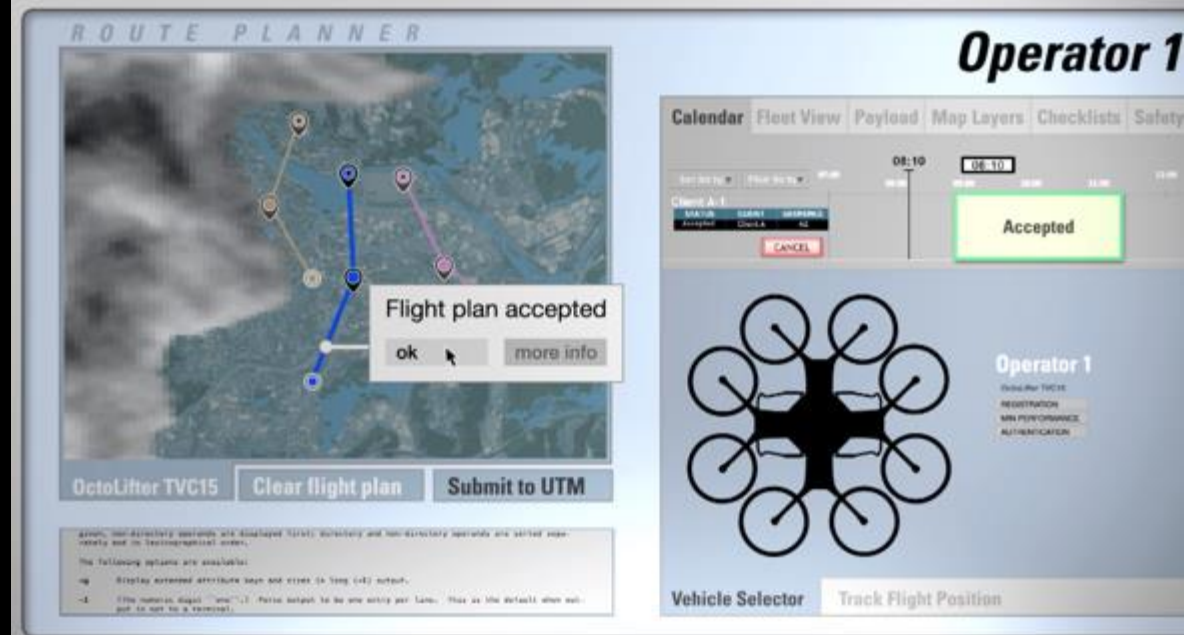
- Connects the operator with the UTM system
- Connects operator with other supplemental data services
- Tracks rules and conformance, among other things



USS Network

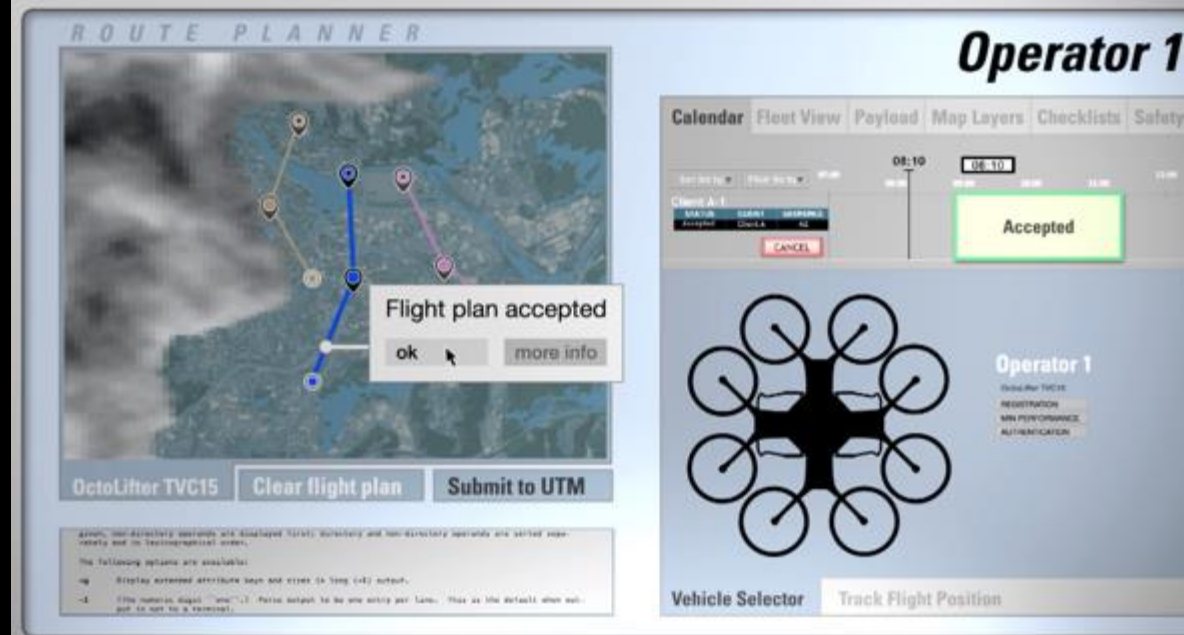
“...allow for a network of USSs to provide cooperative management of low altitude operations without direct FAA involvement.”

