EASA
European Union Aviation Safety Agency

WORKSHOP

NPA 2021-14

Draft AMC/GM to support the U-space regulatory framework

Online workshop 15.02.2022

An Agency of the European Union

Welcome

Maria ALGAR RUIZ
EASA Drones Programme Manager

→ NPA published 16.12.2021

→ *public consultation closes 15.03.2022*

→ Objective of this workshop

→ Management of the presentation and agenda

→ Management of the questions (use chat only)

→ Presentation will be available on the website

Outline

10:00 - 10:20	**WELCOME, INTRODUCTION AND SCOPE** Maria ALGAR RUIZ, EASA Drones programme manager, EASA
10:20 - 10:30	**NPA 2021-14: GENERAL OVERVIEW** Ken ENGELSTAD, Drones project manager, EASA
10:30 - 10:50	**Airspace risk assessment** Elina MILLERE, UAS expert, EUROCONTROL
10:50 - 11:10	**Dynamic airspace reconfiguration (Reg. 2021/665 - amendment to ATM/ANS rules)** Alberto IOVINO, Head Operational Support, ENAV
11:10 - 11:30	**U-space service: Network identification** Benoit CURDY, Head of Section - Strategy and Innovation, FOCA
11:30 - 11:50	**U-space service: Geo-awareness** Benoit CURDY, Head of Section - Strategy and Innovation, FOCA
11:50 - 12:10	**U-space service: UAS flight authorisation** Andrew HATELY, UTM Concept Expert, EUROCONTROL
12:10 - 12:30	**U-space service: Traffic information** Kai LOTHAR JOHN, Chief Engineer Urban ATM Systems, GLVI
12:30 – 13:30	**LUNCH BREAK**
13:30 - 13:40	**U-space service: Weather information** Ken ENGELSTAD, EASA
13:40 – 13:50	**U-space service: Conformance monitoring** Kai LOTHAR JOHN, Chief Engineer Urban ATM Systems, GLVI
13:50 – 14:10	**Common Information Service (CIS)** Angela KIES, Head Unmanned Aircraft Systems, DFS
14:10 – 14:30	**U-space service providers** Jonas STJERNBERG, Senior Vice President, Robots.expert, Finland
14:30 – 14:50	**Coordination with local authorities** Vassilis AGOURIDAS, Head of EU Public Co-Creation & Ecosystem Outreach, AIRBUS Urban Mobility
14:50 – 15:10	**Certification scheme** Ken ENGELSTAD, EASA
15:10 – 15:25	**BREAK**
15:25 – 15:40	**UAS operators** Ken ENGELSTAD, EASA
15:40 – 16:10	**e-conspicuity (Reg. 2021/666 – amendment to SERA))** Vladimir FOLTIN, PCM/ATM expert, EASA
16:10 – 16:30	**CONCLUSIONS** Maria ALGAR RUIZ, EASA

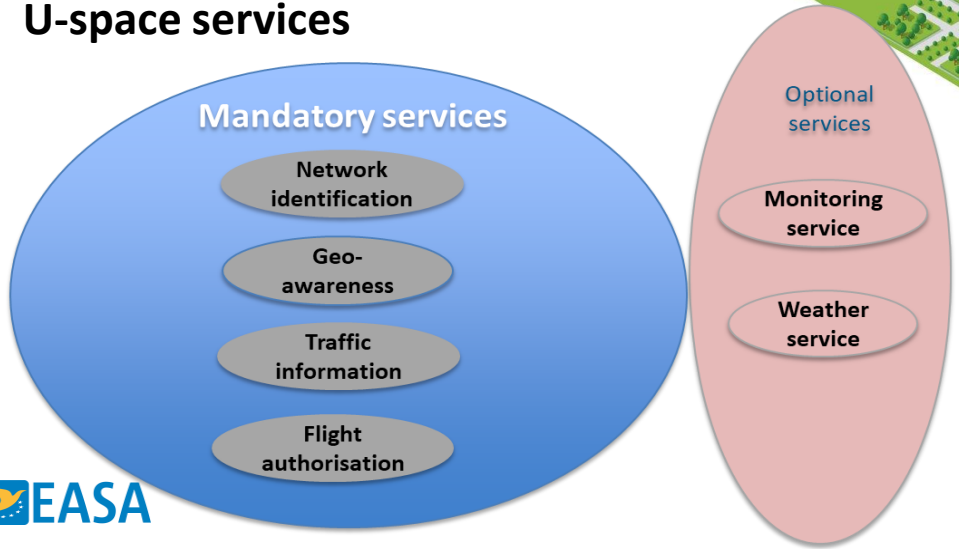
Introduction and scope: why U-space

- Safe drone integration into U-space airspace
- Fulfilling EU strategic priorities on sustainable and smart mobility
- Fulfilling EASA safety and efficiency priorities
- Enabling more complex operations BVLOS and IAM/UAM
- Clarifying roles and responsibilities of ATM/U-space and piloted versus UAS

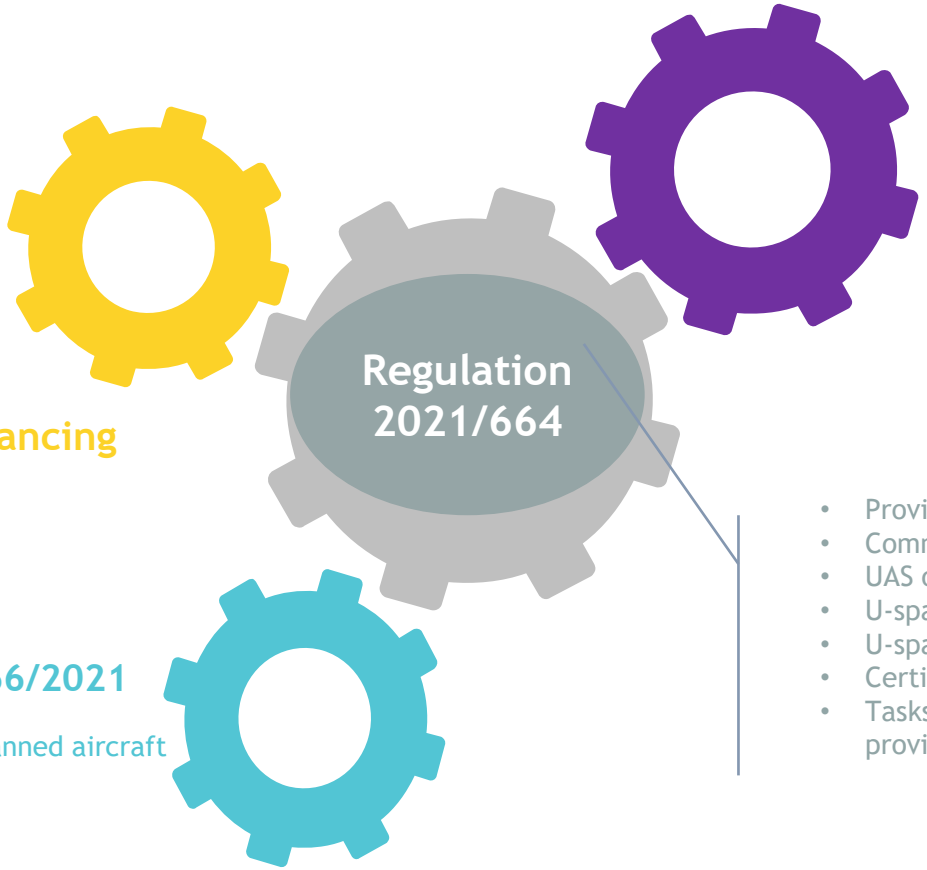
U-space concept

U-space airspace where some services are provided.

U-space services



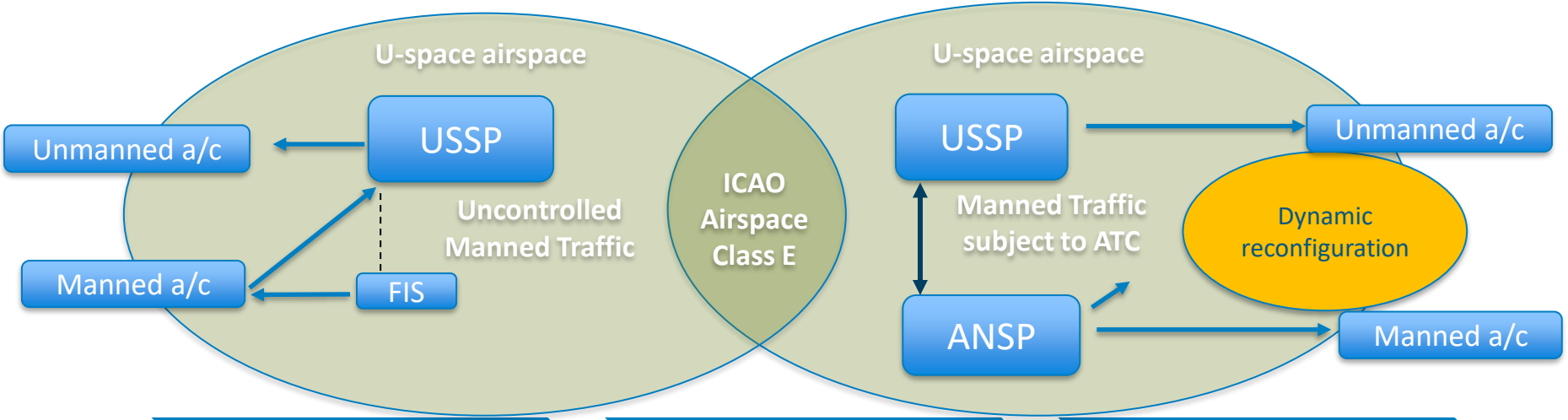
U-space – Regulatory framework



How is safety managed in U-space airspace?

