

An aerial view of a city and rural landscape. The city skyline is in the background, with several circular icons overlaid on the buildings. In the foreground, there's a baseball field, a road with cars, a house, and a person standing. A drone is flying in the sky, and a tractor is in the field. A large plume of smoke or dust is visible on the right side. The text "Introduction to UTM Services & communication" is overlaid in the center.

Introduction to UTM Services & communication

Lauren Claudatos, NASA

Overview

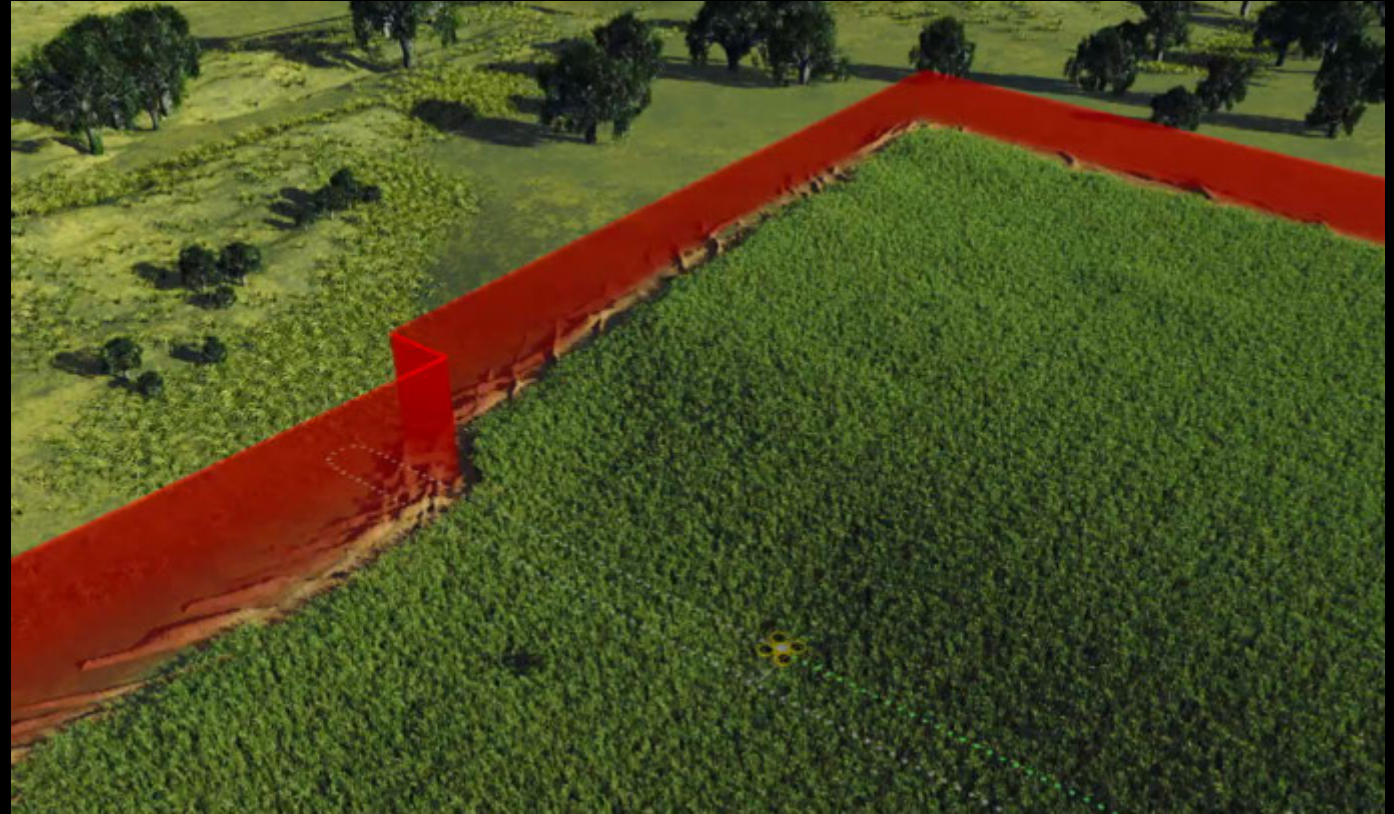
- UAS Traffic management (UTM)
 - Day in the life of a future UTM operator
 - Definition and key concepts
- UTM Research Effort
 - Technical Capability Levels
- Questions