- Standardized platform for sharing operation information & data
 - Operator intention, contingency plans, crew
 - Airspace constraints, manned operations, terrain, weather, & other supplemental data
 - Enables coordination between operators & other stakeholders across multiple platforms
- Goal: safe and efficient use of airspace
 - Safe separation, performance requirements, highly-automated authorization
 - Shared awareness

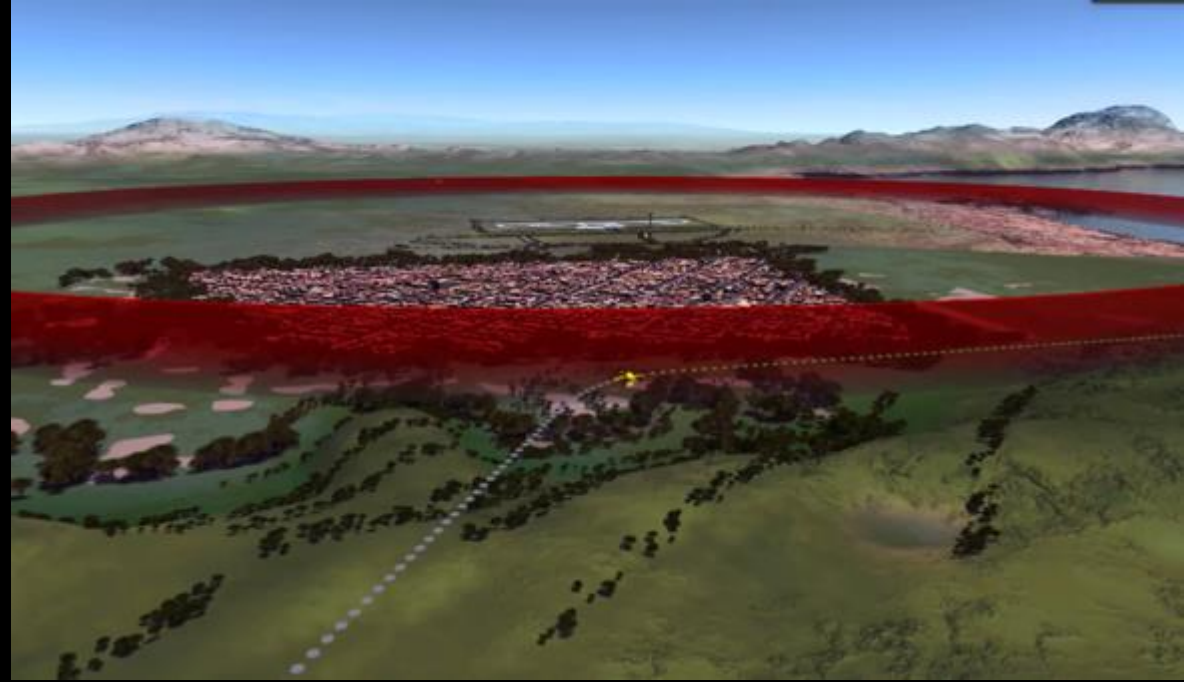


Supplemental Data Service Providers SDSP

- At the USS level or directly to operator
- Examples:
 - Surveillance feeds
 - Manned operations
 - Terrain
 - Weather
 - Flight planning
- Can be shared in a USS network



Flight Information Management System FIMS



Gateway between the FAA and UTM world

- How airspace/NAS information can be input to the UTM world
- How the FAA can access UTM information

