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

EXECUTIVE SUMMARY

The objective of this Notice of Proposed Amendment (NPA) is to maintain a high level of safety for unmanned and manned aircraft operations in the U-space airspace.

This NPA proposes acceptable means of compliance (AMC) and guidance material (GM) to the U-space regulatory package (Regulations (EU) 2021/664, (EU) 2021/665 and (EU) 2021/666).

Due to the novelty of the subject, it is important to provide the necessary means for the implementation of the above-mentioned Regulations as regards:

— the concept of a U-space airspace and its management by the Member States (MSs) in terms of risk assessment and responsibilities;
— the dynamic reconfiguration of the U-space airspace, when applied;
— the operational functioning of the common information service and the certification process for both the providers of this service and the U-space service providers (USSPs);
— the technical specifications and related performance requirements for the different U-space services;
— the exchange of all data and available information between the participants of the U-space airspace;
— the definition of relevant standard(s) for the connection to the common information service provider(s) to ensure interoperability and uniform implementation across the EU;
— detailed procedures and performance requirements for the flight authorisation services;
— the acceptable means for manned aircraft to be conspicuous when entering the U-space airspace in uncontrolled airspace;
— the expected coordination with local authorities, the security aspects to be covered in a specific U-space airspace, and the authorities' oversight programme as well as any other task related to the management of the U-space airspace under their responsibility.

This proposal is expected to help in maintaining safety as regards operations of unmanned and manned aircraft in the U-space airspace and improve harmonisation among MSs as regards the provision of U-space services.

Domain:	Unmanned aircraft systems (UAS)		
Related rules:	AMC & Regulation (EU) 2021/664, Regulation (EU) 2021/665 and Regulation (EU) 2021/666		
Affected stakeholders:	MSs, UAS operators (individuals and organisations), UAS manufacturers, manned aviation community, model aircraft community, air traffic management (ATM)/air navigation services (ANS) service providers, USSPs, aerodrome (ADR) operators, all airspace users		
Driver:	Safety	**Rulemaking group:**	No
Impact assessment:	No	**Rulemaking Procedure:**	Standard

EASA rulemaking procedure milestones

Start Terms of Reference	**Public consultation** NPA	**Decision** Acceptable Means of Compliance, Guidance Material
22.4.2021 (ToR Issue 3)	16.12.2021	

Table of contents

1. About this NPA

1.1. How this NPA was developed

The European Union Aviation Safety Agency (EASA) developed this NPA in line with Regulation (EU) 2018/1139[1] (the 'Basic Regulation') and the Rulemaking Procedure[2]. This Rulemaking Task (RMT).0230 is included in the European Plan for Aviation Safety (EPAS) for 2021-2025[3]. The scope and timescales of the task were defined in the related Terms of Reference (ToR)[4].

EASA developed this NPA based on the input of a dedicated group of experts. More specifically, the draft AMC & GM were developed by working groups under a steering group. Each working group was led by a team leader and composed of several experts in the unmanned traffic management (UTM) and air traffic management (ATM) domain. 15 work packages were created. In total, more than 30 experts were involved in the preparation of the draft AMC & GM. All the working groups met on a regular basis, according to the needs and progress of the work packages under their responsibility. The steering group held its last meeting on 25 October 2021 and proposed a draft final version of the AMC & GM. It is hereby submitted to all interested parties for consultation in accordance with Articles 6(3), 7 and 8 of the Rulemaking Procedure.

EASA conducted several focused consultations on the draft AMC & GM with the affected stakeholders including 12 technical meetings that were held to discuss and develop the proposal with the affected stakeholders (UAS operators, USSPs, air navigation service providers (ANSPs), authorities, associations, and professional organisations).

The major milestones of this RMT are presented on the cover page.

1.2. How to comment on this NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at **http://hub.easa.europa.eu/crt/**[5].

The deadline for the submission of comments is **15 March 2022**.

1.3. The next steps

Following the public consultation, EASA will review all the comments received.

---

1 Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91 (OJ L 212, 22.8.2018, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1535612134845&uri=CELEX:32018R1139).

2 EASA is bound to follow a structured rulemaking process as required by Article 115(1) of Regulation (EU) 2018/1139. Such a process has been adopted by the EASA Management Board (MB) and is referred to as the 'Rulemaking Procedure'. See MB Decision No 18-2015 of 15 December 2015 replacing Decision 01/2012 concerning the procedure to be applied by EASA for the issuing of opinions, certification specifications and guidance material (http://www.easa.europa.eu/the-agency/management-board/decisions/easa-mb-decision-18-2015-rulemaking-procedure).

3 https://www.easa.europa.eu/sites/default/files/dfu/epas_2021_2025_vol_two_final.pdf

4 https://www.easa.europa.eu/document-library/terms-of-reference-and-group-compositions/tor-rmt0230-0

5 In case of technical problems, please send an email to crt@easa.europa.eu with a short description.

Based on the comments received, EASA will publish a decision to issue the related AMC & GM to Regulations (EU) 2021/664[6], (EU) 2021/665[7] and (EU) 2021/666[8].

The individual comments received on this NPA and the EASA responses to them will be reflected in a comment-response document (CRD), which will be published on the EASA website[9].

6 Commission Implementing Regulation (EU) 2021/664 of 22 April 2021 on a regulatory framework for the U-space (OJ L 139, 23.4.2021, p. 161) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R0664&qid=1637943001010).

7 Commission Implementing Regulation (EU) 2021/665 of 22 April 2021 amending Implementing Regulation (EU) 2017/373 as regards requirements for providers of air traffic management/air navigation services and other air traffic management network functions in the U-space airspace designated in controlled airspace (OJ L 139, 23.4.2021, p. 184) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R0665&qid=1637943117201).

8 Commission Implementing Regulation (EU) 2021/666 of 22 April 2021 amending Regulation (EU) No 923/2012 as regards requirements for manned aviation operating in U-space airspace (OJ L 139, 23.4.2021, p. 187) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R0666&qid=1637943352619).

9 https://www.easa.europa.eu/document-library/comment-response-documents

2. In summary — why and what

2.1. Why we need to amend the rules — issue/rationale

The development of this NPA follows the adoption of the U-space regulatory package[10], which creates the conditions necessary for both drones[11] and manned aircraft to operate safely in the U-space airspace. The development of AMC & GM in support of the U-space regulatory package is crucial as the latter only provides a high-level framework for the U-space to enable the first operations of UAS, without specifying the necessary means on how to enable the implementation of the U-space. Therefore, the proposed AMC & GM are important as they provide the means to facilitate the implementation of the U-space services and to support the safe traffic management of unmanned aircraft that can be integrated with manned aviation in all types of environment.

Along with Opinion No 01/2020[12] EASA proposed an initial set of AMC & GM in support of the U-space regulatory framework. These provisions, that were published for information only, identified initial means to implement the regulations, while taking into consideration that U-space services rely on fast-evolving technology developments, supported by the adequate industry standards to support uniform U-space services implementation. The set of AMC & GM proposed in this NPA do not differ from those proposed along with Opinion No 01/2020; they have though been improved and adapted to the regulatory package as adopted.

As the U-space package should ensure interoperability and provide means to give the necessary flexibility to allow for regional or local implementation, it is important that the proposed AMC & GM can ensure this flexibility to support the Regulation.

It is important to highlight that this NPA proposes the first set of AMC & GM that could be developed based on the present status and maturity of the U-space concept and technological solutions. The proposals are covering state-of-the-art solutions for U-space, but these solutions are only tested and demonstrated in some initial concepts of operations (ConOps) and use cases. Therefore the applicability of the AMC & GM would need to be limited to use cases in very low-level airspace (e.g. airspace below 500 ft) and not complex or very dense UAS traffic. For the UAS traffic and traffic complexity, it is not possible to provide a limit because of the lack of data. It is not though foreseen, for instance, that this first set of AMC & GM supporting the implementation of the U-space regulatory package will be sufficient to support UAS operations carrying passengers or dangerous goods.

2.2. What we want to achieve — objectives

The overall objectives of the EASA system are defined in Article 1 of the Basic Regulation. This NPA will contribute to achieving the overall objectives by addressing the issues described in Section 2.1.

---

[10] Regulations (EU) 2021/664 on a regulatory framework for the U-space, (EU) 2021/665 amending Implementing Regulation (EU) 2017/373 as regards requirements for providers of air traffic management/air navigation services and other air traffic management network functions in the U-space airspace designated in controlled airspace, and (EU) 2021/666 amending Regulation (EU) No 923/2012 as regards requirements for manned aviation operating in U-space airspace.

[11] 'Unmanned aircraft systems (UAS)' is the legal and technical term used in the EASA Basic Regulation as well as in the delegated and implementing acts adopted on the basis thereof. 'Drones' is the popular term used to be understood by persons with no aviation background. Both terms are used in this NPA and refer to the same thing.

[12] https://www.easa.europa.eu/document-library/opinions/opinion-012020

The specific objectives of this proposal are to:

— identify the required performance levels and means to achieve them by the USSPs and UAS operators;

— enable interoperability for the deployment of the U-space services;

— ensure the necessary proportionality to the risk and the category of operation which is foreseen for this first phase of U-space implementation as well as operational and technical flexibility; and

— facilitate the timely and harmonised implementation of the U-space regulatory package.

2.3. How we want to achieve it — overview of the proposed amendments

Draft AMC & GM to Regulation (EU) 2021/664 on a regulatory framework for the U-space

2.3.1. Scope and applicability of the AMC & GM

The scope and applicability of the draft EASA Decision with the proposed AMC & GM for the U-space regulation is not presented in the NPA. Based on the state of maturity of the U-space concept and technological solutions contained in the proposed AMC & GM, EASA proposes to include an applicability and scope paragraph in the final EASA Decision limiting the application of the AMC & GM to cases of U-space implementation that concern U-space airspaces that are below certain altitude or height (e.g. low level airspace below 500 ft) and to certain UAS traffic and traffic complexity excluding the applicability for UAS operations carrying passengers for instance. EASA believes that this limitation is necessary to ensure safety of operations in the U-space airspace across the EU as the present status and maturity of the technical solutions are still evolving rapidly. The AMC & GM can be amended as soon as the solutions are demonstrated, and mature, and when more advanced services are available.

Q1 — Stakeholders are invited to express their opinion on the addition of this applicability and scope paragraph to final EASA's Decision with the AMC & GM limiting the applicability of those.

2.3.2. Subject matter and scope — Article 1

GM1 to Article 1(1) highlights the necessary coordination with the military organisations. While the implementation of the Regulations for U-space does not directly apply to military organisations, the cooperation within the U-space may benefit both civil and military organisations. By introducing this GM, EASA expressly includes military organisations as relevant stakeholders in the U-space as a third party. The need for military cooperation is acknowledged by this proposal to decrease the risk to both civil and military aircraft in the U-space airspace and to increase safety by sharing the relevant data between both types of organisations.

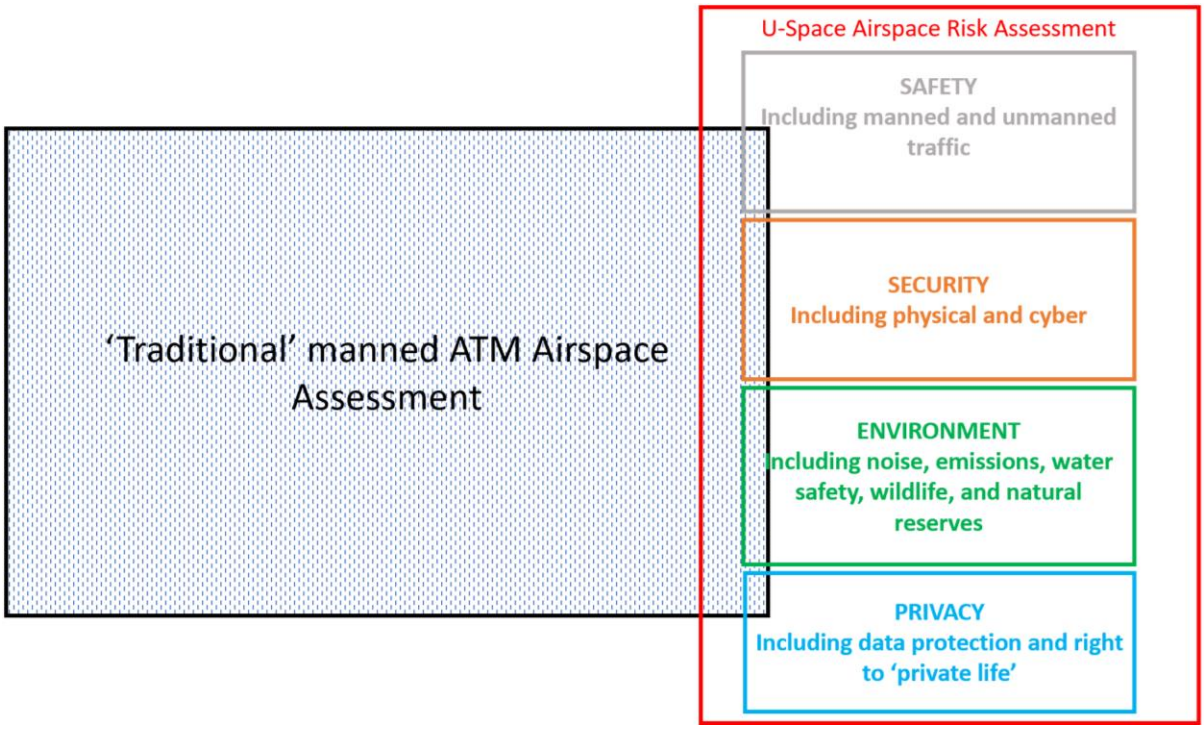
GM1 to Article 1(3) explains the legal basis of the Regulation. Although the latter is based on Article 57 of Regulation (EU) 2018/1139 that only covers unmanned aircraft, it is important to explain the scope. Indeed, the U-space airspace is not an airspace exclusively reserved for unmanned aircraft because manned aircraft may operate in the U-space airspace. Because of the impact of U-space on manned aviation, this GM underlines the necessary amendments to be introduced to the ATM/ANS rules and SERA requirements.

2.3.3. Definitions — Article 2

The definitions in Regulation (EU) 2021/664 were not subject to discussions. The only clarification brought to the definition of 'dynamic airspace reconfiguration' in GM1 to Article 2(6) relates to the term 'short-term changes'. Indeed, it was considered necessary to underline that this term could be interpretated in a broad way and that therefore a balanced approach should be applied, as far as practicable, when deciding to dynamically reconfigure the U-space airspace.

2.3.4. The U-space airspace — Article 3

The main provisions regarding the U-space airspace relate to the airspace risk assessment. To support MSs, this GM provides elements of the risk assessment for the establishment of a U-space airspace. Extensive guidance is provided as a core explanation of what is behind an airspace risk assessment and the elements constituting the basis for it. Apart from the safety risks, guidance material is provided to cover other types of risks such as security, environmental and privacy. Also, a general approach to express the target level of safety (TLS) for the U-space is proposed. However, it is not considered, at this stage of U-space implementation, that a detailed and advanced development of the TLS can support the airspace risk assessment as it is too early to determine the potential elements that need to be taken into consideration. Therefore, the provisions related to TLS remain high level. The diagram below may ease the reader's understanding on the key differences between traditional ATM airspace assessment and U-space airspace risk assessment.



AMC1 to Article 3(1) — It is necessary for the establishment of the U-space to perform an airspace risk assessment since it is a new change to an airspace structure. Since there is no previous experience on UAS flights unlike for manned aviation, there are many unknown factors, and all the new risks need to be identified. The main drivers to perform the airspace risk assessment are safety, privacy, security and environment. It is important to assess the risk posed in each of those areas and to propose mitigations.

GM1 to Article 3(1) is introduced to clarify that a U-space airspace is not obligatory for all airspaces in which UAS flights may take place. In fact, most airspace — e.g. countryside away from urban areas and aerodromes — will most likely not be U-space airspace. Thus, MSs should establish a U-space airspace in airspaces where UAS flights may cause risk to other airspace users or people or property on the ground. Such safety risks are analysed through the U-space airspace risk assessment and mitigated through risk analyses such as the specific operations risk assessment (SORA). However, the need for U-space airspace is not limited to safety; other risks and nuisance in domains such as security, privacy, and the environment will also benefit from U-space. This GM provides a non-exhaustive list of examples of cases of risk or annoyance/nuisance in these four domains that should be considered when deciding on the establishment of a U-space airspace.

GM2 to Article 3(1) highlights important elements to understand how an airspace risk assessment could be performed. It stresses the importance of the need to make use of information relevant for air and ground risks — a methodology to attain the safety objectives.

GM3 to Article 3(1) is introduced to clearly identify a phased approached, taking an example from EUROCONTROL UAS ATM Airspace Assessment document. The three phases, preparation phase, reference scenario phase and the assessment phase are similar from a terminal airspace assessment. Some additional information needs to be provided for comprehensive assessment in U-space, which includes collisions between unmanned aircraft and between unmanned and manned. The objective is to identify safety objectives that meet the safety target that each MS has identified. This phased approach has been kept generic due to different national environments, and further guidance is added on how to identify hazards as this is considered important to identify the ones that are more relevant in the specific airspace. The distinction between pre-existing and system-generated hazards has been outlined. This is an important distinction to be taken into account when assessing complex procedures including multiple technological systems as is the case of the U-space.

GM4 to Article 3(1) proposes a checklist which can help identifying the origin and impact of air and ground risks, communication, navigation and surveillance impact on UAS operations, as well as to identify and involve the key stakeholders from the aviation and non-aviation domains.

GM5 to Article 3(1) outlines the framework to understand and set qualitative TLS for U-space airspace of a Member State, including the factors driving the determination of such TLS. The importance of the units of measurement is underlined to take safety measurements in U-space which would help to determine and measure levels of safety for different types of operations. Finally, the difficulty to perform a quantitative analysis properly at this stage is also presented.

GM6 to Article 3(1) stresses that an airspace risk assessment evaluates air and ground risks that could result in mid-air collisions, death to people on the ground and damage to property on the ground. These are covered under the context of ‘safety’ and the methodologies for undertaking them are detailed in GM2 to Article 3(1). Safety is not, however, the only reason for establishing a U-space airspace; other risks, such as those presented in the examples given in GM1, concerning security (including cybersecurity), privacy and the environment are also major factors. These risks must also be assessed, often because the regulation requires their impacts to be mitigated. This GM is proposed to provide a non-exhaustive regulatory and methodological rationale for these assessments.

2.3.5. Dynamic airspace reconfiguration — Article 4

The dynamic airspace reconfiguration is a new operational concept in aviation to ensure the segregation principle in the U-space airspace. This concept referred to in Article 4 of the Regulation is considered as being an 'umbrella' provision, while the technical provisions related to this concept are found in the AMC & GM related to ATS.OR.127 and ATS.OR.237 of Regulation (EU) 2017/373 (introduced through Regulation (EU) 2021/665).

While the definition of dynamic airspace reconfiguration does not apply to a specific scenario, all the relevant provisions clearly indicate an involvement of air traffic control. The U-space airspace may be established in airspace of any class; however, if a U-space airspace is designated in controlled airspace, the regulation states that controlled manned aircraft and UAS shall be segregated 'for safety reasons', namely by means of dynamic reconfiguration. Therefore, four entities are expected to be involved: ATC units, manned aircraft operators, UAS operators and USSPs.

AMC1 to Article 4 aims at ensuring how segregation can be effectively applied when ATC units need to dynamically reconfigure the U-space airspace. It also clarifies how protection buffers should be applied when assessing the portion of the U-space airspace. Given the importance of this provision on the assurance of effective segregation in the U-space airspace, EASA invites stakeholders to provide their opinion and propose alternative text or approach that would improve and clarify this means of compliance.

GM1 to Article 4 underlines that the envisaged operational concept for the coexistence of manned and unmanned traffic is based on the segregation of airspace volumes, rather than on the tactical separation of aircraft. In that respect, it would be analogous to the usage of airspace reservations, such as restricted areas. It also focuses on the importance of the design of the airspace to facilitate the dynamic reconfiguration of the U-space airspace and specifically the role of the USSP when granting UAS flight authorisations to its UAS operators. This GM also explains how the operational scenario should be understood and what are the roles and responsibilities of each of the entities involved in the dynamic airspace reconfiguration concept.

GM2 to Article 4 recommends focusing on the important elements to ensure proper segregation between manned and unmanned aircraft and clarifies what it would take to ensure segregation in terms of airspace volume and performance of the UAS.

2.3.6. Common information service (CIS) — Article 5

The CIS provides the means to get and to provide essential information that will be used for the U-space to work. The draft AMC & GM cover how all the information can be disseminated, in which format, and the latency. They also consider existing standards that can be used to provide the data stemming from the CIS. This should facilitate the exchange of information and the coordination between USSPs and air traffic services (ATS) providers as well as any participants of the U-space. This information needs to be timely available and meeting certain data quality requirements.

GM1 to Article 5 provides an overview over what the CIS actually is, its function within the U-space concept and how it can be applied in a given U-space airspace. It also explains the difference between the centralised concept of a single CIS provider versus the distributed approach in which all the data is directly exchanged between the relevant operational stakeholders in a distributed architecture.

GM2 to Article 5 lists the relevant stakeholders that may provide to and/or retrieve from the CIS any information and data.

AMC1 to Article 5(1) defines the relevant standard to provide the data in a specific format. When doing so, the standard to be used should be the one described in Chapter VIII 'UAS geographical zone data model' of and Appendix 2 to ED-269 'MINIMUM OPERATIONAL PERFORMANCE STANDARD FOR GEOFENCING'.

AMC2 to Article 5(1) relates to the identification of the necessary interfaces to support the access to the common information services.

GM1 to Article 5(1)(b) explains that the MSs may define a format and data model to support the exchange of information using the JSON format defined in EUROCAE ED-269.

AMC1 to Article 5(1)(f) defines that information on static and dynamic airspace restrictions has to be provided in a timely manner — in this case within 30 seconds.

GM1 to Article 5(1)(f) explains that in the case of dynamic airspace restrictions, MSs may use a specific standard to provide such information.

AMC1 to Article (5)(2) describes a general approach regarding the latency necessary for the dissemination of the traffic information within the CIS.

2.3.7. UAS operators — Article 6

The draft AMC & GM clarify the situations where a UAS operator acts as a USSP.

GM1 to Article 6 explains the obligations of the UAS operators in terms of capabilities and performance requirements, and underlines the importance of entering in contractual arrangements with the USSP. Most of the paragraphs of this Article are covered under the AMC & GM on UAS flight authorisation service in Article 10.

GM1 to Article 6(1)(b) clarifies that UAS operators need to maintain the level of performance needed for the operation during the entire flight. This is important as the UAS operator has to ensure that the UAS has the capability to receive U-space service in a continuous manner and that the level of performance is adequate for the intended operation.

AMC1 to Article 6(5) covers the activation of the UAS flight authorisation by the UAS operator. This AMC is important as it gives the moment at which the operation starts and therefore when U-space services start being provided.

GM1 to Article 6(5) clarifies that the moment when the activation would be triggered by the UAS operator would usually be almost immediately after receiving the confirmation by the USSP, provided that the MSs or the USSP do not constrain the minimum and maximum time before take-off at which the activation is requested.

GM1 to Article 6(6) provides an example of when a change to the UAS flight authorisation could occur. The example given is when the deviation thresholds are updated.

AMC1 to Article 6(8) relates to the contingency measures and procedures and more specifically how those measures and procedures can be made available to the USSP. The most usual means to do so is through the contract between the UAS operator and the USSP.

GM1 to Article 6(8) lists the conditions under which the contingency measures and procedures may be activated. In addition to the situations already described in Regulation (EU) 2019/947[13] that addresses UAS operators when operating in the 'open' or 'specific' category, the list also contains some situations specific to U-space.

2.3.8. USSPs — Article 7

GM1 to Article 7 introduces the concept of USSPs, a new entity in the aviation community, the need for this new entity to be certified as any other service provider intending to provide service in the EU. It clarifies that USSPs are not subject to designation.

AMC1 to Article 7(2) provides means for USSPs to support the UAS operator with regard to applicable operational conditions and airspace constraints by informing them of such airspace limitations, especially in the case of defined deviation thresholds.

GM1 to Article 7(2) explains why it is important for UAS operators to be connected to the USSPs for receiving the U-space services and what is needed to exchange data so that USSPs can effectively provide UAS operators with the U-space services during all phases of operations in the U-space airspace.

GM2 to Article 7(2) recommends that USSPs facilitate the access to their data of the UAS operators with whom they are contractually bound.

AMC1 to Article 7(3) proposes a means on what should be done when dynamic reconfiguration of the U-space airspace ends. It is expected that the arrangements detail the actions to be taken and the procedures to follow in that regard.

GM1 to Article 7(3) lists some elements that would need to be considered when setting up the arrangements between USSPs and the ATS providers. This may include the objectives and the content of the contractual arrangements. Very important is the reference to the coordination procedures as well as the scope of the data and information to be shared between USSPs and ATS providers.

GM2 to Article 7(3) explains two scenarios for the possible scope of the data and information to be shared between USSPs and ATS providers, depending on whether the U-space airspace is established in controlled airspace or uncontrolled airspace because, naturally, the roles and responsibilities of the ATS providers are not the same in one or the other.

AMC1 to Article 7(5) proposes a means to exchange information and points out to the EUROCONTROL Specification for SWIM Technical Infrastructure (TI) Yellow Profile as well as the EUROCONTROL Specification for SWIM Service Description (SD) regarding the documentation of services facilitating the exchange of information. This AMC is expected to ensure harmonisation with the EU MSs by using a common secure interoperable open communication protocol.

GM1 to Article 7(5) clarifies that the information exchange is expected to be based on open protocols and formats, using public IP-based networks as transport layers and recommends using a standard data encoding such as JSON for instance. In addition, this GM further explains the importance of transmission control protocols (TCPs).

[13] Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft (OJ L 152, 11.6.2019, p. 45) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0947&qid=1638799731396).

GM1 to Article 7(6) provides a template form that can be used by the USSPs to report to the competent authority the start or the cease of their operations. The template includes the name of the USSP as well as the confirmation of the start and cease of operations.

2.3.9. Network identification service — Article 8

GM1 to Article 8 explains the overall objective of the network identification service for U-space and what kind of information may be available through this service that supports the traffic information service mainly. Importantly, this GM stresses that this service supports the U-space operational needs and complements the direct network identification of Regulation (EU) 2019/945[14] that supports authorities for security and privacy needs.

AMC1 to Article 8(1) covers the aggregation of network identification data. USSPs should demonstrate that they are able to share data with all other USSPs active in a U-space airspace where they offer services. It is expected that all available network identification data can be made available to authorised users on request. This means that a full picture of active UAS flights in an area can be provided independently of the USSP that any of the operators use.

AMC2 to Article 8(1) proposes means to demonstrate a response time for providing the data. Considering that network identification data is provided to the traffic information service when necessary, setting up an independent value might have resulted in data exchange challenges. A response time of the network identification service to the need of the traffic information service has been therefore proposed.

AMC3 to Article 8(1) describes the duration of the flight, being understood as starting with the activation of the flight authorisation and ending when the operator ends its flight. Activation of the flight authorisation is defined in the regulation. It is a required step before starting an operation. However, the regulation does not specify a specific meaning for ending a flight. As flights might extend beyond their time limit approved by the UAS flight authorisation request, this value was not deemed appropriate for defining what it means to end a flight.

AMC4 to Article 8(1) proposes as a means to provide the remote identification of the UAS in an aggregated manner to use the interface defined in Annex 4 to ASTM F3411-19 'Standard Specification for Remote ID and Tracking' to exchange data. This specification defines message formats, transmission methods, and minimum performance standards for broadcast and network identification. Network Remote ID is based on communication by means of the internet from a network Remote ID service provider that interfaces directly or indirectly with the UAS, or with other sources in the case of non-equipped network participants. Annex 4 to this standard covers open API YAML Description that can be used for the network identification service.

GM1 to Article 8(1) clarifies that USSPs may use a common contract that includes technical indicators, service levels or parameters when providing the network identification service to the UAS operators. There is no template for this agreement and the parties are free to structure this agreement as they wish should they make use of this common contract.

GM2 to Article 8(1) defines the testing infrastructure that may be used by USSPs for testing the data exchange performance. In this case, they may refer to Annex 2 to ASTM F3411-19 'Standard

[14] Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems (OJ L 152, 11.6.2019, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0945&qid=1638799853481).