Day in the life of a future UTM
operator

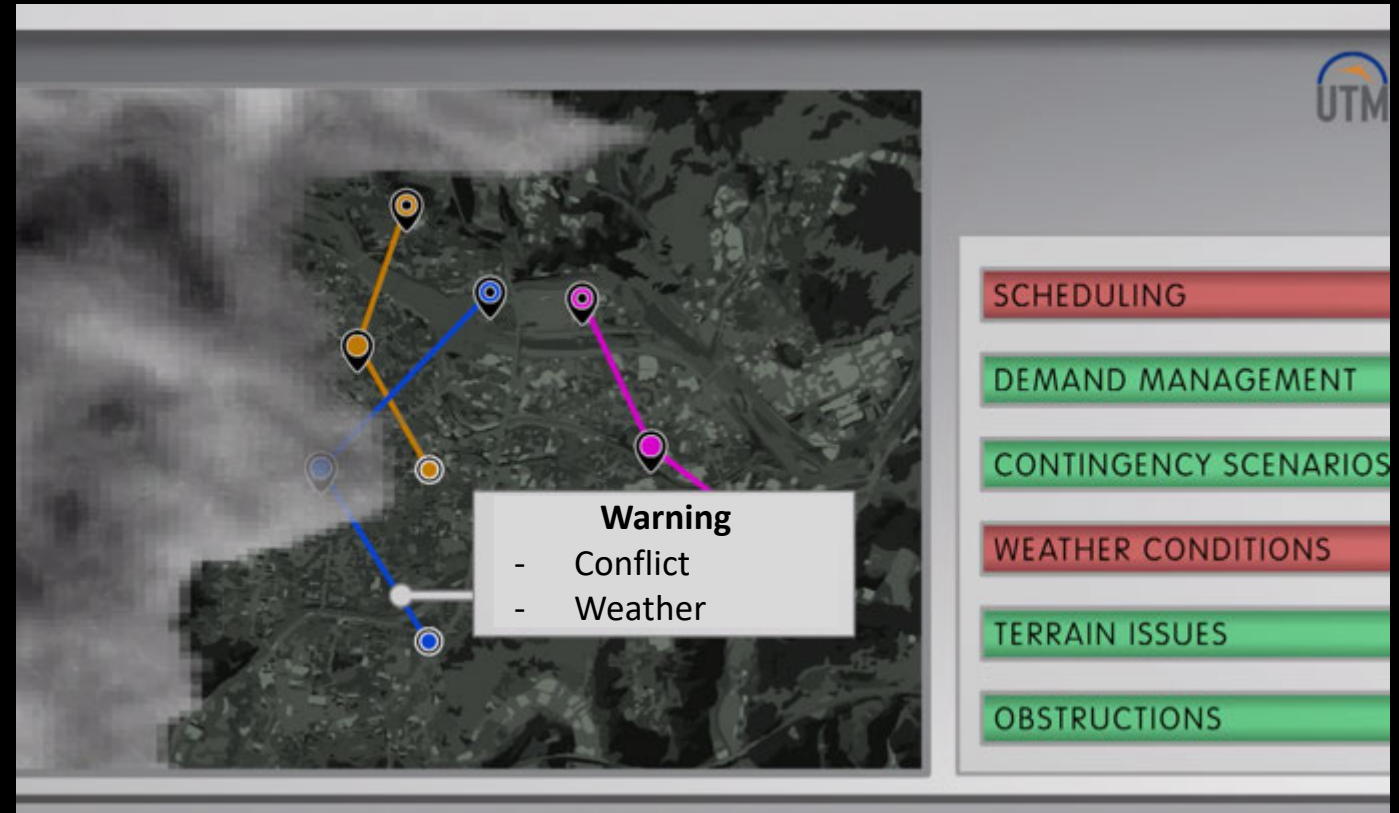
Day in the life of a future UTM operator

- 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

The screenshot displays a user interface for a UTM operator, titled "Operator 1". The interface is divided into two main sections: a "ROUTE PLANNER" on the left and a flight status/management area on the right.