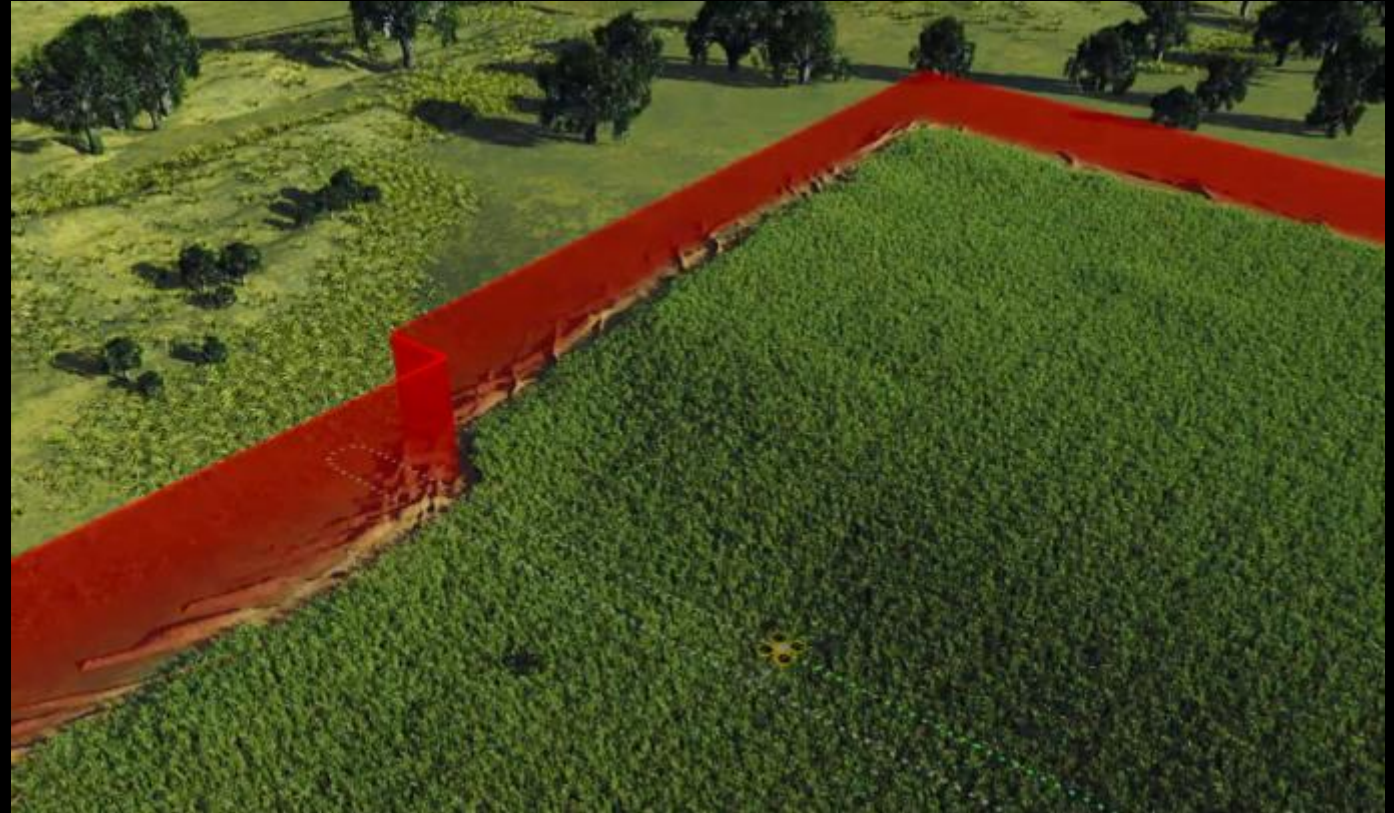
“The FAA interacts with UTM for information/data exchange purposes as required, and has access to data at any time (via FIMS) to fulfill its obligations to provide regulatory and operational oversight. “

