Introduction to UTM Services & communication

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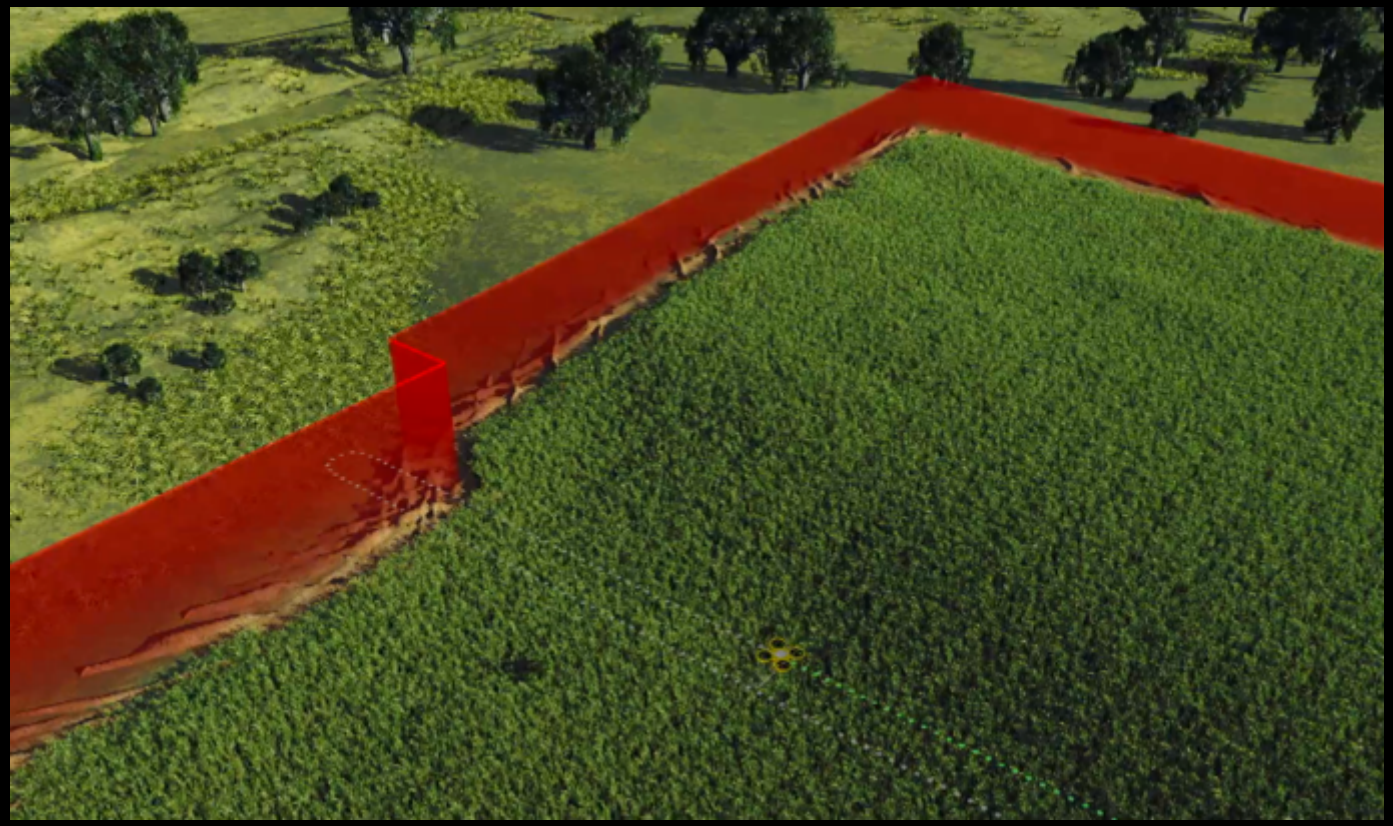
Overview