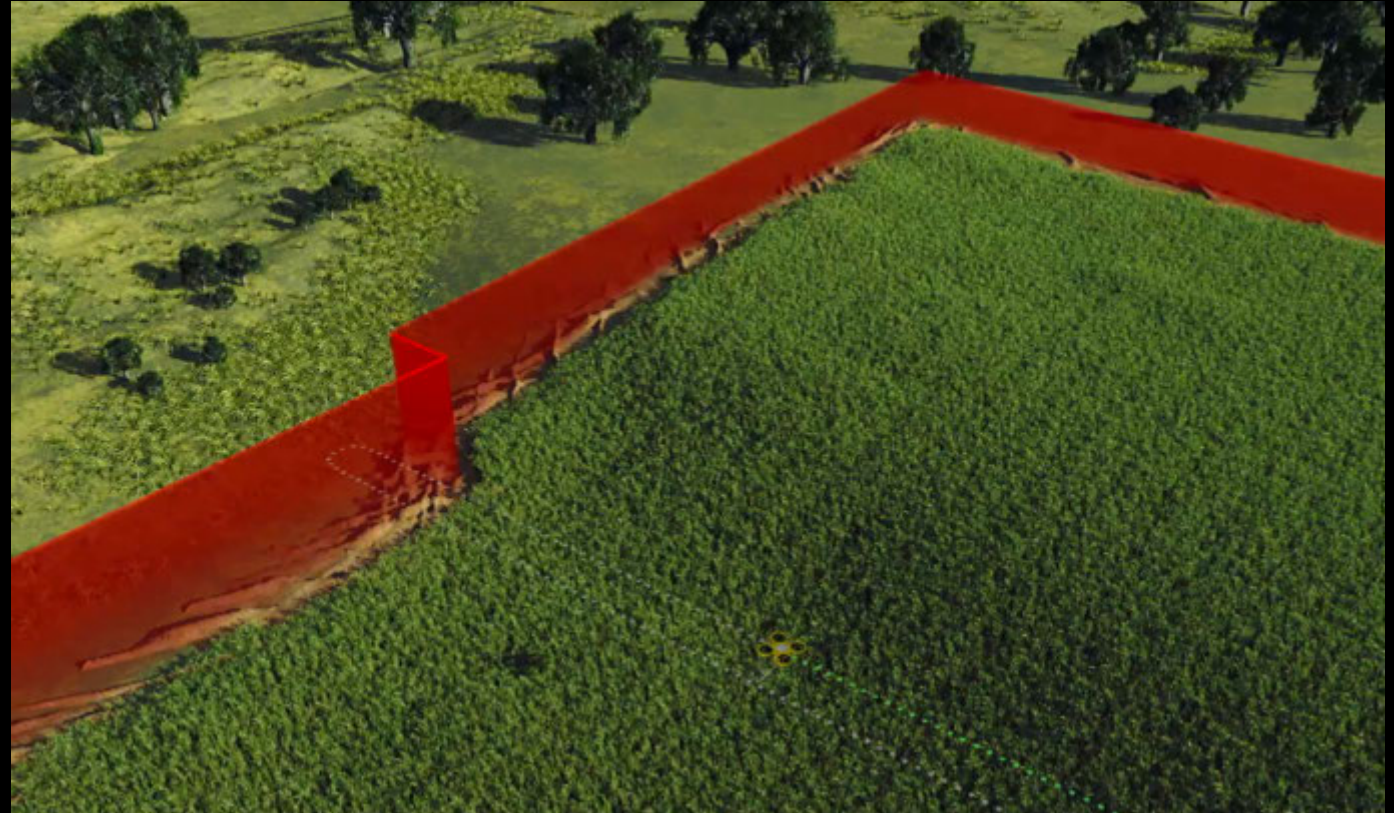
ROUTE PLANNER: This section features a map with a flight path. A blue line indicates the current route, while other paths are shown in orange and pink. A pop-up window over the map displays "Flight plan accepted" with "ok" and "more info" buttons. Below the map, there are buttons for "OctoLifter TVC15", "Clear flight plan", and "Submit to UTM".

Flight Status Area: This section includes a "Calendar" tab and a "Fleet View" tab. A timeline shows a flight scheduled for 08:10, which is currently "Accepted" (highlighted in green). Below this, there is a "Vehicle Selector" showing a drone icon and a "Track Flight Position" button. The interface also displays "Operator 1" details, including "OctoLifter TVC15", "REGISTRATION", "MIN PERFORMANCE", and "AUTHENTICATION".

Footer: A small text box at the bottom left contains technical information: "Given, non-directory operands are displayed first; directory and non-directory operands are sorted separately and in lexicographical order. The following options are available: -g Display extended attribute keys and sizes in long (-E) output. -l (The numerical flag 'long') Force output to be one entry per line. This is the default when output is not to a terminal."

