Unmanned Aerial Systems Traffic Management (UTM)

SAFELY ENABLING UAS OPERATIONS IN LOW-ALTITUDE AIRSPACE

NASA

utm.arc.nasa.gov

Moffett Field, CA
Jaewoo.Jung@nasa.gov, Parimal.H.Kopardekar@nasa.gov
Near-term Goal: Safely enable initial low-altitude UAS as early as possible

Long-term Goal: Accommodate increased demand with highest safety, efficiency, and capacity
UTM: Balancing Multiple Needs

NATIONAL AND REGIONAL SECURITY
Protecting key assets

SAFE AIRSPACE INTEGRATION
Flexibility where possible and structure where needed
Geographical needs, application, and performance-based airspace operations

SCALABLE OPERATIONS FOR ECONOMIC GROWTH
Ever-increasing applications of UAS: Commercial, Agricultural, and Personal
Research software application prototype that

(1) Allows UAS operators to submit flight plans to execute a specific mission in low-altitude airspace, and

(2) Determines how to safely enable such single or multiple UAS operations either within visual line of sight or beyond visual line of sight
UTM Functions

AIRSPACE OPERATIONS & MANAGEMENT

- ~500 ft. and below
- Geographical needs and applications
- Rules of the airspace: performance-based
- Geofences: dynamic and static
UTM Functions

Wind & Weather Integration
• Actual and predicted winds/weather

Congestion Management
• Demand/capacity imbalance
• Only if needed – corridors, altitude for direction, etc.
UTM Functions

**Separation Management**
- Airspace reservation
- V2V and V2UTM
- Tracking: ADS-B, cellphone, & satellite based

**Contingency Management**
- Large-scale GPS or cell outage
- 9-11 like situations
UTM Target Capability Level

Each capability is targeted to type of application, geographical area and uses risk-based approach

**CAPABILITY 1 (AUGUST 2015)**
- Reservation of airspace volume
- Over unpopulated land or water
- Minimal general aviation traffic in area
- Contingencies handled by UAS pilot
- Enable agriculture, firefighting, infrastructure monitoring

**CAPABILITY 2 (OCTOBER 2016)**
- Beyond visual line-of-sight
- Tracking and low density operations
- Sparsely populated areas
- Procedures and “rules-of-the road"
- Longer range applications

**CAPABILITY 3 (JANUARY 2018)**
- Beyond visual line of sight
- Over moderately populated land
- Some interaction with manned aircraft
- Tracking, V2V, V2UTM and internet connected
- Public safety, limited package delivery

**CAPABILITY 4 (MARCH 2019)**
- Beyond visual line of sight
- Urban environments, higher density
- Autonomous V2V, internet connected
- Large-scale contingencies mitigation
- News gathering, deliveries, personal use
Multiple providers could offer some UTM services.

Tailoring operational services based on geographical area needs.

Vehicle performance could be different.
Regulator has a key role in certifying UTM system and operations. All UTM systems must interoperate.
• Research Transition Team with FAA, DHS, and DoD
• 125+ industry and academia collaborators and increasing
• Working groups on UTM services
• Initial UTM Concept of Operations: Industry, academia, and government
• UTM Client interface is ready – You can connect with UTM
• TCL1 tests with 12 partners completed
• International interest
Next Steps

• Development, simulations, and testing of UTM TCL 2-4
• Safety analysis

• NASA will continue to work with industry, academia, and government groups
  – Refine operational requirements, system architecture(s), prototype, and conduct tests – Continue until safe airspace integration is proven!

• National initial safe UAS integration campaign: coordinated effort for data collection and demonstrations
  – Through FAA test sites and other approved locations

Jaewoo.Jung@nasa.gov, Parimal.H.Kopardekar@nasa.gov