EASA

European Union Aviation Safety Agency

UAS

(IR + AMC & GM + DR)

eRules

Easy Access Rules for Unmanned Aircraft Systems (Regulations (EU) 2019/947 and (EU) 2019/945)

EASA eRules: aviation rules for the 21st century

Rules and regulations are the core of the European Union civil aviation system. The aim of the **EASA eRules** project is to make them **accessible** in an efficient and reliable way to stakeholders.

EASA eRules will be a comprehensive, single system for the drafting, sharing and storing of rules. It will be the single source for all aviation safety rules applicable to European airspace users. It will offer easy (online) access to all rules and regulations as well as new and innovative applications such as rulemaking process automation, stakeholder consultation, cross-referencing, and comparison with ICAO and third countries' standards.

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The **EASA eRules** system is developed and implemented in close cooperation with Member States and aviation industry to ensure that all its capabilities are relevant and effective.

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[1] The published date represents the date when the consolidated version of the document was generated.

[2] Euro-Lex, Important Legal Notice: http://eur-lex.europa.eu/content/legal-notice/legal-notice.html.

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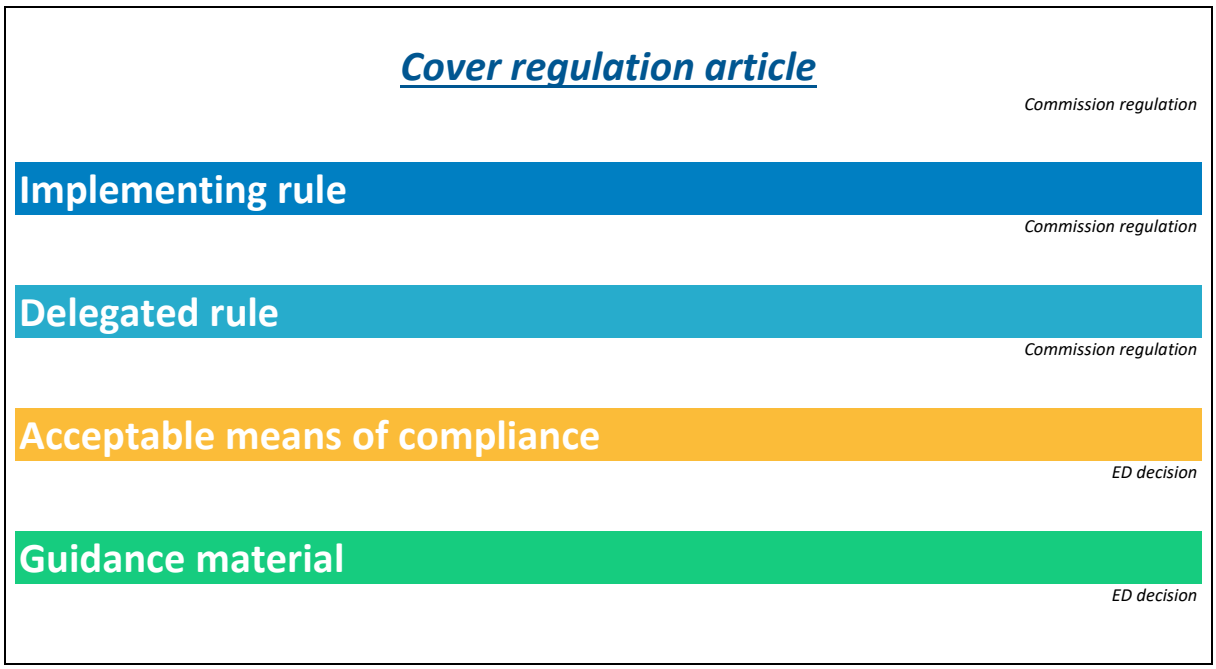
NOTE FROM THE EDITOR

The content of this document is arranged as follows: the cover regulation (recitals and articles) with the implementing rule (IR) points appear first, followed by the related acceptable means of compliance (AMC) and guidance material (GM) paragraph(s). As last comes the delegated rule (DR).

All elements (i.e. cover regulation, IR, AMC, GM, and DR) are colour-coded and can be identified according to the illustration below. The Commission regulation or EASA Executive Director (ED) decision through which the point or paragraph was introduced or last amended is indicated below the point or paragraph title(s) in italics.



This document will be updated regularly to incorporate further amendments.

The format of this document has been adjusted to make it user-friendly and for reference purposes. Any comments should be sent to erules@easa.europa.eu.

INCORPORATED AMENDMENTS

IMPLEMENTING RULES (IRS) (COMMISSION REGULATIONS)

Incorporated Commission Regulation	Regulation amendment	Applicability date[1]
Regulation (EU) 2019/947	Initial issue	1/7/2020

DELEGATED RULES (DRS) (COMMISSION REGULATIONS)

Incorporated Commission Regulation	Regulation amendment	Applicability date[1]
Regulation (EU) 2019/945	Initial issue	1/7/2019

AMC & GM TO IRS (ED DECISIONS)

Incorporated ED Decision	AMC/GM Issue No, Amendment No	Applicability date[1]
ED Decision 2019/021/R	Issue 1	11/10/2019

Note: To access the official versions, please click on the hyperlinks provided above.

[1] *This is the main date of application (i.e. the date from which an act or a provision in an act produces its full legal effects) as defined in the relevant cover regulation article. Some provisions of the regulations though may be applicable at a later date (deferred applicability). Besides, there may be some opt-outs (derogations from certain provisions) notified by the Member States.*

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LIST OF ABBREVIATIONS

ED Decision 2019/021/R

AEC	airspace encounter category
AEH	airborne electronic hardware
ANSP	air navigation service provider
ARC	air risk class
AGL	above ground level
AMC	acceptable means of compliance
ATC	air traffic control
BVLOS	beyond visual line of sight
C2	command and control
C3	command, control and communication
ConOps	concept of operations
DAA	detect and avoid
EASA	European Union Aviation Safety Agency
ERP	emergency response plan
EU	European Union
FHSS	frequency-hopping spread spectrum
GRC	ground risk class
GM	guidance material
GNSS	Global Navigation Satellite System
HMI	human machine interface
ISM	industrial, scientific and medical
JARUS	Joint Authorities for Rulemaking on Unmanned Systems
METAR	aviation routine weather report (in (aeronautical) meteorological code)
MCC	multi-crew cooperation
MTOM	maximum take-off mass
NAA	national aviation authority
OM	operations manual
OSO	operational safety objective
PDRA	predefined risk assessment
RBO	risk-based oversight
RCP	required communication performance
RF	radio frequency
RLP	required C2 link performance
RP	remote pilot
RPS	remote pilot station
SAIL	specific assurance and integrity level
SMM	safety management manual
SORA	specific operations risk assessment
SPECI	aviation selected special weather code in (aeronautical) meteorological code)
STS	standard scenario
SW	software
TAF	terminal area forecast
TCAS	traffic collision avoidance system
TMPR	tactical mitigation performance requirement
UA	unmanned aircraft
UAS	unmanned aircraft system
UAS Regulation	Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft
VLL	very low level
VLOS	visual line of sight
VO	visual observer

COVER REGULATION TO REGULATION (EU) 2019/947

COMMISSION IMPLEMENTING REGULATION (EU) 2019/947

of 24 May 2019

on the rules and procedures for the operation of unmanned aircraft

Regulation (EU) 2019/947

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to 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 216/2008 and (EC) No 552/2004 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91[1], and in particular Article 57 thereof,

Whereas:

(1) Unmanned aircraft, irrespective of their mass, can operate within the same Single European Sky airspace, alongside manned aircraft, whether airplanes or helicopters.

(2) As for manned aviation, a uniform implementation of and compliance with rules and procedures should apply to operators, including remote pilots, of unmanned aircraft and unmanned aircraft system ('UAS'), as well as for the operations of such unmanned aircraft and unmanned aircraft system.

(3) Considering the specific characteristics of UAS operations, they should be as safe as those in manned aviation.

(4) Technologies for unmanned aircraft allow a wide range of possible operations. Requirements related to the airworthiness, the organisations, the persons involved in the operation of UAS and unmanned aircraft operations should be set out in order to ensure safety for people on the ground and other airspace users during the operations of unmanned aircraft.

(5) The rules and procedures applicable to UAS operations should be proportionate to the nature and risk of the operation or activity and adapted to the operational characteristics of the unmanned aircraft concerned and the characteristics of the area of operations, such as the population density, surface characteristics, and the presence of buildings.

(6) The risk level criteria as well as other criteria should be used to establish three categories of operations: the 'open', 'specific' and 'certified' categories.

(7) Proportionate risks mitigation requirements should be applicable to UAS operations according to the level of risk involved, the operational characteristics of the unmanned aircraft concerned and the characteristics of the area of operation.

(8) Operations in the 'open' category, which should cover operations that present the lowest risks, should not require UAS that are subject to standard aeronautical compliance procedures, but

[1] OJ L 212, 22.8.2018, p. 1.

should be conducted using the UAS classes that are defined in Commission Delegated Regulation (EU) 2019/945[1].

(9) Operations in the 'specific' category should cover other types of operations presenting a higher risk and for which a thorough risk assessment should be conducted to indicate which requirements are necessary to keep the operation safe.

(10) A system of declaration by an operator should facilitate the enforcement of this Regulation in case of low risk operations conducted in the 'specific' category for which a standard scenario has been defined with detailed mitigation measures.

(11) Operations in the 'certified' category should, as a principle, be subject to rules on certification of the operator, and the licensing of remote pilots, in addition to the certification of the aircraft pursuant to Delegated Regulation (EU) 2019/945.

(12) Whilst mandatory for the 'certified category', for the 'specific' category a certificate delivered by the competent authorities for the operation of an unmanned aircraft, as well as for the personnel, including remote pilots and organisations involved in those activities, or for the aircraft pursuant to Delegated Regulation (EU) 2019/945 could also be required.

(13) Rules and procedures should be established for the marking and identification of unmanned aircraft and for the registration of operators of unmanned aircraft or certified unmanned aircraft.

(14) Operators of unmanned aircraft should be registered where they operate an unmanned aircraft which, in case of impact, can transfer, to a human, a kinetic energy above 80 Joules or the operation of which presents risks to privacy, protection of personal data, security or the environment.

(15) Studies have demonstrated that unmanned aircraft with a take-off mass of 250 g or more would present risks to security and therefore UAS operators of such unmanned aircraft should be required to register themselves when operating such aircraft in the 'open' category.

(16) Considering the risks to privacy and protection of personal data, operators of unmanned aircraft should be registered if they operate an unmanned aircraft which is equipped with a sensor able to capture personal data. However, this should not be the case when the unmanned aircraft is considered to be a toy within the meaning of Directive 2009/48/EC of the European Parliament and of the Council on the safety of toys[2].

(17) The information about registration of certified unmanned aircraft and of operators of unmanned aircraft that are subject to a registration requirement should be stored in digital, harmonised, interoperable national registration systems, allowing competent authorities to access and exchange that information. The mechanisms to ensure the interoperability of the national registers in this Regulation should be without prejudice to the rules applicable to the future repository referred to in Article 74 of Regulation (EU) 2018/1139.

(18) In accordance with paragraph 8 of Article 56 of Regulation (EU) 2018/1139, this Regulation is without prejudice to the possibility for Member States to lay down national rules to make subject to certain conditions the operations of unmanned aircraft for reasons falling outside the scope of Regulation (EU) 2018/1139, including public security or protection of privacy and personal data in accordance with the Union law.

[1] Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and on third-country operators of unmanned aircraft systems (see page 1 of this Official Journal).

[2] Directive 2009/48/EC of the European Parliament and of the Council of 18 June 2009 on the safety of toys (OJ L 170, 30.6.2009, p. 1).

(19) National registration systems should comply with the applicable Union and national law on privacy and processing of personal data and the information stored in those registrations systems should be easily accessible[1].

(20) UAS operators and remote pilots should ensure that they are adequately informed about applicable Union and national rules relating to the intended operations, in particular with regard to safety, privacy, data protection, liability, insurance, security and environmental protection.

(21) Some areas, such as hospitals, gatherings of people, installations and facilities like penal institutions or industrial plants, top-level and higher-level government authorities, nature conservation areas or certain items of transport infrastructure, can be particularly sensitive to some or all types of UAS operations. This should be without prejudice to the possibility for Member States to lay down national rules to make subject to certain conditions the operations of unmanned aircraft for reasons falling outside the scope of this Regulation, including environmental protection, public security or protection of privacy and personal data in accordance with the Union law.

(22) Unmanned aircraft noise and emissions should be minimised as far as possible taking into account the operating conditions and various specific characteristics of individual Member States, such as the population density, where noise and emissions are of concern. In order to facilitate the societal acceptance of UAS operations, Delegated Regulation (EU) 2019/945 includes maximum level of noise for unmanned aircraft operated close to people in the 'open' category. In the 'specific' category there is a requirement for the operator to develop guidelines for its remote pilots so that all operations are flown in a manner that minimises nuisances to people and animals.

(23) Current national certificates should be adapted to certificates complying with the requirements of this Regulation.

(24) In order to ensure the proper implementation of this Regulation, appropriate transitional measures should be established. In particular, Member States and stakeholders should have sufficient time to adapt their procedures to the new regulatory framework before this Regulation applies.

(25) The new regulatory framework for UAS operations should be without prejudice to the applicable environmental and nature protection obligations otherwise stemming from national or Union law.

(26) While the 'U-space' system including the infrastructure, services and procedures to guarantee safe UAS operations and supporting their integration into the aviation system is in development, this Regulation should already include requirements for the implementation of three foundations of the U-space system, namely registration, geo-awareness and remote identification, which will need to be further completed.

(27) Since model aircraft are considered as UAS and given the good safety level demonstrated by model aircraft operations in clubs and associations, there should be a seamless transition from the different national systems to the new Union regulatory framework, so that model aircraft clubs and associations can continue to operate as they do today, as well as taking into account existing best practices in the Member States.

[1] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1).

(28) In addition, considering the good level of safety achieved by aircraft of class C4 as provided in Annex to this Regulation, low risk operations of such aircraft should be allowed to be conducted in the 'open' category. Such aircraft, often used by model aircraft operators, are comparatively simpler than other classes of unmanned aircraft and should therefore not be subject to disproportionate technical requirements.

(29) The measures provided for in this Regulation are in accordance with the opinion of the committee established in accordance with Article 127 of Regulation (EU) 2018/1139,

HAS ADOPTED THIS REGULATION:

Article 1 - Subject matter

Regulation (EU) 2019/947

This Regulation lays down detailed provisions for the operation of unmanned aircraft systems as well as for personnel, including remote pilots and organisations involved in those operations.

GM1 Article 1 Subject matter

ED Decision 2019/021/R

AREAS OF APPLICABILITY OF THE UAS REGULATION

For the purposes of the UAS Regulation, the term 'operation of unmanned aircraft systems' does not include indoor UAS operations. Indoor operations are operations that occur in or into a house or a building (dictionary definition) or, more generally, in or into a closed space such as a fuel tank, a silo, a cave or a mine where the likelihood of a UA escaping into the outside airspace is very low.

Article 2 - Definitions

Regulation (EU) 2019/947

For the purposes of this Regulation, the definitions in Regulation (EU) 2018/1139 apply.

The following definitions also apply:

(1) 'unmanned aircraft system' ('UAS') means an unmanned aircraft and the equipment to control it remotely;

(2) 'unmanned aircraft system operator' ('UAS operator') means any legal or natural person operating or intending to operate one or more UAS;

(3) 'assemblies of people' means gatherings where persons are unable to move away due to the density of the people present;

(4) 'UAS geographical zone' means a portion of airspace established by the competent authority that facilitates, restricts or excludes UAS operations in order to address risks pertaining to safety, privacy, protection of personal data, security or the environment, arising from UAS operations;

(5) 'robustness' means the property of mitigation measures resulting from combining the safety gain provided by the mitigation measures and the level of assurance and integrity that the safety gain has been achieved;

(6) 'standard scenario' means a type of UAS operation in the 'specific' category, as defined in Appendix 1 of the Annex, for which a precise list of mitigating measures has been identified in

such a way that the competent authority can be satisfied with declarations in which operators declare that they will apply the mitigating measures when executing this type of operation;

(7) 'visual line of sight operation' ('VLOS') means a type of UAS operation in which, the remote pilot is able to maintain continuous unaided visual contact with the unmanned aircraft, allowing the remote pilot to control the flight path of the unmanned aircraft in relation to other aircraft, people and obstacles for the purpose of avoiding collisions;

(8) 'beyond visual line of sight operation' ('BVLOS') means a type of UAS operation which is not conducted in VLOS;

(9) 'light UAS operator certificate' ('LUC') means a certificate issued to a UAS operator by a competent authority as set out in part C of the Annex;

(10) 'model aircraft club or association' means an organisation legally established in a Member State for the purpose of conducting leisure flights, air displays, sporting activities or competition activities using UAS;

(11) 'dangerous goods' means articles or substances, which are capable of posing a hazard to health, safety, property or the environment in the case of an incident or accident, that the unmanned aircraft is carrying as its payload, including in particular:

(a) explosives (mass explosion hazard, blast projection hazard, minor blast hazard, major fire hazard, blasting agents, extremely insensitive explosives);

(b) gases (flammable gas, non-flammable gas, poisonous gas, oxygen, inhalation hazard);

(c) flammable liquids (flammable liquids; combustible, fuel oil, gasoline);

(d) flammable solids (flammable solids, spontaneously combustible solids, dangerous when wet);

(e) oxidising agents and organic peroxides;

(f) toxic and infectious substances (poison, biohazard);

(g) radioactive substances;

(h) corrosive substances;

(12) 'payload' means instrument, mechanism, equipment, part, apparatus, appurtenance, or accessory, including communications equipment, that is installed in or attached to the aircraft and is not used or intended to be used in operating or controlling an aircraft in flight, and is not part of an airframe, engine, or propeller;

(13) 'direct remote identification' means a system that ensures the local broadcast of information about a unmanned aircraft in operation, including the marking of the unmanned aircraft, so that this information can be obtained without physical access to the unmanned aircraft;

(14) 'follow-me mode' means a mode of operation of a UAS where the unmanned aircraft constantly follows the remote pilot within a predetermined radius;

(15) 'geo-awareness' means a function that, based on the data provided by Member States, detects a potential breach of airspace limitations and alerts the remote pilots so that they can take immediate and effective action to prevent that breach;

(16) 'privately built UAS' means a UAS assembled or manufactured for the builder's own use, not including UAS assembled from sets of parts placed on the market as a single ready-to-assemble kit;

(17) 'autonomous operation' means an operation during which an unmanned aircraft operates without the remote pilot being able to intervene;

(18) 'uninvolved persons' means persons who are not participating in the UAS operation or who are not aware of the instructions and safety precautions given by the UAS operator;

(19) 'making available on the market' means any supply of a product for distribution, consumption or use on the Union market in the course of a commercial activity, whether in exchange of payment or free of charge;

(20) 'placing on the market' means the first making available of a product on the Union market;

(21) 'controlled ground area' means the ground area where the UAS is operated and within which the UAS operator can ensure that only involved persons are present;

(22) 'maximum take-off mass' ('MTOM') means the maximum Unmanned Aircraft mass, including payload and fuel, as defined by the manufacturer or the builder, at which the Unmanned Aircraft can be operated;

(23) 'unmanned sailplane' means an unmanned aircraft that is supported in flight by the dynamic reaction of the air against its fixed lifting surfaces, the free flight of which does not depend on an engine. It may be equipped with an engine to be used in case of emergency.

GM1 Article 2(3) Definitions

ED Decision 2019/021/R

DEFINITION OF 'ASSEMBLIES OF PEOPLE'

Assemblies of people have been defined by an objective criterion related to the possibility for an individual to move around in order to limit the consequences of an out-of-control UA. It was indeed difficult to propose a number of people above which this group of people would turn into an assembly of people: numbers were indeed proposed, but they showed quite a large variation. Qualitative examples of assemblies of people are:

(a) sport, cultural, religious or political events;

(b) beaches or parks on a sunny day;

(c) commercial streets during the opening hours of the shops; and

(d) ski resorts/tracks/lanes.

AMC1 Article 2(11) Definitions

ED Decision 2019/021/R

DEFINITION OF 'DANGEROUS GOOD'

Under the definition of dangerous goods, blood may be considered to be capable of posing a hazard to health when it is contaminated or unchecked (potentially contaminated). In consideration of Article 5(1)(b)(iii):

(a) medical samples such as uncontaminated blood can be transported in the 'open', 'specific' or 'certified' categories;

(b) unchecked or contaminated blood must be transported in the 'specific' or the 'certified' categories. If the transport may result in a high risk for third parties, the UAS operation belongs to the 'certified' category (see Article 6 1.(b) (iii) of the UAS Regulation). If the blood is enclosed

in a container such that in case of an accident, the blood will not be spilled, the UAS operation may belong to the 'specific' category, if there are no other causes of high risk for third parties.

GM1 Article 2(17) Definitions

ED Decision 2019/021/R

DEFINITION OF 'AUTONOMOUS OPERATION'

Flight phases during which the remote pilot has no ability to intervene in the course of the aircraft, either following the implementation of emergency procedures, or due to a loss of the command-and-control connection, are not considered autonomous operations.

An autonomous operation should not be confused with an automatic operation, which refers to an operation following pre-programmed instructions that the UAS executes while the remote pilot is able to intervene at any time.

GM1 Article 2(18) Definitions

ED Decision 2019/021/R

DEFINITION OF 'UNINVOLVED PERSONS'

Due to the huge variety of possible circumstances, this GM only provides general guidelines.

An uninvolved person is a person that does not take part in the UAS operation, either directly or indirectly.

A person may be considered to be 'involved' when they have:

(a) given explicit consent to the UAS operator or to the remote pilot to be part of the UAS operation (even indirectly as a spectator or just accepting to be overflown by the UAS); and

(b) received from the UAS operator or from the remote pilot clear instructions and safety precautions to follow in case the UAS exhibits any unplanned behaviour.

In principle, in order to be considered a 'person involved', one:

(a) is able to decide whether or not to participate in the UAS operation;

(b) broadly understands the risks involved;

(c) has reasonable safeguards during the UAS operations, introduced by the site manager and the aircraft operator; and

(d) is not restricted from taking part in the event or activity if they decide not to participate in the UAS operation.

The person involved is expected to follow the directions and safety precautions provided, and the UAS operator or remote pilot should check by asking simple questions to make sure that the directions and safety precautions have been properly understood.

Spectators or any other people gathered for sport activities or other mass public events for which the UAS operation is not the primary focus are generally considered to be 'uninvolved persons'.

People sitting at a beach or in a park or walking on a street or on a road are also generally considered to be uninvolved persons.

An example: when filming with a UAS at a large music festival or public event, it is not sufficient to inform the audience or anyone present via a public address system, or via a statement on the ticket, or in advance by email or text message. Those types of communication channels do not satisfy the

points above. In order to be considered a person involved, each person should be asked for their permission and be made aware of the possible risk(s). This type of operation does not fall into the 'open' category and may be classified as 'specific' or 'certified', according to the risk.

GM1 Article 2(22) Definitions

ED Decision 2019/021/R

DEFINITION OF 'MAXIMUM TAKE-OFF MASS (MTOM)'

This MTOM is the maximum mass defined by the manufacturer or the builder, in the case of privately built UAS, which ensures the controllability and mechanical resistance of the UA when flying within the operational limits.

The MTOM should include all the elements on board the UA:

(a) all the structural elements of the UA;

(b) the motors;

(c) the propellers, if installed;

(d) all the electronic equipment and antennas;

(e) the batteries and the maximum capacity of fuel, oil and all fluids; and

(f) the heaviest payload allowed by the manufacturer, including sensors and their ancillary equipment.

Article 3 - Categories of UAS operations

Regulation (EU) 2019/947

UAS operations shall be performed in the 'open', 'specific' or 'certified' category defined respectively in Articles 4, 5 and 6, subject to the following conditions:

(a) UAS operations in the 'open' category shall not be subject to any prior operational authorisation, nor to an operational declaration by the UAS operator before the operation takes place;

(b) UAS operations in the 'specific' category shall require an operational authorisation issued by the competent authority pursuant to Article 12 or an authorisation received in accordance with Article 16, or, under circumstances defined in Article 5(5), a declaration to be made by a UAS operator;

(c) UAS operations in the 'certified' category shall require the certification of the UAS pursuant to Delegated Regulation (EU) 2019/945 and the certification of the operator and, where applicable, the licensing of the remote pilot.

GM1 Article 3 Categories of UAS operations

ED Decision 2019/021/R

BOUNDARIES BETWEEN THE CATEGORIES OF UAS OPERATIONS

(a) Boundary between 'open' and 'specific'

A UAS operation does not belong to the 'open' category when at least one of the general criteria listed in Article 4 of the UAS Regulation is not met (e.g. when operating beyond visual line of sight (BVLOS)) or when the detailed criteria for a subcategory are not met (e.g. operating a 10 kg UA close to people when subcategory A2 is limited to 4 kg UA).

(b) Boundary between 'specific' and 'certified'

Article 6 of the UAS Regulation and Article 40 of Regulation (EU) 2019/945 define the boundary between the 'specific' and the 'certified' category. The first article defines the boundary from an operational perspective, while the second one defines the technical characteristics of the UA, and they should be read together.

A UAS operation belongs to the 'certified' category when, based on the risk assessment, the competent authority considers that the risk cannot be mitigated adequately without the:

— certification of the airworthiness of the UAS;

— certification of the UAS operator; and

— licensing of the remote pilot, unless the UAS is fully autonomous.

UAS operations are always considered to be in the 'certified' category when they:

— are conducted over assemblies of people with a UA that has characteristic dimensions of 3 m or more; or

— involve the transport of people; or

— involve the carriage of dangerous goods that may result in a high risk for third parties in the event of an accident.

Article 4 - 'Open' category of UAS operations

Regulation (EU) 2019/947

1. Operations shall be classified as UAS operations in the 'open' category only where the following requirements are met:

   (a) the UAS belongs to one of the classes set out in Delegated Regulation (EU) 2019/945 or is privately built or meets the conditions defined in Article 20;

   (b) the unmanned aircraft has a maximum take-off mass of less than 25 kg;

   (c) the remote pilot ensures that the unmanned aircraft is kept at a safe distance from people and that it is not flown over assemblies of people;

   (d) the remote pilot keeps the unmanned aircraft in VLOS at all times except when flying in follow-me mode or when using an unmanned aircraft observer as specified in Part A of the Annex;

   (e) during flight, the unmanned aircraft is maintained within 120 metres from the closest point of the surface of the earth, except when overflying an obstacle, as specified in Part A of the Annex

   (f) during flight, the unmanned aircraft does not carry dangerous goods and does not drop any material;

2. UAS operations in the 'open' category shall be divided in three sub-categories in accordance with the requirements set out in Part A of the Annex.

Article 5 - 'Specific' category of UAS operations

Regulation (EU) 2019/947

1. Where one of the requirements laid down in Article 4 or in Part A of the Annex is not met, a UAS operator shall be required to obtain an operational authorisation pursuant to Article 12 from the competent authority in the Member State where it is registered.

2. When applying to a competent authority for an operational authorisation pursuant Article 12, the operator shall perform a risk assessment in accordance with Article 11 and submit it together with the application, including adequate mitigating measures.

3. In accordance with point UAS.SPEC.040 laid down in Part B of the Annex, the competent authority shall issue an operational authorisation, if it considers that the operational risks are adequately mitigated in accordance with Article 12.

4. The competent authority shall specify whether the operational authorisation concerns:

   (a) the approval of a single operation or a number of operations specified in time or location(s) or both. The operational authorisation shall include the associated precise list of mitigating measures;

   (b) the approval of an LUC, in accordance with part C of the Annex.

5. Where the UAS operator submits a declaration to the competent authority of the Member State of registration in accordance with point UAS.SPEC.020 laid down in Part B of the Annex for an operation complying with a standard scenario as defined in Appendix 1 to that Annex, the UAS operator shall not be required to obtain an operational authorisation in accordance with paragraphs 1 to 4 of this Article and the procedure laid down in paragraph 5 of Article 12 shall apply.

6. An operational authorisation or a declaration shall not be required for:

   (a) UAS operators holding an LUC with appropriate privileges in accordance with point UAS.LUC.060 of the Annex;

   (b) operations conducted in the framework of model aircraft clubs and associations that have received an authorisation in accordance with Article 16.

Article 6 - 'Certified' category of UAS operations

Regulation (EU) 2019/947

1. Operations shall be classified as UAS operations in the 'certified' category only where the following requirements are met:

   (a) the UAS is certified pursuant to points (a), (b) and (c) of paragraph 1 of Article 40 of Delegated Regulation (EU) 2019/945; and

   (b) the operation is conducted in any of the following conditions:

      i. over assemblies of people;

      ii. involves the transport of people;

      iii. involves the carriage of dangerous goods, that may result in high risk for third parties in case of accident.

2. In addition, UAS operations shall be classified as UAS operations in the 'certified' category where the competent authority, based on the risk assessment provided for in Article 11, considers that the risk of the operation cannot be adequately mitigated without the certification

of the UAS and of the UAS operator and, where applicable, without the licensing of the remote pilot.

GM1 Article 6 'Certified' category of UAS operations

ED Decision 2019/021/R

UAS OPERATIONS IN THE 'CERTIFIED' CATEGORY

Article 6 of the UAS Regulation should be read together with Article 40 of Regulation (EU) 2019/945 — Article 6 addresses UAS operations and Article 40 addresses the UAS. This construction was necessary to respect the EU legal order reflected in Regulation (EU) 2018/1139, which foresees that the requirements for UAS operations and registration are in the implementing act, and that the technical requirements for UAS are in the delegated act. The reading of the two articles results in the following:

(a) the transport of people is always in the 'certified' category. Indeed, the UAS must be certified in accordance with Article 40 and the transport of people is one of the UAS operations identified in Article 6 as being in the 'certified' category;

(b) flying over assemblies of people with a UAS that has a characteristic dimension of less than 3 m may be in the 'specific' category unless the risk assessment concludes that it is in the 'certified' category; and

(c) the transport of dangerous goods is in the 'certified' category if the payload is not in a crash-protected container, such that there is a high risk for third parties in the case of an accident.

Article 7 - Rules and procedures for the operation of UAS

Regulation (EU) 2019/947

1. UAS operations in the 'open' category shall comply with the operational limitations set out in Part A of the Annex.

2. UAS operations in the 'specific' category shall comply with the operational limitations set out in the operational authorisation as referred to in Article 12 or the authorisation as referred to in Article 16, or in a standard scenario defined in Appendix 1 to the Annex as declared by the UAS operator.

   This paragraph shall not apply where the UAS operator holds an LUC with appropriate privileges.

   UAS operations in the 'specific' category shall be subject to the applicable operational requirements laid down in Commission Implementing Regulation (EU) No 923/2012[1].

3. UAS operations in the 'certified' category shall be subject to the applicable operational requirements laid down in Implementing Regulation (EU) No 923/2012 and Commission Regulations (EU) No 965/2012[2] and (EU) No 1332/2011[3].

[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).

[2] Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1).

[3] Commission Regulation (EU) No 1332/2011 of 16 December 2011 laying down common airspace usage requirements and operating procedures for airborne collision avoidance (OJ L 336, 20.12.2011, p. 20).

Article 8 - Rules and procedures for the competency of remote pilots

Regulation (EU) 2019/947

1. Remote pilots operating UAS in the 'open' category shall comply with the competency requirements set in Part A of the Annex.

2. Remote pilots operating UAS in the 'specific' category shall comply with the competency requirements set out in the operational authorisation by the competent authority or in the standard scenario defined in Appendix 1 to the Annex or as defined by the LUC and shall have at least the following competencies:

   (a) ability to apply operational procedures (normal, contingency and emergency procedures, flight planning, pre-flight and post-flight inspections);

   (b) ability to manage aeronautical communication;

   (c) manage the unmanned aircraft flight path and automation;

   (d) leadership, teamwork and self-management;

   (e) problem solving and decision-making;

   (f) situational awareness;

   (g) workload management;

   (h) coordination or handover, as applicable.

3. Remote pilots operating in the framework of model aircraft clubs or associations shall comply with the minimum competency requirements defined in the authorisation granted in accordance with Article 16.

Article 9 - Minimum age for remote pilots

Regulation (EU) 2019/947

1. The minimum age for remote pilots operating a UAS in the 'open' and 'specific' category shall be 16 years.

2. No minimum age for remote pilots shall be required:

   (a) when they operate in subcategory A1 as specified in Part A of the Annex to this Regulation, with a UAS Class C0 defined in Part 1 of the Annex to Delegated Regulation (EU) 2019/945 that is a toy within the meaning of Directive 2009/48/EC;

   (b) for privately-built UAS with a maximum take-off mass of less than 250g;

   (c) when they operate under the direct supervision of a remote pilot complying with paragraph 1 and Article 8.

3. Member States may lower the minimum age following a risk-based approach taking into account specific risks associated with the operations in their territory:

   (a) for remote pilots operating in the 'open' category by up to 4 years;

   (b) for remote pilots operating in the 'specific' category by up to 2 years.

4. Where a Member State lowers the minimum age for remote pilots, those remote pilots shall only be allowed to operate a UAS on the territory of that Member State.

5. Member States may define a different minimum age for remote pilots operating in the framework of model aircraft clubs or associations in the authorisation issued in accordance with Article 16.

GM1 Article 9 Minimum age for remote pilots

ED Decision 2019/021/R

SUPERVISOR

A person may act as a remote pilot even if he or she has not reached the minimum age defined in Article 9(1) of the UAS Regulation, provided that the person is supervised. The supervising remote pilot must, in any case, comply with the age requirement specified in that Article. The possibility to lower the minimum age applies only to remote pilots (and not to supervisors). Since the supervisor and the young remote pilot must both demonstrate competency to act as a remote pilot, no minimum age is defined to conduct the training and pass the test to demonstrate the minimum competency to act as a remote pilot in the 'open' category.

Article 10 - Rules and procedures for the airworthiness of UAS

Regulation (EU) 2019/947

Unless privately-built, or used for operations referred to in Article 16, or meeting the conditions defined in Article 20, UAS used in operations set out in this Regulation shall comply with the technical requirements and rules and procedures for the airworthiness defined in the delegated acts adopted pursuant to Article 58 of Regulation (EU) 2018/1139.

Article 11 - Rules for conducting an operational risk assessment

Regulation (EU) 2019/947

1. An operational risk assessment shall:
   (a) describe the characteristics of the UAS operation;
   (b) propose adequate operational safety objectives;
   (c) identify the risks of the operation on the ground and in the air considering all of the below:
      i. the extent to which third parties or property on the ground could be endangered by the activity;
      ii. the complexity, performance and operational characteristics of the unmanned aircraft involved;
      iii. the purpose of the flight, the type of UAS, the probability of collision with other aircraft and class of airspace used;
      iv. the type, scale, and complexity of the UAS operation or activity, including, where relevant, the size and type of the traffic handled by the responsible organisation or person;
      v. the extent to which the persons affected by the risks involved in the UAS operation are able to assess and exercise control over those risks.
   (d) identify a range of possible risk mitigating measures;
   (e) determine the necessary level of robustness of the selected mitigating measures in such a way that the operation can be conducted safely.

2. The description of the UAS operation shall include at least the following:

   (a) the nature of the activities performed;

   (b) the operational environment and geographical area for the intended operation, in particular overflown population, orography, types of airspace, airspace volume where the operation will take place and which airspace volume is kept as necessary risk buffers, including the operational requirements for geographical zones;

   (c) the complexity of the operation, in particular which planning and execution, personnel competencies, experience and composition, required technical means are planned to conduct the operation;

   (d) the technical features of the UAS, including its performance in view of the conditions of the planned operation and, where applicable, its registration number;

   (e) the competence of the personnel for conducting the operation including their composition, role, responsibilities, training and recent experience.

3. The assessment shall propose a target level of safety, which shall be equivalent to the safety level in manned aviation, in view of the specific characteristics of UAS operation.

4. The identification of the risks shall include the determination of all of the below:

   (a) the unmitigated ground risk of the operation taking into account the type of operation and the conditions under which the operation takes place, including at least the following criteria:

      i. VLOS or BVLOS;

      ii. population density of the overflown areas;

      iii. flying over an assembly of people;

      iv. the dimension characteristics of the unmanned aircraft;

   (b) the unmitigated air risk of the operation taking into account all of the below:

      i. the exact airspace volume where the operation will take place, extended by a volume of airspace necessary for contingency procedures;

      ii. the class of the airspace;

      iii. the impact on other air traffic and air traffic management (ATM) and in particular:

         — the altitude of the operation;

         — controlled versus uncontrolled airspace;

         — aerodrome versus non-aerodrome environment;

         — airspace over urban versus rural environment;

         — separation from other traffic.

5. The identification of the possible mitigation measures necessary to meet the proposed target level of safety shall consider the following possibilities:

   (a) containment measures for people on the ground;

   (b) strategic operational limitations to the UAS operation, in particular:

      i. restricting the geographical volumes where the operation takes place;

ii. restricting the duration or schedule of the time slot in which the operation takes place;

(c) strategic mitigation by common flight rules or common airspace structure and services;

(d) capability to cope with possible adverse operating conditions;

(e) organisation factors such as operational and maintenance procedures elaborated by the UAS operator and maintenance procedures compliant with the manufacturer's user manual;

(f) the level of competency and expertise of the personnel involved in the safety of the flight;

(g) the risk of human error in the application of the operational procedures;

(h) the design features and performance of the UAS in particular:

i. the availability of means to mitigate risks of collision;

ii. the availability of systems limiting the energy at impact or the frangibility of the unmanned aircraft;

iii. the design of the UAS to recognised standards and the fail-safe design.

6. The robustness of the proposed mitigating measures shall be assessed in order to determine whether they are commensurate with the safety objectives and risks of the intended operation, particularly to make sure that every stage of the operation is safe.

GM1 to AMC1 Article 11 Rules for conducting an operational risk assessment

ED Decision 2019/021/R

GENERAL

The operational risk assessment required by Article 11 of the UAS Regulation may be conducted using the methodology described in AMC1 to Article 11. This methodology is basically the specific operations risk assessment (SORA) developed by JARUS. Other methodologies might be used by the UAS operator as alternative means of compliance.

Aspects other than safety, such as security, privacy, environmental protection, the use of the radio frequency (RF) spectrum, etc. should be assessed in accordance with the applicable requirements established by the Member State in which the operation is intended to take place, or by other EU regulations.

For some UAS operations that are classified as being in the 'specific' category, alternatives to carrying out a full risk assessment are offered to UAS operators:

(a) for UAS operations with lower intrinsic risks, a declaration may be submitted when the operations comply with the standard scenarios (STSs) listed in Appendix 1 to the UAS Regulation. Table 1 provides a summary of the STSs; and

(b) for other UAS operations, a request for authorisation may be submitted based on the mitigations and provisions described in the predefined risk assessment (PDRA) when the UAS operation meets the operational characterisation described in AMC2 et seq. to Article 11 to the UAS Regulation. Table 2 below provides a summary of the PDRA.

While the STSs are described in a detailed way, the provisions and mitigations in the PDRA are described in a rather generic way to provide flexibility to UAS operators and the competent authorities to establish more prescriptive limitations and provisions that are adapted to the particularities of the intended operations.

In accordance with Article 11 of the UAS Regulation, the applicant must collect and provide the relevant technical, operational and system information needed to assess the risk associated with the intended operation of the UAS, and the SORA (AMC1 to Article 11 of the UAS Regulation) provides a detailed framework for such data collection and presentation. The concept of operations (ConOps) description is the foundation for all other activities, and should be as accurate and detailed as possible. The ConOps should not only describe the operation, but also provide insight into the UAS operator's operational safety culture. It should also include how and when to interact with the air navigation service provider (ANSP) when applicable.

PDRAs only address safety risks; consequently, additional limitations and provisions might need to be included after the consideration of other risks (e.g. security, privacy, etc.).

STS#	Edition/date	UAS characteristics	BVLOS/VLOS	Overflown area	Maximum range from remote pilot	Maximum height	Airspace	notes

Table 1 — List of STSs published as Appendix 1 to the UAS Regulation

PDRA#	Edition/date	UAS characteristics	BVLOS/VLOS	Overflown area	Maximum range from remote pilot	Maximum height	Airspace	AMC# to Article 11	notes
PDRA-01	1.0/xx.xx.2019	maximum characteristic dimension up to 3 m and a typical kinetic energy up to 34 kJ	BVLOS	sparsely populated areas	If no VO up to 1 km	150 m	Controlled	AMC2	

Table 2 — List of PDRAs published as AMC to Article 11 to the UAS Regulation

AMC1 Article 11 Rules for conducting an operational risk assessment

ED Decision 2019/021/R

SPECIFIC OPERATIONS RISK ASSESSMENT (SOURCE JARUS SORA V2.0)

EDITION September 2019

1. Introduction

1.1 Preface

(a) This SORA is based on the document developed by JARUS, providing a vision on how to safely create, evaluate and conduct an unmanned aircraft system (UAS) operation. The SORA provides a methodology to guide both the UAS operator and the competent authority in determining whether a UAS operation can be conducted in a safe manner. The document should not be used as a checklist, nor be expected to provide answers to all the challenges related to the integration of the UAS in the airspace. The SORA is a tailoring guide that allows a UAS operator to find a best fit mitigation means, and hence reduce the risk to an acceptable level. For this reason, it does not contain prescriptive requirements, but rather safety objectives to be met at various levels of robustness, commensurate with the risk.

(b) The SORA is meant to inspire UAS operators and competent authorities and highlight the benefits of a harmonised risk assessment methodology. The feedback collected from real-life UAS operations will form the backbone of the updates in the upcoming revisions of the document.

1.2 Purpose of the document

(a) The purpose of the SORA is to propose a methodology to be used as an acceptable means to demonstrate compliance with Article 11 of the UAS Regulation, that is to evaluate the risks and determine the acceptability of a proposed operation of a UAS within the 'specific' category.

(b) Due to the operational differences and the expanded level of risk, the 'specific' category cannot automatically take credit for the safety and performance data demonstrated with the large number of UA operating in the 'open[1]' category. Therefore, the SORA provides a consistent approach to assess the additional risks associated with the expanded and new UAS operations that are not covered by the 'open' category.

(c) The SORA is not intended as a one-stop-shop for the full integration of all types of UAS in all classes of airspace.

(d) This methodology may be applied where the traditional approach to aircraft certification (approving the design, issuing an airworthiness approval and type certificate) may not be appropriate due to an applicant's desire to operate a UAS in a limited or restricted manner. This methodology may also support the activities necessary to determine the associated airworthiness requirements. This assumes that the safety objectives set forth in, or derived from, those applicable for the

[1] As defined by Article 4 of the UAS Regulation.

'certified'[1] category, are consistent with the ones set forth or derived for the 'specific' category.

(e) The methodology is based on the principle of a holistic/total system safety risk-based assessment model used to evaluate the risks related to a given UAS operation. The model considers the nature of all the threats associated with a specified hazard, the relevant design, and the proposed operational mitigations for a specific UAS operation. The SORA then helps to evaluate the risks systematically, and determine the boundaries required for a safe operation. This method allows the applicant to determine the acceptable risk levels, and to validate that those levels are complied with by the proposed operations. The competent authority may also apply this methodology to gain confidence that the UAS operator can conduct the operation safely.

(f) To avoid repetitive individual approvals, EASA will apply the methodology to define 'standard scenarios' or 'predefined risk assessments' for the identified types of ConOps with known hazards and acceptable risk mitigations.

(g) The methodology, related processes, and values proposed in this document are intended to guide the UAS operator when performing a risk assessment in accordance with Article 11 of the UAS Regulation.

1.3 Applicability

(a) The methodology presented in this document is aimed at evaluating the safety risks involved with the operation of UAS of any class, size or type of operation (including military, experimental, research and development and prototyping). It is particularly suited, but not limited to, 'specific' operations for which a hazard and a risk assessment are required.

(b) The safety risks associated with collisions between UA and manned aircraft are in the scope of the methodology. The risk of a collision between two UA or between a UA and a UA carrying people will be addressed in future revisions of the document.

(c) In the event of a mishap, the carriage of people or payloads on board the UAS (e.g. weapons) that present additional hazards is explicitly excluded from the scope of this methodology.

(d) Security aspects are excluded from the applicability of this methodology when they are not limited to those confined by the airworthiness of the systems (e.g. the aspects relevant to protection from unlawful electromagnetic interference.)

(e) Privacy and financial aspects are excluded from the applicability of this methodology.

(f) The SORA can be used to support waiving the regulatory requirements applicable to the operation if it can be demonstrated that the operation can be conducted with an acceptable level of safety.

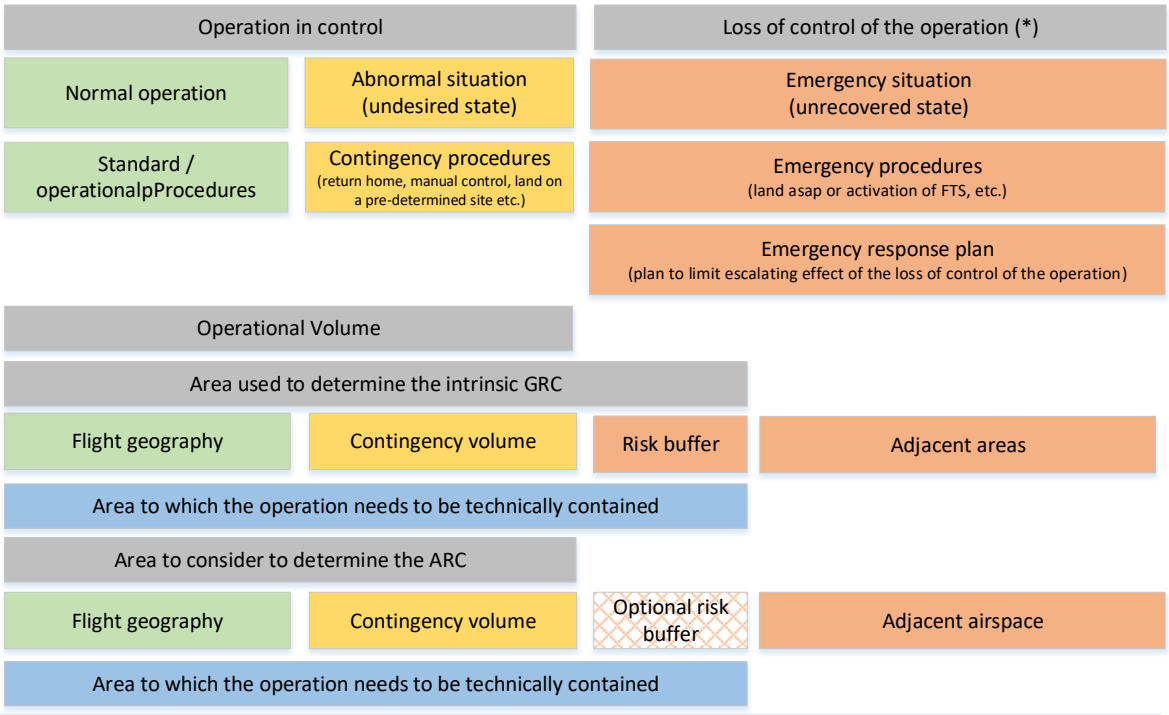
(g) In addition to performing a SORA in accordance with the UAS Regulation, the UAS operator must also ensure compliance with all the other regulatory requirements applicable to the operation that are not necessarily addressed by the SORA.

[1] As defined by Article 6 of the UAS Regulation.

1.4 Key concepts and definitions

1.4.1 Semantic model

(a) To facilitate effective communication of all aspects of the SORA, the methodology requires the standardised use of terminology for the phases of operation, procedures, and operational volumes. The semantic model shown in Figure 1 provides a consistent use of the terms for all SORA users. Figure 2 provides a graphical representation of the model and a visual reference to further aid the reader in understanding the SORA terminology.



(*) The Loss of control of operation corresponds to situations:

- where the outcome of the situation highly relies on providence; or
- which could not be handled by a contingency procedure; or
- when there is grave and imminent danger of fatalities.

Figure 1 — SORA semantic model

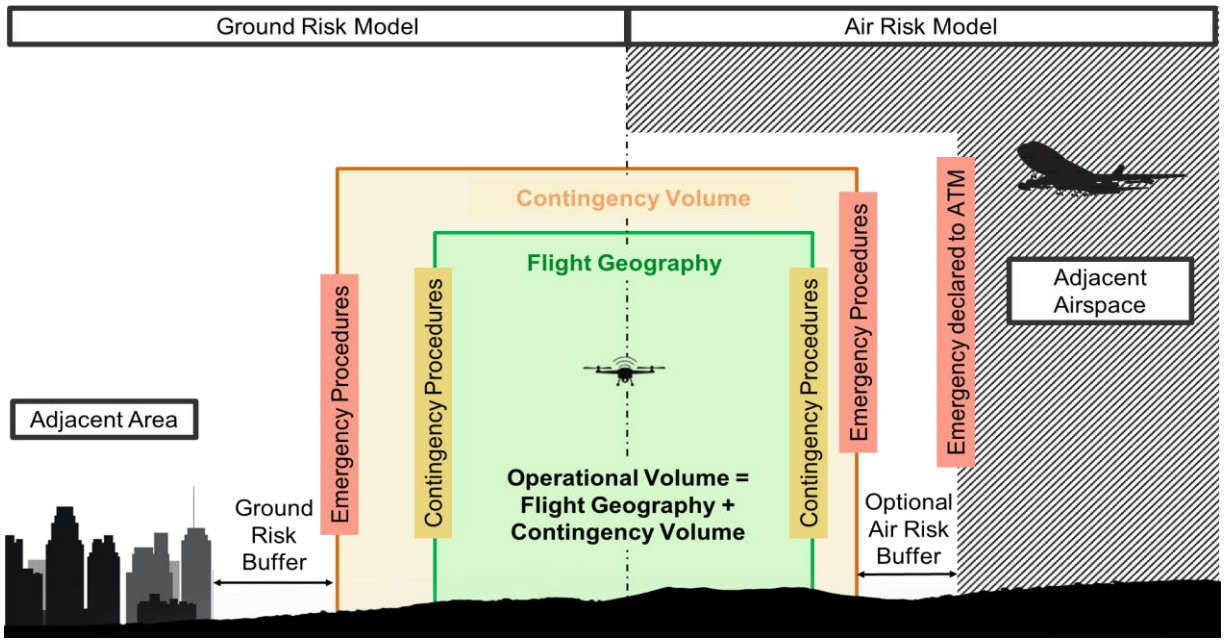


Figure 2 — Graphical representation of the SORA semantic model

1.4.2 Introduction to robustness

(a) To properly understand the SORA process, it is important to introduce the key concept of robustness. Any given risk mitigation or operational safety objective (OSO) can be demonstrated at differing levels of robustness. The SORA process proposes three different levels of robustness: low, medium and high, commensurate with the risk.

(b) The **robustness** designation is achieved using both the **level of integrity** (i.e. safety gain) provided by each mitigation, and the **level of assurance** (i.e. method of proof) that the claimed safety gain has been achieved. These are both risk-based.

(c) The activities used to substantiate the level of integrity are detailed in Annexes B, C, D and E. Those annexes provide either guidance material or reference industry standards and practices where applicable.