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

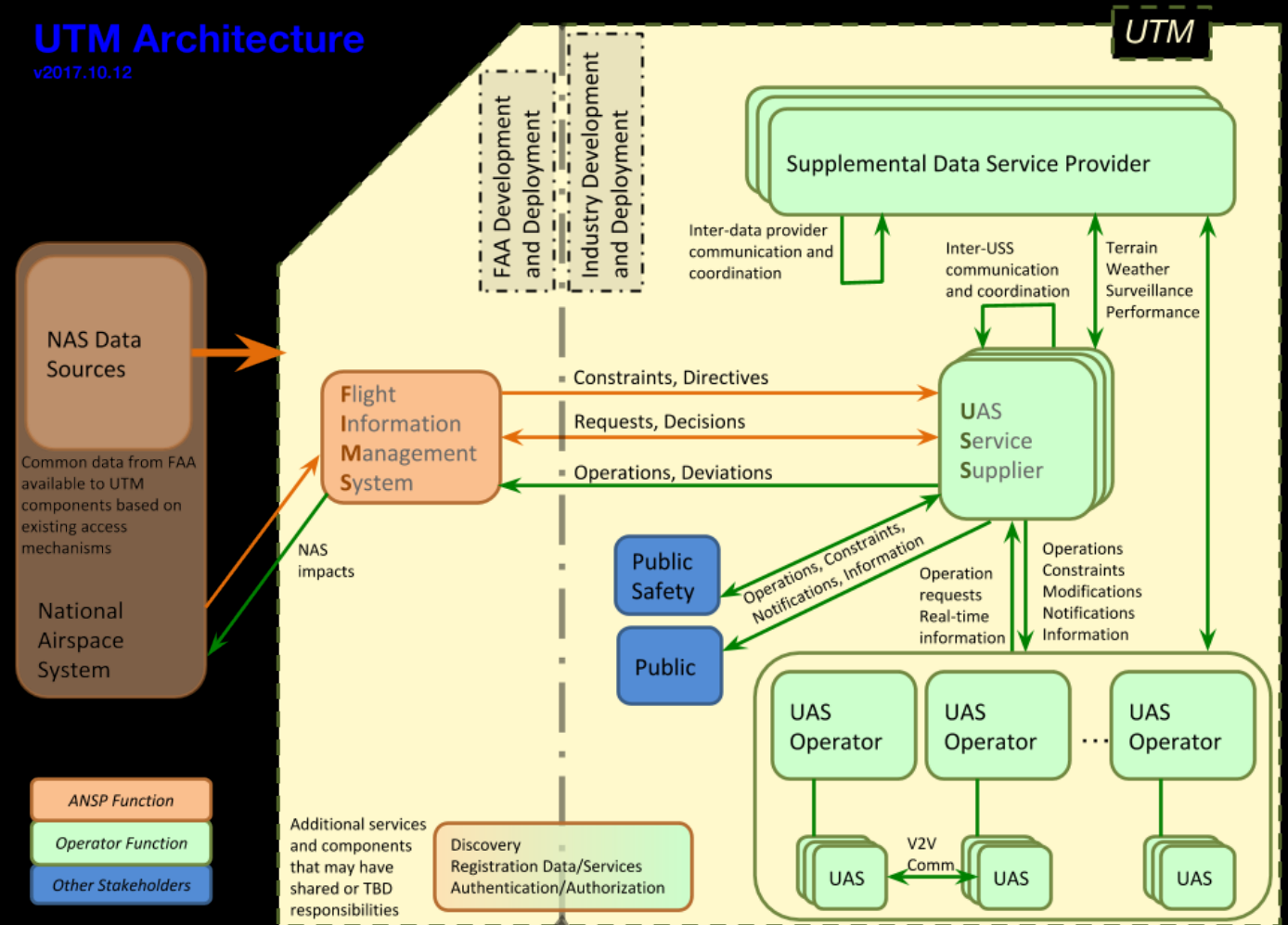


Definition and key concepts

UTM Network

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

UTM Architecture v2017.10.12

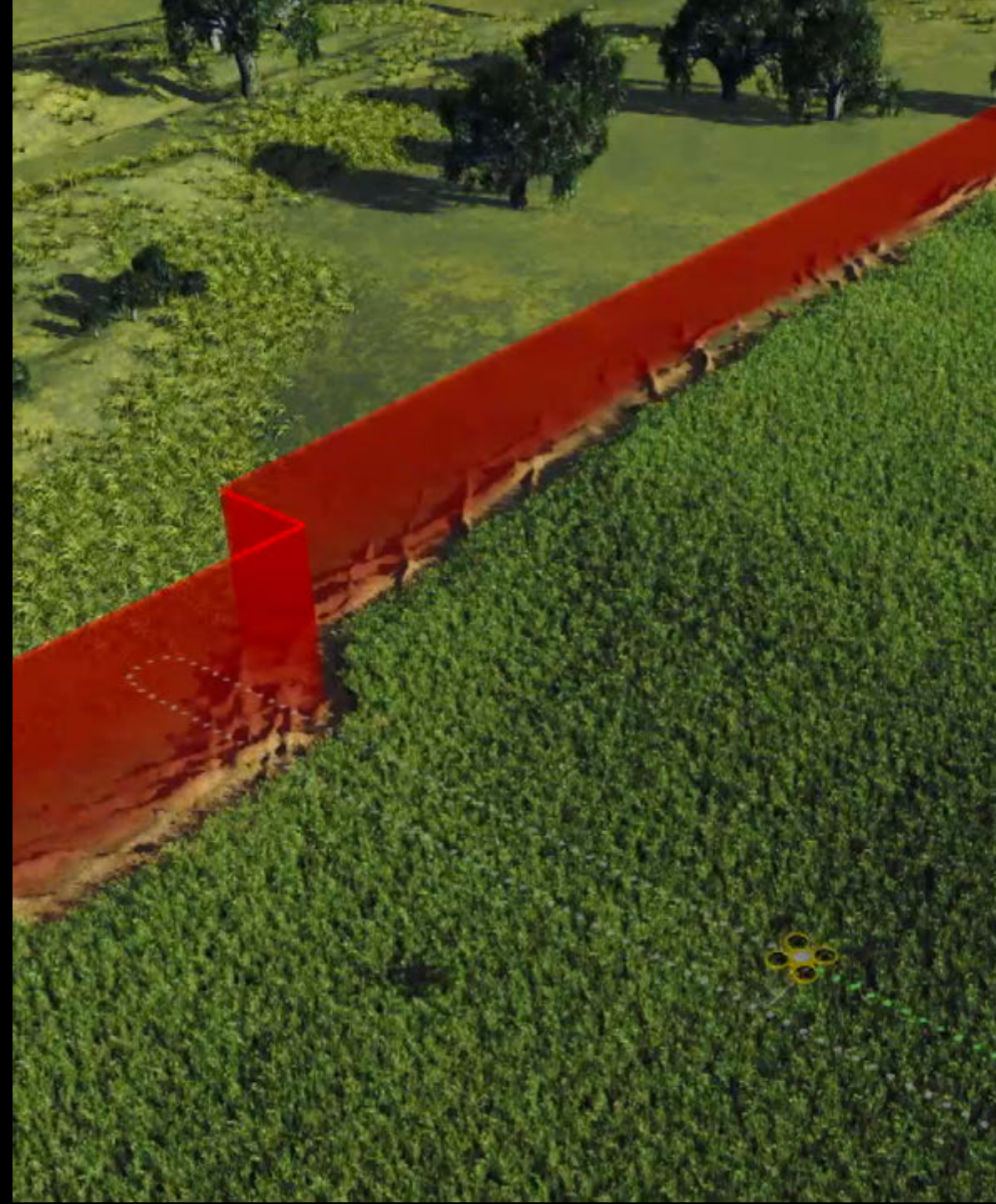




UAS Service Supplier USS

