



The Scope of U-space

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AIRBUS



Paris in 2035

Airbus Blueprint

2035

80 ----- 156

Commercial Aircraft

0 ----- 2,500

UAM

0 ----- 16,667

Delivery Drones

1 ----- 58

Inspection Drones

12 ----- 44

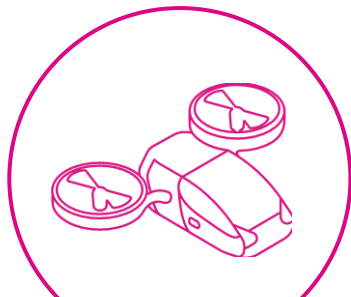
Hobby Drones

Our Airspace is Changing



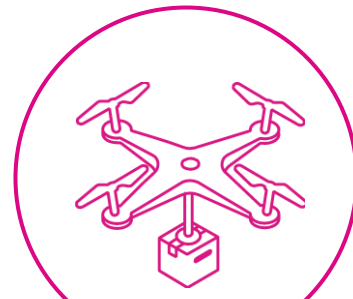
1 Million

of drones registered in 2017*



180

of new electric aircraft



Now

Parcel deliveries, UAM passenger flights

*in U.S.

More Aircraft

New Aircraft

New Operations

In order to support growth, a more modernized and scalable approach to air traffic control is needed.