Specification for Remote ID and Tracking' (Annex 2 is on 'Network Remote ID Interoperability Requirements, APIs, and Testing').

AMC1 to Article 8(2) proposes that USSPs provide authorised users with access to aggregated network remote identification data with an open and properly documented interface. This AMC aims at making sure that the development of solutions against network identification data are not hindered by poor practices in terms of development of the interface.

GM1 to Article 8(3) is addressed to the competent authorities that are required to determine the frequency at which the information will be updated. To support them in this task, this GM provides a reference value that can be found in ASTM F3411-19 'Standard Specification for Remote ID and Tracking' for any updates target.

GM1 to Article 8(4) lists the specific paragraphs of ASTM F3411-19 'Standard Specification for Remote ID and Tracking' that may be used by authorised users to access authorised data.

2.3.10. Geo-awareness service — Article 9

GM1 to Article 9 provides an overall explanation of the objective of the geo-awareness service and what this service is meant to achieve to support UAS operators. Important to note is the difference made between the geo-awareness in the framework of this regulation and the geo-awareness function under Regulation (EU) 2019/945 for specific UAS classes.

AMC1 to Article 9(1) addresses the quality of the geo-awareness information in terms of completeness, integrity, timeliness and availability.

GM1 to Article 9(1) is introduced to indicate that USSPs may create a testing infrastructure to check the performance of a set of predefined testing data.

GM2 to Article 9(1) relates to the feedback that USSPs should provide to the common information service provider in case of data quality issues. This is important for the reliability and integrity of the data generated by the geo-awareness service.

GM3 to Article 9(1) follows up on GM2 above with respect to data quality and highlights the necessity for the USSP to act in a continuous manner to maintain the data and information to the highest quality.

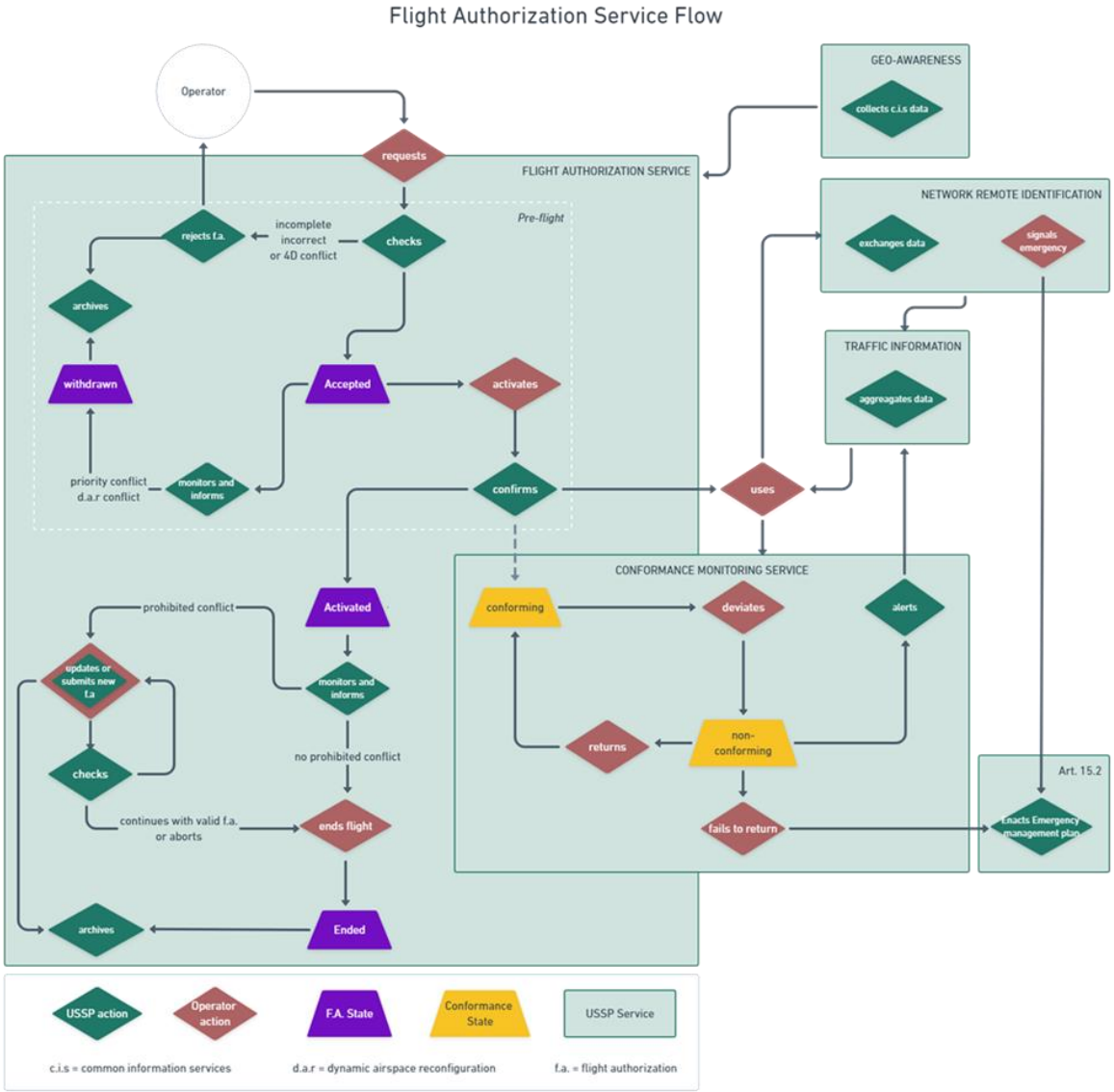
AMC1 to Article 9(2) defines the timeliness in relation with the data received from the common information services. Considering the variety of data shared as part of the geo-information service, a one-size-fits-all is not deemed appropriate. The requirements are, therefore, based on the data's update cycle and criticality level.

GM1 to Article 9(2) introduces a table to illustrate some values that USSPs may use for different types of geo-awareness data, depending on the data type, the CIS update cycle and the geo-awareness service update according to various scenarios. This table serves as a reference that may be used but is not to be considered as being the unique reference.

GM2 to Article 9(2) provides a reference to the EUROCAE ED-269 'MINIMUM OPERATIONAL PERFORMANCE STANDARD FOR GEOFENCING' standard that may be used by USSPs with regard to time format and version number of the geo-awareness information. In particular, such as for the geographical zones, the reference is Chapter VIII of and Appendix 2 to said standard, which give the characteristics and codes for the format specifications.

2.3.11. UAS flight authorisation service — Article 10

GM1 to Article 10 clarifies that the flight authorisation is a process to obtain a single conflict-free reservation of airspace within a U-space airspace. It does not imply that the flight is safe nor that the flight is permitted. The following diagram indicates the possible states of the flight after a request has been authorised:



AMC1 to Article 10(1) relates to the recording UAS flight authorisations as well as rejected flight authorisation requests by USSPs. It is expected that rejections will be followed by attempts to replan the flight. Giving the reason for the rejection is intended to guide the replanning process.

GM1 to Article 10(1) clarifies what should be covered in the terms and conditions of a UAS flight authorisation service. It is expected that the competent authority will set minimum technical performance standards for flight in each U-space airspace that will be proportionate to the expected demand for flights. The capacity of the airspace is a function of how closely together UAS can safely fly and improving that requires an increase in performance that generally implies a cost to the UAS

operator. The terms and conditions are a tool for the competent authority to curb wasteful reservation of airspace. The UAS operator has to describe in the flight authorisation request a 4D volume which has a 95 % probability of containing the flight. The operator is expected to err on the side of caution and operational flexibility by making the 4D volumes in the flight authorisation request as large as is permitted. The result will be that other flights are needlessly prevented from operating. The solution is for the competent authority to limit the dimensions of any 4D volume in the trajectory. Particularly at issue is the time dimension. Manned aviation has such large take off time uncertainty that no attempt is made to deconflict flight plans — conflicts are dealt with tactically. The aim of U-space is to achieve safety by strategically deconflicting the plans. To have anything approaching a useful capacity, U-space will need to limit the permitted take off time uncertainty. The ending of flights is not mentioned in the regulation. Ending is as important a state change as 'activation' — the in-flight services stop. The only actor who can safely end the flight is the UAS operator. Although it may seem valid to focus on the event 'landing', UAS flights are very often at low altitude and there may be no useful way to detect landing, nor any reason to consider a touchdown as the end of an authorised flight.

GM2 to Article 10(1) relates to the logging. The competent authority should be able to investigate any claims by UAS operators that they are being treated unfairly. Furthermore, the competent authority should from time to time review the design of the U-space airspace, one aspect of which is the balance between the capacity of the airspace and the demand to fly in that airspace.

GM1 to Article 10(2) defines the process of a flight authorisation request. No scheme has been standardised yet that allows a flight authorisation request to indicate that a flight has permission to cross an airspace boundary. Rejection of all flight authorisation requests crossing boundaries would be impossible to overcome for flights with permission, hence the only reasonable option is to warn all flights. The UAS operator is uniquely able to determine the 4D volumes required to contain their flight. Any USSP would require significant information proprietary to the UAS operator to calculate these volumes and is probably not interested in being liable for getting that calculation right. Predicting a conflict is thus a simple process of detecting intersections of 4D trajectories. This limits the liability of the USSP and keeps the process entirely transparent. Map making is the subtle art of making a flat two-dimensional representation of the surface of an undulating oblate spheroid, the earth. At different places slightly different projections are used. Different geopotential models are used with WGS84 (EGM84, EGM96, EGM2008, EGM2020) which determine the 'mean sea level'. Because of all these potential sources of confusion, the four dimensions in the flight authorisation should be expressed in terms that are precisely identified. There is an additional issue that conversions may introduce non-linear errors. Of particular concern is how height is expressed. The USSP should make clear to the UAS operator what is acceptable and must be able to convert whatever is accepted into terms agreed with the competent authority and the other USSP within an agreed error margin.

AMC1 to Article 10(2)(c) relates to the USSP providing the reason for any flight authorisation request rejection. It is expected that any rejection will be followed by attempts to replan the flight. Giving the reason for rejection is intended to guide the replanning process.

GM1 to Article 10(2)(d) describes the deviation thresholds to be set in a U-space airspace. Those thresholds derive from the conflict model and the TLS. The competent authority can modulate the separation to accommodate the expected level of traffic safely by imposing navigational performance requirements in terms of the maximum acceptable deviation.

AMC1 to Article 10(3), on weather information, covers the QNH. The QNH data needs to be considered part the normative data. The QNH is a conversion factor that links altitude to air pressure and has the primary feature that the same value is used by all concerned. It is expected to come from the CIS and be promulgated.

GM1 to Article 10(3) specifies that for weather information, the common altitude reference system can be used for converting the height/altitude. It is expected that U-space airspaces will have common altitude reference systems associated with them as part of the technical requirements attached to the airspace. A common altitude reference system indicates which means of measurement of altitude should be used (baro, GNSS, etc.), what datum should be used, how values should be expressed in different situations, and how conversions to other units should be made. The USSP is not expected to be competent in calculating the performance of the UAS operator's fleet nor in judging the safe limits of operation.

GM1 to Article 10(4) provides examples where UAS flight authorisation requests are not accepted and what is expected by the USSPs to ensure in such cases.

AMC1 to Article 10(5) intends to further describe the UAS flight authorisation process by confirming the activation of the flight. It describes when the USSP should confirm the activation and what it should do when the UAS operator does not activate the flight authorisation.

GM1 to Article 10(5) provides guidance on how to understand the phrase 'without unjustified delay' when the USSP confirms the activation of the flight authorisation. It contains a reference to an ASTM standard that is expected to be widely used. The number of 5% is proposed. The referred ATSM (F38 'Standard Specification for UAS Service Supplier (USS) Interoperability') has been published.

GM2 to Article 10(5) is related to the request for activation and the consequence that this has on the other U-space services. Of course, as a reminder, the flight authorisation would not be granted if found in conflict with another flight authorisation request.

AMC1 to Article 10(6) relates to the necessary coordination between all USSPs in order to work together effectively, as strategic conflict resolution is the core element of safe flights in U-space airspace. This should be reflected through specific arrangements in place.

GM1 to Article 10(6) underlines the necessity to ensure interoperability between USSPs. The ASTM standard (F38 'Standard Specification for UAS Service Supplier (USS) Interoperability') is expected to be widely used, as it is currently unique and supported by an open-source implantation. The regulation requires that USSPs to 'establish proper arrangements'. This GM aims to guide stakeholders as to what 'proper arrangements' might be. The general themes are identified. When standards emerge that support the many technical interchanges expected, they should be listed. To ensure that USSPs are treated equally a common contract is recommended.

AMC1 to Article 10(7) aims at clarifying the scope of what is expected from USSPs with regard to airspace restrictions and limitations.

GM1 to Article 10(7) clarifies that the UAS flight authorisation service can only inform the UAS operators that permission to enter a restricted airspace is required but will not refuse a flight authorisation if the flight is expected to enter a restricted airspace. The UAS operators need to take responsibility.

AMC1 to Article 10(8) covers the priority that special operations have against any UAS flight authorisation request. Indeed, a previously authorised flight can have its flight authorisation withdrawn when a higher-priority flight is found to be in conflict with it. In contrast to the case of submitting an authorisation request and immediately having it rejected, the USSP cannot safely discard the flight authorisation. Instead it is changed to a special state — withdrawn. The UAS operator will then try to update the flight to have it authorised. A risk for the UAS operator, being unaware of the withdrawn authorisation, is to try to activate the flight.

GM1 to Article 10(8) lists, for information, the special operations contained in Article 4 of Implementing Regulation (EU) No 923/2012 (SERA). This GM is provided for the sole purpose of giving direct access to the provisions of said Article 4.

AMC1 to Article 10(9) provides means for defining the order of processing when two UAS flight authorisations request have the same priority, based on the first come first served principle.

GM1 to Article 10(9) clarifies the time reference for the order of processing and refers to the UTC time to synchronise the clocks. All references to time should use a common agreed basis, not only in-flight authorisation..

AMC1 to Article 10(10) relates to the distribution of updates to the relevant common information service data and the need to continuously check both manned and unmanned aircraft traffic with regard to the flight authorisation request.

GM1 to Article 10(10) explains that USSP should check existing UAS flight authorisations against new or modified dynamic airspace restrictions/limitations until the end of an active flight. This is important as it gives ATC units the possibility to segregate part or all of the U-space airspace.

GM2 to Article 10(10) provides guidance about updated or withdrawn UAS flight authorisations, notification to other USSPs and the time at which the withdrawal of a flight authorisation may occur.

AMC1 to Article 10(11) relates to the unique authorisation number for a flight authorisation. Any identifier with a finite number of bits/characters/digits is able to represent a finite number of distinct values. Eventually the identifiers may repeat. A practical implementation will balance the size of the identifier against the period for which it is likely to be unique. This AMC proposes that this period not only considers the duration of a flight but also such uses as accident/incident investigation, traffic demand analysis — perhaps over several years.

GM1 to Article 10(11) explains the intent and objective of the unique authorisation number.

2.3.12. Traffic information service — Article 11

GM1 to Article 11 explains the scope and intent of Article 11 by specifying that this service provides the alerts, air situation and known/predicted (e.g. if tracking service is available) traffic to the UAS operator.

AMC1 to Article 11(1) relates to the USSPS identifying any known traffic in real time and reporting it immediately to the UAS operator.

AMC2 to Article 11(1) introduces the need for a common secure interoperable open traffic information protocol to which the USSPs should adhere. This is important to ensure harmonisation of the provision of data to any UAS operator that has or would like to enter into a contractual arrangement with a USSP.

AMC1 to Article 11(2) covers the degradation of service and the obligation for the USSPs to inform their UAS operators in case they are not able to provide the service anymore.

AMC1 to Article 11(3)(a) relates to the protection of the content of the traffic information that should not be modified when forwarded to other parties. The position, time of report as well as speed, heading and direction of an aircraft should therefore be disseminated as it is received by the USSP.

GM1 to Article 11(3)(b) explains that the update frequency of a traffic information service will contribute to the overall latency of aircraft reports.

2.3.13. Weather information service — Article 12

Three main areas are considered important to be covered with regard to the weather service. The first area is the origination of the weather information and being sure that the data comes from trusted sources. The second area is that the weather information needs to be available up to date for both forecast and actual weather data, and the AMC related to the up-to-date information proposes some figures for the latency. Finally, the weather information needs to be reliable.

GM1 to Article 12 explains the objectives of Article 12 and the specificities of weather information for UAS traffic in the U-space airspace as well as the support to other U-space services such as the UAS flight authorisation service. The requirements on weather information for U-space do not indicate who is eligible to provide weather information services but only specifies a minimum content of weather information to be available for the purpose of UAS operations. It does not exclude the possibility that current aeronautical meteorological service providers could provide this service.

AMC1 to Article 12(1)(a) proposes two means by which the USSP can confirm that the weather data and information is trustworthy, stemming from trusted sources. The principle is that the data and information should come from authoritative source. But weather data and information may also come from organisations not formally recognised by the MS to originate and/or publish data which meets the data quality requirements. In that case, the USSP should check through appropriate verification and validation methods that they conform with reliability and the data quality requirements. This AMC ensures that, at any time, the USSP can demonstrate that the weather data is reliable for the UAS operator.

GM1 to Article 12(1)(a) provides explanations about those organisations considered as being authoritative sources and those that are not. This GM is in line with the term ‘authoritative source’ defined in Regulation (EU) 2017/373 Annex I (Definitions).

AMC1 to Article 12(2)(f) specifies the criteria against which the location and time of the weather information should be measured, both for forecasts and observations. The ICAO designator and the reference to WGS-84 should be the main measurement references.

GM1 to Article 12(2)(f) underlines that the list of weather information included in Article 12 constitutes the essential information, but that this requirement does not prevent the USSP from providing a subset of the said weather information.

AMC1 to Article 12(3) relates to the performance requirements relevant to actual weather information as well as updated weather forecast. The number of 30 seconds maximum is proposed for the actual weather information and is considered to give enough time to the USSP to manage this information before sending it to the UAS operators. The proposal for 5 minutes for the forecast data

is meant as being reasonable given the fact that the USSP would need to process it before sending. This AMC also covers the reliability aspects in terms of confidence level, when feasible.

GM1 to Article 12(3) provides clarification on the up-to-date weather data and information as well as on the reliability aspects according to AMC1 above.

2.3.14. Conformance monitoring service – Article 13

GM1 to Article 13 provides a general description of the objective of the conformance service as well as the action to be taken by the USSPs when non-conformities of the UAS flight are detected.

GM2 to Article 13 lists five specific situations when the UAS is defined as non-compliant. It also clarifies that if, during the flight, the UAS operator cannot be provided with the conformance monitoring service anymore, they should continue the flight in accordance with the contingency procedures.

AMC1 to Article 13(1) defines the latency for the issuing of the alert, proposing that this should be done within 5 seconds. The proposed 5 seconds are based on technical discussions held in various organisations developing technical standards for such service.

AMC2 to Article 13(1) is about compliance information. As the information stemming from the conformance monitoring service may be shared through the common information service, it is important that other stakeholders know that the compliance is confirmed.

AMC3 to Article 13(1) defines what the USSP should be capable of doing when providing this service. This should ensure that USSPs can effectively provide the conformance monitoring service by assuring these tasks. Importantly, this AMC stresses that those task should be performed in the sequence they are listed.

GM1 to Article 13(1) provides the meaning of a non-compliance notification and how it should be understood with respect to the flight authorisation.

2.3.15. Application for a certificate — Article 14

GM1 to Article 14 explains the purpose of a certificate, who issues it and underlines the introduction of a standard certification template for the USSP and the single CIS provider.

GM1 to Article 14(3) explains that the USSP certificate may contain operational conditions or limitations and provides some examples of such restriction/limitations.

GM1 to Article 14(6) provides a template for the application form for a certificate. The applicant details as well as the reason for application are included in this template.

2.3.16. Conditions for obtaining a certificate — Article 15

In relation with this article, many AMC and GM are proposed. Therefore, stakeholders will find an overview of what is proposed regarding the conditions for obtaining a certificate. As the requirements in the U-space regulation refer to the requirements in Subpart B of Annex III to Implementing Regulation (EU) 2017/373, it is logical that the AMC & GM proposed in this NPA are based on those AMC & GM used for the ATM/ANS domain. Similarly, the proposed AMC & GM are also applicable to the single CIS providers and USSPs as their services are of a similar nature to those provided by most of the ATM/ANS providers when they ensure the provision of information.

The main areas subject to AMC & GM in this proposal are on occurrence reporting, management system, security management system, contracted activities, personnel requirements, record-keeping,

operations manuals, business plan, insurance cover, contingency plan and emergency plan. As the management system is the core element of the conditions to obtain the certificate, most of the AMC & GM associated with ATM/ANS rules have been taken over by this proposal.

The AMC & GM for U-space take into account the fact that USSPs and single CIS providers are new aviation entities, often smaller organisations compared to known ANSPs today and the scope of their activity is quite different from the latter. Therefore, the proposed AMC & GM take into account this difference and are adapted to the U-space specificities. Proportionality has been applied and a pragmatic approach was favoured during the drafting phase.

2.3.17. Validity of the certificate — Article 16

GM1 to Article 16 explains that the certificate of the USSP/single CIS provider has an indefinite duration subject to the provider being in compliance with the applicable requirements. This is proposed to facilitate and promote the implementation of a risk-based oversight scheme by the competent authority and to ensure a continuous oversight based on identified risks instead of an oversight aiming at ensuring compliance and closing findings only at the stage of re-certification process. This approach is in line with the other aviation domains.

AMC1 to Article 16(3) proposes the criteria for the assessment of the financial performance that the USSP/single CIS provider are subject to. The use of an appropriate accounting system and of balance sheets and accounts are the main elements for the MSs to monitor this financial performance.

2.3.18. Capabilities of the competent authorities — Article 17

GM1 to Article 17 explains that the competent authorities must ensure that they are able to perform their duties by meeting a number of requirements to properly accomplish their function.

2.3.19. Tasks of the competent authorities — Article 18

GM1 to Article 18 explains that the competent authorities have various tasks which are not exclusively related to their 'normal' duties as a certifying authority, but that Article 18 requires them to take operational action/decision in relation to U-space development directly.

AMC1 to Article 18(f) provides means, in the context of integrated and sustainable mobility policies, engaging with, cross-sectoral stakeholders (systemic approach) to ensure the deployment of U-space and future mobility services offered to citizens to aim for a 'negotiated value creation' among affected parties. This requires co-creation and collaborative processes for coordinating and aligning multi-party views.

GM1 to Article 18(f) explains that although airspace is governed at national level and in accordance with international air law conventions, it is acknowledged while the challenges from low-altitude airspace cannot be ignored. For many local authorities (e.g. municipalities) this airspace is considered as extension of the public space under their responsibility (e.g. for the security and well-being of their citizens, as well as urban planning and traffic management arrangements). This GM identifies the evolving roles and responsibilities of all the authorities and entities referred to in Article 18(f).

GM2 to Article 18(f) provides an overview of the coordination mechanism that includes the three phases. The planning phase is the starting point where there is this need to create a U-space airspace; the coordination mechanism is then activated to allow for a decision agreed by all the actors involved. During the execution phase, UAS operations are taking place in the U-space airspace and the coordination between all the actors is ensured in a continuous manner — this is the routine

coordination. Finally, the review phase will allow all the actors to benefit from lessons learned, improve what can be done better, exchange views and experiences, take feedback from operational actors and reflect the societal embracement necessary for the public acceptance of U-space deployment.

GM3 to Article 18(f) explains the coordination mechanism framework combining the actors, the phases and the activities throughout the life cycle of the U-space deployment.

GM4 to Article 18(f) describes in more detail the three phases. The planning phase is the starting point and the competent authority is responsible for engaging the coordination mechanism. This involves the designation of a U-space coordinator that manages the 'hearing' process to ensure inclusion and consultation by all stakeholders affected by the U-space deployment, which should also involve citizens. The hearing process ends with the transmission of the recommendation from the U-space coordinator to the competent authority, which should take the statement into account in the following U-space deployment decision-making process and formal U-space airspace designation. The execution phase starts after the formal designation of the U-space at the time of the actual operations. There is no predetermined end, as long as the U-space is in effect. There may be temporary restrictions or limitations on the U-space airspace by the competent authority at national level or by specific authorities at all levels requesting/demanding time-critical changes due to safety or security concerns (emergencies). This may trigger a dynamic airspace reconfiguration by ATC. The level of the acting authority depends on the kind of the emergency and the organisational structure of the respective MS. The Review phase aims at continuous U-space improvement through a feedback loop on topics dealt with during the Plan phase. If the modification creates new concerns, the Plan phase should start again. The result of the review phase could lead to maintaining or restricting certain U-space operations as well as to reshaping it in terms of either opening new opportunities for its expansion or even its decommissioning.

GM5 to Article 18(f) provides a list of the entities involved during the different phases of U-space, when their involvement is necessary, and how they contribute to the overall coordination mechanism framework.

2.3.20. Entry into force and application — Article 19

GM1 to Article 19 clarifies the reason why the regulation will apply on 26 January 2023 and the need to allow all the affected parties to adapt and prepare for U-space implementation.

2.3.21. Annex IV 'UAS flight authorisation request referred to in Article 6(4)'

GM1 to Annex IV provides a table including the specificities that are expected to be understood within the information disseminated within the UAS flight authorisation service. Specificities are related to the information type and possible examples. This table is provided to explain what information is expected to be covered under the elements of Annex IV.

2.3.22. Annex V 'Exchange of relevant operational data and information between U-space service providers and air traffic service providers in accordance with Article 7(3)

AMC1 to Annex V(2) relates to the obligation to exchange operational data and information between USSPs and ATS. To comply with the requirement, EUROCONTROL 'Specification for SWIM Technical Infrastructure (TI) Yellow Profile' should be used, while the documentation should adhere to the EUROCONTROL 'Specification for SWIM Service Description (SD)' with some limitations.

AMC1 to Annex V(3) refers to conformance according to the requirements in Annex A to the latest version of EUROCONTROL 'Specification for SWIM Technical Infrastructure (TI) Yellow Profile' as a means to ensure the protection of the data.

GM1 to Annex V(3) provides guidance on the transport layers security compliance.

AMC1 to Annex V(4) refers to EUROCONTROL 'Specification for SWIM Technical Infrastructure (TI) Yellow Profile' for the technical infrastructure when using a common secure interoperable open communication protocol.

Draft AMC and GM to Regulation (EU) 2021/665 of 22 April 2021 amending Implementing Regulation (EU) 2017/373 as regards requirements for providers of air traffic management/air navigation services and other air traffic management network functions in the U-space airspace designated in controlled airspace

2.3.23. Dynamic reconfiguration of the U-space airspace

AMC1 ATS.OR.127(a) proposes that ATS providers establish arrangements with manned aircraft operators operating special operations. These arrangements should allow for timely notification of the intended manned operation.

AMC1 ATS.TR.237(a) defines that dynamic airspace reconfiguration causing the forced landing of unmanned aircraft should only be applied by ATC when so dictated by safety reasons connected to manned traffic, in order to avoid unnecessary risks.

AMC2 ATS.TR.237(a) relates to prioritisation of traffic in the U-space airspace. It is noted that, although ATC is understood to have the final decision on applying dynamic airspace reconfiguration, there may be instances where manned traffic does not necessarily have priority over unmanned. While it would be premature, at this stage, to engage in establishing a detailed order of priority, the subject should be addressed in the relevant soft law.

GM1 ATS.TR.237(a) explains that the decision to dynamically reconfigure the U-space airspace should not be applied as a unilateral action by the ATC unit (except for contingency situations, e.g. manned aircraft known or believed to be in a state of emergency, or operations of aircraft engaged in public service such as HEMS operations, police, fire fighting, etc.). In consideration of the need to take into account both actual priorities, and UAS performance and capability to comply, direct coordination among ATC and USSPs should be explored, likely within the framework of letters of agreement.

GM2 ATS.TR.237(a) explains why MSs should consider dynamic reconfiguration of the U-space airspace in a three-dimensional multi-phased manner and provides explanation for the vertical and lateral limitations of the U-space airspace as well as the entire deactivation of the U-space airspace. Airspace design criteria imply the inclusion in airspace structures (e.g. ATZs, CTRs) of volumes of airspace, mostly at very low level, which are not actually of use to manned traffic. While the application of established protection buffers is paramount in manned aviation, additional criteria might be safely used with reference to the operational performance of specific classes of unmanned aircraft, thus allowing for the designation of U-space airspace in controlled airspace with a reasonable assurance that both domains will efficiently coexist in the context of segregation.