“... support Operators’ abilities to meet the regulatory and operational requirements for UAS operations” (p.8)

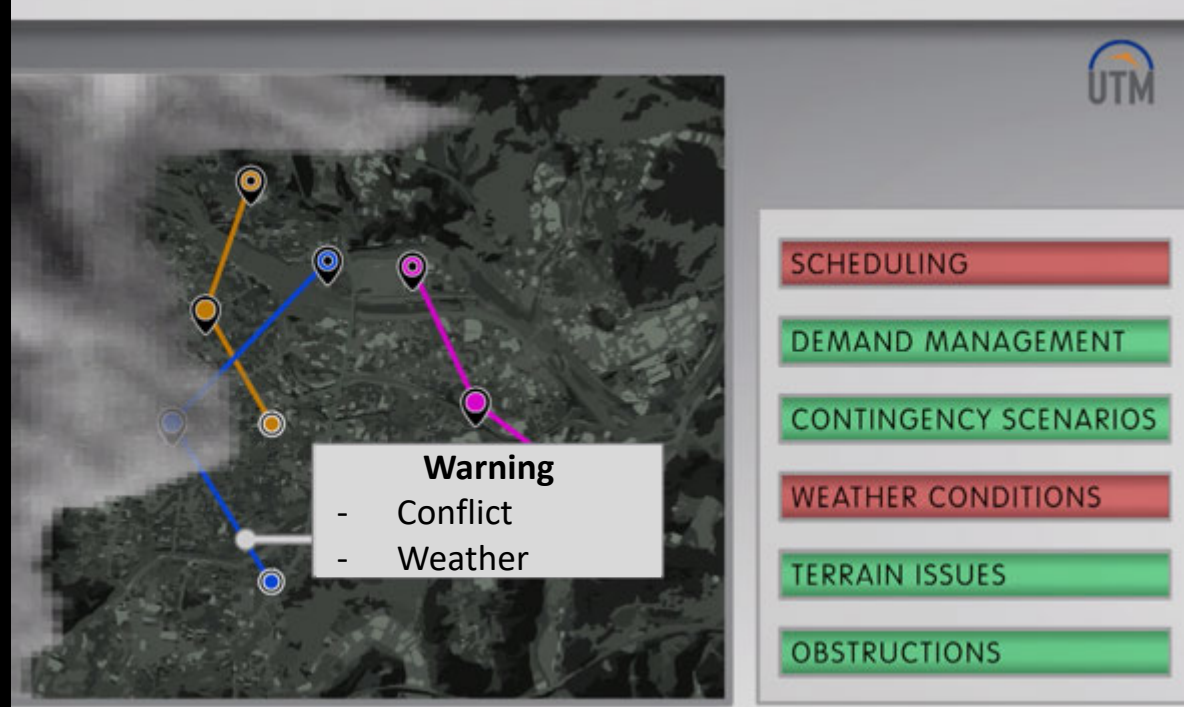
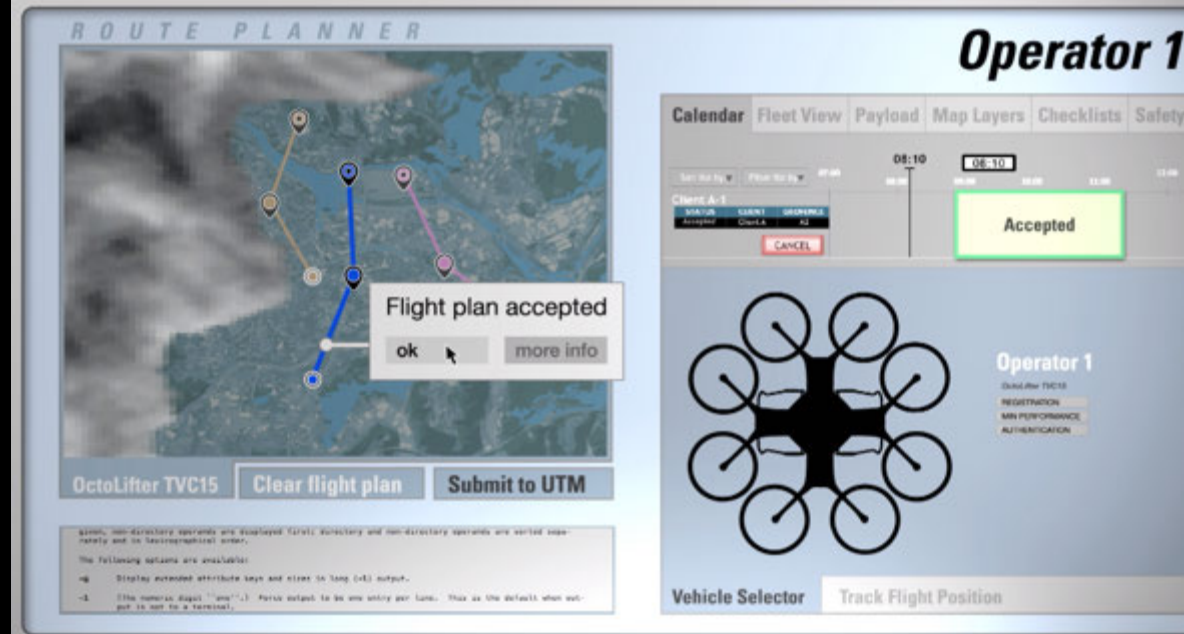
- Connects the operator with the UTM system
- Connects operator with other supplemental data services
- Tracks rules and conformance, among other things