Unmanned Traffic Management

An end-to-end solution from the vehicle perspective



Planning

- Weather
- Flight Planning



Take Off

- Takeoff Clearance
- Surveillance



Inflight

- Dynamic Rerouting for emergencies
- Separation Services



Landing

- Terrain and Obstacle Data
- Infrastructure status



Post-Flight

- Safety Analysis
- Compliance & conformance checks

U-space Will Support a Range of Aircraft and use cases

HIGH ALTITUDE

COMMERCIAL AIRCRAFT

GOVERNMENT AND MILITARY

GENERAL AVIATION

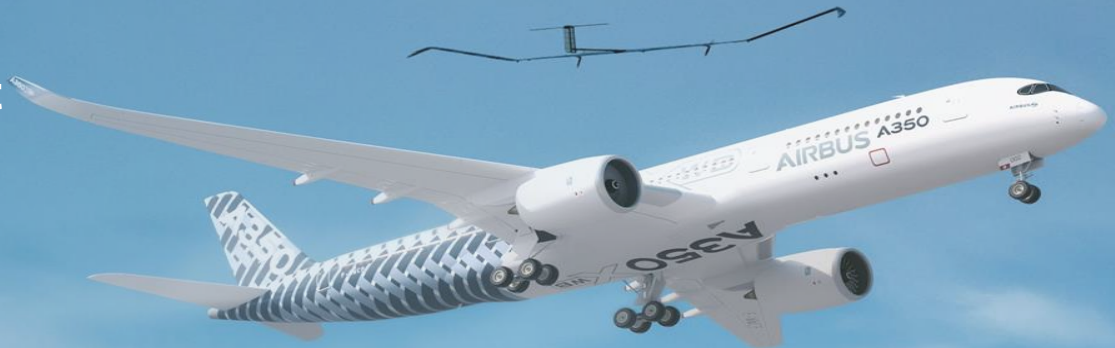
HELICOPTERS

TRANSPORT

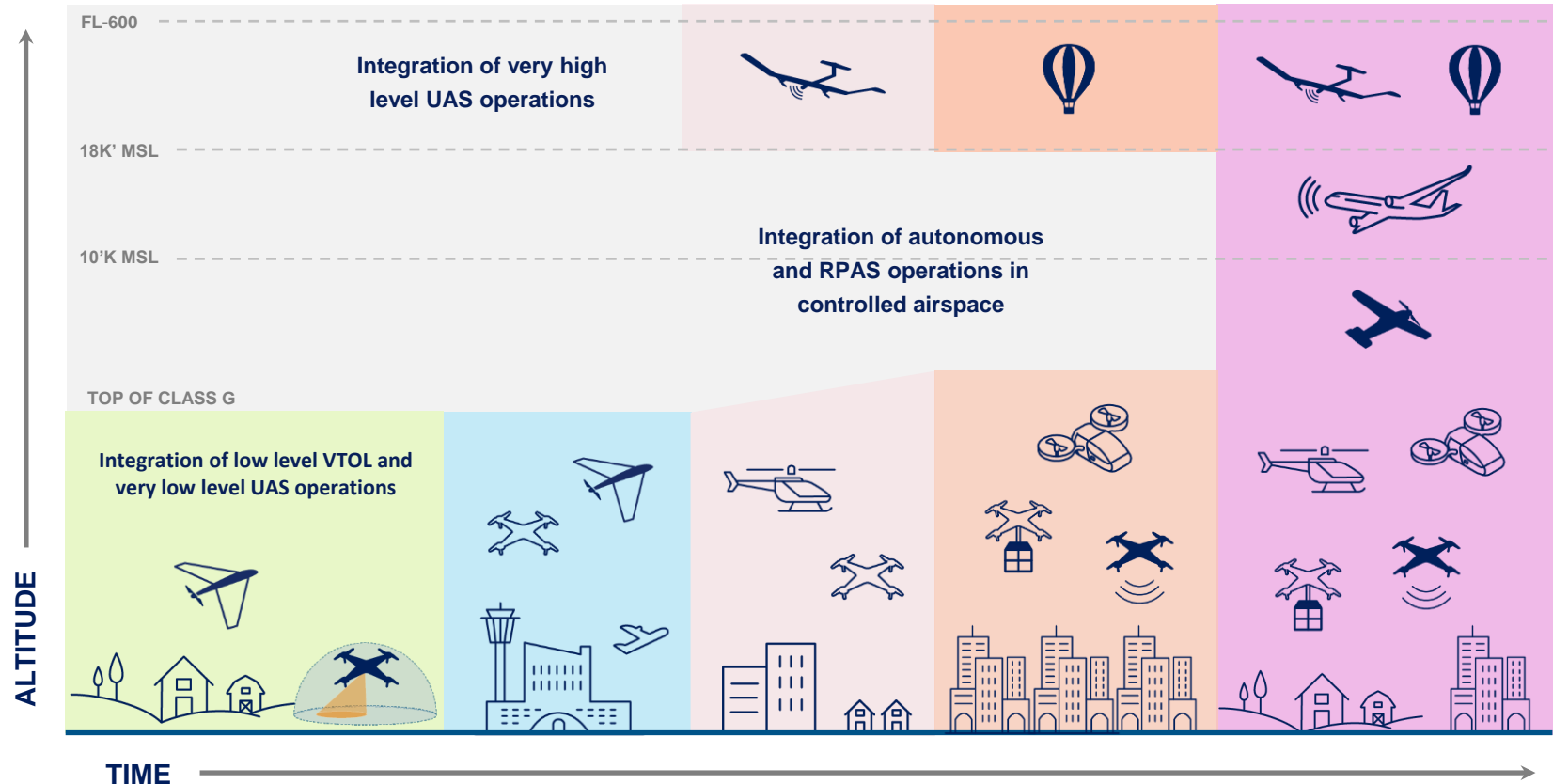
DELIVERIES

IMAGING AND ANALYTICS

HOBBY DRONES



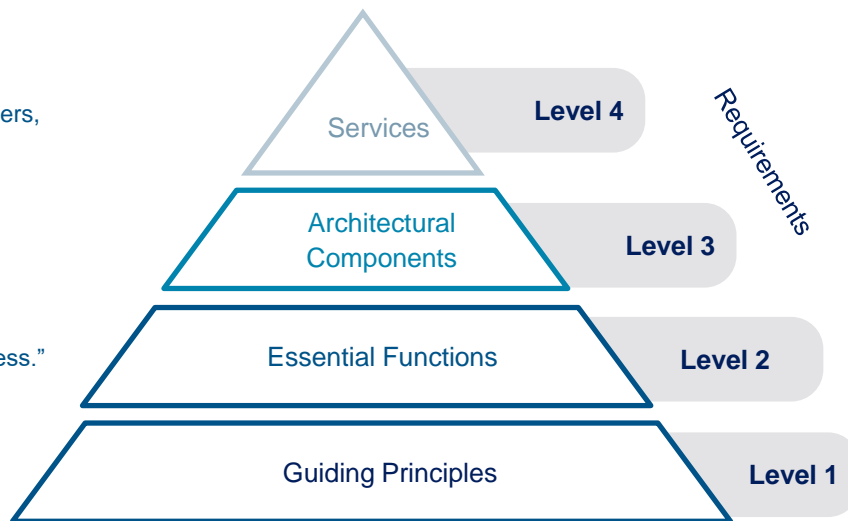
Enabling New Autonomous & Digital Operations In a Fully Integrated Sky



Overarching Guiding Design Principles

Principles are designed to enable open and scalable solutions, while making safety paramount and ensuring there are mechanisms for enforcing fairness in a secure and reliable ecosystem.

- **Scalable.** Support high numbers, varieties, and densities of operations.
- **Interoperable and Compatible** operations involving multiple stakeholders, providers, implementations and jurisdictions.
- **Reliable.** Reliable and available for safe operation at scale.
- **Secure.** High-assurance development, authorization and authentication, and defense-in-depth mechanisms
- **Open architecture.** Design meets normal criteria for architectural “openness.”
- **Future-proof.** Support vehicles, missions, and systems in all environments and airspaces — including future, unforeseen uses.
- **Risk-Aware.** Manage safety and failure risks.
- **Fair.** Ensures that availability and access to airspace takes into account the needs of all stakeholders.