AMC1 ATS.TR.237(b) relates to effectively ensuring the coordination between ATS providers and USSPs. The early notification by the ATC unit is crucial for the activation or deactivation of the U-space

airspace to allow ATC units to anticipate any decision about it and to agree on possible arrangements with manned operators to receive this information as quickly as possible.

GM1 ATS.TR.237(b) explains that ATC should initiate coordination with involved USSPs as early as possible, in view of anticipated airspace reconfiguration (e.g. in conjunction with weather forecast). Establishing a pre-set, minimum advance notice could be difficult in many instances; however, analogy may be found in this respect in EUROCAE ED-269 'Minimum Operational Performance Standard for UAS Geo-Fencing', which specifies the minimum performance expected from a geofencing function to ensure that it will perform its intended sub-functions satisfactorily under all conditions normally encountered in routine aeronautical operation.

Draft AMC and GM to Regulation (EU) 2021/666 of 22 April 2021 amending Regulation (EU) No 923/2012 as regards requirements for manned aviation operating in U-space airspace

2.3.24. E-conspicuity

The requirement in SERA.6005(c) introduces the new obligation for manned aircraft operating in U-space airspace. In case they are not provided with an air traffic control service, they shall make themselves continuously electronically conspicuous to the USSPs. The central part of the proposed AMC & GM is the introduction of a minimum position information message standard for the transmissions by manned aircraft to make themselves conspicuous. Additionally, the proposal refers to the new EASA technical specification that will apply to the transmissions using SRD 860 frequency band. This to ensure a mutual interoperability among the various systems using that spectrum today but transmitting often in different incompatible protocols. Some devices will need to be adapted to comply with the EASA new technical specification to fulfil the objective of the requirement in SERA.6005(c).

The proposal introduces three alternative means for transmissions of minimum position information by operators of manned aircraft:

1. Certified ADS-B out systems compliant with ICAO Annex 10: This option covers ADS-B out certified solutions transmitting on 1090 MHz frequency. It does not cover other internationally standardised solutions (e.g. UAT) that are not yet implemented and deployed for that purpose in all EU.
2. Systems transmitting on SRD 860 frequency band: This option covers the existing systems transmitting on SRD 860 frequency if voluntarily adapted to comply with the new minimum position information standard as well as with the referenced EASA technical specification defining the required transmission protocol to ensure message readability by USSPs.
3. Systems transmitting via standardised mobile telecommunication network services coordinated for aerial use in Europe: This option covers the use of mobile telephony devices utilising the existing application-based mobile telephony services and transmitting position information via (free) applications adapted to the new minimum position information standard.

The overall principle introduced by the proposal is that any USSP will need to support all specified means of transmissions by operators of manned aircraft.

2.4. What are the expected benefits and drawbacks of the proposed amendments

This part complements the assessment of the impact of the requirement in Regulation (EU) 2021/666 as documented in Opinion No 01-2020. There were no additional drawbacks identified as stemming from the proposed AMC & GM in this NPA, which will support the application of the requirement in SERA.6005(c) as further described in point 2.3.24. The proposed AMC & GM for that requirement, which was developed on the basis of regular exchanges with affected stakeholders[15], forms the initial element of a wider iConspicuity[16] strategy aiming at mitigating the airborne collision risk affecting manned aircraft. The next steps, which will build on this proposal, are expected to expand the functionalities beyond what is required by SERA.6005(c) to address the GA iConspicuity issue more generally, including the possibility to use the information transmitted by the GA traffic for enhancing the existing flight information service.

The key element of the proposal is the introduction of the new minimum position information message standard for transmissions by manned aircraft. The new minimum position information standard was derived from the ADS-B out international standard so that there is a mutual interoperability between the two.

From the manned aircraft operators' perspective, the proposal introduces three alternative means (according to the user's preference) for required transmissions of minimum position information in U-space airspace. Any of the three alternatives is effective and achieves the respective objectives of SERA.6005(c).

1. Certified ADS-B out systems compliant with ICAO Annex 10

   This option utilises the previous investments made by airspace users in response to pan-European 1090 MHz ADS-B mandate and other users using this technology on a voluntarily basis. Among the three alternatives this one is considered the most expensive for the aircraft currently not equipped with any of the proposed systems. This option could cover also other internationally standardised solutions (e.g. UAT) if implemented and deployed for that purpose in all the EU.

2. Systems transmitting on SRD 860 frequency band adapted to comply with the new EASA technical specification

   This option utilises the previous investments of 50.000+ airspace users of existing systems originally developed for similar purposes but for specific user groups. These solutions will need to be adapted to the new technical specification for minimum position information. The original equipment manufacturers (OEMs) of existing systems will be closely involved in the development of the new specification so that as many as possible from existing systems could be adapted to the new specification. The cost of the adaptation for aircraft operators is expected to be minimal as was confirmed at the workshop with affected OEMs[17].

3. Systems transmitting via standardised mobile telecommunication network services coordinated for aerial use in Europe

[15] General Aviation, military and State aircraft operators, USSPs and original equipment manufacturers.

[16] 'In-flight capability' to transmit position and/or to receive, process and display information about other aircraft, airspace or weather in real time with the objective of enhancing pilots' situational awareness.

[17] EASA workshop 'Use of existing electronic conspicuity devices for U-space' held on 28 October 2021.

The aerial use of mobile telephony is an affordable alternative for airspace users who prefer to use the existing mobile telephony devices and application-based mobile telephony technology services. The feasibility of this option was confirmed by the feasibility study commissioned by EASA for this purpose[18]. The existing, usually free, applications would need to be adapted, and new applications may be developed to transmit information required by the new minimum position information message standard to make their users conspicuous to USSPs.

The overall principle of the proposal is that any USSP will support all proposed means of transmissions by manned aircraft as described above. That should ensure, from the perspective of manned aircraft not provided with an air traffic control service by the ANSP, a harmonised implementation of U-space airspace anywhere in the EU with a view to guaranteeing a seamless operation of these aircraft regardless of their geographical location. For the complete system, this is also the most affordable way forward to allow a fully harmonised and pan-European introduction of U-space airspace in a very short time frame. It is expected that USSPs will utilise as much as possible the existing infrastructure (e.g. ANSP surveillance systems, mobile telecommunication networks) and install a new but affordable infrastructure only when necessary, e.g. for reception of signals in SRD 860 frequency band. This proposed approach was presented to USSPs at the dedicated workshop[19] where it was confirmed that it is consistent with their plans for making manned aircraft electronically conspicuous in U-space airspace.

The overarching benefit of this proposal is that it provides for full interoperability among the many existing and any future systems for making aircraft electronically conspicuous in an airspace. It is expected that the overall safety and efficiency benefits are well above the potential investment needed by airspace users. In addition, this proposal would further enable the development of U-space.

[18] EASA Feasibility Study about the possibility of using mobile telecommunication technologies for making manned aircraft electronically conspicuous in U-space, September 2021.

[19] EASA workshop - 'What are USSP's needs for aircraft to be electronically conspicuous in U-space' held on 22 July 2021

3. Proposed amendments

All the AMC & GM proposed in this Chapter 3 are new; no existing AMC or GM is affected by this NPA.

3.1. Draft AMC and GM to Regulation (EU) 2021/664 on a regulatory framework for the U-space (U-space framework)

GM1 Article 1(1) Subject matter and scope

SCOPE — MILITARY AND STATE AIRCRAFT

(a) Although military and State aircraft operations are in principle excluded from the scope of Regulation (EU) 2018/1139 and its implementing and delegated regulations, safety of operations is paramount in the airspace subject to EU aviation safety regulations. In this context, a safe separation of aircraft also in the U-space airspace is always expected during all stages of flight.

(b) It is recalled that when defining UAS geographical zones in accordance with Article 15 of Regulation (EU) 2019/947, Member States should also consider other aspects than safety, such as security aspects. Indeed, a Member State could implement a U-space airspace in critical areas for security and/or defence reasons, including military and State aircraft operations.

(c) In this context, military and State aircraft authorities are partners in the decision-making process of the 'coordination mechanism' (as per Article (18)(f) of Regulation (EU) 2021/664) for the implementation of U-space to cover the safety and security aspects in a U-space airspace, from the initial 'airspace assessment' until the U-space is implemented and monitored.

(d) The involvement of military authorities in relation to U-space is considered as key to guarantee the level of safety and security in the U-space airspace — from both a ground and an air risk perspective.

(e) For example, military and State aircraft conducting short-notice off-airfield landings while carrying out their duties may require portions of the U-space to be adjusted or possibly deactivated. In this case, air traffic control units should apply the dynamic reconfiguration of the U-space airspace at short notice, if/when required by military and State aircraft, as necessary, in accordance with the principles of Article 4 of this Regulation.

GM1 Article 1(3) Subject matter and scope

APPLICABILITY

(a) This Regulation has its main legal basis in Article 57 of Regulation (EU) 2018/1139 on implementing acts as regards unmanned aircraft. Its applicability is limited to unmanned aircraft, as well as natural and legal persons involved in their operation — in the context of this Regulation: UAS operators, U-space service providers (USSPs) and common information services (CIS).

(b) Therefore, requirements on ATS providers or requirements related to manned aircraft operations are not included in this Regulation. Instead, provisions pertaining to ATS providers are included in a dedicated amendment to Regulation (EU) 2017/373, which has its legal basis in Article 41 of Regulation (EU) 2018/1139 on ATM/ANS providers. For their part, provisions related to manned aircraft are included in a dedicated amendment to Regulation (EU) No 923/2012 (SERA), which has its legal basis in Articles 31 and 44 of Regulation (EU) 2018/1139 on implementing acts as regards air operations and implementing acts as regards the use of airspace and the design of airspace structures, respectively.

(c) This article also exempts some UAS operations from the application of the rules. In particular, the rules do not apply to:

(1) model aircraft operating in the framework of model aircraft clubs and associations that received an authorisation in accordance with Article 16 of Regulation (EU) 2019/947. Considering the good safety level demonstrated by model aircraft operations in clubs and associations, the seamless transition from the different national systems to the new Union regulatory framework offered by Regulation (EU) 2019/947 is maintained;

(2) unmanned aircraft with a maximum take-off mass (MTOM) of less than 250 g when used in subcategory A1 of the 'open' category. Such unmanned aircraft do not represent a significant safety risk in case of collision. Therefore, operators of these UAS were exempted from the requirement of registering themselves in accordance with Regulation (EU) 2019/947. This includes privately built unmanned aircraft with a MTOM of less than 250 g, as well as class C0 UAS as defined in Regulation (EU) 2019/945, including those that are toys in the meaning of Directive 2009/48/EC;

(3) UAS flying according to instrument flight rules (IFR) in compliance with the current standardised European rules of the air (SERA). Those benefit from air traffic service (ATS) as summarised in Appendix 4 to Implementing Regulation (EU) No 923/2012. This does not exclude certified UAS from flying in U-space airspace with the support of U-space services; and

(4) UAS carrying out military, customs, police, search and rescue, firefighting, border control and coastguard or similar activities and services undertaken in the public interest. This exemption is not explicitly included in Article 1 as it is a general principle deriving from Article 2(3)(a) of Regulation (EU) 2018/1139.

GM1 Article 2(6) Definitions

DYNAMIC AIRSPACE RECONFIGURATION — SHORT-TERM CHANGES

Under the definition of 'dynamic airspace reconfiguration', the expression 'short-term changes in manned traffic demand' may cover various cases ranging from clearing the path of an aircraft in emergency or distress, to accommodating unexpected traffic demand due to any contingency situation or allowing a shorter route for an individual flight, as well as potential U-space airspace restrictions to enable military and State operations. But the objective is to keep these cases exceptional when establishing the U-space airspace, for the sake of safety and efficiency of the aviation system.

GM1 Article 3 U-space airspace

RESPONSIBILITIES IN THE U-SPACE AIRSPACE

(a) Member States have complete and exclusive sovereignty of the airspace above their territory and, therefore, have full authority on the designation of the U-space airspace, regardless of the fact that such designation is driven by safety, security, privacy or environmental considerations.

(b) It is recalled that for the designation of a U-space airspace, a Member State will need to assess numerous safety-significant factors, including, among others:

(1) the type, density, and complexity of existing and planned unmanned traffic, including UAS operations taking place in the context of authorised model aircraft clubs and associations;

(2) the type, density, and complexity of existing and planned manned traffic, including air sports activities;

(3) the operational capacity of the designated ATS providers to interface with the CIS provider and USSPs in the foreseen U-space airspace;

(4) the operational capacity of USSPs and, when relevant, the single CIS provider;

(5) the complexity of the airspace structure;

(6) the availability of safe and secure communication mechanisms to enable UAS operators and USSPs to exchange digital information;

(7) the classification of the airspace and the services provided to IFR and visual flight rules (VFR) aircraft;

(8) existing UAS geographical zones defined in Article 15 of Regulation (EU) 2019/947; and

(9) the topographical environment and prevalent meteorological conditions.

(c) Conversely, when a Member State considers issuing a new authorisation to model aircraft clubs and associations or when defining new UAS geographical zones, it should assess already designated U-space airspace.

(d) Initial designations of U-space airspace are expected to take place at low-level altitude, e.g. below 500 ft, and where there is very little expected manned traffic.

(e) Besides the four mandatory U-space services, Member States may decide that additional U-space services are needed to support safe, secure, and efficient UAS operations in specific volumes of U-space airspace.

AMC1 Article 3(1) U-space airspace

AIRSPACE RISK ASSESSMENT

(a) The airspace risk assessment should cover, as a minimum:

(1) Hazard identification, including safety, security, privacy and environmental hazards.

(2) Risk analysis, including the evaluation of the likelihood and/or exposure of the harm taking place in the planned operations.

(3) Based on the previous analysis, mitigation actions should be taken when necessary to ensure an acceptable risk level.

(b) The airspace risk assessment should be made before the establishment of the U-space airspace and before changes to the U-space airspace affecting the initial airspace risk assessment are introduced.

(c) The airspace risk assessment process should consider the coordination mechanism in Article 18(f) of this Regulation.

GM1 Article 3(1) U-space airspace

REASONS FOR THE ESTABLISHMENT OF A U-SPACE AIRSPACE

A U-space airspace may be established for several reasons; for example:

(a) Safety

(1) UAS operations sharing airspace (or not) with manned aircraft operations;

(2) To improve the visibility of unmanned aircraft;

(3) To decrease the ground risk, such as it is the case of multiple UAS flying over an assembly of people in urban areas or highly populated areas; and

(4) In the case of high UAS density, there could be a need to organise the traffic; for example, an intersection between UAS predefined trajectories. U-space services such as UAS flight authorisation and traffic information may support in that respect.

(b) Security

(1) To improve identification of unmanned aircraft;

(2) To support the enforcement of local rules (e.g. prohibiting flights above sensitive sites, limited schedules, performance requirements) where there are too frequent violations and/or a need to support UAS operators if the availability of the related UAS geographical zones is not sufficient to ensure effective application of flight constraints. This may notably concern protection of critical infrastructures;

(3) To support Member States' authorities in detecting, responding to and investigating the use of UAS for malicious or unlawful purposes; and

(4) To support the protection of services critical to the proper functioning of the Member State, the economy and society from the use of UAS for malicious or unlawful purposes.

(c) Privacy

To support the enforcement of particular conditions for certain or all UAS operations for privacy reasons. Flying above some areas could be restricted to some users or to some slots (as for restricted areas for manned aviation).

(d) Environment

(1) To define environmental requirements for the UAS (speed could be limited, a minimum height could be required);

(2) To limit the traffic density to an acceptable level of disturbance above environmentally sensitive sites.

GM2 Article 3(1) U-space airspace

AIRSPACE RISK ASSESSMENT — GENERAL

(a) An airspace risk assessment involves making use of information relevant for air and ground risks posed by unmanned aircraft flying in the airspace volume assessed. It should also supply information for specifying the minimum performance requirements for the airspace volume assessed. This would ensure a harmonised approach for all involved entities.

(b) An airspace risk assessment is a combination of qualitative and quantitative analysis ensuring that safety and performance criteria are met, and that assumptions and enablers are consistent with the current airspace design and procedures. Expert judgement is essential for a relevant and meaningful analysis, since simply working through a basic checklist may not be sufficient. The methodology used in this process needs to contain a clear set of objectives and a realistic view of airspace operations.

(c) Different formats are recognised (formal to less formal) for the approach to the analytical aspects of the airspace risk assessment. For some hazards, the number of variables and the availability of both suitable data and mathematical models may lead to credible results with quantitative methods (requiring mathematical analysis of specific data). However, few hazards in aviation lend themselves to credible analysis solely through quantitative methods. Typically, these analyses are supplemented qualitatively through critical and logical analysis of the known facts and their relationships.

(d) Initial risk determinations might be qualitative in nature, based on experience and expert judgement more than factual data, while over time quantitative data may support or alter the determinations of severities and probabilities to establish a more precise risk classification scheme.

(e) When available, appropriate tools for quantitative analysis of ground risk and air risk assessment should be used for substantiation of the U-space airspace risk assessment.

(f) Whenever an operation in the ‘specific’ category takes place within U-space airspace, the SORA will require characteristics of the airspace as an input.

(g) The objective of the applied methodology should be to define a means for providing assurance that U-space is safe for operational use. This requires an iterative process, development life cycle, from initial system definition, through design, implementation, integration, transfer to operations, to operations and maintenance. The iterative process could make use of the different tools and methods, such as fault tree analyses, event tree analyses, common cause analyses, data collection, tests and validations or documentation of the evidence among others.

GM3 Article 3(1) U-space airspace

AIRSPACE RISK ASSESSMENT — PROCESS PHASES

(a) An airspace risk assessment can be visualised as a process composed of few phases, as per the following diagram, further detailed below:

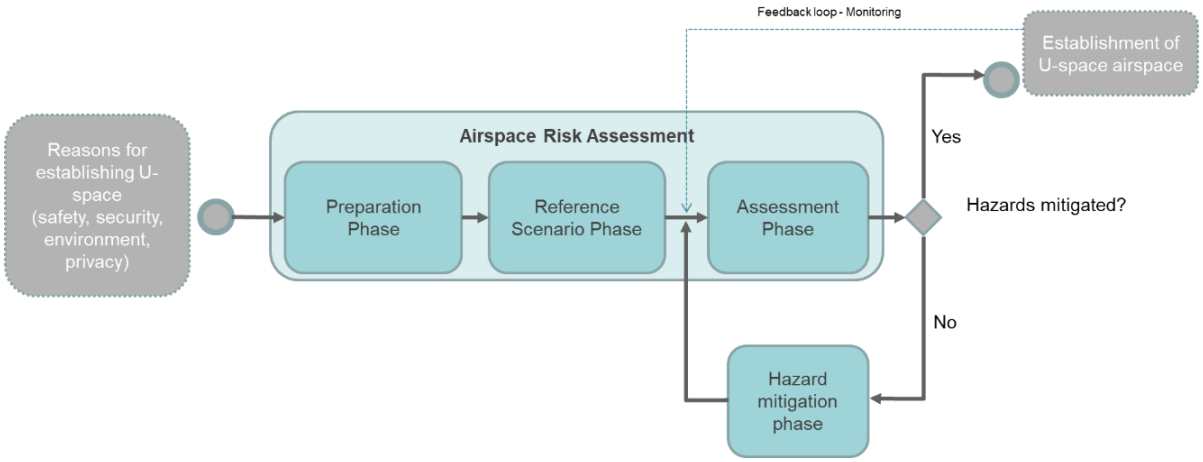


Figure 1 — Airspace risk assessment process

(1) ***The preparation phase*** begins with retrieving parameters of the assessment including operational and infrastructure assessment as well as defining any assumptions and constraints. An important part is the identification of involved stakeholders. An assessment team needs to be created to ensure that no area is left unexamined.

(2) ***The reference scenario phase*** concerns only the analysis of the studied airspace before U-space implementation and includes qualitative analysis that ensures that safety and performance criteria are met, and assumptions and enablers are consistent with the current airspace design. An important step of this phase is conducting interviews with stakeholders, including non-aviation entities, assessing ground infrastructure, identifying technical support infrastructure, and collecting the necessary data in a common data format.

(3) ***The assessment phase*** addresses the need to ensure that airspace (manned and unmanned) users fly in portions of airspace and in certain conditions in a way that will ensure safety, security, privacy, and the protection of property, state apparatus, and the environment to the greatest extent possible. The hazards, the risks and the mitigations in the adjacent area need to be considered. Member States should be familiar with conducting risk assessments, even if several methods can be used during the risk assessment phase.

(4) ***The mitigation phase*** addresses the situation in which the assessment phase requires additional hazard mitigation, including additional U-space services (Regulation (EU) 2021/664, Article 3.3.), to achieve the set-up of the U-space airspace. Simulations can facilitate ensuring the effectiveness of the proposed mitigations. A risk assessment in the context of the U-space is an evaluation based on engineering and operational judgement

and/or analysis methods to establish whether the achieved or perceived risk is acceptable or tolerable while identifying the requirements that are to be met in that perspective.

(b) The assessment phase (focusing on safety)

(1) Member States are invited to select the most appropriate risk assessment method to suit their needs and consider the following.

(2) Currently, there are various risk assessment methods available in different stages of development. The most prominent are SORA (for individual UAS operations only, in the 'specific' category) and EUROCONTROL Expanded Safety Reference Material (E-SRM) related methods. Provided that none of these methodologies have been specifically developed to conduct an airspace risk assessment for U-space airspace, certain gaps need to be covered. Some of these gaps are related to traffic density, mapping information related with population density and obstacles, in-depth assessment of encounters with manned aviation, collision consequences between unmanned aircraft, among others.

(3) A good methodology usually accommodates the following elements during the airspace risk assessment:

(i) What is meant to be safe (i.e. definition of the safety criteria);

(ii) What needs to happen in the airspace to satisfy the safety criteria; and

(iii) How the U-space design and procedures satisfy the safety objectives (safety and performance requirements linked to Article 3(4)(b) of this regulation).

(4) Such elements can be allocated to different stakeholders (e.g. USSPs, UAS operators, etc.)

(5) It is expected that the assessment phase includes a description of the safety activities to be conducted by service providers/operators (e.g.in a safety plan). It is recommended that safety assurance activities are documented to present sufficient evidence that the actions taken are adequate and complete to identify and mitigate the identified risks (e.g. safety assessment report). The aim is to specify the detailed safety assessment activities to be undertaken for a given airspace. This preparatory process identifies the main safety issues associated with the referred airspace under assessment as soon as possible.

(6) It is recommended that the following safety assessment activities, at a minimum, are performed at safety planning level:

(i) Description of the key properties of the operational environment that are relevant to the safety assessment;

(ii) Identification of the pre-existing hazards that are inherent in aviation in the referred U-space airspace under assessment;

(iii) Determination of the operational services (U-space, CIS, ANS, etc.) provided by the USSP relevant to the U-space airspace under assessment; and

(iv) Derivation of suitable safety targets for the U-space airspace.

(c) Safety hazards

(1) Currently, in Regulation (EU) 2017/373, the term 'hazard' means 'any condition, event, or circumstance which could induce an accident'. This definition is maintained in the context of U-space airspace and is considered to cover both pre-existing aviation hazards (not caused by U-space functional systems) and new hazards introduced by the U-space functional systems (failure of the system).

(2) This interpretation relates to a broader understanding of what a hazard is. It addresses two types of hazards: (i) 'pre-existing' hazards, which the U-space associated functional system has to mitigate; and (ii) 'system-generated' hazards, which are created by the potential failure of the U-space functional system.

(3) In an airspace risk assessment associated with U-space, both types of hazards, pre-existing and system-generated hazards, need to be considered, analysed and mitigated.

(4) In a U-space airspace, the pre-existing hazards and risks are generally those inherent in aviation and shall be mitigated as much as possible by the U-space.

(i) Examples of pre-existing hazards:

(A) A situation in which the intended trajectories of two or more aircraft are in conflict

(B) A situation where the intended trajectory of an aircraft conflicts with the terrain or an obstacle

(i) For each system-generated hazard, there is a need to provide:

(A) the assessed immediate operational effect(s);

(B) the possible mitigations in terms of measures to be implemented to protect against the risk-bearing hazards;

(C) the assessed severity of the mitigated effect(s), in accordance with a severity classification scheme defined for the U-space airspace; and

(D) safety objectives, to limit the tolerable frequency with which the system-generated hazard could be allowed to occur.

(d) Frequency of airspace assessments

An airspace assessment should be revised when the operational, regulatory and technology deployment context evolves. Operational context includes incident and accident reports, traffic density, new procedures, and new stakeholders. The frequency of the re-assessment depends on local conditions.

GM4 Article 3(1) U-space airspace

CHECKLIST TEMPLATE

For the purpose of conducting an airspace risk assessment, Member States may wish to use a checklist of different types of environments for which hazards and impact that may be considered when performing an airspace risk assessment (the list is not exhaustive):

Ground risks	
• Taxiway and taxi lane centrelines	
• Critical aerodrome areas ○ ILS critical and sensitive zones, radar, etc.	
Generic airspace restrictions	

• Manned-aviation restricted areas
  ○ aerodrome traffic zone (ATZ);
  ○ temporary reserved area (TRA);
  ○ temporary segregated airspace (TSA);
  ○ cross-border area (CBA);
  ○ ATS routes.	

• Restricted airspace and no-drone zones	
• Nature reserves and other noise-sensitive areas	
Populated areas	
• Boundaries of static population density areas ○ cities and suburbs	
• Boundaries of dynamic population density areas ○ Recurring or one-off events and gatherings (concerts, stadiums, beaches, etc.)	
• Schools, hospitals, and other public buildings	
Physical infrastructure	
• Governmental/military installations	
• Bridges and dams	
• Telecommunication centres	
• High-tension power lines and substations	
• Nuclear and conventional power stations	
• Chemical industry sites	
• Laboratories	
• Main roads, railway lines	

• Harbours	
• Water treatment plants	
• Cranes	
• Summits and VIP protection	
Locations that could cause interference to a UAS flight	
• Electro-magnetic wave emitting sites ○ mobile phone base stations; ○ ground telecommunication sites ○ TV and radio broadcast sites); ○ surveillance equipment sites.	
• Solar panel and wind farms	
• Water jets, geysers, etc.	
• GNSS-outage forecast areas	

Air risks	
Aerodrome operating hours, dimensions, and location	
Manned aircraft operations, locations, and routes within an urban environment	
IFR operations	
• Arrival and departure routes	
• Transit routes	
• RV vectoring areas	
• Altitudes	
VFR operations	
• VFR routes, corridors, altitudes	

• Operations below 150 m/500 ft	
• Low-altitude military operations	
Model aircraft club location, operating hours, and airspace dimensions.	
Generic operations	
• High probability of traffic (hospitals, etc.)	
• Gliders, micro-lights	
• Balloons	
• Seasonal or permanent recreational activities	
• Base jump, wing suits, kite surf, parachuting, parasailing, hang-gliders, paragliders, etc.	
State-specific operations	
• Police	
• Customs, border control	
• Firefighting	
• Military	
• Search and rescue	
• Maritime and fisheries surveillance	
• Operators of essential services	

Communication, navigation and surveillance (CNS) — previous identification of specific locations may be helpful to address the consequence on CNS for UAS	
Communication	
• COM – VFR COM requirements controlled/uncontrolled? Frequencies, radio, transaction expiration time (TET)	

• COMSEC – interferences UAS Coms, link USSP/UAS, USSP/RP, RP/USSP, e-conspicuity system	
• UAS COMs frequencies availabilities, including coverage of 3/4/5G network	
Navigation	
• Navigation requirements	
• GNSS performance including GPS outage reports and augmentation (GBAS, SBAS, etc.) availability	
Surveillance	
• Surveillance requirements	
• Critical surveillance areas (coverage, etc.)	
• Available means of surveillance (FLARM, open glider network (OGN), etc.)	