USS Network

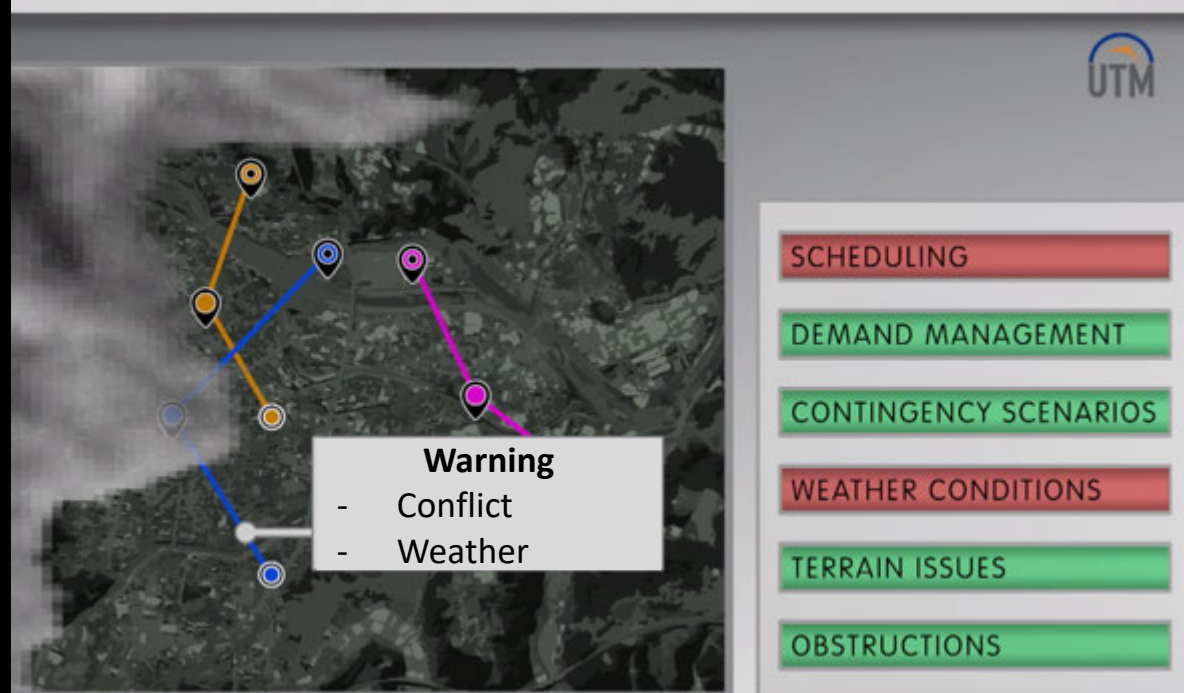
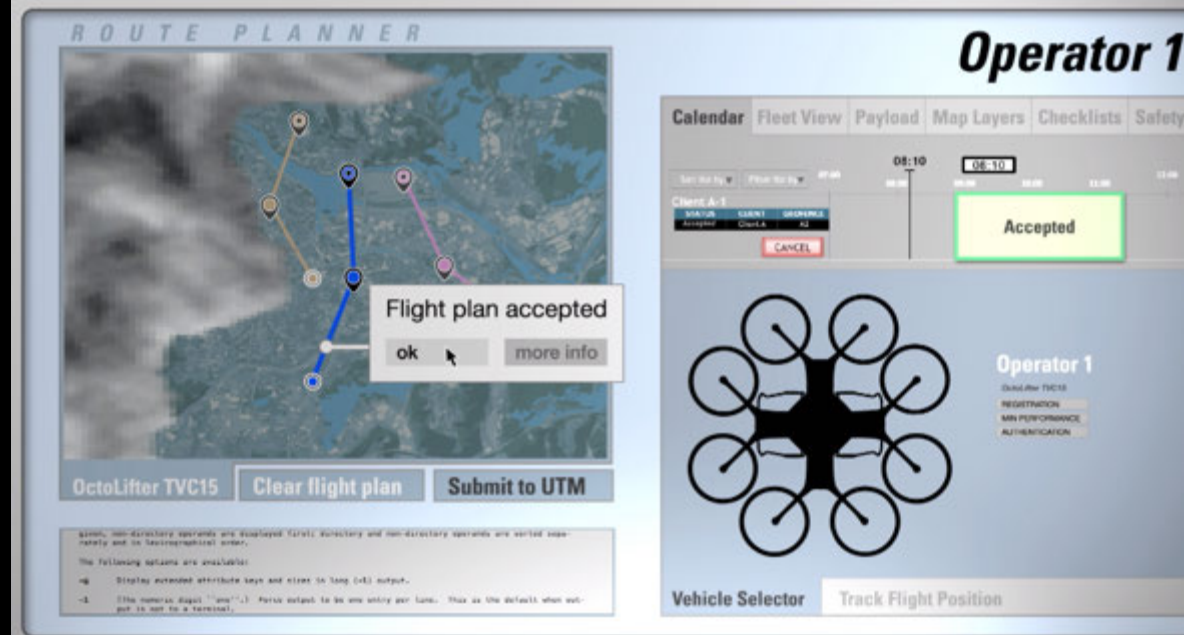
“...allow for a network of USSs to provide cooperative management of low altitude operations without direct FAA involvement.” (p.8)