What are mitigation means in regulation?

MS designate the U-space airspace based on risk assessment → safety performance need to be assessed and defined



Strategic mitigation layer:

U-space airspace is designated on the basis of risk assessment

Pre-tactical mitigation layer:

- Static geo-awareness information
- Flight authorisation

Tactical mitigation layer:

- Dynamic geo-awareness information , - Dynamic airspace reconfigurations
- Traffic information, conformance monitoring

Scope and applicability

In scope: operators, USSP, CIS providers

Outside scope: model a/c, open cat A1, UAS IFR

Regulation applicability is not limited to 500 ft

IR

- Cooperation with MIL highlighted
- Explain the UAS operations outside scope

Q to stakeholders on the scope and applicability of EASA Decision with all AMC/GM

GM

NPA 2021-14 General overview

Ken Engelstad
U-space project manager

European Union Aviation Safety Agency

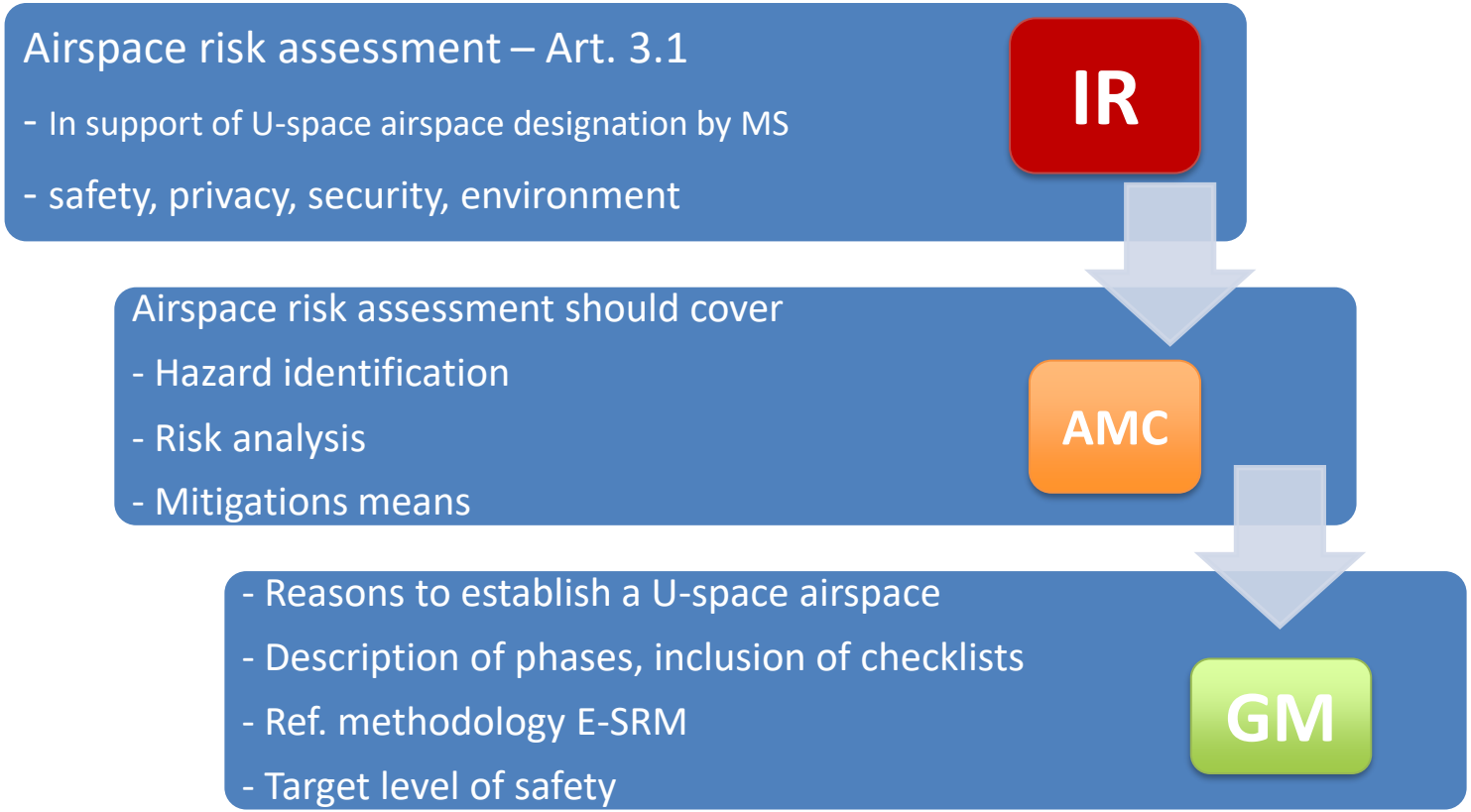
Notice of Proposed Amendment 2021-14

in accordance with
Articles 6(3), 7 and 8 ('Standard procedure': public consultation) of MB Decision No 18-2015

Development of acceptable means of compliance and guidance material to support the U-space regulation

RMT.0230 – Subtask B

U-space airspace



U-space airspace - AMC 1

- Airspace risk assessment shall cover as a minimum:
  - Hazard identification
  - Risk analysis
  - Mitigation measures
- Any new changes affecting initial airspace risk assessment require additional assessment
- Airspace risk assessment should consider coordination mechanism in article 18 (f)

GM1 Reasons for establishment of U-space airspace

→ Safety

e.g. high UAS density, need to organise UAS traffic, ground risk

→ Security

e.g. support enforcement of local rules such as limiting flights above sensitive sites

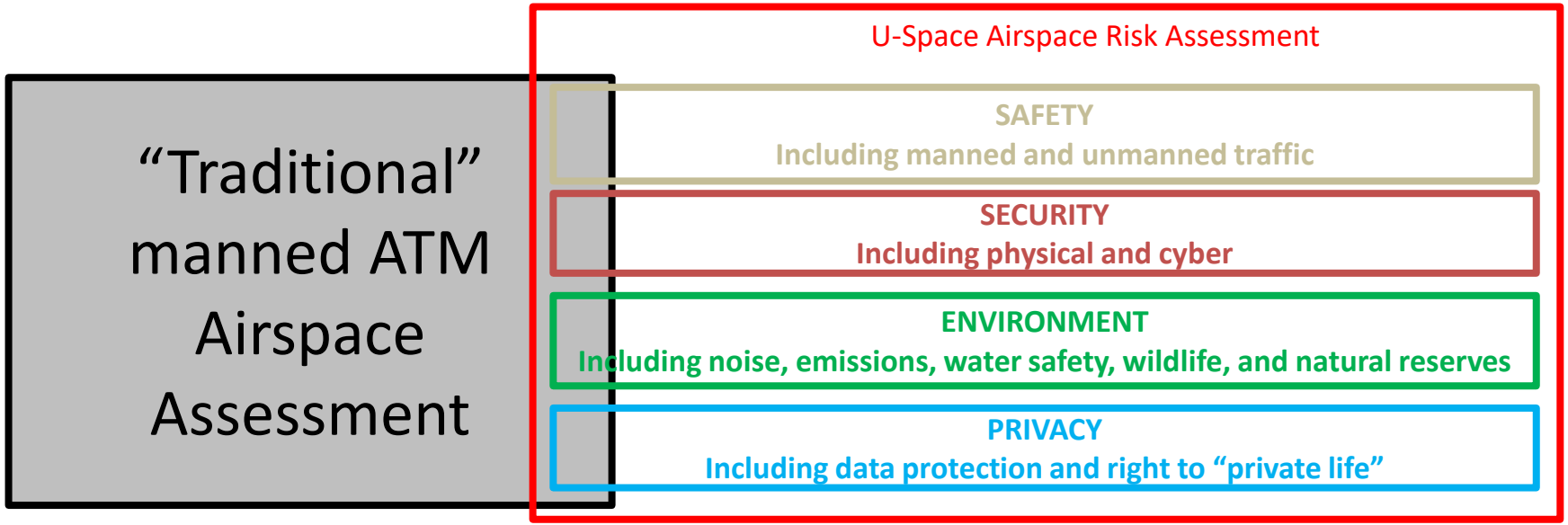
→ Privacy

e.g. support enforcement of particular conditions for certain types of UAS operation

→ Environment

e.g. define environmental requirements, limit traffic density to an acceptable level of disturbance above sensitive sites