List of possible stakeholders involved during the airspace risk assessment process (in no restrictive order):

National/state entities	Organisation	Contact Person
National aviation authority (NAA)		
ATM/ANS service providers		
Air traffic controllers (for standard instrument departure routes (SIDs) & standard arrival routes (STARs))		
Police and state security		
State defence/military		
Customs		
Aviation entities	Organisation	Contact Person
Aerodrome operators		
Airlines		
Pilots (GA, IFR, emergency services)		
Flight schools		
UAS operators/pilots		
U-space service provider (USSP)		

UAS manufacturers		
General aviation representatives (VFR)		
Non-aviation entities	Organisation	Contact Person
Critical infrastructure (nuclear facilities, etc.)		
Industry		
Local government		
Hospitals		
Education/schools		
Road and rail transport		
Ports and the maritime sector		
Telecommunications and others that emit electro-magnetic waves		
Forestry and environmental protection (including non-governmental organisations (NGOs))		
Other		

GM5 Article 3(1) U-space airspace

TARGET LEVEL OF SAFETY (TLS)

(a) Absolute safety is generally an unachievable and very expensive goal. Therefore, the concept of acceptable safety has been adopted in risk-bearing industries, including aviation. The role of safety regulatory authorities in this regard is to set a qualitative or quantitative TLS that fits society expectations about the probability and consequences of occurrences.

(b) The acceptable level of safety expresses the safety goals of an oversight authority, a services provider, or an operator. The regulator sets objectives for the achievement and demonstration of acceptable (or tolerable) safety levels and the organisation must show (by argument and evidence) that those objectives have been met.

(c) In aviation, the acceptable level of safety is generally defined in terms of the probability of an aircraft accident occurring. It is defined individually for each operator/service provider on the basis of the TLS set by the regulator. The concept of acceptable level of safety is generally expressed by two specific metrics, namely safety performance targets and safety performance indicators.

(d) For unmanned aviation, an appropriate TLS needs to be determined, which will take into consideration the airspace and the mix of traffic in that airspace. A number of variables, e.g. type and density of traffic, aircraft and system performance, equipment, aircraft speed, type of operation, can influence the level of safety. Depending on the various factors, a safe distance or safe time between aircraft and maximum capacity in a given volume must then be determined to reach the desired TLS.

(e) It is worth remarking that the goal when setting a TLS in U-space airspaces should be to maintain the safety levels attained over years of experience in manned aviation. However, this might mean a higher rate of collision than for manned aviation due to two different factors. First, the collisions between two unmanned aircraft will not produce casualties in the air and second, unmanned aircraft overflying unpopulated or sparsely populated areas will not cause, in most cases, a fatal injury to people. On the other hand, the traffic level of unmanned operations is expected to be higher than that of manned aviation, especially above populated areas precisely where the ground risk is likely to be the highest. Also, damage to critical infrastructures even when overflying unpopulated areas must be accounted for when computing a TLS.

(f) Units of measurement

(1) The unit of measurement generally applied to aviation risk are aircraft flight hours. The number of aircraft movements, the distance flown, and the aircraft flight hours are all closely related but the interrelation is dependent upon assumptions regarding average flight time per movement and average speed per flight.

(2) It has therefore been determined that the most appropriate units of measurement in the aviation arena for en-route phases of flight are 'per flight hour', and for the take-off, approach and landing phases of flight are 'per movement'.

(3) For UAS operations, the time span of the flights is generally much shorter than that for manned aviation; due to this, the TLS could be referred in different units from those in manned aviation, which suits more the average duration of such flights in each U-space airspace. Nevertheless, a U-space airspace could have a higher density of flights than a typical airspace class for manned aviation so the count 'per flight hour' could still suit the needs of USSPs in terms of safety measurements.

(4) In terms of units of measurement for UAS operations, an important aspect is to maintain the uniformity of terminology throughout all Member States. Due to this, it is recommended to maintain this uniformity with respect to the different UAS operations through one of the dedicated expert groups established to that end.

(g) TLS for U-space

(1) The search for an appropriate TLS for U-space operations faces a number of challenges. Not least among them is the lack of historical data due to the relatively short experience in UAS operations and U-space. Not only the available data is not extensive, but it is also often not homogeneous. Inversely, safety management of traditional aviation could use the consolidated data of many decades. Another challenge is that UAS operations are evolving towards more autonomous, more complex operations with longer distances, heavier payloads and more sophisticated equipment such as high-performance detect and avoid (DAA) systems. The risk is thus evolving.

(2) To establish a quantitative target, it is therefore difficult to use a comparative approach such as 'maintaining or improving' the current safety level of U-space operations. Simply because there is no U-space operations history at this stage. A comparative approach may remain suitable for a qualitative safety assessment. Such an approach results to be more convenient for a short- or mid-term time frame where incremental improvements are applied while planning safety in the long term in terms of procedural and system

design requires quantitative figures. Both approaches are valid and effective considering the objective of such choice in each case.

(3) Finally, at this stage, the acceptable risk level by the society regarding UAS operations is unknown. It may then be appropriate to use simplifying assumptions and approximations to establish manageable and useful quantitative values.

(4) Whenever a manned aircraft operates within a U-space airspace, the TLS applicable to manned aviation remains applicable. It is therefore acceptable to consider and assess separately the accident rate for UAS within a U-space airspace on one hand and the accident rate for manned aircraft that would occasionally enter a U-space airspace on the other hand.

(5) Moreover, when considering a TLS for a U-space airspace, it is acceptable to address separately the collision risk caused by the U-space system itself from the other air and ground risks that are already addressed by airworthiness and operational requirements, those resulting, for instance, from a loss of control. This may simplify the complexity of safety assessment of the U-space system itself.

(6) Therefore, it is considered premature to propose, at this stage of the U-space regulatory implementation, a quantitative analysis based on assumptions for which there is still uncertainty for the U-space environment. In the future, when more operational experience has been gained in the implementation of U-space, numerical examples to propose a TLS will be provided with the needed accuracy.

GM6 Article 3(1) U-space airspace

OTHER RISKS

During the assessment phase, the following guidance regarding the associated security, privacy, and environmental risks may support the competent authorities.

Security

(a) The implementation of the European regulatory framework for the protection of the critical infrastructure as well as cybersecurity may lead to risk assessments that are relevant to the considered airspace. Those risks assessments may be considered as components of the airspace risk assessment if they are reviewed to take into consideration the possible creation of a U-space airspace.

(b) A security risk assessment should assess the security risks of an organisation emerging from intentional unauthorised electronic interaction. The necessary process steps and methodologies to conduct the security risk assessment will vary depending on the particular security risk assessment process that has been adopted.

(c) The methodology used to assess cybersecurity risks is very similar to the one used for physical security risks and therefore recommended to use during the assessment phase. The process for the risk assessment and for the sharing of information security risks is illustrated in Figure 2. This comprises several activities which need to be performed in each risk assessment.

(d) There are fixed inputs (marked with letters A, B, C, D) that should be common to all risk assessments performed by an organisation. These would be established as part of the overall corporate risk management process. The activities described may be conducted in a different order depending on the particular methodology used, and the activities and fixed inputs may have different names as well. Risk sharing can happen at any stage of the life cycle and should be dependent on agreed thresholds for reporting.

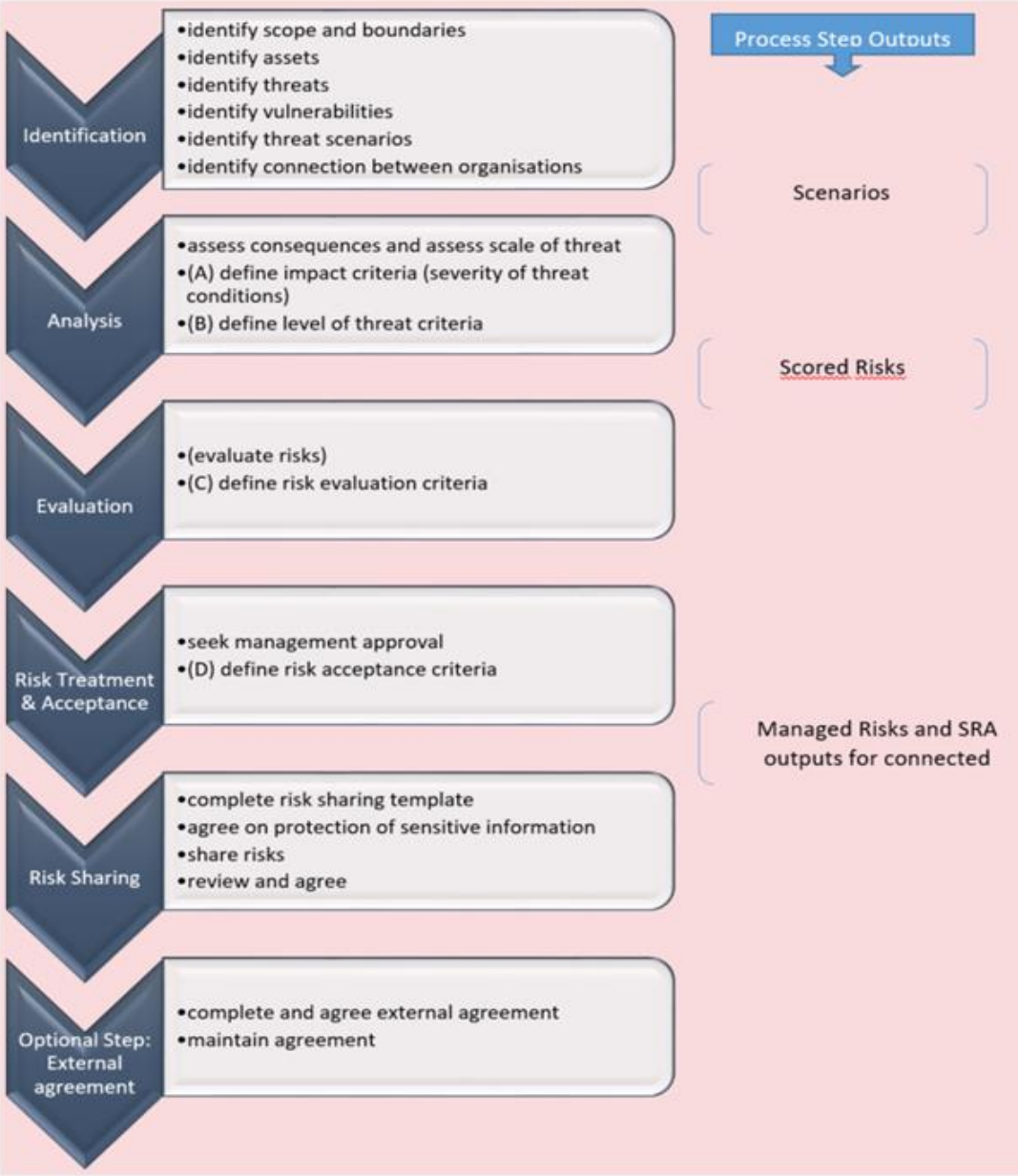


Figure 2: Risk assessment and sharing according to EUROCAE ED-201A

(e) To ensure comparability and compatibility between the different security assessment methodologies and definitions of risk, involved parties should have a common method for categorising risks and different classes of risks. If parties do not have a common method, it should not be possible to compare the outputs of the risk assessments to make them usable between the involved parties.

(f) The following principles should be used for risk sharing outputs where there is a safety impact identified between connected organisations and ecosystems using the same risk assessment method:

(1) All organisations should ensure that their risk assessments outputs produce results which are comparable internally and externally.

(2) Agreement upon common definitions for the connected interfaces e.g. risk classes, vulnerabilities.

(3) All organisations should at a minimum share information on assessed risks that have a potential safety impact with their partners, which relate to connecting networks, to sharing information and to using third-party products.

(4) Different risk assessment matrices should be used according to the type of impact that is being assessed and shared e.g. safety, capacity.

(5) An organisation can only compare and use impact severity of the same type i.e. a safety impact with a safety impact; a safety impact cannot be compared with an organisational impact.

(6) Security protection

(i) The general type of protection (e.g. type of encryption standard)

(ii) The attribute being protected is important as it may be the case that one organisation is protecting availability, but the receiving organisation is concerned with protecting integrity.

(iii) The assurance of security protection which represents the quality it has been designed to operate. If the assurance level of the protection measures of the connected organisation is not broadly equivalent, then each connected system will either have to agree to share and manage the risk to an acceptable level for both organisations or individually manage the risk to an acceptable level.

Privacy

(g) A risk assessment on privacy should assess the privacy risks to third parties emerging from intentional or accidental visualisation, capture and/or retention of personal images or information through (close) overflight or hovering. The necessary process steps and methodologies to conduct the privacy risk assessment will vary depending on the particular privacy risk assessment process that has been adopted.

(h) The main legal reference regarding privacy risk assessment is Regulation (EU) 2016/679 (the General Data Protection Regulation (GDPR)). However, the GDPR only applies to 'personal data' as defined in its Article 4 (1), not to commercial information, which will generally be covered by national laws. Notwithstanding, a privacy risk assessment should ensure the security of third-party commercial data.

(i) Article 35 of the GDPR provides for the conduct of a data protection impact assessment (DPIA), where the processing of any personal data obtained is likely to result in a high risk to the rights and freedoms of the subjects of that data. This DPIA must describe the characteristics of the

data treatment, the risks identified, and the mitigation measures adopted. A DPIA may be used to support the air risk assessment.

Environmental

(j) An environmental risk assessment should assess the risks to people, wildlife and the natural environment emerging from flight near built-up areas, especially schools and hospitals, protected landscape, natural reserves, along known migratory routes, or over lakes, rivers, and other sources of water. The necessary process steps and methodologies to conduct the environmental risk assessment will vary depending on the particular environmental risk assessment process that has been adopted.

(k) Environmental risk assessments for UAS operations should ensure respect for relevant plans and programmes for which such environmental assessments have been carried out.

Noise

(l) Regulation (EU) 2019/945 and Regulation (EU) 2019/947 lay down outline provisions for noise restrictions of small UAS. They require manufacturers to limit noise, and operators to follow guidelines for reducing noise during their operations. The assessment and management of environmental noise of small UAS should take these provisions into account. Directive 2002/49/EC relating to the assessment and management of environmental noise remains applicable, and the action plans required in paragraphs 5-7 of its Article 8 should be updated to include noise from UAS used in the 'specific' and 'certified' categories. In effect, environmental airspace risk assessments ensure that UAS operations comply with these noise action plans.

(m) Many regulations concerning aircraft noise involve airports, e.g. Regulation (EU) No 598/2014 on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports within a Balanced Approach.

Air quality

(n) Directive 2008/50/EC, implementing a common approach to ambient air quality and cleaner air for Europe, applies to the management of local air quality at and around airports. Assessments should determine whether drones whose lift and propulsion does not come solely from electric sources comply with this Directive.

Protection of wildlife and the natural environment

(o) Concerns regarding aviation and wildlife generally focus on strikes against aircraft, mostly by birds. This is also a problem for unmanned aircraft. Such strikes could cause the unmanned aircraft to become uncontrollable, presenting a danger to people and property on the ground. The assessments should ensure that operations avoid known migratory routes.

(p) Assessments will ensure that local laws on the protection of wild birds, notably through Directive 2009/147/EC, on the conservation of wild birds, are respected. They will also ensure that the provisions of Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora, and in particular the respect for *Natura 2000* sites and other areas of special scientific interest and of outstanding natural beauty, are observed.

AMC1 Article 4 Dynamic airspace reconfiguration

SEGREGATION ASSURANCE

Protection buffers should be applied internally in the design phase, when assessing the volume of airspace to be designated as U-space airspace, so that flight authorisations are only granted to a specified vertical/horizontal distance from the U-space airspace limits. ATC would thus be entitled to manage any volume of controlled airspace external to the U-space airspace. The upper limit of the U-space airspace should be considered part of the U-space.

Q2 — Stakeholders are invited to express their opinion on this provision. EASA welcomes any alternative proposal to cover the need of applying protection buffers within the U-space airspace to ensure segregation.

GM1 Article 4 Dynamic airspace reconfiguration

GENERAL

(a) This article introduces the concept of dynamic reconfiguration of the U-space airspace and requires Member States to ensure that this concept is effectively put in place to avoid proximity between manned and unmanned aircraft within the U-space airspace.

(b) The actual requirement to ensure the dynamic reconfiguration of the U-space airspace is found in ATS.TR.237 of Regulation (EU) 2017/373. Subpart B of Annex IV to Regulation (EU) 2017/373 covers the requirements for ATS providers and is, thus, the legally appropriate Regulation to cover such requirement, especially because the U-space regulatory framework only covers those activities associated with unmanned aircraft and cannot regulate service providers already regulated under the ATM/ANS rules.

(c) The 'dynamic reconfiguration' of the U-space airspace is an important element of the overall safety argument for safe operations in the U-space airspace. It applies for operations in a U-space airspace that is established in controlled airspace. It is carried out by the ATC unit in response to variable manned traffic patterns, which demand mid- or short-term U-space airspace adaptations. This is required to allow manned aircraft to fly in the U-space airspace while ensuring segregation of manned and unmanned air traffic.

GENERAL UNDERSTANDING OF THE OPERATIONAL CONCEPT

(d) A U-space airspace would initially be designated in a volume of airspace where UAS operations will be the norm and where manned aircraft operations will be the exception. This should normally limit the number of instances where such dynamic airspace reconfiguration would be required. In addition, certain strategic measures could be taken to limit the extent of the dynamic airspace reconfiguration through, for example, the design of the U-space airspace itself. The better the airspace is designed, the easier it will be for ATC units to segregate manned from unmanned aircraft in the U-space airspace.

(e) The design of the airspace can be the organisation of the U-space airspace into a set of airspace components that can be a basic set of airspace blocks that can be combined/deactivated in changing combinations/configurations to meet the actual manned aviation requirements. It can also be a more sophisticated mathematical grid, the geometry of which can vary depending on

the complexity and density of the operations (e.g. triangles to allow for straight 'areas' boundaries). An efficient strategic approach in the design of the U-space airspace, especially when designated in controlled airspace, is therefore important.

(f) Operationally, the ATC unit will inform the USSPs, as part of the CIS, that certain portions of the U-space airspace, or its entirety, are not eligible for the UAS flight authorisation, activation, and utilisation by the UAS. When these portions of the U-space airspace are dynamically deactivated, for tactical, short-term changes in manned traffic demand, the USSPs should not grant authorisation/activation and should request the UAS operator already into the deactivated portion of the U-space airspace either to leave it or to land.

(g) The time margins (time within which after deactivation it is expected that the UAS occupying the relevant portions of U-space airspace will leave it or will have to land) for these operations should be established on a case-by-case basis, based on different factors, such as the proximity of the ATC route to the U-space airspace, including SID/STAR, typical performance of manned aircraft in that particular airspace, constraints into the controlled airspace, or unexpected situations (e.g. non-standard go-around, emergency).

OPERATIONAL SCENARIO

(h) If the ATC unit intends to issue a clearance for a manned aircraft to enter the U-space airspace, it will initiate a dynamic airspace reconfiguration procedure and publish a temporary U-space airspace restriction as part of the common information for that U-space airspace. This restriction will cover the necessary operational volume for the manned aircraft with a sufficient safety margin taking UAS and manned aircraft navigational performances into account. USSPs active in that U-space airspace will adhere to this newly published restriction and provide the corresponding information to all UAS operators connected to their services through the geo-awareness service. In addition, they will check authorised flights against the new restriction and cancel or amend flight authorisations accordingly.

(i) The UAS operators concerned will be notified through the UAS flight authorisation service and will need to discontinue their flight, vacate the restricted part of the U-space airspace, or conform with the amended UAS flight authorisations, as applicable. USSPs will notify the ATC unit once the restricted part of the U-space airspace is clear of UAS traffic or they will share live UAS traffic information with the ATC unit, as UAS are vacating the restricted part of U-space airspace.

(j) The ATC unit will clear the manned aircraft to enter the U-space airspace once it is confident that segregation from UAS traffic is achieved.

(k) Upon the completion of the manned flight through U-space airspace, the ATC unit would complete its dynamic airspace reconfiguration procedure, the dynamic restriction would be lifted, the USSP would inform the UAS operators accordingly through the geo-awareness service, and they may again issue or amend UAS flight authorisations for UAS operators.

GM2 Article 4 Dynamic airspace reconfiguration

SEGREGATION ASSURANCE

(a) To ensure that manned aircraft operating in controlled airspace within a U-space airspace are segregated from UAS operating in that U-space airspace, there is a need for:

(1) performance standards for UAS — those for manned aircraft being already widely set — to make reasonably sure that UAS will have the capability to stay within the defined airspace volume, with reference both to position accuracy and to horizontal/vertical speed; and to leave the deactivated U-space airspace or land within a reasonable time;

(2) criteria to determine the airspace volume required to consider segregation as reasonably assured (e.g. applicable buffer).

(b) According to Article 3(4)(a) of Regulation (EU) 2021/664, UAS capabilities and performance requirements are determined by Member States for each U-space airspace, based on the related airspace risk assessment. The availability of those standards and criteria would also be of use to an ATC unit for tactical application, although to a limited extent.

GM1 Article 5 Common information services

U-SPACE ARCHITECTURE

(a) Article 5 of Regulation (EU) 2021/664 defines the content and organises the distribution of the 'common information' — the necessary information that needs to be shared between the relevant operational stakeholders for the safe operation in each U-space airspace.

(b) The common information is a collection of data originating mainly from three different sources:

(1) the Members State, responsible for the definition of the U-space airspace, including its dimensions, performance requirements, and static or dynamic restrictions;

(2) the ATC unit when applying the dynamic reconfiguration of the U-space airspace;

(3) USSPs, through the terms and conditions of access to their services.

(c) Member States may decide to designate a dedicated entity to provide the CIS on an exclusive basis in a given U-space airspace. Such 'single CIS provider' would make available the relevant information to all relevant operational stakeholders. The single CIS provider would need to be certified for the services it provides. The designation of a single CIS provider would need to be notified to other Member States as well as to the Agency.

(d) In the absence of a single CIS provider, the common information is directly exchanged between the relevant operational stakeholders in a distributed, peer-to-peer communication architecture, whereby each data provider communicates with another USSP directly for sharing information. Each USSP needs to communicate with other data providers. A clear allocation of common information elements between Member States, ATS providers and USSPs would allow data users to find target data quickly and efficiently. In the absence of a single CIS provider, there is no need for an additional certification; the provision of common information elements by ATS providers and USSPs will be covered by their respective certificate and provisions of Regulation (EU) 2021/664 and amendment to Regulation (EU) 2017/373.

(e) Members States may decide to designate different single CIS providers for different U-space airspaces or to designate a single CIS provider for some of their designated U-space airspaces only, otherwise opting for a distributed model of common information exchange.

GM2 Article 5 Common information services

STAKEHOLDERS

(a) As regards information and data provided to or by the CIS provider, a variety of different stakeholders may be involved. Member States may consider taking the needs and requirements of the below-listed stakeholders into consideration.

(b) Stakeholders to provide information to and retrieve information from the CIS:

(1) CIS providers

(2) ANSPs/ATS providers

(3) USSPs

(4) Competent authorities

(5) UAS operators

(6) Other relevant authorities (e.g. State agencies, municipalities, nature protection authorities, law enforcement authorities, military)

(7) Aerodrome/heliport/vertiport operators

(c) Stakeholders to retrieve information from the CIS:

(1) Military (ATS providers)

(2) EASA

(3) Model aircraft clubs and associations

(4) Manned (general aviation) aircraft

(5) Universities, research Entities

(6) Industry (including application providers)

(7) General public

AMC1 Article 5(1) Common information services

FORMAT OF AIRSPACE INFORMATION

The format of airspace information, including geographical zones, static and dynamic airspace restrictions, adjacent U-space airspace, and the horizontal and vertical limits of the U-space airspace should be as described in Chapter VIII 'UAS geographical zone data model' of and Appendix 2 to the ED-269 'MINIMUM OPERATIONAL PERFORMANCE STANDARD FOR GEOFENCING' standard in the version published in June 2020.

AMC2 Article 5(1) Common information services

INTERFACES

Member States or the single CIS provider should provide and document all information required by the users to identify and implement interfaces to support the access to the CIS.

GM1 Article 5(1)(b) Common information services

UAS CAPABILITIES AND PERFORMANCE REQUIREMENTS

(a) Members States can define a format and data model to support the electronic sharing of information. They may use the JSON format (rfc7159) defined in EUROCAE ED-269. To support interoperability, Members States are encouraged to refer to standards and ensure consistency in the naming convention.

(b) Example of UAS capabilities include connectivity requirements of the system or the accuracy of flight data. The latter case, for instance, is already covered in the EN 4709-003 standard (Geo-awareness). Accuracy on the horizontal position can, therefore, be named 'horizontal accuracy' in the data model used for describing UAS capabilities and performance requirements.

AMC1 Article 5(1)(f) Common information services

TIMELINESS

Information on static and dynamic airspace restrictions should be made available within 30 seconds of their availability at least 99 % of the time.

GM1 Article 5(1)(f) Common information services

DYNAMIC AIRSPACE RESTRICTIONS

In the context of a distributed CIS model, Member States can elect to use ASTM WK63418 'New Specification for Service provided under UAS Traffic Management (UTM)' to provide some or all the relevant dynamic restrictions. The standard specifies how competent authorities may then use CIS providers (certified as USSPs) to disseminate the dynamic restrictions that they are authorised to issue. The output is expected to be compatible with the common unique digital format as described in Chapter VIII 'UAS geographical zone data model' of the EUROCAE ED-269 'MINIMUM OPERATIONAL PERFORMANCE STANDARD FOR GEOFENCING' standard in the version published in June 2020.

AMC1 Article 5(2) Common information services

TIMELINESS

Traffic information should be made available with a latency that is lower than that necessary for the proper functioning of the traffic information service, in at least 99 % of the time.

Q3 — Stakeholders are invited to provide their opinion on the possibility to express a latency number for the distribution of traffic information data to UAS operators.

GM1 Article 6 UAS operators

OBLIGATIONS WHEN OPERATING IN U-SPACE AIRSPACE

(a) This article covers the obligations for UAS operators when they operate in the U-space airspace. To ensure that the risk of mid-air collision is adequately mitigated, and an orderly flow of traffic is ensured, UAS operators are obliged to meet several requirements. On top of making use of the required U-space services, UAS operators would need to ensure in advance that the UAS intended to be operated can comply with the applicable capabilities and performance requirements and that they can comply with the relevant operational conditions and airspace constraints.

(b) To adequately make use of the U-space services, they would need to conclude a contract with the active certified USSP of their choice that provides the required set of U-space services in that U-space airspace.

(c) At a pre-tactical level, UAS operators are required to submit their UAS flight authorisation request to that USSP and comply with the terms and conditions of the UAS flight authorisation once it is granted by the USSP. Certain conditions need to be met prior to the flight. They are not allowed to commence their flight until they have sent an activation request of the UAS flight authorisation to the USSP. Upon the reception of the activation confirmation, the provision of other U-space services required in the U-space airspace can begin. For instance, network identification should be active and traffic information received. UAS operators will ensure that they are able to comply with the terms and conditions associated with operation in that U-space airspace. In case they cannot comply with the UAS flight authorisation, UAS operators will amend their original request.

GM1 Article 6(1)(b) UAS operators

U-SPACE SERVICES — LEVEL OF PERFORMANCE

(a) It is necessary that the UAS operator can demonstrate supporting evidence that the required level of performance for any externally provided service required for safety of the flight can be achieved for the full duration of the flight. This may take the form of a service level agreement (SLA) or any formal commitment that prevails between a service provider and the applicant on the relevant aspects of the service (including quality, availability, responsibilities).

(b) It is expected that UAS operators have the means to monitor externally provided services which affect flight-critical systems and take appropriate actions if real-time performance could lead to the loss of control of the operation.

AMC1 Article 6(5) UAS operators

ACTIVATION OF THE UAS FLIGHT AUTHORISATION

The UAS operator should activate the UAS flight authorisation before the take-off.

GM1 Article 6(5) UAS operators

ACTIVATION OF THE UAS FLIGHT AUTHORISATION

(a) As a good practice, it is expected that the UAS operator starts the operation without undue delay after receiving the activation confirmation from the USSP and would inform the latter of it.

(b) The Member State may constrain the minimum and maximum time (size of time window) before take-off at which activation is requested, which may be linked to the specific airspace.

(c) The USSP may further constrain the minimum and maximum time (size of time window) before take-off at which activation is requested. Such constraints may be applied due to practical capabilities of the system which has been contracted.

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.

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:

(a) Sudden unavailability of U-space airspace

(b) Hijacking

(c) Engine failure

(d) Loss of signal

(e) Loss of control

(f) Loss of payload

(g) Loss of power

(h) Loss of energy reserves

(i) Weather deterioration

(j) Foreign object damage (FOD)

(k) Unidentified aircraft entering protected volume around UAS

(l) Unavailability of landing area

GM1 Article 7 U-space service providers

GENERAL REQUIREMENTS

(a) A U-space service provider is a new entity created by this Regulation. It refers to an organisation that is certified by the relevant competent authority to provide U-space services in a U-space airspace.