Under the hood

How UTM supports a day in the life

Day in the life of a future UTM operator

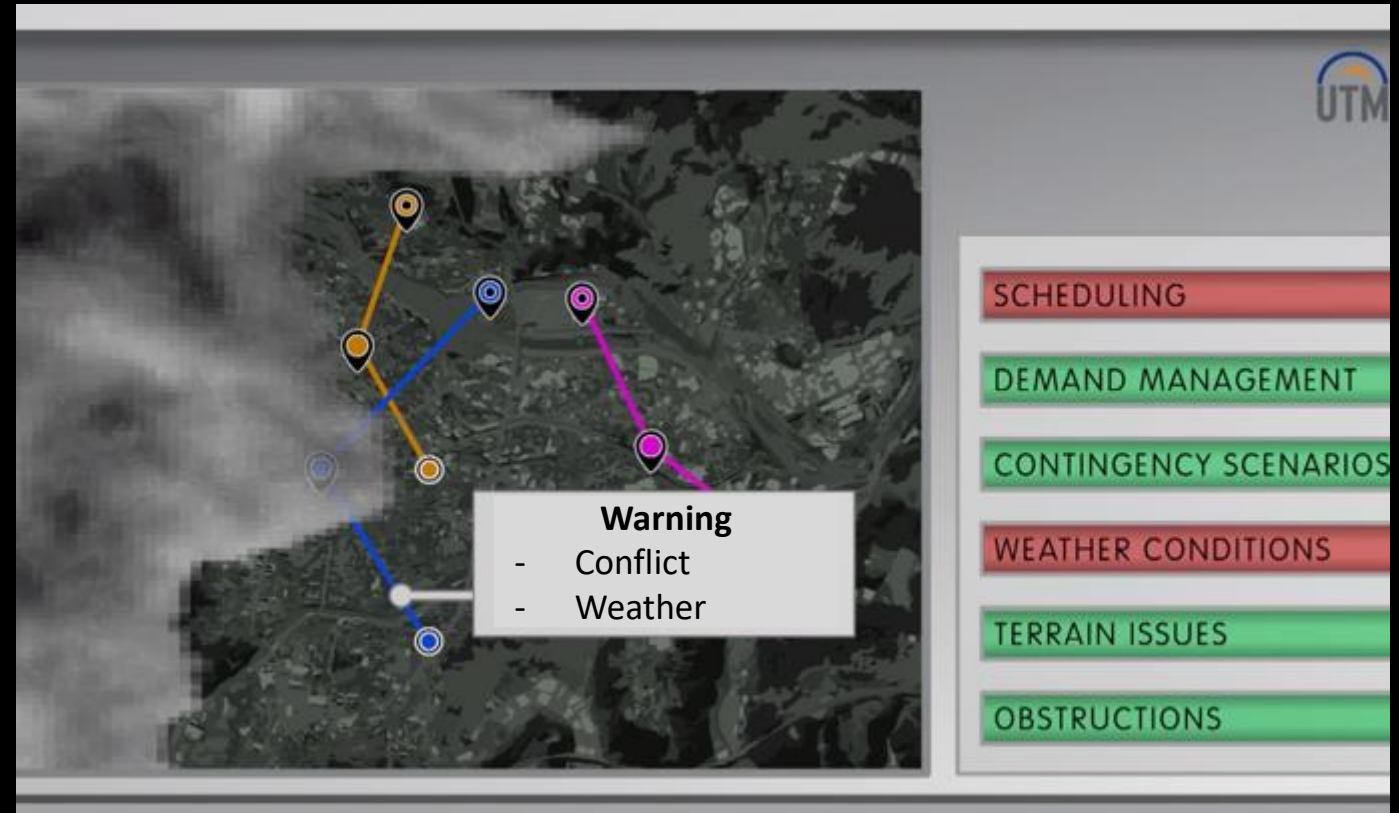
- Grid flight path
 - Line of sight
 - Popular brand UAS
 - Mission planning platform of my choice



- Enables coordination between operators & other stakeholders across multiple platforms
- Standardized communication of operator intention
 - Before & during operation

Day in the life of a future UTM operator

- Plan my operation
 - Warning:
 - Conflict with another operation
 - Expected weather exceeds vehicle capabilities
 - Deconflict by rescheduling