(d) General guidance for the level of assurance is provided below:

(1) A **low** level of assurance is where the applicant simply declares that the required level of integrity has been achieved.

(2) A **medium** level of assurance is where the applicant provides supporting evidence that the required level of integrity has been achieved. This is typically achieved by means of testing (e.g. for technical mitigations) or by proof of experience (e.g. for human-related mitigations).

(3) A **high** level of assurance is where the achieved integrity has been found to be acceptable by a competent third party.

(e) The specific criteria defined in the Annexes take precedence over the criteria defined in paragraph d.

(f) Table 1 provides guidance to determine the level of robustness based on the level of integrity and the level of assurance:

	Low assurance	Medium assurance	High assurance
Low integrity	Low robustness	Low robustness	Low robustness
Medium integrity	Low robustness	Medium robustness	Medium robustness
High integrity	Low robustness	Medium robustness	High robustness

Table 1 — Determination of robustness level

(g) For example, if an applicant demonstrates a medium level of integrity with a low level of assurance, the overall robustness will be considered to be low. In other words, the robustness will always be equal to the lowest level of either the integrity or the assurance.

1.5 Roles and responsibilities

(a) While performing a SORA process and assessment, several key actors might be required to interact in different phases of the process. The main actors applicable to the SORA are described in this section.

(b) UAS operator — The UAS operator is responsible for the safe operation of the UAS, and hence the safety risk analysis. In accordance with Article 5 of the UAS Regulation, the UAS operator must substantiate the safety of the operation by performing the specific operational and risk assessment, except for the cases defined by the same Article 5. Supporting material for the assessment may be provided by third parties (e.g. the manufacturer of the UAS or equipment, U-space service providers, etc.). The UAS operator obtains an operational authorisation from the competent authority/ANSP.

(c) Applicant — The applicant is the party seeking operational approval. The applicant becomes the UAS operator once the operation has been approved.

(d) UAS manufacturer — For the purposes of the SORA, the UAS manufacturer is the party that designs and/or produces the UAS. The UAS manufacturer has unique design evidence (e.g. for the system performance, the system architecture, software/hardware development documentation, test/analysis documentation, etc.) that they may choose to make available to one or many UAS operator(s) or to the competent authority to help to substantiate the UAS operator's safety case. Alternatively, a potential UAS manufacturer may utilise the SORA to target design objectives for specific or generalised operations. To obtain airworthiness approval(s), these design objectives could be complemented by the use of certification specifications (CS) or industry consensus standards if they are found to be acceptable by the competent authority.

(e) Component manufacturer — The component manufacturer is the party that designs and/or produces components for use in UAS operations. The component manufacturer has unique design evidence (e.g. for the system performance, the system architecture, software/hardware development documentation, test/analysis documentation, etc.) that they may choose to make available to one or many UAS operator(s) to substantiate a safety case.

(f) Competent authority — The competent authority is the recognised national authority for approving the safety case of UAS operations, according to Article 12

of the UAS Regulation. The competent authority may accept an applicant's SORA submission in whole or in part. Through the SORA process, the applicant may need to consult with the competent authority to ensure the consistent application or interpretation of individual steps. The competent authority must perform oversight of the UAS operator according to paragraphs (i) and (j) of Article 18 of the UAS Regulation. EASA may perform oversight of the UAS design and/or production organisation, and, when considered necessary, of the component design and/or production organisation, and may approve the design and/or the production of each. The competent authority also provides the operational approval to the UAS operator.

(g) ANSP — The ANSP is the designated provider of air traffic service in a specific area of operation (airspace). The ANSP assesses whether the proposed flight can be safely conducted in the particular airspace that it covers, and if so, authorises the flight.

(h) U-space service provider — U-space service providers are entities that provide services to support the safe and efficient use of airspace.

(i) Remote pilot — The remote pilot is designated by the UAS operator, or, in the case of general aviation, the aircraft owner, as being charged with safely conducting the flight.

2. The SORA process

2.1 Introduction to risk

(a) Many definitions of the word '**risk**' exist in the literature. One of the easiest and most understandable definitions is provided in SAE ARP 4754A / EUROCAE ED-79A: 'the combination of the frequency (probability) of an occurrence and its associated level of severity'. This definition of 'risk' is retained in this document.

(b) The consequence of an occurrence will be designated as **harm** of some type.

(c) Many different categories of harm arise from any given occurrence. Various authors on this topic have collated these categories of harm as supported by the literature. This document will focus on occurrences of harm (e.g. a UAS crash) that are short-lived and usually give rise to a near loss of life. Chronic events (e.g. toxic emissions over a period of time) are explicitly excluded from this assessment. The categories of harm in this document are the potential for:

(1) fatal injuries to third parties on the ground;

(2) fatal injuries to third parties in the air; or

(3) damage to critical infrastructure.

(d) It is acknowledged that the competent authorities, when appropriate, may consider additional categories of harm (e.g. the disruption of a community, environmental damage, financial loss, etc.). This methodology could also be used for those categories of harm.

(e) Several studies have shown that the amount of energy needed to cause fatal injuries, in the case of a direct hit, is extremely low (i.e. in the region of few dozen Joules.) The energy levels of operations addressed within this document are likely to be significantly higher, and therefore the retained harm is the potential for fatal injuries. By application of the methodology, the applicant has the opportunity to

claim lower lethality either on a case-by-case basis, or systematically if allowed by the competent authorities (e.g. in the 'open' category).

(f) Fatal injury is a well-defined condition and, in most countries, is known by the authorities. Therefore, the risk of under-reporting fatalities is almost non-existent. The quantification of the associated risk of fatality is straightforward. The usual means to measure fatalities is by the number of deaths within a particular time interval (e.g. the fatal accident rate per million flying hours), or the number of deaths for a specified circumstance (e.g. the fatal accident rate per number of take-offs).

(g) Damage to critical infrastructure is a more complex condition. Therefore, the quantification of the associated risks may be difficult and subject to cooperation with the organisation responsible for the infrastructure.

2.2 SORA process outline

(a) The SORA methodology provides a logical process to analyse the proposed ConOps and establish an adequate level of confidence that the operation can be conducted with an acceptable level of risk. There are ten steps that support the SORA methodology and each of these steps is described in the following paragraphs and further detailed, when necessary, in the relevant annexes.

(b) The SORA focuses on the assessment of air and ground risks. In addition to air and ground risks, an additional risk assessment of critical infrastructure should also be performed. This should be done in cooperation with the organisation responsible for the infrastructure, as they are most knowledgeable of those threats. Figure 3 outlines the ten steps of the risk model, while Figure 4 provides an overall understanding of how to arrive at an air risk class (ARC) for a given operation.

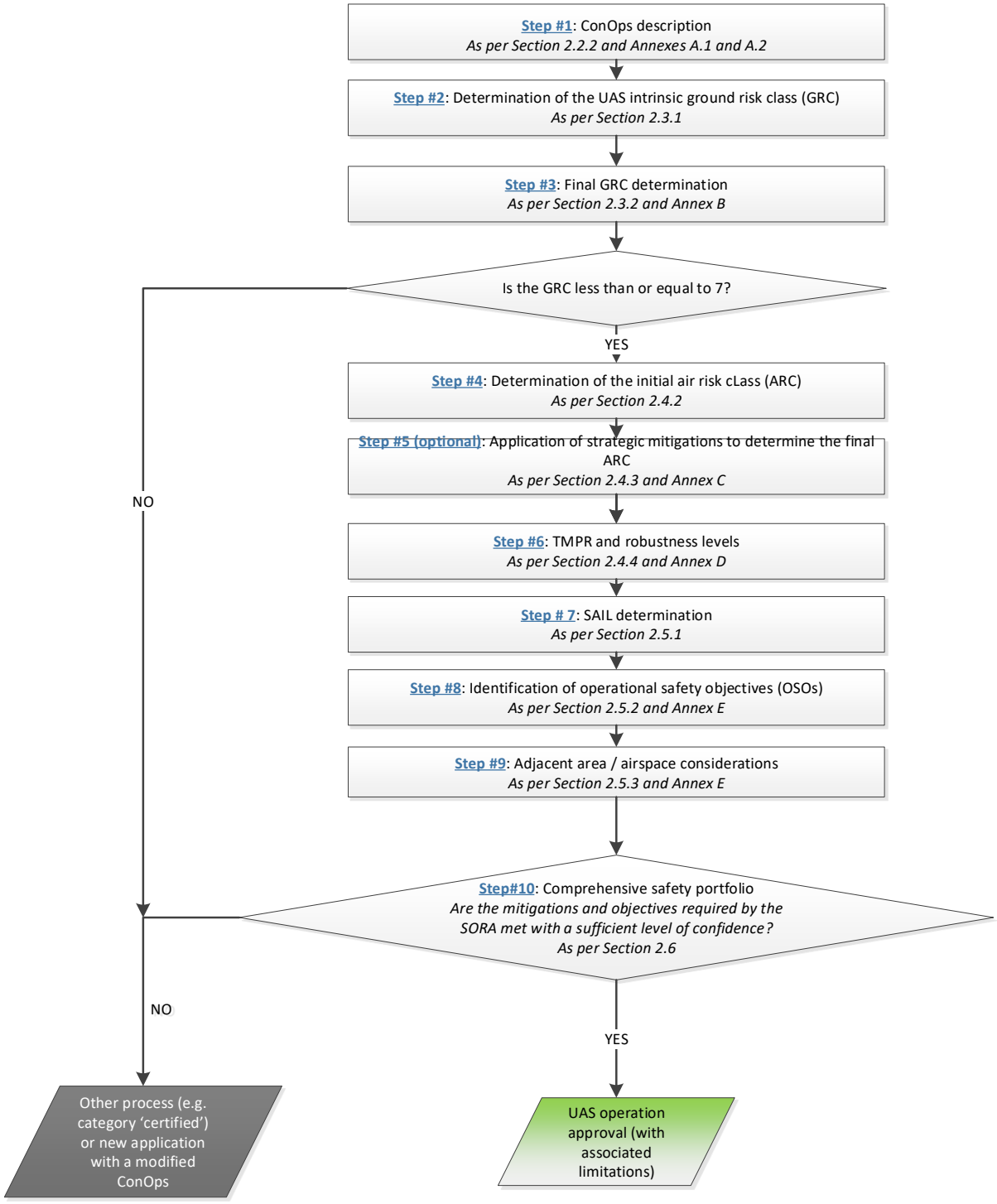


Figure 3 — The SORA process

Note: If operations are conducted across different environments, some steps may need to be repeated for each particular environment.

2.2.1 Pre-application evaluation

(a) Before starting the SORA process, the applicant should verify that the proposed operation is feasible (i.e. not subject to specific exclusions from

the competent authority or subject to an STS). Things to verify before beginning the SORA process are whether:

(1) the operation falls under the 'open' category;

(2) the operation is covered by a 'standard scenario' included in the appendix to the UAS Regulation or by a 'predefined risk assessment' published by EASA;

(3) the operation falls under the 'certified' category; or

(4) the operation is subject to a specific NO-GO from the competent authority.

If none of the above cases applies, the SORA process should be applied.

2.2.2 Step #1 — ConOps description

(a) The first step of the SORA requires the applicant to collect and provide the relevant technical, operational and system information needed to assess the risk associated with the intended operation of the UAS. Annex A to this document provides a detailed framework for data collection and presentation. The ConOps description is the foundation for all other activities, and it should be as accurate and detailed as possible. The ConOps should not only describe the operation, but also provide insight into the UAS operator's operational safety culture. It should also include how and when to interact with the ANSP. Therefore, when defining the ConOps, the UAS operator should give due consideration to all the steps, mitigations and OSOs provided in Figures 3 and 4.

(b) Developing the ConOps can be an iterative process; therefore, as the SORA process is applied, additional mitigations and limitations may be identified, requiring additional associated technical details, procedures, and other information to be provided/updated in the ConOps. This should culminate in a comprehensive ConOps that fully and accurately describes the proposed operation as envisioned.

2.3 The ground risk process

2.3.1 Step #2 – Determination of the intrinsic UAS ground risk class (GRC)

(a) The intrinsic UAS ground risk relates to the risk of a person being struck by the UAS (in the case of a loss of UAS control with a reasonable assumption of safety).

(b) To establish the intrinsic GRC, the applicant needs the maximum UA characteristic dimension (e.g. the wingspan for a fixed-wing UAS, the blade diameter for rotorcraft, the maximum dimension for multi-copters, etc.) and the knowledge of the intended operational scenario.

(c) The applicant needs to have defined the area at risk when conducting the operation including:

(1) the operational volume, which is composed of the flight geography and the contingency volume. To determine the operational volume, the applicant should consider the position-keeping capabilities of the UAS in 4D space (latitude, longitude, height and time). In particular,

the accuracy of the navigation solution, the flight technical error[1] of the UAS and the path definition error (e.g. map errors), and latencies should be considered and addressed in this determination;

(2) whether or not the area is a controlled ground area; and

(3) the associated ground risk buffer with at least a 1:1 rule[2], or for rotary wing UA, defined using a ballistic methodology approach acceptable to the competent authority.

(d) Table 2 illustrates how to determine the intrinsic ground risk class (GRC). The intrinsic GRC is found at the intersection of the applicable operational scenario and the maximum UA characteristic dimension that drives the UAS lethal area. In case of a mismatch between the maximum UAS characteristic dimension and the typical kinetic energy expected, the applicant should provide substantiation for the chosen column.

Intrinsic UAS ground risk class				
Max UAS characteristics dimension	1 m / approx. 3 ft	3 m / approx. 10 ft	8 m / approx. 25 ft	>8 m / approx. 25 ft
Typical kinetic energy expected	< 700 J (approx. 529 ft lb)	< 34 kJ (approx. 25 000 ft lb)	< 1 084 kJ (approx. 800 000 ft lb)	> 1 084 kJ (approx. 800 000 ft lb)
Operational scenarios				
VLOS/BVLOS over a controlled ground area[3]	1	2	3	4
VLOS in a sparsely populated environment	2	3	4	5
BVLOS in a sparsely populated environment	3	4	5	6
VLOS in a populated environment	4	5	6	8
BVLOS in a populated environment	TBD[4]	TBD[4]	TBD[4]	TBD[4]
VLOS over an assembly of people	7			
BVLOS over an assembly of people	TBD[4]			

Table 2 — Determination of the intrinsic GRC

(e) The operational scenarios described attempt to provide discrete categorisations of operations with increasing numbers of **people at risk**.

(f) Reserved.

[1] The flight technical error is the error between the actual track and the desired track (sometimes referred to as 'the ability to fly the flight director').

[2] If the UA is planned to operate at 120 m altitude, the ground risk buffer should at least be 120 m.

[3] In line with Figure 1 and paragraph 2.3.1.(c), the controlled area should encompass the flight geography, the contingency volume and the ground risk buffer.

[4] The intrinsic ground risk class for BVLOS operations in populated environment or over gathering of people will be developed in a future edition of the SORA.

(g) EVLOS[1] operations are to be considered to be BVLOS for the intrinsic GRC determination.

(h) Controlled ground areas[2] are a way to strategically mitigate the risk on ground (similar to flying in segregated airspace); the assurance that there will be uninvolved persons in the area of operation is under the full responsibility of the UAS operator.

(i) An operation occurring in a populated environment cannot be intrinsically classified as being in a sparsely populated environment, even in cases where the footprint of the operation is completely within special risk areas (e.g. rivers, railways, and industrial estates). The applicant can make the claim for a lower density and/or shelter with Step #3 of the SORA process.

(j) Operations that do not have a corresponding intrinsic GRC (i.e. grey cells on the table) are not supported by the SORA methodology.

(k) When evaluating the typical kinetic energy expected for a given operation, the applicant should generally use the airspeed, in particular V_{cruise} for fixed-wing aircraft and the terminal velocity for other aircraft. Specific designs (e.g. gyrocopters) might need additional considerations. Guidance useful in determining the terminal velocity can be found at https://www.grc.nasa.gov/WWW/K-12/airplane/termv.html.

(l) The nominal size of the crash area for most UAS can be anticipated by considering both the size and the energy used in the ground risk determination. There are certain cases or design aspects that are non-typical and will have a significant effect on the lethal area of the UAS, such as the amount of fuel, high-energy rotors/props, frangibility, material, etc. These may not have been considered in the intrinsic GRC determination table. These considerations may lead to a decrease/increase in the intrinsic GRC. The use of industry standards or dedicated research might provide a simplified path for this assessment.

2.3.2 Step #3 – Final GRC determination

(a) The intrinsic risk of a person being struck by the UAS (in case of a loss of control of the operation) can be controlled and reduced by means of mitigation.

(b) The mitigations used to modify the intrinsic GRC have a direct effect on the safety objectives associated with a particular operation, and therefore it is important to ensure their robustness. This has particular relevance for technical mitigations associated with the ground risk (e.g. an emergency parachute).

(c) The final GRC determination (step #three) is based on the availability of these mitigations to the operation. Table 3 provides a list of potential mitigations and the associated relative correction factor. A positive number denotes an increase in the GRC, while a negative number results in a

[1] EVLOS — A UAS operation whereby the remote pilot maintains uninterrupted situational awareness of the airspace in which the UAS operation is being conducted via visual airspace surveillance through one or more human VOs, possibly aided by technological means. The remote pilot has direct control of the UAS at all times.

[2] See the definition in Article 2(21) of the UAS Regulation.

decrease in the GRC. All the mitigations should be applied in numeric sequence to perform the assessment. Annex B provides additional details on how to estimate the robustness of each mitigation. Competent authorities may define additional mitigations and the relative correction factors.

		Robustness		
Mitigation Sequence	Mitigations for ground risk	Low/None	Medium	High
1	M1 — Strategic mitigations for ground risk[1]	0: None -1: Low	-2	-4
2	M2 — Effects of ground impact are reduced[2]	0	-1	-2
3	M3 — An emergency response plan (ERP) is in place, the UAS operator is validated and effective	1	0	-1

Table 3 — Mitigations for final GRC determination

(d) When applying mitigation M1, the GRC cannot be reduced to a value lower than the lowest value in the applicable column in Table 2. This is because it is not possible to reduce the number of people at risk below that of a controlled area.

(e) For example, in the case of a 2.5 m UAS (second column in Table 2) flying in visual line-of-sight (VLOS) over a sparsely populated area, the intrinsic GRC is 3. Upon analysis of the ConOps, the applicant claims to reduce the ground risk by first applying M1 at medium robustness (a GRC reduction of 2). In this case, the result of applying M1 is a GRC of 2, because the GRC cannot be reduced any lower than the lowest value for that column. The applicant then applies M2 using a parachute system, resulting in a further reduction of 1 (i.e. a GRC of 1). Finally, M3 (the ERP) has been developed to medium robustness with no further reduction as per Table 3.

(f) The final GRC is established by adding all the correction factors (i.e. -1-1-0=-2) and adapting the GRC by the resulting number (3-2=1).

(g) If the final GRC is greater than 7, the operation is not supported by the SORA process.

2.4 The air risk process

2.4.1 Air risk process overview

(a) The SORA uses the operational airspace defined in the ConOps as the baseline to evaluate the intrinsic risk of a mid-air collision, and by determining the air risk category (ARC). The ARC may be modified/lowered by applying strategic and tactical mitigation means. The application of strategic mitigations may lower the ARC level. An example of strategic mitigations to reduce the risk of a collision may be by operating during certain time periods or within certain boundaries. After applying the strategic mitigations, any residual risk of a mid-air collision is addressed by means of tactical mitigations.

[1] This mitigation is meant as a means to reduce the number of people at risk.

[2] This mitigation is meant as a means to reduce the energy absorbed by the people on the ground upon impact.

(b) Tactical mitigations take the form of detect and avoid (DAA) systems or alternate means, such as ADS-B, FLARM, U-space services or operational procedures. Depending on the residual risk of a mid-air collision, the tactical mitigation performance requirement(s) (TMPR(s)) may vary.

(c) As part of the SORA process, the UAS operator should cooperate with the relevant service provider for the airspace (e.g. the ANSP or U-space service provider) and obtain the necessary authorisations. Additionally, generic local authorisations or local procedures allowing access to a certain portion of controlled airspace may be used if available (e.g. the Low Altitude Authorization and Notification Capability – LAANC – system in the United States).

(d) Irrespective of the results of the risk assessment, the UAS operator should pay particular attention to all the features that may increase the detectability of the UA in the airspace. Therefore, technical solutions that improve the electronic conspicuousness or detectability of the UAS are recommended.

2.4.2 Step #4 - Determination of the initial air risk class (ARC)

(a) The competent authority, ANSP, or U-space service provider, may elect to directly map the airspace collision risks using airspace characterisation studies. These maps would directly show the initial ARC for a particular volume of airspace. If the competent authority, ANSP, or U-space service provides an air collision risk map (static or dynamic), the applicant should use that service to determine the initial ARC, and go directly to Section 2.4.3 ‘Application of strategic mitigations’ to reduce the initial ARC.

(b) As seen in Figure 4, the airspace is categorised into 13 aggregated collision risk categories. These categories were characterised by the altitude, controlled versus uncontrolled airspace, airport/heliport versus non-airport/non-heliport environments, airspace over urban versus rural environments, and lastly atypical (e.g. segregated) versus typical airspace.

(c) To assign the proper ARC for the type of UAS operation, the applicant should use the decision tree found in Figure 4.

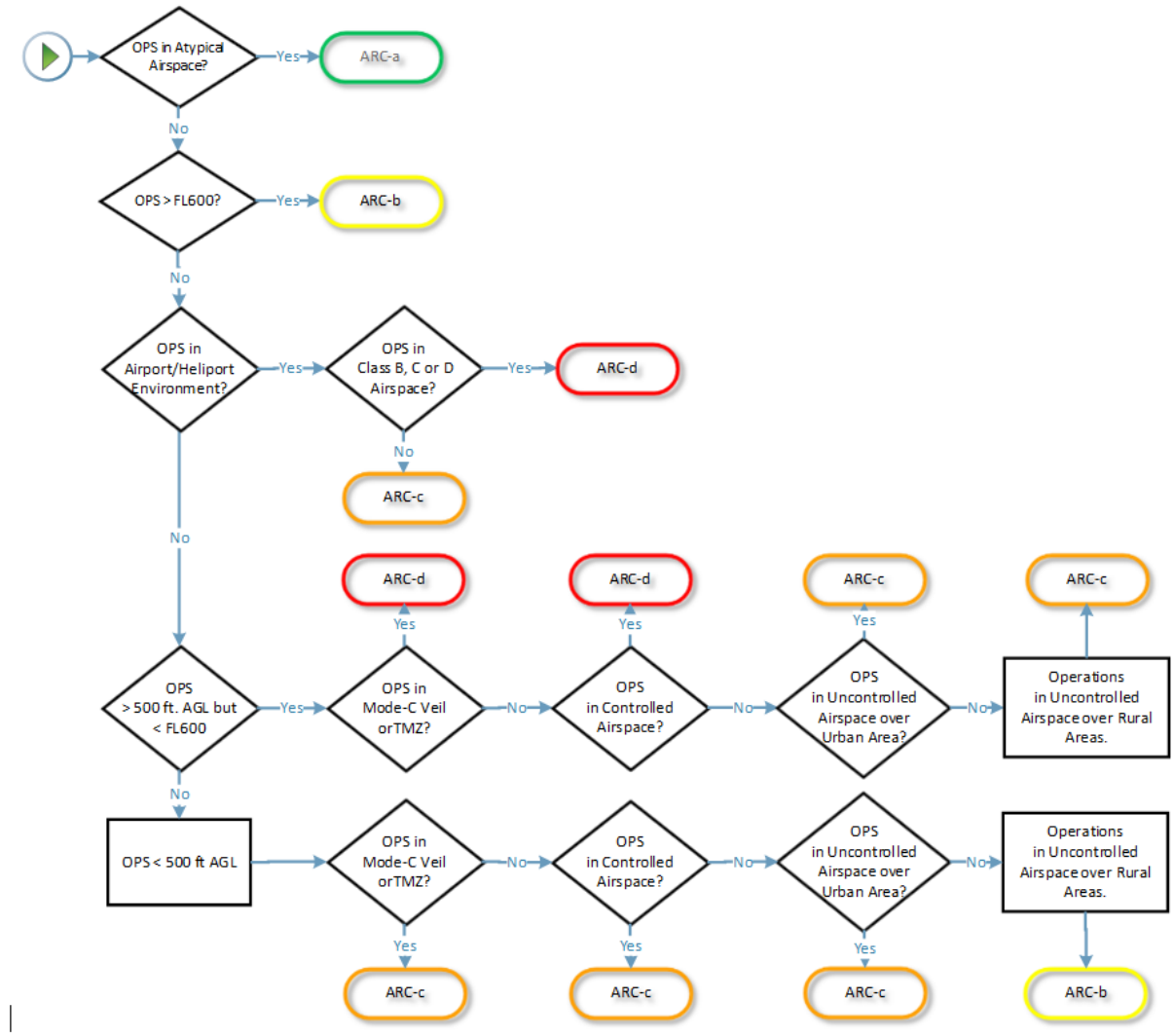


Figure 4 — ARC assignment process

(d) The ARC is a qualitative classification of the rate at which a UAS would encounter a manned aircraft in typical generalised civil airspace. The ARC is an initial assignment of the aggregated collision risk for the airspace, before mitigations are applied. The actual collision risk of a specific local operational volume could be much different, and can be addressed with the application of strategic mitigations to reduce the ARC (this step is optional, see Section 2.4.3, Step #5).

(e) Although the static generalised risk put forward by the ARC is conservative (i.e. it stays on the safe side), there may be situations where that conservative assessment may not suffice. It is important for both the competent authority and the UAS operator to take great care to understand the operational volume and under which circumstances the definitions in Figure 4 could be invalidated. In some situations, the competent authority may raise the operational volume ARC to a level which is greater than that advocated by Figure 4. The ANSP should be consulted to ensure that the assumptions related to the operational volume are accurate.

(f) ARC-a is generally defined as airspace where the risk of a collision between a UAS and a manned aircraft is acceptable without the addition of any tactical mitigation.

(g) ARC-b, ARC-c, ARC-d generally define volumes of airspace with increasing risk of a collision between a UAS and a manned aircraft.

(h) During the UAS operation, the operational volume may span many different airspace environments. The applicant needs to perform an air risk assessment for the entire range of the operational volume. An example scenario of operations in multiple airspace environments is provided at the end of Annex C.

2.4.3 Step #5 — Application of strategic mitigations to determine the residual ARC (optional)

(a) As stated before, the ARC is a generalised qualitative classification of the rate at which a UAS would encounter a manned aircraft in the specific airspace environment. However, it is recognised that the UAS operational volume may have a different collision risk from the one that the generalised initial ARC assigned.

(b) If an applicant considers that the generalised initial ARC assigned is too high for the condition in the local operational volume, then they should refer to Annex C for the ARC reduction process.

(c) If the applicant considers that the generalised initial ARC assignment is correct for the condition in the local operational volume, then that ARC becomes the residual ARC.

2.4.4 Step #6 — TMPR and robustness levels

Tactical mitigations are applied to mitigate any residual risk of a mid-air collision that is needed to achieve the applicable airspace safety objective. Tactical mitigations will take the form of either ‘see and avoid’ (i.e. operations under VLOS), or they may require a system which provides an alternate means of achieving the applicable airspace safety objective (operation using a DAA, or multiple DAA systems). Annex D provides the method for applying tactical mitigations.

2.4.4.1 Operations under VLOS/EVLOS

(a) VLOS is considered to be an acceptable tactical mitigation for collision risk for all ARC levels. Notwithstanding the above, the UAS operator is advised to consider additional means to increase the situational awareness with regard to air traffic operating in the vicinity of the operational volume.

(b) Operational UAS flights under VLOS do not need to meet the TMPR, nor the TMPR robustness requirements. In the case of multiple segments of the flight, those segments conducted under VLOS do not have to meet the TMPR, nor the TMPR robustness requirements, whereas those conducted under BVLOS do need to meet the TMPR and the TMPR robustness requirements.

(c) In general, all VLOS requirements are applicable to EVLOS. EVLOS may have additional requirements over and above those of VLOS. The

EVLOS verification and communication latency between the remote pilot and the observers should be less than 15 seconds.

(d) Notwithstanding the above, the applicant should have a documented VLOS de-confliction scheme, in which the applicant explains which methods will be used for detection, and defines the associated criteria applied for the decision to avoid incoming traffic. If the remote pilot relies on detection by observers, the use of phraseology will have to be described as well.

(e) For VLOS operations, it is assumed that an observer is not able to detect traffic beyond 2 NM. (Note that the 2 NM range is not a fixed value and it may largely depend on the atmospheric conditions, aircraft size, geometry, closing rate, etc.). Therefore, the UAS operator may have to adjust the operation and/or the procedures accordingly.

2.4.4.2 Operations under a DAA system — TMPR

(a) For operations other than VLOS, the applicant will use the residual ARC and Table 4 below to determine the TMPR.

Residual ARC	TMPRs	TMPR level of robustness
ARC-d	High	High
ARC-c	Medium	Medium
ARC-b	Low	Low
ARC-a	No requirement	No requirement

Table 4 — TMPRs and TMPR level of robustness assignment

(b) High TMPR (ARC-d): This is airspace where either the manned aircraft encounter rate is high, and/or the available strategic mitigations are low. Therefore, the resulting residual collision risk is high, and the TMPR is also high. In this airspace, the UAS may be operating in integrated airspace and will have to comply with the operating rules and procedures applicable to that airspace, without reducing the existing capacity, decreasing safety, negatively impacting current operations with manned aircraft, or increasing the risk to airspace users or persons and property on the ground. This is no different from the requirements for the integration of comparable new and novel technologies in manned aviation. The performance level(s) of those tactical mitigations and/or the required variety of tactical mitigations are generally higher than for the other ARCs. If operations in this airspace are conducted more routinely, the competent authority is expected to require the UAS operator to comply with the recognised DAA system standards (e.g. those developed by RTCA SC-228 and/or EUROCAE WG-105).

(c) Medium TMPR (ARC-c): A medium TMPR will be required for operations in airspace where the chance of encountering manned aircraft is reasonable, and/or the strategic mitigations available are medium. Operations with a medium TMPR will likely be supported by the systems currently used in aviation to aid the remote pilot in the detection of other manned aircraft, or by systems designed to support

aviation that are built to a corresponding level of robustness. Traffic avoidance manoeuvres could be more advanced than for a low TMPR.

(d) Low TMPR (ARC-b): A low TMPR will be required for operations in airspace where the probability of encountering another manned aircraft is low, but not negligible, and/or where strategic mitigations address most of the risk, and the resulting residual collision risk is low. Operations with a low TMPR are supported by technology that is designed to aid the remote pilot in detecting other traffic, but which may be built to lower standards. For example, for operations below 120 m, the traffic avoidance manoeuvres are expected to mostly be based on a rapid descent to an altitude where manned aircraft are not expected to ever operate.

(e) No performance requirement (ARC-a): This is airspace where the manned aircraft encounter rate is expected to be extremely low, and therefore there is no requirement for a TMPR. It is generally defined as airspace where the risk of a collision between a UAS and a manned aircraft is acceptable without the addition of any tactical mitigation. An example of this may be UAS flight operations in some parts of Alaska or northern Sweden, where the manned aircraft density is so low that the airspace safety threshold could be met without any tactical mitigation.

(f) Annex D provides information on how to satisfy the TMPR based on the available tactical mitigations and the TMPR level of robustness.

2.4.4.3 Consideration of additional airspace/operational requirements

(a) Modifications to the initial and subsequent approvals may be required by the competent authority or the ANSP as safety and operational issues arise.

(b) The UAS operator and the competent authority need to be cognisant that the ARCs are a generalised qualitative classification of the collision risk. Local circumstances could invalidate the aircraft density assumptions of the SORA, for example, due to special events. It is important for both the competent authority and the UAS operator to fully understand the airspace and air-traffic flows, and develop a system which can alert UAS operators to changes to the airspace on a local level. This will allow the UAS operator to safely address the increased risks associated with these events.

(c) There are many airspace, operational and equipment requirements which have a direct impact on the collision risk of all aircraft in the airspace. Some of these requirements are general and apply to all volumes of airspace, while some are local and are required only for a particular volume of airspace. The SORA cannot possibly cover all the possible requirements for all the conditions in which the UAS operator may wish to operate. The applicant and the competent authority need to work closely together to define and address these additional requirements.

(d) The SORA process should not be used to support operations of a UAS in a given airspace without the UAS being equipped with the required equipment for operations in that airspace (e.g. the equipment required to ensure interoperability with other airspace users). In these cases, specific exemptions may be granted by the competent authority. Those exemptions are outside the scope of the SORA.

(e) Operations in controlled airspace, an airport/heliport environment or a Mode-C Veil/transponder mandatory zone (TMZ) will likely require prior approval from the ANSP. The applicant should ensure that they involve the ANSP/authority prior to commencing operations in these environments.

2.5 Final assignment of specific assurance and integrity level (SAIL) and OSO

2.5.1 Step #7 SAIL determination

(a) The SAIL parameter consolidates the ground and air risk analyses, and drives the required activities. The SAIL represents the level of confidence that the UAS operation will remain under control.

(b) After determining the final GRC and the residual ARC, it is then possible to derive the SAIL associated with the proposed ConOps.

(c) The level of confidence that the operation will remain under control is represented by the SAIL. The SAIL is not quantitative, but instead corresponds to:

(1) the OSO to be complied with (see Table 6);

(2) the description of the activities that might support compliance with those objectives; and

(3) the evidence that indicates that the objectives have been satisfied.

(d) The SAIL assigned to a particular ConOps is determined using Table 5:

SAIL determination				
	Residual ARC			
Final GRC	a	b	c	d
≤2	I	II	IV	VI
3	II	II	IV	VI
4	III	III	IV	VI
5	IV	IV	IV	VI
6	V	V	V	VI
7	VI	VI	VI	VI
>7	Category C operation			

Table 5 — SAIL determination

2.5.2 Step #8 — Identification of the operational safety objectives (OSOs)

(a) The last step of the SORA process is to use the SAIL to evaluate the defences within the operation in the form of OSOs, and to determine the associated level of robustness. Table 6 provides a qualitative methodology to make this determination. In this table, O is optional, L is recommended with low robustness, M is recommended with medium robustness, and H is

recommended with high robustness. The various OSOs are grouped based on the threat they help to mitigate; hence, some OSOs may be repeated in the table.

(b) Table 6 is a consolidated list of the common OSOs that historically have been used to ensure safe UAS operations. It represents the collected experience of many experts, and is therefore a solid starting point to determine the required safety objectives for a specific operation. The competent authorities may define additional OSOs for a given SAIL and the associated level of robustness.

OSO number (in line with Annex E)		SAIL					
		I	II	III	IV	V	VI
	Technical issue with the UAS						
OSO#01	Ensure the UAS operator is competent and/or proven	O	L	M	H	H	H
OSO#02	UAS manufactured by competent and/or proven entity	O	O	L	M	H	H
OSO#03	UAS maintained by competent and/or proven entity	L	L	M	M	H	H
OSO#04	UAS developed to authority recognised design standards[1]	O	O	O	L	M	H
OSO#05	UAS is designed considering system safety and reliability	O	O	L	M	H	H
OSO#06	C3 link performance is appropriate for the operation	O	L	L	M	H	H
OSO#07	Inspection of the UAS (product inspection) to ensure consistency with the ConOps	L	L	M	M	H	H
OSO#08	Operational procedures are defined, validated and adhered to	L	M	H	H	H	H
OSO#09	Remote crew trained and current and able to control the abnormal situation	L	L	M	M	H	H
OSO#10	Safe recovery from a technical issue	L	L	M	M	H	H
	Deterioration of external systems supporting UAS operations						
OSO#11	Procedures are in-place to handle the deterioration of external systems supporting UAS operations	L	M	H	H	H	H
OSO#12	The UAS is designed to manage the deterioration of external systems supporting UAS operations	L	L	M	M	H	H
OSO#13	External services supporting UAS operations are adequate for the operation	L	L	M	H	H	H
	Human error						
OSO#14	Operational procedures are defined, validated and adhered to	L	M	H	H	H	H
OSO#15	Remote crew trained and current and able to control the abnormal situation	L	L	M	M	H	H

[1] The robustness level does not apply to mitigations for which credit has been taken to derive the risk classes. This is further detailed in para. 3.2.11(a).

OSO number (in line with Annex E)		SAIL					
		I	II	III	IV	V	VI
OSO#16	Multi-crew coordination	L	L	M	M	H	H
OSO#17	Remote crew is fit to operate	L	L	M	M	H	H
OSO#18	Automatic protection of the flight envelope from human error	O	O	L	M	H	H
OSO#19	Safe recovery from human error	O	O	L	M	M	H
OSO#20	A human factors evaluation has been performed and the human machine interface (HMI) found appropriate for the mission	O	L	L	M	M	H
	Adverse operating conditions						
OSO#21	Operational procedures are defined, validated and adhered to	L	M	H	H	H	H
OSO#22	The remote crew is trained to identify critical environmental conditions and to avoid them	L	L	M	M	M	H
OSO#23	Environmental conditions for safe operations are defined, measurable and adhered to	L	L	M	M	H	H
OSO#24	UAS is designed and qualified for adverse environmental conditions	O	O	M	H	H	H

Table 6 — Recommended OSOs

2.5.3 Step #9 – Adjacent area/airspace considerations

(a) The objective of this section is to address the risk posed by a loss of control of the operation, resulting in an infringement of the adjacent areas on the ground and/or adjacent airspace. These areas may vary with different flight phases.

(b) Safety requirements for containment are:

> 1. No probable[1] failure[2] of the UAS or any external system supporting the operation should lead to operation outside the operational volume.
>
> *Compliance with the requirement above shall be substantiated by a design and installation appraisal and shall include at least:*
>
> — *the design and installation features (independence, separation and redundancy);*
>
> — *any relevant particular risk (e.g. hail, ice, snow, electro-magnetic interference, etc.) associated with the ConOps.*

(c) The following three safety requirements apply for operations conducted:

(1) either where the adjacent areas:

[1] The term 'probable' needs to be understood in its qualitative interpretation, i.e. 'Anticipated to occur one or more times during the entire system/operational life of an item.'

[2] The term 'failure' needs to be understood as an occurrence that affects the operation of a component, part, or element such that it can no longer function as intended. Errors may cause failures, but are not considered to be failures. Some structural or mechanical failures may be excluded from the criterion if it can be shown that these mechanical parts were designed according to aviation industry best practices.

(i) contain assemblies of people[1] unless the UAS is already approved for operations over assemblies of people; or

(ii) are ARC-d unless the residual ARC of the airspace area intended to be flown within the operational volume is already ARC-d;

(2) Or in populated environments where:

(i) M1 mitigation has been applied to lower the GRC; or

(ii) operating in a controlled ground area.

1. The probability of leaving the operational volume should be less than 10^{-4}/FH. 2. No single failure of the UAS or any external system supporting the operation should lead to its operation outside the ground risk buffer. Compliance with the requirements above should be substantiated by analysis and/or test data with supporting evidence. 3. Software (SW) and airborne electronic hardware (AEH) whose development error(s) could **directly** (refer to Note 2) lead to operations outside the ground risk buffer should be developed to an industry standard or methodology that is recognised as being adequate by the competent authority.

As it is not possible to anticipate all local situations, the UAS operator, the competent authority and the ANSP should use sound judgement with regard to the definition of the 'adjacent airspace' as well as the 'adjacent areas'. For example, for a small UAS with a limited range, these definitions are not intended to include busy airport/heliport environments 30 kilometres away. The airspace bordering the UAS volume of operation should be the starting point of the determination of the adjacent airspace. In exceptional cases, the airspace beyond those volumes that border the UAS volume of operation may also have to be considered.

Note 1: The safety requirements as proposed in this section cover both the integrity and assurance levels.

Note 2: The third safety requirement in Section 2.5.3(c) does not imply a systematic need to develop the SW and AEH according to an industry standard or methodology recognised as adequate by the competent authority. The use of the term 'directly' means that a development error in a software or an airborne electronic hardware would lead the UA outside the ground risk buffer without the possibility for another system to prevent the UA from exiting the operational volume.

2.6 Step #10 — comprehensive safety portfolio

(a) The SORA process provides the applicant, the competent authority and the ANSP with a methodology which includes a series of mitigations and safety objectives to be considered to ensure an adequate level of confidence that the operation can be safely conducted. These are:

(1) mitigations used to modify the intrinsic GRC;

(2) strategic mitigations for the initial ARC;

[1] See the definition in Article 2(3) of the UAS Regulation.

(3) tactical mitigations for the residual ARC;

(4) adjacent area/airspace considerations; and

(5) OSOs.

(b) The satisfactory substantiation of the mitigations and objectives required by the SORA process provides a sufficient level of confidence that the proposed operation can be safely conducted.

(c) The UAS operator should be sure to address any additional requirements that were not identified by the SORA process (e.g. for security, environmental protection, etc.) and identify the relevant stakeholders (e.g. environmental protection agencies, national security bodies, etc.). The activities performed within the SORA process will likely address those additional needs, but they may not be considered to be sufficient at all times.

(d) The UAS operator should ensure the consistency between the SORA safety case and the actual operational conditions (i.e. at the time of the flight).

Annex A to AMC1 to Article 11

ED Decision 2019/021/R

CONOPS: GUIDELINES ON COLLECTING AND PRESENTING SYSTEM AND OPERATIONAL INFORMATION FOR SPECIFIC UAS OPERATIONS

A.0 General guidelines

This document must be original work completed and understood by the applicant (operator). Applicants must take responsibility for their own safety cases, whether the material originates from this template or otherwise.

A.0.1 Document control

Applicants should include an amendment record at the beginning of the document to record changes and show how that the document is controlled.

Amendment/ Revision/ Issue Number	Date	Amended by	Signed
a, b, c or 1, 2, 3 etc.	DDMMYYYY	Name of the person carrying out the amendment/ revision/ issue number	Signature of person carrying out the amendment/ revision/ issue number

This section is critical to ensure appropriate document control.

Any significant changes to the ConOps may require further assessment and approval by the competent authority prior to further operations being conducted.

A.0.2 References

(a) List all references (documents, URL, manuals, appendices) mentioned in the ConOps:

#	Title	Description	Amendment/ Revision/ Issue Number
[1]			
[2]			

A.1 Guidance for the collection and presentation of operationally relevant information

The template below provides section headings detailing the subject areas that should be addressed when producing the ConOps, for the purposes of demonstrating that a UAS operation can be conducted safely. The template layouts as presented are not prescriptive, but the subject areas detailed should be included in the ConOps documentation as required for the particular operation(s), in order to provide the minimum required information and evidence to perform the SORA.

A.1.1 Reserved

A.1.2 Organisation overview

(a) This section describes how the organisation is defined, to support safe operations. It should include:

(1) the structure of the organisation and its management, and

(2) the responsibilities and duties of the UAS operator.

A.1.2.1 Safety

(a) The 'specific' category covers operations where the operational risks are higher and therefore the management of safety is particularly important. The applicant should describe how safety is integrated in the organisation, and the safety management system that is in place, if applicable.

(b) Any additional safety-related information should be provided.

A.1.2.2 Design and production

(a) If the organisation is responsible for the design and/or production of the UAS, this section should describe the design and/or the production organisation.

(b) It should provide information on the manufacturer of the UAS to be used if the UAS is not manufactured or produced by the operator, i.e. by a third-party manufacturer.

(c) If required, information on the production organisation of the third-party organisation should be provided as evidence.

A.1.2.3 Training of staff involved in operations

This section should describe the training organisation or entity that qualifies all the staff involved in operations with respect to the ConOps.

A.1.2.4 Maintenance

This section should describe:

(a) the general maintenance philosophy of the UAS;

(b) the maintenance procedures for the UAS; and

(c) the maintenance organisation, if required.

A.1.2.5 Crew

This section should describe:

(a) the responsibilities and duties of personnel, including all the positions and people involved, for functions such as:

(1) the remote pilot (including the composition of the flight team according to the nature of the operation, its complexity, the type of UAS, etc.); and

(2) support personnel (e.g. visual observers (VOs), launch crew, and recovery crew);

(b) the procedure for multi-crew coordination if more than one person is directly involved in the flight operations;

(c) the operation of different types of UAS, including details of any limitations to the types of UAS that a remote pilot may operate, if appropriate; and

(d) details of the operator's policy on crew health requirements, including any procedures, guidance or references to ensure that the flight team are appropriately fit, capable and able to conduct the planned operations.

A.1.2.6 UAS configuration management

This section should describe how the operator manages changes to the UAS configuration.

A.1.2.7 Other position(s) and other information

Any other position defined in the organisation, or any other relevant information, should be provided.

A.1.3 Operations

A.1.3.1 Type of operations

(a) Detailed description of the ConOps: the applicant should describe what types of operations the UAS operator intends to carry out. The detailed description should contain all the information needed to obtain a detailed understanding of how, where and under which limitations or conditions the operations shall be performed. The operational volume, including the ground and air risk buffers, needs to be clearly defined. Relevant charts/diagrams, and any other information helpful to visualise and understand the intended operation(s) should be included in this section.

(b) The applicant should provide specific details on the type of operations (e.g. VLOS, BVLOS), the population density to be overflown (e.g. away from people, sparsely populated, assemblies of people) and the type of airspace to be used (e.g. a segregated area, fully integrated).

(c) The applicant should describe the level of involvement (LoI) of the crew and any automated or autonomous systems during each phase of the flight.

A.1.3.2 Normal operation strategy

(a) The normal operation strategy should contain all the safety measures, such as technical or procedural measures, crew training, etc. that are put in place to ensure that the UAS can fulfil the operation within the approved limitations, and so that the operation remains in control.

(b) Within this section, it should be assumed that all systems are working normally and as intended.

(c) The intent of this chapter is to provide a clear understanding of how the operation takes place within the approved technical, environmental, and procedural limitations.

A.1.3.3 Standard operating procedures

This section should describe the standard operating procedures (SOP) applicable to all operations for which an approval is requested. A reference to the applicable operations manual (OM) is acceptable. Note: Checklists and SOP templates may be provided by the local competent authority or a qualified entity.

A.1.3.3.1 Normal operating procedures

This section should describe the normal operating procedures in place for the intended operations.

A.1.3.3.2 Contingency and emergency procedures

This section should describe the contingency procedures in place for any malfunction or abnormal operation, as well as an emergency.

A.1.3.3.3 Occurrence reporting procedures

UAS, like all aircraft, are subject to accident investigations and occurrence reporting schemes. Mandatory or voluntary reporting should be carried out using the reporting processes provided by the competent authorities. As a minimum, the SOP should contain:

(a) reporting procedures in case of:

(1) damage to property;

(2) a collision with another aircraft; or

(3) a serious or fatal injury (third parties and own personnel); and

(b) documentation and data logging procedures: describe how records and information are stored and made available, if required, to the accident investigation body, competent authority, and other government entities (e.g. police) as applicable.

A.1.3.4 Operational limits

This section should detail the specific operating limitations and conditions appropriate to the proposed operation(s); for example, operating heights, horizontal distances, weather conditions, the applicable flight performance envelope, times of operations (day and/or night) and any limitations for operating within the applicable class(es) of airspace, etc.

A.1.3.5 Emergency response plan (ERP)

The applicant should:

(a) define a response plan for use in the event of a loss of control of the operation;

(b) describe the procedures to limit the escalating effects of a crash; and

(c) describe the procedures for use in the event of a loss of containment.

A.1.4 Remote crew training

A.1.4.1 General information

This section describes the processes and procedures that the UAS operator uses to develop and maintain the necessary competence for the remote crew (i.e. any person involved in the UAS operation).

A.1.4.2 Initial training and qualification

This section describes the processes and procedures that the UAS operator uses to ensure that the remote crew is suitably competent, and how the qualification of the remote crew is carried out.

A.1.4.3 Procedures for maintenance of currency

This section describes the processes and procedures that the UAS operator uses to ensure that the remote crew acquire and maintain the required currency to execute the various types of duties.

A.1.4.4 Flight simulation training devices (FSTDs)

This section:

(a) describes the use of FSTDs for acquiring and maintaining the practical skills of the remote pilots (if applicable); and

(b) describes the conditions and restrictions in connection with such training (if applicable).

A.1.4.5 Training programme

This section provides a reference to the applicable training programme(s) for the remote crew.

A2 Guidance for the collection and presentation of technical relevant information

The aim of this section is to collect all the necessary technical information about the UAS and its supporting systems. This information needs to be sufficient to address the required robustness levels of the mitigations and the OSOs of the SORA.

The list below is suggested guidance for items which may be relevant for this assessment, but the items may differ, depending on the specific UAS utilised in this ConOps.

A.2.1 Reserved

A.2.2 UAS description

A.2.2.1 Unmanned aircraft (UA) segment

A.2.2.1.1 Airframe

This section should include the following:

(a) A detailed description of the physical characteristics of the UA (mass, centre-of-mass, dimensions, etc.), including photos, diagrams and schematics, if appropriate to support the description of the UA.

(1) Dimensions: for fixed-wing UA, the wingspan, fuselage length, body diameter etc.; for a rotorcraft, the length, width and height, propeller diameter, etc.;

(2) Mass: all the relevant masses such as the empty mass, MTOM, etc.; and

(3) Centre of gravity: the centre of gravity and limits if necessary.

(b) Materials: the main materials used and where they are used in the UA, highlighting in particular any new materials (new metal alloys or composites) or combinations of materials (composites 'tailored' to designs).

(c) Load limits: the capability of the airframe structure to withstand expected flight load limits.

(d) Sub-systems: any sub-systems such as a hydraulic system, environmental control system, parachute, brakes, etc.

A.2.2.1.2 UA performance characteristics

This section should include the following:

(a) the performance of the UA within the proposed flight envelope, specifically addressing at least the following items:

(1) Performance: the

(i) maximum altitude;

(ii) maximum endurance;

(iii) maximum range;

(iv) maximum rate of climb;

(v) maximum rate of descent;

(vi) maximum bank angle; and

(vii) turn rate limits.

(2) Airspeeds: the

(i) slowest speed attainable;

(ii) stall speed (if applicable);

(iii) nominal cruise speed;

(iv) max cruise speed; and

(v) never-exceed airspeed.

(b) Any performance limitations due to environmental and meteorological conditions, specifically addressing the following items:

(1) wind speed limitations (headwind, crosswind, gusts);

(2) turbulence restrictions;

(3) rain, hail, snow, ash resistance or sensitivities;

(4) the minimum visibility conditions, if applicable;

(5) outside air temperature (OAT) limits; and

(6) in-flight icing:

(i) whether the proposed operating environment includes operations in icing conditions;

(ii) whether the system has an icing detection capability, and if so, what indications, if any, the system provides to the remote pilot, and/or how the system responds; and

(iii) any icing protection capability of the UA, including any test data that demonstrates the performance of the icing protection system.

A.2.2.1.3 Propulsion system

This section should include the following:

(a) Principle

A description of the propulsion system and its ability to provide reliable and sufficient power to take off, climb, and maintain flight at the expected mission altitudes.