- 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

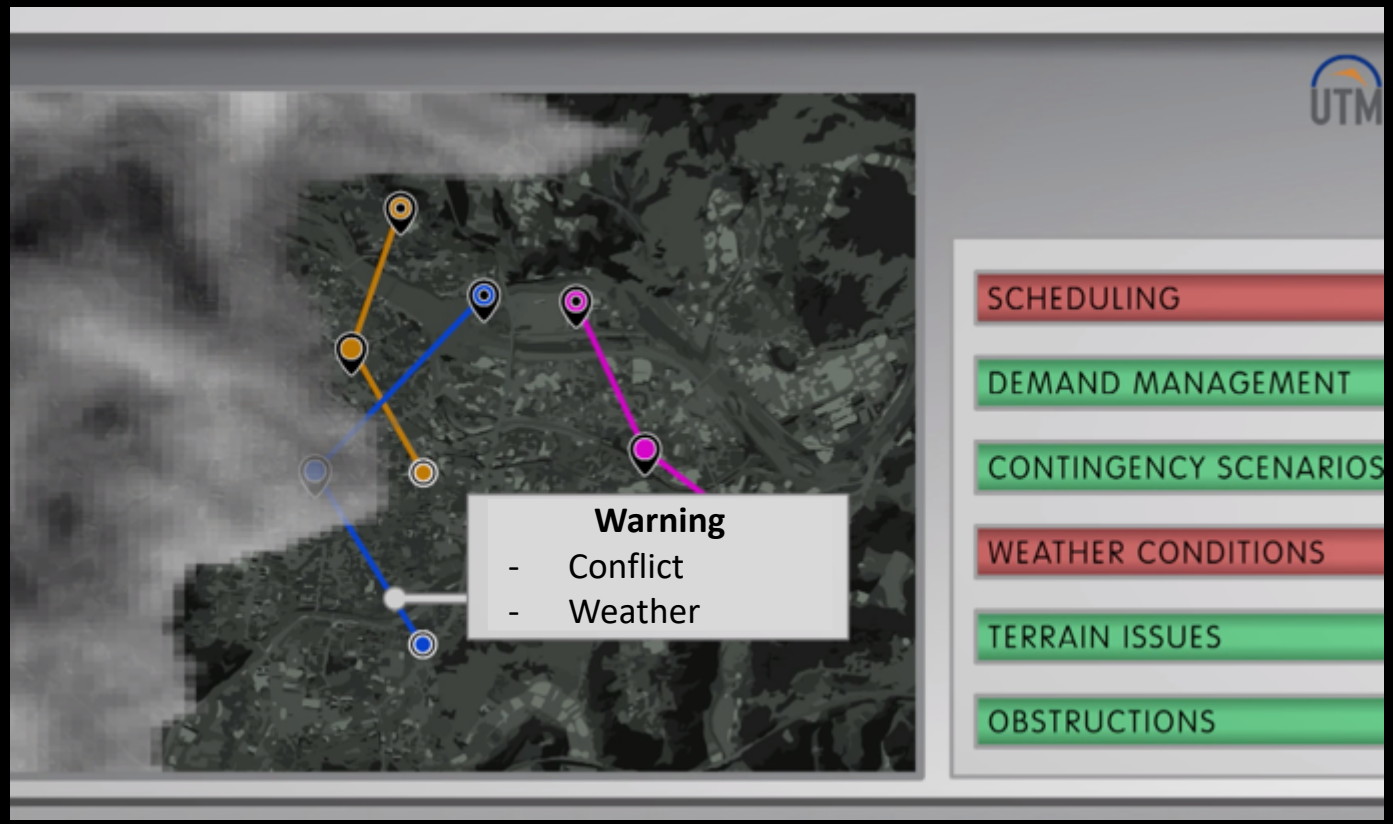
Day in the life of a future UTM operator

- Mapping of field
  - Line of sight
  - Popular brand UAS
  - Mission planning platform of my choice



Day in the life of a future UTM operator

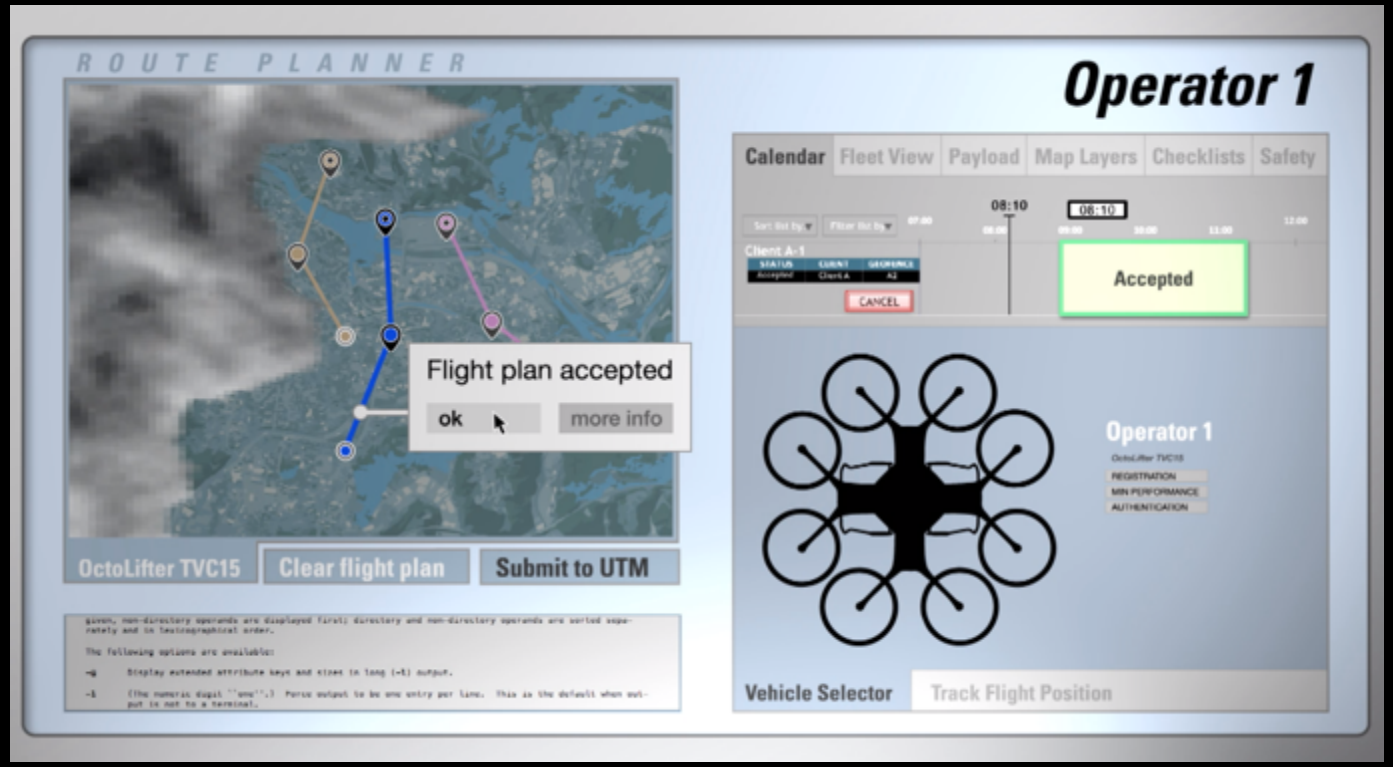
- Plan my operation
  - Warning:
    - Conflict with another operation
    - Expected weather exceeds vehicle capabilities
  - Deconflict by rescheduling