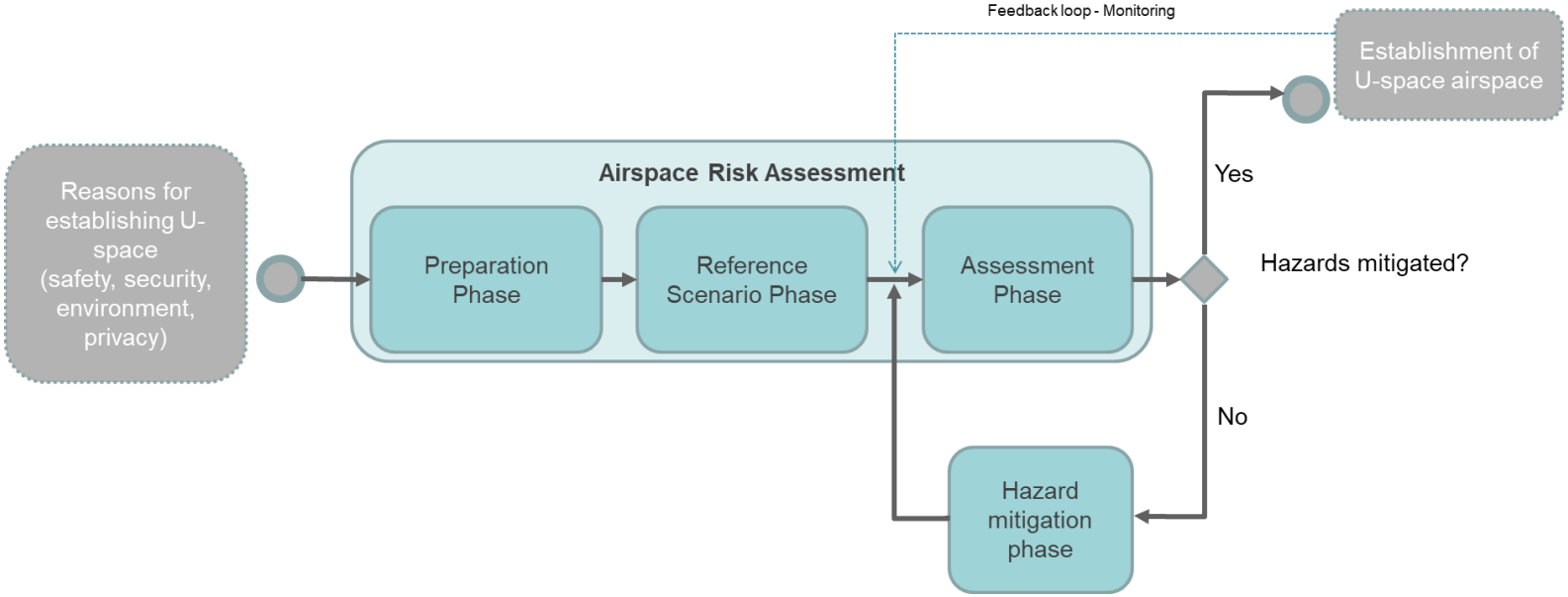
ATM vs U-space Assessments



→ Frequency of airspace assessments

- → With evolution of operational, regulatory, or technology deployment context
  - → Incident/accident reports, traffic density, new procedures, new stakeholders, etc.
- → As with "traditional" airspace assessments!

U-space airspace designation process



U-space airspace - Safety + Security, Privacy, Environment

- Preparation phase
  - Assemble team
  - Identify stakeholders
    - National, aviation, non-aviation
  - Define scope
  - Scope regulatory environment
  - Assumptions and constraints

U-space airspace - Safety + Security, Privacy, Environment

- → Reference scenario phase
  - → Analysis of the studied airspace before U-space implementation
  - → Provides baseline for safety case
    - → Ensure safety and performance criteria are met
    - → Ensure assumptions and enablers are consistent with the current airspace design
      - → qualitative analysis (quantitative tools if available)
  - → Data collection
    - → Common data format
  - → Conduct interviews with identified stakeholders
  - → Assess ground infrastructure,
  - → Identify technical support infrastructure

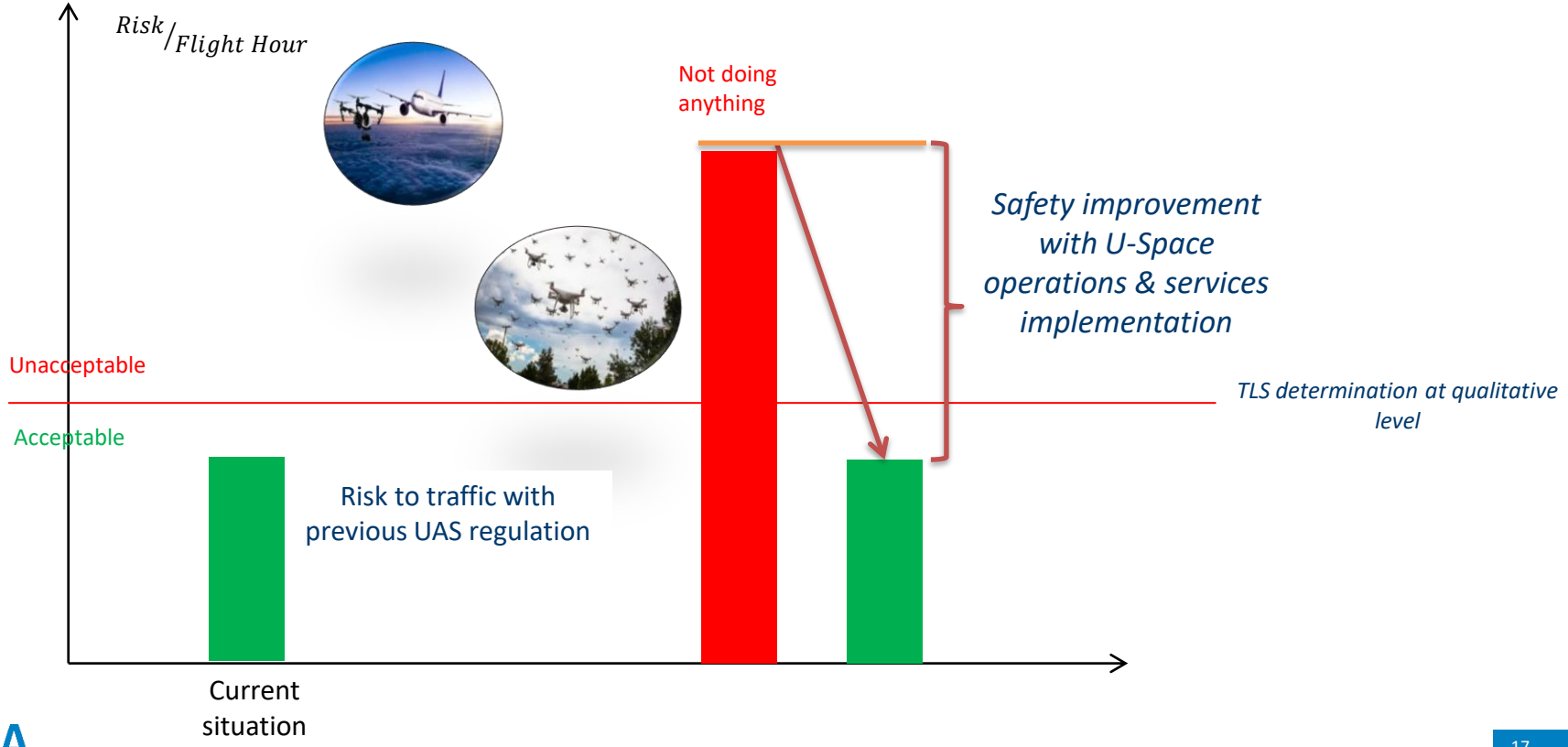
U-space airspace - Safety + Security, Privacy, Environment

→Assessment phase

- → Various risk assessment methods available to be considered and combined to assess risk(e.g. SORA, E-SRM)
- → The following elements need to be incorporated
  - →Description of operational environment
  - →Pre-existing Hazards
  - →Safety criteria determination
  - →Safety objectives → at operational level

- → Target level of safety (TLS)
  - →specific to the U-space being assessed

U-space airspace - Safety – TLS determination



U-space airspace - Safety + Security, Privacy, Environment

- Security
  - Cyber security
  - Physical security
- Privacy
  - Regulation (EU) 2016/679 (the General Data Protection Regulation (GDPR))
  - In addition to “personal data”, a privacy risk assessment should ensure the security of third-party commercial data (not covered by GDPR)
- Environmental
  - Noise
  - Protection of wildlife and the natural environment

U-space airspace - Safety + Security, Privacy, Environment

- → Use cases
  - → Simulations of real scenarios
  - → Risk assessment considering use cases to consolidate initial objectives
    - → Provides operational parameters for Air-Risk Classes and Ground-Risk Classes (ARC and GRC)
    - → Generate definition of safety requirements
  - → Check that requirements satisfy initially set criteria
  - → Criteria for establishing U-space and impacts for safety, security, privacy and environment

- → Enough use-case scenarios to enable satisfactory mitigation for entire U-space
  - → Leading to mitigation measures to be enacted
    - → U-space services, geo-limitations, etc.
  - → Feedback loop for confirmation (or not)

Dynamic airspace reconfiguration

Alberto IOVINO
ENAV

- Activation/deactivation to ensure segregation
- Accommodate short-time changes in manned traffic
- Timely notification

IR

- DAR should be applied only when risk of collision
- Arrangements in place to receive earliest notification
- Timely coordination to notify USSP when DAR

AMC

- General explanation of DAR
- General understanding of the concept
- Operational scenario

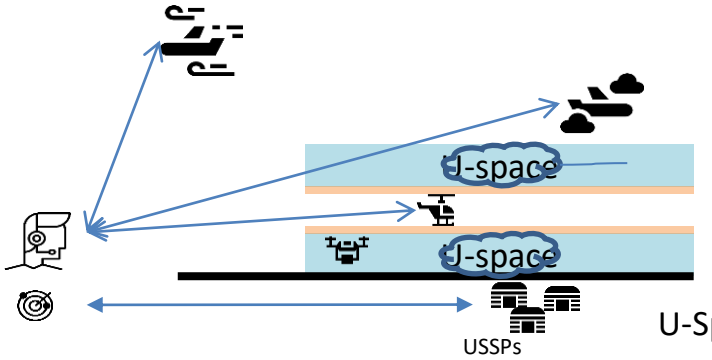
Q to stakeholders to get proposals for the protection buffers with U-space

GM

U-Space (Jan 2023)

Controlled Airspace → ***SEGREGATION***
Manned / Unmanned

Dynamic Airspace
Reconfiguration



U-Space services to UAS

Short-term changes in manned traffic demand

→ Emergency
→ Unexpected traffic demand
→ Short cut
→ Military / State
→ …..