(b) To become a certified U-space service provider, the applicant needs to demonstrate its capability of providing the four mandatory U-space services as listed in Chapter IV of the Regulation (EU) 2021/664. A U-space service provider can sub-contract the provision of some or all U-space services to other entities if they remain under their management control. There can also be associations of U-space service providers or equivalent mechanisms if it is clear that there is one single entity responsible for providing the minimum set of U-space services to the UAS operators.

(c) U-space service providers do not need to be designated for the U-space airspace in which they aim to provide U-space services. Once they are certified, they can provide services in any U-space airspace across the European Union.

(d) U-space service providers should provide their services to support the safe, secure, and efficient operations of aircraft in the U-space airspace and ensure coordination with the relevant ANSPs so that manned aircraft movements are safe and efficient.

AMC1 to Article 7(2) U-space service providers

APPLICABLE OPERATIONAL CONDITIONS AND AIRSPACE CONSTRAINTS

(a) The USSP should inform the operator of the deviation thresholds as well as any airspace boundaries crossed by the UAS flight that require permission.

(b) Other conditions or requirements, if any, associated with the U-space airspace(s) crossed by the UAS flight should also be listed.

GM1 Article 7(2) U-space service providers

CONNECTIVITY

Regulation (EU) 2021/664 assumes that U-space is a connected environment and therefore:

(a) U-space information is exchanged in a machine-readable format to support the necessary exchange of data among relevant U-space actors; and

(b) operations in U-space airspace require the UAS operator to establish a connection to a USSP whenever the delivery of a U-space service is required.

GM2 Article 7(2) U-space service providers

ACCESS TO DATA

It is recommended that USSPs provide subscribed UAS operators with a method to access a copy of their data related to the U-space services required by a Member State. Any requested data should be exported to the operator in a machine-readable format.

AMC1 Article 7(3) U-space service providers

TERMINATION OF DYNAMIC AIRSPACE RECONFIGURATION

When operating in U-space airspace that is established in controlled airspace, USSPs should have arrangements in place to manage the return to normal operations within the U-space airspace, if required, when dynamic reconfiguration ends.

AMC2 Article 7(3) U-space service providers

CONTRACTUAL ARRANGEMENTS BETWEEN THE USSP AND THE ATS PROVIDER

(a) A contract between the USSP and the ATS provider should cover at least these three objectives:

(1) provide clear reference to service ownership, accountability, roles and/or responsibilities.

(2) present a clear, concise, and measurable description of provision of services; and

(3) match the expected service provision with actual service support and delivery.

(b) The contract should establish:

(1) subject matter, which should cover at least:

(i) the U-space airspace(s) serviced; one contract can cover several U-space airspaces;

(ii) the partners' operational, financial and other interests;

(iii) CIS provision and ATS providers — USSP cooperation can be covered in the same contract; and

(iv) an internal contract when an ATSP is also a USSP;

(2) governance model, which may contain at least:

(i) points of contact for at least operational process coordination and system maintenance contacts;

(ii) a coordination process involving representatives from both the USSP and the ATS provider. The agreement should cover procedures to organise meetings (regular and ad hoc); and

(iii) dispute resolution provisions that should ensure fair representation of the USSP and the ATS provider;

(3) coordination procedures, which should cover at least:

(i) nominal, non-nominal and emergency procedures concerning UAS operations, and contingency procedures;

(ii) nominal, non-nominal and emergency procedures concerning manned aircraft relevant to operations in U-space airspace; and

(iii) nominal, non-nominal and contingency procedures concerning system or services shortages and degraded level of quality of a service.

The procedures should describe clear roles and responsibilities for both parties, as defined in Article 15.2; and

(4) data and information-sharing agreement.

(i) The scope of data and information to be shared will depend on the following:

(A) if the U-space is designed in controlled or uncontrolled airspace;

(B) if the ATS provider also acts as the USSP in the given U-space airspace;

(C) if the ATS provider also provides CIS; and

(D) if some information necessary for coordination of U-space airspace activities is already provided by a separate CIS provider, the USSP and the ATS provider contract should cover information which is not provided by the CIS provider.

(ii) The data and information-sharing agreement should cover at least the:

(A) data and information shared;

(B) compliance with data protection legislation;

(C) data processing;

(D) data quality;

(E) data subjects' rights;

(F) data retention and deletion;

(G) security and training;

(H) security breaches and reporting procedures; and

(I) responsibilities for providing data and service by the ATS provider and responsibility for providing data and services by the USSP.

If some or all the topics in the contract are covered in other agreements, the contract may point to those other agreements.

GM2 Article 7(3) U-space service providers

SCOPE OF DATA AND INFORMATION SHARED BETWEEN THE USSP AND THE ATS PROVIDER — SCENARIOS

Scenario 1 — U-space airspace established in controlled airspace

The possible scope of data and information shared between the USSP and the ATS provider may be:

(a) dynamic airspace reconfiguration procedures and responsibilities including pre-planned and ad hoc manned operations;

(b) traffic information other than that provided through CIS (ATS.OR.127);

(c) aeronautical information other than that provided through CIS; and

(d) other data needed by the USSP and available to the ATS provider.

Scenario 2 — U-space airspace established in uncontrolled airspace

The possible scope of data and information shared between the USSP and the ATS provider may be:

(a) traffic information if available (not provided through CIS by default);

(b) aeronautical information other than that provided through CIS; and

(c) other data needed by the USSP and available to the ATS provider.

AMC1 Article 7(5) U-space service providers

INFORMATION EXCHANGE

(a) The exchange of information described in point (c) amongst USSPs should conform to the requirements in Annex A to EUROCONTROL 'Specification for SWIM Technical Infrastructure (TI) Yellow Profile', edition 1.1, published on 5 July 2020.

(b) USSPs should document services facilitating information exchange referred to in Article 3(2) and (3) as well as related services regarding safe service provision and should adhere to version V1.0 of EUROCONTROL 'Specification for SWIM Service Description (SD)' with the following limitations: SWIM-SERV-022 should be considered without regard to describing or verifying the semantic correspondence of the element with AIRM; SWIM-SERV-023 AIRM conformance should not be considered.

(c) The documentation of services defined in (b) should be available to the public.

(d) Compliance for items (a) and (b) should be directly measured against the requirements listed in the respective documents.

GM1 Article 7(5) U-space service providers

INFORMATION EXCHANGE

(a) U-space services can be provided concurrently by multiple USSPs in the same airspace. This requires information exchange and coordination amongst those USSPs, as well as between USSPs and other entities (such as UAS operators, ATS providers and CIS providers). This information exchange is expected to be based on open protocols and formats, using public, IP-based networks as transport layers.

(b) The best scenario is that information models are technology-agnostic, e.g. in Unified Modelling Language. The aim is to document the key aspects of a dedicated information exchange service at the logical level:

(1) Operational and business context of the service

(i) requirements for the service (e.g. information exchange, constraints, validation rules)

(ii) involved nodes: which operational components provide/consume the service

(iii) operational activities supported by the service

(iv) relation of the service to other services

(2) Service description

(i) interfaces

(ii) interface operations

(iii) payload definition

(vi) features

(v) properties/attributes

(vi) data types

(vii) associations

(viii) dynamic behaviour (and life cycle) description

(3) Service performance level and validation aspects

(c) Conceptual information services can be realised in different technical implementations enabling an architectural approach based on one logic and multiple potential solutions.

(d) Consequently, different data encodings might be in use to carry service payload in implementations. A standard data encoding should be used to provide the service (JSON or ASTERIX on the example of traffic information). This is the approach which was used when developing EUROCAE ED-269, where a conceptual definition and its implementation in a standard data encoding are defined in one document.

(e) The data encoding should be mapped to the conceptual definition of the service payload. Furthermore, the service providing information in this data encoding should be mapped in relevant technical details as well, e.g. in the service interfaces and operations.

(f) Further guidance on the information exchanges and coordination specific to the U-space is provided in the GM to Articles 4, 8, 9, 10, 11, 12 and 13 of Regulation (EU) 2021/664.

(g) Safe service provision

(1) In addition to operational information exchanged by respective USSPs, further information on respective service's performance should be collected and made available to ensure safe service provision. Sufficient monitoring and measurement should support technical operations to be performed under controlled conditions. This includes ensuring compliance with the requirements related to data quality, latency and data protection requirements set out in Annex III.

(2) Processes following established standards (e.g. ISO 9001 series) should complement provisioning and exchange of any safety-relevant information. Additional information originating from these processes should be exchanged as well. This includes but is not limited to:

(i) service availability (planned or unplanned downtimes, points of contact for technical and operational matters, etc.)

(ii) service limitations (degraded operations, regional constraints, known issues);

(iii) service integrity (security/safety incidents)

(3) Both operational information and service performance information should be protected; technical and operational measures should be undertaken by the USSP to ensure the necessary information protection.

(h) Protocol

Any information exchange should be based on transmission control protocol (TCP), a common open communication protocol. As a minimum, requirements documented in the SWIM Technical Infrastructure (TI) Yellow Profile, edition 1.1, published on 5 July 2020, should be met.

(i) Extension of information services

(1) The extension of information services, in particular their default data models, should not jeopardise semantic interoperability and standardisation across Member States.

(2) Extension of data models is usually managed by:

(i) adding additional attributes to features;

(i) adding new features to the default data models.

(3) To provide extension points for additional attributes, placeholders could be added to modify the element, such as free text or a custom enumeration.

(4) If custom features/functions are added by extension, the links/references between the default and custom features/functions should always be managed in the custom feature/function. It should always be possible to develop information models or interact with services that have been disseminated. Advanced information models or service interfaces should contain or process only optional information.

(5) The approach is described in detail in the SWIM Service Description and the EUROCONTROL Specification for SWIM – Information Definition.

(j) Protection of information

The necessary protection level will vary depending on the type of information exchanged. As a minimum, requirements documented in the SWIM Technical Infrastructure (TI) Yellow Profile, edition 1.1, published on 5 July 2020, should be met. Additional protection should be put in place where applicable, especially considering the relevant data privacy regulation.

GM1 Article 7(6) U-space service providers

REPORT TO THE COMPETENT AUTHORITY — TEMPLATE FORM

U-space service providers may consider using the template form below for the purpose of reporting the start and ceasing of operations.

Letter to the competent authority
U-space service provider report in accordance with Article 7(6) of Regulation (EU) 2021/664

Report for the start and/or cease of U-space service provision in accordance with Article 7(6) of Regulation (EU) 2021/664
U-space service provider Name: U-space service provider certificate number/issue No: Name and contact details of the accountable manager: List of Member State(s) where the U-space service provider intends to start its operations:
Start of operations The U-space service provider hereby confirms that the provision of U-space services will start/restart on: Day/month/year
Cease of operations The U-space service provider hereby confirms that the provision of U-space services will cease on: Day/month/year
The notification of starting/ceasing/restarting operations must be submitted to the competent authority at least one week before the effective start/cease/restart of operations.
Date, name, and signature of the accountable manager

GM1 Article 8 Network identification service

GENERAL

(a) The network identification service provides the registration number of the UAS operators, serial number of the unmanned aircraft and live flight data of the UAS. It enables the sharing of information with any authorised users listed in Article 8(4)(b) of Regulation (EU) 2021/664. Authorised users will be made aware of the geographical position, heading and emergency status, height, and type of the UAS, among other data elements. Based on the information provided by their operators, USSPs share and consolidate UAS flight data between themselves and can, therefore, support traffic information when needed.

(b) The network identification service complements the original intent of the direct and network remote identification systems referred to in Regulation (EU) 2019/945. Whereas the remote identification in Regulation (EU) 2019/945 supports the authorities in aspects related to security and privacy, the network identification service also supports operational needs and the traceability of the unmanned aircraft during its flight.

AMC1 Article 8(1) Network identification service

AGGREGATED MANNER

USSPs should exchange network remote identification data with all the service providers in geographic proximity. The resulting aggregated data should cover all available network remote identification data in the U-space airspace of interest.

AMC2 Article 8(1) Network identification service

CONTINUOUS PROCESSING

USSPs should demonstrate a response time for distributing data received from the UAS or other service providers that is smaller than the latency necessary for the proper functioning of the traffic information service, this at least 99 % of the time.

Q4 — Stakeholders are invited to provide their opinion on the possibility to express a latency number for the distribution of data for the network identification service.

AMC3 Article 8(1) Network identification service

DURATION OF THE FLIGHT

The network identification service should:

(a) be available for all duration of the flight, starting as soon as the flight authorisation is activated.

(b) not be required when the operator ends its flight, independently of the time limit approved in the flight authorisation.

AMC4 Article 8(1) Network identification service

DATA EXCHANGE INTERFACE

USSPs should use the interface defined in Annex 4 to ASTM F3411-19 ‘Standard Specification for Remote ID and Tracking’.

GM1 Article 8(1) Network identification service

MASTER AGREEMENT

USSPs can use a common contract (master agreement) defining the technical indicators associated with the provision of the network identification service, acceptable and unacceptable service levels, parameters for data-sharing between the providers, as well as dispute resolution procedures and actions to be taken in specific circumstances.

GM2 Article 8(1) Network identification service

TESTING INFRASTRUCTURE

USSPs may set up a testing infrastructure against which authorised users can test their ability to exchange data. The same infrastructure may then be used by oversight authorities to audit USSPs. A possible testing environment is presented in Annex A2 to ASTM F3411-19 'Standard Specification for Remote ID and Tracking'.

AMC1 Article 8(2) Network identification service

ACCESS

USSPs should provide authorised users defined in Article 8(4) items (b), (c) and (d) with access to aggregated network remote identification data using the communication protocol defined in Annex 4 to ASTM F3411-19 'Standard Specification for Remote ID and Tracking'.

GM1 Article 8(3) Network identification service

UPDATE FREQUENCY

Competent authorities may use the value of 1 Hz, 99 % of the time, defined in ASTM F3411-19 'Standard Specification for Remote ID and Tracking' as a target for updates.

GM1 Article 8(4) Network identification service

ACCESS

USSPs may provide a visual interface to the authorised users to access authorised data in accordance with items 5.5.5.6 to 5.5.5.8 of ASTM F3411-19 'Standard Specification for Remote ID and Tracking'.

GM1 Article 9 Geo-awareness service

GENERAL

(a) This article contains the service requirements when USSPs provide geo-awareness service to UAS operators and should not be confused with the geo-awareness function required for certain classes of UAS by Regulation (EU) 2019/945.

(b) This service aims at supporting UAS operators to fulfil their obligations, as it provides the information on applicable operational conditions and airspace constraints with the level of accuracy and other performance requirements for which it has been certified.

(c) The geo-awareness service is used by the UAS flight authorisation service as a source of data to inform UAS operators of relevant operational constraints and changes both prior to and during the flight.

AMC1 Article 9(1) Geo-awareness service

INFORMATION

USSPs should ensure:

(a) the integrity and completeness of the geo-awareness information provided as part of the common information services; and

(b) the timeliness and availability of the geo-awareness information provided to UAS operators.

AMC2 Article 9(1) Geo-awareness service

FEEDBACK

USSPs should inform the relevant common information services provider as soon as practical of any detected data quality issues.

AMC3 Article 9(1) Geo-awareness service

DATA QUALITY

USSPs should take the appropriate measures to maintain the accuracy, resolution, integrity, traceability, timeliness, completeness and logical consistency of the data they are required to collect and distribute.

GM1 Article 9(1) Geo-awareness service

TESTING INFRASTRUCTURE

Upon agreement on the retrieval of a set of predefined testing data, USSPs may set up an environment to check at regular intervals their ability to conform with the requirements for providing geo-awareness information.

AMC1 Article 9(2) Geo-awareness service

TIMELINESS

USSPs should process and make geo-awareness data available to UAS operators based on the data's update cycle and criticality level, but no later than their applicability dates and times.

GM1 Article 9(2) Geo-awareness service

TIMELENESS

The table below illustrates scenarios and values that USSPs may use.

Data type	CIS update cycle	Geo-awareness service update
Static geographical zone	Based on the AIRAC cycle	Daily
Non-urgent dynamic airspace restriction	Several times a day	Every 30 minutes

Urgent dynamic airspace restriction	On demand	Within 30 seconds

GM2 Article 9(2) Geo-awareness service

TIME FORMAT AND VERSION NUMBER

USSPs may use the time format and version number provided for in Chapter VIII 'UAS geographical zone data model' of and Appendix 2 to EUROCAE ED-269 'MINIMUM OPERATIONAL PERFORMANCE STANDARD FOR GEOFENCING' standard in the version published June 2020.

GM1 Article 10 UAS flight authorisation service

GENERAL

(a) The UAS flight authorisation service provides authorisations to UAS operators for each individual flight based on other notified flight requests that may conflict with other unmanned operations within the same U-space airspace. It is a strategic de-confliction tool. The UAS flight authorisation service is provided based on the UAS operator having submitted the UAS flight authorisation request before a flight. The content of this request is detailed in Annex IV to Regulation (EU) 2021/664.

(b) The UAS flight authorisation service is expected to be able to handle flight authorisation requests by UAS operators for single flights and a repetitive number of flights that are conducted consecutively on the same route.

(c) This service covers the flight authorisation provided according to Article 15(1) of Regulation (EU) 2019/947; however, it does not initially cover operational authorisations granted by the competent authority as defined in Article 12 of Regulation (EU) 2019/947. If additional operational authorisation functions are to be included to better serve UAS operations, then these functions would need to be agreed and approved between the USSP and competent authority in that U-space. The service informs the operators of overlaps with any airspace restrictions provided by the geo-awareness service (Article 9). UAS flight authorisations as a 4D volume may be used by the conformance monitoring service.

(d) The USSP is expected to coordinate the flight authorisation with the ANSP and is responsible for providing the final flight authorisation to the UAS operator.

(e) This service is also a way for UAS operators to announce their intent to start their operations by activating their UAS flight authorisation. The activation of a flight initiates the use of other services, like traffic information, network and remote identification or conformance monitoring, when required.

(f) This service is mandatory in U-space airspace designated in any airspace (controlled or not) and applies to UAS operators. This service enforces the prioritisation rules. When there is more than one USSP providing U-space services in a U-space airspace, all USSPs are obliged to exchange the UAS flight authorisation requests between themselves as well as state changes of those requests – Activated, Withdrawn, Ended.

AMC1 Article 10(1) UAS flight authorisation service

RECORD

USSPs should record:

(a) all UAS flight authorisations and associated terms and conditions; and

(b) UAS flight authorisation requests that are rejected, including the cause of the rejection.

GM1 Article 10(1) UAS flight authorisation service

TERMS AND CONDITIONS

(a) The terms and conditions of a flight include a reminder of the applicable conditions and airspace constraints— as per Article 3(4)(c) of Regulation (EU) 2021/664.

(b) The terms and conditions also cover the operating procedures. For example, on how to update the flight authorisation request, the minimum times required for different UAS flight authorisation processes, etc.

(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'.

GM2 Article 10(1) UAS flight authorisation service

LOGGING

USSPs may log flight authorisations and associated terms and conditions, as well as rejected flight authorisations and the cause of rejection, when applicable.

GM1 Article 10(2) UAS flight authorisation service

UAS FLIGHT AUTHORISATION PROCESS

(a) The UAS flight authorisation service is a conflict resolution mechanism and refuses flight authorisation based on intersection. The UAS flight authorisation service describes a 4D trajectory typically in terms of height, length, width, and duration and ensures that the trajectory does not conflict with a no-fly zone.

(b) The 4D trajectory is defined in x, y, z, t typically meaning longitude, latitude, height, and time.

(c) The performance required is primarily driven by consideration of separation assurance and collision avoidance.

(d) The flight should be activated before commencing flight, either by taking off or entering the airspace, unless an active flight is being updated. Activation is only possible for authorisation requests that have been approved.

(e) To allow the USSP to deal with the appearance of a new constraint, there may be a minimum time between authorisation and activation which will be mentioned in the terms and conditions of the UAS flight authorisation.

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.

GM1 Article 10(2)(d) UAS flight authorisation service

DEVIATION THRESHOLD

(a) Following ICAO Doc 9997 'Performance-based Navigation (PBN) Operational Approval Manual', Section 5.1.2 on Integrity, the authorisation of deviation thresholds defines a volume containing the flight with a probability of 95 %.

(b) The deviation threshold may be set for the U-space airspace by the competent authority in consideration of the expected traffic density.

(c) The definition of the UAS flight authorisation deviation thresholds allows for performance-based buffers around the nominal path such that the unmanned aircraft will stay within the operational intent at least 95 % of the flight time as validated by the USSP over time.

(d) The flight should be planned to stay inside its planned 4D volume. The size of the volume should allow for gusts of wind and other likely sources of deviation. Going outside the planned volume is to be an exceptional event with a probability of less than 5 %.

(e) Collision risk is assumed to be low due to low traffic densities during the first few years of operations within U-space. The 95 % may need to be readjusted if there is a change in the traffic density.

AMC1 Article 10(3) UAS flight authorisation service

WEATHER INFORMATION

Whenever QNH is required by the operational conditions, then the appropriate QNH with the geographical location of its applicability should be provided by the USSP as part of the authorisation.

GM1 Article 10(3) UAS flight authorisation service

WEATHER INFORMATION

The USSP does not check the impact of weather on the flight as the operator is responsible for incorporating any appropriate information into their 4D trajectory submitted as in Annex IV. Vehicle limits and the ability to remain in conformance with the plan are the operator's responsibility to manage. Value-added services may exist to support the operator discharging these responsibilities, but they are outside the scope of this Regulation.

GM1 Article 10(4) UAS flight authorisation service

UAS FLIGHT AUTHORISATION NOT ACCEPTED

(a) USSPs should provide the reason for not being able to grant the authorisation and support the planning of an acceptable alternative (i.e. change the start time or change path).

(b) As only warnings will be given regarding airspace access, the UAS operator remains responsible for acquiring any necessary access permissions.

AMC1 Article 10(5) UAS flight authorisation service

ACTIVATION OF THE FLIGHT AUTHORISATION

(a) The USSP should make a final check of the flight authorisation when the activation message is received.

(b) If the UAS flight authorisation has not been withdrawn, the USSP should confirm the activation.

(c) If a UAS operator does not activate a flight authorisation within its time deviation threshold, the USSP should cancel the authorisation and notify the UAS operator accordingly.

(d) The USSP should be able to demonstrate that activation requests are answered in a non-discriminatory basis and that there is no link to the UAS operator or class of operations.

GM1 Article 10(5) UAS flight authorisation service

UNJUSTIFIED DELAY

The expression ‘without unjustified delay’ is interpreted in line with ASTM F38 ‘Standard Specification for UAS Service Supplier (USS) Interoperability’, which requires that flight authorisations are activated within 5 seconds, 95 % of the time.

GM2 Article 10(5) UAS flight authorisation service

ACTIVATION REQUEST

(a) The activation message triggers the start of the network identification and traffic information services and, when applicable, the conformance monitoring service.

(b) When the USSP receives the activation request, it rechecks the flight authorisation request. If the flight authorisation is withdrawn because it is found to be in conflict with a higher-priority flight authorisation or a manned aircraft known or believed to be in a state of emergency, then the USSP should respond negatively to the activation request.

AMC1 Article 10(6) UAS flight authorisation service

ARRANGEMENTS IN CASE OF CONFLICTING UAS FLIGHT AUTHORISATION REQUESTS

(a) The USSP should make arrangements with other USSPs to allow rapid, reliable and unequivocal identification of conflicts between any UAS flight authorisation requests in an incremental way.

(b) The arrangements between USSPs should set service levels and should provide for the failure of USSPs and prioritising safety. In that regard, the terms and conditions associated with the flight should incorporate provisions to deal with the specific case.

GM1 Article 10(6) UAS flight authorisation service

ARRANGEMENTS IN CASE OF CONFLICTING UAS FLIGHT AUTHORISATION REQUESTS

(a) In case of conflicting UAS flight authorisation requests, it should be noted that the competent authority may carefully consider the 'propriety' of these arrangements between USSPs when granting an operating certificate and may consider:

(1) agreement between USSPs and the competent authority on common infrastructure;

(2) automation response time; for example, detection of conflict in less than 15 seconds;

(3) auditability: fair and equitable access to U-space airspace, safety, performance criteria, etc.

(b) The competent authority may also propose a unique (shared) contract template governing the rights and obligations of the parties when providing UAS flight authorisation services.

AMC1 Article 10(7) UAS flight authorisation service

AIRSPACE RESTRICTIONS AND LIMITATIONS

The USSP should:

(a) list any airspace restrictions taking into account the flight's deviation thresholds; and

(b) use the set of current airspace restriction data coming from the CIS.

GM1 Article 10 (7) UAS flight authorisation service

AIRSPACE RESTRICTIONS AND LIMITATIONS

(a) The UAS flight authorisation service can reject the authorisation because a flight penetrates a restricted airspace as there is no way for the UAS operator to indicate that they have already obtained permission to enter any restricted airspace. Hence the UAS flight authorisation service can only inform the UAS operator that permission is required.

(b) The UAS operator is responsible for obtaining the appropriate permissions to enter any restricted airspace, or to not enter the airspace if that permission has not been obtained. The time period during which the flight may occur will be considered in such a check, and warnings should take into account any restriction possible throughout the whole duration of the flight.

AMC1 Article 10(8) UAS flight authorisation service

SPECIAL OPERATIONS

(a) When a previously authorised but not yet activated UAS flight conflicts with an authorised UAS flight conducting a special operation, the USSP should change the status of the flight authorisation for the authorised but not yet activated UAS flight to 'withdrawn'.

(b) In line with Article 6(6) of Regulation (EU) 2021/664, the USSP should inform the affected UAS operator about any change of status for a flight authorisation.

GM1 Article 10(8) UAS flight authorisation service

SPECIAL OPERATIONS

USSPs should give priority to UAS conducting special operations as referred to in Article 4 of Implementing Regulation (EU) No 923/2012 which include:

(a) police and customs missions;

(b) traffic surveillance and pursuit missions;

(c) environmental control missions conducted by, or on behalf of public authorities;

(d) search and rescue;

(e) medical flights;

(f) evacuations;

(g) firefighting;

(h) exemptions required to ensure the security of flights by heads of State, Ministers and comparable State functionaries.

AMC1 Article 10(9) UAS flight authorisation service

ORDER OF PROCESSING

(a) USSPs should process UAS flight authorisations having the same priority in the order of the time at which the operational intent is submitted or updated, whichever is later.

(b) USSPs should reject any UAS flight authorisation request conflicting with an earlier authorisation of equal or higher priority.

(c) The USSP should record the time of reception of the UAS flight authorisation requests.

GM1 Article 10(9) UAS flight authorisation service

PRIORITY

(a) An update of the 4D trajectory within the flight authorisation by the UAS operator will reset the time reference for the process of determining priority to the current time unless the flight authorisation is active.

(b) The USSPs' proper arrangements should include the common UTC time to ensure there is no doubt about which flight authorisation request is first.

(c) The competent authority may monitor or audit authorisation and rejection data to assure fair and equitable access to the airspace.

(d) An active UAS flight should not be rejected as a result of the UAS operator making an update to that flight.

AMC1 Article 10(10) UAS flight authorisation service

CONTINUOUS CHECK

The USSP should:

(a) distribute updates to the relevant CIS data before they come into effect; and

(b) check for manned aircraft traffic that is conspicuous within its U-space airspace at a rate compatible with which surveillance data is received.

GM1 Article 10(10) UAS flight authorisation service

CONTINUOUS CHECK

USSPs are expected to check existing UAS flight authorisations against new or modified dynamic airspace restrictions and limitations until the end of an active flight (i.e. when the operator signals the flight is no longer active). This may be based on the time horizon published by Member States for the currency of geo-awareness data.

GM2 Article 10(10) UAS flight authorisation service

UPDATE OR WITHDRAWAL OF AN AUTHORISATION

(a) USSPs may provide an updated active UAS flight authorisation at the request of the UAS operator at any time as long as doing so does not produce any new conflicts. For example, a USSP may update a UAS flight authorisation at any point to accommodate avoiding manoeuvres (e.g. holding or hovering) without the flight being considered as non-conforming.

(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.

(c) USSPs will notify other relevant USSPs if there is an active, withdrawn UAS flight authorisation. If the UAS flight authorisation is withdrawn but active, USSPs will notify relevant USSPs of the status of this operation until the end of the flight.

(d) Ending an active flight is an action of the UAS operator and is not expected to be performed by the USSP automatically.

(e) The USSP may withdraw a flight authorisation prior to flight activation.

