Unmanned Aerial Systems Traffic Management (UTM)

SAFELY ENABLING UAS OPERATIONS IN LOW-ALTITUDE AIRSPACE

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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
• Safe low-altitude UAS operations with
  – Airspace management and geofencing
  – Weather and severe wind integration
  – Predict and manage congestion
  – Terrain and man-made objects: database and avoidance
  – Maintain safe separation (Airspace reservation, V2V, & V2UTM)
  – Allow only authenticated operations
**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
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<th>Build</th>
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| Build 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 |
| Build 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 |
| Build 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 |
| Build 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 |

Each build is independent and deployable.
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.
Progress

- Research Transition Team with FAA, DHS, and DoD
- 125+ industry and academia collaborators and increasing
- Initial UTM Concept of Operations: Industry, academia, and government
- Client interface allows to connect partners to the UTM
- **Build 1 tests** with 12 partners were successfully completed – data is being analyzed
  - Included NASA and partner vehicles, ADS-B, cell-based communications, and low-altitude radar for non-cooperative targets
  - Data: Trajectory conformance accuracy, geo-fencing conformance reliability, UTM usability
- International interest
• NASA and FAA will work together to institute RTCA committee
• Terms of reference are being finalized
• Close coordination between NASA and FAA will be maintained for one government voice for move forward strategy
• UTM construct may be adapted based on FAA and industry inputs, as well as UTM field tests
Next Steps

- UTM Build 1 testing in August
- Development, simulations, and testing of UTM Builds 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

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