Protection buffers

→ Internal …….. *Or else?*

General – U-space airspace design

→ Mainly UAS
→ Components / Blocks / Grid
→ UAS performance standards / Buffers

Termination of DAR

→ Back to normal

Impact on UAS

→ Forced landing ONLY if risk of collision

CONTINGENCY

Priority

→ Special Operations *manned* / *unmanned*

COORDINATION

Proportionate response

→ Vertical / Lateral / Full

3D MULTI-PHASED

Coordination

→ ATC / USSP ASAP

→ Advance Notice (min 2') *EUROCAE ED-269 Geo-fencing*

→ CIS: Start/End vs. Immediate

→ As far as practicable, sufficient time for UAS to complete/adjust

ANTICIPATE

SAFE

BALANCED APPROACH

Network ID service - mandatory

Benoit CURDY
FOCA

- continuous processing of the remote id of the drone
- Provide the identification to authorised users
- Content of message and updated

IR

- exchange network ID data with other USSP
- COM protocol: F3411-19 Standard Spec for RID and Tracking
- Interface: ASD-STAN4709-002
- Response time to distributing data: Q to stakeholders on latency

AMC

ASTM F3411-19 'Standard Spec for Remote ID and Tracking':

- Testing infrastructure for exchange of data ability
- update frequency
- access interface for authorised users

GM

Geo-awareness service - mandatory

Benoit CURDY
FOCA

- Operational conditions & airspace constraints
- UAS geozones
- Temporary restrictions

IR

- integrity, completeness, availability
- timeliness: based on data's update cycle, no later than applicability dates

AMC

- timeliness: values that may be used
- format: ED-269 (consistent with NPA 2021-09 Geozeones)

GM

UAS flight authorisation service – mandatory

Andrew HATELY
EUROCONTROL

- Flight authorisation for individual flights
- Check request, propose alternative, confirm
- Notify UAS operators when accepted/rejected

IR

- Confirmation of the activation
- Arrangements to identify conflicts of authorisations
- When same priority, time at which the intent is given prevails
- Unique authorisation number should be issued

AMC

- Activation triggers the TIS/network ID
- Time of activation proposed: 5 sec (ASTM F3548-21 'Standard Specification for UAS Service Supplier (USS) Interoperability')

GM

Flight authorisation in 2021/664

- EU regulation 2021/664 describes flight authorisation in:
  - Article 6: Obligations of UAS operators requesting flight authorisation
  - Article 10: Obligations of the U-space Service Providers when processing flight authorisation requests
  - Annex iv: The flight authorisation request
- 2021/664 covers
  - Deconfliction with other flight authorisations
  - Information about which airspaces are penetrated
  - Supporting tactical services such as Conformance Monitoring, Traffic Information
- 2021/664 excludes flight setup processes such as:
  - Specific Operational Risk Assessment and similar
  - Obtaining airspace entry permission – if needed
  - Checking that the operator has his/her paperwork in order

The stages of a flight authorisation

- **Requested**: the operator has sent a flight authorisation request as per Article 6(4) and the USSP is processing it according to Article 10
- **Rejected**: request is either incomplete or incorrect, or is it intersects with at least one other flight of the same or higher priority as described in Article 10 (8)
- **Authorised**: the request is complete, correct and does not intersect.
- **Withdrawn:** A previously authorised flight is no longer authorised
- **Activated**: the flight is just about to start flying, is flying, or has just finished flying, and is following the authorisation.
  - The flight authorisation is retained and used by the USSP as long as it is active
- **Contingent**: the flight is active but is not following the authorisation
- **Ended**: the operator has signalled to the USSP that the flight is over

GM1 to Article 10 – general guidance:

- The Flight Authorisation Service deconflicts plans.
  - It does not include the *operational authorisation* described in Article 12 of Regulation (EU) 2019/947; the specific operational risk assessment and so on.
- A flight authorisation may include moments when the UAS is not flying.
  - A flight authorisation's active period begins with an activation request and ends when the operator declares it terminated. During this period the UAS may touch down
- The flight authorization service may – if needed – coordinate the flight with the relevant Air Navigation Service Provider.
- The flight authorization service may be provided by more than one U-space service provider in a given airspace.
  - In this case the USSP coordinate between each other to detect conflicts

Sending a flight authorisation request

- Article 6(4) obliges a flight authorisation request to be sent
- The flight authorisation request is as Annex iv
- GM1 Annex IV UAS flight authorisation request referred to in Article 6(4)
  - (a) *explains the fields*
  - (b) The 4D trajectory describes a **series of one or more 4D volumes** each with entry and exit times. The operator submits this series of volumes committing to remaining within them. The volumes may overlap to express uncertainty in any dimension; for example, time. The conflict detection process is simply the identification of overlapping 4D volumes.
  - (c) The navigation performance is reflected in the dimensions of the volume. A situation leading to the use of a less precise measurement system — for example, use of barometric height rather than GNSS — should be reflected in a revision of the dimensions to accommodate the corresponding uncertainty (+/- 30m rather than +/- 30cm).

What is *a series of one or more 4D volumes*?

- A 4D volume has
  - Spatial location and dimensions. It can be any shape – it does not have to be a box
  - An entry time and an exit time
- The simplest trajectory is one 4D volume
  - The flight will be in this space during this time.
- What is a series of 4D volumes?
  - The volumes are visited one after the other, the entry times are a sequence
  - The exit time of one volume can be after the entry time of the next.
    - Uncertainty should be expressed by mentioning the earliest possible entry time and the latest possible exit time for each volume.
  - The spatial dimensions should express the uncertainty
  - The 4D volume should contain the flight with 95% confidence – see GM1 to 10(2)(d)
    - The UAS operator knows their flight characteristics better than the USSP
    - The Competent Authority will may check flight authorisation conformance.

Checking the flight authorisation request.

- → Flight authorization requests should be complete and correct: 10(2)(a)
  - → GM1 Article 10(2) UAS flight authorisation service
- → A flight authorization request should not intersect any other. 10(2)(b)
  - → GM1 Article 10(2) UAS flight authorisation service
  - → Intersection is determined by comparing the 4D trajectories
- → USSPs should collaborate to detect and resolve conflicts 10(6)
  - → GM1 Article 10(6) UAS flight authorisation service
- → Flights should be checked against airspace restrictions and limitations 10(7)
  - → AMC1 Article 10(7) UAS flight authorisation service
    - →This check produces a list of restricted / limited airspaces entered by the flight
    - →The operator is obliged to have the relevant permissions
  - → GM1 Article 10 (7) UAS flight authorisation service

Checking the flight authorisation request: intersection

- → *In case of intersection:*
- → A flight performing special operations has priority over any not 10(8)
  - → GM1 Article 10(8) UAS flight authorisation service

- → Among two flight of the same priority, authorization request filed earlier shall take precedence over any coming later 10(9)
  - → AMC1 Article 10(9) UAS flight authorisation service, order of processing
  - → GM1 Article 10(9) UAS flight authorisation service, priority
    - →About time references when comparing authorization requests

Rejection 10(2)c

- AMC1 Article 10(2)(c) UAS flight authorisation service
- REASON FOR REJECTION OF A UAS FLIGHT AUTHORISATION
  - A USSP rejecting a UAS flight authorisation request should indicate the reason for the rejection.

- It is expected that the UAS operator will modify the authorization request and retry.
- The rejection information should assist this process.
  - For example the rejection should clearly indicate the time and place of any conflict.

Authorisation 10(1), 10(2)

- → The USSP should notify the operator 10(2)(c)
- → Sending the **Terms and Conditions** applicable to the flight 10(1)
- → And the **Deviation Thresholds** 10(2)(d)
- → AMC1 Article 10(1) UAS flight authorisation service:
  - → Requires that Rejections, Authorisations, T&C should be recorded by the USSP
- → Terms and conditions are explained in GM1 Article 10(1) UAS flight authorisation service

- → Deviation thresholds are explained in GM1 to 10(2)(d)
  - → Deviation thresholds are a buffer horizontally / vertically / in time around the authorised trajectory
  - → Set by the authority for the particular airspace in function of the traffic and expected surveillance performance.

Withdrawal of flight authorisation 10(8) and 10(10)

- A flight performing special operations has priority over any flight not performing special operations 10(8)
  - AMC1 Article 10(8) UAS flight authorisation service
    - Explains withdrawl
  - GM1 Article 10(8) UAS flight authorisation service
- A priority flight authorization request arriving after a non-priority flight authorization can cause the non-priority flight to have its authorization **withdrawn**
  - This can happen any time after authorization.
  - The UAS operator whose authorization is withdrawn should be notified as soon as it occurs
  - A final check is made when the UAS operator sends an **activation request**

- More reasons for withdrawal are discussed in GM2 Article 10(10) UAS flight authorisation service

Continuous checking of flight authorisation 10(10)

- After authorisation, the USSP must “continuously check” the authorisation 10(10)
  - AMC1 Article 10(10) UAS flight authorisation service
    - Expresses this need in a way that it can be implemented in discrete events
  - GM1 Article 10(10) UAS flight authorisation service
    - Mentions when the “continuous check” ends
  - GM2 Article 10(10) UAS flight authorisation service
    - Explains how to react to this continuous check, including **withdrawal**
- Aspects of this continuous check 10(10) also apply to flight once activated
  - Discussed shortly

Activation - Articles 6(5) and 10(5)

- The **active** period of the flight is when the tactical services operate
  - Network Identification, Traffic Information, Conformance Monitoring
  - The operator must activate the flight authorization to trigger these services
    - And subsequently terminate the flight to stop them
  - Explained in
    - AMC1 Article 6(5) UAS operators
    - GM1 Article 6(5) UAS operators
- The activation request is the “last moment before flight”
  - Final checks may be triggered by the activation request - See GM2 to 10(5)
  - It is these final checks that could lead to refusal to activate, for example due to a conflict with a priority flight.
- Minimum and maximum time window:
  - Limits from the state (b) drive efficient use of the airspace
  - Limits from the USSP (c) allow for practical implementation