- 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



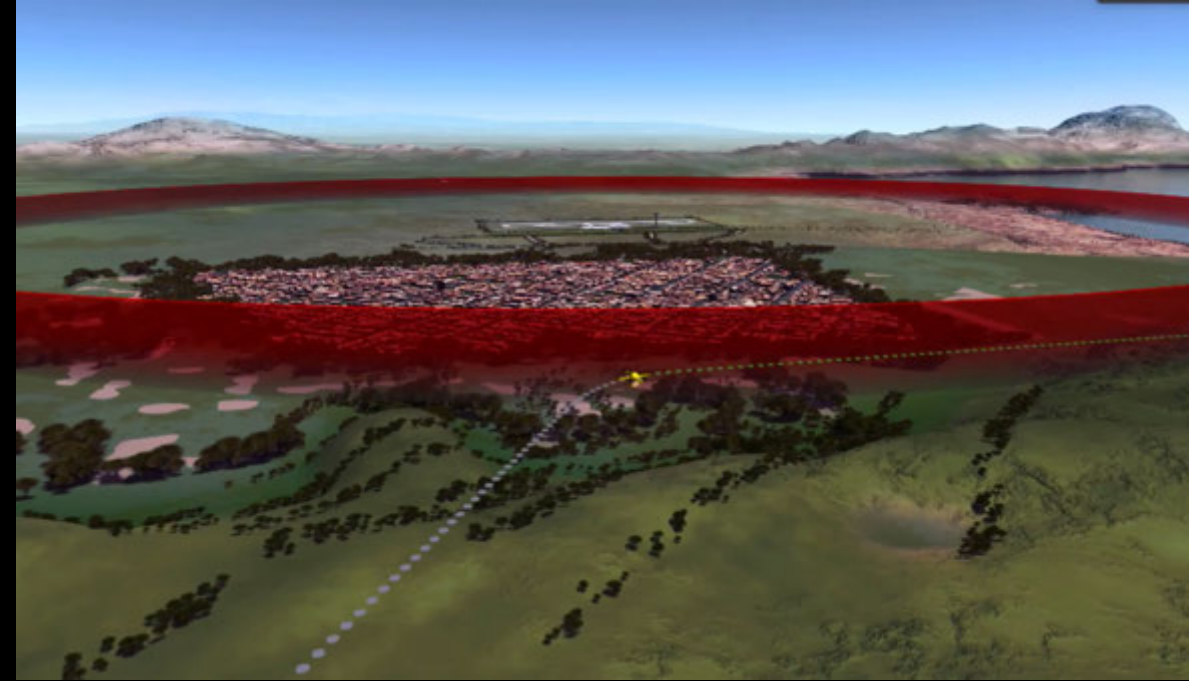
Supplemental Data Service Providers SDSP

- 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.” (p.9)