Day in the life of a future UTM operator

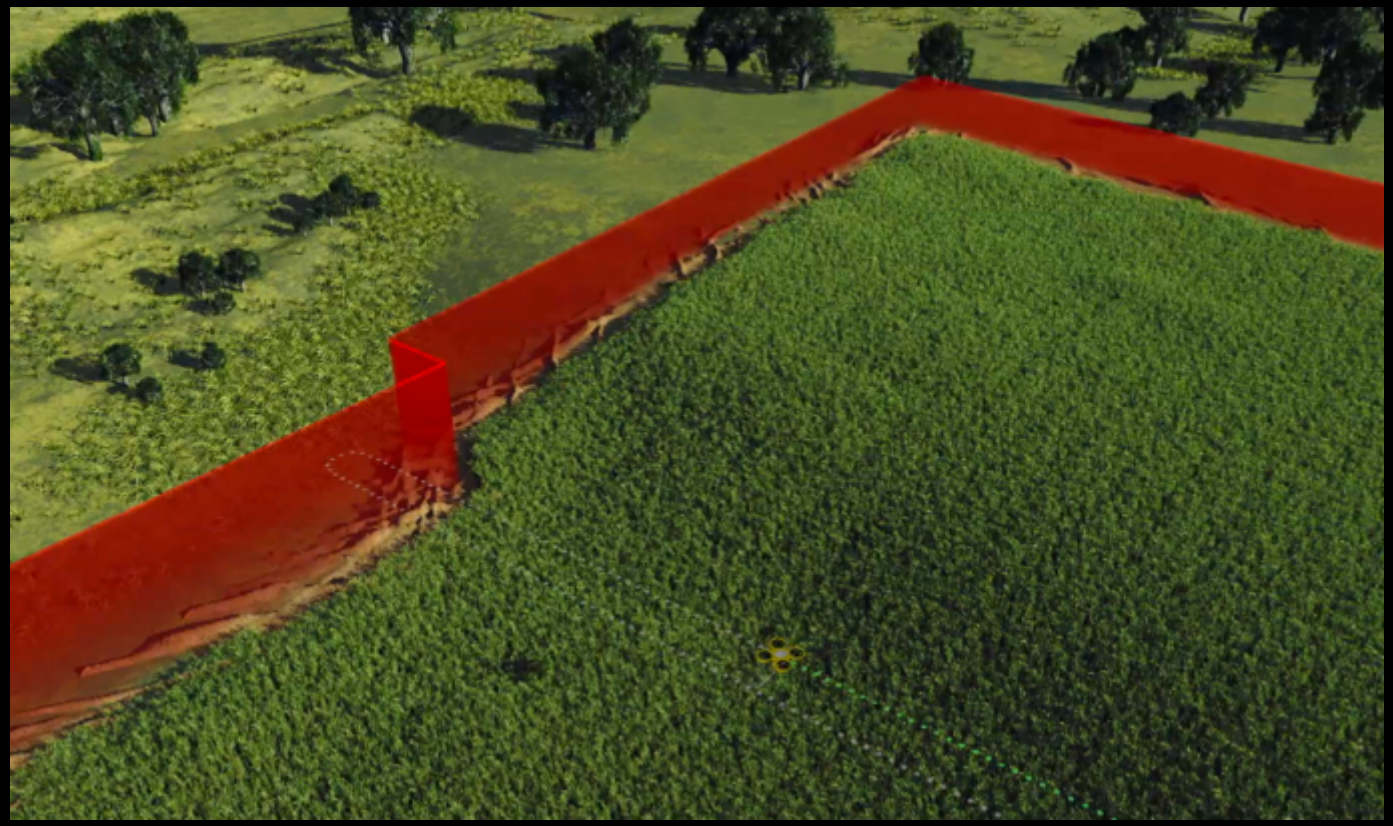
Pre-flight

- Frequented by manned aircraft
  - NOTAM
  - Contact information of nearby tower
  - Channels to monitor
- Offers to publish my contact information



Day in the life of a future UTM operator

- Fly the mission
  - Monitor conformance
- Annotate incoming data
- Display of surveillance and ADS-B
  - All clear!