Contingency: Updates to flight authorisations. Articles 6(6), 6(7) and 10(10)

- GM1 Article 6(6) UAS operators
  - *CHANGES TO THE UAS FLIGHT AUTHORISATION*
  - *Changes to the UAS flight authorisation may be derived from updated deviation thresholds.*

- When a flight is confronted with a tactical problem it may deviate from its authorization
  - for example when encountering a manned aircraft known or believed to be in a state of emergency
  - Similarly, Article 6(7) – the UAS operator shall request a new UAS flight authorization
- In the absence of other traffic the USSP may be able to enlarge the deviation thresholds in such cases
- GM2 Article 10(10) UAS flight authorisation service
  - *(b) When a USSP becomes aware of a conflict, it should either provide the UAS operator with an updated UAS flight authorisation to resolve the conflict or withdraw the existing UAS flight authorisation.*

Article 6 – Contingency procedures

- → AMC1 Article 6(8) UAS operators
  - → CONTINGENCY MEASURES AND PROCEDURES
  - → UAS operators should declare the availability of their contingency measures and procedures within the contractual agreement with USSPs.
- → GM1 AMC1 to Article 6(8) UAS operators
  - → CONTINGENCY MEASURES AND PROCEDURES
  - → The contingency measures and procedures may be derived from those specified in point (6)(d) of Appendix 5 to the Annex to Regulation (EU) 2019/947. They may also address the following conditions: …
- → Contingency measures / procedures will not be deconflicted before flight
  - → But may inform tactical processes
    - → for example which flights are considered to be “in proximity” when generating traffic information

Ending a flight

- GM1 Article 10(1) UAS flight authorisation service:

- *(c) A flight which has not ended by the end of its flight authorisation is out of conformance because it is overdue. A flight which remains airborne after the end of its flight authorisation is no longer conflict-free and is a hazard to other flights which are correctly following their flight authorisations.*

- *(d) The USSP is encouraged to make best use of the airspace by immediately discarding any remaining part of a flight authorisation request after that flight is declared 'ended'.*

Traffic information service - mandatory

Kai LOTHAR JOHN
GLVI

Information on:
- any conspicuous air traffic
- other aircraft managed by other USSP/ATSP
- position, time, heading, emergency status

IR

- Adherence to a common secure open traffic information protocol
- Inform operators when degradation of service
- Identify in real-time when traffic in proximity
- Report to UAS operator without undue delay

AMC

- General explanation and objectives of the TIS

GM

Operators of unmanned aircraft, remote pilots

→IR 2021/664: Art.11(4):

- → Upon receiving the traffic information services from the U-space service provider, UAS operators shall take the relevant action to avoid any collision hazard.

→IR 2019/947 ANNEX: UAS.OPEN.060 (2b), UAS.SPEC.060 (3b)

- → The remote pilot shall discontinue the flight,
  if the operation poses a risk to other aircraft, people, animals, environment or property.

Remote pilots

→maintain constant watch for traffic information,

→continuously assess the traffic situation,

→decide whether their operation poses any risk, and

→if so, discontinue that flight.

Proximity example

→Assuming 100 m/s relative speed(*) between a UA and another aircraft, an area of interest ("proximity") of 30 km around a UA gives an UAS operator about 5 min to take relevant action

(*) based on commercially available drone and helicopter

Traffic Information Service Performance

→ Maximum overall latency

- → Cylically, aircraft estimate their own time, position, velocity, etc.
- → this information is eventually received by a USSP,
- → then shared with other USSP,
- → each TIS computes which of their UAS flights are in proximity, and dispatches the information to those UAS operators
- → This information is received by UAS operators, and then presented to RP

temporal error = period of estimation + network latencies + processing latencies

position error = (½ acceleration × temporal error + velocity) × temporal error

U-space service providers

→IR 2021/664 Art. 7(3c) Annex III(A5)

→ […] shall ensure that error reporting, error measurement and corrective action mechanisms are established and maintained

Weather information service - optional

Ken ENGELSTAD

- trusted sources
- up-to-date information
- Reliability

IR

- Authoritative source vs non-authoritative source
- Up-to-date: 30 sec (current) / 5 min (forecast)
- Reliability: provide a confidence level of data

AMC

- Explains ‘authoritative’ and ‘non-authoritative’ sources

GM

Conformance monitoring service - optional

Ken ENGELSTAD

Provides alerts to:

- UAS operators when deviation thresholds violated
- Other USSP, UAS operators, ATSP when deviations detected

IR

- Alerts should be provided 5 sec, 99% of time
- Compliance information should cover the check and indicate that a/c is compliant

AMC

- Explains what is a non-compliant UAS aircraft
- Explains what a non-compliance information would contains

GM

Article 5: Common information service (CIS)

IR

Angela KIES
DFS

Definition

‘common information service’ means a service consisting in the dissemination of static and dynamic data to enable the provision of U-space services for the management of traffic of unmanned aircraft.

List of data and information to be made available by the CIS

- U-space airspace dimension
- UAS & U-space service performance requirements
- operational conditions and airspace constraints
- USSPs, services provided, terms & conditions

- UAS geographical zones relevant, incl. adjacent U-space airspaces
- static and dynamic airspace restrictions
- dynamic airspace reconfiguration data

Organisation

MS may designate a single common information service provider (S-CISP) to supply the common information services on an exclusive basis in all or some of the U-space airspaces under their responsibility.
CIS provided with a common secure interoperable open communication protocol, meeting defined data quality, latency & protection requirements (Annex II & III).

Article 5: Common information service (CIS)

AMC

- Format of airspace information → Reference ED-269 “Minimum operational performance standard for Geofencing”
- Provision & documentation of interfaces to access the CIS
- Timeliness (within 30’’) & availability (> 99% of the time) for CIS provision
- Timeliness of traffic information (latency tbd.; availability > 99% of the time)

GM

- Stakeholder to provide & retrieve information to and from the CIS
- Interoperable format & data model (JSON) for UAS capabilities & performance requirements
- CIS on dynamic airspace restrictions → Reference ED-269 “Minimum operational performance standard for Geofencing”

Article 5: Common information service (CIS)

Additional Requirements from other AMC & GM

Art. 3 U-space airspace

- Provide operational capacity of the S-CISP to MS for U-space airspace designation
- S-CISP as a stakeholder to be involved in airspace risk assessment process

Art. 4 Dynamic airspace reconfiguration

- Publication of temporary U-space airspace restriction → data from ANSP

Art. 7 USSPs

- Interface for information exchange with CIS; Contractual arrangement or LOA with S-CISP tbd.

Art. 9 Geo-awareness service

- USSP informs CIS on detected data quality issues (reference system desirable – tbd.)
- CIS update cycles (static AIRAC; dynamic 30'')

Article 5: Common information service (CIS)

Additional Requirements from other AMC & GM

Art. 10 UAS flight authorization service

- Use of common UTC time for information
- Information on active but withdrawn flight authorization tbd.; general sharing of authorization number tbd.

Art. 11 Traffic information service

- S-CISP role tbd.

Art. 12 Weather information service

- Could be shared via the CIS – tbd.

Art. 14 Application for a certificate

- Relevant for S-CISP

U-space service providers

Jonas STJERNBERG
Robots.expert

- Provide U-space services to operators
- Coordinate and exchange data with ATSP
- Exchange data/information between USSP

IR

- Exchange machine readable data only
- **EUROCONTROL SWIM TI Yellow Profile between USSP's and between USSP and ATSP (Annex V)**
- Service descriptions between USSP's and between USSP and ATSP to be publicly available and adhere to SWIM SD except for some AIRM requirements
- Content of contract with ATSP

AMC

U-space service providers

- Needs to have capability to provide the four mandatory service (can subcontract)
- Once certified, can provide services in any EASA country
- U-space services can be provided concurrently by multiple USSPs in the same airspace
- UAS Operators must have digital connection to USSP

- Scope of data/info shared
- Conceptual information services can be realised in different technical implementations

→ different data encodings might be in use to carry service payload in implementations.

→ A standard data encoding should be used to provide the service (e.g., JSON or ASTERIX for TIS)

The extension of information services, in particular their default data models, should not jeopardise semantic interoperability and standardisation across Member States. Refer to SWIM – Information Definition for approach.

- Any information exchange should be based on transmission control protocol (TCP), meeting SWIM TI YP req's

Art. 18(f): Coordination mechamism

(incl. involvement of local authorities)

Vassilis AGOURIDAS
UIC2 EU Smart Cities

Article 18, **Tasks of the competent authorities**

The designated competent authorities shall:

(f) establish a mechanism to coordinate with other authorities and entities, including at local level, the designation of U-space airspace, the establishment of airspace restrictions for UAS within that U-space airspace and the determination of the U-space services to be provided in the U-space airspace

IR

Draft available for public consultation

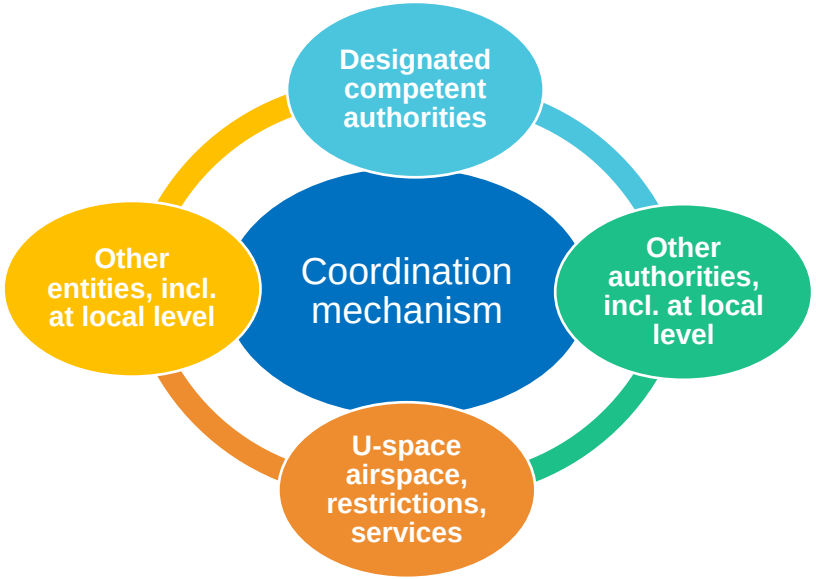
- Roles and responsibilities
- Phases and process (plan, execution and review)
- Overview of main tasks