Defining Fairness

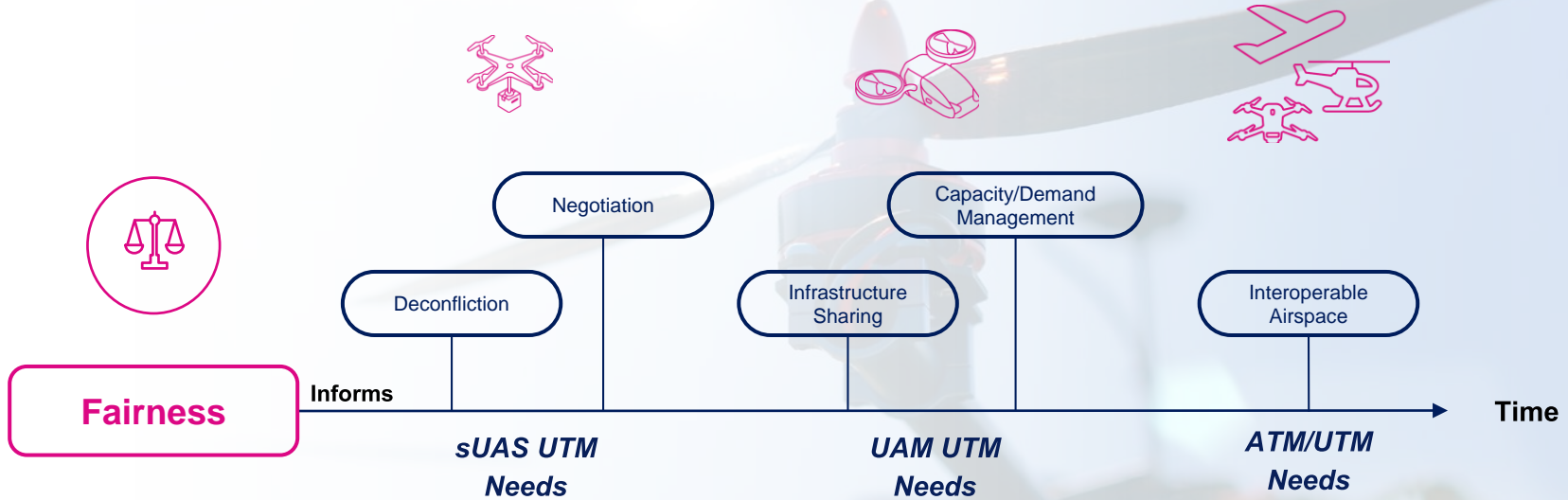


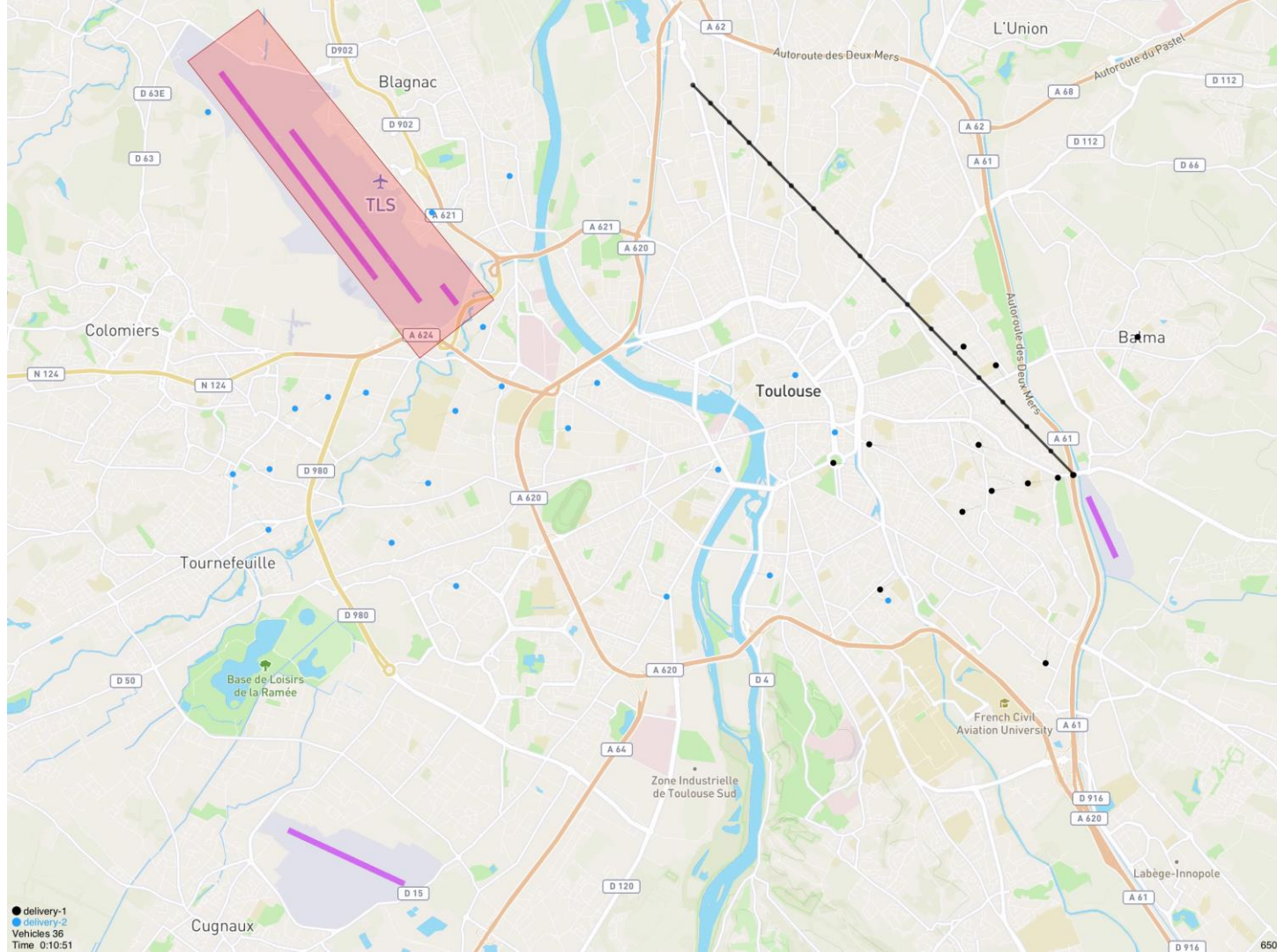
Fairness is the state in which each stakeholder's welfare is increased to the extent possible, given limited resources, after taking proper account of disparate claims and individual circumstances.¹