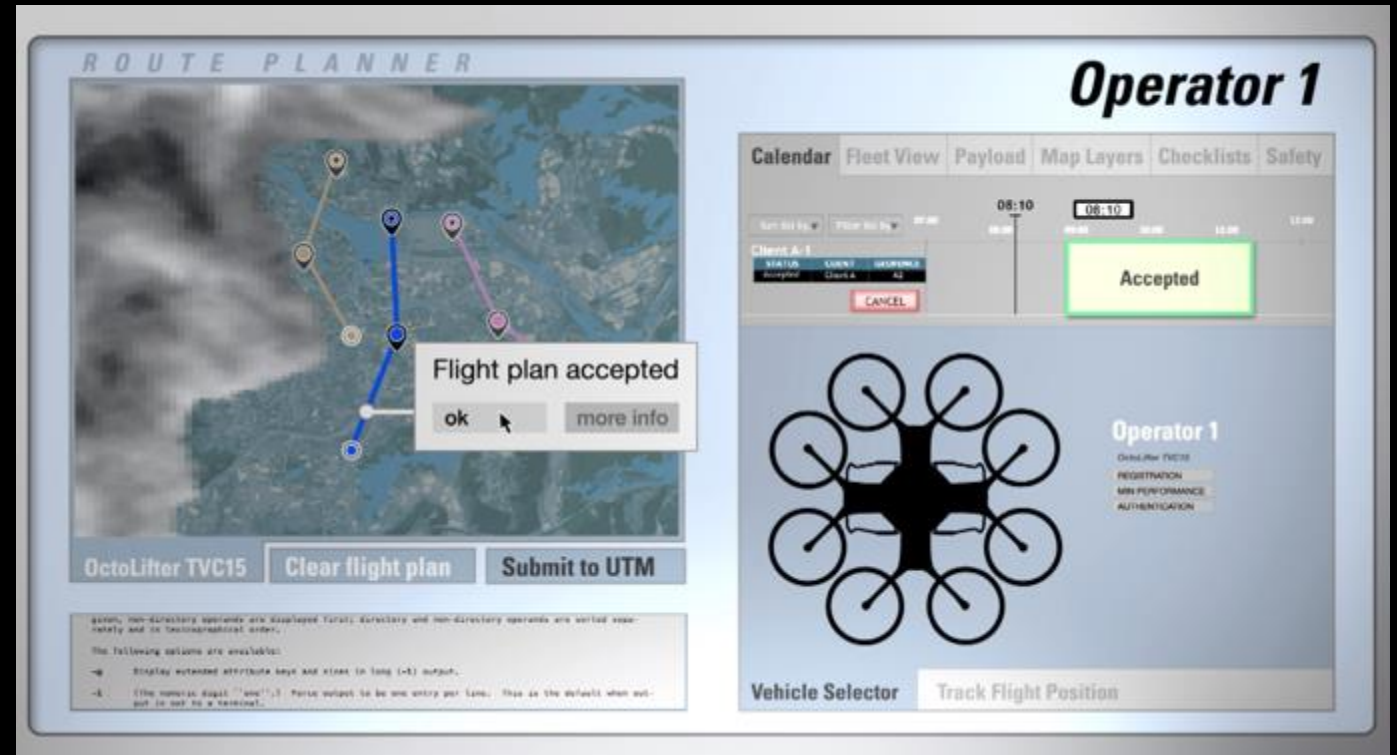
Participation in the UTM system enables

- Deconfliction of airspace
- Checks airspace constraints
- Connects operator with other supplemental data services
 - Vehicle capabilities compared to weather
 - Service recommends a good time to fly

Day in the life of a future UTM operator

Pre-flight

- Frequented by manned aircraft
 - NOTAM
 - Contact information of nearby tower
 - Channels to monitor
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Supplemental Data Services

- Assists in tasks involved with flying in chosen airspace

Day in the life of a future UTM operator

- Fly the mission
 - Monitor conformance
 - Airspace updates
- Display of surveillance and ADS-B
 - All clear!



UTM System

- Enables operator to connect with proper authorities or other stakeholders

Day in the life of a future UTM operator

- High-priority delivery to nearby hospital
 - Notified of incoming operation
- Initiate contingency plan
 - Hoover in place as it passes through field
- All-clear – resume mission



Participation in the UTM system enables

- Communication of priority
- Communication of contingency plan

An aerial view of a city and rural landscape. The city is on the left, with several circular icons containing drone symbols overlaid on the buildings. A road winds through the landscape. In the foreground, a person stands on a field, and a drone is flying in the sky. A large house and a tractor are also visible in the rural area. The text "UTM Mantra" is overlaid on the left side of the image.