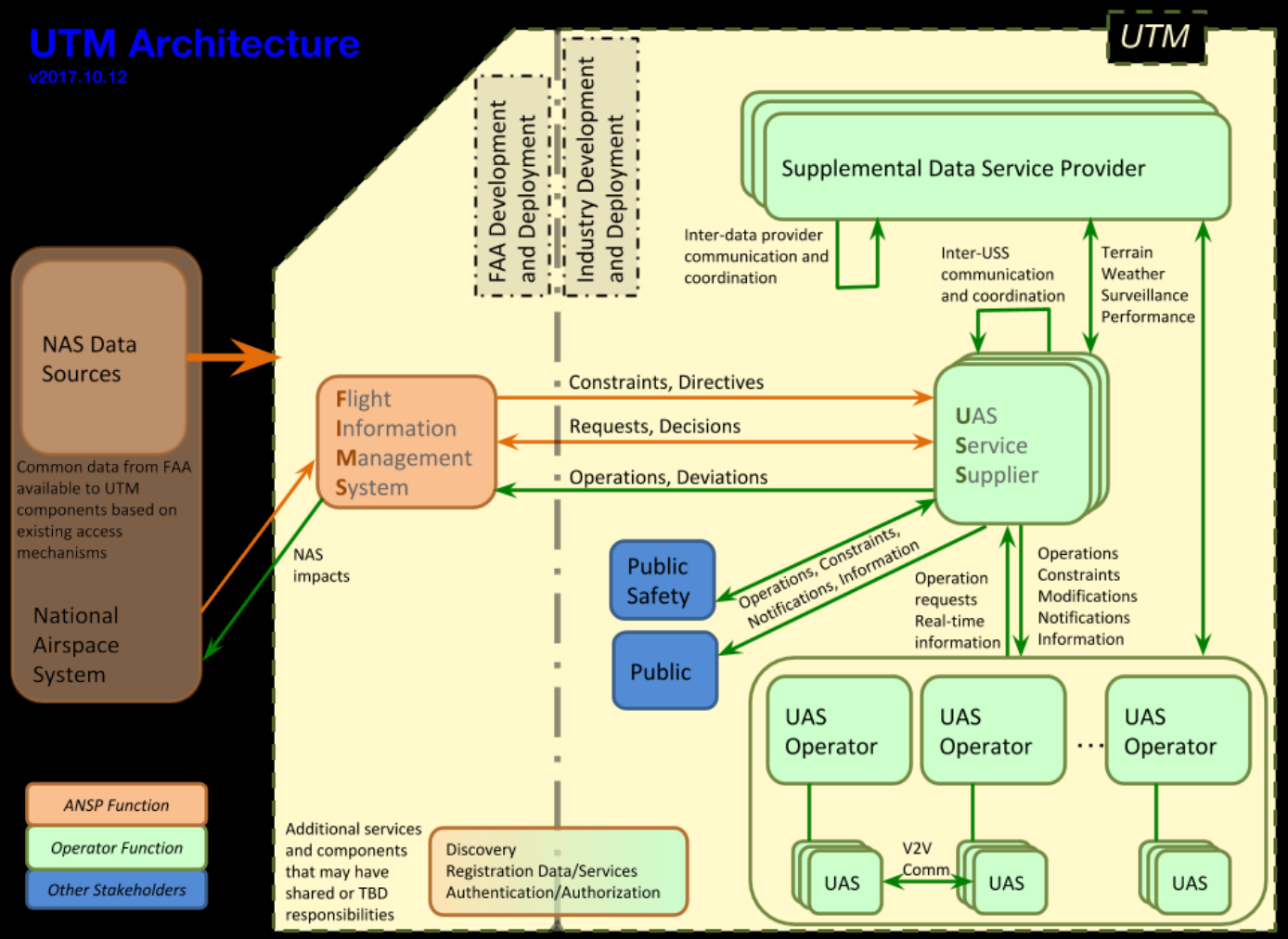
Day in the life of a future UTM operator