AMC1 Article 10(11) UAS flight authorisation service

UNIQUE AUTHORISATION NUMBER

The USSP should issue an authorisation number that is unique over the full duration that the authorisation is expected to be referred to, including after flight.

GM1 Article 10 (11) UAS flight authorisation service

UNIQUE AUTHORISATION NUMBER

(a) The purpose of a unique authorisation number is to support the identity of an operation during all its phases. It provides a globally unique identifier for each flight.

(b) Updates to a UAS flight authorisation should not request an update of the universally unique identifier (UUID).

GM1 Article 11 Traffic information service

GENERAL

(a) The traffic information service provides information to UAS operators about other air traffic that is or may be present in proximity to the position of their UAS and supports situational awareness of the UAS operators.

(b) This article contains the requirements for the provision of known air traffic information relevant to the UAS operator's flight (i.e. those in close proximity to the position or intended route of the UAS flight); hence, not only UAS but also manned aircraft traffic. For instance, when, for whichever reason, a manned aircraft needs to cross a U-space airspace, when established in uncontrolled airspace, they would need to make their position available to USSPs. To provide this service, the USSP may use the position information on other UAS traffic available to them through the network identification service, manned traffic information provided by ATS providers and electronic conspicuity received from manned traffic transiting in uncontrolled U-space airspace.

(c) Detailed and accurate information about the position of other unmanned aircraft and the update frequency of the information would need to be identified and assessed during the USSP certification process.

AMC1 Article 11(1) Traffic information service

IDENTIFICATION IN REAL TIME

USSPs should:

(a) identify in real time when any known traffic is in proximity to the position or intended route of any active UAS flight under its responsibility; and

(b) report such traffic to the UAS operator without undue delay.

AMC2 Article 11(1) Traffic information service

COMMON PROTOCOL

USSPs should adhere to a common secure interoperable open traffic information protocol to ensure that any traffic information is delivered to each UAS operator exactly once, except when the operator has just changed its subscription.

AMC1 Article 11(2) Traffic information service

DEGRADATION OF SERVICE

USSPs should inform their UAS operators about the degradation of the traffic information services.

AMC1 Article 11(3)(a) Traffic information service

PROTECTION OF CONTENT

USSPs should forward traffic information without modification.

GM1 Article 11(3)(b) Traffic information service

PERIODICITY

The update frequency of a traffic information service contributes to the overall latency of aircraft reports. It should be chosen such that it makes no significant contribution to the maximum overall latency.

GM1 Article 12 Weather information service

GENERAL

(a) This article lays down the requirements for the weather information service, as well as which weather information should be provided by USSPs providing such service. This service collects the weather information necessary to support UAS operational decisions in a specific U-space airspace and supports the provision of other U-space services, such as the UAS flight authorisation service.

(b) It is recognised that the weather information service for UAS operations is different from the one provided by today's meteorological service providers, especially when it comes to UAS operations under the 'open' and 'specific' categories. UAS can fly near buildings and in areas where current aeronautical meteorological information is not always provided. Therefore, this article specifies a minimum content of weather information to be available for the purpose of UAS operations. It does not exclude the possibility that current aeronautical meteorological service providers can also provide this service.

AMC1 Article 12(1)(a) Weather information service

TRUSTED SOURCES

(a) USSPs should use weather data coming from authoritative sources, when feasible.

(b) Where such weather data is not formally available by an authoritative source or does not meet the applicable data quality requirements, but is required by end users, USSPs should use weather data from other (non-authoritative) sources, provided these have been verified and validated by the USSP to conform with the reliability and data quality requirements.

(c) USSPs should enable the identification of the source of the weather data in accordance with the contractual arrangements with their UAS operators.

GM1 Article 12(1)(a) Weather information service

TRUSTED SOURCES

(a) An authoritative source may be a Member State, or an organisation formally recognised by the Member State to originate and/or publish weather information which meets the data quality requirements in accordance with Annex III to this Regulation.

(b) A non-authoritative source may be an organisation other than those defined in point (a), but providing and/or publishing weather data derived from data gathering or measuring performed (e.g. by aircraft operators, USSPs, or other relevant weather information organisations, or a combination thereof), which conform with the data quality requirements in accordance with Annex III to Regulation (EU) 2021/664.

AMC1 Article 12(2)(f) Weather information service

WEATHER INFORMATION

USSPs should provide weather information that contains:

(a) the location of the observation or forecast using:

(1) ICAO designator, where available; or

(2) the location expressed in WGS-84 coordinate;

(b) the validity of the observation or forecast by specifying:

(1) the validity area/volume either via ICAO designator, where available, WGS-84 position or WGS-84 area of validity; and

(2) the time of the observation and/or the validity of the forecast in UTC time.

GM1 Article 12(2)(f) Weather information service

WEATHER REPORTS

Article 12(2) defines the minimum weather information set and it is recognised that certain meteorological data will be of greater relevance to UAS operators. Therefore, USSPs are required to include the weather information as listed in Article 12(2) but may display a subset of this weather data set (or additional sources of information) to provide the information to the user for awareness without offering a full panel of the required weather fields.

AMC1 Article 12(3) Weather information service

UP-TO-DATE INFORMATION

(a) Upon receipt of updated weather information related to current weather, the USSP should provide it to the UAS operator within maximum 30 seconds.

(b) Upon receipt of an updated weather forecast, the USSP should provide it to the UAS operator within maximum 5 minutes from the time the data is being processed by the USSP.

(c) The USSP should inform the user when the information is not up to date.

RELIABILITY

(d) The USSP should inform the user of the source of the data at the request of the UAS operator.

(e) The USSP should provide a confidence level of the data being provided where available or indicate that the confidence level is unknown.

GM1 Article 12(3) Weather information service

UP-TO-DATE INFORMATION

(a) Up-to-date weather information is considered as the last available data for the ICAO designator geographical point or geographical area of interest.

(b) It is the responsibility of the USSP to ensure that the data being consumed or referred to is the last available data set from the trusted source.

(c) The USSP is not responsible for ensuring that the data being exposed by the trusted source is effectively the last available data.

RELIABILITY

The reliability of data pertains mostly to the security, availability and status reporting to the user. The USSPs should ensure that the UAS operator is presented with accurate information that has not been tampered with and with information regarding the confidence level of the data where this is available at the source.

GM1 Article 13 Conformance monitoring service

GENERAL

(a) This article includes a general description of the objective of the conformance monitoring service, as well as the requirements for the USSPs providing this service. This service checks the current flight authorisation of each UAS with respect to their planned operation as defined in the approved UAS flight authorisation, updated as required by the UAS flight authorisation service to take dynamic conditions in account, and compares it with it. The monitoring is performed per UAS flight.

(b) When non-conformities of the UAS flight are detected and potential hazardous situations are evident, the USSPs alert other air traffic and other USSPs or other relevant authorities with the available means.

(c) It is recommended that the USSPs:

(1) add the information of deviation in the traffic information message if an unmanned aircraft is non-compliant;

(2) alert the UAS operators whose unmanned aircraft fails to comply with its planned operation; and

(3) monitor all current flight operations of their subscribed UAS operators. All USSPs have a shared responsibility to dispatch relevant information to the UAS operators concerned.

GM2 Article 13 Conformance monitoring service

NON-COMPLIANT UAS

(a) An unmanned aircraft can be defined as non-compliant for any of the following reasons:

(1) When it does not comply with any of the capabilities or performance requirements referred to in Article 3(4)(a).

(2) When it does not use all the mandatory U-space services, as referred to in Article 3(2) and (3) or does not comply with any of their requirements.

(3) When it does not comply with any of the operational conditions or airspace constraints referred to in Article 3(4)(c).

(4) When it does not comply with any of the terms or conditions of its flight authorisation in accordance with Article 10(1).

(5) When it does not comply with any of the deviation thresholds of its flight authorisation in accordance with Article 10(2)(d).

(b) If during the flight, the UAS operator cannot be provided with the conformance monitoring service anymore, it is expected that they continue the flight in accordance with the contingency procedures.

AMC1 Article 13(1) Conformance monitoring service

PERFORMANCE

A USSP should alert the UAS operator within 5 seconds, 99 % of the time, when the flight authorisation deviation thresholds are violated.

AMC2 Article 13(1) Conformance monitoring service

CONFIRMATION OF COMPLIANCE

USSPs should provide compliance information to indicate that a compliance check has been performed, and the aircraft in question are compliant.

AMC3 Article 13(1) Conformance monitoring service

USSP CAPABILITY

A USSP should be capable of the following, in the sequence they are listed:

(a) to match all incoming unmanned aircraft traffic information with their corresponding flight authorisation(s);

(b) to determine if such an unmanned aircraft is compliant with the deviation thresholds of its authorisation;

(c) if non-compliant, to provide the details of the deviation in the alert;

(d) if compliant, optionally, to confirm that the unmanned aircraft comply with the requirements set out in Article 6(1) of Regulation (EU) 2021/664 and the terms and conditions of the UAS flight authorisation.

GM1 Article 13(1) Conformance monitoring service

NON-COMPLIANCE NOTIFICATION

(a) Information about a non-compliant unmanned aircraft comprises a time, a position, and zero or more non-compliance statuses, each with a measure of deviation if applicable.

(b) The meaning of a non-compliance notification is that at the estimated time the unmanned aircraft in question was at the stated position. At that time, the unmanned aircraft was non-compliant with respect to its flight authorisation.

GM1 Article 14 Application for a certificate

GENERAL

(a) The provision of U-space services and single CIS is subject to certification by the relevant competent authority.

(b) The competent authority can be:

(1) the national competent authority of the Member States where the U-space service providers and, when designated, single CIS providers have their principal place of business;

(2) the Agency for USSPs and single CIS providers from third countries;

(3) the Agency, at the request of USSPs or single CIS providers that are providing services in more than one Member States, following a coordination process described in Article 64 (at the request of the organisation) or Article 65 (at the request of the national competent authority) of Regulation (EU) 2018/1139.

(c) The certification scheme aims at preserving public interest requirements, most notably in terms of safety. The certificate confirms that the single CIS provider or USSP meets the requirements contained in the Regulation for providing specific U-space services in the U-space airspace, commensurate with the risk associated with the U-space services they provide. The certificate specifies the rights and obligations of the single CIS provider or USSP, with particular regard to safety.

(d) Annexes VI and VII introduce the standard certificate forms for the USSP and the single CIS provider. By introducing this single certificate concept, all the privileges of a USSP are to be mentioned in the attachment to the certificate specifying the types of U-space services, the respective conditions and associated limitations. For the CIS provider, the certificate form does not include an attachment with the type of services, conditions, and limitations of the certificate because the CIS provider should always provide the required CIS for the U-space airspace for which the CIS provider has been designated.

GM1 Article 14(3) Application for a certificate

OPERATIONAL CONDITIONS OR LIMITATIONS IN THE USSP CERTIFICATE

(a) Limitations in the certificate may be used to identify restrictions to be applied in the provision of services and any other particularity of the service provided (e.g. intended usage, type of operations).

(b) Limitations may also relate to some restrictions on the service(s) provided associated with non-compliances with respect to some performance requirements.

(c) Conditions may address actions that require to be accomplished to confirm the validity of the certificate.

GM1 Article 14(6) Application for a certificate

APPLICATION FORM — TEMPLATE

Competent authorities may wish to consider using the following application form template, for facilitation purposes of the harmonised implementation of the Regulation.

Applicant details		
(a)	Legal name of applicant	
(b)	Name of USSP or single CIS provider	
(c)	Address of registry	
(d)	Principal place of business	
(e)	Telephone	
(f)	Email	
(g)	Your reference	
Reason for application		
1.	Initial issue	
2.	Renewal	
Declaration		
(a)	Full name of accountable manager	
(b)	Signature of accountable manager	
(c)	Date of application	

GM1 Article 15 Conditions for obtaining a certificate

GENERAL

(a) This article lists the conditions for obtaining a certificate. It is based on requirements similar to those used for ATM/ANS providers (i.e. those contained in Subpart B of Annex III to Regulation (EU) 2017/373) to obtain and maintain their respective certificates.

(b) As both the single CIS provider and USSP are organisations that directly contribute to safe UAS operations within the U-space airspace, it is important that they have a risk-based management system in place. To apply this management system taking into account the different types of providers and the performance of the services they will manage, the Regulation includes a list of some management system requirements. The elements of this management system are

therefore harmonised for all the different types of single CIS providers or USSPs, but their application may be different depending on the different services provided, especially for the USSPs. Therefore, the proposed management system provides a proportionate application of requirements to both providers.

(c) USSPs and single CIS providers are also required to implement a security management system based on those requirements referred to in point ATM/ANS.OR.D.010 in Subpart D of Annex III to Regulation (EU) 2017/373. Regarding information security (including cybersecurity), Opinion No 03/2021 on the 'Management of information security risks' proposes the necessary provisions, and an amendment is foreseen to both Subparts B and D to of Annex III to Regulation (EU) 2017/373. Therefore, information security provisions are expected to be applicable to USSPs and single CIS providers by reference when such Regulation becomes applicable.

AMC1 Article 15(1)(d) Conditions for obtaining a certificate

OCCURRENCE REPORTING (ATM/ANS.OR.A.065 OF REGULATION (EU) 2017/373)

USSPs and, when designated, single CIS providers should establish procedures for reporting to the competent authority and any other organisation required, which include a description of:

(a) the applicable requirements for reporting;

(b) the reporting mechanism, including reporting forms, means and deadlines;

(c) the personnel responsible for reporting; and

(d) the mechanism for identifying root causes, and the actions to be taken to prevent similar occurrences in the future, as appropriate.

AMC1 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — TECHNICAL AND OPERATIONAL CAPACITY (ATM/ANS.OR.B.001 OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that they have sufficient technical and operational capacity, i.e. adequate and appropriate resources to perform their tasks and discharge their responsibilities.

AMC2 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — ISO (ATM/ANS.OR.B.005 OF REGULATION (EU) 2017/373)

An ISO 9001 certificate, issued by an appropriately accredited organisation, addressing the quality management elements should be considered a sufficient means of compliance. In this case, USSPs and single CIS providers should accept the disclosure of the documentation related to the certification to the competent authority upon the latter's request.

AMC3 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — RESPONSIBILITIES (ATM/ANS.OR.B.005(a)(1) OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that senior management:

(a) define and communicate responsibilities and accountabilities within the organisation and document them within the management system; and

(b) ensure that the management system policy:

(1) is appropriate to the purpose of the organisation;

(2) provides a framework for establishing and reviewing objectives in relation to the provision of the service;

(3) is communicated and understood within the organisation; and

(4) is reviewed for continuing suitability.

AMC4 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — POLICY (ATM/ANS.OR.B.005(a)(2) OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that the management system policy includes a commitment to:

(a) improve towards the highest performance standards so as to support the achievement of the highest level of safety;

(b) comply with all applicable requirements and standards, and consider best practices;

(c) continually improve the effectiveness of the management system;

(d) provide appropriate resources; and

(e) enforce the performance of the service required to support the achievement of the highest level of safety in the U-space airspace.

AMC5 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — SAFETY PERFORMANCE MONITORING AND MEASUREMENT (ATM/ANS.OR.B.005(a)(3) OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that the safety performance monitoring and measurement process include:

(a) safety reporting;

(b) safety reviews including trends reviews, which would be conducted during introduction and deployment of new technologies, change or implementation of procedures, or in situations of structural change in operations; and

(c) safety surveys, examining elements or procedures of a specific operation, such as problem areas or bottlenecks in daily operations, perceptions and opinions of operational personnel, and areas of dissent or confusion.

AMC6 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — SAFETY ASSESSMENT (ATM/ANS.OR.B.005(a)(3) OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that the safety assessment comprises:

(a) the identification of hazards;

(b) the risk analysis of the effects related to a change;

(c) the risk evaluation and, if required, risk mitigation for a change;

(d) the verification that any change meets the safety criteria;

(e) the specification of the monitoring criteria necessary to demonstrate that the service delivered by the changed functional system will continue to meet the safety criteria.

AMC7 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — ASSESSMENT OF THE MANAGEMENT SYSTEM (ATM/ANS.OR.B.005(a)(4) OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that:

(a) senior management assess the service provider's management system, at planned intervals, to ensure its continuing suitability, adequacy, and effectiveness;

(b) the review includes assessing opportunities for improvement and the need for changes to the management system, including the policy and objectives; and

(c) records from management assessments are maintained.

AMC8 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — TRAINING AND COMPETENCY OF PERSONNEL (ATM/ANS.OR.B.005(a)(6) OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should :

(a) determine the necessary competence for personnel performing activities supporting service provision;

(b) where applicable, provide training or take other actions to achieve the necessary competence;

(c) evaluate the effectiveness of the actions taken;

(d) ensure that personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the objectives; and

(e) maintain appropriate records of education, training, skills and experience.

AMC9 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — COMMUNICATION RESPONSIBILITIES (ATM/ANS.OR.B.005(a)(7) OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that appropriate communication processes are established, and that communication takes place regarding the effectiveness of the management system.

AMC10 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — DOCUMENTATION (ATM/ANS.OR.B.005(b) OF REGULATION (EU) 2017/373)

In their documentation, USSPs and single CIS providers should include:

(a) a statement signed by the accountable manager to confirm that the organisation will continuously work in accordance with the applicable requirements;

(b) the scope of activities;

(c) the titles and names of nominated postholders;

(d) the chart showing the lines of responsibility between the nominated postholders;

(e) a general description and location of the facilities;

(f) procedures describing the function and specifying how the organisation monitors and ensures compliance with the applicable requirements; and

(g) the amendment procedure for the management system documentation.

AMC11 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — COMPLIANCE MONITORING (ATM/ANS.OR.B.005(c) OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should:

(a) specify the basic structure of the compliance monitoring function, structured according to the size of the service provider and the complexity of the activities to be monitored, including those which have been subcontracted;

(b) monitor compliance with the procedures they have designed to ensure that services are provided with the required safety levels and quality, as applicable. In doing so, they should as a minimum, and where appropriate, monitor:

  (1) manuals, logs, and records;

  (2) training standards; and

  (3) management system procedures;

(c) ensure that a person is responsible for compliance monitoring to ensure that the organisation continues to meet the applicable requirements. The accountable manager should ensure that adequate resources are allocated for compliance monitoring;

(d) ensure that personnel involved in the compliance monitoring have access to all parts of the USSP or single CIS provider and, as necessary, any contracted organisation. The independence of the compliance monitoring function should be established by ensuring that audits and inspections are carried out by personnel not directly involved in the activity being audited;

(e) ensure that the management system documentation includes:

(1) terminology;

(2) a description of the service provider;

(3) allocation of duties and responsibilities;

(4) procedures to ensure compliance;

(5) the compliance monitoring programme, reflecting:

(i) the schedule of the monitoring programme;

(ii) audit procedures;

(iii) reporting procedures;

(iv) follow-up and corrective action procedures;

(v) the record-keeping system; and

(vi) document control; and

(f) ensure that those responsible for managing the compliance monitoring function receive training on this task.

AMC12 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — CHANGE MANAGEMENT PROCEDURE (ATM/ANS.OR.B.010 OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that:

(a) the procedures to manage changes cover the complete life cycle of a change;

(b) the roles and responsibilities for the change management processes are identified;

(c) the notification process for changes includes:

(1) the point of contact in charge of the notification of changes;

(2) the means used for notification;

(d) the management of change procedures includes a change identification procedure. This procedure should seek out potential changes, confirm that there is a real intent to implement them and, if so, initiate the notification process; and

(e) as part of the change management procedures, it keeps a register of the records of all notified changes, including:

(1) the status of the implementation of the change;

(2) the notification; and

(3) a link to the location of the actual record, including a reference to all information passed to the competent authority.

AMC13 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — CHANGE MANAGEMENT PROCEDURE (ATM/ANS.OR.B.010 OF REGULATION (EU) 2017/373)

(a) The USSP or single CIS provider should seek prior approval of the competent authority for any changes affecting:
  (1) the scope of its certificate or the terms of approval of its service; or
  (2) any of the elements of its management system.

(b) The USSP or single CIS provider should:
  (1) notify the competent authority before any such changes take place; and
  (2) provide the competent authority with any relevant documentation.

(c) Changes requiring prior approval may only be implemented upon receipt of formal approval by the competent authority.

(d) The USSP and single CIS provider should operate under the conditions prescribed by the competent authority during such changes, as applicable.

(e) In order for a USSP or single CIS provider to implement changes without prior approval, they should submit a procedure defining the scope of such changes and describing how such changes will be managed and notified.

AMC14 Article 15(1)(e) Conditions for obtaining a certificate

CONTRACTED ACTIVITIES (ATM/ANS.OR.B.015 OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that:

(a) a contract exists with the contracted organisation clearly defining the contracted activities and the applicable requirements;

(b) the contracted activities, performed by an organisation that is not itself certified in accordance with this Regulation to carry out such activity, are included in their oversight process;

(c) when the contracted organisation is itself certified in accordance with this Regulation to carry out the contracted activities, their compliance monitoring should at least check that the approval effectively covers the contracted activities and that it is still valid;

(d) when they are not certified to provide the service themselves, they should only contract or purchase services from a certified organisation when so required by this Regulation.

AMC15 Article 15(1)(e) Conditions for obtaining a certificate

PERSONNEL REQUIREMENTS — GENERAL (ATM/ANS.OR.B.020 OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that a member of the organisation's management has the authority to:

(a) ensure that processes needed for the management system are established, implemented and maintained;

(b) report to senior management on the performance of the management system and any need for improvement; and

(c) ensure the promotion of awareness of performance and service requirements and of the impact they have on safety.

AMC16 Article 15(1)(e) Conditions for obtaining a certificate

RECORD-KEEPING — GENERAL (ATM/ANS.OR.B.030 OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that:

(a) all the records are accessible whenever needed. These records should be organised in a way that ensures traceability and retrieval throughout the retention period;

(b) records are kept in paper form or in electronic format or a combination of both and should remain legible throughout the required retention period;

(c) paper systems use robust material which can withstand normal handling and filing;

(d) computer systems have at least one backup system which should be updated within 24 hours of any new entry. Computer systems should include safeguards against the probability of unauthorised personnel altering the data;

(e) all computer hardware used to ensure data backup are stored in a different location from that containing the working data and in an environment that ensures they remain in a good condition';

(f) the records are kept for a minimum period of at least 5 years unless otherwise specified by the competent authority.

AMC17 Article 15(1)(e) Conditions for obtaining a certificate

OPERATIONS MANUAL (ATM/ANS.OR.B.035 OF REGULATION (EU) 2017/373)

USSPs and single CIS providers should ensure that the operations manual:

(a) is signed by the accountable manager;

(b) is printed or is in electronic format and is easy to revise;

(c) has a system for version control management;

(d) includes a description of its amendment and revision process specifying:

(1) the person(s) who may approve amendments or revisions;

(2) the conditions for temporary revisions and/or immediate amendments, or revision required in the interest of safety; and

(3) the methods by which all personnel and organisations are advised of changes to the operations manual.

GM1 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — ISO (ATM/ANS.OR.B.005 OF REGULATION (EU) 2017/373)

An ISO 9001 certificate covers the quality management elements of the management system. Other elements required, which are not covered by the ISO 9001 certificate issued by an appropriately accredited organisation, should be subject to oversight by the competent authority.

GM2 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — SAFETY PERFORMANCE MONITORING AND MEASUREMENT (ATM/ANS.OR.B.005(a)(3) OF REGULATION (EU) 2017/373)

(a) Safety performance monitoring and measurement is the process by which the safety performance is verified in comparison to the safety policy and the safety objectives established by the USSP and single CIS provider.

(b) A performance indicator (PI) is a type of performance measurement. An organisation may use PIs to evaluate its success, or to evaluate the success of a particular activity in which it is engaged. Sometimes success is defined in terms of making progress towards strategic goals, but often success is simply the repeated, periodic achievement of some level of operational goal (e.g. zero defects). Accordingly, choosing the right PIs relies upon a good understanding of what is important to the organisation. Since there is a need to understand well what is important, various techniques to assess the present state of the business, and its key activities, are associated with the selection of PIs. These assessments often lead to the identification of potential improvements, so PIs are routinely associated with 'performance improvement' initiatives. When PIs have performance targets associated with them, they are known as key performance indicators (KPIs).

GM3 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — SAFETY ASSESSMENT (ATM/ANS.OR.B.005(a)(3) OF REGULATION (EU) 2017/373)

(a) A safety assessment is performed before a USSP or a single CIS provider is granted a certificate, and when a change affects a part of the management system used in the provision of its services.

(b) The safety assessment is usually conducted by the USSP or single CIS provider itself. It may also be carried out by another organisation, on its behalf, provided that the responsibility for the safety assessment remains with USSP or the single CIS provider.

GM4 Article 15(1)(e) Conditions for obtaining a certificate

MANAGEMENT SYSTEM — COMPLIANCE MONITORING (ATM/ANS.OR.B.005(c) OF REGULATION (EU) 2017/373)

(a) Compliance monitoring is performed by a compliance monitoring manager to ensure that the activities of the organisation are monitored for compliance with the applicable regulatory requirements and that these activities are being carried out properly under the supervision of other relevant nominated postholders and line managers.

(b) The compliance monitoring manager may perform all audits and inspections themselves or appoint one or more auditors by choosing personnel having the related competence, either from within or outside the service provider. Regardless of the option chosen, the independence of the audit function should not be affected; in the cases where those performing the audit or inspection are also responsible for other activities within the organisation.

(c) In the case external personnel are used to perform compliance audits or inspections, compliance monitoring is performed under the responsibility of the compliance monitoring manager who remains responsible for ensuring that the external personnel have relevant knowledge, background and experience as appropriate to the activities being audited or inspected, including knowledge and experience in compliance monitoring.

(d) The organisation retains the ultimate responsibility for the effectiveness of the compliance monitoring function, for the effective implementation and follow-up of all corrective actions.

GM5 Article 15(1)(e) Conditions for obtaining a certificate

CONTRACTED ACTIVITIES (ATM/ANS.OR.B.015 OF REGULATION (EU) 2017/373)

(a) 'Contracted activities' means those activities within the service provision conditions attached to the certificate that are performed by other organisations either themselves certified to carry out such an activity or if not certified, working under the service provider's oversight. The scope of the oversight covers the contracted activities performed by the external organisation that is not itself certified in accordance with this Regulation.

(b) A contract could take the form of a written agreement, letter of agreement, service letter agreement, memorandum of understanding, etc. as appropriate for the contracted activities.

(c) To ensure that the contracted organisation can perform the contracted activities, USSPs and single CIS providers may conduct a prior audit of the contracted party.

(d) The ultimate responsibility for the services provided by contracted organisations always remains with the contracting organisation.

GM6 Article 15(1)(e) Conditions for obtaining a certificate

PERSONNEL REQUIREMENTS (ATM/ANS.OR.B.020 OF REGULATION (EU) 2017/373)

(a) The acceptability of a single person holding more than one post, possibly in combination with being the accountable manager, depends on the complexity of the organisation's activities. The two main areas of concern are competence and an individual's capacity to meet their responsibilities.

(b) The capacity of an individual to meet their responsibilities is primarily dependent upon the complexity of the organisation's activities. However, the complexity of the service provider's organisation or of its activities may prevent or limit the combination of posts.

GM7 Article 15(1)(e) Conditions for obtaining a certificate

OPERATIONS MANUAL (ATM/ANS.OR.B.035 OF REGULATION (EU) 2017/373)

(a) The operations manual is a key document for the USSP and single CIS provider as well as for the competent authority. It describes how the infrastructure, facilities, and operational procedures will operate safely.

(b) The principal objective of an operations manual is to show how management will accomplish its safety responsibilities. It sets out the policy and expected standards of performance, and the procedures by which they will be achieved.

(c) The competent authority will expect the operations manual to be an accurate reflection of the day-to-day functioning of the management system. It shows how the organisation intends to measure its performance against safety targets and objectives. The operations manual should give a clear statement of how safety is developed, managed, and maintained. All safety policies, operational procedures and instructions should be described.

(d) For many small organisations, the operations manual can be both simple and brief if it covers procedures essential for satisfactory day-to-day operations.

(e) The operations manual is one of the means by which all relevant operating staff can be informed as to their duties and responsibilities with regard to safety. It describes the infrastructure, services and facilities, all operating procedures, and any restrictions on service availability.

(f) The operations manual describes how the safety of operations is to be managed. There should never be any doubt in terms of 'safety accountability' for each domain or activity described. It defines who is accountable, who is responsible, who has the authority, who has the expertise, and who carries out the tasks described.