UTM Mantra

“Flexibility where possible and structure where necessary”

“Risk based approach where geographical needs and use cases will dictate the performance requirements for airspace operations”



emergency response operations aren't easy:

- conducted under adverse conditions
- involve numerous organizations
- limited communication and infrastructure
- manual coordination to deconflict/use airspace
- challenges with timeliness of information

the result? safe procedures with minimal technological advances



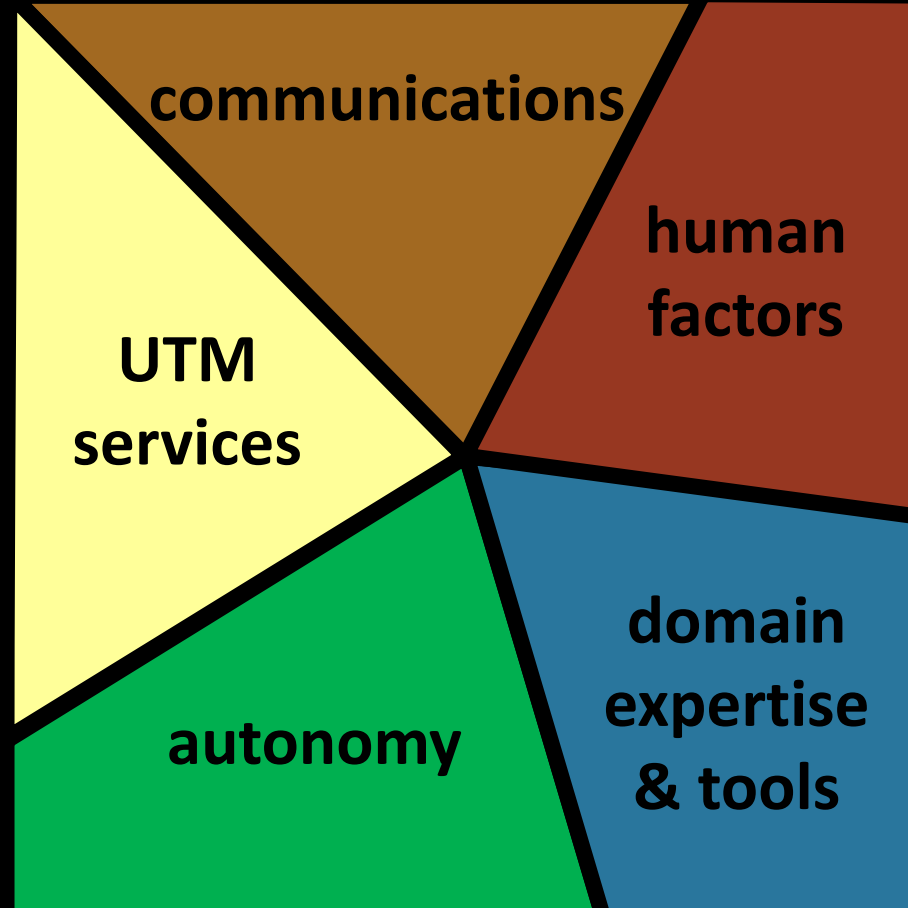
use innovative communication approaches to enable new traffic management and autonomous vehicle capabilities, providing a data-rich common operating picture

the result? responders can do more, know more, safely

STEReO as a product



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- how can state-of-the-art vehicle autonomy help UAS vehicles become a valuable part of emergency response operations?
 - what is the state-of-the-art?
 - what hurdles do we need to consider?
 - what are the ripe opportunities?



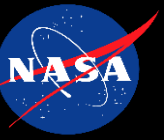
- how can UTM services be leveraged to support scalability of operations, and to provide improved awareness via an enhanced common operating picture?
 - what capabilities do UTM services provide?
 - how do they relate to today's procedures for airspace coordination?
 - what new capabilities can be added to UTM services that address the unique needs of emergency responders?



- how can advanced communication/connectivity technologies enable new data exchanges and information sharing?
 - what data do we want to send?
 - what infrastructure/techniques can we employ to send that data?
 - how can we support resilient operations/communications in challenging environments?



- how can data be delivered to best support operator awareness and decision-making?
 - what types of collaborations occur today?
 - what interfaces are the most appropriate for data-supported tasks?
 - what information must be included to support effective teamwork between operators, between systems, and between operators and systems?



- how can new processes, products, and options be integrated into existing workflows that are critical to established operations?
 - what things are used today?
 - where are there flexibilities and constraints?
 - what are the needs for interoperability/sharing?



flight test/demonstration

- spring/summer of 2021
- manned-unmanned interactions
- new data exchanges for partially automated air traffic management
- challenge comms dependencies
- enhance shared situation awareness
- integration with stakeholder systems/workflows

questions



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