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

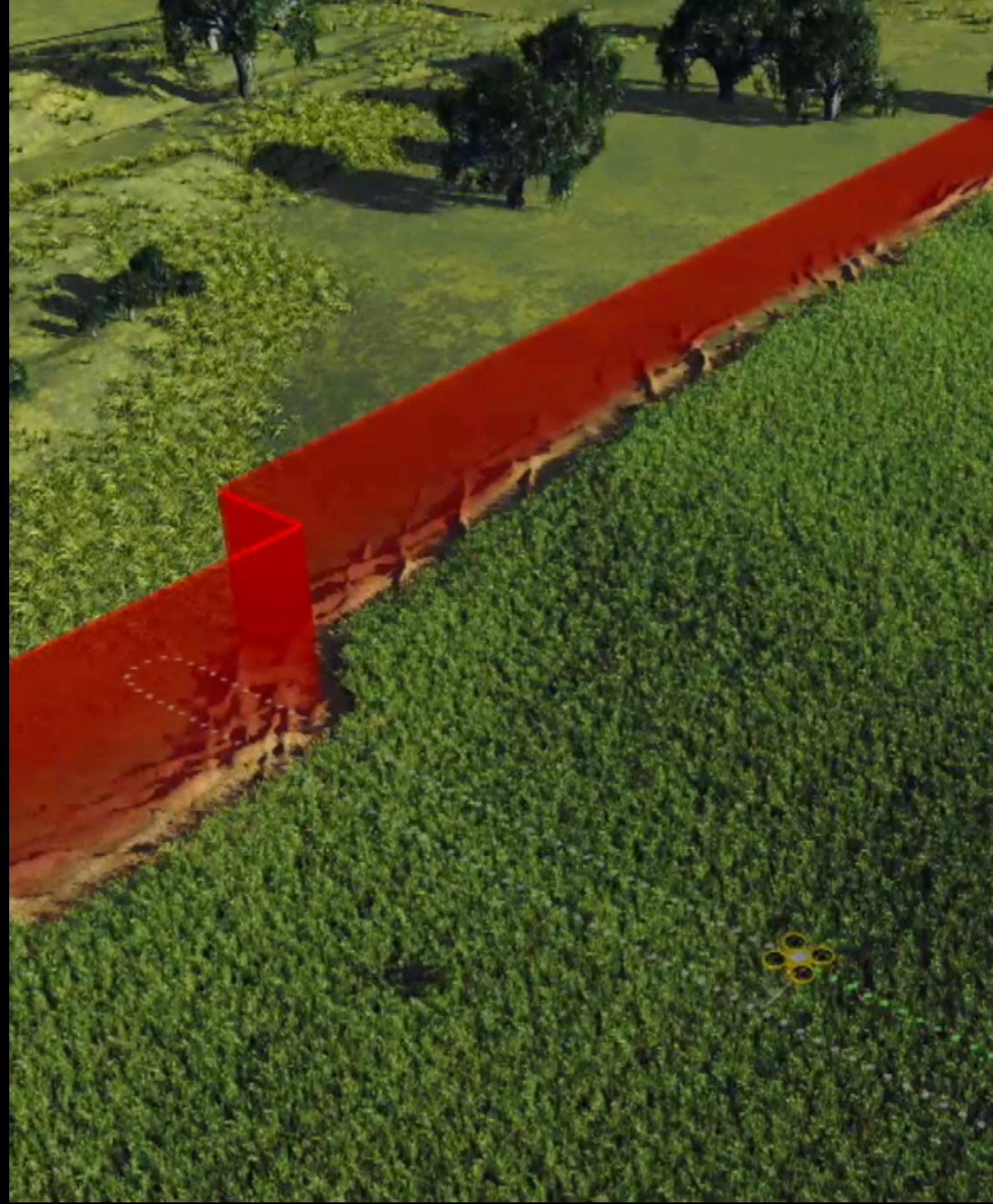


National Aeronautics and Space Administration (2018) *UTM UAS Service Supplier Development - Sprint 2 Toward Technical Capability Level 4* (NASA/TM-2018-220050). NASA Ames Research Center. Retrieved from https://utm.arc.nasa.gov/docs/2018-UTM_UAS_TCL4_Sprint2_Report_v2.pdf

UAS Service Supplier
USS

"… support Operators' abilities to meet the regulatory and operational requirements for UAS operations" (p.8)

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



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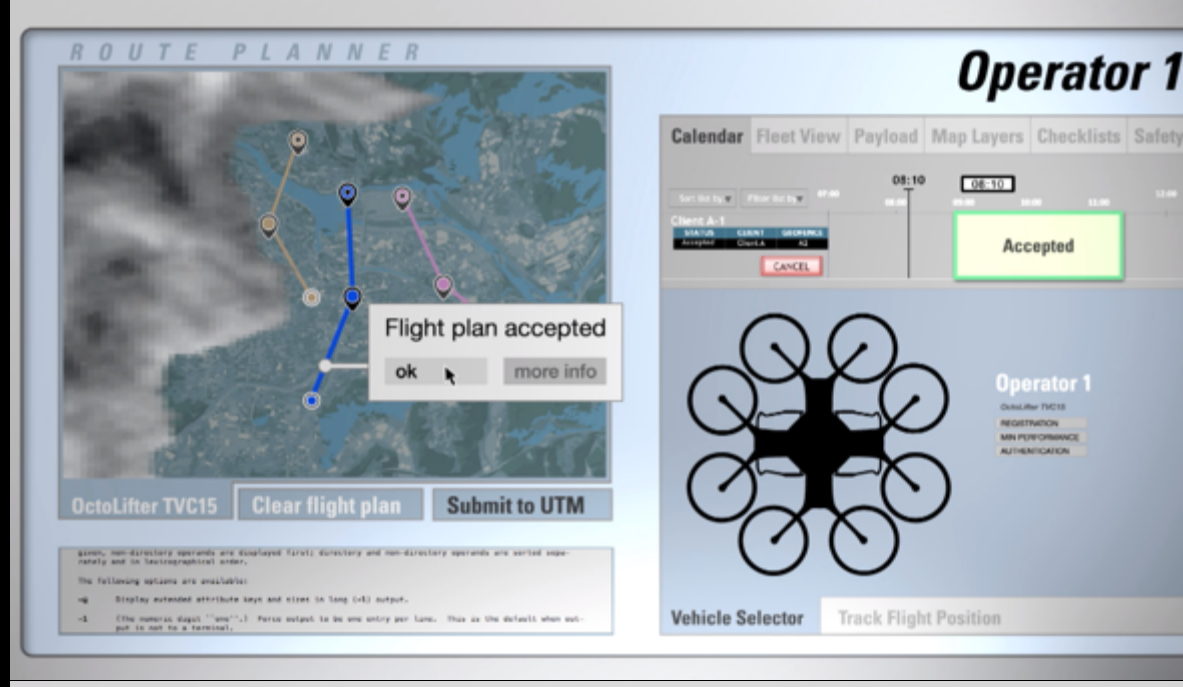
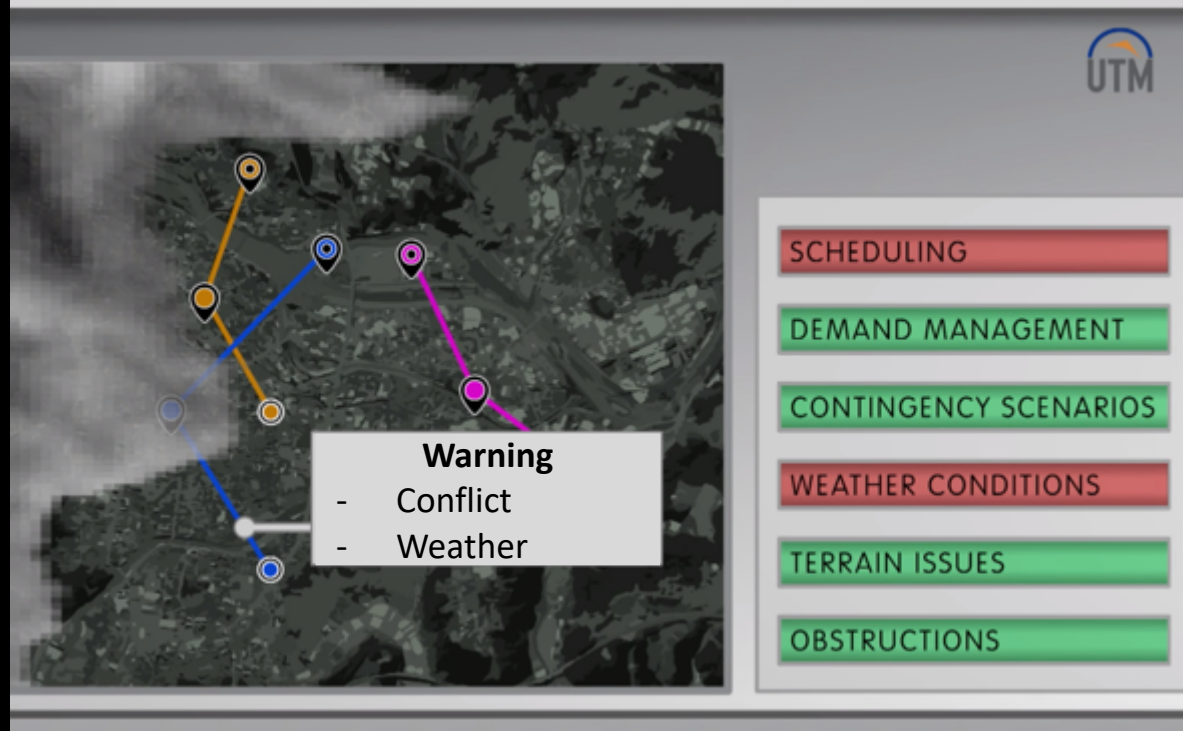
USS Network

