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Thematic Area 3:
Airspace User Operations Mid-Term Horizon

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CORUS five 3nd Workshop

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Airspace User Operations / Mid-Term

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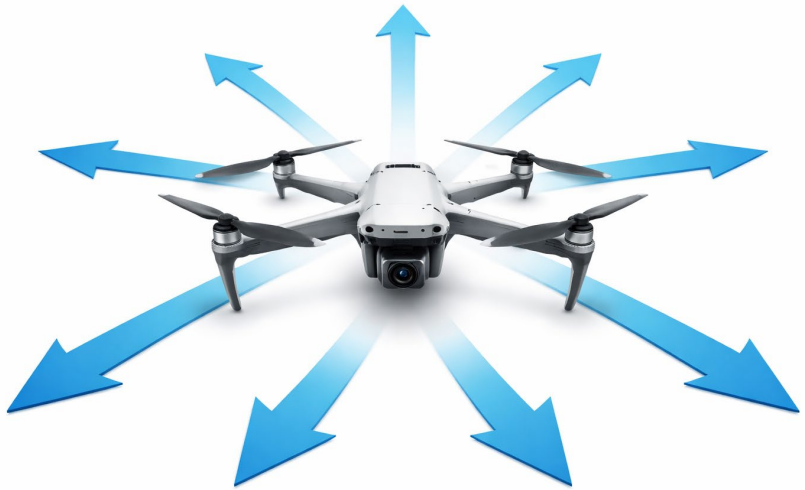
Operator Preferences in U-plans

Tactical Traffic Conflict Awareness



Overlaps and Risk in Approved U-Plans

UAS Contingencies in U-space

Acceptable Overlaps in Approved U-Plans

Limitations of Volume-Based U-plans

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Operator Preferences in U-plans

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- U-plans should allow operators to **declare operational preferences**.
- These preferences communicate:

  1. **Temporal Preferences**
  2. **Geographical Preferences**

- Balance operator needs with airspace availability.

- **Questions:**

  1. What kind of preferences should operators be able to declare?
  2. How should time vs. location preferences be prioritised?
  3. How much flexibility should the system allow?

Overlaps and Risk in Approved U-Plans

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- U-plans could be approved with **limited overlaps** during strategic planning.
- Some conflicts are driven mainly by take-off and early trajectory uncertainty.
- **After take-off:**
  - Uncertainty is reduced
  - Some predicted conflicts may no longer materialise
- **Benefits:**
  - Improved airspace utilisation
  - Higher U-Plan approval rates, especially under high demand
- **Implication:**
  - Full separation cannot rely only on pre-flight deconfliction.
  - Requires post-take-off monitoring and conflict management to resolve residual conflicts if they persist.

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Overlaps and Risk in Approved U-Plans

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- **Questions: Accepting Overlaps for Efficiency**
  - Should we allow overlaps in approved U-plans?
  - Under what conditions are overlaps acceptable?
  - Is early uncertainty a good reason to allow overlaps?
  - Who should manage conflicts after take-off?

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Acceptable Overlaps in Approved U-Plans

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- If strategic approval **allows limited overlap between U-Plans**, clear criteria are required to determine which overlaps are acceptable. The goal is to distinguish between:
  - Operationally harmless overlaps
  - Overlaps creating a credible risk of conflict
- Overlaps affecting **external protection** volumes may be acceptable if:
  - Margins are small
  - Exposure time is limited
- Overlaps affecting **internal protection** volumes remain unacceptable.
- **Temporal factors**:
  - Short-duration overlaps driven by timing uncertainty may be tolerable.
  - Persistent overlaps over significant portions of the operation should not be allowed.

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Acceptable Overlaps in Approved U-Plans

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- **Questions: What is “Safe Enough”?**
  - How do we define an acceptable overlap?
  - What factors matter most: time, distance, or predictability?
  - Should short overlaps always be allowed?
  - Where do we draw the line for safety?

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Limitations of Volume-Based U-plans

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- U-Plans are currently defined as **4D volumes** (geographical area + time interval).
- This representation indicates where and when airspace will be used, but it does not describe how the aircraft will fly within that space.
- **From the perspective of a volume this is treated exactly the same:**
  - An aircraft flying along a structured path with predictable timing.
  - An aircraft operating freely within the same area.
- **However, operationally these situations are very different:**
  - Structured trajectories use space sequentially and predictably.
  - Free-flight operations use space in a distributed and less predictable way.
- **The current model treats both cases as equivalent, leading to conservative assumptions and inefficient airspace allocation.**

Limitations of Volume-Based U-plans

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- **Questions: Is the Current Model Good Enough?**
  - What are the limitations of volume-based U-plans?
  - Should we move toward more trajectory-based models?
  - Is predictability more important than flexibility?
  - How should different flight styles be handled?

Tactical Traffic Conflict Awareness

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- If **tactical conflicts** may occur during execution, **operators must receive information** about nearby traffic to understand and manage the situation.
  - **Minimum information**: Traffic State Vector (Position, Velocity and Acceleration).
  - This allows ground or onboard systems to detect conflicts and analyse separation trends.
- State information alone does not indicate whether the aircraft:
  - Is following its authorised plan.
  - May have changed its expected behaviour.
- Adding **traffic status** may improve awareness?
  - Trajectory intent.
  - Conforming with the authorised U-Plan / non-conforming / contingency.
  - Emergency operation.
- Status information helps **assess predictability** and **risk level** of the conflicting traffic.