(g) The operations manual may vary in detail according to the complexity of the operation, and the type of services. It may be presented in any form, including electronic form.

GM1 Article 15(1)(f) Conditions for obtaining a certificate

SECURITY MANAGEMENT SYSTEM (ATM/ANS.OR.D.010 OF REGULATION (EU) 2017/373)

Regarding the security management requirements, reference is made to ATM/ANS.OR.A.D.010 in Subpart D of Annex III to Regulation (EU) 2017/373. It should be noted that this Subpart D is amended by the new requirements of Annex II (Part-IS.OR) to Regulation (EU) 2023/xxx.

GM2 Article 15(1)(f) Conditions for obtaining a certificate

INFORMATION SECURITY THREAT (ATM/ANS.OR.D.010 OF REGULATION (EU) 2017/373)

Information security threat may be any circumstance or event with the potential to adversely impact the operation, systems and/or constituents (accidental, casual or purposeful, intentional or unintentional, mistaken) resulting from unauthorised access, use, disclosure, denial, disruption, modification, or destruction of information and/or information system interfaces. This should include malware and the effects of external systems on dependent systems but does not include physical threats.

AMC1 Article 15(1)(g) Conditions for obtaining a certificate

RETENTION OF OPERATIONAL DATA AND INFORMATION

(a) USSPs and single CIS providers should retain operational data and information, as applicable, that consists, as a minimum, of:

(1) exchange with the UAS operators relevant to the UAS flight authorisation request acceptance;

(2) requested and granted UAS flight authorisations;

(3) traffic information provided to UAS operators;

(4) coordination exchange with the ATC units and between USSPs;

(5) flown trajectory by the UAS operators; and

(6) status and the level of service of the infrastructure used for the provision of the service.

(b) The retention of operational data and information should ensure that all the records are accessible whenever needed, subject to requirements for privacy. These records should be organised in a way that ensures traceability and retrieval throughout the retention period.

AMC1 Article 15(1)(h) Conditions for obtaining a certificate

BUSINESS PLAN

(a) USSPs and single CIS providers should present a business plan that shows that the service delivery costs can be reconciled with the prices that can be achieved on the market.

(b) The business plan should cover:

(1) market analysis;

(2) information on the implementation of new infrastructure or other developments, and a statement on how they will contribute to improving the performance of their services, including level and quality of services;

(3) the expected short-term financial position and any changes to or impacts on the business plan; and

(4) planning showing how the business will be financially sustainable.

GM1 Article 15(1)(h) Conditions for obtaining a certificate

BUSINESS PLAN — CONTINUITY OF SERVICES

USSPs and single CIS providers do not necessarily need to provide U-space services during 12 months from the start of operations. The business plan is required to show that a USSP is financially able to ensure the provision of services but not necessarily that it will provide such services. Indeed, it is recognised that, due to certain operational circumstances (e.g. winter conditions) under which UAS operators would not use the U-space services for a certain period of time, the capability of providing services in a continuous manner for a period of 12 months from the start of operations might not be possible. Therefore, it is expected that USSPs should have the service available for 12 months in a continuous manner even if they would not necessarily provide the service the whole year long.

AMC1 Article 15(1)(i) Conditions for obtaining a certificate

INSURANCE COVER

The method employed to provide the cover should be appropriate to the potential loss and damage in question, taking into account the level of commercial insurance cover available.

AMC1 Article 15(1)(k) Conditions for obtaining a certificate

CONTINGENCY PLAN

The contingency plan should include the definition of the measures, the coordination with other actors and alternative services needed in case of degradation or interruption of the U-space services, while the applicability of emergency response planning may be attributable to or affected by an aviation safety occurrence.

AMC1 Article 15(2) Conditions for obtaining a certificate

EMERGENCY RESPONSE PLAN

(a) USSPs and single CIS providers should develop and maintain an emergency response plan (ERP) that ensures:

  (1) an orderly and safe transition from normal to emergency operations;

  (2) safe continuation of operations or return to normal operations as soon as practicable;

  (3) coordination with the ERPs of other organisations, where appropriate.

(b) The ERP should determine the actions to be taken by USSPs and single CIS providers and reflect the nature and complexity of the activities performed by them.

(c) USSPs and single CIS providers should ensure that communication systems:

  (1) are established to provide rapid response of the emergency equipment to accidents and incidents; and

  (2) are tested regularly to verify their operability.

(d) A complete and current list of telephone numbers should be available to all authorities and to personnel responsible for the ERP, to ensure rapid notification in case of emergencies.

GM1 Article 16 Validity of the certificate

GENERAL

(a) The certificate has an indefinite duration but only remains valid as long as the competent authority has verified that the USSP and the single CIS provider continue to conform with the relevant requirements. For USSPs, the certificate is issued for a bundle of U-space services plus, where applicable, the supporting U-space services provided to support the four mandatory ones. The competent authority checks the validity of the certificate on a regular basis. To maintain their certificate valid once it has been issued, the USSPs and single CIS providers must respect the conditions and limitations set out by the certifying competent authority in Annex VI and Annex VII respectively. Such conditions should be objectively justified, non-discriminatory, proportionate, and transparent.

(b) It is considered that when there is a cease of activity by the holder of the certificate, the competent authority cannot assume that it continues to comply with the requirements to ensure reliable and safe service provision.

(c) One task that may be performed by the competent authority is to conduct an operational and financial assessment of the holder of the certificate to evaluate if additional conditions should be imposed or, in the worse-case scenario, take a decision affecting the certificate, with the possibility of revoking it ultimately.

AMC1 Article 16(3) Validity of the certificate

CRITERIA FOR THE ASSESSMENT OF THE FINANCIAL PERFORMANCE

When assessing the operational and financial performance of a USSP and single CIS provider, the competent authority or the Agency should ensure that USSPs and single CIS providers:

(a) are able to meet their financial obligations, such as fixed and variable costs of operation or capital investment costs and use an appropriate cost-accounting system; and

(b) demonstrate their ability through balance sheets and accounts, as applicable under their legal statute, and regularly undergo an independent financial audit.

GM1 Article 17 Capabilities of the competent authorities

RESPONSIBILITIES

The main objective of this article is to ensure that the competent authorities have the technical and operational capacity and expertise to assess the resources needed to effectively perform their certification, oversight, and enforcement tasks and to act accordingly should this not be the case.

GM1 Article 18 Tasks of the competent authorities

CERTIFICATION, OVERSIGHT AND OPERATIONAL RESPONSIBILITIES

(a) This article lays down requirements for competent authorities that perform certification, oversight, and enforcement tasks. It also lists several obligations that are directly related to the functioning of the U-space system.

(b) With a view to ensuring that the requirements are always complied with while ensuring that they can effectively perform their tasks, the competent authorities are granted certain specific investigatory powers. Those powers should be exercised in accordance with the applicable national rules and procedures, while having due regard to several specific elements that are meant to ensure a fair balance between all rights and interests.

(c) Competent authorities also need to ensure operational tasks for the effective implementation of U-space such as the establishment of a registration system to record the service providers involved in the U-space, to determine the type of data to be made available to those who need it, and the way this data can be exchanged to guarantee interoperability of the systems.

AMC1 Article 18(f) Tasks of the competent authorities

COORDINATION MECHANISM

When establishing the coordination mechanism, the designated competent authorities should ensure that it addresses the coordination activities by demonstrating multi-party public, institutional, and private stakeholders' participation and consultation, as applicable, before coming to a resolution.

GM1 Article 18(f) Tasks of the competent authorities

COORDINATION MECHANISM — EVOLVING AND EMERGING ROLES AND RESPONSIBILITIES

(a) Member States should designate one or more competent authorities to perform the tasks listed in Article 18 of this Regulation, and in particular, to designate the competent authority that will have the responsibility for establishing a coordination mechanism. They should designate the authority that will be the responsible coordinator for U-space. The authority acting as the U-space coordinator should take the initiative to coordinate with other public and administrative authorities, and entities at national, regional, and local levels in accordance with the national governance model of a given Member State (e.g. Federal States, Prefectures, Cantons, Regions). So, there are two different roles: the role of the competent authority (designated by the Member State), which must establish the coordination mechanism, and the U-space coordinator, which must do the coordination.

(b) The term 'other authorities and entities, including at local level' can include a variety of organisations (e.g. ministries, environmental and defence organisations, municipalities) in any given country, and thus, an exhaustive list of them is not practical. The U-space coordinator should identify, involve and consult with these 'other authorities and entities, including at local level'. These authorities or entities may be affected by, or interested in, the deployment of a U-space airspace in some way and therefore should be considered accordingly. The term 'local' implies public and administrative authorities, and entities of various types at local and regional

levels, such as municipalities, metropoles, prefectures, regions, airports and ports in accordance with the layered governance models of Member States.

GM2 Article 18(f) Tasks of the competent authorities

COORDINATION MECHANISM — PHASES

(a) The design of a U-space airspace can be changed, temporary or dynamically, and may need to be adapted after designation. This complexity should be addressed by dealing with it through its different life cycle phases, namely, the *planning, execution and review* phases. Also, a three-stage coordination mechanism is proposed.

(b) The coordination mechanism should establish a U-space coordinator and address the planning, execution and review phases.

(1) Planning phase: this phase includes the establishment of a multi-stakeholder collaborative set-up, which is hereafter referred to as 'U-space observatory'. The set-up of the U-space observatory should address multi-party engagement and collaboration, information flow and transparency, and the establishment of KPIs at national, regional, and local levels of U-space deployment. To this end, U-space observatories may be established at national, regional and local levels to deal with the multilevel governance required.

(2) Execution phase: this phase enables the capability to ensure near-to-real-time dynamic responses in dealing with exceptional cases. Consequently, several different stakeholders may be necessary to be involved. To this end, responsive practices and routines and public infrastructure investments may be required and should be deployed, maintained and verified.

(3) Review phase: this phase should contain the lessons learnt for improving the U-space deployment. The monitoring of the KPIs (established during the planning phase), as well as evidence and experience from dealing with exceptional cases (execution phase) should be the means for driving the review phase.

GM3 Article 18(f) Tasks of the competent authorities

COORDINATION MECHANISM — PROCESS

The coordination mechanism is considered as a high-level framework (see Figure 1 below) for managing the coordination and alignment activities throughout the life cycle phases of the U-space deployment. The following topics should be considered during its definition and establishment:

(a) the coordination mechanism should facilitate and safeguard the collection of views, concerns and risks by interested and potentially impacted, public bodies and wider stakeholders on the deployment of U-space, but also to take into account, address and mitigate them, respectively, as required.

(b) The coordination mechanism should deal with topics beyond the safety, security and performance of aviation activities, which are typically managed at national level, by

encompassing and addressing the requirements and constraints (e.g. environmental and social) set by regional and local authorities at different time horizons of U-space deployment.

(c) The coordination mechanism should generate a 'result' in getting the 'green', or 'red', light, which is a decision made by the designated competent authorities, but through their alignment with local and regional authorities, for the short- and long-term U-space deployment.

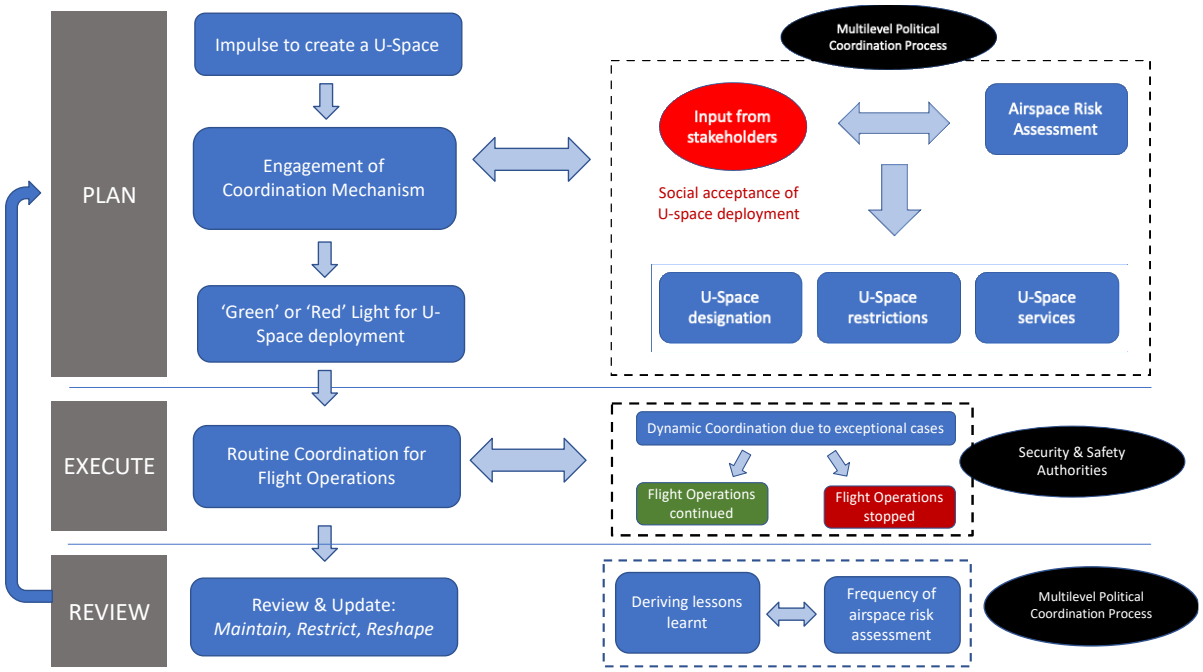


Figure 1: Overview of main tasks requiring coordination among stakeholders across different levels of governance and activity for the planning, execution and review of U-space deployment.

GM4 Article 18(f) Tasks of the competent authorities

COORDINATION MECHANISM — PLANNING, EXECUTION AND REVIEW PHASES

1. The planning phase

The planning phase follows a screened trigger, or impulse, to create a U-space that subsequently engages the coordination mechanism. Engagement of the coordination mechanism should include as a first task the designation, or confirmation, of a U-space coordinator. This phase starts either due to a submitted U-space designation proposal, or due to the need to develop a U-space designation proposal. In both cases, the competent authority engages the coordination mechanism to deliver a decision on U-space deployment. In case of approval ('green' light), then there is a formal U-space designation.

(a) The decision of the Plan phase is based on inputs by all stakeholders and thus takes into consideration not only technical requirements (non-aviation safety and security) but also political issues and public policies. The U-space coordinator is responsible for managing the necessary 'hearing' process.

(b) The hearing process is to ensure inclusion of and consultation with all stakeholders affected by the U-space deployment.

(1) The U-space coordinator should also involve citizens. Public consultation is a necessary step in determining the level of the social acceptance for the planned U-space airspace.

(2) The U-space coordinator should decide in which manner the process itself will take place; examples could be public hearings and discussions or interviews with affected stakeholders.

(3) A crucial part of the hearing process is that the U-space coordinator should form a statement about its position on the potential U-space deployment, based on the evidence and knowledge gained through the process. The statement should include proposals for the design of the U-space; for example, spatial limits of the designated airspace, specific restrictions regarding areas or types of operation, or required U-space services.

(4) The hearing process should end with the submission of the recommendation from the U-space coordinator to the competent authority, which should take the statement into account in the following U-space deployment decision-making process and formal U-space designation. When the competent authority decides to deviate from these recommendations, such deviation has to be justified.

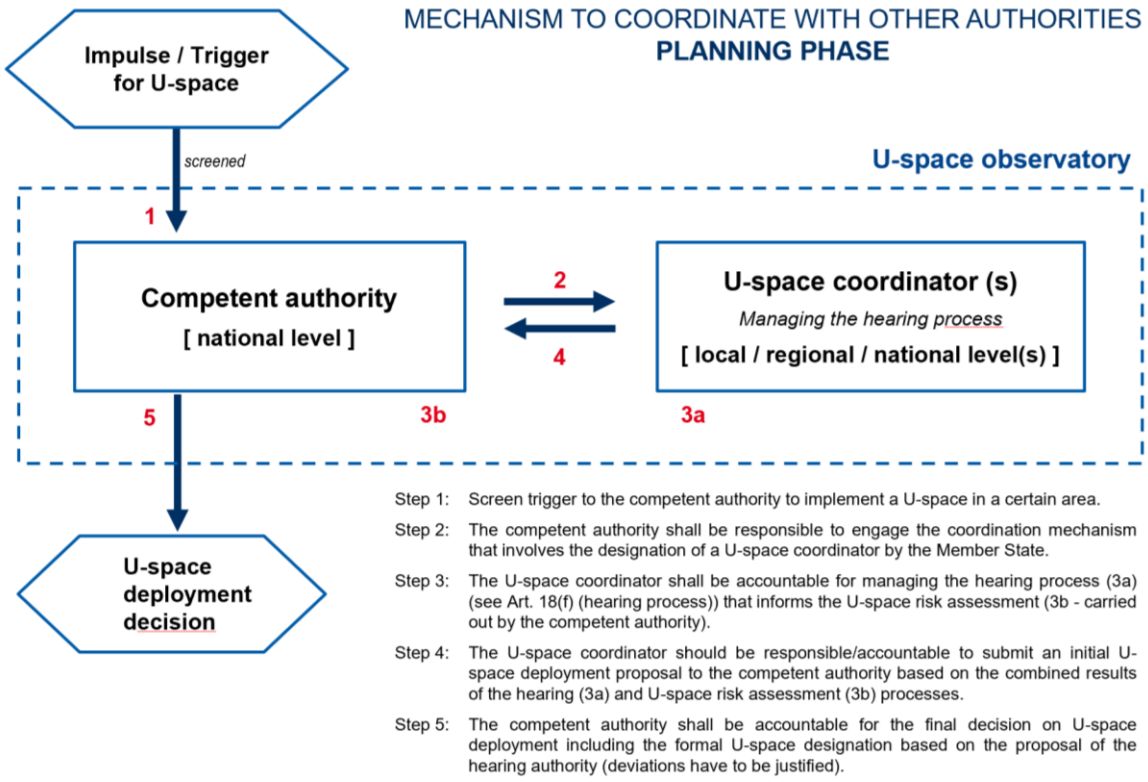


Figure 2: Example of how the coordination mechanism could be implemented. The diagram provides an overview of high-level steps, stakeholders and their relationship during the planning phase

(c) U-space observatory — The set-up of *U-space observatory* may be introduced as a means to promote the systematic coordination at local and regional levels while keeping alignment at national and supra-national levels. The dotted lines in Figure 2 are intended to show that the U-space observatory should not necessarily be a separate entity, but rather to emphasise the need for the competent authority, responsible for making a decision on the U-space deployment to

coordinate with *other* authorities and entities through a hearing process managed by the U-space coordinator.

(d) Competent authority — The designated competent authority establishes a coordination mechanism. This involves the designation of a U-space coordinator, which may be any authority or entity, by the Member States.

(e) U-space coordinator and the hearing process — The U-space coordinator may be introduced to take the lead to manage the 'hearing' process, and hence the role in the identification, coordination and alignment process among cross-sectorial stakeholders.

(f) The U-space coordinator should have the skills and experience to manage 'hearings'.

(g) Besides the airspace itself, a U-space is also affecting ground-based interests of a social, cultural, and political nature, due to the operation of UAS in the lowest airspace. Therefore, on the one hand, air transport is affected, which is regulated at EU level and requires uniform rules throughout the whole Union and, on the other hand, interests on the ground are affected. Any regulations on this matter must be designed to meet the needs of the citizens and the society at local and regional levels in a holistic and integrated manner. Therefore, it is considered that the role of the U-space coordinator could be taken over by an authority at local or regional level.

(h) The distinction of the competent authority (at national level), as well as of the U-space coordinator (at national level[20]), and the U-space coordinator (at regional/local level) can mitigate the risks of:

(1) not aligned airspace and ground regulations across the different layers of governance in Member States,

(2) conflicts of interests among various public and private actors, and

(3) compromising the liveability of cities and regions.

(i) If multiple local or regional authorities are affected, there may be several or only one U-space coordinators designated by a Member State; this is upon the discretion of a Member State by evaluating the capabilities and capacities of the affected authorities.

2. The execution phase

(a) The execution phase starts after the formal designation of the U-space at the time of the actual operations. There is no predetermined end, as long as the U-space is in effect.

(b) There may be temporary restrictions or limitations on the U-space airspace:

(1) By the competent authority at the national level or by specific authorities at all levels requesting/demanding time-critical changes due to safety or security concerns (emergencies). This may trigger, for example, a dynamic airspace reconfiguration by ATC. The level of the acting authority depends on the kind of the emergency and the organisational structure of the respective Member State.

[20] Depending on the governmental structure of the respective Member State, the U-space coordinator at national level could be, for example, any authority or entity as described in GM1 on Clarifications of terms 1(a)(i, ii). The choice of a military organisation as U-space coordinator for a U-space where civil operations take place can be done only if the same organisation is not exempted from the application of the Basic Regulation and the applicable implementing rules, delegated act as well as Commission decisions.

(2) The temporal restrictions of the U-space are carried out only by designating UAS geographical zones according to Article 15 of Regulation (EU) 2019/947 which could be established as:

(i) dynamic geographical zones in terms of time and activated/deactivated without preannouncement; and

(ii) dynamic geographical zones in terms of time and location.

(3) The temporal restrictions of the U-space could also be introduced by doing a dynamic airspace reconfiguration in accordance with ATS.TR.237 of Regulation (EU) 2017/373.

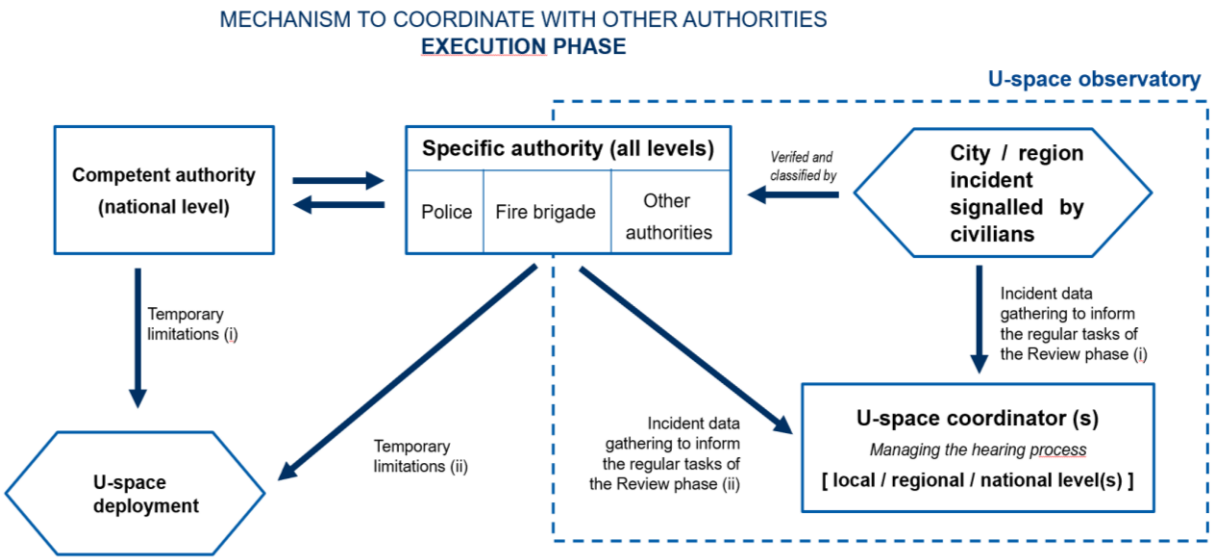


Figure 3: Example of how the coordination mechanism could be implemented. The diagram provides an overview of high-level steps, stakeholders and their relationship during the execution phase

Specific authority (all levels) — Emergency authorities like the police, fire brigade or civil protection agencies depending on the structure of the Member State.

Temporary limitations on the U-space — 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 on the U-space directly; for example, restricted or prohibited airspaces or limitation of the number of UAS in a specific area.

(c) As in manned aviation, the competent authority can always impose temporary limitations (notice to airmen (NOTAM), airworthiness directive, air exclusion zones) on the operation.

(d) Due to the nature of U-space (low-altitude flights over populated areas), the near-to-real-time reaction to incidents is a strong prerequisite in gaining social trust and acceptance. To this end, incident detection and verification as well as a streamlined and visible coordination process among aviation and non-aviation authorities and stakeholders could be facilitated by a digital infrastructure.

(e) U-space coordinator (all levels) — The role of the U-space coordinator is to ensure 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.

3. The review phase

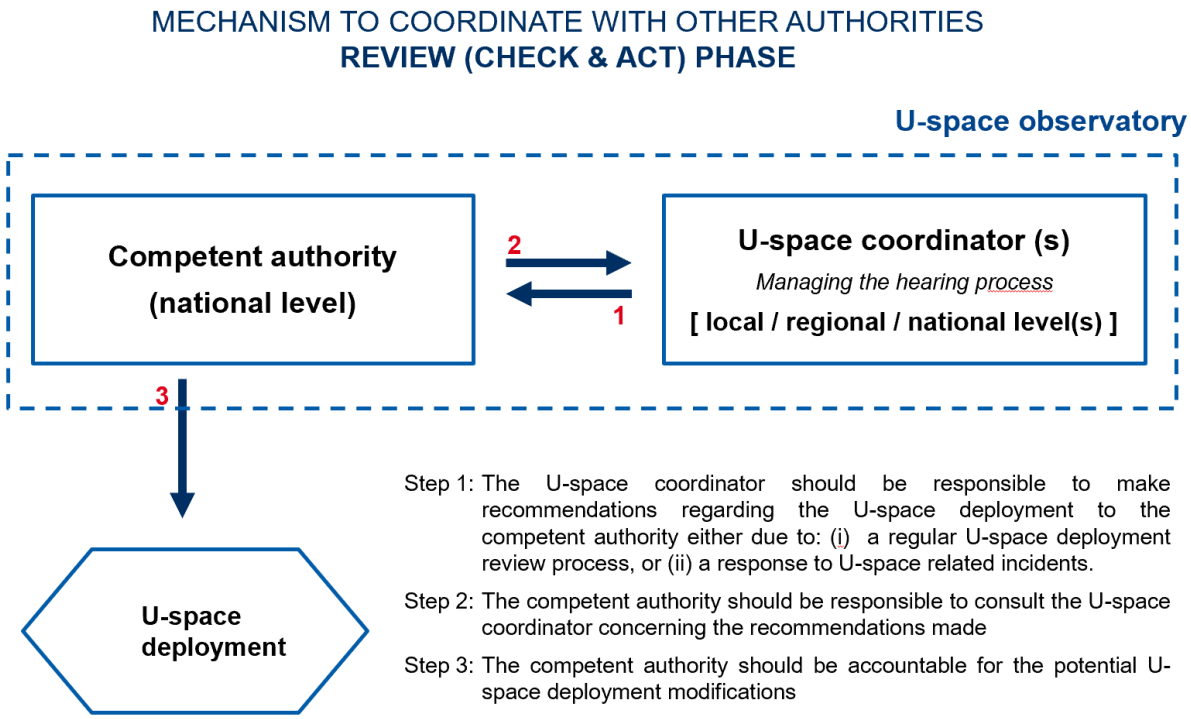


Figure 4: Example of how the coordination mechanism could be implemented. The diagram provides an overview of high-level steps, stakeholders and their relationship during the review phase.

(a) The review phase starts in the context of a regular review (defined during the planning phase) or in the case of a U-space-related incident. Two types of review are proposed:

(1) a technical review carried out by competent authorities in the context of the U-space oversight process (e.g. safety, security, performance indicators, etc.), and

(2) a coordination review carried out, led 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.

(b) The review process should be initiated by the U-space coordinator in the context of the U-space observatory function (Step 1, Figure 4))

(c) The U-space coordinator should be entitled to make recommendations to the competent authority on maintaining, restricting, or reshaping (expanding or reducing) the U-space deployment. The competent authority should consider the recommendations (Step 2, Figure 4) in view of making decisions on the U-space deployment (Step 3, Figure 4). When the competent authority decides to deviate from these recommendations, such deviation must be justified.

(1) The result of the review phase could lead to maintaining or restricting certain U-space operations as well as to reshaping the U-space deployment in terms of either opening new opportunities for its expansion or even its decommissioning in case more extreme, negative, situations are recorded at the execution phase.

(2) The review phase aims at continuous U-space improvement (check and act) through a feedback loop on topics dealt with during the planning phase. If the modification creates new concerns, the planning phase should start again (see Figure 1).

(d) The review phase allows for closing the loop not only in terms of technical and operational performance but overall societal performance of the U-space deployment with all key stakeholders.