"…allow for a network of USSs to provide cooperative management of low altitude operations without direct FAA involvement."(p.8)

- Standardized platform for sharing operation information & data
  - Operator intention, contingency plans, equipage
  - 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





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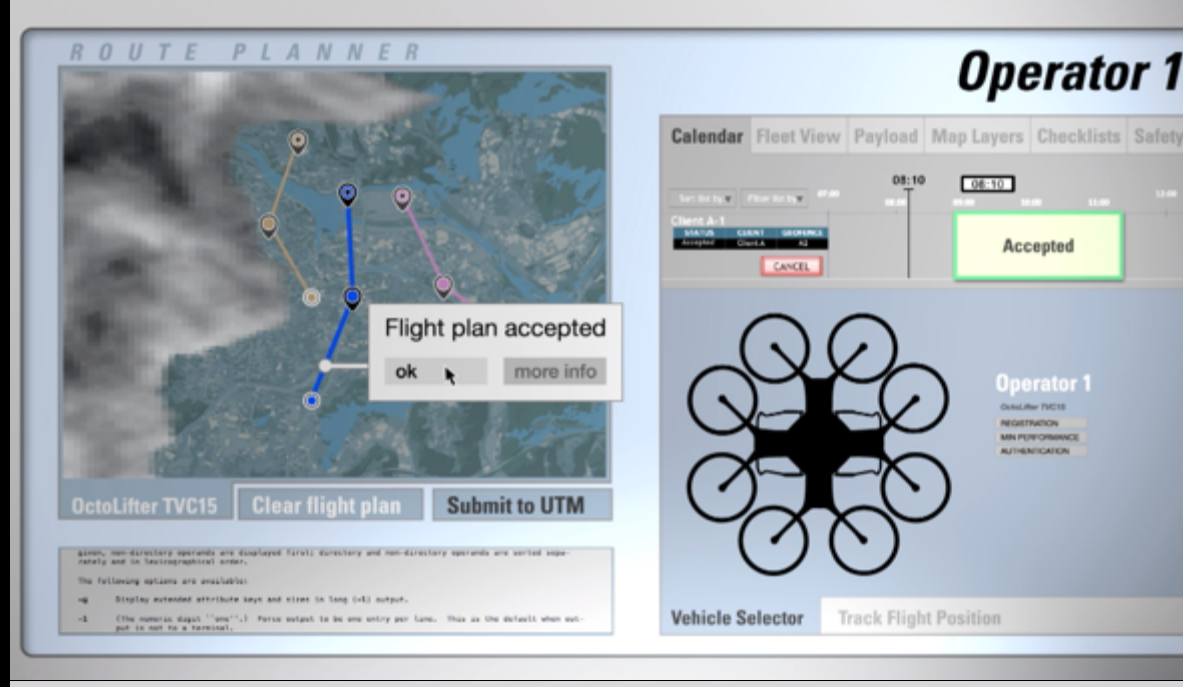
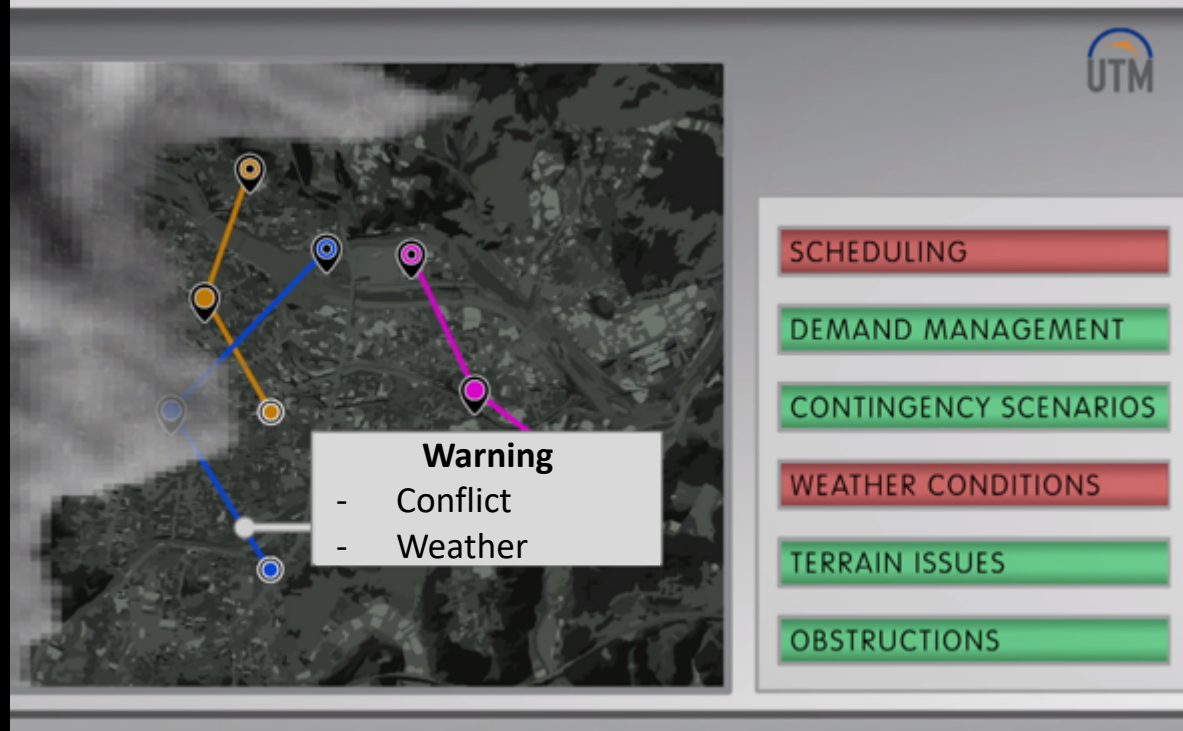
Supplemental Data Service Providers
SDSP