(b) Fuel-powered propulsion systems

(1) The type (manufacturer organisation and model) of engine that is used;

(2) How many engines are installed;

(3) The type and the capacity of fuel that is used;

(4) How the engine performance is monitored;

(5) The status indicators, alerts (such as warning, caution and advisory), messages that are provided to the remote pilot;

(6) A description of the most critical propulsion-related failure modes/conditions and their impact on the operation of the system;

(7) How the UA responds, and the safeguards that are in place to mitigate the risk of a loss of engine power for each of the following:

(i) fuel starvation;

(ii) fuel contamination;

(iii) failed signal input from the remote pilot station (RPS); and

(iv) engine controller failure;

(8) The in-flight restart capabilities of the engine, if applicable, and if so, a description of the manual and/or automatic features of this capability;

(9) The fuel system and how it allows for adequate control of the fuel delivery to the engine, and provides for aircrew determination of the fuel remaining. This includes a system level diagram showing the location of the system in the UA and the fuel flow path; and

(10) How the fuel system is designed in terms of safety (fire detection and extinguishing, reduction of risk in case of impact, leak prevention, etc.).

(c) Electric-powered propulsion systems

(1) A high-level description of the electrical distribution architecture, including items such as regulators, switches, buses, and converters, as necessary;

(2) The type of motor that is used;

(3) The number of motors that are installed;

(4) The maximum continuous power output of the motor in watts;

(5) The maximum peak power output of the motor in watts;

(6) The current range of the motor in amps;

(7) Whether the propulsion system has a separate electrical source, and if not, how the power is managed with respect to the other systems of the UA;

(8) A description of the electrical system and how it distributes adequate power to meet the requirements of the receiving systems. This should include a system level diagram showing the electrical power distribution throughout the UA;

(9) How power is generated on board the UA (for example, generators, alternators, batteries).

(10) If a limited life power source such as batteries is used, the useful life of the power source during normal and emergency conditions, and how this was determined;

(11) How information on the battery status and the remaining battery capacity is provided to the remote pilot or the watchdog system;

(12) If available, a description of the source(s) of backup power for use in the event of a loss of the primary power source. This should include:

(i) the systems that are powered during backup power operation;

(ii) a description of any automatic or manual load shedding; and

(iii) how much operational time the backup power source provides, including the assumptions used to make this determination;

(13) How the performance of the propulsion system is monitored;

(14) The status indicators and alert (such as warning, caution and advisory) messages that are provided to the remote pilot;

(15) A description of the most critical propulsion-related failure modes/conditions and their impact on system operation;

(16) How the UA responds, and the safeguards that are in place to mitigate the risk of a propulsion system loss for each of the following:

(i) Low battery charge;

(ii) A failed signal input from the RPS; and

(iii) A motor controller failure;

(17) If the motor has in-flight reset capabilities, a description of the manual and/or automatic features of this capability.

(d) Other propulsion systems

A description of these systems to a level of detail equivalent to the fuel and electrical propulsions sections above.

A.2.2.1.4 Flight control surfaces and actuators

This section should include the following:

(a) A description of the design and operation of the flight control surfaces and servos/actuators, including a diagram showing the location of the control surfaces and the servos/actuators;

(b) A description of any potential failure modes and the corresponding mitigations;

(c) How the system responds to a servo/actuator failure; and

(d) How the remote-pilot or watchdog system is alerted of a servo/actuator malfunction.

A.2.2.1.5 Sensors

This section should describe the non-payload sensor equipment on board the UA and its role.

A.2.2.1.6 Payloads

This section should describe the payload equipment on board the UA, including all the payload configurations that significantly change the weight and balance, electrical loads, or flight dynamics.

A.2.3 UAS control segment

This section should include the following:

A.2.3.1 General

An overall system architecture diagram of the avionics architecture, including the location of all air data sensors, antennas, radios, and navigation equipment. A description of any redundant systems, if available.

A.2.3.2 Navigation

(a) How the UAS determines its location;

(b) How the UAS navigates to its intended destination;

(c) How the remote pilot responds to instructions from:

(1) air traffic control;

(2) UA observers or VOs (if applicable); and

(3) other crew members (if applicable);

(d) The procedures to test the altimeter navigation system (position, altitude);

(e) How the system identifies and responds to a loss of the primary means of navigation;

(f) A description of any backup means of navigation; and

(g) How the system responds to a loss of the secondary means of navigation, if available.

A.2.3.3 Autopilot

(a) How the autopilot system was developed, and the industry or regulatory standards that were used in the development process.

(b) If the autopilot is a commercial off-the-shelf (COTS) product, the type/design and the production organisation, with the criteria that were used in selecting the COTS autopilot.

(c) The procedures used to install the autopilot and how its correct installation is verified, with references to any documents or procedures provided by the manufacturer's organisation and/or developed by the UAS operator's organisation.

(d) If the autopilot employs input limit parameters to keep the aircraft within defined limits (structural, performance, flight envelope, etc.), a list of those limits and a description of how these limits were defined and validated.

(e) The type of testing and validation that was performed (software-in-the-loop (SITL) and hardware-in-the-loop (HITL) simulations).

A.2.3.4 Flight control system

(a) How the control surfaces (if any) respond to commands from the flight control computer/autopilot.

(b) A description of the flight modes (i.e. manual, artificial-stability, automatic, autonomous).

(c) Flight control computer/autopilot:

(1) If there are any auxiliary controls, how the flight control computer interfaces with the auxiliary controls, and how they are protected against unintended activation.

(2) A description of the flight control computer interfaces required to determine the flight status and to issue appropriate commands.

(3) The operating system on which the flight controls are based.

A.2.3.5 Remote pilot station (RPS)

(a) A description or a diagram of the RPS configuration, including screen captures of the control station displays.

(b) How accurately the remote pilot can determine the attitude, altitude (or height) and position of the UA.

(c) The accuracy of the transmission of critical parameters to other airspace users/air traffic control (ATC).

(d) The critical commands that are safeguarded from inadvertent activation and how that is achieved (for example, is there a two-step process to command 'switch the engine off'). The kinds of inadvertent input that the remote pilot could enter to cause an undesirable outcome (for example, accidentally hitting the 'kill engine' control in flight).

(e) Any other programmes that run concurrently on the ground control computer, and if there are any, the precautionary measures that are used to ensure that flight-critical processing will not be adversely affected.

(f) The provisions that are made against an RPS display or interface lock-up.

(g) The alerts (such as warning, caution and advisory) that the system provides to the remote pilot (e.g. low fuel or battery level, failure of critical systems, or operation out of control).

(h) A description of the means to provide power to the RPS, and redundancies, if any.

A.2.3.6 Detect and avoid (DAA) system

(a) Aircraft conflict avoidance

(1) A description of the system/equipment that is installed for collaborative conflict avoidance (e.g. SSR, TCAS, ADS-B, FLARM, etc.).

(2) If the equipment is qualified, details of the detailed qualification to the respective standard.

(3) If the equipment is not qualified, the criteria that were used in selecting the system.

(b) Non-collaborative conflict avoidance:

A description of the equipment that is installed (e.g. vision-based, PSR data, LIDAR, etc.).

(c) Obstacle conflict avoidance

A description of the system/equipment that is installed, if any, for obstacle collision avoidance.

(d) Avoidance of adverse weather conditions

A description of the system/equipment that is installed, if any, for the avoidance of adverse weather conditions.

(e) Standard

(1) If the equipment is qualified, a list of the detailed qualification to the respective standard.

(2) If the equipment is not qualified, the criteria that were used in selecting the system.

(f) A description of any interface between the conflict avoidance system and the flight control computer.

(g) A description of the principles that govern the installed DAA system

(h) A description of the role of the remote pilot or any other remote crew in the DAA system.

(i) A description of the known limitations of the DAA system.

A.2.4 Containment system

(a) A description of the principles of the system/equipment used to perform containment functions for:

(1) avoidance of specific area(s) or volume(s); or

(2) confinement in a given area or volume.

(b) The system information and, if applicable, supporting evidence that demonstrates the reliability of the containment system.

A.2.5 Ground support equipment (GSE) segment

(a) A description of all the support equipment that is used on the ground, such as launch or recovery systems, generators, and power supplies.

(b) A description of the standard equipment available, and the backup or emergency equipment.

(c) A description of how the UAS is transported on the ground.

A.2.6 Command and control (C2) link segment

(a) The standard(s) with which the system is compliant.

(b) A detailed diagram that shows the system architecture of the C2 link, including informational or data flows and the performance of the subsystem, and values for the data rates and latencies, if known.

(c) A description of the control link(s) connecting the UA to the RPS and any other ground systems or infrastructures, if applicable, specifically addressing the following items:

(1) The spectrum that will be used for the control link and how the use of this spectrum has been coordinated. If approval of the spectrum is not required, the regulation that was used to authorise the frequency.

(2) The type of signal processing and/or link security (i.e. encryption) that is employed.

(3) The datalink margin in terms of the overall link bandwidth at the maximum anticipated distance from the RPS, and how it was determined.

(4) If there is a radio signal strength and/or health indicator or similar display to the remote pilot, how the signal strength and health values were determined, and the threshold values that represent a critically degraded signal.

(5) If the system employs redundant and/or independent control links, how different the design is, and the likely common failure modes.

(6) For satellite links, an estimate of the latencies associated with using the satellite link for aircraft control and for air traffic control communications.

(7) The design characteristics that prevent or mitigate the loss of the datalink due to the following:

(i) RF or other interference;

(ii) flight beyond the communications range;

(iii) antenna masking (during turns and/or at high attitude angles);

(iv) a loss of functionality of the RPS;

(v) a loss of functionality of the UA; and

(vi) atmospheric attenuation, including precipitation.

A.2.7 C2 link degradation

A description of the system functions in case of a C2 link degradation:

(a) Whether the C2 link degradation status is available and in what form (e.g. degraded, critical, automatic messages).

(b) How the status of the C2 link degradation is announced to the remote pilot (e.g. visual, haptic, or sound).

A description of the associated contingency procedures.

(c) Other.

A.2.8 C2 link loss

(a) The conditions that could lead to a loss of the C2 link.

(b) The measures in case of a loss of the C2 link.

(c) A description of the clear and distinct aural and visual alerts to the remote pilot for any case of a lost link.

(d) A description of the established lost link strategy presented in the UAS operating manual, taking into account the emergency recovery capability.

(e) A description of how the geo-awareness or geo-fencing system is used in this case, if available.

(f) The lost link strategy, and, if incorporated, the re-acquisition process in order to try to re-establish the link in a reasonably short time.

A.2.9. Safety features

(a) A description of the single failure modes and their recovery mode(s), if any.

(b) A description of the emergency recovery capability to prevent risks to third-parties. This typically consists of:

(1) a flight termination system (FTS), procedure or function that aims to immediately end the flight; or

(2) an automatic recovery system (ARS) that is implemented through UAS crew command or by the on board systems. This may include an automatic pre-programmed course of action to reach a predefined and unpopulated forced landing area; or

(3) any combination of the above, or other methods.

(c) The applicant should provide both a functional and physical diagram of the global UA system with a clear depiction of its constituent components, and, where applicable, an indication of its peculiar features (e.g. independent power supplies, redundancies, etc.)

Annex B to AMC1 to Article 11

ED Decision 2019/021/R

INTEGRITY AND ASSURANCE LEVELS FOR THE MITIGATIONS USED TO REDUCE THE INTRINSIC GROUND RISK CLASS (GRC)

B.1 How to use Annex B

The following Table B-1 provides the basic principles to consider when using SORA Annex B.

	Principle description	Additional information
#1	Annex B provides assessment criteria for the integrity (i.e. safety gain) and assurance (i.e. method of proof) of the applicant's proposed mitigations. The proposed mitigations are intended to reduce the intrinsic ground risk class (GRC) associated with a given operation.	The identification of mitigations is the responsibility of the applicant.
#2	Annex B does not cover the LoI of the competent authority. The LoI is based on the competent authority's assessment of the applicant's ability to perform the given operation.	
#3	A proposed mitigation may or may not have a positive effect in reducing the ground risk associated with a given operation. In the case where a mitigation is available but does not reduce the risk on the ground, its level of integrity should be considered equivalent to 'None'.	
#4	To achieve a given level of integrity/assurance, when more than one criterion exists for that level of integrity/assurance, all the applicable criteria need to be met.	
#5	Annex B intentionally uses non-prescriptive terms (e.g. suitable, reasonably practicable) to provide flexibility to both the applicant and the competent authorities. This does not constrain the applicant in proposing mitigations, nor the competent authority in evaluating what is needed on a case-by-case basis.	
#6	This annex in its entirety also applies to single-person organisations.	

Table B.1 – Basic principles

B.2 M1 – Strategic mitigations for ground risk

M1 mitigations are 'strategic mitigations' intended to reduce the number of people at risk on the ground. To assess the integrity levels of M1 mitigations, the following need to be considered:

(a) the definition of the ground risk buffer and the resulting ground footprint; and

(b) the evaluation of the people at risk.

With the exception of the specific case of a 'tether' provided in the following paragraph (2), the generic criteria to assess the level of integrity (Table B.2) and level of assurance (Table B.3) of the M1 type ground risk mitigations are provided in following paragraph (1).

(1) **Generic criteria**

		Level of integrity		
		Low	**Medium**	**High**
M1 — Strategic mitigations for ground risk	Criterion #1 (Definition of the ground risk buffer)	A ground risk buffer with at least a 1:1 rule[1] or for rotary wing UA defined using a ballistic methodology approach acceptable to the competent authority.	The ground risk buffer takes into consideration: (a) improbable[2] single malfunctions or failures (including the projection of high energy parts such as rotors and propellers) which would lead to an operation outside the operational volume; (b) meteorological conditions (e.g. wind); (c) UAS latencies (e.g. latencies that affect the timely manoeuvrability of the UA); (d) UA behaviour when activating a technical containment measure; and (e) UA performance.	Same as medium[3]
	Comments	*[1] If the UA is planned to operate at an altitude of 150 m, the ground risk buffer should be a minimum of 150 m.*	*[2] For the purpose of this assessment, the term 'improbable' should be interpreted in a qualitative way as 'Unlikely to occur in each UAS during its total life, but which may occur several times when considering the total operational life of a number of UAS of this type'.* *[3] The distinction between a medium and a high level of robustness for this criterion is achieved through the level of assurance (Table 3 below).*	
	Criterion #2 (Evaluation of people at risk)	The applicant evaluates the area of operations by means of on-site inspections or appropriate appraisals to justify lowering the density of the people at risk (e.g. a residential area during daytime when some people may not be present or an industrial area at night time for the same reason).	The applicant evaluates the area of operations by use of authoritative density data (e.g. data from the U-space data service provider) relevant for the proposed area and time of operation to substantiate a lower density of people at risk. If the applicant claims a reduction, due to a sheltered operational environment, the applicant: (a) uses a UA of less than 25 kg and not flying above 174 knots[4], and (b) demonstrates that although the operation is conducted in a populated environment, it is reasonable to consider that most of the non-involved persons will be located within a building[5].	Same as medium.
	Comments	*N/A*	*[4] as per MITRE presentation given during the UAS Technical Analysis and Applications Center (TAAC) conference in 2016 titled 'UAS EXCOM Science and Research Panel (SARP) 2016 TAAC Update' - PR 16-3979* *[5] The consideration of this mitigation may vary based on the local conditions.*	*N/A*

Table B.2 — Level of integrity assessment criteria for ground risk of non-tethered M1 mitigations

		Level of assurance		
		Low	**Medium**	**High**
M1 — Strategic mitigations for ground risk	Criterion #1 (Definition of the ground risk buffer)	The applicant declares that the required level of integrity is achieved[1].	The applicant has supporting evidence to claim that the required level of integrity has been achieved. This is typically done by means of testing, analysis, simulation[2], inspection, design review or through operational experience.	The claimed level of integrity is validated by a competent third party.
	Comments	*[1] Supporting evidence may or may not be available.*	*[2] When simulation is used, the validity of the targeted environment used in the simulation needs to be justified.*	*N/A*
	Criterion #2 (Evaluation of people at risk)	The applicant declares that the required level of integrity has been achieved[3].	The density data used for the claim of risk reduction is an average density map for the date/time of the operation from a static sourcing (e.g. census data for night time ops). In addition, for localised operations (e.g. intra-city delivery or infrastructure inspection), the applicant submits the proposed route/area of operation to the applicable authority (e.g. city police, office of civil protection, infrastructure owner etc.) to verify the claim of a reduced number of people at risk.	Same as medium; however, the density data used for the claim of risk reduction is a near-real time density map from a dynamic sourcing (e.g. cellular user data) and applicable for the date/time of the operation.
	Comments	*[3] Supporting evidence may or may not be available*	*N/A*	*N/A*

Table B.3 — Level of assurance assessment criteria for ground risk of non-tethered M1 mitigations

(2) **Specific criteria in case of use of a tether to reduce people at risk**

When an applicant wants to take credit for a tether to justify a reduction in the number of people at risk:

(a) the tether needs to be considered part of the UAS and assessed based on the criteria below, and

(b) potential hazards created by the tether itself should be addressed through the OSOs defined in Annex E.

The level of integrity criteria for a tethered mitigation is found in Table B.4. The level of assurance for a tethered mitigation is found in Table B.5.

		Level of integrity		
		Low	**Medium**	**High**
M1 — Tethered operation	Criterion #1 (Technical design)	Does not meet the 'medium' level criteria	(a) The length of the line is adequate to contain the UA in the operational volume and reduce the number of people at risk. (b) The strength of the line is compatible with the ultimate loads[1] expected during the operation. (c) The strength of the attachment points is compatible with the ultimate loads[1] expected during the operation. (d) The tether cannot be cut by the rotating propellers.	Same as medium[2]
	Comments	*N/A*	*[1] Ultimate loads are identified as the maximum loads to be expected in service, including all the possible nominal and failure scenarios multiplied by a 1.5 safety factor.* *[2] The distinction between a medium and a high level of robustness for this criterion is achieved through the level of assurance (Table B.5 below).*	
	Criterion #2 (Procedures)	Does not meet the 'medium' level criteria	The applicant has procedures to install and periodically inspect the condition of the tether.	Same as medium[3]
	Comments	*N/A*	*[3] The distinction between a medium and a high level of robustness for this criterion is achieved through the level of assurance (Table B.5 below).*	

Table B.4 — Level of integrity assessment criteria for ground risk tethered M1 mitigations

		Level of assurance		
		Low	**Medium**	**High**
M1 — Tethered operation	Criterion #1 (Technical design)	Does not meet the 'medium' level criteria	The applicant has supporting evidence (including the specifications of the tether material) to claim that the required level of integrity is achieved. (a) This is typically achieved through testing or operational experience. (b) Tests can be based on simulations; however, the validity of the target environment used in the simulation needs to be justified.	The claimed level of integrity is validated by EASA.
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #2 (Procedures)	(a) Procedures do not require validation against either a standard or a means of compliance considered adequate by the competent authority.	(a) Procedures are validated against standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. (b) Adequacy of the procedures is proven through: (1) dedicated flight tests; or (2) simulation, provided the simulation is proven valid for the	Same as medium. In addition: (a) Flight tests performed to validate the procedures cover the complete flight envelope or are proven to be conservative.

		(b) The adequacy of the procedures and checklists is declared.	intended purpose with positive results.	(b) The procedures, flight tests and simulations are validated by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*

Table B.5 — Level of assurance assessment criteria for ground risk tethered M1 mitigations

B.3 M2 — Effects of ground impact are reduced

M2 mitigations are intended to reduce the effect of ground impact once the control of the operation is lost. This is done by reducing the effect of the UA impact dynamics (i.e. the area, energy, impulse, transfer energy, etc.). One example would be the use of a parachute.

		Level of integrity		
		Low/None	**Medium**	**High**
M2 — Effects of UA impact dynamics are reduced (e.g. parachute)	Criterion #1 (Technical design)	Does not meet the 'medium' level criterion	(a) Effects of impact dynamics and post impact hazards[1] are significantly reduced although it can be assumed that a fatality may still occur. (b) When applicable, in case of malfunctions, failures or any combinations thereof that may lead to a crash, the UAS contains all the elements required for the activation of the mitigation. (c) When applicable, any failure or malfunction of the proposed mitigation itself (e.g. inadvertent activation) does not adversely affect the safety of the operation.	Same as medium. In addition: (a) When applicable, the activation of the mitigation is automated[2]. (b) The effects of impact dynamics and post impact hazards are reduced to a level where it can be reasonably assumed that a fatality will not occur[3].
	Comments	*N/A*	*[1] Examples of post impact hazards include fires and the release of high-energy parts.*	*[2] The applicant retains the discretion to implement an additional manual activation function.* *[3] Emerging research and upcoming industry standards will help applicants to substantiate compliance with this integrity criterion.*
	Criterion #2 (Procedures, if applicable)	Any equipment used to reduce the effect of the UA impact dynamics is installed and maintained in accordance with the manufacturer's instructions.[4]		
	Comments / Notes	*[4] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (Table B.7 below).*		
	Criterion #3 (Training, if applicable)	Personnel responsible for the installation and maintenance of the measures proposed to reduce the effect of the UA impact dynamics are identified and trained by the applicant.[5]		
	Comments / Notes	*[5] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (Table B.7 below).*		

Table B.6 — Level of integrity assessment criteria for M2 mitigations

		Level of assurance		
		Low/None	**Medium**	**High**
M2 — Effects of UA impact dynamics are reduced (e.g. parachute)	Criterion #1 (Technical design)	The applicant declares that the required level of integrity has been achieved[1].	The applicant has supporting evidence to claim that the required level of integrity is achieved. This is typically[2] done by means of testing, analysis, simulation[3], inspection, design review or through operational experience.	The claimed level of integrity is validated by EASA against a standard considered adequate by EASA and/or in accordance with means of compliance acceptable to EASA (when applicable).
	Comments	*[1] Supporting evidence may or may not be available.*	*[2] The use of industry standards is encouraged when developing mitigations used to reduce the effect of ground impact.* *[3] When simulation is used, the validity of the targeted environment used in the simulation needs to be justified.*	
	Criterion #2 (Procedures, if applicable)	(a) Procedures do not require validation against either a standard or a means of compliance considered adequate by the competent authority. (b) The adequacy of the procedures and checklists is declared.	(a) Procedures are validated against standards considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority. (b) The adequacy of the procedures is proven through: (1) dedicated flight tests; or (2) simulation, provided that the representativeness of the simulation means is proven for the intended purpose with positive results.	Same as medium. In addition: (a) Flight tests performed to validate the procedures cover the complete flight envelope or are proven to be conservative. (b) The procedures, flight tests and simulations are validated by a competent third party.
	Comments	*N/A*		*N/A*
	Criterion #3 (Training, if applicable)	Training is self-declared (with evidence available)	(a) Training syllabus is available. (b) The UAS operator provides competency-based, theoretical and practical training.	(a) Training syllabus is validated by a competent third party. (b) Remote crew competencies are verified by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*

Table B.7 - Level of assurance assessment criteria for M2 mitigations

B.4 M3 — An ERP is in place, UAS operator validated and effective

An ERP should be defined by the applicant in the event of a loss of control of the operation (*). These are emergency situations where the operation is in an unrecoverable state and in which:

(a) the outcome of the situation relies highly on providence; or

(b) it could not be handled by a contingency procedure; or

(c) when there is a grave and imminent danger of fatalities.

The ERP proposed by an applicant is different from the emergency procedures. The ERP is expected to cover:

(1) a plan to limit the escalating effect of a crash (e.g. to notify first responders), and

(2) the conditions to alert ATM.

(*) Refer to the SORA semantic model (Figure 1) in the main body.

		Level of integrity		
		Low/None	**Medium**	**High**
M3 — An ERP is in place, UAS operator validated and effective	Criteria	No ERP is available, or the ERP does not cover the elements identified to meet a 'medium' or 'high' level of integrity	The ERP: (a) is suitable for the situation; (b) limits the escalating effects; (c) defines criteria to identify an emergency situation; (d) is practical to use; (e) clearly delineates the duties of remote crew member(s).	Same as medium. In addition, in case of a loss of control of the operation, the ERP is shown to significantly reduce the number of people at risk, although it can be assumed that a fatality may still occur.
	Comments	*N/A*	*N/A*	*N/A*

Table B.8 — Level of integrity assessment criteria for M3 mitigations

		Level of assurance		
		Low/None	**Medium**	**High**
M3 — An ERP is in place, UAS operator validated and effective	Criterion #1 (Procedures)	(a) Procedures do not require validation against either a standard or a means of compliance considered adequate by the competent authority. (b) The adequacy of the procedures and checklists is declared.	(a) The ERP is developed to standards considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority. (b) The ERP is validated through a representative tabletop exercise[1] consistent with the ERP training syllabus.	Same as medium. In addition: (a) The ERP and the effectiveness of the plan with respect to limiting the number of people at risk are validated by a competent third party. (b) The applicant has coordinated and agreed the ERP with all third parties identified in the plan. (c) The representativeness of the tabletop exercise is validated by a competent third party.
	Comments	*N/A*	*[1]The tabletop exercise may or may not involve all third parties identified in the ERP.*	*N/A*
	Criterion #2 (Training)	Does not meet the 'medium' level criterion	(a) An ERP training syllabus is available. (b) A record of the ERP training completed by the relevant staff is established and kept up to date.	Same as medium. In addition, competencies of the relevant staff are verified by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*

Table B.9 — Level of assurance assessment criteria for M3 mitigations

Annex C to AMC1 to Article 11

ED Decision 2019/021/R

STRATEGIC MITIGATION — COLLISION RISK ASSESSMENT

C.1 Introduction — air risk strategic mitigations

The target audience for Annex C is the UAS operator who wishes to demonstrate to the competent authority that the risk of a mid-air collision in the operational volume is acceptably safe, and to obtain, with concurrence from the ANSP, approval to operate in the particular airspace.

More particularly, this Annex C covers the process of how the UAS operator justifies lowering the initial assessment of the ARC.

The air risk model provides a holistic means to assess the risk of an encounter with manned aircraft. This provides guidance to both the UAS operator and the competent authority on determining whether an operation can be conducted in a safe manner. The model does not provide answers to all the air risk challenges, and should not be used as a checklist. This guidance provides the UAS operator with suitable mitigation means and thereby reduces the air risk to an acceptable level. This guidance does not contain prescriptive requirements, but rather a set of objectives at various levels of robustness.

C.2 Principles

The SORA is only used to establish an initial ARC for an operational volume when the competent authority has not already established one. The initial ARC is a generalised qualitative classification of the rate at which a UAS would encounter a manned aircraft in the operational volume. A residual ARC is the classification after mitigations are applied. The UAS operational volume may have collision risk levels that differ from the generalised initial ARC level. If this is assumed to be the case, this Annex provides a process to help the UAS operator and the competent authority work to lower the initial ARC through the application of strategic mitigations.

C.3 Air risk scope and assumptions

The scope of this air risk assessment is designed to help the UAS operator and the competent authority in determining the risk of a collision with manned aircraft which are operated under the ‘specific’ category. The scope of the air risk assessment does not include:

(a) the probability of UAS on UAS encounters; or

(b) risks due to wake turbulence, adverse weather, controlled flight into terrain, return-to-course functions, a lost link, or an automatic response.

C.3.1 SORA qualitative vs quantitative approach

This air risk assessment is qualitative in nature. Where possible, this assessment will use quantitative data to back up and support the qualitative assumptions. The SORA approach in general provides a balance between qualitative and quantitative approaches, as well as between known prescriptive and non-traditional methodologies.

C.3.2 SORA U-space assumptions

The SORA has used U-space mitigations to a limited extent, because U-space is in the early stages of development. When U-space provides adequate mitigations to limit the risk of UAS encounters with manned aircraft, a UAS operator can apply for, and obtain credit for these mitigations, whether they are tactical or strategic.

C.3.3 SORA flight rules assumptions

Today, UAS flight operations under the 'specific' category cannot fully comply with the IFR and VFR rules as written. Although IFR infrastructures and mitigations are designed for manned aircraft operations (e.g. minimal safe altitudes, equipage requirements, operational restrictions, etc.), it may be possible for a UAS to comply with the IFR requirements. UAS operating at very low levels (e.g. 400 ft AGL and below) may technically comply with the IFR rules, but the IFR infrastructure was not designed with that airspace in mind; therefore, mitigations for this airspace would be derived, and highly impractical and inefficient. When operating BVLOS, a UAS cannot comply with VFR[1].

Given the above, for the purposes of this risk assessment, it is assumed that the competent authority will address these shortcomings. All aircraft must adhere to specific flight rules to mitigate the collision risk, in accordance with Regulation (EU) No 923/2012[2] (the standardised European rules of the air (SERA) Regulation). The implementation of procedures and guidelines appropriate to the airspace structure reduces the collision risk for all aircraft. For instance, there are equipment requirements established for the airspace requested and requirements associated with day-night operations, pilot training, airworthiness, lighting requirements, altimetry requirements, airspace restrictions, altitude restrictions, etc. These rules must still be addressed by the competent authority.

The Member State is responsible for defining the airspace structures in accordance with Regulation (EU) 2017/373; in addition, as required in Article 15 of the UAS Regulation, the Member State will define the geographical zones for UAS operators. The Member State, when defining the airspace structure, considers the traffic type and complexity and defines the airspace classes and services being provided in accordance with the SERA. This information, which can be published either in the aeronautical information publication (AIP) or any other aeronautical publication, can be used by the UAS operator to identify the initial air risk. The SORA air risk model is a tool to assess the risks associated with UAS operations in a particular volume of airspace, and a method to determine whether those risks are within acceptable safety limits.

C.3.4 Regulatory requirements, safety requirements, and waivers

The SERA Regulation requires all aircraft, manned and UAS, to 'remain well clear from and avoid collisions with' other manned aircraft. The UAS is unable to 'see and avoid', therefore, it must employ an alternate means of compliance to meet the intent of 'see and avoid', which will have to be defined in terms of safety and performance for the UAS operation. When the risk of an encounter with manned aircraft is extremely low (i.e. in atypical/segregated airspace), an alternate means of compliance may not be required. For example, in areas where the manned airspace density is so low, (e.g. in the case of low-level operations in remote parts of Alaska or northern Sweden), the airspace safety threshold could be met with no additional mitigation. UAS operators need to understand that although the airspace may be technically safe to fly in from an air collision risk

[1] A UAS operating under VLOS may be able to comply with VFR.

[2] Commission Regulation (EU) No 923/2012 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.

standpoint, it does not fulfil point SERA.3201 of the SERA Regulation, or the ICAO Annex 2, Section 3.2 'See and Avoid' requirements.

To operate a UAS in manned airspace, two requirements must be met:

(a) A safety requirement that ensures that the operation is safe to conduct in the operational volume; and

(b) A requirement for compliance with point SERA.3201 of the SERA Regulation to 'see and avoid'.

These requirements must be addressed to the competent authority through either:

(1) demonstration of compliance with both requirements;

(2) demonstration of an alternate means of compliance with the requirements; or

(3) a waiver of the requirement(s) by the competent authority.

The SORA provides a means to assess whether the air risks associated with UAS operations is within acceptable limits.

C.3.5 SORA assumptions on threat aircraft

This air risk assessment does not consider the ability of the threat aircraft to remain well clear from or to avoid collisions with the UAS in any part of the safety assessment.

C.3.6 SORA assumptions on people-carrying UAS

This air risk model does not consider the notion of UAS carrying people, or urban mobility operations. The model and the assessment criteria are limited to the risk of an encounter with manned aircraft, i.e. an aircraft piloted by a human on board.

C.3.7 SORA assumptions on UAS lethality

This air risk assessment assumes that a mid-air collision between a UAS and manned aircraft is catastrophic. Frangibility is not considered.

C.3.8 SORA assertion on tactical mitigations

The SORA model makes no distinction between separation provision and collision avoidance but treats them as one dependent system performing a continuous function, whose goals and objectives change over time. This continuum starts with an encounter and progresses to a near mid-air collision objective as the pilot and/or the detect and avoid system of the UA negotiate(s) the encounter. The use of the term 'tactical mitigation' should therefore not be confused with the provisioning of (tactical) separation services referred to in ICAO Doc 9854.

C.4 General air-SORA mitigation overview

SORA classification of mitigations

The SORA classifies mitigations to suit the operational needs of a UAS in the 'specific' class. These mitigations are classified as:

(a) strategic mitigations by the application of operational restrictions;

(b) strategic mitigations by the application of common structures and rules; and

(c) tactical mitigations.

Figure C.5 shows the alignment of the mitigation definitions between ICAO and the SORA.

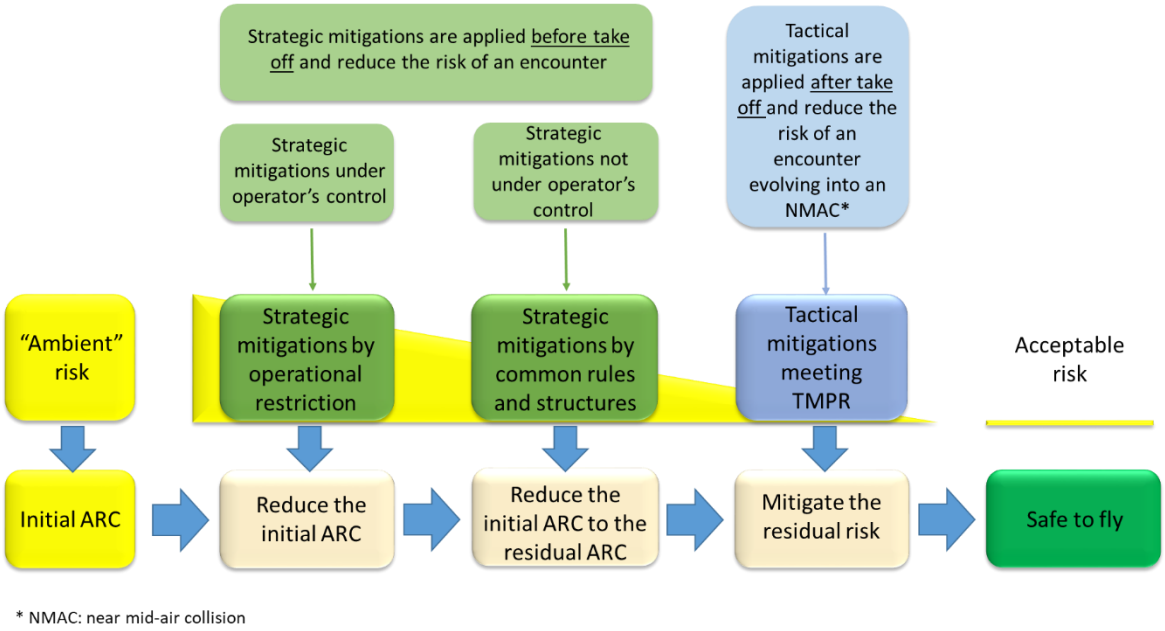


Figure C.5 — SORA air-conflict mitigation process

C.5 Air risk strategic mitigation

Strategic mitigation consists of procedures and operational restrictions intended to reduce the UAS encounter rates or the time of exposure, prior to take-off.

Strategic mitigations are further divided into:

(a) mitigations by operational restrictions which are mitigations that are controlled[1] by the UAS operator; and

(b) mitigations by common structures[2] and rules which are mitigations which cannot be controlled by the UAS operator.

C.5.1 Strategic mitigation by operational restrictions

Operational restrictions are controlled by the UAS operator and are intended to mitigate the risk of a collision prior to take-off. This section provides details on operational restrictions, and examples of how these can be applied to UAS operations.

Operational restrictions are the primary means that a UAS operator can apply to reduce the risk of collision using strategic mitigation(s). The most common mitigations by operational restriction are:

(a) mitigation(s) that bound the geographical volume in which the UAS operates (e.g. certain boundaries or airspace volumes); and

[1] The usage of the word 'controlled' means that the UAS operator is not reliant on the cooperation of other airspace users to implement an effective operational restriction mitigation strategy.

[2] This usage of the word 'structure' means air structure, airways, traffic procedures and the like.

(b) mitigation(s) that bound the operational time frame (e.g. restricted to certain times of day, such as flying only at night).

In addition to the above, another approach to limit exposure to risk is to limit the exposure time. This is called 'mitigation by exposure'. Mitigation by exposure simply limits the time of exposure to the operational risk.

Mitigations that limit the flight time or the exposure time to risk may be more difficult to apply. With this said, there is some precedence for this mitigation, which has (in some cases) been accepted by the competent authority. Therefore, even though it is considered to be difficult, this mitigation strategy may be considered.

One example is the minimum equipment list (MEL) system, which allows, in certain situations, a commercial airline to fly for three to ten days with an inoperative traffic collision avoidance system (TCAS). The safety argument is that three days is a very short exposure time compared with the total life-time risk exposure of the aircraft. This short time of elevated risk exposure is justified to allow the aircraft to return to a location where proper equipment maintenance can take place. While appreciating that this may be a difficult argument for the UAS operation to make, the UAS operator is still free to pursue this line of reasoning for a reduction in the risk of collision by applying a time of exposure argument.

C.5.1.1. Example of operational restriction by geographical boundary

The UAS operator intends to fly in a Class B airport airspace. The Class B airspace, as a whole, has a very high encounter rate. However, the UAS operator wishes to operate at a very low altitude and at the very outer reaches of the Class B airspace where manned aircraft do not routinely fly. The UAS operator draws up a new operational volume at the outer edge of the class B airspace and demonstrates that operations within the new Class B volume have very low encounter rates.

The UAS operator may approach this scenario by requesting the competent authority to more precisely define the airport environment from the SORA perspective. The UAS operator then considers the newly defined airport environment, and provides an operational restriction that allows the UAS operation to safely remain inside the class B airspace, but outside the newly defined SORA airport environment.

C.5.1.2 Example of operational restriction by time limitations

The UAS operator wishes to fly in a Class B airport airspace. The Class B airspace, as a whole, has a very high encounter rate. However, the UAS operator wishes to operate at a time of day when manned aircraft do not routinely fly. The UAS operator then restricts the time schedule of the UAS operation and demonstrates that the new time (e.g. 03:00 / 3 AM and still within Class B) has very low encounter rates and is safe for operation.

C.5.1.3 Example of operational restriction by time of exposure

The UAS operator wishes to cut the corner of a Class B airspace for flight efficiency. The UAS operator demonstrates that even though the Class B airspace has a high encounter rate, the UAS is only exposed to that higher rate for a very short amount of time as it transitions the corner.

C.5.2 Strategic mitigation by common structures[1] and rules

Strategic mitigation by common structures and rules requires all aircraft within a certain class of airspace to follow the same structures and rules; these structures and rules work to lower the risk of collision within the airspace. In accordance with the SERA Regulation, all aircraft in that airspace must participate, and only the competent authorities have the authority to set requirements for those aircraft, while the ANSP and ATCO provide instructions. The UAS operator does not have control[2] over the existence or level of participation of the airspace structure or the application of the flight rules. Therefore, strategic mitigation by common structures and rules is applied by the competent authorities. These should be made available to the UAS operator through the geographical zones, defined in accordance with Article 15 of the UAS Regulation.

For example, imagine the situation if individual drivers could create their own driving rules to cover their direction, lanes, boundaries and speed. If the driving rules were different from one driver to another, no safety benefit would be gained, even though they were all following rules (their own), and total chaos would ensue. However, if all drivers were compelled to follow the same set of rules, then the traffic flow would be orderly, with increased safety for all drivers. This is why a UAS operator cannot propose a mitigation schema requiring participation from other airspace users that differs from that required by the competent authority.

Most strategic mitigations by common structures and rules will take the form of:

(a) common flight rules; and

(b) common airspace structures.

Strategic mitigations by common flight rules is accomplished by setting a common set of rules which all airspace users must comply with. These rules reduce air conflicts and/or make conflict resolution easier. Examples of common flight rules that reduce the collision risk include right of way rules, implicit and explicit coordination schemes, conspicuity requirements, cooperative identification system, etc.

Strategic mitigation by using a common airspace structure is accomplished by controlling the airspace infrastructure through physical characteristics, procedures, and techniques that reduce conflicts or make conflict resolution easier. Examples of common flight airspace structures which reduce the risk of collision are airways, departure and approach procedures, airflow management, etc.

In the future, as U-space structures and rules become more readily defined and adopted, they will provide a source for the strategic mitigation of UAS operations by common structures and rules that UAS operators could more easily apply.

[1] This usage of the word ‘structure’ means air structure, airways, traffic procedures and the like.

[2] The usage of the words ‘does not control’ means that the UAS operator does not have control over the implementation of aviation structures and rules and is reliant on the competent authority to implement structures and rules.

C.5.2.1 Example of mitigation by common flight rules

The UAS operator intends to fly in a volume of airspace in which the competent authority requires all UAS to be equipped with an electronic cooperative system[1] and anti-collision lighting. The rules further require the UAS operator to file a flight plan with the designated ANSP/U-space service providers, and check for potential hazards along the whole flight route. The operator complies with these requirements and installs anti-collision lights and a Mode-S Transponder. The operator further agrees to file a flight plan prior to each flight. These rules enhance the safety of the flight in the same way as a notice to airmen (NOTAM). The UAS operator should also have a system in place to check for high airspace usage in the intended operational volume (e.g. a glider competition or a fly-in). In those situations where the UAS operator does not own the airspace in which the operational volume exists, the rules require the UAS operator to request permission prior to entering that airspace.

C.5.2.2. Examples of mitigation by common airspace structure

Example 1: The competent authority establishes a transit corridor through Class B airspace that keeps the UAS separated from other non-UAS airport traffic, and safely separates the corridor traffic in one direction from the traffic in the other direction. The UAS operator intends to fly through this Class B airport airspace, and hence must stay within the established transit corridor and adhere to the transit corridor rules.

Example 2: The UAS operator intends to fly a UAS from one location to another, and files a flight plan with a U-space service provider or the procedural separation system. As the UAS takes off, the U-space service provider then guarantees separation by procedural control of all the aircraft in the airspace. Procedural controls are the take-off windows, reporting points, assigned airways and altitudes, route clearances, etc. required for safe operation.

C.6 Reducing the initial air risk class (ARC) assignment (optional)

This section is intended for an applicant that intends to use strategic mitigations to reduce the collision risk (i.e. ARC). There are two types of ARC:

(a) the initial ARC, which is a qualitative classification of a UAS operational collision risk within an operational volume before strategic mitigations are applied; and

(b) the residual ARC, which is a qualitative classification of a UAS operational collision risk in an operational volume after all strategic mitigations are applied.

If a UAS operator agrees that the (generalised) initial ARC applicable to their operation and operational volume is correct, then this step is not necessary, and the assessment should continue at SORA Step #6 (assigning the DAA tactical performance requirement and robustness levels based on the residual collision risk).

If mitigations to reduce the ARC are relevant and are proposed, this section provides information and examples of how to use strategic mitigation(s) to lower the collision risk within the operational volume, and demonstrate the strategy to a competent authority. The examples within the SORA may or may not be applicable or acceptable to the competent authority;

[1] The installation of an electronic cooperative system would make the UAS a cooperative aircraft in accordance with FAA Interim Operational Approval Guidance 08-01, 'Unmanned Aircraft Systems Operations in the U.S. National Airspace System,' Federal Aviation Administration, FAA/AIR-160, 2008.

however, the SORA encourages an open dialogue between the applicant and the competent authority to determine what is acceptable evidence.

C.6.1 Lowering the initial ARC to the residual ARC-a in any operational volume (optional)

ARC-a is intended for operations in atypical/segregated airspace (see Table C.1). Lowering the initial ARC to residual ARC-a requires a higher level of safety verification because it allows a UAS operator to operate without any tactical mitigation.

To demonstrate that an operation could be reduced to a residual ARC-a, the UAS operator should demonstrate:

(a) that the operational volume can meet the requirements of SORA atypical/segregated airspace; and

(b) compliance with any other requirements mandated by the competent authority for the intended operational volume.

A residual ARC-a assessment does necessarily exempt the UAS operator from the requirements to 'see and avoid' and to 'remain well clear from' other aircraft. If the designated competent authority allows the UAS operator a residual ARC-a assessment for the operational volume, in order to comply with the SERA Regulation, the UAS operator must either provide a valid means and equipment as an alternate means of compliance for the 'see and avoid' requirement, or the competent authority must waive the requirement to 'see and avoid' and 'remain well clear.'

C.6.2 Lowering the initial ARC using operational restrictions (optional)

There may be many methods by which a UAS operator may wish to demonstrate a suitable air risk and strategic mitigations. The SORA does not dictate how this is achieved, and instead, allows the applicant to propose and demonstrate the suitability and effectiveness of their strategic mitigations. It is important for both the UAS operator and the competent authority to understand that the assessment may be qualitative in nature, and where possible, augmented with quantitative data to support the qualitative assumptions and decisions. The UAS operator and the competent authority should understand there may not be a clear delineation of the decision points, so common sense and the safety of manned aircraft should be of paramount consideration.

The SORA provides a two-step method to reduce the air risk by operational mitigation. The first step is to determine the initial ARC by using the potential air risk encounter rate based on known airspace densities (as per Table C.1). The second step is to reduce the initial risk through UAS operator-provided evidence that demonstrates that the intended operation is more indicative of another airspace volume and an encounter rate that corresponds to a lower risk classification (ARC); hence, reducing the initial ARC to a residual ARC (as per Table C.2). This requires the agreement of the competent authority before the ARC may be reduced.

The SORA used expertise from subject matter experts to rate the airspace encounter category (AEC) and the variables that influence the encounter rates (i.e. proximity, geometry, and dynamics). The variables are not interdependent, nor do they influence the encounter outcome in the same manner. A small increase in one encounter rate variable can have major effects on the collision risk; conversely, a small increase in another variable could have limited effect on the collision risk. Hence, lowering the aircraft density of an AEC airspace does not equate to a direct and equal lowering of the

ARC risk level. There is no direct correlation between an individual AEC variable and the ARC collision risk levels. In summary:

(a) there are three inter-dependent variables that affect the ARC;

(b) the contribution of each variable to the total collision risk is not the same; and

(c) for simplicity, the SORA only allows the manipulation of one of the variables: the proximity, i.e. the aircraft density.

The first step to potentially lowering the ARC is to determine the AEC and the associated density rating using Table C.1. 12 operational/airspace environments were considered for the SORA air risk classification, and they correspond to the 12 scenarios found in Figure 4 of the SORA main body.

Operational environment, AEC and ARC			
Operations in:	**Initial generalised density rating**	**Corresponding AEC**	**Initial ARC**
Airport/heliport environment			
OPS in an airport/heliport environment in class B, C or D airspace	5	AEC 1	ARC-d
OPS in an airport/heliport environment in class E airspace or in class F or G	3	AEC 6	ARC-c
Operations above 400 ft AGL but below flight level 600			
OPS > 400 ft AGL but < FL 600 in a Mode-S Veil or transponder mandatory zone (TMZ)	5	AEC 2	ARC-d
OPS > 400 ft AGL but < FL 600 in controlled airspace	5	AEC 3	ARC-d
OPS > 400 ft AGL but < FL 600 in uncontrolled airspace over an urban area	3	AEC 4	ARC-c
OPS > 400 ft AGL but < FL 600 in uncontrolled airspace over a rural area	2	AEC 5	ARC-c
Operations below 400 ft AGL			
OPS < 400 ft AGL in a Mode-S Veil or TMZ	3	AEC 7	ARC-c
OPS < 400 ft AGL in controlled airspace	3	AEC 8	ARC-c
OPS < 400 ft AGL in uncontrolled airspace over an urban area	2	AEC 9	ARC-c
OPS < 400 ft AGL in uncontrolled airspace over a rural area	1	AEC 10	ARC-b
Operations above flight level 600			
OPS > FL 600	1	AEC 11	ARC-b
Operations in atypical or segregated airspace			
OPS in atypical/segregated airspace	1	AEC 12	ARC-a

Table C.1 – Initial air risk category assessment

After determining the initial risk using Table C.1, an applicant may choose to reduce that risk using Table C.2. To understand Table C.2, the first column shows the AEC in the environment in which the UAS operator wishes to operate. Column A shows the associated airspace density rating for that AEC rated from 5 to 1, with 5 being very high density, and 1 being very low density.

Column B shows the corresponding initial ARC.

Column C is key to lowering the initial ARC. This column shows the relative density ratings that a UAS operator should demonstrate to the competent authority in order to argue and justify that the actual local air density rating of the operational area is lower than the rating associated with the initial AEC (Column A) in Table C.1. If this can be shown and accepted by the competent authority, then the new lower ARC level as shown in column D may be applicable.

As stated earlier, the UAS operator is responsible for collecting and analysing the airspace density and for demonstrating the effectiveness of their proposal for strategic mitigations by operational restrictions to the competent authority. In summary, the UAS operator should demonstrate that the restrictions imposed on the UAS operation can lower the risk of a collision by showing that the local airspace encounter rate, under the operational restrictions, is lower than the generalised AEC assessed encounter rate provided in Table C.1.

The strategic mitigation reduction case should be modelled after a safety case. The size and complexity of the strategic mitigation reduction depends entirely on what the UAS operator is trying to do, and where/when they want to do it. The strategic mitigation case as a safety case has two advantages. Firstly, it provides the UAS operator with a structured approach to describe and capture the operation, the hazards identified, the risk analysed, and the threat(s) mitigated. Secondly, it provides a safety case structure that a competent authority is familiar with, which, in turn, helps the competent authority to understand the UAS operator's intended operation and their reasoning as to why a reduction in the ARC can be safely justified.

As each authority is different, the SORA recommends the applicant to contact the competent authority and/or ANSP to determine the format and presentation of the strategic mitigation reduction case.

The density rating of manned aircraft, assessed on a scale of 1 to 5, with 1 representing a very low density and 5 representing a very high density.				
Column	A	B	C	D
AEC	Initial generalised density rating for the environment	Initial ARC	If the local density can be demonstrated to be similar to:	New lowered (residual) ARC
AEC 1 or; AEC 2	5	ARC-d	4 or 3	ARC-c
			2 or 1[Note 1]	ARC-b
AEC 3	4	ARC-d	3 or 2	ARC-c
			1[Note 1]	ARC-b
AEC 4	3	ARC-c	1[Note 1]	ARC-b
AEC 5	2	ARC-c	1[Note 1]	ARC-b
AEC 6 or; AEC 7 or; AEC 8	3	ARC-c	1[Note 1]	ARC-b
AEC 9	2	ARC-c	1[Note 1]	ARC-b
Note 1: The reference environment for assessing density is AEC 10 (OPS < 400 ft AGL over rural areas).				
AEC10 and AEC 11 are not included in this table, as any ARC reduction would result in ARC-a. A UAS operator claiming a reduction to ARC-a should demonstrate that all the requirements that define atypical or segregated airspace have been met.				

Table C.2

To fully understand the above, the SORA provides three examples.

Example 1:

A UAS operator is intending to operate in an airport/heliport environment, in class C airspace, which corresponds to AEC 1.

The UAS operator enters the initial ARC reduction table at Row AEC 1. Column A shows that the generalised airspace density of this environment is 5. Column B shows the associated initial ARC as ARC-d. Column C indicates that if a UAS operator can demonstrate that the actual, local airspace density corresponds to a generalised density rating of 3 or 4, then the ARC level may be reduced to a residual ARC-c (Column D). If a UAS operator demonstrates that the local airspace density corresponds more to scenarios with a density of 2 or 1, then the ARC level may be lowered to a residual ARC-b (Column D).