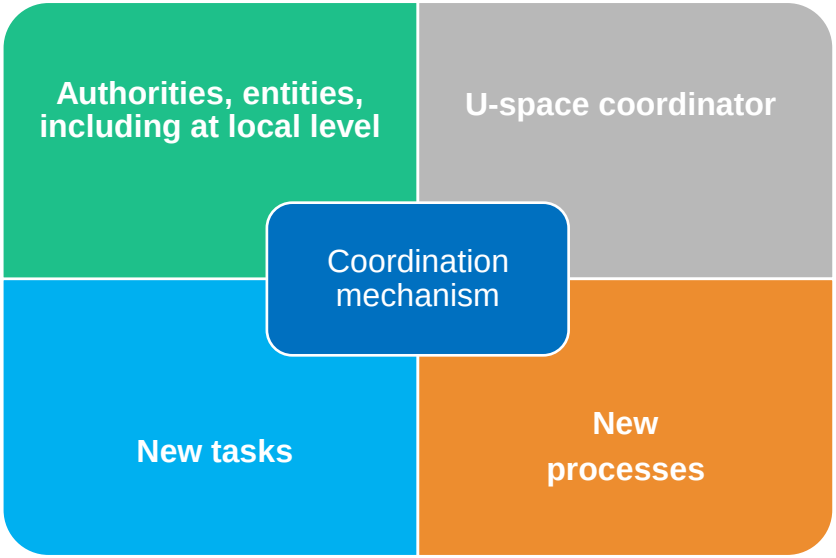
AMC1

GM1 **GM2** **GM3**

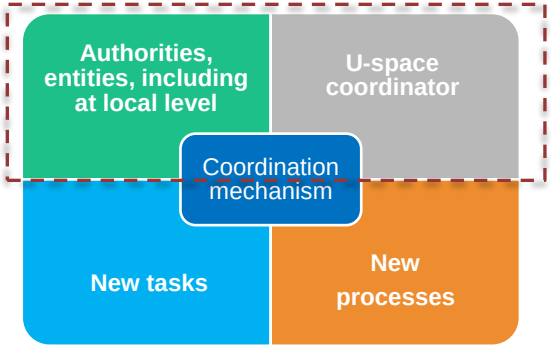
GM4 **GM5**

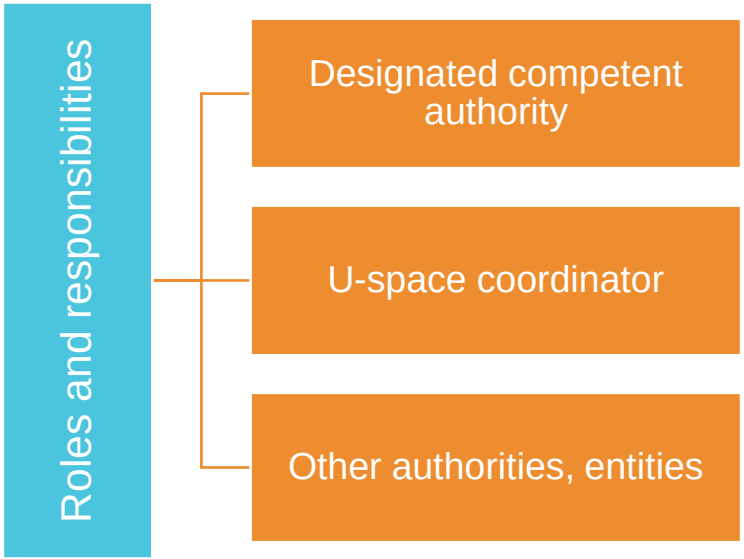
A novel approach to build up the coordination mechanism





A novel approach to build up the coordination mechanism





Competent authority vs U-space coordinator:

two different roles

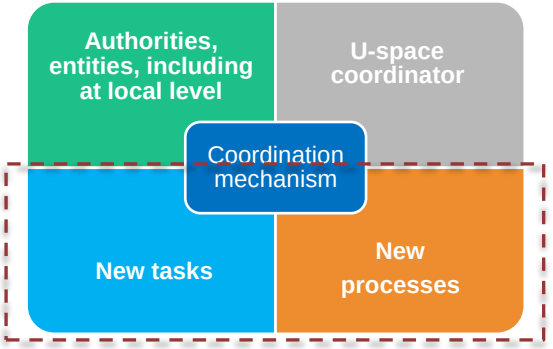
- ✓ the role of the competent authority (designated by the Member State) who must establish the coordination mechanism, and
- ✓ the U-space coordinator (an authority designated by MS) who must carry out the coordination.

New process: plan, execute, review

PLAN

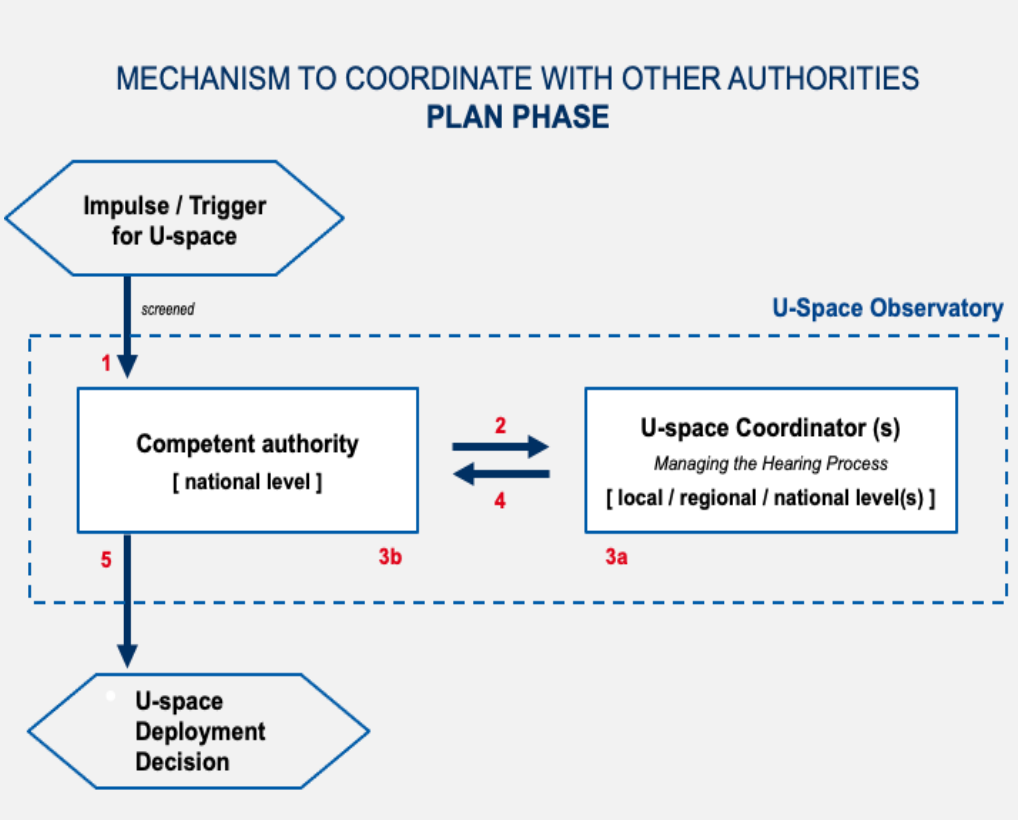
EXECUTE

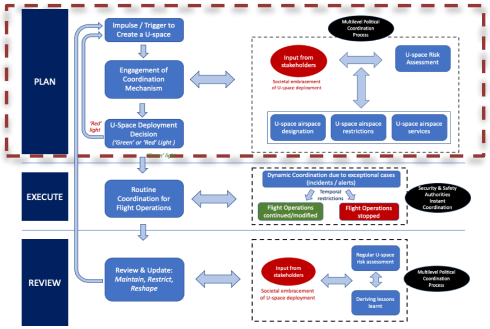
REVIEW



Overview of main tasks requiring coordination among stakeholders across different levels of governance and activity for the planning, execution and review of U-space deployment.

New process: the plan phase





Step 1: Screen trigger to the competent authority to implement a U-space in a certain area.