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





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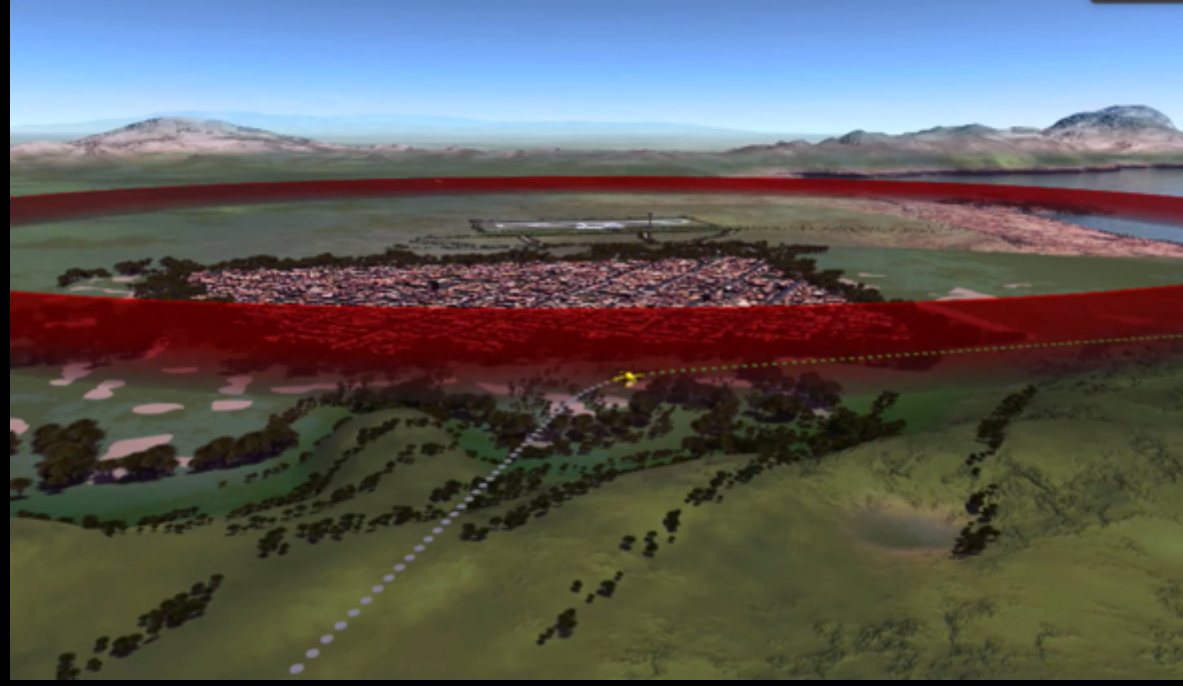
Flight Information Management System
FIMS



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." (p.9)

Federal Aviation Administration (2018). *Unmanned Aircraft Systems (UAS) Traffic Management (UTM) Concept of Operations* (v1.0). Retrieved from https://utm.arc.nasa.gov/docs/2018-UTM-ConOps-v1.0.pdf

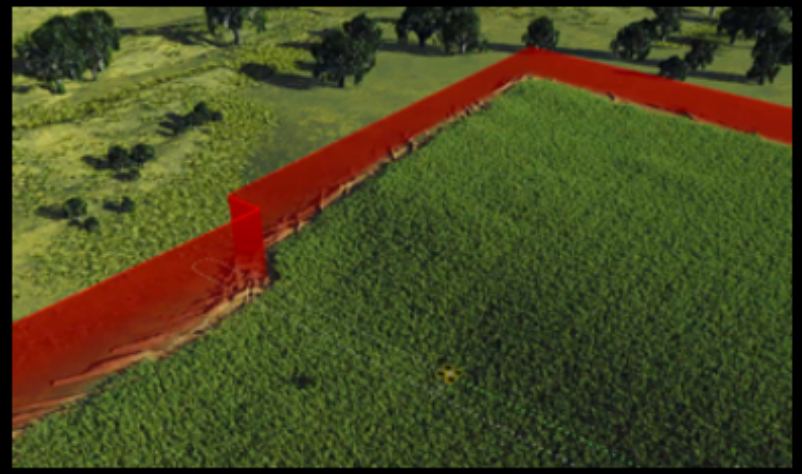
Under the hood

How UTM supports a day in the life

- 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

- **Mapping of field**
  - Line of sight
  - Popular brand UAS
  - Mission planning platform of my choice