Example 2:

A UAS operator is intending to operate in an airport/heliport environment, in class G airspace, with a corresponding level of AEC 6.

The UAS operator enters the initial ARC reduction table at Row AEC 6. Column A shows that the generalised airspace density rating that corresponds with this environment is 3. Column B shows the associated initial ARC as ARC-c. Column C indicates that if a UAS operator can demonstrate that the actual, local, airspace density corresponds more to the reference scenario that has a generalised density rating of 1, namely AEC 10, then the residual ARC level may be reduced to ARC-b (Column D).

Example 3:

A UAS operator is intending to operate below 400 ft AGL, in a class G (uncontrolled) airspace, over an urbanised area, with a corresponding level of AEC 9.

The UAS operator enters the initial ARC reduction table at Row AEC 9. Column A indicates that the generalised airspace density rating corresponding with this environment is 2. Column B shows the associated initial ARC is ARC-c. Column C indicates that if a UAS operator demonstrates that the local airspace density corresponds more to a density rating of 1, namely AEC 10, then the residual ARC level may be reduced to ARC-b (Column D).

C.6.3 Lowering the initial ARC by common structures and rules (optional)

Today, aviation airspace rules and structures mitigate the risk of collision. As the airspace risk increases, more structures and rules are implemented to reduce the risk. In general, the higher the aircraft density, the higher the collision risk, and the more structures and rules are required to reduce the collision risk.

In general, manned aircraft do not use very low level (VLL) airspace, as it is below the minimum safe height to perform an emergency procedure, ‘unless at such a height as will permit, in the event of an emergency arising, a landing to be made without undue hazard to persons or property on the surface’ (Ref. point SERA.3105 of the SERA Regulation). Subject to permission from the competent authority, special flights may be granted permission to use this airspace. Every aircraft will cross VLL airspace in an airport environment for take-off and landing.

With the advent of UAS operations, VLL airspace is expected to soon become more crowded, requiring more common structures and rules to lower the collision risk. It is

anticipated that U-space services will provide these risk mitigation measures. This will require mandatory participation by all aircraft in that airspace, similar to how the current flight rules apply to all manned aircraft operating in a particular airspace today.

The SORA does not allow the initial ARC to be lowered through strategic mitigation by common structures and rules for all operations in AEC 1, 2, 3, 4, 5, and 11.[1] Outside the scope of the SORA, a UAS operator may appeal to the competent authority to lower the ARC by strategic mitigation by using common structures. The determination of acceptability falls under the normal airspace rules, regulations and safety requirements for ATM/ANS providers.

Similarly, the SORA does not allow for lowering the initial ARC through strategic mitigation by using common structures and rules for all operations in AEC 10[2].

The maximum amount of ARC reduction through strategic mitigation by using common structures and rules is by one ARC level.

The SORA does allow for lowering the initial ARC through strategic mitigation by structures and rules for all operations below 400 ft AGL within VLL airspace (AECs 7, 8, 9 and 10).

To claim an ARC reduction, the UAS operator should show the following:

(a) the UA is equipped with an electronic cooperative system, and navigation and anti-collision lighting[3];

(b) a procedure has been implemented to verify the presence of other traffic during the UAS flight operation (e.g. checking other aircraft's filed flight plans, NOTAMs[4], etc.);

(c) a procedure has been implemented to notify other airspace users of the planned UAS operation (e.g. filing of the UAS flight plan, applying for a NOTAM from the service provider for UAS[5] operations, etc.);

(d) permission has been obtained from the airspace owner to operate in that airspace (if applicable);

(e) compliance with the airspace UAS flight rules, the UAS Regulation, and the policies, etc. applicable to the UAS operational volume and with which all/most aircraft are required to comply (these flight rules, the UAS Regulation, and policies are aimed primarily at UAS operations in VLL airspace);

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1 AEC 1, 2, 3, 4, and 5 already have manned airspace rules and structures defined by Regulation (EU) No 923/2012. Any UAS operating in these types of airspace shall comply with the applicable airspace rules, regulations and safety requirements. As such, no lowering of the ARC by common structures and rules is allowed, as those mitigations have already been accounted for in the assessment of those types of airspace. Lowering the ARC for rules and structures in AEC 1, 2, 3, 4, 5, and 11 would amount to double counting of the mitigations.

2 AEC 10: the initial ARC is ARC-b. To lower the ARC in these volumes of airspace (to ARC-a) requires the operational volume to meet one of the requirements of atypical/segregated Airspace.

3 Although the SORA takes into account the questionable effects of anti-collision lighting, it also takes into account that the installation of anti-collision lights is often relatively simple and has a net positive effect in preventing collisions.

4 Although NOTAMs are used here as an example, the use of NOTAMs may not be acceptable unless they cover all operations in VLL airspace. It is envisioned that a separate system like that of NOTAMs, which specifically addresses the concerns of VLL airspace, will fulfil this requirement.

5 Although flight plans and posting NOTAMS are used here as examples, the use of flight plans and NOTAMs may not be acceptable unless they cover all operations in VLL airspace. It is envisioned that a separate system, which specifically addresses the concerns of VLL airspace, will fulfil this requirement.

(f) a UAS airspace structure (e.g. U-space) exists in VLL airspace to help keep UAS separated from manned aircraft. This structure must be complied with by all UAS in accordance with the EU[1] or national regulations;

(g) a UAS airspace procedural separation service has been implemented for VLL airspace. The use of this service must be mandatory for all UAS to keep UAS separated from manned aircraft[2] in accordance with the SERA Regulation; and

(h) all UAS operators can directly communicate with the air traffic controller or flight information services directly or through a U-space service provider in accordance with the SERA Regulation (EU).

C.6.3.1 Demonstration of strategic mitigation by structures and rules

The UAS operator is responsible for collecting and analysing the data required to demonstrate the effectiveness of their strategic mitigations by structures and rules to the competent authority.

C.7 Determination of the residual ARC risk level by the competent authority

As stated before, the UAS operator is responsible for collecting and analysing the data required to demonstrate the effectiveness of all their strategic mitigations to the competent authority.

The competent authority makes the final determination of the airspace residual ARC level.

Caution: As the SORA breaks down collision mitigation into strategic and tactical parts, there can be some overlap between all these mitigations. The UAS operator and the competent authority need to be cognisant and to ensure that mitigations are not counted twice.

Although the static generalised risk (i.e. ARC) is conservative, there may be situations where that conservative assessment may be insufficient. In those situations, the competent authority may raise the ARC to a level that is higher than that advocated by the SORA.

For example, a UAS operator surveys a forest near an airport for beetle infestation, and the airspace was assessed as being ARC-b. The airport is hosting an air show. The competent authority informs the UAS operator that during the week of the air show, the ARC for that local airspace will be ARC-d. The UAS operator can either equip for ARC-d airspace or suspend operations until the air show is over.

[1] The U-space regulation and the relevant adaptation of SERA will apply

[2] This refers to possible future applications of an automated traffic management separation service for unmanned aircraft in a U-space environment. These applications may not exist as such today. A subscription to these services may be required.

Annex D to AMC1 to Article 11

ED Decision 2019/021/R

TACTICAL MITIGATION COLLISION RISK ASSESSMENT

D.1 Introduction-tactical mitigation

The target audience for Annex D is the UAS operator who wishes to apply TMPR, robustness, integrity, and assurance levels for their operation.

Annex D provides the tactical mitigation(s) used to reduce the risk of a mid-air collision. The TMPR is driven by the residual collision risk of the airspace. Some of these tactical mitigations may also provide means of compliance with point SERA.3201 of the SERA Regulation, and the additional requirements of various states.

The air-risk model has been developed to provide a holistic method to assess the risk of an air encounter, and to mitigate the risk that an encounter develops into a mid-air collision. The SORA air-risk model guides the UAS operator, the competent authority, and/or ANSP in determining whether an operation can be conducted in a safe manner. This Annex is not intended to be used as a checklist, nor does it provide answers to all the challenges of DAA. The guidance allows a UAS operator to determine and apply a suitable means of mitigation to reduce the risk of a mid-air collision to an acceptable level. This guidance does not contain prescriptive requirements, but rather objectives to be met at various levels of robustness.

D.2 Principles

The mitigation of the risk that an encounter develops into a mid-air collision is a highly dynamic, variable, and complicated process. To simplify the process, the air-risk model takes a more qualitative approach to arrive at an initial aggregated airspace risk assessment. After an assessment of the initial, unmitigated risk of an encounter, and optional application of strategic mitigations, this Annex assigns a performance requirement on the UAS operation to mitigate the remaining collision hazard (i.e. the residual airspace risk).

D.3 Scope, assumptions and definitions

See Annex C for the scope and assumptions

D.4 Knowledge of terms and definitions

To understand this section, the following SORA definitions need to be understood:

(a) atypical/segregated vs other airspace;

(b) AEC (see Annex C);

(c) initial ARC (see Annex C);

(d) residual ARC (see Annex C);

(e) ICAO conflict management (see ICAO Doc 9854, Section 2.7);

(f) strategic mitigation (see Annex C);

(g) tactical mitigations and feedback loops; and

(h) VLOS and BVLOS.

D.5 TMPR assignment

A tactical mitigation is a mitigation applied after take-off, and for the air risk model, it takes the form of a ‘mitigating feedback loop’. This feedback loop is dynamic in that it reduces the rate of

collision by modifying the geometry and dynamics of the aircraft in conflict, based on real-time aircraft conflict information.

SORA tactical mitigations are applied to cover the gap between the residual risk of an encounter (the residual ARC) and the airspace safety objectives. The residual risk is the remaining collision risk after all strategic mitigations are applied.

D.5.1 Two classifications of tactical mitigation

There are two classifications of tactical mitigations within the SORA, namely:

(a) VLOS, whereby a pilot and/or observer uses (use) human vision to detect aircraft and take action to remain well clear from and avoid collisions with other aircraft.

(b) BVLOS, whereby an alternate means of mitigation to human vision, as in machine or machine assistance[1], is applied to remain well clear from and avoid collisions with other aircraft (e.g. ATC separation services, TCAS, DAA, U-space, etc.).

D.5.2 TMPR using VLOS

Originally the regulations for 'see and avoid' and 'avoid collisions', defined in point SERA.3201 of the SERA Regulation, assumed that a pilot was on board the aircraft. With UA, this assumption is no longer valid, as the aircraft is piloted remotely.

Under VLOS, the pilot/UAS operator accomplishes 'see and avoid' by keeping the UAS within their VLOS. The UAS remains close enough to the remote pilot/observer to allow them to see and avoid another aircraft with human vision unaided by any device other than, perhaps, corrective lenses. VLOS is generally considered an acceptable means of compliance with the 'remain well clear from' and 'avoiding collisions' requirements of point SERA.3201 of the SERA Regulation.

VLOS generally provides sufficient mitigation for cases where the requirements for tactical mitigations are low, medium, and high. Different states may have other rules and restrictions for VLOS operations (e.g. altitudes, horizontal distances, times for relaying critical flight information, UAS operator/observer training, etc.). In some situations, the competent authority may decide that VLOS does not provide sufficient mitigation for the airspace risk, and may require compliance with additional rules and/or requirements. It is the UAS operators' responsibility to comply with these rules and requirements.

The UAS operator should produce a documented VLOS de-confliction scheme, explaining the methods that will be applied for detection and the criteria used to avoid incoming traffic. If the remote pilot relies on detection by observers, the use of communication phraseology, procedures, and protocols should be described. Since the VLOS operation may be sufficiently complex, a requirement to document and approve the VLOS strategy is necessary before approval by the competent authority.

The use of VLOS as a mitigation does not exempt the UAS operator from performing the full SORA risk analysis.

D.5.3 TMPR using BVLOS

Since VLOS has operational limitations, there was a concerted effort to find an alternate means of compliance with the human 'see and avoid' requirements. This alternate means of mitigation is loosely described as 'detect and avoid (DAA)'. DAA can be achieved in several ways, e.g. through ground-based DAA systems, air-based DAA systems, or some

[1] For the purposes of this dissection, systems like ATC separation services would be considered to be machine assisted.

combination of the two. DAA may incorporate the use of various sensors, architectures, and even involve many different systems, a human in the loop, on the loop, or no human involvement at all.

TMPR provides tactical mitigations to assist the pilot in detecting and avoiding traffic under BVLOS conditions. The TMPR is the amount of tactical mitigation required to further mitigate the risks that could not be mitigated through strategic mitigation (the residual risk). The amount of residual risk is dependent on the ARC. Hence, the higher the ARC, the greater the residual risk, and the greater the TMPR.

Since the TMPR is the total performance required by all tactical mitigation means, tactical mitigations may be combined. When combining multiple tactical mitigations, it is important to recognise that the mitigation means may interact with each other, depending on the level of interdependency. This may negatively affect the effectiveness of the overall mitigation. Care should be exercised not to underestimate the negative effects of interactions between mitigation systems. Regardless of whether mitigations or systems are dependent or independent, when they act on the same event, unintended consequences may occur.

D.5.3.1 TMPR assignment risk ratio

The SORA TMPR is based on the findings of several studies. These studies provide performance guidance using risk ratios. Table shows the SORA TMPR risk ratio requirements derived from those studies.

Air-Risk Class	TMPR	TMPR system risk ratio objectives
ARC-d	**high performance**	**system risk ratio ≤ 0.1**
ARC-c	medium performance	system risk ratio ≤ 0.33
ARC-b	low performance	system risk ratio ≤ 0.66
ARC-a	No performance requirement	No system risk ratio guidance; although the UAS operator/applicant may still need to show some form of mitigation as deemed necessary by the competent authority

Table D.1 — TMPR risk ration requirements table

Table provides TMPR qualitative criteria as a qualitative means of compliance to help UAS operators translate the risk ratio quantitative values found in Table D.1 into system qualitative functional requirements. Table D.3 provides guidance for the TMPR integrity and assurance objectives for compliance with the objectives of Table C.1.

For the purpose of this assessment, the objectives of Table D.1 take precedence over the guidance provided in Tables D.2 and D.3.

D.5.3.2 TMPR qualitative criterion table

Table D.2, below, shows more qualitative criteria for the different functions and levels of the TMPR. The qualitative criteria are divided into five sub-functions of DAA, namely: detect, decide, command, execute, and the feedback loop. Where reference is made to the detection of a percentage of all aircraft, this should be

read as a detection rate of the overall mix of aircraft anticipated to be encountered in the detection volume, and not limited to the detection of just the subset of aircraft in the mix.

	Function	TMPR Level				
		VLOS	No Requirement (ARC-a)	Low (ARC-b)	Medium (ARC-c)	**High (ARC-d)**
Tactical mitigation performance requirements (TMPR)	Detect[1]	No Requirement	No Requirement	The expectation is for the applicant's DAA Plan to enable the operator to detect approximately 50 % of all aircraft in the detection volume[2]. This is the performance requirement in the absence of failures and defaults. It is required that the applicant has awareness of most of the traffic operating in the area in which the operator intends to fly, by relying on one or more of the following: • Use of (web-based) real time aircraft tracking services • Use Low Cost ADS-B In /UAT/FLARM[3]/Pilot Aware[3] aircraft trackers • Use of UTM/U-space Dynamic Geofencing[4] • Monitoring aeronautical radio communications (e.g. use of a scanner)[5]	The expectation is for the applicant's DAA Plan to enable the operator to detect approximately 90 % of all aircraft in the detection volume[2]. To accomplish this, the applicant will have to rely on one or a combination of the following systems or services: • Ground based DAA /RADAR • FLARM [3/6] • Pilot Aware [3/6] • ADS-B In/ UAT In Receiver[6] • ATC Separation Services[7] • UTM/U-space Surveillance Service[4] • UTM/U-space Early Conflict Detection and Resolution Service[4] • Active communication with ATC and other airspace users[5]. The operator provides an assessment of the effectiveness of the detection tools/methods chosen.	A system meeting RTCA SC-228 or EUROCAE WG-105 MOPS/MASPS (or similar) and installed in accordance with applicable requirements.

[1]For an in-depth understanding of the derivation, please see Annex G. Detection should be done with adequate precision for the avoidance manoeuvre to be effective.

[2]The detection volume is the volume of airspace (temporal or spatial measurement) which is required to avoid a collision (and remain well clear if required) with manned aircraft. It can be thought of as the last point at which a manned aircraft must be detected, so that the DAA system can performance all the DAA functions. The detection volume in not tied to the sensor(s) Field of View/Field of Regard. The size of the detection volume depends on the aggravated closing speed of traffic that may reasonably be encountered, the time required by the remote pilot to command the avoidance manoeuvre, the time required by the system to respond and the manoeuvrability and performance of the aircraft. The detection volume is proportionally larger than the alerting threshold.

[3]FLARM and PilotAware are commercially available (trademarked) products/brands. They are referenced here only as example technologies. The references do not imply an endorsement by the approval authority for the use of these products. Other products offering similar functions may also be used.

[4]These refer to possible future applications of automated traffic management systems for unmanned aircraft in an UTM/U-space environment. These applications may not exist as such today.

[5]If permitted by the authority. May require a Radio-License or Permit.

[6]The selection of systems to aid in electronic detection of traffic should be made considering the average equipment of the majority of aircraft operating in the area. For example: in areas where many gliders are known to operate, the use of FLARM or similar systems should be considered whereas for operations in the vicinity of large commercially operated aircraft, ADS-B IN is probably more appropriate. These refer to possible future applications of automated traffic management systems for unmanned aircraft in an UTM/U-space environment. These applications may not exist as such today. A subscription to these services may be required.

[7]The selection of systems to aid in electronic detection of traffic should be made considering the average equipment of the majority of aircraft operating in the area.

	Function	TMPR Level				
		VLOS	No Requirement (ARC-a)	Low (ARC-b)	Medium (ARC-c)	**High (ARC-d)**
Tactical mitigation performance requirements (TMPR)	Decide	No Requirement	No Requirement	The UAS operator should have a documented de-confliction scheme, in which the UAS operator explains which tools or methods will be used for detection and what the criteria are that will be applied for the decision to avoid incoming traffic. In case the remote pilot relies on detection by someone else, the use of phraseology will have to be described as well. Examples: • The operator will initiate a rapid descend if traffic is crossing an alert boundary and operating at less than 1000ft. • The observer monitoring traffic uses the phrase: 'DESCEND!, DESCEND!, DESCEND!'.	All requirements of ARC-b and in addition: 1. The operator provides an assessment of the human/machine interface factors that may affect the remote pilot's ability to make a timely and appropriate decision. 2. The UAS operator provides an assessment of the effectiveness of the tools and methods utilised for the timely detection and avoidance of traffic. In this context timely is defined as enabling the remote pilot to decide within 5 seconds after the indication of incoming traffic is provided. The UAS operator provides an assessment of the failure rate or availability of any tool or service the UAS operator intends to use.	A system meeting RTCA SC-228 or EUROCAE WG-105 MOPS/MASPS (or similar) and installed in accordance with applicable requirements.

	Function	TMPR Level				
		VLOS	No Requirement (ARC-a)	Low (ARC-b)	Medium (ARC-c)	**High (ARC-d)**
Tactical mitigation performance requirements (TMPR)	Command	No Requirement	No Requirement	The latency of the whole command (C2) link, i.e. the time between the moment that the remote pilot gives the command and the airplane executes the command should not exceed 5 seconds.	The latency of the whole command (C2) link, i.e. the time between the moment that the remote pilot gives the command and the airplane executes the command should not exceed 3 seconds.	A system meeting RTCA SC-228 or EUROCAE WG-105 MOPS/MASPS (or similar) and installed in accordance with applicable requirements.

	Function	TMPR Level				
		VLOS	No Requirement (ARC-a)	Low (ARC-b)	Medium (ARC-c)	**High (ARC-d)**
Tactical mitigation performance requirements (TMPR)	Execute	No Requirement	No Requirement	UAS descending to an altitude not higher than the nearest trees, buildings or infrastructure or ≤ 60 feet AGL is considered sufficient. The aircraft should be able to descend from its operating altitude to the 'safe altitude' in less than a minute.	Avoidance may rely on vertical and horizontal avoidance manoeuvring and is defined in standard procedures. Where horizontal manoeuvring is applied, the aircraft shall be demonstrated to have adequate performance, such as airspeed, acceleration rates, climb/descend rates and turn rates. The following are suggested minimum performance criteria:[10] • Airspeed: ≥ 50 knots • Rate of climb/descend: ≥ 500 ft/min • Turn rate: ≥ 3 degrees per second	A system meeting RTCA SC-228 or EUROCAE WG-105 MOPS/MASPS (or similar) and installed in accordance with applicable requirements.

[10] Low End Performance Representative (LEPR) performance requirments for RTCA SC-228 Study 5

	Function	TMPR Level				
		VLOS	No Requirement (ARC-a)	Low (ARC-b)	Medium (ARC-c)	**High (ARC-d)**
Tactical mitigation performance requirements (TMPR)	Feedback Loop	No Requirement	No Requirement	Where electronic means assist the remote pilot in detecting traffic, the information is provided with a latency and update rate for intruder data (e.g. position, speed, altitude, track) that support the decision criteria. For an assumed 3 NM threshold, a 5 second update rate and a latency of 10 seconds is considered adequate (see example below).	The information is provided to the remote pilot with a latency and update rate that support the decision criteria. The applicant provides an assessment of the aggravated closure rates considering traffic that could reasonably be expected to operate in the area, traffic information update rate and latency, C2 Link latency, aircraft manoeuvrability and performance and sets the detection thresholds accordingly. The following are suggested minimum criteria: • Intruder and ownship vector data update rates: ≤ 3 seconds.	A system meeting RTCA SC-228 or EUROCAE WG-105 MOPS/MASPS (or similar) and installed in accordance with applicable airworthiness requirements.

Table D.2 — TMPR qualitative criteria table

D.5.3.3 Effects of aircraft equipment on tactical system performance

The performance of a tactical mitigation is affected by the equipment of both the UAS and threat aircraft, on an encounter-by-encounter basis. A tactical mitigation mitigates the encounter risk by using a set of sub-functions of the DAA routine, namely see/detect, decide, command, execute, and feedback loop. Equipment that aids these sub-functions increases the overall performance of the tactical mitigation system.

The following example illustrates how the equipment of both the UAS and threat aircraft affects the overall tactical performance. Given a threat aircraft equipped with a transponder, it is easier for other aircraft to detect and track the threat aircraft. In this case, the UAS can be equipped with a system that is able to detect and track transponders. However, a UAS that mitigates the risk by locating the threat aircraft by detecting their transponder (e.g. through ACAS-II V. 7.1) cannot use the same approach to mitigate the risks posed by an aircraft without a transponder.

Tactical mitigation equipment is not homogeneous within the airspace. Different classes of airspace have different mixes of equipment. General aviation aircraft tend to be less well-equipped than commercial aircraft. There will be differences in the mix of general aviation/commercial aircraft from one location/airspace to another. Based on the aircraft equipment, a specific tactical system (e.g. FLARM, ACAS, etc.) could mitigate the risk of a collision in some classes of airspace and not in others.

Therefore, the UAS operator needs to understand the effectiveness of their tactical mitigation systems within the context of the airspace in which they intend to operate, and select systems used for tactical mitigation accordingly. A TCAS II 7.1/ACAS-II equipped UAS will not mitigate all the encounter risks in an area where sailplanes equipped with FLARM are known to operate.

D.5.4. TMPR robustness (integrity and assurance) assignment

Table D.3, below, lists the recommended requirements to comply with the TMPR integrity and assurance assignment.

		TMPR: N/A (ARC-a)	TMPR: Low (ARC-b)	TMPR: Medium (ARC-c)	TMPR: High (ARC-d)
Level of integrity	Criteria	Allowable loss of function and performance of the Tactical Mitigation System: < 1 per 100 Flight Hours (1E-2 Loss/FH)	Allowable loss of function and performance of the Tactical Mitigation System: < 1 per 100 Flight Hours (1E-2 Loss/FH)	Allowable loss of function and performance of the Tactical Mitigation System: < 1 per 1 000 Flight Hours (1E-3 Loss/FH)	Allowable loss of function and performance of the Tactical Mitigation System: < 1 per 100 000 Flight Hours (1E-5 Loss/FH)
	Comments / Notes	*The requirement is considered to be met by commercially available products. No quantitative analysis is required.*	*The requirement is considered to be met by commercially available products. No quantitative analysis is required.*	*This rate is commensurate with a probable failure condition. These failure conditions are anticipated to occur one or more times during the entire operational life of each aircraft.*	*A quantitative analysis is required.*

		TMPR: N/A (ARC-a)	TMPR: Low (ARC-b)	TMPR: Medium (ARC-c)	TMPR: High (ARC-d)
Level of assurance	Criteria	N/A	The operator declares that the tactical mitigation system and procedures will mitigate the risk of collisions with manned aircraft to an acceptable level.	The operator provides evidence that the tactical mitigation system will mitigate the risk of collisions with manned aircraft to an acceptable level.	The evidence that the tactical mitigation system will mitigate the risk of collisions with manned aircraft to an acceptable level is verified by a competent third party.
	Comments / Notes	*N/A*	*N/A*	*N/A*	*N/A*

Table D.3 — TMPR integrity and assurance objectives

D.6 Maintenance and continued airworthiness

The DAA maintenance and continued airworthiness requirements are addressed in the SAIL requirements; please refer to Annex E.

Annex E to AMC1 to Article 11

ED Decision 2019/021/R

INTEGRITY AND ASSURANCE LEVELS FOR THE OPERATIONAL SAFETY OBJECTIVES (OSOs)

E.1 How to use SORA Annex E

The following Table E.1 provides the basic principles to consider when using SORA Annex E.

	Principle description	Additional information
#1	Annex E provides assessment criteria for the integrity (i.e. safety gain) and assurance (i.e. method of proof) of OSOs proposed by an applicant.	The identification of OSOs for a given operation is the responsibility of the applicant.
#2	Annex E does not cover the LoI of the competent authority. LoI is based on the competent authority's assessment of the applicant's ability to perform the given operation.	
#3	To achieve a given level of integrity/assurance, when more than one criterion exists for that level of integrity/assurance, all applicable criteria need to be met.	
#4	'Optional' cases defined in SORA main body Table 6 do not need to be defined in terms of integrity and assurance levels in Annex E.	All robustness levels are acceptable for OSOs for which an 'optional' level of robustness is defined in Table 6 'Recommended OSOs' of the SORA main body.
#5	When the criteria to assess the level of integrity or assurance of an OSO rely on 'standards' that are not yet available, the OSO needs to be developed in a manner acceptable to the competent authority.	
#6	Annex E intentionally uses non-prescriptive terms (e.g. suitable, reasonably practicable) to provide flexibility to both the applicant and the competent authorities. This does not constrain the applicant in proposing mitigations, nor the competent authority in evaluating what is needed on a case-by-case basis.	
#7	This annex in its entirety also applies to single-person organisations.	

Table E.1 – Basic principles to consider when using SORA Annex E

E.2 OSOs related to technical issues with the UAS

OSO #01 — Ensure that the UAS operator is competent and/or proven

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	**Medium**	**High**
OSO #01 Ensure that the UAS operator is competent and/or proven	Criteria	The applicant is knowledgeable of the UAS being used and as a minimum has the following relevant operational procedures: checklists, maintenance, training, responsibilities, and associated duties.	Same as low. In addition, the applicant has an organisation appropriate[1] for the intended operation. Also, the applicant has a method to identify, assess, and mitigate the risks associated with flight operations. These should be consistent with the nature and extent of the operations specified.	Same as medium.
	Comments	*N/A*	*[1] For the purpose of this assessment, 'appropriate' should be interpreted as commensurate with/proportionate to the size of the organisation and the complexity of the operation.*	*N/A*

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	**Medium**	**High**
OSO #01 Ensure that the UAS operator is competent and/or proven	Criteria	The elements delineated in the level of integrity are addressed in the ConOps.	Prior to the first operation, a competent third party performs an audit of the organisation	The applicant holds an organisational operating certificate or has a recognised flight test organisation. In addition, a competent third party recurrently verifies the UAS operator's competences.
	Comments	*N/A*	*N/A*	*N/A*

OSO #02 — UAS designed and produced by a competent and/or proven entity

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	Medium	High
OSO #02 UAS manufactured by competent and/or proven entity	Criteria	As a minimum, manufacturing procedures cover: (a) the specification of materials; (b) the suitability and durability of materials used; and (c) the processes necessary to allow for repeatability in manufacturing, and conformity within acceptable tolerances.	Same as low. In addition, manufacturing procedures also cover: (a) configuration control; (b) the verification of incoming products, parts, materials, and equipment; (c) identification and traceability; (d) in-process and final inspections & testing; (e) the control and calibration of tools; (f) handling and storage; and (g) the control of non-conforming items.	Same as medium. In addition, the manufacturing procedures cover at least: (a) manufacturing processes; (b) personnel competence and qualifications; and (c) supplier control.
	Comments	*N/A*	*N/A*	*N/A*

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	Medium	High
OSO #02 UAS manufactured by competent and/or proven entity	Criteria	The declared manufacturing procedures are developed to a standard considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.	Same as low. In addition, evidence is available that the UAS has been manufactured in conformance to its design.	Same as medium. In addition: (a) manufacturing procedures; and (b) the conformity of the UAS to its design and specification are recurrently verified through process or product audits by a competent third party (or competent third parties).
	Comments	*N/A*	*N/A*	*N/A*

OSO #03 — UAS maintained by competent and/or proven entity

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	Medium	High
OSO #03 UAS maintained by	Criteria	(a) The UAS maintenance instructions are defined, and, when applicable, cover	Same as low. In addition:	Same as medium. In addition, the maintenance staff work in accordance with a maintenance

competent and/or proven entity (e.g. industry standards)		the UAS designer's instructions and requirements. (b) The maintenance staff is competent and has received an authorisation to carry out UAS maintenance. (c) The maintenance staff use the UAS maintenance instructions while performing maintenance.	(a) Scheduled maintenance of each UAS is organised and in accordance with a maintenance programme. (b) Upon completion, the maintenance log system is used to record all the maintenance conducted on the UAS, including releases. A maintenance release can only be accomplished by a staff member who has received a maintenance release authorisation for that particular UAS model/family.	procedure manual that provides information and procedures relevant to the maintenance facility, records, maintenance instructions, release, tools, material, components, defect deferral, etc.
	Comments	*N/A*	*N/A*	*N/A*

TECHNICAL ISSUE WITH THE UAS		**Level of assurance**		
		Low	**Medium**	**High**
OSO #03 UAS maintained by competent and/or proven entity (e.g. industry standards)	Criterion #1 (Procedure)	(a) The maintenance instructions are documented. (b) The maintenance conducted on the UAS is recorded in a maintenance log system[1/2]. (c) A list of the maintenance staff authorised to carry out maintenance is established and kept up to date.	Same as low. In addition: (a) The maintenance programme is developed in accordance with standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. (b) A list of maintenance staff with maintenance release authorisation is established and kept up to date.	Same as medium. In addition, the maintenance programme and the maintenance procedures manual are validated by a competent third party.
	Comments	*[1] Objective is to record all the maintenance performed on the aircraft, and why it is performed (rectification of defects or malfunctions, modifications, scheduled maintenance, etc.)* *[2] The maintenance log may be requested for inspection/audit by the approving authority or an authorised representative.*	*N/A*	*N/A*
	Criterion #2 (Training)	A record of all the relevant qualifications, experience and/or training completed by	Same as low. In addition: (a) The initial training syllabus and training standard including theoretical/practical	Same as medium. In addition: (a) A programme for the recurrent training of staff holding

		the maintenance staff is established and kept up to date.	elements, duration, etc. is defined and is commensurate with the authorisation held by the maintenance staff. (b) For staff that hold a maintenance release authorisation, the initial training is specific to that particular UAS model/family. (c) All maintenance staff have undergone initial training.	a maintenance release authorisation is established; and (b) This programme is validated by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*

OSO #04 — UAS developed to authority recognised design standards

TECHNICAL ISSUE WITH THE UAS		**Level of integrity**		
		Low	**Medium**	**High**
OSO #04 UAS developed to authority recognised design standards	Criteria	The UAS is designed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. The standards and/or the means of compliance should be applicable to a low level of integrity and the intended operation.	The UAS is designed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. The standards and/or the means of compliance should be applicable to a medium level of integrity and the intended operation.	The UAS is designed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. The standards and/or the means of compliance should be applicable to a high level of integrity and the intended operation.
	Comments	*NAAs may define the standards and/or the means of compliance they consider adequate.*		

TECHNICAL ISSUE WITH THE UAS		**Level of assurance**		
		Low	**Medium**	**High**
OSO #04 UAS developed to authority recognised design standards	Criteria	Consider the criteria defined in Section 9		
	Comments	*N/A*	*N/A*	*N/A*

OSO #05 — UAS is designed considering system safety and reliability

This OSO complements:

(a) the safety requirements for containment defined in the main body; and

(b) OSO #10 and OSO #12, which only address the risk of a fatality while operating over populated areas or assemblies of people.

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	**Medium**	**High**
OSO #05 UAS is designed considering system safety and reliability	Criteria	The equipment, systems, and installations are designed to minimise hazards[1] in the event of a probable[2] malfunction or failure of the UAS.	Same as low. In addition, the strategy for detection, alerting and management of any malfunction, failure or combination thereof, which would lead to a hazard, is available.	Same as medium. In addition: (a) Major failure conditions are not more frequent than remote[3]; (b) Hazardous failure conditions are not more frequent than extremely remote[3]; (c) Catastrophic failure conditions are not more frequent than extremely improbable[3]; and (d) SW and AEH whose development error(s) may cause or contribute to hazardous or catastrophic failure conditions are developed to an industry standard or a methodology considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority[4].
	Comments	*[1] For the purpose of this assessment, the term 'hazard' should be interpreted as a failure condition that relates to major, hazardous, or catastrophic consequences.* *[2] For the purpose of this assessment, the term 'probable' should be interpreted in a qualitative way as 'anticipated to occur one or more times during the entire system/operational life of a UAS'.*	*N/A*	*[3] Safety objectives may be derived from JARUS AMC RPAS.1309 Issue 2 Table 3 depending on the kinetic energy assessment made in accordance with Section 6 of EASA policy E.Y013-01.* *[4] Development assurance levels (DALs) for SW/AEH may be derived from JARUS AMC RPAS.1309 Issue 2 Table 3 depending on the kinetic energy assessment made in accordance with Section 6 of EASA policy E.Y013-01.*

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	Medium	High
OSO #05 UAS is designed considering system safety and reliability	Criteria	A functional hazard assessment[1] and a design and installation appraisal that shows hazards are minimised, are available.	Same as low. In addition: (a) Safety analyses are conducted in line with standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. (b) A strategy for the detection of single failures of concern includes pre-flight checks.	Same as medium. In addition, safety analyses and development assurance activities are validated by EASA, according to Article 40 of Regulation (EU) 2019/945.
	Comments	*[1] The severity of failure conditions (no safety effect, minor, major, hazardous and catastrophic) should be determined according to the definitions provided in JARUS AMC RPAS.1309 Issue 2.*	*N/A*	*N/A*

OSO #06 — C3 link characteristics (e.g. performance, spectrum use) are appropriate for the operation

(a) For the purpose of the SORA and this specific OSO, the term 'C3 link' encompasses:

(1) the C2 link; and

(2) any communication link required for the safety of the flight.

(b) To correctly assess the integrity of this OSO, the applicant should identify the following:

(1) The performance requirements for the C3 links necessary for the intended operation.

(2) All the C3 links, together with their actual performance and RF spectrum usage.

Note: The specification of the performance and RF spectrum for a C2 Link is typically documented by the UAS designer in the UAS manual.

Note: The main parameters associated with the performance of a C2 link (RLP) and the performance parameters for other communication links (e.g. RCP for communication with ATC) include, but are not limited to, the following:

(i) the transaction expiration time;

(ii) the availability;

(iii) the continuity; and

(iv) the integrity.

Refer to the ICAO references for definitions.

(3) The RF spectrum usage requirements for the intended operation (including the need for authorisation if required).

Note: Usually, countries publish the allocation of RF spectrum bands applicable in their territories. This allocation stems mostly from the International Communication Union (ITU) Radio Regulations. However, the applicant should check the local requirements and request authorisation when needed since there may be national differences and specific allocations (e.g. national sub-divisions of ITU allocations). Some aeronautical bands (e.g. AM(R)S, AMS(R)S 5030-5091MHz) were allocated for potential use in UAS operations under the ICAO scope for UAS operations classified as cat. C ('certified'), but their use may be authorised for operations under the 'specific' category. It is expected that the use of other licensed bands (e.g. those allocated to mobile networks) may also be authorised under the 'specific' category. Some un-licensed bands (e.g. industrial, scientific and medical (ISM) or short-range devices (SRDs)) may also be acceptable under the 'specific' category; for instance, for operations with lower integrity requirements.

(4) Environmental conditions that might affect the performance of C3 links.

TECHNICAL ISSUE WITH THE UAS		**Level of integrity**		
		Low	**Medium**	**High**
OSO #06 C3 link characteristics (e.g. performance, spectrum use) are appropriate for the operation	Criteria	(a) The applicant determines that the performance, RF spectrum usage[1] and environmental conditions for C3 links are adequate to safely conduct the intended operation. (b) The remote pilot has the means to continuously monitor the C3 performance and ensures that the performance continues to meet the operational requirements[2].	Same as low[3].	Same as low. In addition, the use of licensed[4] frequency bands for C2 Links is required.
	Comments	*[1] For a low level of integrity, unlicensed frequency bands might be acceptable under certain conditions, e.g.:*	*[3] Depending on the operation, the use of licensed frequency bands might be necessary. In some cases, the use of non-aeronautical bands*	*[4] This ensures a minimum level of performance and is not limited to aeronautical licensed frequency bands (e.g. licensed bands for cellular*

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	Medium	High
		(a) the applicant demonstrates compliance with other RF spectrum usage requirements (e.g. Directive 2014/53/EU), by showing that the UAS equipment is compliant with these requirements; and *(b) the use of mechanisms to protect against interference (e.g. FHSS, frequency de-confliction by procedure).* *[2] The remote pilot has continual and timely access to the relevant C3 information that could affect the safety of flight. For operations requesting only a low level of integrity for this OSO, this could be achieved by monitoring the C2 link signal strength and receiving an alert from the UAS HMI if the signal strength becomes too low.*	*(e.g. licensed bands for cellular network) may be acceptable.*	*network). Nevertheless, some operations may require the use of bands allocated to the aeronautical mobile service for the use of C2 Link (e.g. 5030 – 5091 MHz).* *In any case, the use of licensed frequency bands needs authorisation.*

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	Medium	High
OSO #06 C3 link characteristics (e.g. performance, spectrum use) are appropriate for the operation	Criteria	Consider the assurance criteria defined in Section 9 (low level of assurance)	Demonstration of the C3 link performance is in accordance with standards considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority.	Same as medium. In addition, evidence is validated by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*

OSO #07 — Inspection of the UAS (product inspection) to ensure consistency with the ConOps

The intent of this OSO is to ensure that the UAS used for the operation conforms to the UAS data used to support the approval/authorisation of the operation.

TECHNICAL ISSUE WITH THE UAS		Level of integrity		
		Low	Medium	High
OSO #07 Inspection of the UAS (product inspection) to ensure consistency with the ConOps	Criteria	The remote crew ensures that the UAS is in a condition for safe operation and conforms to the approved ConOps.[1]		
	Comments	*[1] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see the table below).*		

TECHNICAL ISSUE WITH THE UAS		Level of assurance		
		Low	Medium	High
OSO #07 Inspection of the UAS (product inspection) to ensure consistency with the ConOps	Criterion #1 (Procedures)	Product inspection is documented and accounts for the manufacturer's recommendations if available.	Same as low. In addition, the product inspection is documented using checklists.	Same as medium. In addition, the product inspection is validated by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #2 (Training)	The remote crew is trained to perform the product inspection, and that training is self-declared (with evidence available).	(a) A training syllabus including a product inspection procedure is available. (b) The UAS operator provides competency-based, theoretical and practical training.	A competent third party: (a) validates the training syllabus; and (b) verifies the remote crew competencies.
	Comments	*N/A*	*N/A*	*N/A*

E.3 OSOs related to operational procedures

OPERATIONAL PROCEDURES		Level of integrity		
		Low	Medium	High
OSO #08, OSO #11, OSO #14 and OSO #21	Criterion #1 (Procedure definition)	(a) Operational procedures[1] appropriate for the proposed operation are defined and, as a minimum, cover the following elements: (1) Flight planning; (2) Pre- and post-flight inspections; (3) Procedures to evaluate the environmental conditions before and during the mission (i.e. real-time evaluation); (4) Procedures to cope with unexpected adverse operating conditions (e.g. when ice is encountered during an operation not approved for icing conditions); (5) Normal procedures; (6) Contingency procedures (to cope with abnormal situations);		

OPERATIONAL PROCEDURES		Level of integrity		
		Low	Medium	High
		(7) Emergency procedures (to cope with emergency situations); (8) Occurrence reporting procedures; and Note: normal, contingency and emergency procedures are compiled in an OM. (b) The limitations of the external systems supporting UAS operation[2] are defined in an OM.		
	Comments	*[1] Operational procedures cover the deterioration3 of the UAS itself and any external system supporting UAS operation.* *[2] In the scope of this assessment, external systems supporting UAS operation are defined as systems that are not already part of the UAS but are used to:* *(a) launch/take-off the UA;* *(b) make pre-flight checks; or* *(c) keep the UA within its operational volume (e.g. GNSS, satellite systems, air traffic management, U-Space).* *External systems activated/used after a loss of control of the operation are excluded from this definition.* *[3] To properly address the deterioration of external systems required for the operation, it is recommended to:* *(a) identify these 'external systems';* *(b) identify the modes of deterioration of the 'external systems' (e.g. complete loss of GNSS, drift of the GNSS, latency issues, etc.) which would lead to a loss of control of the operation;* *(c) describe the means to detect these modes of deterioration of the external systems/facilities; and* *(d) describe the procedure(s) used when deterioration is detected (e.g. activation of the emergency recovery capability, switch to manual control, etc.).*		
	Criterion #2 (Procedure complexity)	Operational procedures are complex and may potentially jeopardise the crew's ability to respond by raising the remote crew's workload and/or the interactions with other entities (e.g. ATM, etc.).	Contingency/emergency procedures require manual control by the remote pilot[2] when the UAS is usually automatically controlled.	Operational procedures are simple.
	Comments	*N/A*	*[2] This is still under discussion since not all UAS have a mode where the pilot could directly control the surfaces; moreover, some people claim it requires significant skill not to make things worse.*	*N/A*

OPERATIONAL PROCEDURES		Level of integrity		
		Low	**Medium**	**High**
	Criterion #3 (Consideration of Potential Human Error)	At a minimum, operational procedures provide: (a) a clear distribution and assignment of tasks, and (b) an internal checklist to ensure staff are adequately performing their assigned tasks.	Operational procedures take human error into consideration.	Same as medium. In addition, the remote crew[3] receives crew resource management (CRM)[4] training.
	Comments	*N/A*	*N/A*	*[3] In the context of the SORA, the term 'remote crew' refers to any person involved in the mission.* *[4] CRM training focuses on the effective use of all the remote crew to ensure safe and efficient operation, reducing error, avoiding stress and increasing efficiency.*

OPERATIONAL PROCEDURES		Level of assurance		
		Low	**Medium**	**High**
OSO #08, OSO #11, OSO #14 and OSO #21	Criteria	(a) Operational procedures do not require validation against either a standard or a means of compliance considered adequate by the competent authority. (b) The adequacy of the operational procedures is declared, except for emergency procedures, which are tested.	(a) Operational procedures are validated against standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. (b) Adequacy of the contingency and emergency procedures is proven through: (1) dedicated flight tests; or (2) simulation, provided the simulation is proven valid for the intended purpose with positive results.	Same as medium. In addition: (a) Flight tests performed to validate the procedures and checklists cover the complete flight envelope or are proven to be conservative. (b) The procedures, checklists, flight tests and simulations are validated by a competent third party.
	Comments	*N/A*	*N/A*	

E.4 OSOs related to remote crew training

(a) The applicant needs to propose competency-based, theoretical and practical training that:

(1) is appropriate for the operation to be approved; and

(2) includes proficiency requirements and recurrent training.

(b) The entire remote crew (i.e. any person involved in the operation) should undergo competency-based, theoretical and practical training specific to their duties (e.g. pre-flight inspection, ground equipment handling, evaluation of the meteorological conditions, etc.).

REMOTE CREW COMPETENCIES		Level of integrity		
		Low	Medium	High
OSO #09, OSO #15 and OSO #22	Criteria	The competency-based, theoretical and practical training is adequate for the operation[1] and ensures knowledge of: (a) the UAS Regulation; (b) airspace operating principles; (c) airmanship and aviation safety; (d) human performance limitations; (e) meteorology; (f) navigation/charts; (g) the UAS; and (h) operating procedures.		
	Comments	*[1] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*		

REMOTE CREW COMPETENCIES		Level of assurance		
		Low	Medium	High
OSO #09, OSO #15 and OSO #22	Criteria	Training is self-declared (with evidence available).	(a) Training syllabus is available. (b) The UAS operator provides competency-based, theoretical and practical training.	A competent third party: (a) validates the training syllabus; and (b) verifies the remote crew competencies.
	Comments	*N/A*	*N/A*	*N/A*

E.5 OSOs related to safe design

(a) The objectives of OSO#10 and OSO#12 are to complement the technical containment safety requirements by addressing the risk of a fatality while operating over populated areas or assemblies of people.

(b) In the scope of this assessment, external systems supporting UAS operations are defined as systems that are not already part of the UAS but are used to:

(1) launch/take off the UA;

(2) make pre-flight checks; or

(3) keep the UA within its operational volume (e.g. GNSS, satellite systems, air traffic management, U-space).

External systems activated/used after a loss of control of the operation are excluded from this definition.

		LEVEL of INTEGRITY		
		Low	**Medium**	**High**
OSO #10 & OSO #12	Criteria	When operating over populated areas or assemblies of people, it can be reasonably expected that a fatality will not occur from any probable[1] failure[2] of the UAS or any external system supporting the operation.	When operating over populated areas or assemblies of people, it can be reasonably expected that a fatality will not occur from any single failure[3] of the UAS or any external system supporting the operation. SW and AEH whose development error(s) could directly lead to a failure affecting the operation in such a way that it can be reasonably expected that a fatality will occur, are developed to a standard considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority.	Same as medium
	Comments	*[1] For the purpose of this assessment, the term 'probable' should be interpreted in a qualitative way as, 'anticipated to occur one or more times during the entire system/operational life of a UAS'.* *[2] Some structural or mechanical failures may be excluded from the criterion if it can be shown that these mechanical parts were designed according to aviation industry best practices.*	*[3] Some structural or mechanical failures may be excluded from the no-single failure criterion if it can be shown that these mechanical parts were designed to a standard considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority*	

		LEVEL of ASSURANCE		
		Low	**Medium**	**High**
OSO #10 & OSO #12	Criteria	A design and installation appraisal is available. In particular, this appraisal shows that: (a) the design and installation features (independence, separation and redundancy) satisfy the low integrity criterion; and (b) particular risks relevant to the ConOps (e.g. hail, ice, snow, electromagnetic interference, etc.) do not violate the independence claims, if any.	Same as low. In addition, the level of integrity claimed is substantiated by analysis and/or test data with supporting evidence.	Same as medium. In addition, a competent third party validates the level of integrity claimed.
	Comments	*N/A*	*N/A*	*N/A*

E.6 OSOs related to the deterioration of external systems supporting UAS operations

For the purpose of the SORA and this specific OSO, the term 'external services supporting UAS operations' encompasses any service providers necessary for the safety of the flight, such as communication service providers (CSPs) and U-space service providers.

DETERIORATION OF EXTERNAL SYSTEMS SUPPORTING UAS OPERATIONS BEYOND THE CONTROL OF THE UAS		**Level of integrity**		
		Low	**Medium**	**High**
OSO #13 External services supporting UAS operations are adequate for the operation	Criteria	The applicant ensures that the level of performance for any externally provided service necessary for the safety of the flight is adequate for the intended operation. If the externally provided service requires communication between the UAS operator and the service provider, the applicant ensures there is effective communication to support the service provision. Roles and responsibilities between the applicant and the external service provider are defined.		
	Comments	*N/A*	*N/A*	*Requirements for contracting services with the service provider may be derived from ICAO Standards and Recommended Practices (SARPs) that are currently under development.*

DETERIORATION OF EXTERNAL SYSTEMS SUPPORTING UAS OPERATION BEYOND THE CONTROL OF THE UAS		Level of assurance		
		Low	Medium	High
OSO #13 External services supporting UAS operations are adequate for the operation	Criteria	The applicant declares that the requested level of performance for any externally provided service necessary for the safety of the flight is achieved (without evidence being necessarily available).	The applicant has 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 mission. This may take the form of a service-level agreement (SLA) or any official commitment that prevails between a service provider and the applicant on the relevant aspects of the service (including quality, availability, responsibilities). The applicant has a 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.	Same as medium. In addition: (a) the evidence of the performance of an externally provided service is achieved through demonstrations; and (b) a competent third party validates the claimed level of integrity.
	Comments	*N/A*	*N/A*	*N/A*

E.7 OSOs related to Human Error

OSO #16 — Multi-crew coordination

This OSO applies only to those personnel directly involved in the flight operation.

HUMAN ERROR		Level of integrity		
		Low	Medium	High
OSO #16 Multi crew coordination	Criterion #1 (Procedures)	Procedure(s) to ensure coordination between the crew members and robust and effective communication channels is (are) available and at a minimum cover: (a) assignment of tasks to the crew, and (b) establishment of step-by-step communications.[1]		
	Comments	*[1] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see the table below).*		

	Criterion #2 (Training)	Remote crew training covers multi-crew coordination	Same as low. In addition, the remote crew[2] receives CRM[3] training.	Same as medium.
	Comments	*N/A*	*[2] In the context of the SORA, the term 'remote crew' refers to any person involved in the mission.* *[3] CRM training focuses on the effective use of all the remote crew to assure a safe and efficient operation, reducing error, avoiding stress and increasing efficiency.*	*N/A*
	Criterion #3 (Communication devices)	N/A	Communication devices comply with standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.	Communication devices are redundant[4] and comply with standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.
	Comments	*N/A*	*N/A*	*[4] This implies the provision of an extra device to cope with the failure of the first device.*

HUMAN ERROR		**LEVEL of ASSURANCE**		
		Low	**Medium**	**High**
OSO #16 Multi crew coordination	Criterion #1 (Procedures)	(a) Procedures do not require validation against either a standard or a means of compliance considered adequate by the competent authority. (b) The adequacy of the procedures and checklists is declared.	(a) Procedures are validated against standards considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority. (b) Adequacy of the procedures is proven through: (1) dedicated flight tests; or (2) simulation, provided the simulation is proven valid for the intended purpose with positive results.	Same as medium. In addition: (a) flight tests performed to validate the procedures cover the complete flight envelope or are proven to be conservative; and (b) the procedures, flight tests and simulations are validated by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #2 (Training)	Training is self-declared (with evidence available)	(a) Training syllabus is available. (b) The UAS operator provides competency-based, theoretical and practical training.	A competent third party: (a) validates the training syllabus; and (b) verifies the remote crew competencies.
	Comments	*N/A*	*N/A*	*N/A*

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	Medium	High
	Criterion #3 (Communication devices)	Consider the criteria defined in Section 9		
	Comments	*N/A*	*N/A*	*N/A*

OSO #17 — Remote crew is fit to operate

(a) For the purpose of this assessment, the expression 'fit to operate' should be interpreted as physically and mentally fit to perform their duties and safely discharge their responsibilities.