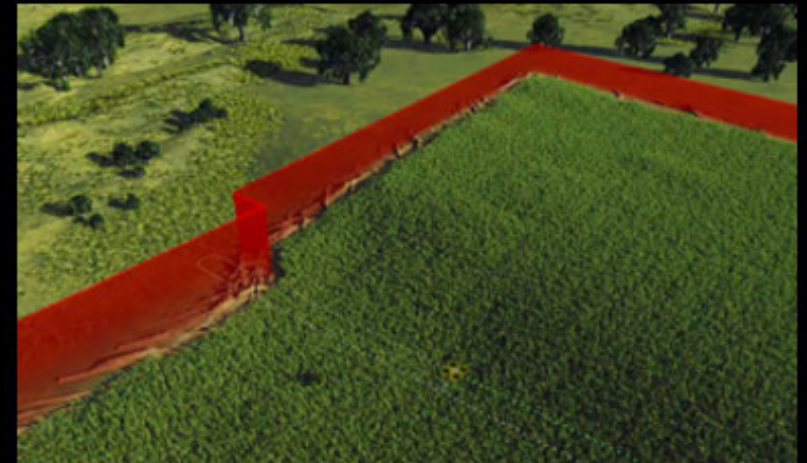
Under the hood

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

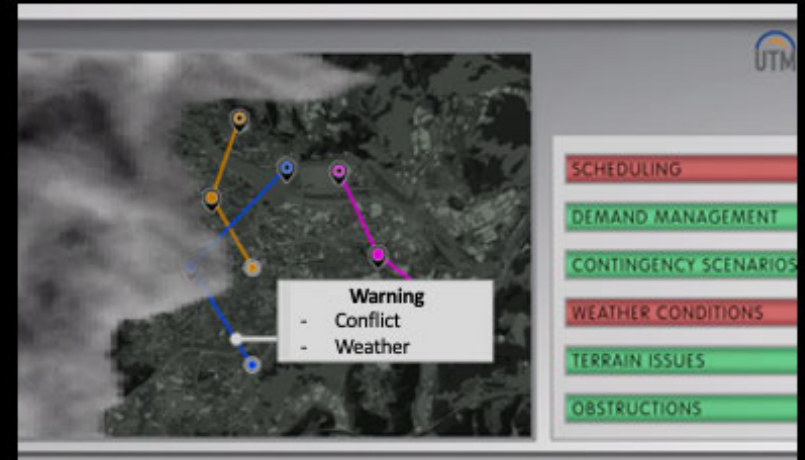
- Mapping of field
 - Line of sight
 - Popular brand UAS
 - Mission planning platform of my choice



- 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

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

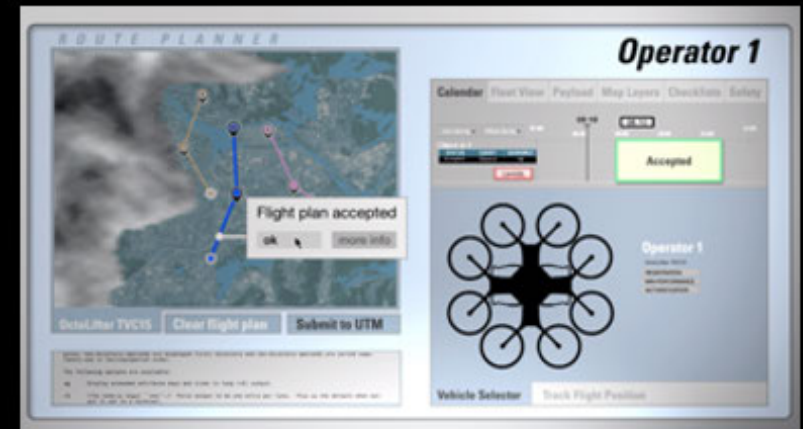


- UTM System
 - Enables operator to connect with proper authorities or other stakeholders
- Supplemental Data Services
 - Assists in tasks involved with flying in chosen airspace

Day in the life of a future UTM operator

Pre-flight

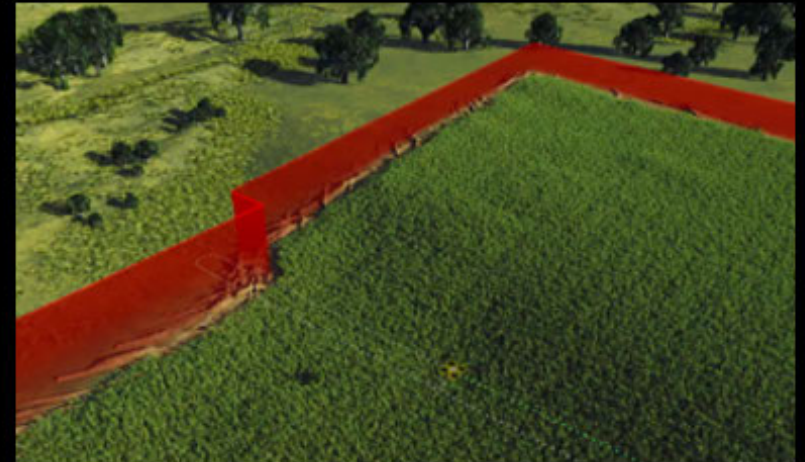
- Frequented by manned aircraft
 - NOTAM
 - Contact information of nearby tower
 - Channels to monitor
- Offers to publish my contact information



- 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

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



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**
 - Notified of incoming operation
- **Initiate contingency plan**
 - Hoover in place as it passes through field
- **All-clear – resume mission**



An aerial view of a city and rural landscape. The city is on the left, with several circular icons containing drone symbols overlaid on it. A road winds through the landscape, and a helicopter is visible in the sky. A large plume of smoke or debris is on the right. A house and a tractor are in the foreground. A green bar is in the top left corner.

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”

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

Questions?

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

references

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>

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