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Tactical Traffic Conflict Awareness

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- **Questions: What Information Do Operators Need?**
  - What traffic information is essential for safe operations?
  - Is position data enough, or do we need more context?
  - Should operators know intent and status of others?
  - How much information is too much?

UAS Contingencies in U-space

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- When a UAS experiences a **contingency**, it may need to:
  - Perform immediate landing / Divert to an alternate landing site / Return to home.
- These actions **deviate from the approved U-plan**, meaning the assumptions used during strategic deconfliction no longer apply.
  - ➡ This introduces additional risk to other operators in the airspace.
- Operators must **immediately inform the USSP** when a contingency occurs, including:
  - Type of operational impact.
  - Intended reaction (landing, diversion, return).
- This information **allows the USSP** to:
  - Assess the scale of disruption.
  - Inform nearby operators.
  - Support tactical conflict management.

UAS Contingencies in U-space

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- **Questions: Handling the Unexpected**
  - How should contingencies be handled in U-space?
  - What information must be shared immediately?
  - Who should be informed first?
  - How do we minimise disruption to others?

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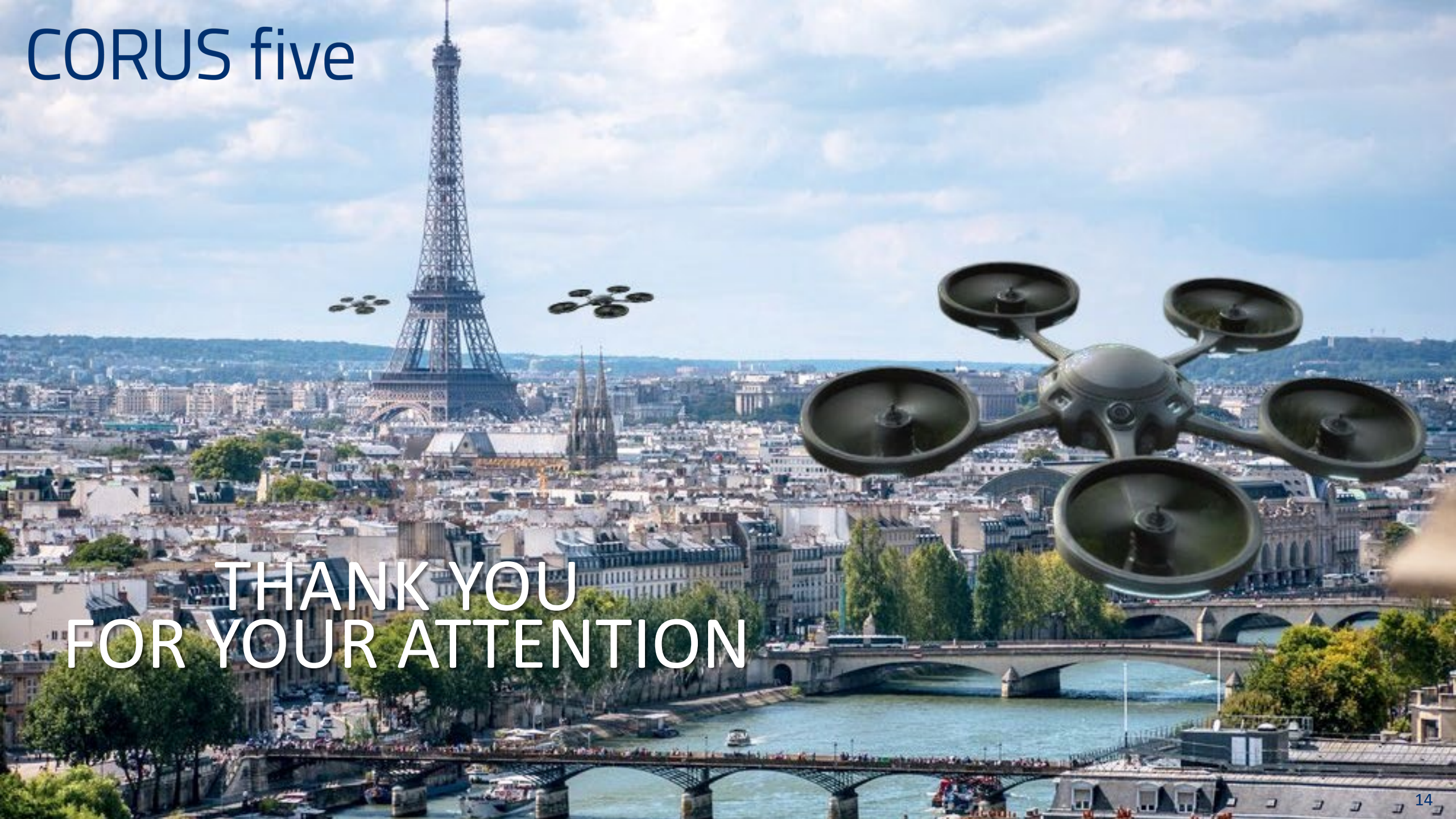

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