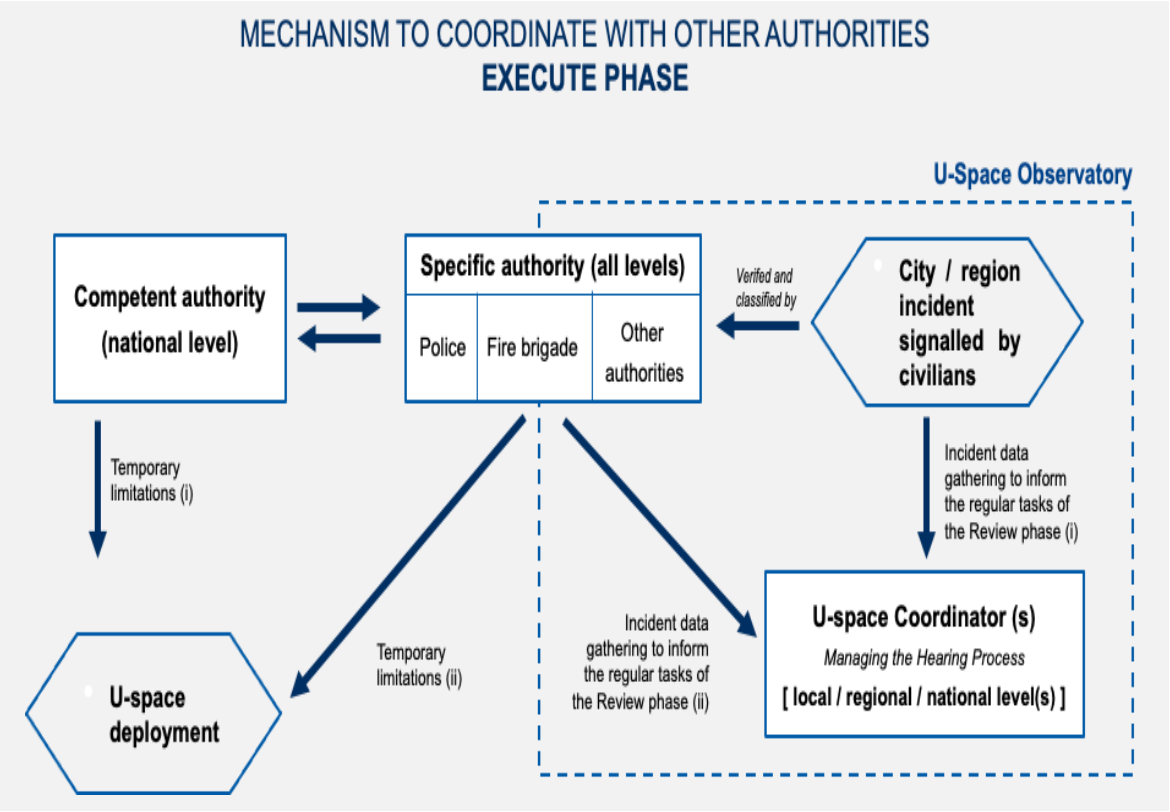
Step 2: The competent authority shall be responsible to engage the coordination mechanism that involves the designation of a U-space coordinator by the Member State.

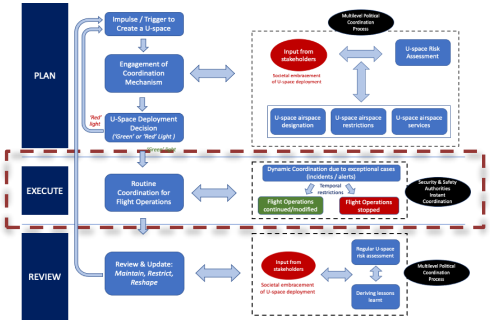
Step 3: The U-space coordinator shall be accountable for managing the hearing process (3a) (see Art. 18(f) (hearing process)) that informs the U-space risk assessment (3b - carried out by the competent authority).

Step 4: The U-space coordinator should be responsible/accountable to submit an initial U-space deployment proposal to the competent authority based on the combined results of the hearing (3a) and U-space risk assessment (3b) processes.

Step 5: The competent authority shall be accountable for the final decision on U-space deployment including the formal U-space designation based on the proposal of the hearing authority (deviations have to be justified).

New process: the execute phase





- ✓ Temporary limitations – Time critical restrictions for safety and/or security reasons, e.g., in the event of an emergency or a natural disaster. In this case, the competent authority may impose, according to national regulations, temporary limitations e.g. restricted or prohibited airspaces or limit the number of UAS in a specific area.
- ✓ The role of the U-space Coordinator relies on ensuring the incident data gathering to inform the regular tasks of the U-space deployment Review phase. Established accident reporting mechanisms of cities or regions, or purposefully developed tools for the monitoring of the U-space deployment, may link to this task.

New process: the review phase

MECHANISM TO COORDINATE WITH OTHER AUTHORITIES
REVIEW (CHECK & ACT) PHASE

U-space observatory

Competent authority (national level)

2

1

U-space coordinator (s)

Managing the hearing process

[local / regional / national level(s)]

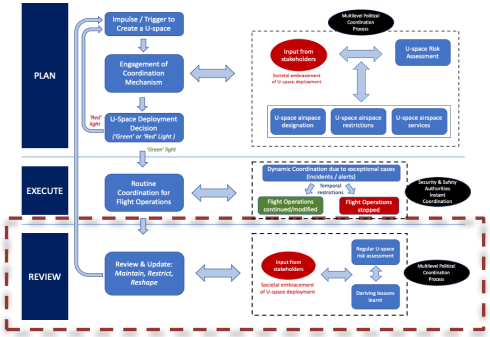
3

U-space deployment

Step 1: The U-space coordinator should be responsible to make recommendations regarding the U-space deployment to the competent authority either due to: (i) a regular U-space deployment review process, or (ii) a response to U-space related incidents.

Step 2: The competent authority should be responsible to consult the U-space coordinator concerning the recommendations made

Step 3: The competent authority should be accountable for the potential U-space deployment modifications



The Review phase starts during a regular review or in the case of a U-space related incident. Two types could exist:

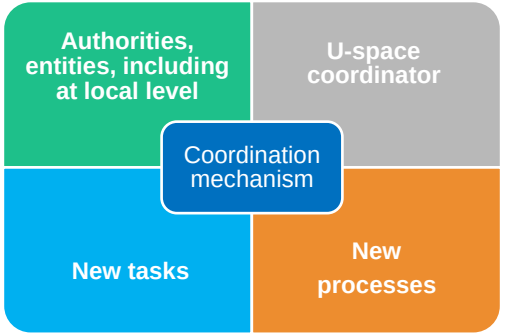
1. a technical review carried out by competent authorities during its oversight process (safety, security, performance indicators, etc.)
2. a coordination review carried out by the U-space coordinator and involving the State and local authorities along with the other stakeholders, in terms of societal, environmental, economic and other aspects.

The review process should be initiated by the U-space coordinator in the context of the U-space observatory function.

The current AMC/GM draft proposal on Public Consultation

AMC1	AMC1 to ensure the multi-party Coordination Mechanism (CM) approach
GM1	GM1 on the emerging roles and responsibilities of all the players (cross-sectoral)
GM2	GM2 on the setting up of a predefined, three-phase framework for the CM
GM3	GM3 on the main tasks across the three phases of the CM
GM4	GM4 detailing the CM phases / tasks to ensure implementation harmonisation
GM5	GM5 summarising requirements for multilevel governance (scope of tasks)

Draft available for public consultation



Certification scheme

Ken ENGELSTAD

- application for certificate
- Conditions for obtaining a certificate
- Validity of the certificate

IR

- AMCs based on those existing under ATM/ANS
- Management system, contracted activities, personnel requirements, record-keeping, operations manuals, security management system, business plan, contingency plans

AMC

GM based on those from ATM/ANS

GM

Certification scheme (Art. 15 Conditions for obtaining a certificate)

- Risk-based management system & security management system
- Occurrence reporting
- Technical & operational capacity
- quality management system (ISO 9001)
- Defined responsibilities & policies within the organization
- Safety performance monitoring & measurement, safety assessment
- Assessment of the management system
- Training & competency of personnel

- Communication responsibilities
- Documentation responsibilities
- Compliance monitoring
- Change management procedure
- Contracted activities procedures
- Record keeping & retention of operational data
- Operations manual
- Business plan
- Insurance Coverage
- Contingency plan

UAS operators

Ken Engelstad

- Compliance with capabilities and perf req, airspace constraints
- Use of U-space services
- Submit flight authorisation request, activation request
- Comply with fight authorisation & possible changes

IR

- Activation of the flight
- Contingency measures and procedures

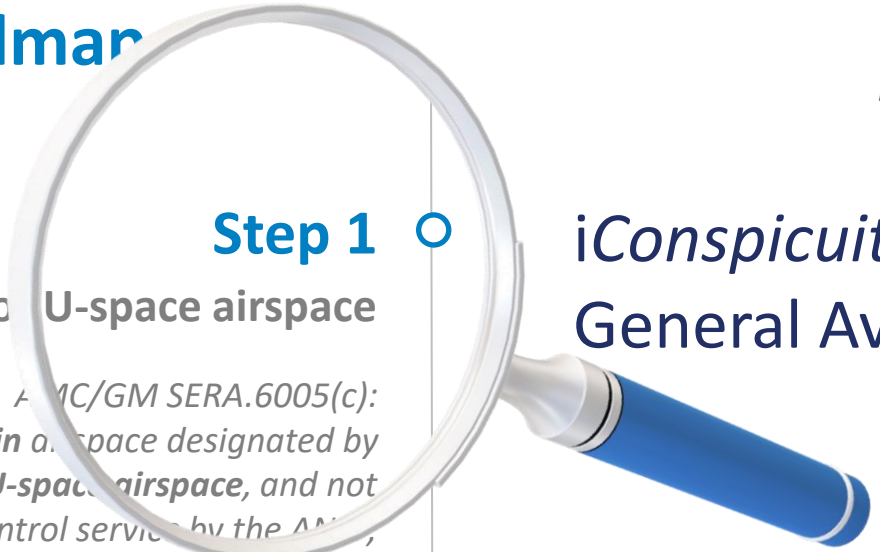
AMC

- Activation of the flight as soon as possible
- Contingency measures

GM

High Level Roadmap

Vladimir FOLTIN
PCM/ATM Expert EASA



Step 1

Propose a solution for U-space airspace

AMC/GM SERA.6005(c):
Manned aircraft operating in** airspace designated by the competent authority as a **U-space airspace**, and not provided with an air traffic control service by the ANSP, shall continuously make themselves **electronically conspicuous to** the **U-space service providers

i*Conspicuity* for VTOL and General Aviation

Step 2

Build on the U-space solution

Expand the functionalities and **address the GA conspicuity issue generally**, **including** the possibility to use the information broadcasted by the GA traffic **for Flight Information Service**