- 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

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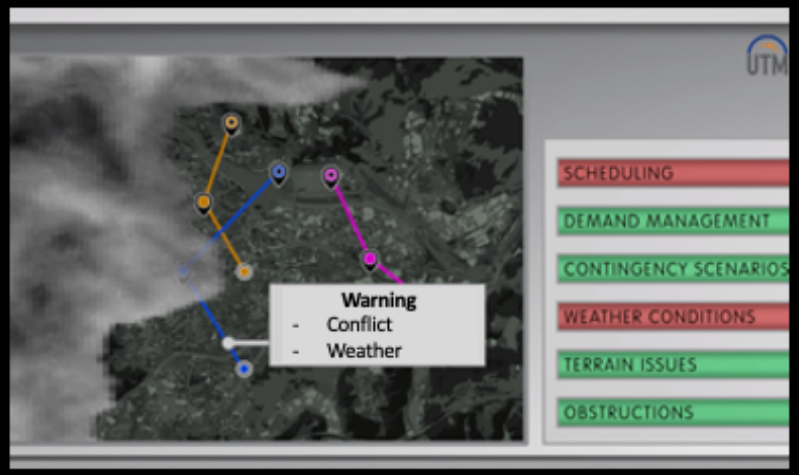

- UTM System
  - Enables operator to connect with proper authorities or other stakeholders
- Supplemental Data Services
  - Assists in tasks involved with flying in chosen airspace

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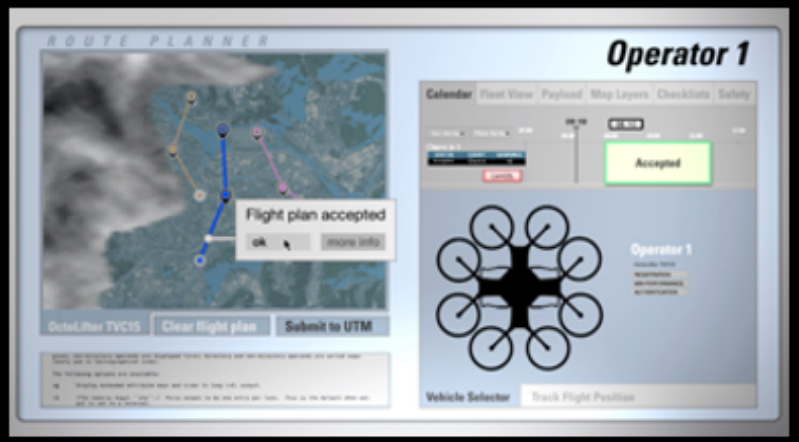

- UTM System
  - Monitors conformance
  - Platform for sharing data
- Supplemental Data Services
  - Data sources
  - Tools for interacting with the data

Day in the life of a future UTM operator

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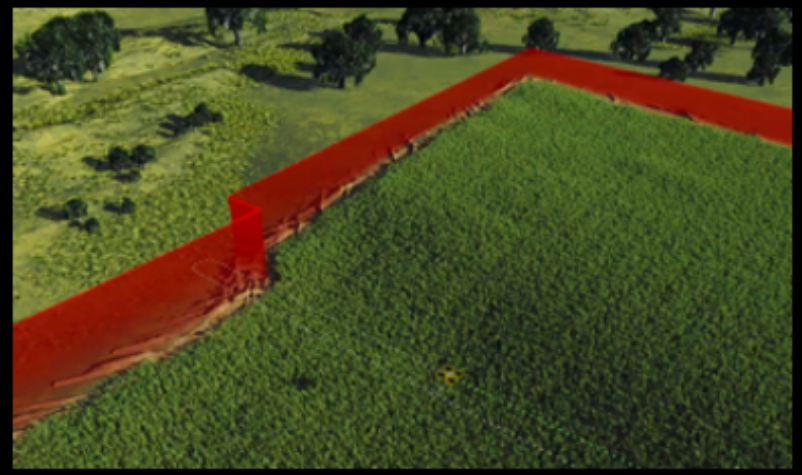

Participation in the UTM system enables :

- Communication of priority
- Communication of contingency plan
- Alerts to changes in the airspace

Both operators are aware of each other, even if operating beyond visual line of sight

Day in the life of a future UTM operator

- **High-priority delivery to nearby hospital**
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- **Initiate contingency plan**
  - Hoover in place as it passes through field
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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"

Kopardekar, P., Rios, J., Prevot, T., Johnson, M., Jung, J., & Robinson, J. (2016). *Unmanned Aircraft System Traffic Management (UT*
Concept of Operations. 16th AIAA Aviation Technology, Integration, and Operations Conference, Washington, DC. Retrieve
from https://utm.arc.nasa.gov/docs/Kopardekar_2016-3292_ATIO.pdf

UTM Research Effort

Technical Capability Levels

Technical Capability Levels (TCL)

Risk-based development and test approach along four distinct TCL

TCL 1

- Remote Population
- Low Traffic Density
- Rural Applications
- Multiple VLOS Operations
- Notification-based Operations

TCL 2

- Sparse Population
- Low-Mod Traffic Density
- Rural / Industrial Applications
- Multiple BVLOS Operations
- Tracking and Operational Procedures

TCL 3

- Moderate Population
- Moderate Traffic Density
- Suburban Applications
- Mixed Operations
- Vehicle to Vehicle Communication
- Public Safety Operations

TCL 4

- Dense Population
- High Traffic Density
- Urban Applications
- Dense BVLOS Operations
- Large Scale Contingency Management

National Aeronautics and Space Administration (2018) *NASA UTM Executive Summary: TCL 3 Media Day June 2018*. NASA Ames Research Center. Retrieved from https://utm.arc.nasa.gov/docs/2018-June-UTM-Media-Day.pdf

Questions?

Our goal is to use NASA technology to improve emergency response operations.

references

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