GM5 Article 18(f) Tasks of the competent authorities

COORDINATION MECHANISM — REQUIREMENTS FOR MULTILEVEL GOVERNANCE: SCOPE OF TASKS

(a) The U-space coordinator involves all the layers of governance in the engagement and coordination among public authorities and entities spreading across the:

(1) national[21] (e.g. ministries, incl. at federal level, defence authorities);

(2) regional (e.g. prefectures, Federal States and cantons, regions); and

(3) local levels of governance (e.g. metropoles, municipalities, airports, ports) and public activity (e.g. civil society associations, USSPs, UAS operators).

(b) The coordination mechanism is an essential element for U-space to function due to its multi-dimensional impact. While there is a requirement about the spectrum of gathering, and addressing, opinions, views and risks just *before* the deployment of U-space operations as part of the planning and preparatory activities, there is also a need for a coordination of tasks among the different public authorities and entities during the actual U-space operations as well as after their completion.

(c) Depending on the phase of U-space, there are different needs for the participation of the stakeholders referred to in Article 18, which should be differentiated by different expressions/manifestations of the coordination mechanism. The scope of the main tasks to be coordinated at each U-space life cycle phase of Plan-Execute-Review, as shown in Figure 1, in conjunction with the key stakeholders (who), the timing of their engagement (when) and the coordination activities required (how) are outlined in Table 1 below.

	Who	**When**	**How**	***Comments***
PLANNING PHASE				
U-space designation	CAA, ministries (e.g. environment, culture, interior), military, etc.	At the very beginning of the U-space designation process and after the	By consultation, reiteration and alignment among	*CAAs are the final decision-makers after collaboration or consultation with other authorities, e.g. military.*

[21] Where applicable, supranational authorities should also be engaged as necessary; for example, it should be recalled that according to Article 20, EASA should act as the competent authority for USSPs intending to provide, or providing U-space services, in more than one European Member State as well as for USSPs established outside the EU and intending to provide, or providing, services within its territory.

		airspace risk assessment (Art. 3.1)	national, regional and local authorities.	
U-space airspace restrictions	National authorities by defining geo-zones, ref. Art.15 2019/947 Regional or local authorities for the U-space designation	During the initial U-space designation	Based on the national geo-zones, additional regional and local restrictions may apply; by following the consultation process	*U-space is a geo-zone*
U-space services determination	Mandatory: CAA Optional: ANSP, USSP, operators' associations, regional and local authorities	As part of the U-space designation process	Coordination only for the optional services through the consultation process	*Mandatory and optional U-space services should not be confused with commercial or publicly offered U-space services*
EXECUTION PHASE				
U-space designation	Approved by regional /local authorities if they have the capability otherwise the ANSP / USSP will approve	Monitored through the mission	Operations monitored by ANSP/ USSP and from relevant regional /local authorities i.e. emergency medical services, etc.	*It is expected that more mandatory services will gradually be implemented; in particular, tactical information flow, dynamic geo-fences, etc.*
U-space airspace restrictions	The authorised actors provide real-time U-space restrictions as part of the CIS. For example, a local authority (e.g. municipal police, fire brigade) and USSP/ANSP in alignment with the national authorities' policies	When an emergency is identified and verified by local authorities ANSP or USSP will be notified, and the information will be automatically transferred to the operator	Automated/real-time triggering of U-Space restrictions prompted from verified emergencies by local authorities Information flow and decision-making to be managed and governed by U-space standard operations	*These U-space restrictions refer to exceptional cases that result in temporary and/or of more pseudo-permanent nature.* *Accident reporting mechanisms may link to this task*
U-space services determination	n/a	n/a	n/a	*Various predetermined and agreed U-Space services will be used during a mission*
REVIEW PHASE				
U-space designation	CAA, ANSP and/or USSP, 'hearing' authority /regional/local actors/authorities	As part of regular U-space review exercises After mitigation of exceptional cases	Through consideration of U-space KPIs' monitoring and feedback from stakeholders Through risk assessment, airspace restrictions, U-space services needed	*Follow-up*
U-space airspace restrictions				*Follow-up*
U-space services determination				*Evaluation of the usability of the services. Consideration of addition or removal of optional services*

Table 1: Overview of the who-when-how during the different phases of the U-Space coordination mechanism

GM1 Article 19 Entry into force and application

TRANSITION PERIOD

While it is considered important to give Member States, USSPs and CIS providers as well as ANSPs and UAS operators sufficient time to allow them to effectively implement the Regulation, it is also important to ensure that the implementation of the Regulation does not lead to obsolete technical solutions. Therefore, by setting the applicability date of the Regulation on 26 January 2023, a certain period is provided to all the regulated parties to prepare for their implementation. It is equally important to ensure that the implementation of this 'first-phase' regulation provides valuable results based on which more advanced services and procedures can be developed at a regulatory and standardisation level.

GM1 Annex IV UAS flight authorisation request referred to in Article 6(4)

CONSTITUENT

(a) The table below includes the specificities that are expected to be understood within the information mentioned in Annex IV.

	Information type	**Possible examples**
1	unique serial number of the unmanned aircraft or RID add-on	ANSI/CTA-2063-A specified in Regulation (EU) 2019/947
2	mode of operation	VLOS, BVLOS
3	type of flight (special operations)	SERA Article 4 (1) (a) police and customs missions; (b) traffic surveillance and pursuit missions; (c) environmental control missions conducted by, or on behalf of public authorities; (d) search and rescue; (e) medical flights; (f) evacuations; (g) firefighting; (h) exemptions required to ensure the security of flights by heads of State, Ministers and comparable State functionaries.
4a	category of UAS operation	'open', 'specific', 'certified'
4b	UAS aircraft class	C0, C1, C2, C3, C4, C5, C6, <1m, <3m, <8m, >= 8m, Other: can be linked to model aircraft or similar special cases.
4c	UAS type certificate	A UAS subject to certification should comply with the applicable requirements set out in Regulations (EU) No 748/2012, (EU) 2015/640 and (EU) No 1321/2014.
5	4D trajectory	Standardisation of acceptable formats for storing and distribution of a common data models (DTM/DSM/DEM) along with their metadata and timeliness.
6	identification technology	
7	expected connectivity methods	To be expressed in terms of a standard when available
8	endurance	Maximum endurance (minutes) Endurance under nominal conditions
9	applicable emergency procedure in case of a loss of command-and-control link	Emergency procedures will be supplied in a form agreed with the USSP. The information should allow the service provider to anticipate the behaviour of the aircraft in case the link is lost.
10a	registration number of the UAS operator	Regulation (EU) 2019/947 AMC1 Article 14(6)

10b	registration number of the unmanned aircraft	Informally the 'tail number' — for certified aircraft

(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).

AMC1 Annex V(2) Exchange of relevant operational data and information between U-space service providers and air traffic service providers in accordance with Article 7(3)

EXCHANGE MODEL

(a) The exchange of relevant operational data and information described in Article 7(3) between USSPs and ATS providers should conform to the requirements in Annex A to the latest version of EUROCONTROL Specification for SWIM Technical Infrastructure (TI) Yellow Profile, edition 1.1, published on 5 July 2020.

(b) USSPs and ATS providers should document all services facilitating information exchange and should for that purpose adhere to version 1.0 of EUROCONTROL Specification for SWIM Service Description (SD) with the following limitations: SWIM-SERV-022 should be considered without regard to describing or verifying the semantic correspondence of the element with AIRM; SWIM-SERV-023 AIRM conformance should not be considered.

(c) Documentation of all services facilitating information exchange should be available to the public.

(d) Compliance with points (a) and (b) above should be directly measured against the requirements listed in the respective documents (Yellow Profile and published service descriptions).

AMC1 Annex V(3) Exchange of relevant operational data and information between U-space service providers and air traffic service providers in accordance with Article 7(3)

ENCRYTPION METHOD

To be secure, the exchange of relevant operational data and information between USSPs and ATS providers should prove conformance according to the requirements in Annex A to the latest version of EUROCONTROL Specification for SWIM Technical Infrastructure (TI) Yellow Profile, edition 1.1, published on 5 July 2020.

GM1 Annex V(3) Exchange of relevant operational data and information between U-space service providers and air traffic service providers in accordance with Article 7(3)

EXCHANGE MODEL — TRANSPORT LAYER SECURITY

To facilitate data security and privacy for communication over the internet, transport layer security can be used to encrypt the communication between web applications and servers. USSPs and ATS providers may use the transport layer security 1.2 version.

Transport layer security 1.2 compliance covers:

(a) Key Exchange Algorithms (RSA, DH, ECDH, DHE, ECDHE, PSK)

(b) Authentication/Digital Signature Algorithm (RSA, ECDSA, DSA)

(c) Bulk Encryption Algorithms (AES, CHACHA20, Camellia, ARIA)

(d) Message Authentication Code Algorithms (SHA-256, POLY1305)

AMC1 Annex V(4) Exchange of relevant operational data and information between U-space service providers and air traffic service providers in accordance with Article 7(3)

EXCHANGE MODEL

Technical infrastructure supporting information exchange between USSPs and ATS providers should adhere to the latest version of EUROCONTROL Specification for SWIM Technical Infrastructure (TI) Yellow Profile, edition 1.1, published on 5 July 2020.

3.2. Draft AMC and GM to Regulation (EU) 2021/665 amending Implementing Regulation (EU) 2017/373 as regards requirements for providers of air traffic management/air navigation services and other air traffic management network functions in the U-space airspace designated in controlled airspace

AMC1 ATS.OR.127(a) Coordination by air traffic service providers in U-space airspace

INFORMATION ON MANNED AIRCRAFT

ATS providers should establish arrangements with operators of manned special operations, exempted from flight plan submission time requirements according to SERA.4001 (d), to receive the earliest possible notification of an intended manned operation, either directly or through common information services when a single common information service provider is designated.

AMC1 ATS.TR.237(a) Dynamic reconfiguration of the U-space airspace

IMPACT ON UAS OPERATIONS

Air traffic control units should only apply the dynamic reconfiguration of the U-space airspace in the event of risk of collision between manned and unmanned aircraft, causing the forced landing of unmanned aircraft.

AMC2 ATS.TR.237(a) Dynamic reconfiguration of the U-space airspace

PRIORITY

When intending to apply dynamic airspace reconfiguration, air traffic control units should give priority to special operations, as defined in Article 4 of Regulation No (EU) 923/2012, whether performed by UAS or manned aircraft.

GM1 ATS.TR.237(a) Dynamic reconfiguration of the U-space airspace

TIMELINESS

Air traffic control units are expected to coordinate directly with the USSP to receive the information about UAS special operations in a timely manner so that that the air traffic control units can prioritise the traffic in the affected U-space airspace.

GM2 ATS.TR.237(a) Dynamic reconfiguration of the U-space airspace

PROPORTIONATE RESPONSE

(a) In support of a higher degree of flexible use of the available airspace and to reduce the likelihood of forced landings, as airspace volumes are three-dimensional, Member States may

consider dynamic reconfiguration of the U-space airspace in a three-dimensional multi-phased manner.

(b) The following multi-phased reconfiguration may be considered:

(1) Vertical limitation: limit the ceiling of UAS operations to a level, such as the lowest limit of the applicable obstacle limitation surface (i.e. inner horizontal surface) when available. Lowering the ceiling of the U-space airspace would allow for continuous segregated operations as manned aircraft will overfly UAS. Keeping the U-space airspace partially active and usable for a prolonged period would safeguard the operation of UAS flying at lower altitudes.

(2) Lateral limitation: deactivation of a U-space airspace section down to ground, where manned aircraft operations take place. UAS flights outside the deactivated portion can continue. Hereby, the impact on UAS operations is limited to what is necessary.

(3) Full deactivation: fully deactivating of the U-space airspace.

(c) As a result of phases 1 and 2, UAS in flight will comply with updated UAS flight authorisations, as applicable, or immediately approach a predefined safety landing point, while because of phase 3 they will proceed to such landing point. Safety landing points are appropriately selected by the UAS operator and submitted during UAS flight authorisation to ensure a quick landing without endangering people or surrounding property on the ground or damaging the UAS hardware.

AMC1 ATS.TR.237(b) Dynamic reconfiguration of the U-space airspace

TIMELY COORDINATION FOR NOTIFICATION

ATC units should coordinate, as early as possible, with involved USSPs to notify them so that they anticipate any decision on dynamic reconfiguration of the U-space airspace.

GM1 ATS.TR.237(b) Dynamic reconfiguration of the U-space airspace

EFFECTIVE COORDINATION

(a) Establishing a preset, minimum advance notice could be difficult in many instances; however, analogy may be found in this respect in EUROCAE ED-269 'Minimum Operational Performance Standard for UAS Geo-Fencing' (published on 1 June 2020), which specifies the minimum performance expected from a geofencing function to ensure that it will perform its intended sub-functions satisfactorily under all conditions normally encountered in a routine aeronautical operation.

(b) Said EUROCAE ED-269 indicates the issuance of a caution alert to the remote pilot when the current location is to become forbidden soon and will have to be exited, soon enough to enable exit before active restriction; for example; considering the distance to come back to the authorised limit (or distance to exit) divided by the anticipated ground speed to do so. A minimum value of 2 minutes is suggested. It is also recommended to have an advisory alert before this last one (either 10 minutes or five times the caution anticipation time).

(c) In any case, when data resulting from the dynamic airspace reconfiguration is made available as part of the CIS, it may include starting/ending time of the reconfiguration; otherwise it is intended to be immediately applicable, until further notice.

(d) Except for emergency situations, coordination between air traffic control units and USSPs should allow for completion of any already started authorised UAS flight, possibly through a revised UAS flight authorisation. In circumstances where the air traffic control unit deems that this would inappropriately postpone airspace reconfiguration, UAS operators should at least be allowed sufficient time to reposition unmanned aircraft according to the adjusted geographical limits of U-space airspace, or to safely proceed, without delay, to a landing site.

3.3. Draft AMC and GM to Regulation (EU) 2021/666 amending Regulation (EU) No 923/2012 as regards requirements for manned aviation operating in U-space airspace

AMC1 SERA.6005(c) Requirements for communications, SSR transponder and electronic conspicuity in U-space airspace

INFORMATION TO BE TRANSMITTED AND MEANS OF TRANSMITION

(a) Manned aircraft should transmit the information using one or more of the following means:

(1) An ADS-B out system compliant with ICAO Annex 10, Volume IV, Chapter 5 (Mode-S Extended Squitter) or Volume III, Chapter 12 (Universal Access Transceiver), that is implemented and deployed for that purpose in all Member States.

(2) A system that transmits the information specified in Appendix 1 to this AMC using:

(i) SRD 860 frequency band, and the information is transmitted in compliance with the format as documented in the [*EASA technical specification*];

(i) standardised mobile telecommunication network services coordinated for aerial use in Europe. The aircraft operator using application-based service should ensure that all other applications or functions that might run in the background are switched off or made inactive to limit in-flight transmissions to only those necessary to minimise interferences through unpredictable data upload.

Note: The devices used for transmissions in accordance with point (2)(ii) should carry an appropriate CE marking and be either installed on the aircraft with the installation approved by the competent authority or carried on board the aircraft as a non-installed equipment.

(b) The information specified in Appendix 1 to this AMC should be transmitted in a machine-readable format that is accessible to USSPs without any restrictions.

Appendix 1 to AMC1 SERA.6005(c) Requirements for communications, SSR transponder and electronic conspicuity in U-space airspace

TECHNICAL SPECIFICATION OF THE MESSAGE GENERATION FUNCTION

(a) This technical specification details the minimum set of parameters that should be transmitted and a set of parameters that may be transmitted optionally.

(b) All parameters should originate from a position source or from the device configuration. Each message should include an identifier unique to the transmission source.

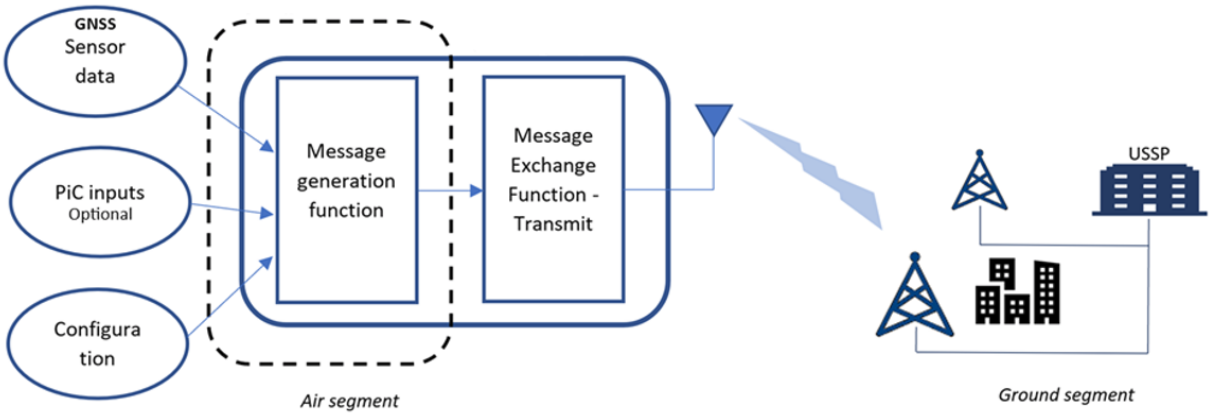


Figure 1: The scope of the message generation function (dashed line) as specified in Appendix 1 to AMC1 to SERA.6005(c)

TRANSMITTED PARAMETERS

Data type	Parameter	Required/ optional	Remarks	Source
Aircraft address	Unique identifier / address	Required	Should be included in each transmission	Configuration
	Address type	Required	See the table below	Configuration
Time	Timestamp	Required*	** Only applicable to AMC1 options (a)(2)*	Position source
Aircraft identification	Aircraft category	Required	See the table below	Configuration
Emergency status	Emergency status	Optional	See the table below	Pilot-in-command inputs
Position	Latitude	Required	Reference WGS-84	Position source
	Longitude	Required	Reference WGS-84	Position source
	Altitude	Required	Reference WGS-84 Height Above Ellipsoid (HAE)	Position source
Velocity / track	Ground speed	Required	Alternatively, North-South, East - West velocities	Position source
	Ground track	Required		Position source
	Vertical rate	Required		Position source
	Velocity accuracy	Optional	See the table below	Position source
Capabilities and status	Version	Required		Configuration
	Design assurance	Optional	See the table below	Configuration
	Horizontal position accuracy	Required	95 % confidence See table below	Position source
	Vertical position accuracy	Required	95 % confidence See the table below	Position source
	Navigation integrity	Optional	Containment radius (Rc) See table below	Position source
	Source integrity level	Optional	Probability that Rc is exceeded See the table below	Configuration

TABLES FOR REQUIRED PARAMETERS

Data type	Values
Address type	Reserved
	ICAO
	Unique identifier
	Reserved

Parameter	Values
Aircraft category	No emitter category information available
	Light (<15 500 lbs)
	Small to heavy (≥15 500 lbs)
	Rotorcraft
	Glider / sailplane
	Lighter-than-air
	Ultralight / hang-glider / paraglider
	Parachutist / skydiver
	eVTOL
	Reserved
	Reserved

Parameter	95 % horizontal accuracy bound
	EPU ≥ 926 m (0.5 NM)
	EPU < 926 m (0.5 NM)
	EPU < 555.6 m (0.3 NM)
	EPU < 185.2 m (0.1 NM)
	EPU < 92.6 m (0.05 NM)
	EPU < 30 m
	EPU < 10 m
	EPU < 3 m

Data type	95 % geometric altitude accuracy
Vertical position accuracy	Unknown or > 150 m
	<= 150 m
	<= 45 m
	<= 15 m

TABLES FOR OPTIONAL PARAMETERS

Parameter	Values
Emergency status	No emergency
	General emergency
	Lifeguard/medical emergency
	Minimum fuel (Energy)
	No communications
	Unlawful interference
	Downed aircraft
	Reserved

Parameter	HFOMr values
Velocity accuracy	Unknown or >= 10 m/s
	< 10 m/s
	< 3 m/s
	< 1 m/s

Parameter	Software & hardware DAL
Design assurance	N/A
	D
	C
	B

Parameter	Rc
Navigation integrity	>= 20 Nm
	< 20 Nm
	< 8 Nm
	< 4 Nm
	< 2 Nm
	< 1 Nm
	< 0.6 Nm
	< 0.2 Nm
	< 0.1 Nm
	< 75 m
	< 25 m
	< 7.5 m

Parameter	Probability of exceeding Rc
Source integrity level	Unknown or > 1E-3 / F.H.
	≤ 1E-3 / F.H.
	≤ 1E-5 / F.H.
	≤ 1E-7 / F.H.

TRANSMISSION RATE

The position and ‘velocity/track parameters should be transmitted at a rate of at least 1 Hz. The transmission of other parameters may be less frequent than 1 Hz, but not less frequent than 0.1 Hz.

ERROR CONTROL

There should be at least a digital error detection technique at one level of the transmission (e.g. CRC). No specific error-controls means are prescribed.

POSITION SOURCE

The horizontal and vertical position and velocity/track parameters should primarily be based on a GNSS source.

GM1 SERA.6005(c) Requirements for communications, SSR transponder and electronic conspicuity in U-space airspace

POSITION SOURCE

It is expected that the GNSS position source processes more than one constellation and/or uses SBAS augmentation if available.

INSTALLED SYSTEMS

(a) ADS-B out system compliant to ICAO Annex 10 that is implemented and deployed for that purpose in all Member States

The systems may be installed in accordance with CS-ACNS (Subpart D, Section 4) or CS-STAN or AMC 20-24. The system installation should be approved by the competent authority.

(b) Systems using SRD 860 frequency band or using standardised mobile telecommunication network services coordinated for aerial use in Europe

Installation of systems in an aircraft, where EASA is the competent authority for the aircraft design, should be done in accordance with EASA aircraft design change processes or in accordance with CS-STAN.

(c) Installation of a system in an aircraft, where a national competent authority (NCA) is the authority for the aircraft design, should be done in accordance with the aircraft design change processes defined by the relevant NCA. The NCAs can make use of CS-STAN for technically similar installations in aircraft specified in Annex I to Regulation (EU) 2018/1139.

The manufacturer may declare compliance of its system with SERA.6005(c). Such a declaration of compliance may be used by an aircraft operator to demonstrate compliance with SERA.6005(c) to its competent authority. The manufacturer of the system may voluntarily ask for a technical evaluation of their system by a competent authority.

NON-INSTALLED EQUIPMENT

(d) The carriage of a non-installed equipment on board the aircraft, where EASA is the competent authority for the aircraft design, should comply with the applicable air operations requirements (e.g. CAT.GEN.MPA.140, NCC.GEN.130, NCO.GEN.125, SPO.GEN.130). The carriage of a non-installed equipment on board the aircraft, where an NCA is the authority for the aircraft design, should comply with the applicable air operations requirements defined by the relevant NCA. The NCAs may accept to use the relevant EASA requirements for similar air operations with aircraft specified in Annex I to Regulation (EU) 2018/1139.

(e) The 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 maximise ground visibility of the transmitting antennas.

MOBILE TELECOMMUNICATION SERVICES FOR AERIAL USE

(f) National and international roaming agreements rely on standardised roamed services (SMS, voice streaming, etc.), which cannot be automatically presumed for aerial services. Only the

mobile telecommunication services concluded by the standardisation bodies for aerial use could be used by manned aircraft to make themselves electronically conspicuous to USSPs.

(g) There are country-specific restrictions for the aerial use of certain mobile telecommunication frequencies. Therefore, the frequencies used by aerial mobile telecommunication services should be consistent with the relevant decisions of the Electronic Communication Committee (ECC) of the European Conference of Postal and Telecommunications Administrations (CEPT) as implemented by national telecommunication authorities.

MILITARY AND STATE AIRCRAFT OPERATIONS

(h) Although the amendment to Regulation (EU) No 923/2012 introduced by Regulation (EU) 2021/666 does not apply to military and State aircraft operations and training, full or partial participation of these aircraft in U-space airspace may take place. Military and State organisations can reserve the right not to be conspicuous to the USSPs taking both security and safety requirements into account.

(i) At national level, coordination between civil and military / State aircraft authorities should assess the risk of the non-conspicuous military and State aircraft operating in U-space airspace and may specify means by which the presence and or location of such aircraft may be communicated by the relevant operational units to affected USSPs.

(j) In determining the designation of an area as U-space, States should have regard to operations and training of manned military and State aircraft operating in the airspace concerned and the ability or otherwise to be conspicuous, whether for technical or operational reasons.

SAFEGUARDS FOR CONTINUOUS TRANSMISSIONS

(k) USSPs may use provisions in Article 18(h) of Regulation (EU) 2021/664 to inform the competent authority about any known irregularities in continuous transmissions of the systems making manned aircraft electronically conspicuous to USSPs, particularly if these irregularities may negatively affect the provision of air traffic information services as referred to in Article 11 of that Regulation.

(l) The manned aircraft operating in U-space airspace should use the provisions of Regulation (EU) No 376/2014 [*as amended by the U-space regulation*] for reporting of any known irregularities in continuous transmissions of the systems used for making the aircraft electronically conspicuous to USSPs.

(m) The competent authority should, in case of an urgent safety problem, determine a corrective action to be taken by a natural or a legal person, including directives or recommendations, where this is necessary to safeguard safety of traffic information service.

4. Impact assessment (IA)

No detailed impact assessment has been carried out for this NPA. EASA carried out an impact assessment when publishing Opinion No 01-2020 and highlighted the impact of the U-space regulatory framework.

The conclusions of the impact assessment made within Opinion No 01-2020 are still valid for the present proposal and no new controversial subject have risen from the proposal.

However, to elaborate on the impact of this proposal on general aviation in particular and the draft AMC & GM on e-conspicuity, EASA provides, in Section 2.4, additional explanation on the advantages and drawbacks of the proposal regarding this category of airspace users.

5. Proposed actions to support implementation

— Focused communication for Advisory Body meeting(s) (MAB/SAB/TeB/TEC/COM)

— Clarifications via electronic communication tools between EASA and NCAs (EU Survey or other)

— Detailed explanations/clarifications on the EASA website for industry and NCAs

— Dedicated thematic workshop/sessions/webinars for industry and NCAs

— Combination of the above-mentioned means

6. References

6.1. Related EU regulations

— Commission Implementing Regulation (EU) 2021/664 of 22 April 2021 on a regulatory framework for the U-space (OJ L 139, 23.04.2021, p. 161)

— Commission Implementing Regulation (EU) 2021/665 of 22 April 2021 amending Implementing Regulation (EU) 2017/373 as regards requirements for providers of air traffic management/air navigation services and other air traffic management network functions in the U-space airspace designated in controlled airspace (OJ L 139, 23.04.2021, p. 139)

— Commission Implementing Regulation (EU) 2021/666 of 22 April 2021 amending Regulation (EU) No 923/2012 as regards requirements for manned aviation operating in U-space airspace (OJ L 139, 23.04.2021, p. 187)

— Commission Implementing Regulation (EU) 2017/373 of 1 March 2017 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, repealing Regulation (EC) No 482/2008, Implementing Regulations (EU) No 1034/2011, (EU) No 1035/2011 and (EU) 2016/1377 and amending Regulation (EU) No 677/2011 (OJ L 62, 8.3.2017, p. 1)

— Commission Implementing Regulation (EU) No 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No 1035/2011 and Regulations (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010 (OJ L 281, 13.10.2012, p. 1).

— Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft (OJ L 152, 11.6.2019, p. 45)

— Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems (OJ L 152, 11.6.2019, p. 1)

6.2. Related EASA decisions

N/A

6.3. Other references

N/A

7. Appendix

N/A

8. Quality of the NPA

To continuously improve the quality of its documents, EASA welcomes your feedback on the quality of this NPA with regard to the following aspects:

8.1. The regulatory proposal is of technically good/high quality

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

8.2. The text is clear, readable and understandable

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

8.3. The regulatory proposal is well substantiated

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

8.4. The regulatory proposal is fit for purpose (capable of achieving the objectives set)

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

8.5. The impact assessment (IA), as well as its qualitative and quantitative data, is of high quality

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

8.6. The regulatory proposal applies the 'better regulation' principles[1]

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

8.7. Any other comments on the quality of this NPA (please specify)

Note: Your comments on Chapter 8 will be considered for internal quality assurance and management purposes only and will not be published in the related CRD.

[1] For information and guidance, see:
- https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how_en
- https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox_en
- https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox/better-regulation-toolbox_en