Constraints & Boundaries

Development of AMC/GM to SERA.6005(c) by Q4 2021

Aircraft (manned)

- **Affordability** (to end users)
- Technology **available now** (aviation & other)
- **Single device policy**
- Simple installations
- Enable airborne collision risk mitigation for manned aircraft

USSP

- Minimum necessary position information (incl. from 3rd parties)
- **Affordable infrastructure** (ideally compatible with UAS needs)
- Minimum performance meeting U-space objectives

Resources

- Existing international standards (aviation & other)
- **Pan-European applicability**
- ITU regulated spectrum
- **Machine readable**
- Open standards (non-proprietary or free of royalties)

Suitable for urban and low level environments

Contributors

Means of Transmission

ADS-B Out (1090 MHz)

For certified aircraft, using the **existing certified technology** already installed on board

ADS-L (SRD-860)

Non-certified devices transmitting at low power on the licence-free band SRD-860, in compliance with ADS-L specifications

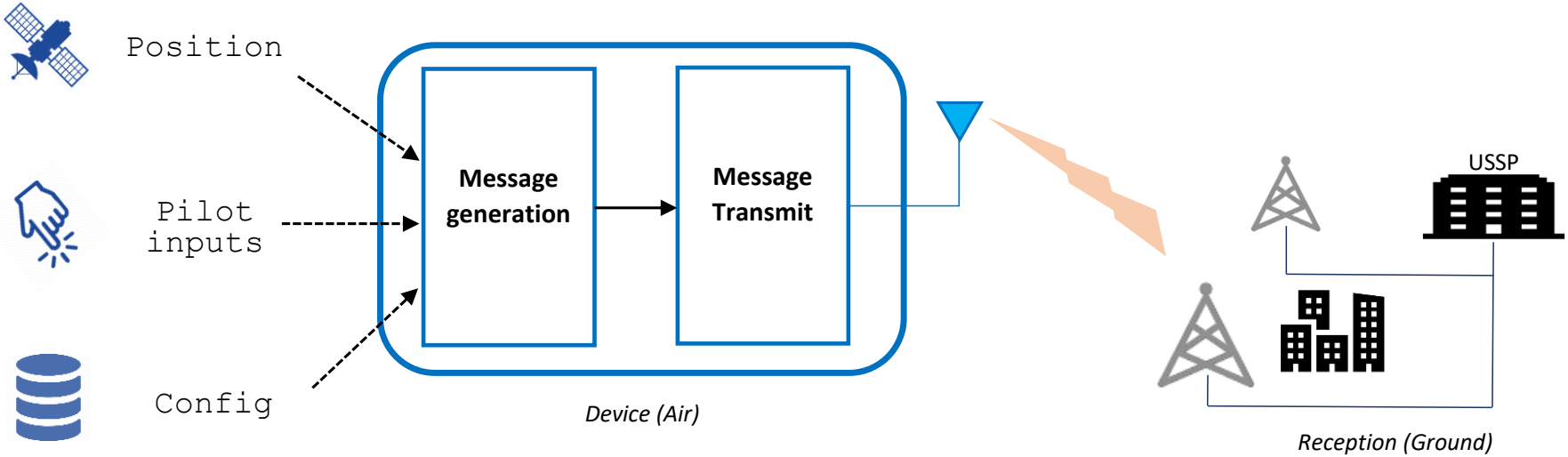
ADS-L (Mobile telephony)

Mobile telephony application transmitting in compliance with ADS-L specifications

Introducing ADS-L

- **Minimum standard** for making manned aircraft in U-space conspicuous to USSPs
- **Principle: “-L” is for “Light”**
  - Compatible with **low-cost devices** and **mobile telephones**
  - **GNSS-based** parameters
  - Derived from **ADS-B** and **simplified**
- Should support possible **future applications** (traffic awareness)

ADS-L Concept



ADS-L Required parameters

- Aircraft address, address type
- Timestamp
- Aircraft category
- Position, altitude
- Velocities, track
- Position accuracy
- Version

ADS-L Optional parameters

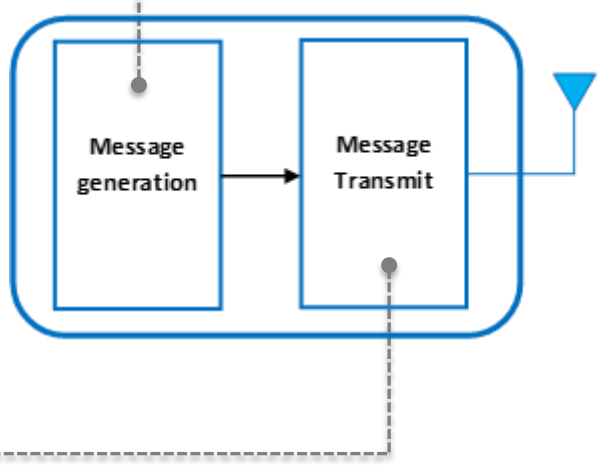
- Emergency status
- Velocity accuracy
- Design assurance
- Integrity parameters

ADS-L – Message characteristics

Minimum transmission rate	• **1 Hz** (position) • **0.1 Hz** (other parameters)
Error control	• **At least one error detection technique** (e.g. CRC)
Position source	• **GNSS based**

ADS-L – Standardisation

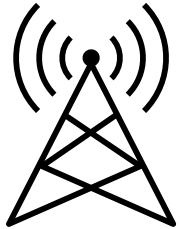
- → **Appendix 1 to AMC1 SERA.6005(c)** ☑
  - → **Specification of the message** generation function
    - → List of parameters
    - → Characteristics
- → **EASA Technical Specification** – SRD-860 ☐
  - → Easy implementation in existing devices
  - → Current open standards as a starting point
  - → Content
    - → **Specification of transmission function**
    - → Example of transmitter code
    - → Example of receiver code



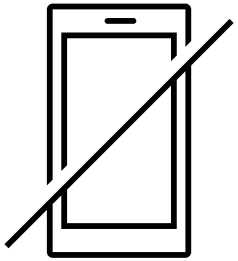
Mobile Telephony Feasibility Study

Can existing mobile telephony technology make aircraft electronically conspicuous to USSPs today?

Legal certainty for aerial use



Standardization
(frequencies, services, roaming …)



Smartphones / Dedicated devices

Installations

Certified ADS-B out

- ☑ CS-ACNS
- ☑ CS-STAN
- ☑ AMC 20-24

SRD 860 Band &

- ☑ EASA design approval
- ☑ EASA CS-STAN
- ☑ National design approval

Mobile Telephony

- ☑ EASA design approval
- ☑ EASA CS-STAN
- ☑ National design approval

Non Installed Equipment

Should **comply with** applicable **air operations requirements**

(e.g. CAT.GEN.MPA.140, NCC.GEN.130, NCO.GEN.125, SPO.GEN.130 or equivalent national AIR OPS requirements)

Signal Obscuration

Equipment should be set up on board the aircraft **to limit its obscuration** by the airframe, human body, or other structures and at the same time **maximize ground visibility of the transmitting antennas**.

Military And State Aircraft Operations

SERA.6005(c) does not apply => Right not to be conspicuous to the USSPs

National level coordination to assess the risk of the non-conspicuous aircraft and specify communication means

U-space airspace designation with regard such operations and the ability or otherwise to be conspicuous

USSPs

Article 18(h) of Regulation (EU) 2021/664 to **inform** about **any known irregularities** in continuous transmissions

Manned Aircraft

Regulation (EU) No 376/2014 for **reporting** of **any known irregularities** in continuous transmissions

Authorities

In case of an **urgent safety problem**, determine a corrective action, **including directives or recommendations**, to safeguard safety

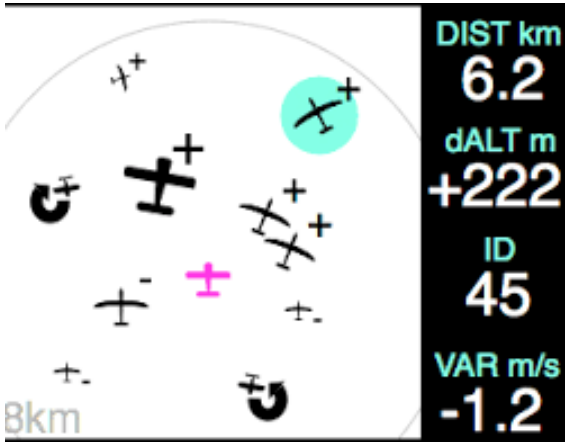
Summary

Certified ADS-B out

- ✓ ICAO standard
- ✓ Already installed
- ✓ All elements in place

SRD 860 Band

- ✓ Utilises past investments
- ✓ Affordable infrastructure
- ? Standardization



Mobile Telephony

- ✓ Existing infrastructure
- ✓ Affordable to new users
- ? Needs further actions

Conclusions

Maria ALGAR RUIZ
EASA Drones Programme Manager

→Comments are welcome until 15 March 2023!

→**Next AMC/GM steps:**

→ Review of the comments (CRD) and revision of AMC/GM

→ ED Decision expected in early Q3/2022

→ **Next important actions:**

→ Launch of the implementation TF with MS

→ Workshop on e-conspicuity 23.02.2022

EASA
European Union Aviation Safety Agency

WORKSHOP

NPA 2021-14

Draft AMC/GM to support the U-space regulatory framework

Thank you for attending this workshop!

Online workshop 15.02.2022

An Agency of the European Union