- ICAO's UTM Framework: "access to the airspace should remain equitable"
- SESAR U-Space ConOps: "guarantee equitable and fair access to airspace for all users"
- FAA UTM ConOps: "maintain fair and equitable access to airspace"

1. Metron Aviation, "Equitable Allocation of Limited Resources", Technical Report, 2004.

Why should it matter?





Thank You

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Digital European Sky -> Digital Global Sky

Submitted to ICAO:

- States should implement authoritative and validated digital data sources for UTM providers and UAS operators;
- States need to ensure alignment of risk profiles between manned and unmanned aircraft operating in shared airspace;
- States should use / require a common risk assessment methodology for UAS operations and UTM operations within their airspace.
- CNS performance requirements for UAS / UTM will, in theory, need to be compatible with ATM operations

E-identification service



1. The identification shall include at least make, model, serial number and registration number
2. The identification service shall provision levels of access based on the credentials of the user.
3. The identification service shall correlate identification and tracking information (vehicle location, altitude, and time) gathered by the tracking service.
4. The tracking information shall include the vehicle location, altitude, vehicle registration, and time.
5. All correlated identification information shall be retained for a period of not less than 90 days.

Geo-awareness service



1. The geometry of all airspace with special access rules for UAS shall be provided to the operator or other applicable U-Space services
2. Any valid times or special airspace rules shall be provided with the airspace geometries.
3. All airspace information shall include a date of update or a version number
4. Authority to update or add to the geofence map shall be limited to Authorities and Privileged Users, as defined in the U-Space Architecture Principles
5. The geofence map shall include its time of update and/or a valid time.
6. Terrain data shall use the WGS 84 datum.

Traffic information service



Note: There needs to be a standard altitude reference (AGL, WGS84, or MSL) and conversion to minimize confusion between data sources. Manned aircraft track altitude are typically provided in baro-compensated MSL, whereas UAS telemetry are provided in AGL or WGS84 altitude, and occasionally MSL. It is important that the traffic information service provide altitude based on a common reference. This may require a conversion between AGL, WGS84, and MSL (both compensated and uncompensated for barometric pressure).

1. The traffic information service shall include available position reports of cooperative and non-cooperative correlated manned aircraft in the region of UAS operation.
2. The traffic information service shall include available position reports of UAS that are input from the tracking service
3. Position reports shall be expressed as floating decimal latitude and longitude, altitude (see above note), and time of report.
4. The traffic information shall be updated at a frequency that has been determined adequate for safety.
5. Traffic alerts shall be given to an operator if any manned aircraft are observed within a prespecified radius and altitude to the location of the UAS operation.

Weather service



1. The weather information shall include, at a minimum, wind direction and speed, including gusts; the height of the lowest broken or overcast layer in hundreds of feet above ground level (AGL); visibility in statute miles; temperature, and indicators of convective activity and precipitation.
2. The weather information shall be sufficiently reliable to support operational decision making
3. The weather information shall include the location and time of the observation, or the valid times and locations of the forecast

Flight authorisation service



1. The airspace authorization service must be able to automatically resolve requests.
2. The service shall use an airspace access map maintained and updated by the competent authority or air navigation service provider.
3. The airspace authorization service shall check the request against airspace restrictions and limitations as exposed by the Geo-awareness service.
4. The airspace authorization service shall ensure appropriate communication and coordination to maintain safety in the airspace.



Aerial view of a city with a prominent blue skyscraper. White lines connect various points across the city, including a point on the skyscraper's roof and a point in a pink circle in the bottom left. The lines are a mix of solid and dashed.

Airbus UTM

Defining Future Skies