(b) Fatigue and stress are contributory factors to human error. Therefore, to ensure that vigilance is maintained at a satisfactory level of safety, consideration may be given to the following:

(1) remote crew duty times;

(2) regular breaks;

(3) rest periods; and

(4) handover/takeover procedures.

HUMAN ERROR		Level of integrity		
		Low	Medium	High
OSO #17 Remote crew is fit to operate	Criteria	The applicant has a policy defining how the remote crew can declare themselves fit to operate before conducting any operation.	Same as low. In addition: — Duty, flight duty and resting times for the remote crew are defined by the applicant and adequate for the operation. — The UAS operator defines requirements appropriate for the remote crew to operate the UAS.	Same as Medium. In addition: — The remote crew is medically fit, — A fatigue risk management system (FRMS) is in place to manage any escalation in duty/flight duty times.
	Comments	*N/A*	*N/A*	*N/A*

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	**Medium**	**High**
OSO #17 Remote crew is fit to operate	Criteria	The policy to define how the remote crew declares themselves fit to operate (before an operation) is documented. The remote crew declaration of fit to operate (before an operation) is based on policy defined by the applicant.	Same as Low. In addition: — Remote crew duty, flight duty and the resting times policy are documented. — Remote crew duty cycles are logged and cover at a minimum: — when the remote crew member's duty day commences, — when the remote crew members are free from duties, and — resting times within the duty cycle. — There is evidence that the remote crew is fit to operate the UAS.	Same as Medium. In addition: — Medical standards considered adequate by the competent authority and/or means of compliance acceptable to that authority are established and a competent third party verifies that the remote crew is medically fit. — A competent third party validates the duty/flight duty times. — If an FRMS is used, it is validated and monitored by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*

OSO #18 — Automatic protection of the flight envelope from human errors

(a) Each UA is designed with a flight envelope that describes its safe performance limits with regard to minimum and maximum operating speeds, and its operating structural strength.

(b) Automatic protection of the flight envelope is intended to prevent the remote pilot from operating the UA outside its flight envelope. If the applicant demonstrates that the remote-pilot is not in the loop, this OSO is not applicable.

(c) A UAS implementing such an automatic protection function will ensure that the UA is operated within an acceptable flight envelope margin even in the case of incorrect remote-pilot control inputs (human errors).

(d) UAS without automatic protection functions are susceptible to incorrect remote-pilot control inputs (human errors), which can result in the loss of the UA if the designed performance limits of the aircraft are exceeded.

(e) Failures or development errors of the flight envelope protection are addressed in OSOs #5, #10 and #12.

HUMAN ERROR		LEVEL of INTEGRITY		
		Low	Medium	High
OSO #18 Automatic protection of the flight envelope from human errors	Criteria	The UAS flight control system incorporates automatic protection of the flight envelope to prevent the remote pilot from making any single input under normal operating conditions that would cause the UA to exceed its flight envelope or prevent it from recovering in a timely fashion.	The UAS flight control system incorporates automatic protection of the flight envelope to ensure the UA remains within the flight envelope or ensures a timely recovery to the designed operational flight envelope following remote pilot error(s).[1]	
	Comments	*N/A*	*[1] The distinction between a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*	

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	Medium	High
OSO #18 Automatic protection of the flight envelope from human errors	Criteria	The automatic protection of the flight envelope has been developed in-house or out of the box (e.g. using commercial off-the-shelf elements), without following specific standards.	The automatic protection of the flight envelope has been developed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.	Same as Medium. In addition, evidence is validated by EASA.
	Comments	*N/A*	*N/A*	*N/A*

OSO #19 — Safe recovery from human errors

(a) This OSO addresses the risk of human errors which may affect the safety of the operation if not prevented or detected and recovered in a timely fashion.

i) Errors can be made by anyone involved in the operation.

ii) An example could be a human error leading to the incorrect loading of the payload, with the risk of it falling off the UA during the operation.

iii) Another example could be a human error not to extend the antenna mast, thus reducing the C2 link coverage.

Note: the flight envelope protection is excluded from this OSO since it is specifically covered by OSO #18.

(b) This OSO covers:

i) procedures and lists,

ii) training, and

iii) UAS design, i.e. systems detecting and/or recovering from human errors (e.g. safety pins, use of acknowledgment features, fuel or energy consumption monitoring functions …)

HUMAN ERROR		LEVEL of INTEGRITY		
		Low	**Medium**	**High**
OSO #19 Safe recovery from Human Error	Criterion #1 (Procedures and checklists)	Procedures and checklists that mitigate the risk of potential human errors from any person involved with the mission are defined and used. Procedures provide at a minimum: — a clear distribution and assignment of tasks, and — an internal checklist to ensure staff are adequately performing their assigned tasks.		
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #2 (Training)	— The remote crew[1] is trained to use procedures and checklists. — The remote crew[1] receives CRM[2] training.[3]		
	Comments	*[1] In the context of SORA, the term 'remote crew' refers to any person involved in the mission.* *[2] CRM training focuses on the effective use of all the remote crew to ensure a safe and efficient operation, reducing error, avoiding stress and increasing efficiency.* *[3] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*		
	Criterion #3 (UAS design)	Systems detecting and/or recovering from human errors are developed according to industry best practices.	Systems detecting and/or recovering from human errors are developed to standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.	Same as medium.
	Comments	*N/A*	*N/A*	*N/A*

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	**Medium**	**High**
OSO #19 Safe recovery from Human Error	Criterion #1 (Procedures and checklists)	— Procedures and checklists do not require validation against either a standard or a means of compliance considered adequate by the competent authority. — The adequacy of the procedures and checklists is declared.	— Procedures and checklists are validated against standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority. — Adequacy of the procedures and checklists is proven through:	Same as Medium. In addition: — Flight tests performed to validate the procedures and checklists cover the complete flight envelope or are proven to be conservative.

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	Medium	High
			— Dedicated flight tests, or — Simulation, provided the simulation is proven valid for the intended purpose with positive results.	— The procedures, checklists, flight tests and simulations are validated by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #2 (Training)	Consider the criteria defined for the level of assurance of the generic remote crew training OSO (i.e. OSO #09, OSO #15 and OSO #22) corresponding to the SAIL of the operation		
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #3 (UAS design)	Consider the criteria defined in Section 9		
	Comments	*N/A*	*N/A*	*N/A*

OSO #20 — A Human Factors evaluation has been performed and the HMI found appropriate for the mission

HUMAN ERROR		LEVEL of INTEGRITY		
		Low	Medium	High
OSO #20 A Human Factors evaluation has been performed and the HMI found appropriate for the mission	Criteria	The UAS information and control interfaces are clearly and succinctly presented and do not confuse, cause unreasonable fatigue, or contribute to remote crew errors that could adversely affect the safety of the operation.		
	Comments	*If an electronic means is used to support potential VOs in their role to maintain awareness of the position of the unmanned aircraft, its HMI:* — *is sufficient to allow the VOs to determine the position of the UA during operation; and* — *does not degrade the VO's ability to:* — *scan the airspace visually where the unmanned aircraft is operating for any potential collision hazard; and* — *maintain effective communication with the remote pilot at all times.*		

HUMAN ERROR		LEVEL of ASSURANCE		
		Low	Medium	High
OSO #20 A Human Factors evaluation has been performed and the HMI	Criteria	The applicant conducts a human factors evaluation of the UAS to determine whether the HMI is appropriate for the mission. The HMI evaluation is based on inspection or analyses.	Same as Low but the HMI evaluation is based on demonstrations or simulations.[1]	Same as Medium. In addition, EASA witnesses the HMI evaluation of the UAS and a competent third party witnesses the HMI evaluation of the possible electronic means used by the VO.

found appropriate for the mission	*Comments*	*N/A*	*[1] When simulation is used, the validity of the targeted environment used in the simulation needs to be justified.*	*N/A*

E.8 OSOs related to Adverse Operating Conditions

OSO #23 — Environmental conditions for safe operations are defined, measurable and adhered to

ADVERSE OPERATING CONDITIONS		LEVEL of INTEGRITY		
		Low	**Medium**	**High**
OSO #23 Environmental conditions for safe operations are defined, measurable and adhered to	Criterion #1 (Definition)	The environmental conditions for safe operations are defined and reflected in the flight manual or equivalent document.[1]		
	Comments	*[1] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*		
	Criterion #2 (Procedures)	Procedures to evaluate environmental conditions before and during the mission (i.e. real-time evaluation) are available and include assessment of meteorological conditions (METAR, TAFOR, etc.) with a simple recording system.[2]		
	Comments	*[2] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*		
	Criterion #3 (Training)	Training covers assessment of meteorological conditions.[3]		
	Comments	*[3] The distinction between a low, a medium and a high level of robustness for this criterion is achieved through the level of assurance (see table below).*		

ADVERSE OPERATING CONDITIONS		LEVEL of ASSURANCE		
		Low	**Medium**	**High**
OSO #23 Environmental conditions for safe operations defined, measurable and adhered to	Criterion #1 (Definition)	Consider the criteria defined in Section 9		
	Comments	*N/A*		
	Criterion #2 (Procedures)	— Procedures do not require validation against either a standard or a means of compliance considered adequate by the competent authority.	— Procedures are validated against standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.	Same as Medium. In addition: — Flight tests performed to validate the procedures cover the complete flight envelope or are proven to be conservative.

		— The adequacy of the procedures and checklists is declared.	— The adequacy of the procedures is proved through: — Dedicated flight tests, or — Simulation, provided the simulation is proven valid for the intended purpose with positive results.	— The procedures, flight tests and simulations are validated by a competent third party.
	Comments	*N/A*	*N/A*	*N/A*
	Criterion #3 (Training)	Training is self-declared (with evidence available).	— Training syllabus is available. — The UAS operator provides competency-based, theoretical and practical training.	A competent third party: — Validates the training syllabus. — Verifies the remote crew competencies.
	Comments	*N/A*	*N/A*	*N/A*

OSO #24 — UAS is designed and qualified for adverse environmental conditions (e.g. adequate sensors, DO-160 qualification)

(a) To assess the integrity of this OSO, the applicant determines:

(1) whether credit can be taken for the equipment environmental qualification tests / declarations, e.g. by answering the following questions:

(i) Is there a Declaration of Design and Performance (DDP) available to the applicant stating the environmental qualification levels to which the equipment was tested?

(ii) Did the environmental qualification tests follow a standard considered adequate by the competent authority (e.g. DO-160)?

(iii) Are the environmental qualification tests appropriate and sufficient to cover all the environmental conditions related to the ConOps?

(iv) If the tests were not performed following a recognised standard, were the tests performed by an organisation/entity that is qualified or that has experience in performing DO-160 like tests?

(2) Can the suitability of the equipment for the intended/expected UAS environmental conditions be determined from either in-service experience or relevant test results?

(3) Any limitations which would affect the suitability of the equipment for the intended/expected UAS environmental conditions.

(b) The lowest integrity level should be considered for those cases where a UAS equipment has only a partial environmental qualification and/or a partial demonstration by similarity and/or parts with no qualification at all.

ADVERSE OPERATING CONDITIONS		LEVEL of INTEGRITY		
		N/A	Medium	High
OSO #24 UAS is designed and qualified for adverse environmental conditions	Criteria	N/A	The UAS is designed to limit the effect of environmental conditions.	The UAS is designed using environmental standards considered adequate by the competent authority and/or in accordance with a means of compliance acceptable to that authority.
	Comments	*N/A*	*N/A*	*N/A*

ADVERSE OPERATING CONDITIONS		LEVEL of ASSURANCE		
		N/A	Medium	High
OSO #24 UAS is designed and qualified for adverse environmental conditions	Criteria	N/A	Consider the criteria defined in Section 9	
	Comments	*N/A*	*N/A*	

E.9 Assurance level criteria for technical OSO

		LEVEL of ASSURANCE		
		Low	Medium	High
TECHNICAL OSO	Criteria	The applicant declares that the required level of integrity has been achieved[1].	The applicant has supporting evidence that the required level of integrity is achieved. This is typically done by testing, analysis, simulation[2], inspection, design review or through operational experience.	EASA validates the claimed level of integrity.
	Comments	*[1] Supporting evidence may or may not be available.*	*[2] When simulation is used, the validity of the targeted environment used in the simulation needs to be justified.*	*N/A*

AMC2 Article 11 Rules for conducting an operational risk assessment

ED Decision 2019/021/R

PREDEFINED RISK ASSESSMENT PDRA-01 Version 1.0

EDITION September 2019

(a) Scope

This PDRA is the result of applying the methodology described in AMC1 to Article 11 of the UAS Regulation to UAS operations performed in the 'specific' category with the following main attributes:

(1) UA with maximum characteristic dimensions (e.g. wingspan, rotor diameter/area or maximum distance between rotors in case of multirotor) up to 3 m and typical kinetic energies up to 34 kJ;

(2) operated BVLOS of the remote pilot with visual air risk mitigation;

(3) over sparsely populated areas;

(4) less than 150 m (500 ft) above the overflown surface (or any other altitude reference defined by the state); and

(5) in uncontrolled airspace.

(b) PDRA characterisation and provisions

Characterisation and provisions for this PDRA are summarised in Table PDRA-01.1.

PDRA characterisation and provisions	
1. Operational characterisation (scope and limitations)	
Level of human intervention	1.1 No autonomous operations: the remote pilot should have the ability to control the UA, except in case of a lost link. 1.2 The remote pilot should only operate one UA at a time. 1.3 The remote pilot should not operate from a moving vehicle. 1.4 Handover between RPSs should not be performed.
UA range limit	1.5 Launch/recovery: VLOS distance from the remote pilot 1.6 In flight: 1.6.1 If no VOs are used: UA is not operated at more than 1 km (or other distance defined by the competent authority) from the remote pilot. *Note: The remote pilot's workload should be adequate to allow him or her to continuously scan the airspace.* 1.6.2 If VOs are used: the range is not limited as long as the UA is not operated at more than 1 km (unless a different distance is defined by the competent authority) from the VO who is nearest to the UA.
Overflown areas	1.7 Sparsely populated areas.
UA limitations	1.8 Maximum characteristic dimension (e.g. wingspan, rotor diameter/area or maximum distance between rotors in the case of a multirotor): 3 m 1.9 Typical kinetic energy (as defined in paragraph 2.3.1(k) of AMC1 to Article 11 of the UAS Regulation up to 34 kJ
Flight height limit	1.10 The maximum height of the operational volume should not be greater than 150 m (500 ft) above the overflown surface (or any other altitude reference defined by the state).

PDRA characterisation and provisions					
	Note: In addition to the vertical limit for the operational volume, an air risk buffer is to be considered (see 'air risk' under point 3 of this table).				
Airspace	1.11 Operated: 1.11.1 in uncontrolled airspace (Class F or G) (corresponding to an air risk that can be classified as ARC-b); or 1.11.2 in a segregated area (corresponding to an air risk that can be classified as ARC-a); or 1.11.3 as otherwise established by the Member States in accordance with Article 15 (with an associated air risk that can be classified as not higher than ARC-b)				
Visibility	1.12 The UA should be operated in an area where the minimum flight visibility is more than 5 km. *Note: This flight visibility should be understood as the distance that an aircraft can be visually detected by the remote crew.*				
Others	1.13 The UA should not be used to drop material or carry dangerous goods, except for dropping items in connection with agricultural, horticultural or forestry activities in which the carriage of the items does not contravene any other applicable regulations.				
2. Operational risk classification (according to the classification defined in AMC1 to Article 11 of the UAS Regulation)					
Final GRC	3	Final ARC	ARC-b	SAIL	II
3. Operational mitigations					
Operational volume (see Figure PDRA-01.1)	3.1 To determine the operational volume, the applicant should consider the position-keeping capabilities of the UAS in 4D space (latitude, longitude, height and time). 3.2 In particular, the accuracy of the navigation solution, the flight technical error of the UAS and the path definition error (e.g. map error) and latencies should be considered and addressed in this determination. 3.3 If the UA leaves the operational volume, emergency procedures should be activated immediately.				
Ground risk	3.4 A ground risk buffer should be established to protect third parties on the ground outside the operational volume. 3.4.1 The minimum criterion should be the use of the '1:1 rule' (e.g. if the UA is planned to operate at a height of 150 m, the ground risk buffer should at least be 150 m). 3.5 The operational volume and the ground risk buffer should be all contained in a sparsely populated environment. 3.6 The applicant should evaluate the area of operations typically by means of an on-site inspection or appraisal, and should be able to justify a lower density of people at risk.				
Air risk	3.7 An air risk buffer should be defined. 3.8 This air risk buffer should be contained in the F or G airspace class (uncontrolled airspace) over sparsely populated areas and in UAS geographical zones defined by MSs where the probability of encounter with manned aircraft and other airspace users is not low. 3.9 The operational volume should be outside any geographical zone corresponding to a flight restriction zone of a protected aerodrome or of any other type, as defined by the responsible authority, unless the UAS operator is in receipt of the appropriate permission. 3.10 Prior to flight, the proximity of the planned operation to manned aircraft activity should be assessed.				
VOs	3.11 The remote pilot should determine the correct placement and number of VOs along the intended flight path. Prior to each flight, the UAS operator should check: 3.11.1 the compliance between the visibility and planned range for VOs; 3.11.2 the presence of potential terrain obstructions for VOs; and 3.11.3 that there are no gaps between the zones covered by each of the VOs. 3.12 The VO(s) necessary to safely conduct the operation should be in place during flight operations.				

PDRA characterisation and provisions	
	Note: The remote pilot may perform the visual scan of the airspace instead of a VO provided that the workload is adequate to perform his or her duties as the remote pilot.
4. Operator provisions	
Operator	4.1 The UAS operator should: 4.1.1 have knowledge of the UAS being used; and 4.1.2 develop relevant procedures including at least the following as a minimum: operational procedures (e.g. checklists), maintenance, training, responsibilities, and duties. 4.2 The aforementioned aspects should be addressed in the ConOps (see Annex A to AMC1 to Article 11 of the UAS Regulation).
UAS operations	4.3 The UAS operator should develop an OM (for the template, refer to GM1 UAS.SPEC.030(3)(e)). 4.4 The operational procedures should be validated against standards recognised by the competent authority and/or in accordance with a means of compliance acceptable to that authority. 4.5 The adequacy of the contingency and emergency procedures should be proved through: 4.5.1 dedicated flight tests; or 4.5.2 simulations, provided that the representativeness of the simulation means is proven for the intended purpose with positive results; or 4.5.3 any other means acceptable to the competent authority. 4.6 The UAS operator should develop an ERP (see GM2 UAS.SPEC.030(3)(e)) 4.7 The remote crew should be competent and be authorised by the UAS operator to carry out the intended operations. 4.8 A list of the remote crew members authorised to carry out UAS operations is established and kept up to date. 4.9 A record of all the relevant qualifications, experience and/or training completed by the remote crew is established and kept up to date. 4.10 The applicant should have a policy that defines how the remote crew can declare themselves fit to operate before conducting any operation.
UAS maintenance	4.11 The UAS maintenance instructions should be defined by the UAS operator, documented and cover at least the UAS manufacturer's instructions and requirements when applicable. 4.12 The maintenance staff should be competent and should have received an authorisation from the UAS operator to carry out maintenance. 4.13 The maintenance staff should use the UAS maintenance instructions while performing maintenance. 4.14 The maintenance instructions should be documented. 4.15 The maintenance conducted on the UAS should be recorded in a maintenance log system. 4.16 A list of the maintenance staff authorised to carry out maintenance should be established and kept up to date. 4.17 A record of all the relevant qualifications, experience and/or training completed by the maintenance staff should be established and kept up to date. 4.18 The maintenance log may be requested for inspection/audit by the approving authority or an authorised representative.
External services	4.19 The applicant should ensure that the level of performance for any externally provided service necessary for the safety of the flight is adequate for the intended operation. The applicant should declare that this adequate level of performance is achieved. 4.20 The roles and responsibilities between the applicant and the external service provider should be defined.

PDRA characterisation and provisions	
5. Provisions for the personnel in charge of duties essential to the UAS operation	
	As per Appendix A
6. Technical provisions	
General	6.1 Means to monitor critical parameters for a safe flight should be available, in particular the: 6.1.1 UA position, height or altitude, ground speed or airspeed, attitude and trajectory; 6.1.2 UAS energy status (fuel, battery charge, etc.); and the 6.1.3 status of critical functions and systems; as a minimum, for services based on RF signals (e.g. C2 Link, GNSS, etc.), means should be provided to monitor the adequate performance and trigger an alert if the level becomes too low. 6.2 The UA should have the performance capability to descend safely from its operating altitude to a 'safe altitude' in less than a minute, or have a descent rate of at least 2.5 m/s (500 fpm).
HMI	6.3 The UAS information and control interfaces should be clearly and succinctly presented and should not confuse, cause unreasonable fatigue, or contribute to causing any disturbance to the personnel in charge of duties essential to the UAS operation such that this could adversely affect the safety of the operation. 6.4 If an electronic means is used to support VOs in their role of maintaining awareness of the position of the unmanned aircraft, its HMI should: 6.4.1 be sufficiently easy to understand to allow the VOs to determine the position of the UA during the operation; and 6.4.2 not degrade the VOs' ability to: 6.4.2.1 perform unaided visual scanning of the airspace where the UA is operating for any potential collision hazard; and 6.4.2.2 maintain effective communication with the remote pilot at all times. 6.5 The applicant should conduct an evaluation of the UAS considering and addressing human factors to determine whether the HMI is appropriate for the mission.
C2 links and communication	6.6 The UAS should comply with the appropriate requirements for radio equipment and the use of the RF spectrum. 6.7 Protection mechanisms against interference should be used, especially if unlicensed bands (e.g. ISM) are used for the C2 Link (mechanisms such as FHSS, technology or frequency de-confliction by procedure). 6.8 Communication between the remote pilot and the VO(s) should allow the remote pilot to manoeuvre the UA with sufficient time to avoid any risk of collision with manned aircraft, in accordance with UAS.SPEC.060(3)(b) of the UAS Regulation.
Tactical mitigation	6.9 The UAS design should be adequate to ensure that the time required between a command given by the remote pilot and the UA executing it does not exceed 5 seconds. 6.10 Where an electronic means is used to assist the remote pilot and/or VOs in being aware of the UA position in relation to potential 'airspace intruders', the information is provided with a latency and an update rate for intruder data (e.g. position, speed, altitude, track) that support the decision criteria.
Containment	6.11 To ensure a safe recovery from a technical issue involving the UAS or an external system supporting the operation, the UAS operator should ensure: 6.11.1 that no probable failure of the UAS or any external system supporting the operation should lead to operation outside the operational volume. 6.11.2 that it is reasonably expected that a fatality will not occur from any probable failure of the UAS, or any external system supporting the operation. 6.12 The vertical extension of the operational volume should be 150 m above the surface (or any other altitude reference defined by the state).

PDRA characterisation and provisions	
	Note: The term 'probable' needs to be understood in its qualitative interpretation, i.e. 'anticipated to occur one or more times during the entire system/operational life of an item.' 6.13 A design and installation appraisal should be made available and should minimally include: 6.13.1 design and installation features (independence, separation and redundancy); 6.13.2 particular risks (e.g. hail, ice, snow, electro-magnetic interference, etc.) relevant to the ConOps. 6.14 The following additional provisions should apply if the adjacent area includes an assembly of people or if the adjacent airspace is classified as ARC-d (in accordance with AMC1 to Article 11 of the UAS Regulation): 6.14.1 The probability of leaving the operational volume should be less than 10-4/FH. 6.14.2 No single failure of the UAS or any external system supporting the operation should lead to operation outside the ground risk buffer. *Note: The term 'failure' needs to be understood as an occurrence, which affects the operation of a component, part, or element such that it can no longer function as intended. Errors may cause failures but are not considered to be failures. Some structural or mechanical failures may be excluded from the criterion if it can be shown that these mechanical parts were designed according to aviation industry best practices.* 6.16.3 SW and AEH whose development error(s) could directly lead to operations outside the ground risk buffer should be developed to an industry standard or methodology recognised as adequate by the competent authority. *Note 1: The proposed additional safety provisions cover both the integrity and assurance levels.* *Note 2: The proposed additional safety provisions do not imply a systematic need to develop the SW and AEH according to an industry standard or methodology recognised as adequate by the competent authority. For instance, if the UA design includes an independent engine shutdown function which systematically prevents the UA from exiting the ground risk buffer due to single failures or a SW/AEH error of the flight controls, the intent of provisions 6.16.2 and 6.16.3 could be considered to be met.* 6.15 Compliance with provisions 6.16.1 and 2 above should be substantiated by analysis and/or test data with supporting evidence.

Table PDRA-01.1 — Main limitations and provisions for PDRA-01

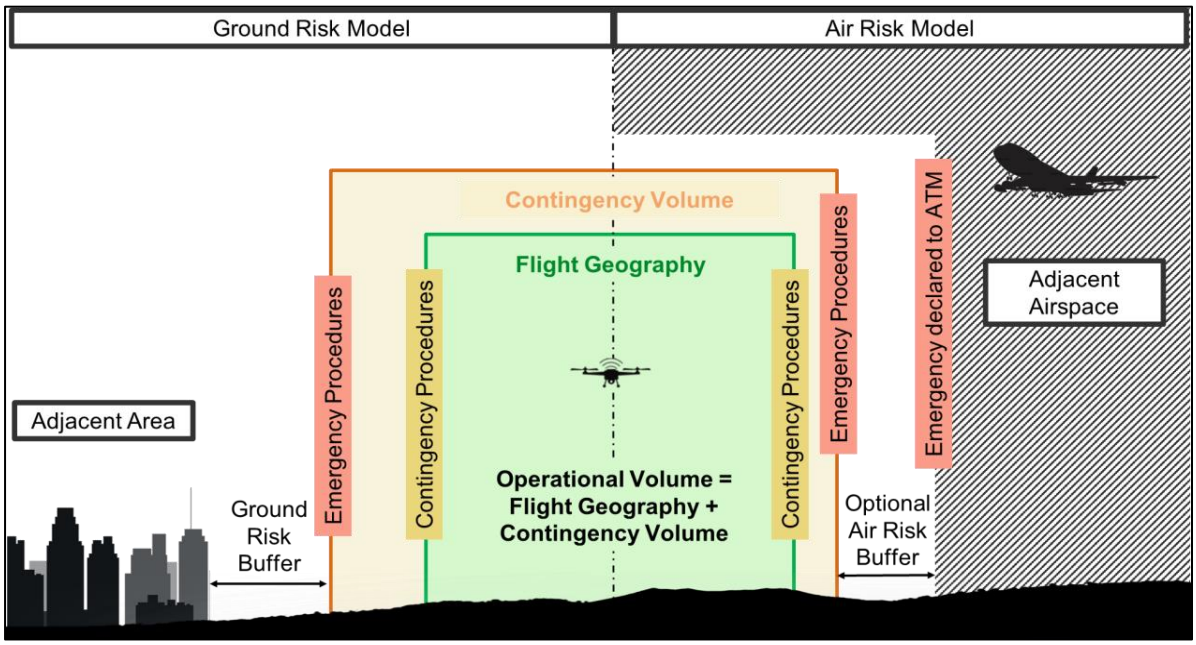


Figure PDRA-01.1 — Graphical representation of the SORA semantic model

Appendix A to AMC2 to Article 11: The personnel in charge of duties essential to the UAS operation

The following are provisions applicable to UAS operators in relation to ensuring the proficiency, competency and clear duty assignment to the personnel in charge of duties essential to the UAS operation. UAS operators may decide to expand these requirements as applicable to its operation.

A.1 Training and qualifications for the personnel in charge of duties essential to the UAS operation

A.1.1 The UAS operator should ensure that all the personnel in charge of duties essential to the UAS operation (i.e. any people involved in the operation) are provided with competency-based theoretical and practical training specific to their duties that consists of the following elements:

A.1.1.2 The basic competencies from the competency framework that are necessary for staff to be adequate for the operation, to ensure safe flight, are as follows:

A.1.1.2.1 the UAS regulation,

A.1.1.2.2 UAS airspace operating principles,

A.1.1.2.3 airmanship and aviation safety,

A.1.1.2.4 human performance limitations,

A.1.1.2.5 meteorology,

A.1.1.2.6 navigation/charts,

A.1.1.2.7 UA knowledge,

A.1.1.2.8 operating procedures,

A.1.1.2.9 assignment of tasks to the crew,

A.1.1.2.10 establishment of step-by-step communications, and

A.1.1.2.11 coordination and handover.

A.1.1.3 Familiarisation with the 'specific' category of operations

A.1.1.3.1 The training programme should be documented (at least the training syllabus should be available).

A.1.1.3.2 Evidence of training should be presented for inspection upon request from the competent authority or authorised representative.

A.2. VOs

A.2.1 The VO's main responsibilities should be to:

A.2.1.1 perform unaided visual scanning of the airspace where the UA is operating for any potential hazard in the air;

A.2.1.2 maintain awareness of the position of the UA through direct visual observation or through assistance provided by an electronic means; and

A.2.1.3 alert the remote pilot if a hazard is detected and assist in avoiding or minimising the potential negative effects.

A.3 Remote pilot

A.3.1 The remote pilot has the authority to cancel or delay any or all flight operations under the following conditions:

A.3.1.1 the safety of persons is threatened; or

A.3.1.2 property on the ground is threatened; or

A.3.1.3 other airspace users are in jeopardy; or

A.3.1.4 there is a violation of the terms of this authorisation.

A.3.2 If VOs are used, then the remote pilot should ensure that the necessary VOs are available and correctly placed, and that the communications with them can be adequately performed.

A.3.3 The remote pilot should ensure that the UA remains clear of clouds, and that the ability of the remote pilot, or one of the VOs, to perform unaided visual scanning of the airspace where the unmanned aircraft is operating for any potential collision hazard is not hampered by clouds.

A.4. Multi-crew cooperation (MCC)

A.4.1 In applications where MCC might be required, the UAS operator should:

A.4.1.1 include procedures to ensure coordination between the remote crew members with robust and effective communication channels. Those procedures should cover as a minimum:

A.4.1.1.1 the assignment of tasks to the remote crew members; and

A.4.1.1.2 the establishment of step-by-step communication; and

A.4.1.2 ensure that the training of the remote crew covers MCC.

A.5. The remote crew is fit to operate

A.5.1 The UAS operator should have a policy defining how the remote crew can declare themselves fit to operate before conducting any operation.

A.5.2 The remote crew shall declare that they are fit to operate before conducting any operation based on the policy defined by the UAS operator.

A.6. Maintenance staff

A.6.1 Any staff member authorised by the UAS operator to perform maintenance activities should have been duly trained regarding the documented maintenance procedures.

A.6.2 Evidence of training should be presented for inspection upon request from the competent authority or authorised representative.

A.6.3 The UAS operator may declare that the maintenance team has received training regarding the documented maintenance procedures; however, evidence of this training shall be made available upon request from the competent authority or authorised representative.

Article 12 - Authorising operations in the 'specific' category

Regulation (EU) 2019/947

1. The competent authority shall evaluate the risk assessment and the robustness of the mitigating measures that the UAS operator proposes to keep the UAS operation safe in all phases of flight.

2. The competent authority shall grant an operational authorisation when the evaluation concludes that:

   (a) the operational safety objectives take account of the risks of the operation;

   (b) the combination of mitigation measures concerning the operational conditions to perform the operations, the competence of the personnel involved and the technical features of the unmanned aircraft, are adequate and sufficiently robust to keep the operation safe in view of the identified ground and air risks;

   (c) the UAS operator has provided a statement confirming that the intended operation complies with any applicable Union and national rules relating to it, in particular, with regard to privacy, data protection, liability, insurance, security and environmental protection.

3. When the operation is not deemed sufficiently safe, the competent authority shall inform the applicant accordingly, giving reasons for its refusal to issue the operational authorisation.

4. The operational authorisation granted by the competent authority shall detail:

   (a) the scope of the authorisation;

   (b) the 'specific' conditions that shall apply:

      i. to the UAS operation and the operational limitations;

      ii. to the required competency of the UAS operator and, where applicable, of the remote pilots;

      iii. to the technical features of the UAS, including the certification of the UAS, if applicable;

   (c) the following information:

      i. the registration number of the UAS operator and the technical features of the UAS;

      ii. a reference to the operational risk assessment developed by the UAS operator;

      iii. the operational limitations and conditions of the operation;

      iv. the mitigation measures that the UAS operator has to apply;

      v. the location(s) where the operation is authorised to take place and any other locations in a Member States in accordance with Article 13;

      vi. all documents and records relevant for the type of operation and the type of events that should be reported in addition to those defined in Regulation (EU) No 376/2014 of the European Parliament and of the Council[1].

[1] Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and repealing Directive 2003/42/EC of the European Parliament and of the Council and Commission Regulations (EC) No 1321/2007 and (EC) No 1330/2007 (OJ L 122, 24.4.2014, p. 18).

5. Upon receipt of the declaration referred to in paragraph 5 of Article 5, the competent authority shall:

   (a) verify that it contains all elements set out in paragraph 2 of point UAS.SPEC.020 of the Annex;

   (b) if this is the case, provide the UAS operator with a confirmation of receipt and completeness without undue delay so that the operator may start the operation.

AMC1 Article 12(5) Authorising operations in the 'specific' category

ED Decision 2019/021/R

DECLARATION, VERIFICATION AND ACKNOWLEDGEMENT OF RECEIPT

(a) The competent authority should establish an online system for the submission of operational declarations, which provides the submitter with an automatic acknowledgement of receipt when the submission has been successful.

(b) For a submission to be considered successful, the online system should check that all the required information has been provided. Otherwise, the system should indicate to the submitter which parts of the information still need to be added to complete the submission of the declaration (e.g. fields to be filled in, compliance with requirements or statements to be accepted or acknowledged, etc.).

(c) In order to facilitate cross-border operations, the acknowledgement of receipt should be written at least in English, in addition to the language of the Member State. A formula such as the following may be used:

'The {*name of the competent authority*} acknowledges the receipt of the declaration submitted by {*name of the UAS operator and UAS operator registration number*}, on {*date of submission of the declaration*} related to the STS {*identification of the STS*}. The declaration has been found to be complete.'

Article 13 - Cross-border operations or operations outside the state of registration

Regulation (EU) 2019/947

1. When an UAS operator intends to conduct an operation in the 'specific' category for which an operational authorisation has already been granted in accordance with Article 12, and which is intended to take place partially or entirely in the airspace of a Member State other than the Member State of registration, the UAS operator shall provide the competent authority of the Member State of intended operation with an application including the following information:

   (a) a copy of the operational authorisation granted to the UAS operator in accordance with Article 12; and

   (b) the location(s) of the intended operation including the updated mitigation measures, if needed, to address those risks identified under Article 11(2)(b) which are specific to the local airspace, terrain and population characteristics and the climatic conditions.

2. Upon receipt of the application set out in paragraph 1, the competent authority of the Member State of intended operation shall assess it without undue delay and provide the competent authority of the Member State of registration and the UAS operator with a confirmation that the updated mitigation measures referred to in point (b) of paragraph 1 are satisfactory for the operation at the intended location. Upon receipt of that confirmation, the UAS operator may

start the intended operation and the Member State of registration shall record the updated mitigation measures that the UAS operator has to apply in the operational authorisation issued in accordance with Article 12.

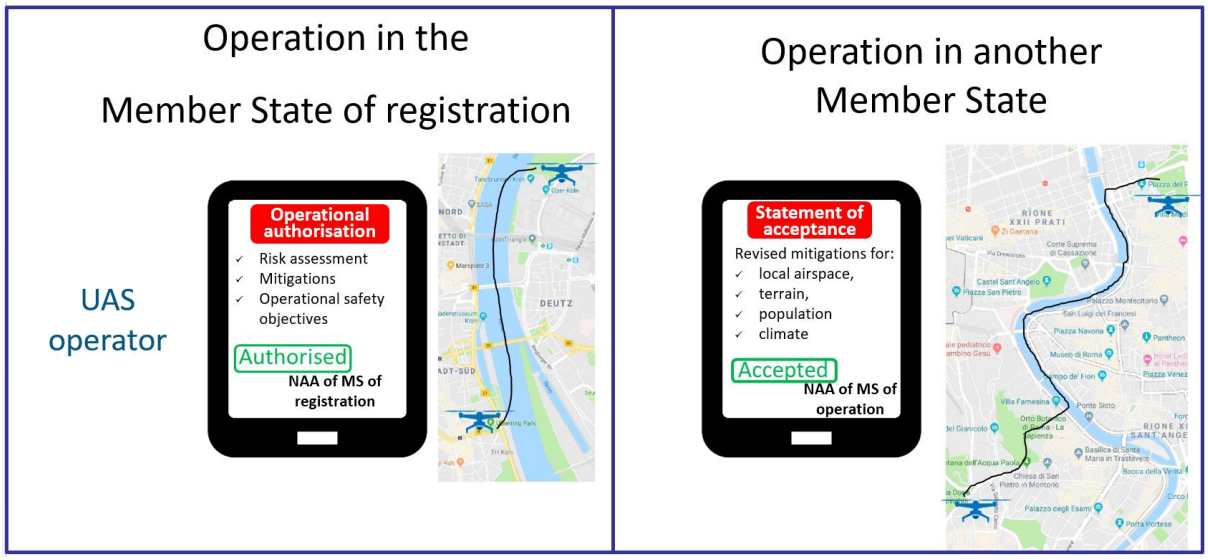
3. When an UAS operator intends to conduct an operation in the 'specific' category for which a declaration has been made in accordance with paragraph 5 of Article 5, and which is intended to take place partially or entirely in the airspace of a Member State other than the Member State of registration, the UAS operator shall provide the competent authority of the Member State of the intended operation with a copy of the declaration submitted to the Member State of registration, as well as a copy of the confirmation of receipt and completeness.

GM1 Article 13 Cross-border operations or operations outside the state of registration

ED Decision 2019/021/R

GENERAL

The picture below illustrates an example of an authorisation, already provided by the competent authority, to conduct an operation in the Member State of registration, which is used to conduct the same operation in another Member State:



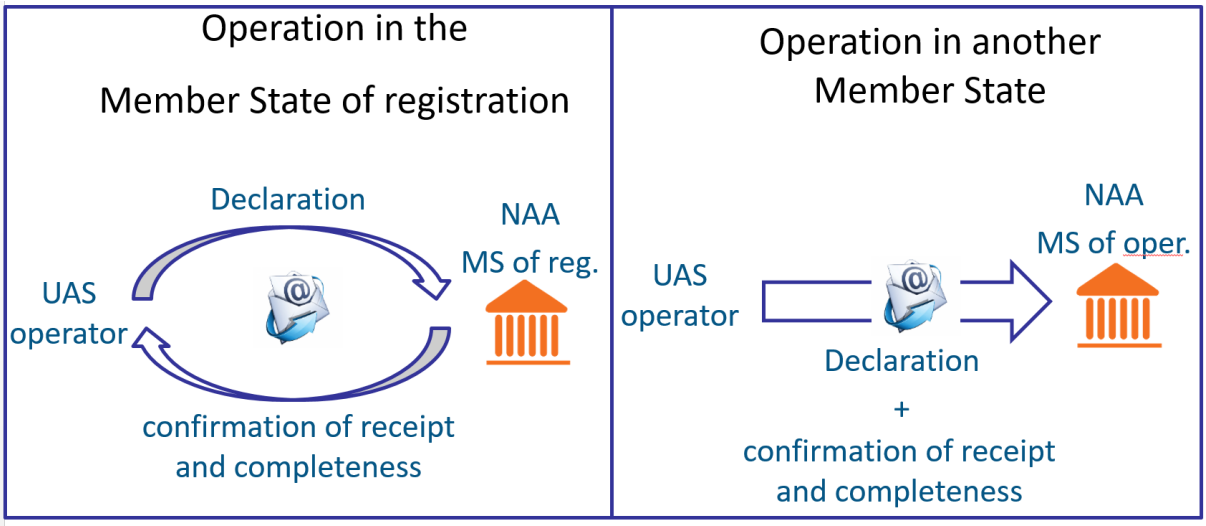
In the example, the UAS operator receives the authorisation from the competent authority of the Member State of registration where the mitigation measures are listed, and they may be adapted to the characteristics of the area of operation (e.g. the ground risk may be mitigated by flying over a river).

When the UAS operator intends to conduct the same operation in another Member State, a copy of the authorisation issued by the competent authority of the Member State of registration needs to be sent to the NAA of the Member State of the UAS operations. A number of elements of the mitigation measures may remain valid, such as the way the operator is organised, the competences of the pilot, or the characteristics of the UAS, for example. Other elements instead need to be adapted to the geography of the area of operation (e.g. the operations cannot be conducted mostly over the river, or it is necessary to identify a flight path meeting the equivalent conditions in terms of the ground risk, the local airspace, terrain and climate). On these points and also on the airspace, terrain and climate,

the UAS operators are expected to review and possibly update the mitigation means, but only in relation to those elements.

The competent authority of the Member State of operation is not expected to review the full risk assessment, but to limit its activity to checking and providing the UAS operator and the competent authority of the Member State of registration with confirmation that the updated mitigation measures are satisfactory. Upon receipt of the confirmation, the UAS operator may start operating immediately, and the competent authority of registration will update the authorisation.

The picture below illustrates an example of the case when an operation complying with one of the STSs listed in Appendix 1 to the UAS Regulation is conducted in a Member State other than the state of registration:



The UAS operator firstly submits the declaration to the competent authority of the Member State of registration, which, if the declaration complies with the UAS Regulation, issues a confirmation of receipt and completeness. The UAS operator will then provide the competent authority of the Member State of operations with a copy of the declaration and the confirmation of completeness received by the competent authority of the Member State of registration. There is no need for further verification.

Article 14 - Registration of UAS operators and certified UAS

Regulation (EU) 2019/947

1. Member States shall establish and maintain accurate registration systems for UAS whose design is subject to certification and for UAS operators whose operation may present a risk to safety, security, privacy, and protection of personal data or environment.
2. The registration systems for UAS operators shall provide the fields for introducing and exchanging the following information:
   (a) the full name and the date of birth for natural persons and the name and their identification number for legal persons;
   (b) the address of UAS operators;
   (c) their email address and telephone number;
   (d) an insurance policy number for UAS if required by Union or national law;

(e) the confirmation by legal persons of the following statement: 'All personnel directly involved in the operations are competent to perform their tasks, and the UAS will be operated only by remote pilots with the appropriate level of competency';

(f) operational authorisations and LUCs held and declarations followed by a confirmation in accordance with Article 12(5)(b).

3. The registration systems for unmanned aircraft whose design is subject to certification shall provide the fields for introducing and exchanging the following information:

(a) manufacturer's name;

(b) manufacturer's designation of the unmanned aircraft;

(c) unmanned aircraft's serial number;

(d) full name, address, email address and telephone number of the natural or legal person under whose name the unmanned aircraft is registered.

4. Member States shall ensure that registration systems are digital and interoperable and allow for mutual access and exchange of information through the repository referred to in Article 74 of Regulation (EU) 2018/1139.

5. UAS operators shall register themselves:

(a) when operating within the 'open' category any of the following unmanned aircraft:

i. with a MTOM of 250 g or more, or, which in the case of an impact can transfer to a human kinetic energy above 80 Joules;

ii. that is equipped with a sensor able to capture personal data, unless it complies with Directive 2009/48/EC.

(b) when operating within the 'specific' category an unmanned aircraft of any mass.

6. UAS operators shall register themselves in the Member State where they have their residence for natural persons or where they have their principal place of business for legal persons and ensure that their registration information is accurate. A UAS operator cannot be registered in more than one Member State at a time.

Member States shall issue a unique digital registration number for UAS operators and for the UAS that require registration, allowing their individual identification.

The registration number for UAS operators shall be established on the basis of standards that support the interoperability of the registration systems;

7. The owner of an unmanned aircraft whose design is subject to certification shall register the unmanned aircraft.

The nationality and registration mark of an unmanned aircraft shall be established in line with ICAO Annex 7. An unmanned aircraft cannot be registered in more than one State at a time.

8. The UAS operators shall display their registration number on every unmanned aircraft meeting the conditions described in paragraph 5.

AMC1 Article 14 Registration of UAS operators and 'certified' UAS

ED Decision 2019/021/R

NATIONAL CONTACT POINT FOR ACCESSING AND EXERCISING THE RIGHTS

The competent authority should identify and publish the contact point for accessing and exercising the rights in accordance with Regulation (EU) 2016/679[1] on the protection of natural persons with regard to the processing of personal data and on the free movement of such data.

AMC1 Article 14(8) Registration of UAS operators and 'certified' UAS

ED Decision 2019/021/R

DISPLAY OF REGISTRATION INFORMATION

(a) If the UAS operator owns the UAS, it should display on the UA the registration number received at the end of the registration process in a way that this information is readable at least when the UA is on the ground without the need for any devices other than eyeglasses or corrective lenses.

(b) A QR code (quick response code) may be used.

(c) If the size of the UA does not allow the mark to be displayed in a visible way on the fuselage, or the UA represents a real aircraft where affixing the marking on the UA would spoil the realism of the representation, a marking inside the battery compartment is acceptable if the compartment is accessible.

(d) If a UAS operator uses a UAS owned by a third party, the UAS operator that operates the UAS should:

(1) register itself;

(2) display its registration number on the UA; and

(3) upload the registration number into the e-identification system, if the UA is equipped with one.

Article 15 - Operational conditions for UAS geographical zones

Regulation (EU) 2019/947

1. When defining UAS geographical zones for safety, security, privacy or environmental reasons, Member States may:

(a) prohibit certain or all UAS operations, request particular conditions for certain or all UAS operations or request a prior operational authorisation for certain or all UAS operations;

(b) subject UAS operations to specified environmental standards;

(c) allow access to certain UAS classes only;

(d) allow access only to UAS equipped with certain technical features, in particular remote identification systems or geo awareness systems.

[1] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation).

2. On the basis of a risk assessment carried out by the competent authority, Member States may designate certain geographical zones in which UAS operations are exempt from one or more of the 'open' category requirements.

3. When pursuant to paragraphs 1 or 2 Member States define UAS geographical zones, for geo awareness purposes they shall ensure that the information on the UAS geographical zones, including their period of validity, is made publicly available in a common unique digital format.

Article 16 - UAS operations in the framework of model aircraft clubs and associations

Regulation (EU) 2019/947

1. Upon request by a model aircraft club or association, the competent authority may issue an authorisation for UAS operations in the framework of model aircraft clubs and associations.

2. The authorisation referred to in paragraph 1 shall be issued in accordance with any of the following:

   (a) relevant national rules;

   (b) established procedures, organisational structure and management system of the model aircraft club or association, ensuring that:

      i. remote pilots operating in the framework of model aircraft clubs or associations are informed of the conditions and limitations defined in the authorisation issued by the competent authority;

      ii. remote pilots operating in the framework of model aircraft clubs or associations are assisted in achieving the minimum competency required to operate the UAS safely and in accordance with the conditions and limitations defined in the authorisation;

      iii. the model aircraft club or association takes appropriate action when informed that a remote pilot operating in the framework of model aircraft clubs or associations does not comply with the conditions and limitations defined in the authorisation, and, if necessary, inform the competent authority;

      iv. the model aircraft club or association provides, upon request from the competent authority, documentation required for oversight and monitoring purposes.

3. The authorisation referred to in paragraph 1 shall specify the conditions under which operations in the framework of the model aircraft clubs or associations may be conducted and shall be limited to the territory of the Member State in which it is issued.

4. Member States may enable model aircraft clubs and associations to register their members into the registration systems established in accordance with Article 14 on their behalf. If this is not the case, the members of model aircraft clubs and associations shall register themselves in accordance with Article 14.

GM1 Article 16 UAS operations in the framework of model aircraft clubs and associations

ED Decision 2019/021/R

GENERAL

Unless differently provided by national regulation, a model aircraft club and association may obtain from the national competent authority an authorisation that is valid for all their members to operate UA according to conditions and limitations tailored for the club or association.

The model aircraft club and association will submit to the competent authority the procedures that all members are required to follow. When the competent authority is satisfied with the procedures, organisational structure and management system of the model aircraft club and association, it may provide an authorisation that defines different limitations and conditions from those in the UAS Regulation. The authorisation will be limited to the operations conducted within the authorised club or association and within the territory of the Member State of the authorised competent authority. The authorisation cannot exempt members of the club or association from registering themselves according to Article 14 of the UAS Regulation; however, it may allow a model club or association to register their members on their behalf.

The authorisation may also include operations by persons who temporarily join in with the activities of the club or association (e.g. for leisure during holidays or for a contest), as long as the procedures provided by the club or association define conditions acceptable to the competent authority.

GM2 Article 16 UAS operations in the framework of model aircraft clubs and associations

ED Decision 2019/021/R

OPTIONS TO OPERATE A MODEL AIRCRAFT

Model flyers have the following options to conduct their operations:

(a) They may operate as members of a model club or association that has received from the competent authority an authorisation, as defined in Article 16 of the UAS Regulation. In this case, they should comply with the procedures of the model club or association in accordance with the authorisation. The authorisation should define all the deviations from the aforementioned Regulation granted to the model club or association's members. Members must register themselves in accordance with Article 14 of the UAS Regulation, except when the model aircraft clubs and associations have obtained from the Member State the right to register their members in the registration system.

(b) In accordance with Article 15(2) of the UAS Regulation, Member States may define zones where UAS are exempted from certain technical requirements, and/or where the operational limitations are extended, including mass or height limitations. They may also define different height limitations for those zones.

(c) The UAS may be operated in Subcategory A3, in which the following categories of UAS are allowed to fly according to the limitations and conditions defined in UAS.OPEN.040:

(1) UAS with a class C0, C1, C2, C3, C4 CE mark;

(2) UAS that meet the requirements defined in Article 20(b) of the UAS Regulation; and

(3) privately built UAS with MTOMs of less than 25 kg.

GM1 Article 16(2)(b)(iii) UAS operations in the framework of model aircraft clubs and associations

ED Decision 2019/021/R

ACTION IN CASES OF OPERATIONS/FLIGHTS THAT EXCEED THE CONDITIONS AND LIMITATIONS DEFINED IN THE OPERATIONAL AUTHORISATION

When a model club or association is informed that a member has exceeded the conditions and limitations defined in the operational authorisation, appropriate measures will be taken, proportionate to the risk posed. Considering the level of risk, the model club or association decides whether the competent authority should be informed. In any case, occurrences that cause an injury to persons or where the safety of other aircraft was compromised, as defined in Article 125 of Regulation (EU) 2018/1139[1], must be reported by the model club or association to the competent authority.

Article 17 - Designation of the competent authority

Regulation (EU) 2019/947

1. Each Member State shall designate one or more entities as the competent authority for the tasks referred to in Article 18.

