Unmanned Aircraft Systems (UAS) Traffic Management (UTM) Project

UTM Concepts and Use Cases

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UTM Technical Interchange Meeting
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Outline

- UTM RTT Concepts and Use Cases Working Group (CWG) Overview
- Activities
- Publications
- Test Involvement
- Areas of Future Work
- Summary and Impact
UTM RTT Working Groups

- NASA-FAA UTM Research Transition Team (RTT) has been a joint undertaking for the development and eventual implementation of UTM
- UTM RTT initiated in 2016
- Four primary working groups
- Joint Management Plan (JMP) formulated with Research Transition Products for each group to deliver as part of RTT goals and objectives
- JMP signed in 2017
• The CWG was chartered with collaboratively defining the UTM concept through the development of supporting use cases that will ultimately span the range of UTM operations and environments.

• Through this process, the CWG worked to identify information flows and exchanges, supporting architectures, and the roles and responsibilities of those entities interacting with the UTM ecosystem. The process and its output served as input to other programs and UTM RTT Working Groups.
• The CWG was composed of a small core membership between NASA and the FAA
• Regular meetings were held for use case development and concept discussions. Number of attendees fluctuated depending on the focus of discussion.
• The majority of discussions centered around the development of use cases that highlighted concept elements that in turn clarified and refined the assumptions, stakeholder roles, and operational processes envisioned for the future UTM environment.
• Participation and coordination among all RTT leads in the CWG was an important part of the development process.
Each technical capability level had an associated Research Transition Product (RTP) in the form of a use case package.

Overarching Concept of Operations (ConOps) were also planned for publication to capture major elements and outputs of the ongoing RTT collaboration.
CWG Use Case Packages and ConOps

Unmanned Aircraft System (UAS) Traffic Management (UTM)

Cover Letter
UTM RTF CWG Concept & Use Cases Package #1

The Concept & Use Case Package #1, U.S. T document represents the collaborative research efforts between the FAA and NASA as part of the Universal Access to System Traffic Management (UTM) Research Team (RTT). Commissioned in this document are the (i) Terms and Definitions, (ii) Foundational Principles, (iii) Concept Narrative, (iv) Use Cases, (v) Operational Plans, and (vi) Rules and Responsibilities of actors interacting within what is considered to be encompassed by Technical Capability Level 1 UTM operating environments. The contents of this document may be maintained within these boundaries or expanded as necessary in light of emerging technologies. This document is an effort to provide a common understanding of the conceptual framework of UTM RRTI. This document is intended to provide a framework for the purposes of supporting the FAA UTM Program. This document serves as a foundation of the concepts and principles being developed as part of the other RRTI working groups.

October 2017

For NASA Internal Use Only
CWG Use Case Packages

• Three use case packages produced through the CWG as part of RTT deliverables
• Each package developed to encompass specific concept elements related to the UTM environment envisioned as part of a given Technical Capability Level (TCL)

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CWG Use Case Package #1: TCLs 1 & 2

- Published October 2017
- Basic elements introduced as part of TCL 1:
  - 1 use case: 2 VLOS operations
- Greater complexity included as part of TCL 2:
  - 4 use cases: 1 BVLOS 1 VLOS operation, 2 BVLOS near airport, Emergency medical priority, BVLOS conformance violation into Class D
CWG Use Case Package #2: TCL 3

- Two publications in 2018
- Use cases and topics:
  - One-Way BVLOS Flight, Separate Landing/Take-Off Locations
  - Negotiation between Operators Due to Dynamic Restriction
  - UAS Interaction with Manned Aircraft
  - High Density UTM Operations
  - Last-Mile Rural Deliveries under Mode C Veil
  - sUAS Operator In-Flight Loss of Performance Capabilities
CWG Use Case Package #3: TCL 4

- Published March 2019
- Use cases and topics:
  - BVLOS UTM Operation within UAS Facility Maps
  - Historical UTM Information Queries by Authorized Entities
  - UAS Urgency/Distress Condition with Alternate Landing and UTM Coordination
  - UAS Volume Reservation in Controlled Airspace
  - Report to FAA due to UAS Flight Incident
UTM Concept of Operations

- Published May 2018
- First formal publication setting out the joint vision of UTM with broader input from multiple organizations and industry
- Established initial framework and definitions that included:
  - Notional architecture
  - Roles and Responsibilities of actors and entities
  - Airspace management philosophy with respect to safety, security, and equity
  - Eight illustrative use cases
UTM Concept of Operations

• Published March 2020
• Updated view of UTM concept informed by work of RTT and testing developments
• Addressed:
  – Operations of greater complexity in controlled and uncontrolled airspace
  – Expanded discussion of Performance and Airspace Authorizations
  – Introduction of Remote ID
  – Expanded discussion of Safety, Security, and Equity
  – Five illustrative use cases
CWG Test Involvement

- Flight demonstrations provided a means to test aspects of the UTM concept in real world environments
- TCL 3 involved dedicated tests as a distinct thrust under the concepts area
- TCL 4 scenario foundations provided by CWG
- Concept elements incorporated into FAA UTM Pilot Program (UPP) testing
Five distinct tests were included in the TCL 3 Statement of Work:

- CON1: BVLOS Landing
- CON2: Contingency Initiation
- CON3: Public Portal
- CON4: Multiple TCL 2/TCL 3 Operations for a Sustained Period
- CON5: FIMS/USS Interaction When a Vehicle Heads Towards Controlled or Unauthorized Airspace

A total of 17 CON tests were conducted across five test sites.
• Developed initial scenarios based on CWG and broader RTT discussions
• Five scenarios generated to examine a “day in the life” that addressed concept elements related to:
  – High density operations
  – Priority/Public Safety operations
  – UAS Volume Reservations in dense environments
  – Contingency Management
  – Remote ID
CWG: TCL 4 Demonstration

- Large-scale Contingency Events
- High Density Operations in Urban Environment
- Public Safety Priority Operations
CWG Areas of Future Work

- Addressing comments related to ConOps v2.0
- UTM ConOps v3.0 in formulation stages
- Continued engagement between NASA and FAA on further development and refinement of the UTM concept and related areas covered through the RTT
- Additional areas of work and testing opportunities in discussion
Three use case packages and two formal concept of operations were published that defined the concept and laid the foundations for subsequent progress in the UTM domain.

CWG involvement in NASA and FAA testing ensured concept elements were explored and helped frame the targeted technical testing in other working group areas.

The work of CWG and its collaborative nature resulted in the development of strong working relationships across multiple teams and the open exchange of information and ideas that will continue to drive the UTM concept from its humble beginnings to the vision of its promising future reality.