CORUS-XUAM

CONCEPT OF OPERATIONS FOR EUROPEAN U-SPACE SERVICES - EXTENSION FOR URBAN AIR MOBILITY

Karolin Schweiger, German Aerospace Center (DLR)
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Agenda

DLR Institute of Flight Guidance

CORUS-XUAM
A two-year project encompassing very large-scale Europe-wide urban air mobility demonstrations and the definition of the concept of operations
DLR is the Federal Republic of Germany’s research centre for aeronautics and space. We conduct research and development activities in the fields of aeronautics, space, energy, transport, security and digitalization.

The DLR Institute of Flight Guidance in Braunschweig, Germany, is working on the development and application of future processes and technologies for the integrated airborne and ground-based guidance of aircraft, including unmanned aircraft.

Divisions (each ranging from 25 to 50 persons):
Unmanned Aircraft Systems and Urban Air Mobility
Optimised use of airspace for all users

Integration of UAS into controlled airspace

Optimised mission planning and execution

Testing new procedure and concepts

- Current U-space projects: AREA U-space, EUREKA, SAFIR-Ready, etc.
- **Institute of Flight Guidance - Unmanned Aircraft Systems (dlr.de)**
Progress from U-space Blueprint to ConOps Edition 3 to 4

2017

2019

2023
Update of the U-space concept of operations
addressing the integration of UAM/UAS operations into the airspace

Six large-scale live demonstrations
in Belgium, France, Germany and the UK, Italy, Spain and Sweden

Focus on different types of mission
such as passenger transport, delivery, emergency response and surveillance

Consider coordination between ATC and U-space
including interaction with air traffic controllers and pilots

Combine flights by eVTOLs with other traffic
and operations in the CTRs of major airports

Demonstrate vertiport procedures
as well as separation, and data services
Who and What is U-space?

U-space stakeholders

- Aeronautical Information Service Provider
- Supplemental Data Service Provider
- Common Information Service Provider
- Airspace user (other than UAS)
- General public
- Air Traffic Service Provider
- Vertiport operator (And Cargo - hub operator)
- Aerodrome operator (Airfield /Airport, Civilians / Military)
- Competent Authority and local and spec. authorities
- CNS Service Providers
- Authority Safety and Emergency responder
- UAS operator
- UAM operator
- UAS delivery clients
- UAM passenger
- UAS manufacturer
U-space Concept of Operations Edition 4

U-space evolution eras

- Before 2023: the foundation of U-space
- 2023-2030: Initial U-space implementation
- From 2030: General U-space
- Advanced U-space
- Full U-space Integration
What's new?

U-space Concept of Operations Edition 4

U-space Services
- Identification and Tracking
  - Registration
  - Network Identification
  - Surveillance Data Exchange
  - Tracking
  - Vertical Conversion
- Airspace Management
  - Drone Aeronautical Information Management
  - Common Information
  - Geo-awareness
  - Geofence Information Exchange
- Mission Management
  - Flight Authorisation
  - U-plan processing
  - Dynamic Capacity Management
  - Vertiport Availability
- Conflict Management
  - Strategic Conflict Detection
  - Strategic Conflict Resolution
  - Tactical Conflict Detection
  - Tactical Conflict Resolution
- Emergency Management
  - Emergency Management
  - Incident/Accident reporting
  - Citizen Reporting service
- Monitoring
  - Conformance Monitoring
  - Traffic Information
  - Vertical Alert & Info
- Environmental data
  - Weather Information
  - Geospatial Information service
  - Population density map
  - Electromagnetic interference information
  - Communication Coverage Information
- Interface with ATC
  - Procedural Interface with ATC
  - Collaborative Interface with ATC
  - Tactical Operational Message Info Exch

U-levels:
- U1
- U2
- U3

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What's new?

U-plan

- Different tasks in different phases
  - Pre-defined U-plan states: authorisation, activation, termination
  - Strategic and tactical conflict detection, prediction and resolution
  - Vertiports play important part in U-plan

- 4D Trajectories/Volumes

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What’s new?

Vertiports

- Important part of the U-plan and its lifecycle
- Real-time tracking of vertiport availability and capacity constraints
- Selection of alternate vertiports
- Vertiport Traffic Zone (V-TZ)
Proposal of a dedicated set of flight rules uniquely applicable for users of U-space services in U-space airspace

„The principle behind UFR is to enable aircraft operations that cannot conform to VFR, SVFR or IFR in all operational conditions”

Standardized U-space equipment, interfaces and protocols

Aircraft operating under UFR are not expected to receive voice communications from ATS units

*Low maturity
Open Questions at ConOps Level

- Fairness in conflict resolution & demand capacity balancing
  - What does fair mean?
  - Can cost be part of a fairness mechanism?
  - Where else should cost be discussed?

- Human factors
  - Crewed vs. uncrewed operations
  - How does that impact the design of tactical processes?

- Flight rules
- Responsibilities
- Detect and Avoid
  - Independent safety net or part of U-space

- How does weather impact strategic and tactical decision making processes
Points of Contact

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THANK YOU!

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