2. Where a Member State designates more than one entity as a competent authority it shall:

   (a) clearly define the areas of competence of each competent authority in terms of responsibilities;

   (b) establish appropriate coordination mechanism between those entities to ensure the effective oversight of all organisations and persons subject to this Regulation.

GM1 Article 17 Designation of the competent authority

ED Decision 2019/021/R

GENERAL

Member States may also designate an entity as a competent authority only for specific tasks. It should be highlighted that in such a case, this entity must comply with Article 62(3) of Regulation (EU) 2018/1139 and is the one that will be audited by EASA under Article 85 (monitoring of Member State) of the same Regulation.

Article 18 - Tasks of the competent authority

Regulation (EU) 2019/947

The competent authority shall be responsible for:

(a) enforcing this Regulation;

(b) issuing, suspending or revoking certificates of UAS operators and licenses of remote pilots operating within the 'certified' category of UAS operations;

(c) issuing remote pilots with a proof of completion of an online theoretical knowledge examination according to points UAS.OPEN.020 and UAS.OPEN.040 of the Annex and issuing,

[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.

amending, suspending, limiting or revoking certificates of competency of remote pilots according to point UAS.OPEN.030 of the Annex;

(d) issuing, amending, suspending, limiting or revoking operational authorisations and LUCs and verifying completeness of declarations, which are required to carry out UAS operations in the 'specific' category of UAS operations;

(e) keeping documents, records and reports concerning UAS operational authorisations, declarations, certificates of competency of the remote pilots and LUCs;

(f) making available in a common unique digital format information on UAS geographical zones identified by the Member States and established within the national airspace of its State;

(g) issuing a confirmation of receipt and completeness in accordance with Article 12(5)(b) or a confirmation in accordance with paragraph 2 of Article 13;

(h) developing a risk-based oversight system for:

i. UAS operators that have submitted a declaration or hold an operational authorisation or an LUC;

ii. model clubs and associations that hold an authorisation referred to in Article 16;

(i) for operations other than those in the 'open' category, establishing audit planning based on the risk profile, compliance level and the safety performance of UAS operators who have submitted a declaration, or hold a certificate issued by the competent authority;

(j) for operations other than those in the 'open' category, carrying out inspections with regard to UAS operators who have submitted a declaration or hold a certificate issued by the competent authority inspecting UAS and ensuring that UAS operators and remote pilots comply with this Regulation;

(k) implementing a system to detect and examine incidents of non-compliance by UAS operators operating in the 'open' or 'specific' categories and reported in accordance with paragraph 2 of Article 19;

(l) providing UAS operators with information and guidance that promotes the safety of UAS operations;

(m) establishing and maintaining registration systems for UAS whose design is subject to certification and for UAS operators whose operation may present a risk to safety, security, privacy, and protection of personal data or the environment.

GM1 Article 18(a) Tasks of the competent authority

ED Decision 2019/021/R

ENFORCEMENT

Member States are responsible for enforcing the UAS Regulation, and it is their decision to nominate the competent authority. In making this decision, Member States should consider that most of the UAS operations will occur in areas far from aerodromes, and therefore, the selected competent authority should employ personnel able to verify that the UAS operations conducted in such areas are safe. In addition, the issues that are likely to occur more often will be related to noise, privacy and security. Taking all this into account, law enforcement authorities may be well-placed to fulfil that role. Law enforcement authorities may take different forms, depending on the Member State's national legal framework.

AMC1 Article 18(e) Tasks of the competent authority

ED Decision 2019/021/R

DOCUMENTS, RECORDS AND REPORTS TO BE KEPT

(a) The competent authority should keep at least the following documentation:

(1) operational authorisations, in accordance with Article 12(2) of the UAS Regulation:

(i) the initial application for an authorisation as defined in UAS.SPEC.030(3) of Part-B and the associated documents;

(ii) the application(s) for updated operational authorisations;

(iii) the final version of the risk assessment performed by the UAS operator, and the supporting material;

(iv) the UAS operator's statement confirming that the intended UAS operation complies with any applicable European Union and national rules relating to it, in particular with regard to privacy, data protection, liability, insurance, security and environmental protection, in accordance with Article 12(2)(c) of the UAS Regulation;

(v) the procedures to ensure that all operations comply with Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data;

(vi) confirmation by the competent authority of the Member State of operation that the updated mitigation measures are satisfactory for the operation at the intended location in accordance with Article 13(2) of the UAS Regulation;

(vii) when applicable, a procedure for coordination with the relevant service provider for the airspace if the entire operation, or part of it, is to be conducted in controlled airspace; and

(viii) up-to-date operational authorisation(s) with a table outlining successive changes;

(2) declarations in accordance with Article 12(5) of the UAS Regulation:

(i) up-to-date declarations with a table outlining successive changes;

(ii) up-to-date confirmations of receipt and completeness, provided in accordance with Article 12(5)(b) of the UAS Regulation, with a table outlining successive changes;

(3) remote pilots' competency:

(i) proof of competency for remote pilots that have passed the online theoretical knowledge examination in accordance with UAS.SPEC.020(4)(b) of Part-B;

(ii) certificates of remote pilot competency for remote pilots that have passed the examination in accordance with UAS.SPEC.030(2)(c) of Part-B, with the declaration of completion of the practical self-training provided by the remote pilot; and

(iii) proof of competency or other certificates for remote pilots, as required by the STSs as defined in Appendix 1 to the UAS Regulation or the operational authorisations;

(4) Light UAS Operator Certificates:

(i) initial applications in accordance with UAS.LUC.010(2) of Part-C and associated documents;

(ii) applications for amendments to an existing LUC, and the associated documents; and

(iii) up-to-date terms of approval in accordance with UAS.LUC.050 of Part-C, with a table outlining the successive changes.

(b) The records should be kept for at least for three years after their validity date expires.

GM1 Article 18(h) Tasks of the competent authority

ED Decision 2019/021/R

GUIDELINES FOR RISK-BASED OVERSIGHT (RBO)

NOTE: The guidelines below are based on the document 'Practices for risk-based oversight', which may be found at the address below, and where further information may also be found:

https://www.easa.europa.eu/document-library/general-publications/practices-risk-based-oversight

That document:

— highlights the relationship between RBO and the (safety) management system, the management of change, the overall performance of the organisation and the oversight cycle;

— describes the interconnection, availability and exchange of data, which will significantly change the relationship between the authority and their regulated entities, as well as their ongoing management of safety;

— does not constitute regulatory material nor means of compliance nor guidance material. It reflects the RBO state of play to date, in an effort to gain a common understanding and to look ahead; and

— can be used as guidelines for competent authorities who have to implement RBO.

(a) General Definitions:

(1) Oversight: the function by means of which a competent authority ensures that the applicable requirements are met by regulated entities.

(2) Risk profile: the element of risks that are inherent to the nature and operations of the regulated entity, this includes the:

— specific nature of the organisation;

— complexity of its activities; and

— risks stemming from the activities carried out.

(3) Safety performance: the demonstration of how effectively a regulated entity can mitigate its risks, substantiated through the proven ability to:

— comply with the applicable requirements;

— implement and maintain effective safety management;

— identify and manage safety risks; and

— achieve and maintain safe operations.

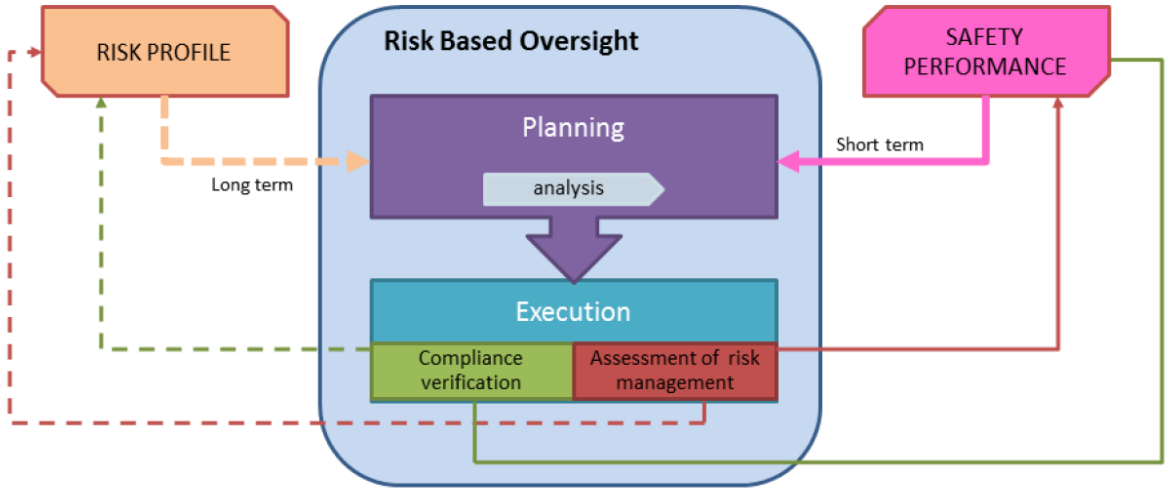
The results of past certification or oversight also need to be taken into account.

(4) RBO: a way of performing oversight, in which:

— planning is driven by the combination of the risk profile and safety performance; and

— execution focuses on the management of risk, besides ensuring compliance.

(b) The RBO scheme is summed-up by the drawing below:



(1) the risk profile and oversight are described in paragraph 3 of the 'Practices for risk-based oversight';

(2) the management of safety information and information sharing with other authorities are described in paragraph 4 of 'Practices for risk-based oversight';

(3) the training and qualification of inspectors are described in paragraph 4.3 of 'Practices for risk-based oversight';

(4) conducting risk-based audits is described in paragraph 5 of 'Practices for risk-based oversight'.

Article 19 - Safety information

Regulation (EU) 2019/947

1. The competent authorities of the Member States and market surveillance and control authorities referred to in Article 36 of Delegated Regulation (EU) 2019/945 shall cooperate on safety matters and establish procedures for the efficient exchange of safety information.

2. Each UAS operator shall report to the competent authority on any safety-related occurrence and exchange information regarding its UAS in compliance with Regulation (EU) No 376/2014.

3. The European Union Aviation Safety Agency ('the Agency') and the competent authorities shall collect, analyse and publish safety information concerning UAS operations in their territory in accordance with Article 119 of Regulation (EU) 2018/1139 and its implementing acts.

4. Upon receiving any of the information referred to in paragraphs 1, 2 or 3, the Agency and the competent authority shall take the necessary measures to address any safety issues on the best available evidence and analysis, taking into account interdependencies between the different

domains of aviation safety, and between aviation safety, cyber security and other technical domains of aviation regulation.

5. Where the competent authority or the Agency takes measures in accordance with paragraph 4, it shall immediately notify all relevant interested parties and organisations that need to comply with those measures in accordance with Regulation (EU) 2018/1139 and its implementing acts.

GM1 Article 19 Safety information

ED Decision 2019/021/R

EXCHANGE OF SAFETY INFORMATION

Cooperation between competent authorities should be organised pursuant to Article 61 of Regulation (EU) 2018/1139. Cooperation between market surveillance authorities and the exchange of safety-related and non-compliance information should be organised pursuant to Regulation (EC) No 765/2008[1]. Article 19 of the UAS Regulation is intended to help organise the information flow and cooperation between the competent authorities on the one hand, and between the market surveillance authorities on the other.

Cooperation should be organised primarily at the Member State level. All the competent authorities concerned should make the best use of the information systems defined in Articles 22 'Exchange of information — Community Rapid Information System' and 23 'General information support system' of Regulation (EC) No 765/2008, as well as of the occurrence-reporting system of Regulation (EU) No 376/2014.

GM1 Article 19(2) Safety information

ED Decision 2019/021/R

OCCURRENCE REPORT

According to Regulation (EU) No 376/2014, occurrences shall be reported when they refer to a condition which endangers, or which, if not corrected or addressed, would endanger an aircraft, its occupants, any other person, equipment or installation affecting aircraft operations. Obligations to report apply in accordance with Regulation (EU) No 376/2014, namely its Article 3(2), which limits the reporting of events for operations with UA for which a certificate or declaration is not required, to occurrences and other safety-related information involving such UA if the event resulted in a fatal or serious injury to a person, or it involved aircraft other than UA.

Article 20 - Particular provisions concerning the use of certain UAS in the 'open' category

Regulation (EU) 2019/947

UAS types within the meaning of Decision No 768/2008/EC of the European Parliament and of the Council[2], which do not comply with Delegated Regulation (EU) 2019/945 and which are not privately-built are allowed to continue to be operated under the following conditions, when they have been placed on the market before 1 July 2022:

[1] Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93 (OJ L 218, 13.8.2008, p. 30).

[2] Decision No 768/2008/EC of the European Parliament and of the Council of 9 July 2008 on a common framework for the marketing of products, and repealing Council Decision 93/465/EEC (OJ L 218 13.8.2008, p. 82)

(a) in subcategory A1 as defined in Part A of the Annex, provided that the unmanned aircraft has a maximum take-off mass of less than 250 g, including its payload;

(b) in subcategory A3 as defined in Part A of the Annex, provided that the unmanned aircraft has a maximum take-off mass of less than 25 kg, including its fuel and payload.

Article 21 - Adaptation of authorisations, declarations and certificates

Regulation (EU) 2019/947

1. Authorisations granted to UAS operators, certificates of remote pilot competency and declarations made by UAS operators or equivalent documentation, issued on the basis of national law, shall remain valid until 1 July 2021.

2. By 1 July 2021 Member States shall convert their existing certificates of remote pilot competency and their UAS operator authorisations or declarations, or equivalent documentation, including those issued until that date, in accordance with this Regulation.

3. Without prejudice to Article 14, UAS operations conducted in the framework of model aircraft clubs and associations shall be allowed to continue in accordance with relevant national rules and without an authorisation in accordance with Article 16 until 1 July 2022.

Article 22 - Transitional provisions

Regulation (EU) 2019/947

Without prejudice to Article 20, the use of UAS in the 'open' category which do not comply with the requirements of Parts 1 to 5 of the Annex to Delegated Regulation (EU) 2019/945 shall be allowed for a transitional period of two years starting one year after the date of entry into force of this Regulation, subject to the following conditions:

(a) unmanned aircraft with a maximum take-off mass of less than 500 g are operated within the operational requirements set out in points UAS.OPEN.020(1) of Part A of the Annex by a remote pilot having competency level defined by the Member State concerned;

(b) unmanned aircraft with a maximum take-off mass of less than 2 kg is operated by keeping a minimum horizontal distance of 50 meters from people and the remote pilots have a competency level at least equivalent to the one set out in point UAS.OPEN.030(2) of Part A of the Annex;

(c) unmanned aircraft with a maximum take-off mass of more than 2 kg and less than 25 kg is operated within the operational requirements set out in point UAS.OPEN.040(1) and (2) and the remote pilots have a competency level at least equivalent to the one set out in point UAS.OPEN.020(4)(b) of Part A of the Annex.

Article 23 - Entry into force and application

Regulation (EU) 2019/947

1. This Regulation shall enter into force on the twentieth day following that of its publication in the Official Journal of the European Union.

   It shall apply from 1 July 2020.

2. Paragraph 5 of Article 5 shall apply as from the date on which Appendix 1 of the Annex is amended so that it contains the applicable standard scenarios. Member States may in accordance with paragraph 5 of Article 5 accept declarations by UAS operators based on national standard scenarios, if those scenarios meet the requirements of point UAS.SPEC.020

of the Annex until this Regulation is amended to include the standard scenario in Appendix 1 of the Annex.

3. Paragraph 3 of Article 15 shall apply from 1 July 2021.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 24 May 2019

For the Commission

The President

Jean-Claude JUNCKER

ANNEX TO REGULATION (EU) 2019/947 – UAS OPERATIONS IN THE 'OPEN' AND 'SPECIFIC' CATEGORIES

PART A – UAS OPERATIONS IN THE 'OPEN' CATEGORY

UAS.OPEN.010 General provisions

Regulation (EU) 2019/947

(1) The category of UAS 'open' operations is divided into three subcategories A1, A2 and A3, on the basis of operational limitations, requirements for the remote pilot and technical requirements for UAS.

(2) Where the UAS operation involves the flight of the unmanned aircraft starting from a natural elevation in the terrain or over terrain with natural elevations, the unmanned aircraft shall be maintained within 120 metres from the closest point of the surface of the earth. The measurement of distances shall be adapted accordingly to the geographical characteristics of the terrain, such as plains, hills, mountains.

(3) When flying an unmanned aircraft within a horizontal distance of 50 metres from an artificial obstacle taller than 105 metres, the maximum height of the UAS operation may be increased up to 15 metres above the height of the obstacle at the request of the entity responsible for the obstacle.

(4) By way of derogation from point (2), unmanned sailplanes with a MTOM, including payload, of less than 10 kg, may be flown at a distance in excess of 120 metres from the closest point of the surface of the earth, provided that the unmanned sailplane is not flown at a height greater than 120 metres above the remote pilot at any time.

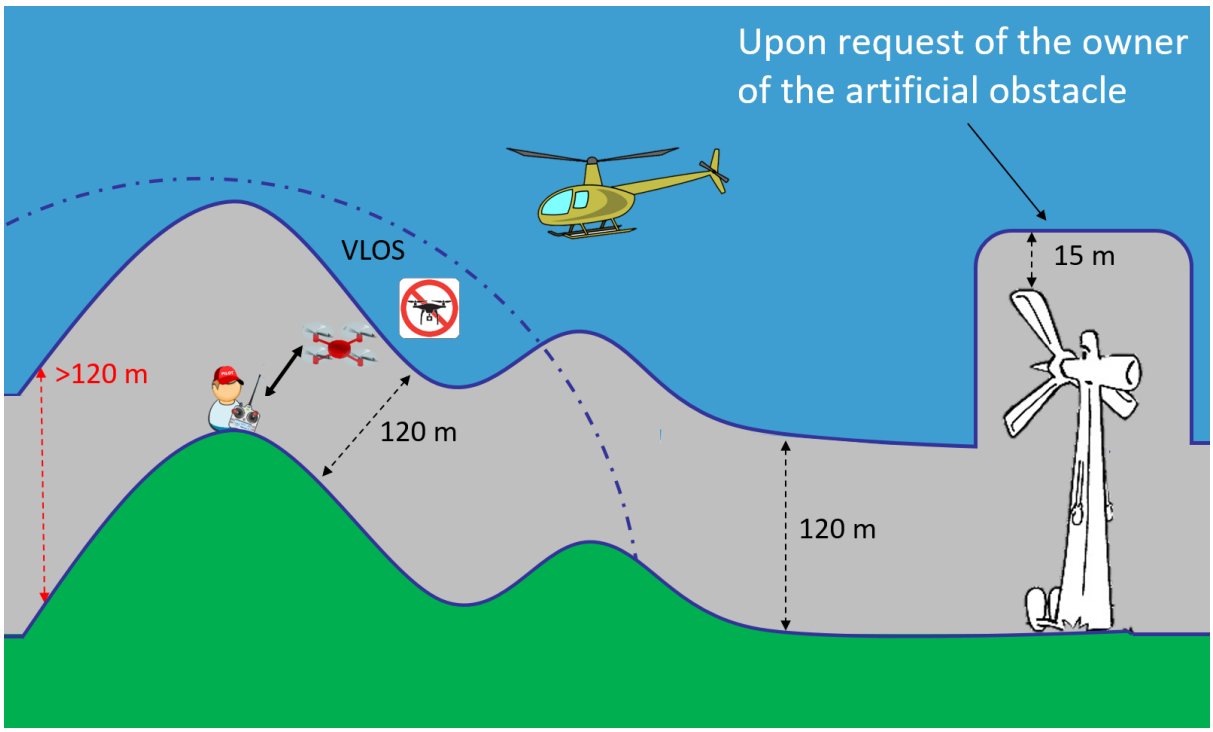
GM1 UAS.OPEN.010 General provisions

ED Decision 2019/021/R

MAXIMUM HEIGHT

The remote pilot must ensure that he or she keeps the unmanned aircraft (UA) at a distance less than 120 m (400 ft) from the terrain, and the picture below shows how the maximum height that the UA may reach changes according to the topography of the terrain. In addition, when the Member State (MS) has defined a geographical zone with a lower maximum height, the remote pilot must ensure that the UA always complies with the requirements of the geographical zone.

The entity responsible for the artificial obstacle referred to in point UAS.OPEN.010(3) needs to explicitly grant the unmanned aircraft system (UAS) operator permission to conduct an operation close to a tall man-made obstacle, e.g. a building, or antenna. No UAS operator should conduct an operation close to such an obstacle without permission from the entity responsible for the obstacle.



GM1 UAS.OPEN.010(4) General provisions

ED Decision 2019/021/R

OPERATIONS WITH UNMANNED SAILPLANES

This derogation was included to allow model gliders to continue to operate along slopes. Strictly applying the 120-metre distance from the closest point of the surface of the earth would have had disproportionate consequences. These operations have been conducted successfully for decades and have generated a micro-economy in certain countries. Two measures have been put in place to reduce the risk:

(a) A maximum takeoff mass (MTOM), including the payload, limited to 10 kg to reduce the consequences of an impact. 10 kg should cover the vast majority of gliders in operation.

(b) The maximum height above the remote pilot is limited to 120 m, which reduces the air risk.

UAS.OPEN.020 UAS operations in subcategory A1

Regulation (EU) 2019/947

UAS operations in subcategory A1 shall comply with all of the following conditions:

(1) for unmanned aircraft referred to in point (5)(d), be conducted in such a way that a remote pilot of the unmanned aircraft does not overfly assemblies of people and reasonably expects that no uninvolved person will be overflown. In the event of unexpected overflight of uninvolved persons, the remote pilot shall reduce as much as possible the time during which the unmanned aircraft overflies those persons;

(2) in the case of an unmanned aircraft referred to in points (5)(a), (5)(b) and (5)(c), be conducted in such a way that the remote pilot of the unmanned aircraft may overfly uninvolved persons but shall never overfly assemblies of people;

(3) by way of derogation from point (d) of paragraph 1 of Article 4, be conducted, when the follow-me mode is active, up to a distance of 50 metres from the remote pilot;

(4) be performed by a remote pilot:

(a) familiarised with the user's manual provided by the manufacturer of the UAS;

(b) in the case of an unmanned aircraft class C1, as defined in Part 2 of the Annex to Delegated Regulation (EU) 2019/945, who has completed an online training course followed by completing successfully an online theoretical knowledge examination provided by the competent authority or by an entity recognised by the competent authority of the Member State of registration of the UAS operator. The examination shall comprise 40 multiple-choice questions distributed appropriately across the following subjects:

i. air safety;

ii. airspace restrictions;

iii. aviation regulation;

iv. human performance limitations;

v. operational procedures;

vi. UAS general knowledge;

vii. privacy and data protection;

viii. insurance;

ix. security.

(5) be performed with an unmanned aircraft that:

(a) has an MTOM, including payload, of less than 250 g and a maximum operating speed of less than 19 m/s, in the case of a privately built UAS; or

(b) meets the requirements defined in point (a) of Article 20;

(c) is marked as class C0 and complies with the requirements of that class, as defined in Part 1 of the Annex to Delegated Regulation (EU) 2019/945; or

(d) is marked as class C1 and complies with the requirements of that class, as defined in Part 2 of the Annex to Delegated Regulation (EU) 2019/945 and is operated with active and updated direct remote identification and geo-awareness systems.

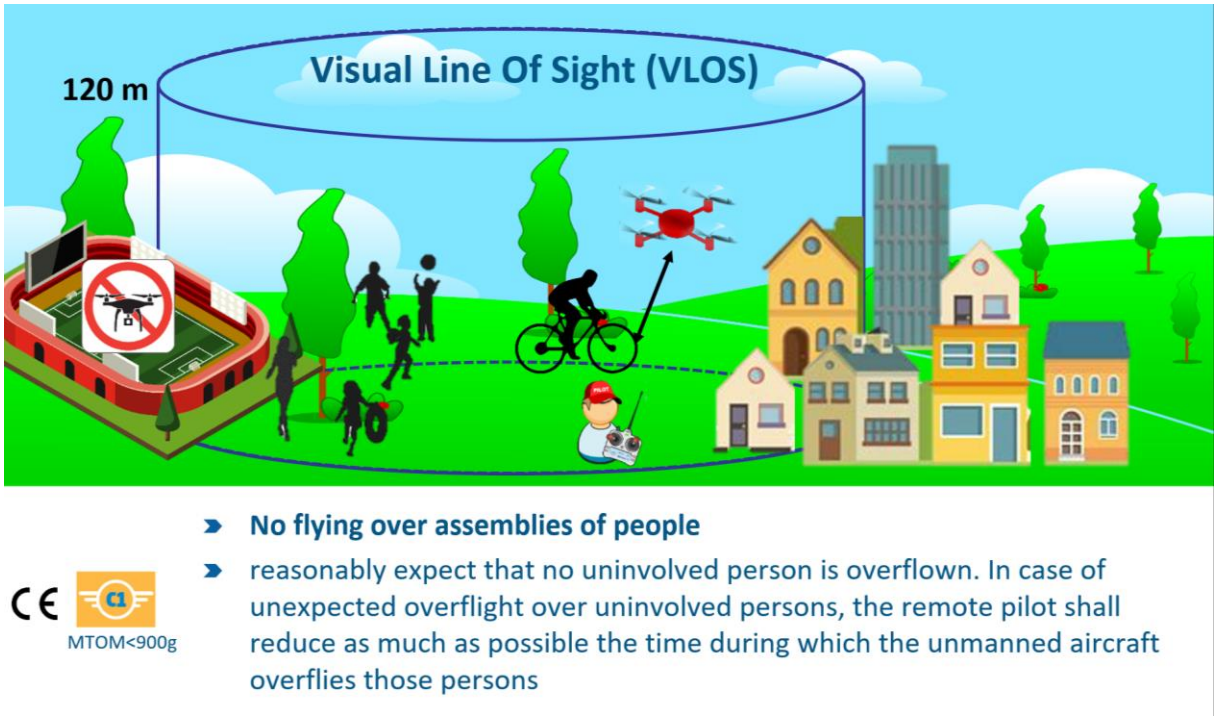
AMC1 UAS.OPEN.020(1) and (2) UAS operations in subcategory A1

ED Decision 2019/021/R

OPERATIONAL LIMITATIONS IN SUBCATEGORY A1

As a principle, the rules prohibit overflying assemblies of people. Overflying isolated people is possible, but there is a distinction between class C1 and class C0 UAS or privately built UAS with MTOMs of less than 250 g.

(a) For UAS in class C1, before starting the UAS operation, the remote pilot should assess the area and should reasonably expect that no uninvolved person will be overflown. This evaluation should be made taking into account the configuration of the site of operation (e.g. the existence of roads, streets, pedestrian or bicycle paths), and the possibility to secure the site and the time of the day. In case of an unexpected overflight, the remote pilot should reduce as much as possible the duration of the overflight, for example, by flying the UAS in such a way that the distance between the UA and the uninvolved people increases, or by positioning the UAS over a place where there are no uninvolved people.



(b) It is accepted that UAS in class C0 or privately built UAS with MTOMs less than 250 g may fly over uninvolved people; however, this should be avoided whenever possible, and where it is unavoidable, extreme caution should be used.

AMC1 UAS.OPEN.020(4)(b) and UAS.OPEN.040(3) UAS operations in subcategories A1 and A3

ED Decision 2019/021/R

THEORETICAL KNOWLEDGE SUBJECTS FOR BASIC ONLINE TRAINING COURSES AND EXAMINATIONS FOR SUBCATEGORIES A1 AND A3

The acquisition of theoretical knowledge by each remote pilot should cover the following elements:

(a) Air safety:

(1) non-reckless behaviour, safety precautions for UAS operations and basic requirements regarding dangerous goods;

(2) starting or stopping the operations taking into account environmental factors, UAS conditions and limitations, remote pilot limitations and human factors;

(3) operation in visual line of sight (VLOS), which entails:

(i) keeping a safe distance from people, animals, property, vehicles, and other airspace users;

(ii) the identification of assemblies of people;

(iii) a code of conduct in case the UA encounters other traffic;

(iv) respecting the height limitation; and

(v) when using a UA observer, the responsibilities and communication between the UA observer and the remote pilot; and

(4) familiarisation with the operating environment, in particular:

(i) how to perform the evaluations of the presence of uninvolved person in the overflown area as required in UAS.OPEN.020(1) and UAS.OPEN.040(1); and

(ii) informing the people involved;

(b) Airspace restrictions: obtain and observe updated information about any flight restrictions or conditions published by the MS according to Article 15 of the UAS Regulation[1].

(c) Aviation regulations:

(1) Introduction to EASA and the aviation system;

(2) Regulation (EU) 2019/945 and Regulation (EU) 2019/947:

(i) their applicability to EU MSs;

(ii) subcategories in the 'open' category and the associated classes of UAS;

(iii) registration of UAS operators;

(iv) the responsibilities of the UAS operator;

(v) the responsibilities of the remote pilot; and

(vi) incident – accident reporting;

[1] Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft

(d) Human performance limitations:

(1) the influence of psychoactive substances or alcohol or when the remote pilot is unfit to perform their tasks due to injury, fatigue, medication, sickness or other causes;

(2) human perception:

(i) factors influencing VLOS;

(ii) the distance of obstacles and the distance between the UA and obstacles;

(iii) evaluation of the speed of the UA;

(iv) evaluation of the height of the UA;

(v) situational awareness; and

(vi) night operations.

(e) Operational procedures:

(1) pre-flight:

(i) assessment of the area of operation and the surrounding area, including the terrain and potential obstacles and obstructions for keeping VLOS of the UA, potential overflight of uninvolved persons, and the potential overflight of critical infrastructure;

(ii) identification of a safe area where the remote pilot can perform a practice flight;

(iii) environmental and weather conditions (e.g. factors that can affect the performance of the UAS such as electromagnetic interference, wind, temperature, etc.); methods of obtaining weather forecasts; and

(iv) checking the conditions of the UAS;

(2) in-flight:

(i) normal procedures; and

(ii) procedures for abnormal situations (e.g. for lost-data-link connections);

(3) post-flight:

(i) maintenance; and

(ii) logging of flight details;

(f) UAS general knowledge:

(1) basic principles of flight;

(2) the effect of environmental conditions on the performance of the UAS;

(3) principles of command and control:

(i) overview;

(ii) data link frequencies and spectrums; and

(iii) automatic flight modes, override and manual intervention;

(4) familiarisation with the instructions provided by the user's manual of a UAS, and in particular with regard to:

(i) overview of the main elements of the UAS;

(ii) limitations (e.g. mass, speed, environmental, duration of battery, etc.);

(iii) controlling the UAS in all phases of flights (e.g. the take-off, hovering in mid-air, when applicable, flying basic patterns and landing);

(iv) features that affect the safety of flight;

(v) setting the parameters of the lost link procedures;

(vi) setting the maximum height;

(vii) procedures to load geographical zone data into the geo-awareness system;

(viii) procedures to load the UAS operator registration number into the direct remote identification system;

(ix) safety considerations:

(A) instructions to secure the payload;

(B) precautions to avoid injuries from rotors and sharp edges; and

(C) the safe handling of batteries;

(x) Maintenance instructions:

(g) Privacy and data protection:

(1) understanding the risk posed to privacy and data protection; and

(2) the guiding principles for data protection under the GDPR[1];

(h) Insurance:

(1) liability in case of an accident or incident;

(2) general knowledge of the EU regulations; and

(3) awareness of the possible different national requirements for insurance in the MSs.

(i) Security:

(1) an understanding of the security risk;

(2) an overview of the EU regulations;

(3) awareness of the possible different national requirements for security in the MSs.

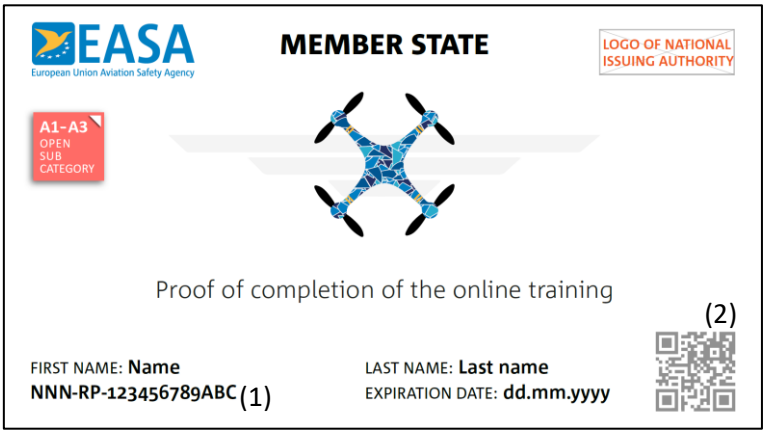
[1] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1).

AMC2 UAS.OPEN.020(4)(b) and UAS.OPEN.040(3) UAS operations in subcategories A1 and A3

ED Decision 2019/021/R

PROOF OF COMPLETION OF THE ONLINE TRAINING

Upon receipt of proof of a remote pilot passing the online theoretical examination, the MS should provide the following proof of completion to the remote pilot. The proof may be provided in electronic form.



(1) Insert the identifier provided by the authority releasing the proof of completion. The reference should have the following format:

NNN-RP-xxxxxxxxx

Where:

— NNN is the ISO 3166 Alpha-3 code of the MS releasing the proof of completion;

— RP is a fixed field meaning: remote pilot; and

— Xxxxxxxxx are 12 alphanumeric characters (lower-case only) defined by the MS releasing the proof of completion.

As an example: (FIN-RP-123456789abc)

(2) QR code providing a link to the national database where the information related to the remote pilot is stored. Through the 'remote pilot identifier', number (1) all information related to the training of the remote pilot can be retrieved.

AMC1 UAS.OPEN.020(5)(c) and (d), UAS.OPEN.030(3) and UAS.OPEN.040(4)(c),(d) and (e) UAS operations in subcategories A1, A2 and A3

ED Decision 2019/021/R

MODIFICATION OF A UAS WITH A CE CLASS MARK

UAS operators should not make any modifications to a UAS in class C0, C1, C2, C3 or C4 that breach compliance with the product requirements. If the UAS operator carries out such a modification on a UAS, that UAS is no longer considered to have a CE Class mark and it may only be operated in

Subcategory A3, or in the 'specific' category in accordance with Subpart B of Annex I to the UAS Regulation.

GM1 UAS.OPEN.020(5)(c) and (d), UAS.OPEN.030(3) and UAS.OPEN.040(4)(c), (d) and (e) UAS operations in subcategories A1, A2 and A3

ED Decision 2019/021/R

MODIFICATION OF A UAS WITH A CE CLASS MARK

Modifications to UAS that breach compliance with the requirements for the CE marking are those that affect the weight or performance so that they are outside the specifications or the instructions provided by the manufacturer in the user manual. A replacement of a part with another that has the same physical and functional characteristics is not considered to be a breach of the requirements for the CE marking (e.g. a replacement of a propeller with another of the same design). The UA user manual should define instructions for performing maintenance and applying changes that do not breach compliance with the CE marking requirements.

UAS.OPEN.030 UAS operations in subcategory A2

Regulation (EU) 2019/947

UAS operations in subcategory A2 shall comply with all of the following conditions:

(1) be conducted in such a way that the unmanned aircraft does not overfly uninvolved persons and the UAS operations take place at a safe horizontal distance of at least 30 metres from them; the remote pilot may reduce the horizontal safety distance down to a minimum of 5 metres from uninvolved persons when operating an unmanned aircraft with an active low speed mode function and after evaluation of the situation regarding:

(a) weather conditions,

(b) performance of the unmanned aircraft,

(c) segregation of the overflown area.

(2) be performed by a remote pilot who is familiar with the user's manual provided by the manufacturer of the UAS and holds a certificate of remote pilot competency issued by the competent authority or by an entity recognised by the competent authority of the Member State of registration of the UAS operator. This certificate shall be obtained after complying with all of the following conditions and in the order indicated:

(a) completing an online training course and passed the online theoretical knowledge examination as referred to in point (4)(b) of point UAS.OPEN.020;

(b) completing a self-practical training in the operating conditions of the subcategory A3 set out in points (1) and (2) of point UAS.OPEN.040;

(c) declaring the completion of the self-practical training defined in point (b) and passing an additional theoretical knowledge examination provided by the competent authority or by an entity recognised by the competent authority of the Member State of registration of the UAS operator. The examination shall comprise at least 30 multiple-choice questions aimed at assessing the remote pilot's knowledge of the technical and

operational mitigations for ground risk, distributed appropriately across the following subjects:

i. meteorology;

ii. UAS flight performance;

iii. technical and operational mitigations for ground risk.

(3) be performed with an unmanned aircraft which is marked as class C2 and complies with the requirements of that class, as defined in Part 3 of the Annex to Delegated Regulation (EU) 2019/945, and is operated with active and updated direct remote identification and geo-awareness systems.

AMC1 UAS.OPEN.030(1) UAS operations in subcategory A2

ED Decision 2019/021/R

SAFE DISTANCE FROM UNINVOLVED PERSONS

(a) The minimum horizontal distance of the UA from uninvolved persons should be defined as the distance between the points where the UA would hit the ground in the event of a vertical fall and the position of the uninvolved persons.

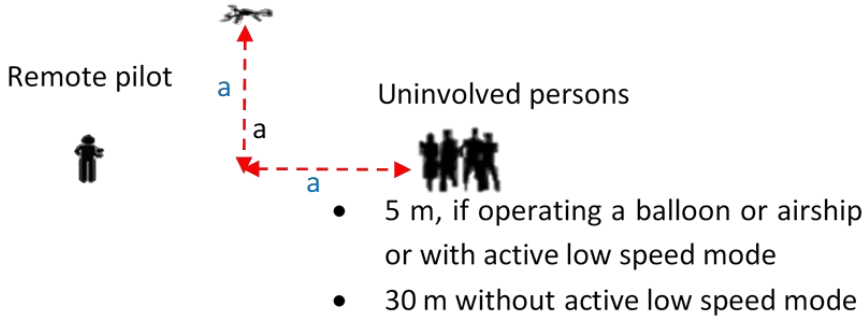
(b) As a reference, when the UA is operating in close proximity to people, the remote pilot should keep the UA at a lateral distance from any uninvolved person that is not shorter than the height ('1:1 rule', i.e. if the UA is flying at a height of 30 m, the distance from any uninvolved person should be at least 30 m).

(c) In any case, the distance from uninvolved persons should always be greater than:

(1) 5 m, when the low-speed mode function on the UA is activated and set to 3 m per second;

(2) 5 m, when operating a UAS balloon or airship; or

(3) 30 m in all other cases.



GM1 UAS.OPEN.030(1) UAS operations in subcategory A2

ED Decision 2019/021/R

SAFE DISTANCE FROM UNINVOLVED PERSONS

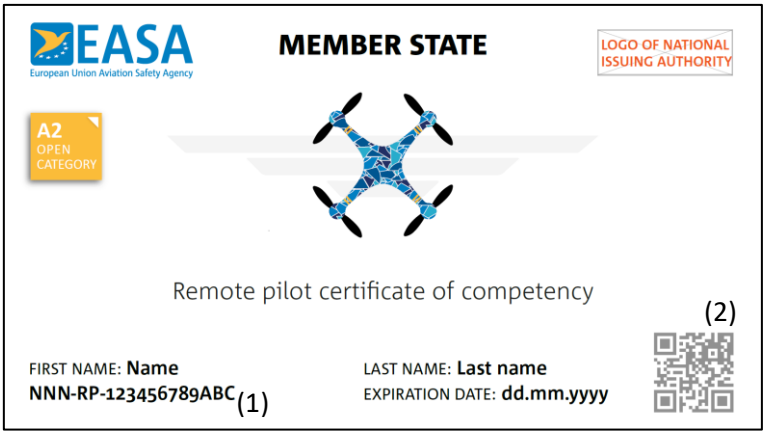
The safe distance of the UA from uninvolved persons is variable and is heavily dependent on the performance and characteristics of the UAS involved, the weather conditions and the segregation of the overflown area. The remote pilot is ultimately responsible for the determination of this distance.

AMC1 UAS.OPEN.030(2) UAS operations in subcategory A2

ED Decision 2019/021/R

REMOTE PILOT CERTIFICATE OF COMPETENCY

After the verification that the applicant has passed the online theoretical knowledge examination, has completed and declared the self-practical training and has passed the additional theoretical knowledge examination provided by the competent authority or by an entity recognised by the competent authority, the MS should provide the following certificate of competency to the remote pilot. The certificate may be provided in electronic form.



(1) Insert the identifier provided by the authority releasing the remote pilot certificate of competency. The reference should have the following format:

NNN-RP-xxxxxxxxx

Where:

— NNN is the ISO 3166 Alpha-3 code of the MS releasing the proof of completion;

— RP is a fixed field meaning: remote pilot; and

— Xxxxxxxxx are 12 alphanumeric characters (lower-case only) defined by the MS releasing the proof of completion.

As an example: (ESP-RP-123456789abc)

(2) QR code providing a link to the national database where the information related to the remote pilot is stored. Through the 'remote pilot identifier', number (1) all information related to the training of the remote pilot can be retrieved.

AMC1 UAS.OPEN.030(2)(b) UAS operations in subcategory A2

ED Decision 2019/021/R

PRACTICAL SELF-TRAINING

(a) The aim of the practical self-training is to ensure that the remote pilot should be able to demonstrate at all times the ability to:

(1) operate a class C2 UAS within its limitations;

(2) complete all manoeuvres with smoothness and accuracy;

(3) exercise good judgment and airmanship;

(4) apply their theoretical knowledge; and

(5) maintain control of the UA at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

(b) The remote pilot should complete the practical self-training with a UAS that features the same flight characteristics (e.g. fixed wing, rotorcraft), control scheme (manual or automated, human machine interface) and a similar weight as the UAS intended for use in the UAS operation. This implies the use of a UA with an MTOM of less than 4 kg and bearing the Class 2 CE marking after the transition period relative to CE marking is closed.

(c) If a UAS with both manual and automated control schemes is used, the practical self-training should be performed with both control schemes. If this UAS has multiple automated features, the remote pilot should demonstrate proficiency with each automated feature.

(d) The practical self-training should contain at least flying exercises regarding take-off or launch and landing or recovery, precision flight manoeuvres remaining in a given airspace volume, hovering in all orientations or loitering around positions when applicable. In addition, the remote pilot should exercise procedures for abnormal situations (e.g. a return-to-home function, if available), as stipulated in the user's manual provided by the manufacturer.

AMC2 UAS.OPEN.030(2)(b) UAS operations in subcategory A2

ED Decision 2019/021/R

PRACTICAL COMPETENCIES FOR PRACTICAL SELF-TRAINING

When executing the practical self-training, the remote pilot should perform as many flights as they deem necessary to gain a reasonable level of knowledge and the skills to operate the UAS.

The following list of practical competencies should be considered:

(a) Preparation of the UAS operation:

(1) make sure that the:

(i) chosen payload is compatible with the UAS used for the UAS operation;

(ii) zone of UAS operation is suitable for the intended operation; and

(iii) UAS meets the technical requirements of the geographical zone;

(2) define the area of operation in which the intended operation takes place in accordance with UAS.OPEN.040;

(3) define the area of operation considering the characteristics of the UAS;

(4) identify the limitations published by the MS for the geographical zone (e.g. no-fly zones, restricted zones and zones with specific conditions near the operation zone), and if needed, seek authorisation by the entity responsible for such zones;

(5) identify the goals of the UAS operation;

(6) identify any obstacles and the potential presence of uninvolved persons in the area of operation that could hinder the intended UAS operation; and

(7) check the current meteorological conditions and the forecast for the time planned for the operation.

(b) Preparation for the flight:

(1) assess the general condition of the UAS and ensure that the configuration of the UAS complies with the instructions provided by the manufacturer in the user's manual;

(2) ensure that all removable components of the UA are properly secured;

(3) make sure that the software installed on the UAS and on the remote pilot station (RPS) is the latest published by the UAS manufacturer;

(4) calibrate the instruments on board the UA, if needed;

(5) identify possible conditions that may jeopardise the intended UAS operation;

(6) check the status of the battery and make sure it is compatible with the intended UAS operation;

(7) update the geo-awareness system; and

(8) set the height limitation system, if needed.

(c) Flight under normal conditions:

(1) using the procedures provided by the manufacturer in the user's manual, familiarise with how to:

(i) take off (or launch)

(ii) make a stable flight:

(A) hover in case of multirotor UA;

(B) perform coordinated large turns;

(C) perform coordinated tight turns;

(D) perform straight flight at constant altitude;

(E) change direction, height and speed;

(F) follow a path;

(G) return of the UA towards the remote pilot after the UA has been placed at a distance that no longer allows its orientation to be distinguished, in case of multirotor UA;

(H) perform horizontal flight at different speed (critical high speed or critical low speed), in case of fixed wing UA;

(iii) keep the UA outside no-fly zones or restricted zones, unless holding an authorisation;

(iv) use some external references to assess the distance and height of the UA;

(v) perform return to home procedure — automatic or manual;

(vi) land (or recovery); and

(vii) perform landing procedure and missed approach in case of fixed wing UA; and

(2) maintain a sufficient separation from obstacles;

(d) Flight under abnormal conditions:

(i) manage the UAS flight path in abnormal situations;

(ii) manage a situation when the UAS positioning equipment is impaired;

(iii) manage a situation of incursion of a person into the area of operation, and take appropriate measures to maintain safety;

(iv) manage the exit from the operation zone as defined during the flight preparation;

(v) manage the incursion of a manned aircraft nearby the area of operation;

(vi) manage the incursion of another UAS in the area of operation;

(vii) select the safeguard mechanism relevant to a situation;

(viii) deal with a situation of a loss of attitude or position control generated by external phenomena;

(ix) resume manual control of the UAS when automatic systems render the situation dangerous; and

(x) carry out the loss of link procedure.

(e) Briefing, debriefing and feedback:

(i) conduct a review of the UAS operation; and

(ii) identify situations when an occurrence report is necessary and complete the occurrence report.

AMC1 UAS.OPEN.030(2)(c) UAS operations in subcategory A2

ED Decision 2019/021/R

ADDITIONAL THEORETICAL KNOWLEDGE OF SUBJECTS FOR THE EXAMINATION FOR SUBCATEGORY A2

(a) By passing the additional theoretical knowledge examination, the remote pilot should demonstrate that they:

(1) understand the safety risks linked with a UAS operation in close proximity to uninvolved people or with a heavier UA;

(2) are able to assess the ground risk related to the environment where the operation takes place, as well as to flying in close proximity to uninvolved people;

(3) have a basic knowledge of how to plan a flight and define contingency procedures; and

(4) understand how weather conditions may affect the performance of the UA.

(b) The theoretical knowledge examination should cover aspects from the following subjects:

(1) meteorology:

(i) the effect of weather on the UA:

(A) wind (e.g. urban effects, turbulence);

(B) temperature;

(C) visibility; and

(D) the density of the air;

(ii) obtaining weather forecasts;

(2) UAS flight performance:

(i) the typical operational envelope of a rotorcraft, for fixed wing and hybrid configurations;

(ii) mass and balance, and centre of gravity (CG):

(A) consider the overall balance when attaching gimbals, payloads;

(B) understand that payloads can have different characteristics, thus making a difference to the stability of a flight; and

(C) understand that each different type of UA has a different CG;

(iii) secure the payload;

(iv) batteries:

(A) understand the power source to help prevent potential unsafe conditions;

(B) familiarise with the existing different kinds of battery types;

(C) understand the terminology used for batteries (e.g. memory effect, capacity, c-rate); and

(D) understand how a battery functions (e.g. charging, usage, danger, storage); and

(3) technical and operational mitigations for ground risk:

(i) low-speed mode functions;

(ii) evaluating the distance from people; and

(iii) the 1:1 rule.

GM1 UAS.OPEN.030(2)(c) UAS operations in subcategory A2

ED Decision 2019/021/R

REMOTE PILOT COMPETENCIES REQUIRED TO OBTAIN A CERTIFICATE OF REMOTE PILOT COMPETENCY

A remote pilot may obtain the knowledge needed to pass the exam for a certificate of remote pilot competency in one of the following two ways:

(a) Competency-based training

(1) Competency-based training covers aspects related to non-technical skills in an integrated manner, taking into account the particular risks associated with UAS operations.

(2) Competency-based training should be developed using the analysis, design, development, implementation, evaluation (ADDIE) principles.

(b) Self-study

(1) A remote pilot may undertake self-study in many ways in order to obtain a certificate of competency. The purpose of this self-study is to acquire some basic competency and

familiarise themselves with the UA, as well as with the UAS operations they want to conduct.

(2) Examples of self-study:

(i) reading the manual or leaflet provided by the UA manufacturer;

(ii) reading related information or watching instructional films; and

(iii) obtaining information from others who have already experience in flying a UA.

The remote pilot may also undertake this study as classroom training, e-learning or similar training at a training facility. Since this training is not mandated by the MSs, the national aviation authorities (NAAs) are not required to approve the training syllabuses.

UAS.OPEN.040 UAS operations in subcategory A3

Regulation (EU) 2019/947

UAS operations in subcategory A3 shall comply with all of the following conditions:

(1) be conducted in an area where the remote pilot reasonably expects that no uninvolved person will be endangered within the range where the unmanned aircraft is flown during the entire time of the UAS operation;

(2) be conducted at a safe horizontal distance of at least 150 metres from residential, commercial, industrial or recreational areas;

(3) be performed by a remote pilot who has completed an online training course and passed an online theoretical knowledge examination as defined in point (4)(b) of point UAS.OPEN.020;

(4) be performed with an unmanned aircraft that:

(a) has an MTOM, including payload, of less than 25 kg, in the case of a privately built UAS, or

(b) meets the requirements defined in point (b) of Article 20;

(c) is marked as class C2 and complies with the requirements of that class, as defined in Part 3 of the Annex to Delegated Regulation (EU) 2019/945 and is operated with active and updated direct remote identification and geo-awareness systems or;

(d) is marked as class C3 and complies with the requirements of that class, as defined in Part 4 of the Annex to Delegated Regulation (EU) 2019/945 and is operated with active and updated direct remote identification and geo-awareness systems; or

(e) is marked as class C4 and complies with the requirements of that class, as defined in Part 5 of the Annex to Delegated Regulation (EU) 2019/945.

AMC1 UAS.OPEN.040(1) Operations in subcategory A3

ED Decision 2019/021/R

AREAS WHERE UAS OPERATIONS IN A3 MAY BE CONDUCTED

(a) If an uninvolved person enters the range of the UAS operation, the remote pilot should, where necessary, adjust the operation to ensure the safety of the uninvolved person and discontinue the operation if the safety of the UAS operation is not ensured.

(b) A minimum horizontal distance from the person that is passing the area could be estimated as follows:

(1) no less than 30 m;

(2) no less than the height ('1:1 rule', i.e. if the UA is flying at a height of 30 m, the distance of the UA from the uninvolved person should be at least 30 m), and

(3) no less than the distance that the UA would cover in 2 seconds at the maximum speed (this assumes a reaction time of 2 seconds).

This minimum horizontal distance is intended to protect people on the ground, but can be extended to property and animals.

GM1 UAS.OPEN.030(1) and UAS.OPEN.040(1) UAS operations in subcategories A1 and A3

ED Decision 2019/021/R

DIFFERENCE BETWEEN SUB-CATEGORIES A2 AND A3

Subcategory A2 addresses operations during which flying close to people is intended for a significant portion of the flight. The minimum distance ranges from 30 m to 5 m from uninvolved people. 5 m is only allowed when there is an active low-speed mode function on the UA, and the remote pilot has conducted an evaluation of the situation regarding the weather, the performance of the UA and the segregation of the overflown area.

Sub-category A3 addresses operations that are conducted in an area (hereafter referred to as 'the area') where the remote pilot reasonably expects that no uninvolved people will be endangered within the range of the unmanned aircraft where it is flown during the mission. In addition, the operation must be conducted at a safe horizontal distance of at least 150 m from residential, commercial, industrial or recreational areas.

UAS.OPEN.050 Responsibilities of the UAS operator

Regulation (EU) 2019/947

The UAS operator shall comply with all of the following:

(1) develop operational procedures adapted to the type of operation and the risk involved;

(2) ensure that all operations effectively use and support the efficient use of radio spectrum in order to avoid harmful interference;

(3) designate a remote pilot for each UAS operation;

(4) ensure that the remote pilots and all other personnel performing a task in support of the operations are familiar with the user's manual provided by the manufacturer of the UAS, and:

(a) have appropriate competency in the subcategory of the intended UAS operations in accordance with points UAS.OPEN.020, UAS.OPEN.030 or UAS.OPEN.040 to perform their tasks or, for personnel other than the remote pilot, have completed an on-the-job-training course developed by the operator;

(b) are fully familiar with the UAS operator's procedures;

(c) are provided with the information relevant to the intended UAS operation concerning any geographical zones published by the Member State of operation in accordance with Article 15;

(5) update the information into the geo-awareness system when applicable according to the intended location of operation;

(6) in the case of an operation with an unmanned aircraft of one of the classes defined in Parts 1 to 5 of Delegated Regulation (EU) 2019/945, ensure that the UAS is:

(a) accompanied by the corresponding EU declaration of conformity, including the reference to the appropriate class; and

(b) the related class identification label is affixed to the unmanned aircraft.

(7) Ensure in the case of an UAS operation in subcategory A2 or A3, that all involved persons present in the area of the operation have been informed of the risks and have explicitly agreed to participate.

AMC1 UAS.OPEN.050(1) Responsibilities of the UAS operator

ED Decision 2019/021/R

OPERATIONAL PROCEDURES

The UAS operator should develop procedures adapted to the type of operations and to the risks involved. Therefore, written procedures should not be necessary if the UAS operator is also the remote pilot, and the remote pilot may use the procedures defined by the manufacturer in the operations manual (OM).

If a UAS operator employs more than one remote pilot, the UAS operator should:

(a) develop procedures for UAS operations in order to coordinate the activities between its employees; and

(b) establish and maintain a list of their personnel and their assigned duties.

AMC1 UAS.OPEN.050(4)(c) Responsibilities of the UAS operator

ED Decision 2019/021/R

OBTAIN UPDATED INFORMATION ABOUT THE GEOGRAPHICAL ZONE

The UAS operator should download the latest version of the geographical data and make available to the remote pilot such that they can upload it onto the geo-awareness system, if such a system is available on the UA used for the operation.

UAS.OPEN.060 Responsibilities of the remote pilot

Regulation (EU) 2019/947

(1) Before starting an UAS operation, the remote pilot shall:

(a) have the appropriate competency in the subcategory of the intended UAS operations in accordance with points UAS.OPEN.020, UAS.OPEN.030 or UAS.OPEN.040 to perform its task and carry a proof of competency while operating the UAS, except when operating an unmanned aircraft referred to in points (5)(a), (5)(b) or (5)(c) of point UAS.OPEN.020;

(b) obtain updated information relevant to the intended UAS operation about any geographical zones published by the Member State of operation in accordance with Article 15;

(c) observe the operating environment, check the presence of obstacles and, unless operating in subcategory A1 with an unmanned aircraft referred to in points (5)(a), (5)(b) or (5)(c) of point UAS.OPEN.020, check the presence of any uninvolved person;

(d) ensure that the UAS is in a condition to safely complete the intended flight, and if applicable, check if the direct remote identification works properly;

(e) if the UAS is fitted with an additional payload, verify that its mass does not exceed the MTOM defined by the manufacturer or the MTOM limit of its class.

(2) During the flight, the remote pilot shall:

(a) not perform duties under the influence of psychoactive substances or alcohol or when it is unfit to perform its tasks due to injury, fatigue, medication, sickness or other causes;

(b) keep the unmanned aircraft in VLOS and maintain a thorough visual scan of the airspace surrounding the unmanned aircraft in order to avoid any risk of collision with any manned aircraft. The remote pilot shall discontinue the flight if the operation poses a risk to other aircraft, people, animals, environment or property;

(c) comply with the operational limitations in geographical zones defined in accordance with Article 15;

(d) have the ability to maintain control of the unmanned aircraft, except in the case of a lost link or when operating a free-flight unmanned aircraft;

(e) operate the UAS in accordance with the user's manual provided by the manufacturer, including any applicable limitations;

(f) comply with the operator's procedures when available.

(3) During the flight, remote pilots and UAS operators shall not fly close to or inside areas where an emergency response effort is ongoing unless they have permission to do so from the responsible emergency response services.

(4) For the purposes of point (2)(b), remote pilots may be assisted by an unmanned aircraft observer, situated alongside them, who, by unaided visual observation of the unmanned aircraft, assists the remote pilot in safely conducting the flight. Clear and effective communication shall be established between the remote pilot and the unmanned aircraft observer.

GM1 UAS.OPEN.060(1)(b) Responsibilities of the remote pilot

ED Decision 2019/021/R

OBTAINING UPDATED INFORMATION ABOUT ANY FLIGHT RESTRICTIONS OR CONDITIONS PUBLISHED BY THE MEMBER STATE

Information on airspace structure and limitations, including limited zones for UA or no-UA zones, will be provided by the MSs in accordance with Article 15 of the UAS Regulation.

AMC1 UAS.OPEN.060(1)(c) Responsibilities of the remote pilot

ED Decision 2019/021/R

OPERATING ENVIRONMENT

(a) The remote pilot should observe the operating environment and check any conditions that might affect the UAS operation, such as the locations of people, property, vehicles, public roads, obstacles, aerodromes, critical infrastructure, and any other elements that may pose a risk to the safety of the UAS operation.

(b) Familiarisation with the environment and obstacles should be conducted, when possible, by walking around the area where the operation is intended to be performed.

(c) It should be verified that the weather conditions at the time when the operation starts and those that are expected for the entire period of the operation are compatible with those defined in the manufacturer's manual.

(d) The remote pilot should be familiar with the operating environment and the light conditions, and make a reasonable effort to identify potential sources of electromagnetic energy, which may cause undesirable effects, such as electromagnetic interference (EMI) or physical damage to the operational equipment of the UAS.

AMC1 UAS.OPEN.060(1)(d) Responsibilities of the remote pilot

ED Decision 2019/021/R

UAS IN A SAFE CONDITION TO COMPLETE THE INTENDED FLIGHT

The remote pilot should:

(a) update the UAS with data for the geo-awareness function if it is available on the UA;

(b) ensure that the UAS is fit to fly and complies with the instructions and limitations provided by the manufacturer, or the best practice in the case of a privately built UAS;

(c) ensure that any payload carried is properly secured and installed and that it respects the limits for the mass and CG of the UA;

(d) ensure that the charge of the battery of the UA is enough for the intended operation based on:

  (1) the planned operation; and

  (2) the need for extra energy in case of unpredictable events; and

(e) for UAS equipped with a loss-of-data-link recovery function, ensure that the recovery function allows a safe recovery of the UAS for the envisaged operation; for programmable loss-of-data-link recovery functions, the remote pilot may have to set up the parameters of this function to adapt it to the envisaged operation.

GM1 UAS.OPEN.060(2)(a) and UAS.SPEC.060(1)(a) Responsibilities of the remote pilot

ED Decision 2019/021/R

OTHER CAUSES

'Other causes' means any physical or mental disorder or any functional limitation of a sensory organ that would prevent the remote pilot from performing the operation safely.

AMC1 UAS.OPEN.060(2)(b) Responsibilities of the remote pilot

ED Decision 2019/021/R

VLOS RANGE

(a) The maximum distance of the UA from the remote pilot should depend on the size of the UA and on the environmental characteristics of the area (such as the visibility, presence of tall obstacles, etc.).

(b) The remote pilot should keep the UA at a distance such that they are always able to clearly see it and evaluate the distance of the UA from other obstacles. If the operation takes place in an area where there are no obstacles and the remote pilot has unobstructed visibility up to the horizon, the UA can be flown up to a distance such that the UA remain clearly visible. If there are obstacles, the distance should be reduced such that the remote pilot is able to evaluate the relative distance of the UA from that obstacle. Moreover, the UA should be kept low enough so that it is essentially 'shielded' by the obstacle, since manned aircraft normally fly higher than obstacles.

GM1 UAS.OPEN.060(2)(b) Responsibilities of the remote pilot

ED Decision 2019/021/R

DISCONTINUATION OF THE FLIGHT IF THE OPERATION POSES A RISK TO OTHER AIRCRAFT

The rules put an obligation on the remote pilot to maintain a thorough visual scan of the airspace to avoid any risk of a collision with manned aircraft. This means that the remote pilot is primarily responsible for avoiding collisions. The reason is that the manned aircraft pilot(s) may not be able to see the UA due to its small size. Therefore, the remote pilot should make an evaluation of the risk of collision and take appropriate action.

As soon as the remote pilot sees another aircraft or a parachute or any other airspace user, they must immediately keep the UA at a safe distance from it and land if the UA is on a trajectory towards the other object.

For example, if the remote pilot sees a manned aircraft flying at very high altitude (i.e. an en route flight at a height of 1 km or more), since the pilot will always keep the UA below 120 m, they can continue the operation.

If the remote pilot observes an aircraft passing through the sky at a low altitude, at which it may interact with the UA, they need to immediately reduce the height of the UA (e.g. to less than 10 m above the ground) and keep the UA in an area that is far (not less than 500 m) from the other aircraft. If they cannot ensure such a distance, the UA needs to be immediately landed.

AMC1 UAS.OPEN.060(2)(d) Responsibilities of the remote pilot

ED Decision 2019/021/R

ABILITY TO MAINTAIN CONTROL OF THE UA

(a) The remote pilot should:

(1) be focused on the operation of the UA, as appropriate;

(2) not operate a UA while operating a moving vehicle; and

(3) operate only one UA at a time.

(b) If the remote pilot operates a UA from a moving ground vehicle or boat, the speed of the vehicle should be slow enough for the remote pilot to maintain a VLOS of the UA, maintain control of the UA at all times and maintain situational awareness and orientation.

GM1 UAS.OPEN.060(2)(d) Responsibilities of the remote pilot

ED Decision 2019/021/R

ABILITY TO MAINTAIN CONTROL OF THE UA

Autonomous operations are not allowed in the 'open' category, and the remote pilot must be able to take control of the UA at any time, except in the event of a lost-link condition or a free-flight UA.

GM2 UAS.OPEN.060(2)(d) Responsibilities of the remote pilot

ED Decision 2019/021/R

FREE-FLIGHT UA

'Free flight' means performing flights with no external control, taking advantage of the ascending currents, dynamic winds and the performance of the model. Outdoor free flights are carried out with gliders or with models equipped with means of propulsion (e.g. rubber-bands, thermal engines) that raise them in altitude, before they freely glide and follow the air masses.

GM1 UAS.OPEN.060(3) and UAS.SPEC.060(3)(e) Responsibilities of the remote pilot

ED Decision 2019/021/R

EMERGENCY RESPONSE DEFINITION

'Emergency response' is an action taken in response to an unexpected and dangerous event in an attempt to mitigate its impact on people, property or the environment.

GM2 UAS.OPEN.060(3) and UAS.SPEC.060(3)(e) Responsibilities of the remote pilot

ED Decision 2019/021/R

EMERGENCY RESPONSE EFFORT

When there is an emergency response effort taking place in the operational area of a UAS, the UAS operation should be immediately discontinued unless it was explicitly authorised by the responsible emergency response services. Otherwise, a safe distance must be maintained between the UA and the emergency response site so that the UA does not interfere with, or endanger, the activities of the emergency response services. The UAS operator should take particular care to not hinder possible aerial support and to protect the privacy rights of persons involved in the emergency event.

GM1 UAS.OPEN.060(4) Responsibilities of the remote pilot

ED Decision 2019/021/R

ROLE OF THE UA OBSERVER AND FIRST PERSON VIEW

The remote pilot may be assisted by a UA observer helping them to keep the UA away from obstacles. The UA observer must be situated alongside the remote pilot in order to provide warnings to the remote pilot by supporting them in maintaining the required separation between the UA and any obstacle, including other air traffic.

UA observers may also be used when the remote pilot conducts UAS operations in first-person view (FPV), which is a method used to control the UA with the aid of a visual system connected to the camera of the UA. In any case, including during FPV operations, the remote pilot is still responsible for the safety of the flight.

As the UA observer is situated alongside the remote pilot and they must not use aided vision (e.g. binoculars), their purpose is not to extend the range of the UA beyond the VLOS distance from the remote pilot. Exceptions are emergency situations, for instance, if the pilot must perform an emergency landing far from the pilot's position, and binoculars can assist the pilot in safely performing such a landing.

UAS.OPEN.070 Duration and validity of the remote pilot online theoretical competency and certificates of remote pilot competency

Regulation (EU) 2019/947

(1) The remote pilot online theoretical competency, required by points (4)(b) of point UAS.OPEN.020 and point (3) of point UAS.OPEN.040, and the certificate of remote pilot competency, required by point (2) of point UAS.OPEN.030, shall be valid for five years.

(2) The renewal of the remote pilot online theoretical competency and of the certificate of remote pilot competency is subject to the demonstration of competencies in accordance with point (2) of point UAS.OPEN.030 or point (4)(b) of point UAS.OPEN.020.

PART B – UAS OPERATIONS IN THE 'SPECIFIC' CATEGORY

UAS.SPEC.010 General provisions

Regulation (EU) 2019/947

The UAS operator shall provide the competent authority with an operational risk assessment for the intended operation in accordance with Article 11, or submit a declaration when point UAS.SPEC.020 is applicable, unless the operator holds a light UAS operator certificate (LUC) with the appropriate privileges, in accordance with Part C of this Annex. The UAS operator shall regularly evaluate the adequacy of the mitigation measures taken and update them where necessary.

UAS.SPEC.020 Operational declaration

Regulation (EU) 2019/947

(1) In accordance with Article 5, the UAS operator may submit an operational declaration of compliance with a standard scenario as defined in Appendix 1 to this Annex to the competent authority of the Member State of operation as an alternative to points UAS.SPEC.30 and UAS.SPEC.40 in relation to operations:

(a) of unmanned aircraft with:

i. maximum characteristic dimension up to 3 metres in VLOS over controlled ground area except over assemblies of people,

ii. maximum characteristic dimension up to 1 metre in VLOS except over assemblies of people;

iii. maximum characteristic dimension up to 1 metre in BVLOS over sparsely populated areas;

iv. maximum characteristic dimension up to 3 metres in BVLOS over controlled ground area.

(b) performed below 120 metres from the surface of earth, and:

i. in uncontrolled airspace (class F or G), or

ii. in controlled airspace after coordination and individual flight authorisation in accordance with published procedures for the area of operation.

(2) A declaration of UAS operators shall contain:

(a) administrative information about the UAS operator;

(b) a statement that the operation satisfies the operational requirement set out in point (1) and a standard scenario as defined in Appendix 1 to the Annex;

(c) the commitment of the UAS operator to comply with the relevant mitigation measures required for the safety of the operation, including the associated instructions for the operation, for the design of the unmanned aircraft and the competency of involved personnel.

(d) confirmation by the UAS operator that an appropriate insurance cover will be in place for every flight made under the declaration, if required by Union or national law.

(3) Upon receipt of the declaration, the competent authority shall verify that the declaration contains all the elements listed in point (2) and shall provide the UAS operator with a confirmation of receipt and completeness without undue delay.

(4) After receiving the confirmation of receipt and completeness, the UAS operator is entitled to start the operation.

(5) UAS operators shall notify, without any delay, the competent authority of any change to the information contained in the operational declaration that they submitted.

(6) UAS operators holding an LUC with appropriate privileges, in accordance with Part C of this Annex, are not required to submit the declaration.

UAS.SPEC.030 Application for an operational authorisation

Regulation (EU) 2019/947

(1) Before starting an UAS operation in the 'specific' category the UAS operator shall obtain an operational authorisation from the national competent authority of the Member State of registration, except:

(a) when point UAS.SPEC.020 is applicable; or

(b) the UAS operator holds an LUC with the appropriate privileges, in accordance with Part C of this Annex.

(2) The UAS operator shall submit an application for an updated operational authorisation if there are any significant changes to the operation or to the mitigation measures listed in the operational authorisation.

(3) The application for an operational authorisation shall be based on the risk assessment referred to in Article 11 and shall include in addition the following information:

(a) the registration number of the UAS operator;

(b) the name of the accountable manager or the name of the UAS operator in the case of a natural person;

(c) the operational risk assessment;

(d) the list of mitigation measures proposed by the UAS operator, with sufficient information for the competent authority to assess the adequacy of the mitigation means to address the risks;

(e) an operations manual when required by the risk and complexity of the operation;

(f) a confirmation that an appropriate insurance cover will be in place at the start of the UAS operations, if required by Union or national law.

AMC1 UAS.SPEC.030(2) Application for an operational authorisation

ED Decision 2019/021/R

APPLICATION FORM FOR THE OPERATIONAL AUTHORISATION

The UAS operator should submit an application according to the following form. The application and all the documentation referred to or attached should be stored for two years in a manner that ensures

their protection from unauthorised access, damage, alteration, and theft. The declaration may be complemented by the description of the procedures to ensure that all operations are in compliance with Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, as required by UAS.SPEC.050(1)(a)(iv).

Application for operational authorisation

Data protection: Personal data included in this application is processed by the competent authority pursuant to Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation). It will be processed for the purposes of the performance, management and follow-up of the application by the competent authority in accordance with Article 12 of Regulation (EU) 2019/947. If you require further information concerning the processing of your personal data or exercising your rights (e.g. to access or rectify any inaccurate or incomplete data), please refer to the contact point of the competent authority. The applicant has the right to make a complaint regarding the processing of the personal data at any time to the national Data Protection Supervisor Authority.				
UAS operator data				
1.1 UAS operator registration number				
1.2 UAS operator name				
UAS data				
2.1 Manufacturer		**2.2 Model**		
2.3 Serial number or UA registration mark if applicable				
2.4 Configuration:	☐Aeroplane ☐Helicopter ☐Multirotor ☐Hybrid/VTOL ☐Lighter than air/other			
2.5 MTOM		**2.6 Maximum airspeed**		**2.7 Maximum characteristic dimensions**
Operation				
3.1 ConOps				
3.2 Operation manual available	☐ **yes** ☐ **no**			
3.3 Predefined risk assessment (PDRA) (if applicable)				
3.4 If the operation complies with a PDRA published by EASA, provide all the information and documentation identified in it.				
3.5 If the operation does not comply with a PDRA published by EASA, provide the operational risk assessment in accordance with Article 11 of Regulation (EU) 2019/947				

3.6 Mitigations and operational safety objectives (OSOs)	
3.7 Insurance cover will be in place at the start of the UAS operations	☐ yes ☐ no
I, the undersigned, hereby declare that the UAS operation will comply with: — *any applicable Union and national rules related to privacy, data protection, liability, insurance, security and environmental protection;* — *the applicable requirement of Regulation (EU) 2019/947; and* — *the limitations and conditions defined in the authorisation provided by the competent authority.*	
Date	**Signature**

Instructions for filling in the form

1.1 The UAS operator registration number in accordance with Article 14 of the UAS Regulation

1.2 The name of the accountable manager or the name of the UAS operator in the case of a natural person

2.1 The name of the manufacturer of the UAS

2.2 The model of the UAS as defined by the manufacturer

2.3 The serial number of the UA defined by the manufacturer, or the registration mark for the UA requiring registration according to Article 14 of the UAS Regulation

2.4 The configuration of the UA

2.5 The maximum take-off mass for which the UA is designed, expressed in kg

2.6 The maximum cruise air speed expressed in m/s and knots in parenthesis

2.7 State the maximum dimensions of the UA in metres (e.g. for aeroplanes: the length of the wingspan; for helicopters: the diameter of the propellers; for multirotors: the maximum distance between the tips of 2 opposite propellers).

NOTE: Section 2 may include more than one UAS. In that case, it should be filled with the data of all the UAS intended to be operated.

3.1 The description of the intended operation characterising the area where it will take place (i.e. urban, sparsely populated, industrial, etc.) and the airspace.

3.3 The number of the PDRA, if applicable.

3.6 A list of the mitigation measures and the OSOs put in place, as required by the PDRA or proposed by the UAS operator if no PDRA is available. Sufficient information should be provided to the competent authority to assess the robustness of the measures.

3.8 A short description of the procedures established by the UAS operator to ensure that all operations are in compliance with Regulation (EU) 2016/679 on the protection on personal data as required by point UAS.SPEC.050(1)(a)iv.

Note: The signature and stamp may be provided in electronic form.

AMC2 UAS.SPEC.030(2) Application for an operational authorisation

ED Decision 2019/021/R

SIGNIFICANT CHANGES TO THE OPERATIONAL AUTHORISATION

(a) Any non-editorial change that affects the operational authorisation, or affects any associated documentation that is submitted to demonstrate compliance with the requirements established for the authorisation, should be considered to be a significant change.

(b) With regard to the information and documentation associated with the authorisation, changes should be considered to be significant when they involve, for example:

(1) changes in the operations that affect the assumptions of the risk assessment;

(2) changes that relate to the management system of the UAS operator (including changes of key personnel), its ownership or its principal place of business;

(3) non-editorial changes that affect the operational risk assessment report;

(4) non-editorial changes that affect the policies and procedures of the UAS operator; and

(5) non-editorial changes that affect the OM (when required).

GM1 UAS.SPEC.030(2) Application for an operational authorisation

ED Decision 2019/021/R

APPLICATION FORM FOR THE OPERATIONAL AUTHORISATION

Depending on the level of the risk of the operation, the technical characteristics of the UAS may play an important role in mitigating the risk. In that case, the UAS operator may provide additional information to the NAA on the characteristics of the UAS to be operated. The NAA will, in any case, ask for additional data when needed.

As an example regarding how to structure the additional information, the UAS operator may supplement the application for the authorisation with the additional elements shown below. Elements from the example may be added or removed as required.

LANDING GEAR		☐ yes ☐ no
Type	☐ **Fixed** ☐ **Retractable** ☐ **Other**	
Characteristics	☐ **Wheels** ☐ **Skids** ☐ **Legs** ☐ **Other**	
CONSPICUITY CHARACTERISTICS (2)		
Paint (1):		
Lights (2)	☐ yes ☐ no	**Intensity:**
Aircraft visibility lights:		
Control lights (flight mode or alert indicators, etc.):		
PROPULSION (3)		
☐ **Electrical** ☐ **Combustion** ☐ **Hybrid** ☐ **Other** **Description:**		

Note: Provide a brief description (for example, push/pull systems, coaxial systems in the case of multirotors, combined systems, etc.).
SYSTEMS
☐ **Propellers** ☐ **Turbines** ☐ **Other** **Description:**
Control and/or positioning system (4)
FLIGHT CONTROLLER (5)
Manufacturer: Model: **Description:**
FLIGHT TERMINATION SYSTEM (6)
Description:
FLIGHT MODES (7)
Description:
GROUND CONTROL STATION (8)
Radio emitter: **Manufacturer: Model:**
Mobile/computer application: **Manufacturer: Model:**
Other: **Manufacturer:Model:**
CONTROL COMMUNICATION LINK
Description (frequency):
TELEMETRY COMMUNICATION LINK ☐ yes ☐ no
Description (frequency):
VIDEO SYSTEM COMMUNICATION LINK (FPV) ☐ yes ☐ no
Description (frequency):
PAYLOAD COMMUNICATION LINK ☐ yes ☐ no
Description (frequency):
PAYLOAD (9) ☐ yes ☐ no
TYPE
☐ **Fixed** ☐ **Interchangeable** **Description:**
OPERATION LIMITS (10)
Maximum operating height:

Max airspeed:
Weather conditions:
SAFETY SYSTEMS/SAFETY NETS AND AWARENESS (11)
DETECT AND AVOID ☐ yes ☐ no **Description:**
GEO-FENCING OR GEO-CAGING ☐ yes ☐ no **Description:**
TRANSPONDER ☐ yes ☐ no **Description:**
SYSTEMS FOR LIMITING IMPACT ENERGY ☐ yes ☐ no **Description:**
OTHER **Description:**

(1) PAINT

Describe any painted elements that are visible (marks) and significant (colour, shape, etc.).

(2) LIGHTS

Describe the lights, including their colours and locations.

(3) PROPULSION

Mark the type of propulsion used, indicating (in the space provided) the manufacturer and model, and detailing relevant information such as the number of motors/engines, the configuration, etc. Powerplant design diagrams may be attached if necessary.

(4) CONTROL AND/OR POSITIONING SYSTEM

As a general instruction for this section, in addition to the description and information deemed necessary to define these systems, provide any certification and rating for the systems, such as those related to electromagnetic compatibility or any other European Directive satisfied by the equipment installed on the aircraft, for consideration during the specific risk assessment conducted using the specific operations risk assessment (SORA) or any other SMS methodology to evaluate and authorise operations.

(5) FLIGHT CONTROLLER

Indicate the manufacturer and model of the flight controller. Describe the relevant aspects affecting flight safety.

(6) FLIGHT TERMINATION SYSTEM

Describe and include the technical characteristics of the system, its modes of operation, system activation and any certification and rating for the components, as well as proof of its electromagnetic compatibility for consideration during the SORA or any other SMS methodology that is followed to evaluate and authorise operations.

(7) FLIGHT MODES

Describe the flight modes (i.e. manual, artificial stability with controller, automatic, autonomous). For each flight mode, describe the variable that controls the aircraft: increments in position, speed control, attitude control, type of altitude control (which sensor is used for this purpose), etc.

(8) GROUND CONTROL STATION

For 'encrypted' links, describe the encryption system used, if any.

(9) PAYLOAD

Describe each of the different payload configurations that affect the mission or that, without changing it, impact the weight and balance, the electrical charge or the flight dynamics. Include all relevant technical details. If needed, you may use other documents that provide the specified details.

(10) OPERATION LIMITS

Describe in this section the maximum operating height, the maximum airspeed (including Vmax ascent, Vmax descent and Vmax horizontal), and, in addition, the meteorological limit conditions in which the UAS can operate (e.g. rain, maximum wind, etc.)

(11) SAFETY SYSTEMS/SAFETY NETS AND AWARENESS

Describe the systems or equipment installed on the aircraft to mitigate potential operational safety risks, whether included in the form or not.

AMC1 UAS.SPEC.030(3)(e) Application for an operational authorisation

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OPERATIONS MANUAL — TEMPLATE

When required in accordance with UAS.SPEC.030(3)(e), the OM should contain at least the information listed below, if applicable, customised for the area and type of operation.

0. Cover and contact.

0.1 Cover identifying the UAS operator with the title 'Operations Manual', contact information and OM revision number.

0.2 Table of contents.

1. Introduction

1.1 Definitions, acronyms and abbreviations.

1.2 System for amendment and revision of the OM *(list the changes that require prior approval and the changes to be notified to the competent authority)*.

1.3 Record of revisions with effectivity dates.

1.4 List of effective pages *(list of effective pages unless the entire manual is re-issued and the manual has an effective date on it)*.

1.5 Purpose and scope of the OM with a brief description of the different parts of the documents.

1.6 Safety statement *(include a statement that the OM complies with the relevant requirements of Regulation (EU) 2019/947 and with the authorisation or the terms of approval of the light UAS operator certificate (LUC), in the case of a LUC holder, and contains instructions that are to be complied with by the personnel involved in flight operations)*.

1.7 Approval signature *(the accountable manager must sign this statement)*.

2. Description of the UAS operator's organisation *(include the organigram and a brief description thereof)*.

3. Concept of operations (ConOps

For each operation, please describe the following:

3.1 Nature of the operation and associated risks *(describe the nature of the activities performed and the associated risks)*.

3.2 Operational environment and geographical area for the intended *operations (in general terms, describe the characteristics of the area to be overflown, its topography, obstacles etc., and the characteristics of the airspace to be used, and the environmental conditions (i.e. the weather and electromagnetic environment); the definition of the required operation volume and risk buffers to address the ground and air risks)*.

3.3 Technical means used *(in general terms, describe their main characteristics, performance and limitations, including UAS, external systems supporting the UAS operation, facilities, etc.)*

3.4 Competency, duties and responsibilities of personnel involved in the operations such as the remote pilot, UA observer, visual observer (VO), supervisor, controller, operations manager, etc. *(initial qualifications; experience in operating UAS; experience in the particular operation; training and checking; compliance with the applicable regulations and guidance to crew members concerning health, fitness for duty and fatigue; guidance to staff on how to facilitate inspections by competent authority personnel)*.

3.5 Risk analysis and methods for reduction of identified risks *(description of methodology used; bow-tie presentation or other)*.

3.6 Maintenance *(provide maintenance instructions required to keep the UAS in a safe condition, covering the UAS manufacturer's maintenance instructions and requirements when applicable)*.

4. Normal procedures;

(The UAS operator should complete the following paragraphs considering the elements listed below. The procedures applicable to all UAS operations may be listed in paragraph 4.1.)

4.1 General procedures valid for all operations

4.2 Procedures peculiar to a single operation

5. Contingency procedures

(The UAS operator should complete the following paragraphs considering the elements listed below. The procedures applicable to all UAS operations may be listed in paragraph 5.1).

5.1 General procedures valid for all operations

5.2 Procedures peculiar to a single operation

6. Emergency procedures

(The UAS operator should define procedures to cope with emergency situations.)

7. Emergency response plan (ERP) (optional)

8. **Security** (security procedures referred to in UAS.SPEC.050(a)(ii) and (iii); instructions, guidance, procedures, and responsibilities on how to implement security requirements and protect the UAS from unauthorised modification, interference, etc.]

9. **Guidelines to minimise nuisance and environmental impact referred to in** UAS.SPEC.050(a)(v);

10. **Occurrence reporting procedures according to Regulation (EU) No 376/2014.**

11. **Record-keeping procedures** (instructions on logs and records of pilots and other data considered useful for the tracking and monitoring of the activity).

GM1 UAS.SPEC.030(3)(e) Application for an operational authorisation

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OPERATIONS MANUAL — TEMPLATE

A non-exhaustive list of topics to be considered by the UAS operator when compiling some chapters of the OM is provided below:

'1.2 System for amendment and revision of the OM'

(a) A description of the system for indicating changes and of the methodology for recording effective pages and effectivity dates; and

(b) Details of the person(s) responsible for the revisions and their publication.

'2 Description of the UAS operator's organisation'

(a) The organisational structure and designated individuals. Description of the operator's organisational structure, including an organisational chart showing the different departments, if any (e.g. flight/ground operations, operational safety, maintenance, training, etc.) and the head of each department;

(b) Duties and responsibilities of the management personnel; and

(c) Duties and responsibilities of remote pilots and other members of the organisation involved in the operations (e.g. payload operator, ground assistant, maintenance technician, etc.).

'3.4 Competency, duties and responsibilities of personnel involved in the operations such as the remote pilot, UA observer, VO, supervisor, controller, operations manager etc.'

(a) Theoretical, practical (and medical) requirements for operating UAS in compliance with the applicable regulation;

(b) Training and check programme for the personnel in charge of the preparation and/or performance of the UAS operations, as well as for the VOs, when applicable;

(c) Training and refresher training records; and

(d) Precautions and guidelines involving the health of the personnel, including precautions pertaining to environmental conditions in the area of operation (policy on consumption of alcohol, narcotics and drugs, sleep aids and anti-depressants, medication and vaccination, fatigue, flight and duty period limitations, stress and rest, etc.).

'5.1 General procedures valid for all operations':

(a) Consideration of the following to minimise human errors:

(1) a clear distribution and assignment of tasks; and

(2) an internal checklist to check that staff are properly performing their assigned tasks.

(b) Consideration of the deterioration of external systems supporting the UAS operation; in order to assist in the identification of procedures related to the deterioration of external systems supporting the UAS operation, it is recommended to:

(1) identify the external systems supporting the operation;

(2) describe the deterioration modes of these external systems which would prevent the operator maintaining a safe operation of the UAS (e.g. complete loss of GNSS, drift of the GNSS, latency issues, etc.);

(3) describe the means put in place to detect the deterioration modes of the external systems; and

(4) describe the procedure(s) in place once a deterioration mode of one of the external systems is detected (e.g. activation of the emergency recovery capability, switch to manual control, etc.).

(c) Coordination between the remote pilot(s) and other personnel;

(d) Methods to exercise operational control; and

(e) Pre-flight preparation and checklists. These include, but are not limited to, the following points:

(1) The site of the operation:

(i) the assessment of the area of operation and the surrounding area, including, for example, the terrain and potential obstacles and obstructions for keeping a VLOS of the UA, potential overflight of uninvolved persons, potential overflight of critical infrastructure (a risk assessment of the critical infrastructure should be performed in cooperation with the responsible organisationfor the infrastructure, as they are most knowledgeable of the threats)

(ii) the assessment of the surrounding environment and airspace, including, for example, the proximity of restricted zones and potential activities by other airspace users;

(iii) when UA VOs are used, the assessment of the compliance between visibility and planned range, the potential terrain obstruction, and the potential gaps between the zones covered by each of the UA VOs; and

(iv) the class of airspace and other aircraft operations (local aerodromes or operating sites, restrictions, permissions).

(2) Environmental and weather conditions:

(i) environmental and weather conditions adequate to conduct the UAS operation; and

(ii) methods of obtaining weather forecasts.

(3) Coordination with third parties, if applicable (e.g. requests for additional permits from various agencies and the military when operating, for example, in environmentally protected areas, areas restricted to photographic flights, near critical infrastructure, in urban areas, emergency situations, etc.);

(4) the minimum number of crew members required to perform the operation, and their responsibilities;

(5) the required communication procedures between the personnel in charge of duties essential to the UAS operation, and with external parties when needed;

(6) compliance with any specific requirement from the relevant authorities in the intended area of operations, including those related to security, privacy, data and environmental protection, use of the RF spectrum; also considering cross-border operations (specific local requirements) when applicable;

(7) the required risk mitigations put in place to ensure the operation is safely conducted (e.g. a controlled ground area, securing the controlled ground area to avoid third parties entering the area during the operation, and ensuring coordination with the local authorities when needed, etc.); and

(8) procedures to verify that the UAS is in a condition to safely conduct the intended operation (e.g. update of geographical zones data for geo-awareness or geo-fencing systems; definition and upload of lost link contingency automatic procedures; battery status, loading and securing the payload;).

(f) Launch and recovery procedures;

(g) In-flight procedures (operating instructions for the UA (reference to or duplication of information from the manufacturer's manual); instructions on how to keep the UA within the flight geography, how to determine the best flight route; obstacles in the area, height; congested environments, keeping the UA in the planned volume);

(h) Post-flight procedures, including the inspections to verify the condition of the UAS;

(i) Procedures for the detection of potentially conflicting aircraft by the remote pilot and, when required by the UAS operator, UA VOs; and

(j) Dangerous goods (limitations on their nature, quantity and packaging; acceptance prior to loading, inspecting packages for any evidence of leakage or damage).

'5.2 Procedures peculiar to a single operation'

(a) Procedures to cope with the UA leaving the desired 'flight geography';

(b) Procedures to cope with the UA entering the 'containment' volume;

(c) Procedures to cope with uninvolved persons entering the controlled ground area, if applicable;

(d) Procedures to cope with adverse operating conditions (e.g. in case icing is encountered during the operation, if the operation is not approved for icing conditions);

(e) Procedures to cope with the deterioration of external systems supporting the operation. In order to help properly identify the procedures related to the deterioration of external systems supporting the UAS operation, it is recommended to:

(1) identify the external systems supporting the operation;

(2) describe the deterioration modes of these external systems which would prevent the operator maintaining a safe operation of the UAS (e.g. complete loss of GNSS, drift of the GNSS, latency issues, etc.);

(3) describe the means put in place to detect the deterioration modes of the external systems; and

(4) describe the procedure(s) in place once a deterioration mode of one of the external systems is detected (e.g. activation of the emergency recovery capability, switch to manual control, etc.).

(f) De-confliction scheme (i.e. the criteria that will be applied for the decision to avoid incoming traffic). In cases where the detection is performed by UA VOs, the phraseology to be used.

'6 Emergency procedures'

(a) Procedures to avoid or, at least minimise, harm to third parties in the air or on the ground. With regard to the air risk, an avoidance strategy to minimise the collision risk with another airspace user (in particular, an aircraft with people on board); and

(b) Procedures for the emergency recovery of the UA (e.g. landing immediately, termination of the flight with FTS or a controlled crash/splash, etc.).

'7. Emergency response plan (ERP)'

When the UAS operator develops an ERP, the following should be considered:

(a) it is expected to cover:

(1) the plan to limit crash-escalating effects (e.g. notify the emergency services and other relevant authorities); and

(2) the conditions to alert ATM.

(b) it is suitable for the situation;

(c) it limits the escalating effects;

(d) it defines criteria to identify an emergency situation;

(e) it is practical to use;

(f) it clearly delineates the responsibilities of the personnel in charge of duties essential to the UAS operation;

(g) it is developed to standards considered adequate by the competent authority and/or in accordance with means of compliance acceptable to that authority; and

(h) when considered appropriate by the competent authority, to be validated through a representative tabletop exercise[1] consistent with the ERP training syllabus.

[1] The tabletop exercise may or may not involve all third parties identified in the ERP.

UAS.SPEC.040 Issuing of an operational authorisation

Regulation (EU) 2019/947

(1) When receiving an application in accordance with point UAS.SPEC.030, the competent authority shall issue, without undue delay, an operational authorisation in accordance with Article 12 when it concludes that the operation meets the following conditions:

(a) all information in accordance with point (3) of point UAS.SPEC.030 is provided;

(b) a procedure is in place for coordination with the relevant service provider for the airspace if the entire operation, or part of it, is to be conducted in controlled airspace.

(2) The competent authority shall specify in the operational authorisation the exact scope of the authorisation in accordance with Article 12.

AMC1 UAS.SPEC.040(1) Operational authorisation

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OPERATIONAL AUTHORISATION TEMPLATE

The competent authority should produce the operational authorisation according to the following form:

Operational authorisation

NAA Logo

1. AUTHORITY RELEASING THE AUTHORISATION		
1.1	**State of the UAS operator**	
1.2	**Issuing authority**	
1.3	**Contact person** Name Telephone Email	
2. UAS operator data		
2.1	**UAS operator registration number**	
2.2	**UAS operator name**	
2.3	**Operational point of contact** Name Telephone Fax Email	
2.4	**Authorisation number**	

3. Data of authorised UAS			
3.1 **Brand**		**3.2** **Model**	
3.3 **Serial number or UA registration mark (if applicable)**			
4. Limitations and conditions for the UAS operation			
4.1 **Authorised location(s)**			
4.2 **Authorised airspace risk level**			
4.3 **Operational limitations**			
4.4 **Mitigation measures**			
4.5 **Remote pilot competency**			
4.6 **Competency of other staff essential for the safety of the operation**			
4.7 **Records to be kept**			
4.8 **Type of events to be reported to the competent authority according to Regulation (EU) No 376/2014**			
4.9 **Duration of the authorisation**			
The…… (2.2) is authorised to conduct UAS operations with the UAs defined in Section 3 and according to the conditions and limitations defined in Section 4, as long as it complies with this authorisation, Annex IX to Regulation (EU) 2018/1139 and its implementing rules.			
Date, signature and stamp			

Instructions for filling in the form

1.1 Name of the State of the UAS operator.

1.2 Identification of the issuing competent authority.

1.3 Contact data of the person responsible for issuing the authorisation.

2.1 Registration information of the UAS operator in accordance with Article 14 of the UAS Regulation.

2.2 UAS operator's registered name and last name or, in the case of a legal entity, the business name.

2.3 The contact details include the telephone and fax numbers, including the country code, and the email address at which the accountable manager and the safety manager can be contacted without undue delay.

2.4 Reference number, as issued by the competent authority.

3.1 Name of the manufacturer of the UAS.

3.2 Model of the UAS as defined by the manufacturer.

3.3 Serial number of the UA defined by the manufacturer or registration mark for the UA requiring registration according to Article 14 of the UAS Regulation

4.1 Locations where the operation has been authorised, based on the adaptation of mitigation measures.

4.2 Characterisation of the authorised airspace (i.e. low risk — ARC A, medium risk — ARC b, high risk — ARC C).

4.3 List the operational limitation including at least:

— the maximum height;

— limitations on the payload;

— limitations on the operations (i.e. the possibility to handover during the flight);

— the minimum contents of the OM;

— the methodology to verify the operational procedures;

— the need for an emergency response plan;

— the maintenance requirements; and

— the record-keeping requirements.

4.4 List the mitigation measures including[1] at least protection of a third party on the ground (including the definition of a specific authorised flight path, if applicable).

4.5 The minimum competency required for the remote pilot and the methodology to assess it.

4.6 The minimum competency required for the staff essential for the operation (i.e. maintenance staff, the launch and recovery assistant, UA VO, etc.) and the methodology to assess it.

Note: The signature and stamp may be provided in electronic form.

GM1 UAS.SPEC.040(1) Operational authorisation

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OPERATIONAL AUTHORISATION TEMPLATE

In order to facilitate mutual recognition in cases of cross-border operations, the competent authority should produce an English version of the operational authorisation.

[1] In case of cross-border operations, this information will be revised by the NAA of the MS of operation.

UAS.SPEC.050 Responsibilities of the UAS operator

Regulation (EU) 2019/947

(1) The UAS operator shall comply with all of the following:

(a) establish procedures and limitations adapted to the type of the intended operation and the risk involved, including:

i. operational procedures to ensure the safety of the operations;

ii. procedures to ensure that security requirements applicable to the area of operations are complied with in the intended operation;

iii. measures to protect against unlawful interference and unauthorised access;

iv. procedures to ensure that all operations are in respect of Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data. In particular it shall carry out a data protection impact assessment, when required by the National Authority for data protection in application of Article 35 of Regulation (EU) 2016/679;

v. guidelines for its remote pilots to plan UAS operations in a manner that minimises nuisances, including noise and other emissions-related nuisances, to people and animals.

(b) designate a remote pilot for each operation or, in the case of autonomous operations, ensure that during all phases of the operation, responsibilities and tasks especially those defined in points (2) and (3) of point UAS.SPEC.060 are properly allocated in accordance with the procedures established pursuant to point (a) above;

(c) ensure that all operations effectively use and support the efficient use of radio spectrum in order to avoid harmful interference;

(d) ensure that before conducting operations, remote pilots comply with all of the following conditions:

i. have the competency to perform their tasks in line with the applicable training identified by the operational authorisation or, if point UAS.SPEC.020 applies, by the conditions and limitations defined in the appropriate standard scenario listed in Appendix 1 or as defined by the LUC;

ii. follow remote pilot training which shall be competency based and include the competencies set out in paragraph 2 of Article 8:

iii. follow remote pilot training, as defined in the operational authorisation, for operations requiring such authorisation, it shall be conducted in cooperation with an entity recognised by the competent authority;

iv. follow remote pilot training for operations under declaration that shall be conducted in accordance with the mitigation measures defined by the standard scenario;

v. have been informed about the UAS operator's operations manual, if required by the risk assessment and procedures established in accordance with point (a);

vi. obtain updated information relevant to the intended operation about any geographical zones defined in accordance with Article 15;

(e) ensure that personnel in charge of duties essential to the UAS operation, other than the remote pilot itself, comply with all of the following conditions:

i. have completed the on-the-job-training developed by the operator;

ii. have been informed about the UAS operator's operations manual, if required by the risk assessment, and about the procedures established in accordance with point (a);

iii. have obtained updated information relevant to the intended operation about any geographical zones defined in accordance with Article 15;

(f) carry out each operation within the limitations, conditions, and mitigation measures defined in the declaration or specified in the operational authorisation;

(g) keep a record of the information on UAS operations as required by the declaration or by the operational authorisation;

(h) use UAS which, as a minimum, are designed in such a manner that a possible failure will not lead the UAS to fly outside the operation volume or to cause a fatality. In addition, Man Machine interfaces shall be such to minimise the risk of pilot error and shall not cause unreasonable fatigue;

(i) maintain the UAS in a suitable condition for safe operation by:

i. as a minimum, defining maintenance instructions and employing an adequately trained and qualified maintenance staff; and

ii. complying with point UAS.SPEC.100, if required;

iii. using an unmanned aircraft which is designed to minimise noise and other emissions, taking into account the type of the intended operations and geographical areas where the aircraft noise and other emissions are of concern.

AMC1 UAS.SPEC.050(1) Responsibilities of the UAS operator

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OPERATIONAL PROCEDURES

(a) The UAS operator should develop procedures as required by the standard scenario (STS) or by the operational authorisation.

(b) If a UAS operator employs more than one remote pilot, the UAS operator should:

(1) develop procedures for UAS operations in order to coordinate the activities between its employees; and

(2) compile and maintain a list of their personnel and their assigned duties.

(c) The UAS operator should allocate functions and responsibilities in accordance with the level of autonomy of the UAS during the operation.

AMC1 UAS.SPEC.050(1)(a) Responsibilities of the UAS operator

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OPERATIONAL PROCEDURES

The UAS operator should develop operational procedures based on the manufacturer's recommendations, if available.

When the UAS operator is required to develop an OM in accordance with point UAS.SPEC.030(3)(e), the procedures should be included in that manual.

GM1 UAS.SPEC.050(1)(a)(iv) Responsibilities of the UAS operator

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PROCEDURES TO ENSURE THAT ALL OPERATIONS ARE IN COMPLIANCE WITH REGULATION (EU) 2016/679 ON THE PROTECTION OF NATURAL PERSONS WITH REGARD TO THE PROCESSING OF PERSONAL DATA AND ON THE FREE MOVEMENT OF SUCH DATA

The UAS operator is responsible for complying with any applicable European Union and national rules, in particular, with regard to privacy, data protection, liability, insurance, security and environmental protection.

This GM has the purpose of providing guidance to the UAS operator to help them to identify and describe the procedures to ensure that the UAS operations are in compliance with Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data.

Description of the procedures established by the UAS operator to ensure that the UAS operation is in compliance with Regulation (EU) 2016/679

1.	**Identify the privacy risks[1] that the intended operation may create**
2.	**Define your role with respect to personal data collection and processing**
	☐ I am the (joint) data controller ☐ I am the (joint) data processor
3.	**Data protection impact assessment (DPIA)**
Have you assessed the need to perform a DPIA: Yes ☐ No ☐ If yes, do you have to perform a DPIA? Yes ☐ No ☐ - If yes, did you perform a DPIA? Yes ☐ No ☐	
4.	**Describe the measures you are taking to ensure data subjects are aware that their data may be collected[6]**
5.	**Describe the measures you are taking to minimise the personal data you are collecting or to avoid collecting personal data[7]**
6.	**Describe the procedure established to store the personal data and limit access to it**

7.	**Describe the measures taken to ensure that data subjects can exercise their right to access, correction, objection and erasure**
8.	**Additional information**

Notes:

1. For guidance regarding the identification of the **privacy risks** of your operation, please check:
   - The DR PRO online training course: Module 1 — Privacy risks in context; and
   - The DR PRO Privacy-by-Design Guide: Privacy risks and safeguards in drone manufacturing (page 10).
2. For more information about **definitions of personal data**, please check:
   - The DR PRO online training course: Module 2 – What is personal data? and
   - The DR PRO Privacy Code of Conduct: 3. Glossary.

   'Data controller' means that you make decisions about what personal data is collected and how it is collected, processed and stored.

   'Data processor' means that you follow instructions from another entity on collecting, processing and storing personal data.

   For more information about your potential role as **data controller or data processor**, you can check:
   - The DR PRO online training course: Module 2 – Data protection Roles; and
   - The DR PRO Privacy Code of Conduct for the responsibilities of data controllers.
3. For more information about when and how to conduct **data protection impact assessments** please check:
   - The DR PRO Data Protection Impact Assessment template
4. For more information about how to **inform data subjects** about your activities you can check:
   - The DR PRO Privacy Code of Conduct: 4.3.2 Act visibly and transparently;
   - The DR PRO online training course: Module 3 – Carry out your operation; and
   - The DR PRO Pre-flight checklist
5. For more information about the **data minimisation principle**, please check:
   - The DR PRO Privacy Code of Conduct: 4.3.1 Minimise the impact on people's privacy and data protection;
   - The DR PRO Privacy-by-Design Guide: Drone Privacy Enhancing Software Features; and
   - The DR PRO online training course: Module 3 – Risk mitigation strategies.

6. For guidance on the **secure storage and access** to personal data, please check:

— The DR PRO Privacy Code of Conduct: 4.4.2 Handle data securely;

— The DR PRO online training course: Module 2 – How should personal data be handled? and

— The DR PRO Privacy-by-Design Guide: Drone Privacy Enhancing Software Features.

7. For more information about the **rights of data subjects**, please check:

— The DR PRO Privacy Code of Conduct: 4.3.3 Respect the rights of individuals; and

— The DR PRO online training course: Module 2 – How should individuals be treated?

GM1 UAS.SPEC.050(1)(b) Responsibilities of the UAS operator

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LEVEL OF AUTONOMY AND GUIDELINES FOR HUMAN-AUTONOMY INTERACTION

The concept of autonomy, its levels and human-autonomous system interactions are currently being discussed in various domains (not only in aviation), and no common understanding has yet been reached. Guidance will therefore be provided once this concept is mature and globally accepted.

Nevertheless, the risk assessment of autonomous operations should ensure, as for any other operations, that the risk is mitigated to an acceptable level.

Besides, it is expected that autonomous operations or operations with a high level of autonomy will be subject to authorisation and will not be covered by STSs until enough experience is gained.

GM1 UAS.SPEC.050(1)(d) Responsibilities of the UAS operator

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THEORETICAL KNOWLEGDE SUBJECTS FOR REMOTE PILOT TRAINING FOR THE 'SPECIFIC' CATEGORY

(a) The 'specific' category may cover a wide range of UAS operations with different levels of risk. The UAS operator is therefore required to identify the competency required for the remote pilot and all the personnel in charge of duties essential to the UAS operation, according to the outcome of the risk assessment.

(b) When the UAS operation is conducted according to a STS listed in Appendix 1 to the UAS Regulation, the UAS operator must ensure that the remote pilot has the competency defined in the STS. In all other cases, the UAS operator may propose to the NAA, as part of the application, a theoretical knowledge training course for the remote pilot based on the elements listed in AMC1 UAS.OPEN.020(4)(b) and in UAS.OPEN.030(2), complemented by the following subjects:

(1) air safety:

(i) remote pilot records;

(ii) logbooks and associated documentation;

(iii) good airmanship principles;

(iv) aeronautical decision-making;

(v) aviation safety;

(vi) air proximity reporting; and

(vii) advanced airmanship:

(A) manoeuvres and emergency procedures; and

(B) general information on unusual conditions (e.g. stalls, spins, vertical lift limitations, autorotation, vortex ring states);

(2) aviation regulations:

(i) introduction to the 'specific' category;

(ii) risk assessment, introduction to SORA; and

(iii) overview of STSs and PDRA;

(3) navigation:

(i) navigational aids and their limitations (e.g. GNSS)

(ii) reading maps and aeronautical charts (e.g. 1:500 000 and 1:250 000, interpretation, specialised charts, helicopter routes, U-space service areas, and understanding of basic terms); and

(iii) vertical navigation (e.g. reference altitudes and heights, altimetry);

(4) human performance limitations:

(i) perception (situational awareness in BVLOS operations); and

(ii) fatigue:

(A) flight durations within work hours;

(B) circadian rhythms;

(C) work stress; and

(D) commercial pressures;

(iii) attentiveness:

(A) eliminating distractions; and

(B) scan techniques;

(iv) medical fitness (health precautions, alcohol, drugs, medication etc.); and

(v) environmental factors such as vision changes from orientation to the sun;

(5) operational procedures:

(i) airspace classifications;

(ii) procedures for airspace reservation;

(iii) aeronautical information publications;

(iv) NOTAMs; and

(v) mission planning, airspace considerations and site risk-assessment:

(A) measures to comply with the limitations and conditions applicable to the operational volume and the ground risk buffer for the intended operation; and

(B) BVLOS operations. Use of UA VOs;

(6) UAS general knowledge:

(i) loss of signal and system failure protocols — understanding the condition and planning for programmed responses such as returning to home, loiter, landing immediately;

(ii) flight termination systems; and

(iii) flight control modes;

(7) meteorology:

(i) obtaining and interpreting advanced weather information:

(A) weather reporting resources;

(B) reports;

(C) forecasts and meteorological conventions appropriate for typical UAS flight operations;

(D) local weather assessments;

(E) low-level charts; and

(F) METAR, SPECI, TAF;

(ii) regional weather effects — standard weather patterns in coastal, mountain or desert terrains; and

(iii) weather effects on the UA (wind, storms, mist, variation of wind with altitude, wind shear etc.); and

(8) emergency response plan (ERP) — the UAS operator should provide competency-based theoretical and practical training covering the ERP that includes the related proficiency requirements and recurrent training.

(c) The UAS operator may define additional aspects from the subjects mentioned in point (b) based on the UAS operations intended to be conducted:

(1) operational procedures;

(i) mission planning, airspace considerations and site risk-assessment — operations over a controlled ground area;

(ii) multi crew cooperation (MCC):

(A) coordination between the remote pilot and other personnel in charge of duties essential to the UAS operation (i.e. VO);

(B) crew resource management (CRM):

(a) effective leadership; and

(b) working with others;

(2) UAS general knowledge — the means supporting BVLOS operations:

(i) the means to monitor the UA (its position, height, speed, C2 Link, systems status, etc.);

(ii) the means of communication with VOs; and

(iii) the means to support air traffic awareness.

AMC1 UAS.SPEC.050(1)(e)(ii) Responsibilities of the UAS operator

ED Decision 2019/021/R

INFORMATION ABOUT THE UAS OPERATOR'S MANUAL

The UAS operator should ensure that the personnel in charge of duties essential to the UAS operation apply the procedures contained in the operator's manual.

AMC1 UAS.SPEC.050(1)(g) Responsibilities of the UAS operator

ED Decision 2019/021/R

LOGGING OF FLIGHT ACTIVITIES AND RECORD-KEEPING

(a) An acceptable means to log and record the flight activities is to use a logbook, which may be electronic.

(b) The information to be recorded should be indicated in the declaration or in the operational authorisation, which may include the following:

(1) the identification of the UAS (manufacturer, model/variant (e.g. serial number);

NOTE: if the UAS is not subject to registration, the identification of the UAS may be done using the serial number of the UAS.

(2) the date, time, and location of the take-off and landing;

(3) the duration of each flight;

(4) the total number of flight hours/cycles;

(5) in the case of a remotely piloted operation, the name of the remote pilot responsible for the flight;

(6) the activity performed (add the reference to the STS or the authorisation number, as applicable);

(7) any significant incident or accident[1] that occurred during the operation;

(8) a completed pre-flight inspection;

(9) any defects and rectifications;

(10) any repairs and changes to the UAS configuration; and

(11) the information required to comply with UAS.SPEC.100.

(c) Records should be stored for 2 years in a manner that ensures their protection from unauthorised access, damage, alteration, and theft.

(d) The logbook can be generated in one of the following formats: electronic or paper. If the paper format is used, it should contain, in a single volume, all the pages needed to log the holder's

[1] As defined by Regulation (EU) No 376/2014.

flight time. When one volume is completed, a new one will be started based on the cumulative data from the previous one.

UAS.SPEC.060 Responsibilities of the remote pilot

Regulation (EU) 2019/947

(1) The remote pilot shall:

(a) not perform duties under the influence of psychoactive substances or alcohol or when it is unfit to perform its tasks due to injury, fatigue, medication, sickness or other causes;

(b) have the appropriate remote pilot competency as defined in the operational authorisation, in the standard scenario defined in Appendix 1 or as defined by the LUC and carry a proof of competency while operating the UAS.

(2) Before starting an UAS operation, the remote pilot shall comply with all of the following:

(a) obtain updated information relevant to the intended operation about any geographical zones defined in accordance with Article 15;

(b) ensure that the operating environment is compatible with the authorised or declared limitations and conditions;

(c) ensure that the UAS is in a safe condition to complete the intended flight safely, and if applicable, check if the direct remote identification works properly;

(d) ensure that the information about the operation has been made available to the relevant air traffic service (ATS) unit, other airspace users and relevant stakeholders, as required by the operational authorisation or by the conditions published by the Member State for the geographical zone of operation in accordance with Article 15.

(3) During the flight, the remote pilot shall:

(a) comply with the authorised or declared limitations and conditions;

(b) avoid any risk of collision with any manned aircraft and discontinue a flight when continuing it may pose a risk to other aircraft, people, animals, environment or property;

(c) comply with the operational limitations in geographical zones defined in accordance with Article 15;

(d) comply with the operator's procedures;

(e) not fly close to or inside areas where an emergency response effort is ongoing unless they have permission to do so from the responsible emergency response services.

AMC1 UAS.SPEC.060(2)(b) Responsibilities of the remote pilot

ED Decision 2019/021/R

OPERATING ENVIRONMENT

(a) The remote pilot, or the UAS operator in the case of an autonomous operation, should check any conditions that might affect the UAS operation, such as the locations of people, property, vehicles, public roads, obstacles, aerodromes, critical infrastructure, and any other elements that may pose a risk to the safety of the UAS operation.

(b) Familiarisation with the environment and obstacles should be conducted through a survey of the area where the operation is intended to be performed.

(c) It should be verified that the weather conditions at the time when the operation starts and those that are expected for the entire period of the operation are compatible with those defined in the manufacturer's manual, as well as with the operational authorisation or declaration, as applicable.

(d) The remote pilot should be familiar with the light conditions and make a reasonable effort to identify potential sources of electromagnetic energy, which may cause undesirable effects, such as EMI or physical damage to the operational equipment of the UAS.

AMC1 UAS.SPEC.060(2)(c) Responsibilities of the remote pilot

ED Decision 2019/021/R

THE UAS IS IN A SAFE CONDITION TO COMPLETE THE INTENDED FLIGHT

The remote pilot, or the operator in the case of an autonomous operation, should:

(a) update the UAS with data for the geo-awareness function if one is available on the UA;

(b) ensure that the UAS is fit to fly and complies with the instructions and limitations provided by the manufacturer;

(c) ensure that any payload carried is properly secured and installed, respecting the limits for the mass and CG of the UA;

(d) ensure that the UA has enough propulsion energy for the intended operation based on:

(i) the planned operation; and

(ii) the need for extra energy in case of unpredictable events; and

(e) for a UAS equipped with a loss-of-data-link recovery function, ensure that the recovery function allows a safe recovery of the UAS for the envisaged operation; for programmable loss-of-data-link recovery functions, the remote pilot may have to set up the parameters of this function to adapt it to the envisaged operation.

UAS.SPEC.070 Transferability of an operational authorisation

Regulation (EU) 2019/947

An operational authorisation is not transferable.

UAS.SPEC.080 Duration and validity of an operational authorisation

Regulation (EU) 2019/947

(1) The competent authority shall specify the duration of the operational authorisation in the authorisation itself.

(2) Notwithstanding point (1), the operational authorisation remains valid as long as the UAS operator remains compliant with the relevant requirements of this Regulation and with the conditions defined in the operational authorisation.

(3) Upon revocation or surrender of the operational authorisation the UAS operator shall provide an acknowledgment in digital format that must be returned to the competent authority without delay.

UAS.SPEC.090 Access

Regulation (EU) 2019/947

For the purpose of demonstrating compliance with this Regulation, an UAS operator shall grant to any person, that is duly authorised by the competent authority, an access to any facility, UAS, document, records, data, procedures or to any other material relevant to its activity, which is subject to operational authorisation or operational declaration, regardless of whether or not its activity is contracted or subcontracted to another organisation.

UAS.SPEC.100 Use of certified equipment and certified unmanned aircraft

Regulation (EU) 2019/947

(1) If the UAS operation is using an unmanned aircraft for which a certificate of airworthiness or a restricted certificate of airworthiness have been issued, or using certified equipment, the UAS operator shall record the operation or service time in accordance either with the instructions and procedures applicable to the certified equipment, or with the organisational approval or authorisation.

(2) The UAS operator shall follow the instructions referred to in the unmanned aircraft certificate or equipment certificate, and also comply with any airworthiness or operational directives issued by the Agency.

GM1 UAS.SPEC.100 The use of certified equipment and certified unmanned aircraft

ED Decision 2019/021/R

GENERAL

For the purposes of UAS.SPEC.100, 'certified equipment' is considered to be any equipment for which the relevant design organisation has demonstrated compliance with the applicable certification specifications and received a form of recognition from EASA that attests such compliance (e.g. an ETSO authorisation). This process is independent from the CE marking process.

The use of certified equipment or certified UA in the 'specific' category of operation does not imply a transfer of the flight activities into the 'certified' category of operation. However, the use of certified equipment or certified UA in the 'specific' category should be considered as a risk reduction and/or mitigation measure in the SORA.

PART C – LIGHT UAS OPERATOR CERTIFICATE (LUC)

UAS.LUC.010 General requirements for an LUC

Regulation (EU) 2019/947

(1) A legal person is eligible to apply for an LUC under this Part.

(2) An application for an LUC or for an amendment to an existing LUC shall be submitted to the competent authority and shall contain all of the following information:

(a) a description of the UAS operator's management system, including its organisational structure and safety management system;

(b) the name(s) of the responsible UAS operator's personnel, including the person responsible for authorising operations with UASs;

(c) a statement that all the documentation submitted to the competent authority has been verified by the applicant and found to comply with the applicable requirements.

(3) If the requirements of this Part are met, an LUC holder may be granted the privileges, in accordance with point UAS.LUC.060.

GM1 UAS.LUC.010 General requirements for an LUC

ED Decision 2019/021/R

GENERAL

UAS operators may decide to apply for authorisations or issue declarations, as applicable, for their operations, or apply for an LUC.

An LUC holder is considered to be a UAS operator; therefore, they must register according to Article 14 and can do it in parallel to the LUC application.

AMC1 UAS.LUC.010(2) General requirements for an LUC

ED Decision 2019/021/R

APPLICATION FOR AN LUC

The application should include at least the following information:

(a) Name and address of the applicant's principal place of business.

(b) Statement that the application serves as a formal application for a LUC.

(c) Statement that all the documentation submitted to the competent authority has been verified by the applicant and found to comply with the applicable requirements.

(d) Desired date for the operation to commence.

(e) Signature of the applicant's accountable manager.

(f) List of attachments that accompany the formal application *(the following is not an exhaustive list)*:

(i) name(s) of the responsible UAS operator's personnel, including the accountable manager, operations, maintenance and training managers, the safety manager and security manager, the person responsible for authorising operations with UASs;

(ii) list of UASs to be operated;

(iii) details of the method of control and supervision of operations to be used;

(iv) identification of the operation specifications sought;

(v) OM and safety management manual (SMM). (Note: the OM and SMM may be combined under the LUC Manual);

(vi) schedule of events in the process to gain the LUC certificate with appropriate events addressed and target dates;

(vii) documents of purchase, leases, contracts or letters of intent;

(viii) arrangements for the facilities and equipment required and available; and

(ix) arrangements for crew and ground personnel training and qualification.

UAS.LUC.020 Responsibilities of the LUC holder

Regulation (EU) 2019/947

The LUC holder shall:

(1) comply with the requirements of points UAS.SPEC.050 and UAS.SPEC.060;

(2) comply with the scope and privileges defined in the terms of approval;

(3) establish and maintain a system for exercising operational control over any operation conducted under the terms of its LUC;

(4) carry out an operational risk assessment of the intended operation in accordance with Article 11 unless conducting an operation for which an operational declaration is sufficient according to point UAS.SPEC.020,

(5) keep records of the following items in a manner that ensures protection from damage, alteration and theft for a period at least 3 years for operations conducted using the privileges specified under point UAS.LUC.060:

(a) the operational risk assessment, when required according to point (4), and its supporting documentation;

(b) mitigation measures taken; and

(c) the qualifications and experience of personnel involved in the UAS operation, compliance monitoring and safety management;

(6) keep personnel records referred to in point (5)(c) as long as the person works for the organisation and shall be retained until 3 years after the person has left the organisation.

AMC1 UAS.LUC.020(3) Responsibilities of the LUC holder

ED Decision 2019/021/R

OPERATIONAL CONTROL

The organisation and methods established by the LUC holder to exercise operational control within its organisation should be included in the OM as an additional chapter in relation to the template provided in GM1 UAS.SPEC.030(3)(e).

GM1 UAS.LUC.020(3) Responsibilities of the LUC holder

ED Decision 2019/021/R

OPERATIONAL CONTROL

'Operational control' should be understood as the responsibility for the initiation, continuation, termination or diversion of a flight in the interest of safety.

'System' in relation to operational control should be understood as the organisation, methods, documentation, personnel and training of those personnel for the initiation, continuation, termination or diversion of a flight in the interest of safety.

AMC1 UAS.LUC.020(5) Responsibilities of the LUC holder

ED Decision 2019/021/R

RECORD-KEEPING — GENERAL

The record-keeping system should ensure that all records are stored in a manner that ensures their protection from damage, alteration and theft. They should be accessible on request of the NAA, whenever needed within a reasonable time. These records should be organised in a way that ensures traceability, availability and retrievability throughout the required retention period. The retention period starts when the record was created or last amended. Adequate backups should be ensured.

UAS.LUC.030 Safety management system

Regulation (EU) 2019/947

(1) An UAS operator who applies for an LUC shall establish, implement and maintain a safety management system corresponding to the size of the organisation, to the nature and complexity of its activities, taking into account the hazards and associated risks inherent in these activities.

(2) The UAS operator shall comply with all of the following:

(a) nominate an accountable manager with authority for ensuring that within the organisation all activities are performed in accordance with the applicable standards and that the organisation is continuously in compliance with the requirements of the management system and the procedures identified in the LUC manual referred to in point UAS.LUC.040;

(b) define clear lines of responsibility and accountability throughout the organisation;

(c) establish and maintain a safety policy and related corresponding safety objectives;

(d) appoint key safety personnel to execute the safety policy;

(e) establish and maintain a safety risk management process including the identification of safety hazards associated with the activities of the UAS operator, as well as their evaluation and the management of associated risks, including taking action to mitigate those risks and verify the effectiveness of the action;

(f) promote safety in the organisation through:

i. training and education;

ii. communication;

(g) document all safety management system key processes for making personnel aware of their responsibilities and of the procedure for amending this documentation; key processes include:

i. safety reporting and internal investigations;

ii. operational control;

iii. communication on safety;

iv. training and safety promotion;

v. compliance monitoring;

vi. safety risk management;

vii. management of change;

viii. interface between organisations;

ix. use of sub-contractors and partners;

(h) include an independent function to monitor the compliance and adequacy of the fulfilment of the relevant requirements of this Regulation, including a system to provide feedback of findings to the accountable manager to ensure effective implementation of corrective measures as necessary;

(i) include a function to ensure that safety risks inherent to a service or product delivered through subcontractors are assessed and mitigated under the operator's safety management system.

(3) If the organisation holds other organisation certificates within the scope of Regulation (EU) No 2018/1139, the safety management system of the UAS operator may be integrated with the safety management system that is required by any of those additional certificate(s).

AMC1 UAS.LUC.030(2) Safety management system

ED Decision 2019/021/R

PERSONNEL REQUIREMENTS — GENERAL

(a) The accountable manager should have the authority to ensure that all activities are carried out in accordance with the requirements of the UAS Regulation.

(b) The safety manager should:

(1) facilitate hazard identification, risk analysis, and risk management;

(2) monitor the implementation of risk mitigation measures;

(3) provide periodic reports on safety performance;

(4) ensure maintenance of the safety management documentation;

(5) ensure that there is safety management training available and that it meets acceptable standards;

(6) provide all the personnel involved with advice on safety matters; and

(7) ensure the initiation and follow-up of internal occurrence investigations.

(c) Management and other personnel of the LUC holder should be qualified for the planned operations in order to meet the relevant requirements of the UAS Regulation.

(d) The LUC holder should ensure that its personnel receive appropriate training to remain in compliance with the relevant requirements of the UAS Regulation.

GM1 UAS.LUC.030(2)(a) Safety management system

ED Decision 2019/021/R

ACCOUNTABLE MANAGER

The accountable manager is a single, identifiable person who has the responsibility for the effective and efficient performance of the LUC holder's safety management system.

AMC1 UAS.LUC.030(2)(c) Safety management system

ED Decision 2019/021/R

SAFETY POLICY

(a) The safety policy should:

(1) be endorsed by the accountable manager;

(2) reflect organisational commitments regarding safety, and its proactive and systematic management;

(3) be communicated, with visible endorsement, throughout the organisation;

(4) include internal reporting principles, and encourage personnel to report errors related to UAS operations, incidents and hazards; and

(5) recognise the need for all personnel to cooperate with compliance monitoring and safety investigations.

(b) The safety policy should include a commitment to:

(1) improve towards the highest safety standards;

(2) comply with all applicable legislation, meet all applicable standards, and consider best practices;

(3) provide appropriate resources;

(4) apply the human factors principles;

(5) enforce safety as a primary responsibility of all managers; and

(6) apply 'just culture' principles and, in particular, not to make available or use the information on occurrences:

(i) to attribute blame or liability to someone for reporting something which would not have been otherwise detected; or

(ii) for any purpose other than the improvement of safety.

(c) The senior management of the UAS operator should:

(1) continually promote the UAS operator's safety policy to all personnel, and demonstrate their commitment to it;

(2) provide the necessary human and financial resources for the implementation of the safety policy; and

(3) establish safety objectives and associated performance standards.

GM1 UAS.LUC.030(2)(c) Safety management system

ED Decision 2019/021/R

SAFETY POLICY

The safety policy is the means whereby an organisation states its intention to maintain and, where practicable, improve safety levels in all its activities and to minimise its contribution to the risk of an accident or serious incident as far as is reasonably practicable. It reflects the management's commitment to safety, and should reflect the organisation's philosophy of safety management, as well as be the foundation on which the organisation's safety management system is built. It serves as a reminder of 'how we do business here'. The creation of a positive safety culture begins with the issuance of a clear, unequivocal direction.

The commitment to apply 'just culture' principles forms the basis for the organisation's internal rules that describe how 'just culture' principles are guaranteed and implemented.

For organisations that have their principal place of business in a MS, Regulation (EU) No 376/2014 defines the 'just culture' principles to be applied (refer in particular to Article 16(11) thereof).

GM1 UAS.LUC.030(2)(d) Safety management system

ED Decision 2019/021/R

PERSONNEL REQUIREMENTS

The functions of the safety manager may be fulfilled by the accountable manager or another person charged by the UAS operator with the responsibility of ensuring that the UAS operator remains in compliance with the requirements of the UAS Regulation.

Where the safety manager already fulfils the functions of the compliance monitoring manager, the accountable manager cannot be the safety manager.

Depending on the size of the organisation and the nature and complexity of its activities, the safety manager may be assisted by additional safety personnel for the performance of all the safety management tasks.

Regardless of the organisational set-up, it is important that the safety manager remains the unique focal point as regards the development, administration, and maintenance of the organisation's management system.

GM2 UAS.LUC.030(2)(d) Safety management system

ED Decision 2019/021/R

PERSONNEL REQUIREMENTS

A UAS operator may include a safety committee in the organisational structure of its safety management system and, if needed, one or more safety action groups.

(a) Safety committee

A safety committee may be established to support the accountable manager in their safety responsibilities. The safety committee should monitor:

(1) the UAS operator's performance against safety objectives and performance standards;

(2) whether safety action is taken in a timely manner; and

(3) the effectiveness of the UAS operator's safety management processes.

(b) Safety action group

(1) Depending on the scope of the task and the specific expertise required, one or more safety action groups should be established to assist the safety manager in their functions.

(2) The safety action group should be comprised of managers, supervisors and personnel from operational areas, depending on the scope of the task and the specific expertise required.

(3) The safety action group should at least perform the following:

(i) monitor operational safety and assess the impact of operational changes on safety;

(ii) define actions to mitigate the identified safety risks; and

(iii) ensure that safety measures are implemented within agreed timescales.

GM3 UAS.LUC.030(2)(d) Safety management system

ED Decision 2019/021/R

KEY SAFETY PERSONNEL

The UAS operator should appoint personnel to manage key fields of activity such as operations, maintenance, training, etc.

AMC1 UAS.LUC.030(2)(g) Safety management system

ED Decision 2019/021/R

DOCUMENTATION

The safety management system documentation of the LUC holder should be included in an SMM or in the LUC manual. If that documentation is contained in more than one operator's manual and is not duplicated, cross references should be provided.

GM1 UAS.LUC.030(2)(g)(i) Safety management system

ED Decision 2019/021/R

SAFETY REPORTING AND INTERNAL INVESTIGATIONS

The purpose of safety reporting and internal investigations is to use reported information to improve the level of safety performance of the UAS operator. The purpose is not to attribute blame or liability.

The specific objectives of safety reporting and internal investigations are to:

(a) enable assessments of the safety implications of each relevant incident and accident, including previous similar occurrences, so that any necessary action can be initiated; and

(b) ensure that knowledge of relevant incidents and accidents is disseminated so that other persons and UAS operators may learn from them.

All occurrence reports that are considered to be reportable by the person who submits the report should be retained, as the significance of such reports may only become obvious at a later date.

AMC1 UAS.LUC.030(2)(g)(iii) Safety management system

ED Decision 2019/021/R

COMMUNICATION ON SAFETY

(a) The organisation should establish communication about safety matters that:

(1) ensures that all personnel are aware of the safety management activities as appropriate for their safety responsibilities;

(2) conveys safety-critical information, especially information related to assessed risks and analysed hazards;

(3) explains why particular actions are taken; and

(4) explains why safety procedures are introduced or changed.

(b) Regular meetings with personnel, where information, actions, and procedures are discussed, may be used to communicate safety matters.

GM1 UAS.LUC.030(2)(g)(iv) Safety management system

ED Decision 2019/021/R

TRAINING AND SAFETY PROMOTION

Training, combined with safety communication and information sharing form part of safety promotion and supplement the organisation's policies, encouraging a positive safety culture and creating an environment that is favourable to the achievement of the organisation's safety objectives.

Safety promotion can also be the instrument for the development of a just culture.

Depending on the particular risk, safety promotion may constitute or complement a risk mitigation action and an effective reporting system.

AMC1 UAS.LUC.030(2)(g)(v) Safety management system

ED Decision 2019/021/R

COMPLIANCE MONITORING

(a) The accountable manager should designate a manager to monitor the compliance of the LUC holder with:

(1) the terms of approval, the privileges, the risk assessment and the resulting mitigation measures;

(2) all operator's manuals and procedures; and

(3) training standards.

(b) The compliance monitoring manager should:

(1) have knowledge of, and experience in, compliance monitoring;

(2) have direct access to the accountable manager to ensure that findings are addressed, as necessary; and

(3) not be one of the other persons referred to in UAS.LUC.030(2)(c).

(c) The tasks of the compliance monitoring manager may be performed by the safety manager, provided that the latter has knowledge of, and experience in, compliance monitoring.

(d) The compliance monitoring function should include audits and inspections of the LUC holder. The audits and inspections should be carried out by personnel who are not responsible for the function, procedure or products being audited.

(e) An organisation should establish an audit plan to show when and how often the activities as required by the UAS Regulation will be audited.

(f) The independent audit should ensure that all aspects of compliance, including all the subcontracted activities, are checked within a period defined in the scheduled plan, and agreed by the competent authority.

(g) Where the organisation has more than one approved location, the compliance monitoring function should describe how these locations are integrated into the system and include a plan to audit each location in a risk-based programme as agreed by the competent authority.

(h) A report should be raised each time an audit is carried out, describing what was checked and the resulting findings against applicable requirements and procedures.

(i) The feedback part of the compliance monitoring function should address who is required to rectify any non-compliance in each particular case, and the procedure to be followed if rectification is not completed within appropriate timescales. The procedure should lead to the accountable manager.

(j) The LUC holder should be responsible for the effectiveness of the compliance monitoring function, in particular for the effective implementation and follow-up of all corrective measures.

GM1 UAS.LUC.030(2)(g)(v) Safety management system

ED Decision 2019/021/R

COMPLIANCE MONITORING

The primary objective of the compliance monitoring function is to enable the UAS operator to ensure a safe operation and to remain in compliance with the UAS Regulation.

An external organisation may be contracted to perform compliance monitoring functions. In such cases, that organisation should designate the compliance monitoring manager.

The compliance monitoring manager may use one or more auditors to carry out compliance audits and inspections of the LUC holder under their own responsibility.

AMC1 UAS.LUC.030(2)(g)(vi) Safety management system

ED Decision 2019/021/R

SAFETY RISK MANAGEMENT

The LUC holder should have a safety management system that is able to perform at least the following:

(a) identify hazards through reactive, proactive, and predictive methodologies, using various data sources, including safety reporting and internal investigations;

(b) collect, record, analyse, act on and generate feedback about hazards and the associated risks that affect the safety of the operational activities of the UAS operator;

(c) develop an operational risk assessment as required by Article 11;

(d) carry out internal safety investigations;

(e) monitor and measure safety performance through safety reports, safety reviews, in particular during the introduction and deployment of new technologies, safety audits, including periodically assessing the status of safety risk controls, and safety surveys;

(f) manage the safety risks related to a change, using a documented process to identify any external and internal change that may have an adverse effect on safety; the management of change should make use of the UAS operator's existing hazard identification, risk assessment, and mitigation processes;

(g) manage the safety risks that stem from products or services delivered through subcontractors, by using its existing hazard identification, risk assessment, and mitigation processes, or by requiring that the subcontractors have an equivalent process for hazard identification and risk management; and

(h) respond to emergencies using an ERP that reflects the size, nature, and complexity of the activities performed by the organisation. The ERP should:

  (1) contain the action to be taken by the UAS operator or specified individuals in an emergency;

  (2) provide for a safe transition from normal to emergency operations and vice versa;

  (3) ensure coordination with the ERPs of other organisations, where appropriate; and

  (4) describe emergency training/drills, as appropriate.

GM1 UAS.LUC.030(2)(g)(vi) Safety management system

ED Decision 2019/021/R

SAFETY RISK MANAGEMENT

In very broad terms, the objective of safety risk management is to eliminate risk, where practical, or reduce the risk (likelihood/severity) to acceptable levels, and to manage the remaining risk to avoid or mitigate any possible undesirable outcome. Safety risk management is, therefore, integral to the development and application of effective safety management.

Safety risk management can be applied at many levels in an organisation. It can be applied at the strategic level and at operational levels. The potential for human error, its influences and sources, should be identified and managed through the safety risk management process. Human factors risk management should allow the organisation to determine where it is vulnerable to human performance limitations.

GM1 UAS.LUC.030(2)(g)(vii) Safety management system

ED Decision 2019/021/R

MANAGEMENT OF CHANGE

Unless properly managed, changes in organisational structures, facilities, the scope of work, personnel, documentation, policies and procedures, etc. can result in the inadvertent introduction of new hazards, which expose the organisation to new, or increased risk. Effective organisations seek to improve their processes, with conscious recognition that changes can expose the organisations to potentially latent hazards and risks if the changes are not properly and effectively managed.

Regardless of the magnitude of a change, large or small, proactive consideration should always be given to the safety implications. This is primarily the responsibility of the team that proposes and/or implements the change. However, change can only be successful if all the personnel affected by the change are engaged and involved, and they participate in the process. The magnitude of a change, its safety criticality, and its potential impact on human performance should be assessed in any change management process.

The process for the management of change typically provides principles and a structured framework for managing all aspects of the change. Disciplined application of change management can maximise the effectiveness of the change, engage staff, and minimise the risks inherent in change.

Change is the catalyst for an organisation to perform the hazard identification and risk management processes.

Some examples of change include, but are not limited to:

(a) changes to the organisational structure;

(b) a new type of UAS being employed;

(c) additional UASs of the same or similar type being acquired;

(d) significant changes in personnel (affecting key personnel and/or large numbers of personnel, high turn-over);

(e) new or amended regulations;

(f) changes in financial status;

(g) new location(s), equipment, and/or operational procedures; and

(h) new subcontractors.

A change may have the potential to introduce new human factors issues, or exacerbate pre-existing issues. For example, changes in computer systems, equipment, technology, personnel (including the management), procedures, the work organisation, or work processes are likely to affect performance.

The purpose of integrating human factors into the management of change is to minimise potential risks by specifically considering the impact of the change on the people within a system.

Special consideration, including any human factors issues, should be given to the 'transition period'. In addition, the activities utilised to manage these issues should be integrated into the change management plan.

Effective management of change should be supported by the following:

(a) implementation of a process for formal hazard analyses/risk assessment for major operational changes, major organisational changes, changes in key personnel, and changes that may affect the way a UAS operation is carried out;

(b) identification of changes likely to occur in business which would have a noticeable impact on:

(1) resources — material and human;

(2) management guidance — processes, procedures, training; and

(3) management control;

(c) safety case/risk assessments that are focused on aviation safety; and

(d) involvement of key stakeholders in the change management process as appropriate.

During the change management process, previous risk assessments and existing hazards are reviewed for possible effects.

GM1 UAS.LUC.030(2)(g)(viii) Safety management system

ED Decision 2019/021/R

SAFETY RISK MANAGEMENT — INTERFACES BETWEEN ORGANISATIONS

Safety risk management processes should specifically address the planned implementation of, or participation in, any complex arrangements (such as when multiple organisations are contracted, or when multiple levels of contracting/subcontracting are included).

Hazard identification and risk assessment start with the identification of all parties involved in the arrangement, including independent experts and non-approved organisations. This extends to the overall control structure, and assesses in particular the following elements across all subcontract levels and all parties within such arrangements:

(a) coordination and interfaces between the different parties;

(b) applicable procedures;

(c) communication between all the parties involved, including reporting and feedback channels;

(d) task allocation, responsibilities and authorities; and

(e) the qualifications and competency of key personnel.

Safety risk management should focus on the following aspects:

(a) clear assignment of accountability and allocation of responsibilities;

(b) only one party is responsible for a specific aspect of the arrangement — there should be no overlapping or conflicting responsibilities, in order to eliminate coordination errors;

(c) the existence of clear reporting lines, both for occurrence reporting and progress reporting; and

(d) the possibility for staff to directly notify the organisation of any hazard by suggesting an obviously unacceptable safety risk as a result of the potential consequences of this hazard.

Regular communication between all parties to discuss work progress, risk mitigation actions, changes to the arrangement, as well as any other significant issues, should be ensured.

AMC1 UAS.LUC.030(2)(g)(ix) Safety management system

ED Decision 2019/021/R

USE OF SUBCONTRACTORS

(a) When an LUC holder uses products or services delivered through a subcontractor that is not itself approved in accordance with this Subpart, the subcontractor should work under the terms of the LUC.

(b) Regardless of the certification status of the subcontractor, the LUC holder is responsible for ensuring that all subcontracted products or services are subject to the hazard identification, risk management, and compliance monitoring of the LUC holder.

UAS.LUC.040 LUC manual

Regulation (EU) 2019/947

(1) An LUC holder shall provide the competent authority with an LUC manual describing directly or by cross reference its organisation, the relevant procedures and the activities carried out.

(2) The manual shall contain a statement signed by the accountable manager that confirms that the organisation will at all times work in accordance with this Regulation and with the approved LUC manual. When the accountable Manager is not the Chief Executive Officer of the organisation, the chief executive officer shall countersign the statement.

(3) If any activity is carried out by partner organisations or subcontractors, the UAS operator shall include in the LUC manual procedures on how the LUC holder shall manage the relationship with those partner organisations or subcontractors.

(4) The LUC manual shall be amended as necessary to retain an up-to-date description of the LUC holder's organisation, and copies of amendments shall be provided to the competent authority.

(5) The UAS operator shall distribute the relevant parts of the LUC manual to all its personnel in accordance with their functions and duties.

AMC1 UAS.LUC.040 LUC manual

ED Decision 2019/021/R

GENERAL

(a) The LUC holder should ensure that all personnel are able to understand the language in which those parts of the LUC manual which pertain to their duties and responsibilities are written.

(b) The LUC manual should contain a statement signed by the accountable manager that confirms that the organisation will at all times work in accordance with the UAS Regulation, as applicable, and with the approved LUC manual. When the accountable manager is not the chief executive officer of the organisation, then the chief executive officer shall countersign the statement.

AMC2 UAS.LUC.040 LUC manual

ED Decision 2019/021/R

GENERAL

The LUC manual may contain references to the OM, where an OM is compiled in accordance with GM1 UAS.SPEC.030(3)(e).

The LUC manual should contain at least the following information, customised according to the complexity of the UAS operator.

LUC MANUAL TEMPLATE

Operator's name

Table of contents

1. Introduction *(the information under Chapter O, points 1-6 of the OM may be duplicated here or simply referenced to the OM)*
2. SMM
   - 2.1. Safety policy *(provide details of the UAS operator's safety policy, safety targets)*
   - 2.2. Organisational structure *(include the organogram and brief description thereof)*
   - 2.3. Duties and responsibilities of the accountable manager and key management personnel; *(in addition, clearly identify the person who authorises operations)*
   - 2.4. Safety management system *(provide a description of the safety management system, including the lines of responsibilities with regard to safety matters)*
   - 2.5. Operational control system *(provide a description of the procedures and responsibilities necessary to exercise operational control with respect to flight safety)*
   - 2.6. Compliance monitoring *(provide a description of the compliance monitoring function)*
   - 2.7. Safety risk management *(the information about hazard identification, safety risk assessment and mitigation under Chapter A of the OM may be duplicated here or simply referenced to the OM)*
   - 2.8. Management of change *(description of the process to identify safety-critical changes within the organisation and its operation and to eliminate or modify safety risk controls that are no longer needed or effective due to such changes)*

2.9. Development and approval of an operational scenario *(provide a description of the process)*

2.10. Interface with subcontractors and partners *(describe the relationship with any subcontractor delivering products or services to the UAS operator as well as with partners, if available)*

2.11. Documentation of key management system processes

3. OM *(the information under Chapters 2-11 of the OM may be duplicated here or references to the OM may be provided)*

4. Handling, notifying and reporting accidents, incidents and occurrences

5. Handling of dangerous goods *(specify the relevant regulations and instructions to crew members concerning the transport of dangerous goods such as pesticides and chemicals, etc. and the use of dangerous goods during operations such as batteries and fuel cells, engines, magnetising materials, pyrotechnics, flares and firearms)*

AMC1 UAS.LUC.040(3) LUC manual

ED Decision 2019/021/R

PROCEDURES FOR SUBCONTRACTORS

If any activity is carried out by partner organisations or subcontractors, the LUC manual should include a relevant statement of how the LUC holder is able to ensure compliance with UAS.LUC.030(2)(i), and should contain, directly or by cross reference, descriptions of, and information on, the activities of those organisations or subcontractors, as necessary to substantiate this statement.

UAS.LUC.050 Terms of approval of the LUC holder

Regulation (EU) 2019/947

(1) The competent authority shall issue an LUC after it is satisfied that the UAS operator complies with points UAS.LUC.020, UAS.LUC.030 and UAS.LUC.040.

(2) The LUC shall include:

(a) the UAS operator identification;

(b) the UAS operator's privileges;

(c) authorised type(s) of operation;

(d) the authorised area, zone or class of airspace for operations, if applicable;

(e) any special limitations or conditions, if applicable;

AMC1 UAS.LUC.050 Terms of approval of an LUC holder

ED Decision 2019/021/R

FORM FOR THE TERMS OF APPROVAL OF AN LUC HOLDER

<table>
<tr><td colspan="3">LIGHT UAS OPERATOR CERTIFICATE (LUC)
(Terms of approval of anLUC holder)</td></tr>
<tr><td rowspan="2">(3)</td><td>State of the operator (1):</td><td rowspan="2">(3)</td></tr>
<tr><td>Issuing competent authority(2):</td></tr>
<tr><td>LUC # (4):</td><td rowspan="2">Operator name (5):
Registration number of the UAS operator (6):
Operator address (8):
Telephone (9):
Email (10):</td><td rowspan="2">Contact details, at which operational management can be contacted without undue delay (7):</td></tr>
<tr><td></td></tr>
<tr><td colspan="3">This certificate certifies that ……..(5) is authorised to perform UAS operations, as defined in the attached UAS operations specifications, in accordance with the LUC manual, with the Annex to Regulation (EU) No 2019/947 and with Annex IX to Regulation (EU) 2018/1139.</td></tr>
<tr><td colspan="2">Date of issue (11):____</td><td>Name and signature (12):_____
Title: _____</td></tr>
</table>

1. Enter the name of the State of the operator.
2. Enter the identification of the issuing competent authority.
3. Reserved for use of the competent authority.
4. Enter the approval reference (digital and/or letter code) of the LUC, as issued by the competent authority.
5. Enter the name of the legal entity of the UAS operator and UAS operator's trading name, if different from the name of the legal entity.
6. Enter the registration number of the UAS operator, provided according to Article 14 of the UAS Regulation.
7. Enter contact details such as the telephone numbers, including the country code, and the email address at which operational management can be contacted without undue delay for issues related to UAS operations, the airworthiness of UAS, remote crew competency and other matters as appropriate.
8. Enter the UAS operator's principal place of business address.
9. Enter the UAS operator's principal place of business telephone details, including the country code.
10. Enter the UAS operator's email.
11. Enter the issue date of the LUC (dd-mm-yyyy).
12. Enter the title, name and signature of the competent authority representative. In addition, an official stamp may be applied on the LUC.

UAS OPERATIONS SPECIFICATIONS			
LUC ([1]):			
Operator name ([2]):			
The UAS operator ([2])_____ has the privilege to _____([3]), subject to the following:			
UAS model ([4]): _____; UAS serial number or registration mark ([5]): _____			
Type(s) of UAS operation ([6]) or :	Specifications ([7]):	Special limitations ([8]):	Remarks([9])
1. _____; 2. _____;			
Issuing competent authority ([10]): Telephone([11]): Email([12]):			
Date ([13]):			
Signature([14]):			

1. Enter the approval reference (digital and/or letter code) of the LUC, as issued by the competent authority.
2. Enter the name of the legal entity of the UAS operator and UAS operator's trading name, if different from the name of the legal entity.
3. Enter any privilege listed in AMC1 UAS.LUC.060 that has been granted.
4. Enter the UAS model.
5. Enter the UAS serial number or the UAS registration mark if applicable.
6. Specify the type(s) of UAS operation (e.g. STS, PDRA when applicable, or type of UAS operations in case the operation is not covered by an STS or a PDRA; the type of UAS operation may be: survey, linear inspection, urban delivery; agricultural, photography, advertising, calibration, construction work, stringing power line, aerial mapping, pollution control, news media, television and movie, flying display, competition, etc.).
7. Enter the relevant specifications describing where the operation is allowed to take place (area of operation or class of airspace for operations; maximum height, BVLOS/VLOS; range; etc.).
8. Enter the limitations related to: restriction of the ground area (i.e. controlled ground area, population density; ground risk buffer); the UAS performance and equipment (i.e. maximum speed; maximum weight etc.); data link or communications; external systems or loads; carriage of dangerous goods, possibility of handover, etc.
9. Enter remarks such as the remote pilot's competency; normal, contingency and emergency procedures.
10. Enter the identification of the issuing competent authority.
11. Enter the telephone number of the competent authority, including the country code.
12. Enter the email address of the competent authority.
13. Issue date of the operations specifications (dd-mm-yyyy).
14. Signature of the competent authority representative.

UAS.LUC.060 Privileges of the LUC holder

Regulation (EU) 2019/947

When satisfied with the documentation provided, the competent authority shall:

(1) specify the terms and conditions of the privilege granted to the UAS operator in the LUC; and

(2) within the terms of approval, grant to an LUC holder the privilege to authorise its own operations without:

(a) submitting an operational declaration;

(b) applying for an operational authorisation.

AMC1 UAS.LUC.060 Privileges of an LUC holder

ED Decision 2019/021/R

SCOPE OF PRIVILEGES

Within the terms of its approval, the LUC holder should be able:

(a) without prior declaration to the competent authority, to authorise its own operations based on an STS;

(b) without prior approval of the competent authority, to authorise one or more of the following types of own operations:

(1) one based on a PDRA that requires an authorisation;

(2) one based on one or more modifications of an STS (variants), which does not involve changes in the ConOps, the category of UAS used or the competencies of the remote pilots; or

(3) one that does not correspond to a PDRA, but falls within a type of activity already performed by the UAS operator.

GM1 UAS.LUC.060 Privileges of an LUC holder

ED Decision 2019/021/R

GENERAL

For the purpose of granting privileges to LUC applicants, the competent authority may apply a gradual approach. Depending on the UAS operator's past safety performance and safety record over a defined period of time (e.g. the previous 6 months), the competent authority may expand the scope of the UAS operator's privileges.

The gradual approach should not be understood as preventing the competent authority from granting privileges with a greater scope to a first-time LUC applicant who has an adequate structure and competent personnel, an effective safety management system and has demonstrated a good compliance disposition.

UAS.LUC.070 Changes in the LUC management system

Regulation (EU) 2019/947

After an LUC is issued, the following changes require prior approval by the competent authority:

(1) any change in the terms of approval of the UAS operator;

(2) any significant change to the elements of the LUC holder's safety management system as required by point UAS.LUC.030.

AMC1 UAS.LUC.070(2) Changes in the LUC management system

ED Decision 2019/021/R

CHANGES REQUIRING PRIOR APPROVAL

A change of the accountable manager is considered a significant change that requires a prior approval.

UAS.LUC.075 Transferability of an LUC

Regulation (EU) 2019/947

Except for the change to the ownership of the organisation, approved by the competent authority in accordance with point UAS.LUC.070, an LUC is not transferable.

UAS.LUC.080 Duration and validity of an LUC

Regulation (EU) 2019/947

(1) An LUC shall be issued for an unlimited duration. It shall remain valid subject to:

(a) the LUC holder´s continuous compliance with the relevant requirements of this Regulation and of the Member State that issued the certificate; and

(b) it not being surrendered or revoked.

(2) Upon revocation or surrender of an LUC, the LUC holder shall provide an acknowledgment in digital format that must be returned to the competent authority without delay.

UAS.LUC.090 Access

Regulation (EU) 2019/947

For the purpose of demonstrating compliance with this Regulation, the LUC holder shall grant any person, that is duly authorised by the competent authority, an access to any facility, UAS, document, records, data, procedures or to any other material relevant to its activity, which is subject to certification, operational authorisation or operational declaration, regardless of whether or not its activity is contracted or subcontracted to another organisation.

COMMISSION DELEGATED REGULATION (EU) 2019/945

of 12 March 2019

on unmanned aircraft systems and on third-country operators of unmanned aircraft systems

Regulation (EU) 2019/945

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to 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[1], and in particular Article 58 and Article 61 thereof,

Whereas:

(1) The unmanned aircraft systems ('UAS') whose operation presents the lowest risks and that belong to the 'open' category of operations should not be subject to classic aeronautical compliance procedures. The possibility to establish Community harmonisation legislation as referred to in paragraph 6 of Article 56 of Regulation (EU) 2018/1139 should be used for those UAS. Consequently, it is necessary to set out the requirements that address the risks posed by the operation of those UAS, taking full account of other applicable Union harmonisation legislation.

(2) These requirements should cover the essential requirements provided for in Article 55 of Regulation (EU) 2018/1139, in particular as regards the specific features and functionalities necessary to mitigate risks pertaining to the safety of the flight, privacy, and protection of personal data, security or the environment, arising from the operation of these UAS.

(3) When manufacturers place a UAS on the market with the intention to make it available for operations under the 'open' category and therefore affix a class identification label on it, they should ensure compliance of the UAS with the requirements of that class.

(4) Considering the good level of safety achieved by model aircraft already made available on the market, it is appropriate to create the C4 class of UAS which should not be subject to disproportionate technical requirements for the benefit of model aircraft operators.

(5) This Regulation should also apply to UAS, which are considered as toys within the meaning of Directive 2009/48/EC of the European Parliament and of the Council[2]. Those UAS should also comply with Directive 2009/48/EC. That compliance requirement should be taken into account when defining additional safety requirements under this Regulation.

(6) UAS that are not toys within the meaning of Directive 2009/48/EC should comply with the relevant essential health and safety requirements set out in Directive 2006/42/EC of the

[1] OJ L 212, 22.8.2018, p. 1.

[2] Directive 2009/48/EC of the European Parliament and of the Council of 18 June 2009 on the safety of toys (OJ L 170, 30.6.2009, p. 1).

European Parliament and of the Council[1] in so far as this Directive applies to them, to the extent that those health and safety requirements are not intrinsically linked to the safety of the flight by UAS. Where those health and safety requirements are intrinsically linked to the safety of the flight, only this Regulation should apply.

(7) Directive 2014/30/EU[2] and Directive 2014/53/EU[3] of the European Parliament and of the Council should not apply to unmanned aircraft that are subject to certification according to Regulation (EU) 2018/1139, are exclusively intended for airborne use and intended to be operated only on frequencies allocated by the Radio Regulations of the International Telecommunication Union for protected aeronautical use.

(8) Directive 2014/53/EU should apply to unmanned aircraft that are not subject to certification and are not intended to be operated only on frequencies allocated by the Radio Regulations of the International Telecommunication Union for protected aeronautical use, if they intentionally emit and/or receive electromagnetic waves for the purpose of radio communication and/or radiodetermination at frequencies below 3 000 GHz.

(9) Directive 2014/30/EU should apply to unmanned aircraft that are not subject to certification and are not intended to be operated only on frequencies allocated by the Radio Regulations of the International Telecommunication Union for protected aeronautical use, if they do not fall within the scope of Directive 2014/53/EU.

(10) Decision No 768/2008/EC of the European Parliament and of the Council[4] sets out common principles and horizontal provisions intended to apply to marketing of products that are subject to relevant sectorial legislation. In order to ensure consistency with other sectorial product legislation, the provisions on the marketing of UAS intended to be operated in the 'open' category should be aligned with the framework established by Decision 768/2008/EC.

(11) Directive 2001/95/EC of the European Parliament and of the Council[5] applies to safety risks of UAS so far as there are no specific provisions with the same objective in rules of Union law governing the safety of the products concerned.

(12) This Regulation should apply to all forms of supply, including distance selling.

(13) Member States should take the necessary steps to ensure that UAS intended to be operated in the 'open' category are made available on the market and put into service only where they do not compromise the health and safety of persons, domestic animals or property, when normally used.

(14) In order to provide citizens with high level of environmental protection, it is necessary to limit the noise emissions to the greatest possible extent. Sound power limitations applicable to UAS

[1] Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (OJ L 157, 9.6.2006, p. 24).

[2] Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (OJ L 96, 29.3.2014, p. 79).

[3] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC (OJ L 153, 22.5.2014, p. 62).

[4] Decision No 768/2008/EC of the European Parliament and of the Council of 9 July 2008 on a common framework for the marketing of products, and repealing Council Decision 93/465/EEC (OJ L 218, 13.8.2008, p. 82).

[5] Directive 2001/95/EC of the European Parliament and of the Council of 3 December 2001 on general product safety (OJ L 11, 15.1.2002, p. 4).

intended to be operated in the 'open' category might be reviewed at the end of the transitional periods as defined in Commission Implementing Regulation (EU) 2019/947[1].

(15) Special attention should be paid to ensure compliance of products in the context of an increase of e-commerce. To that end, Member States should be encouraged to pursue cooperation with the competent authorities in third countries and to develop cooperation between market surveillance authorities and customs authorities. Market surveillance authorities should make use, when possible, of the 'notice and action' procedures and establish cooperation with their national authorities competent for the implementation of Directive 2000/31/EC of the European Parliament and of the Council[2]. They should establish close contacts allowing rapid response with key intermediaries that provide hosting services for products sold online.

(16) In order to ensure a high level of protection of public interest, such as health safety, and to guarantee fair competition on the Union market, economic operators should be responsible for the compliance of UAS intended to be operated in the 'open' category with the requirements laid down in this Regulation, in relation to their respective roles in the supply and distribution chain. Therefore, it is necessary to provide a clear and proportionate distribution of obligations, which corresponds to the role of each economic operator in the supply and distribution chain.

(17) In order to facilitate communication between economic operators, national market surveillance authorities and consumers, economic operators supplying or distributing UAS intended to be operated in the 'open' category should provide a website address in addition to the postal address.

(18) The manufacturer, having detailed knowledge of the design and production process, is best placed to carry out the conformity assessment procedure of UAS intended to be operated in the 'open' category. Conformity assessment should therefore remain solely the obligation of the manufacturer.

(19) This Regulation should apply to any UAS intended to be operated in the 'open' category that is new to the Union market, whether a new UAS made by a manufacturer established in the Union or a new or second-hand UAS imported from a third country.

(20) It is necessary to ensure that UAS from third countries entering the Union market comply with the requirements of this Regulation if they are intended to be operated in the 'open' category. In particular, it should be ensured that manufacturers carry out appropriate conformity assessment procedures. Provision should therefore be made for importers to make sure that the UAS they place on the market comply with the requirements of this Regulation and that they do not place on the market UAS which do not comply with these requirements or present a risk. Provision should also be made for importers to make sure that the conformity assessment procedures have been carried out and that the CE marking and technical documentation drawn up by the manufacturers is available for inspection by the competent national authorities.

(21) The distributor who makes a UAS intended to be operated in the 'open' category available on the market should act with due care to ensure that its handling of the product does not adversely affect its compliance. Both importers and distributors are expected to act with due care in relation to the requirements applicable when placing or making products available on the market.

[1] Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft (see page 45 of this Official Journal).

[2] Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market ('Directive on electronic commerce') (OJ L 178, 17.7.2000, p. 1).

(22) When placing on the market a UAS intended to be operated in the 'open' category, every importer should indicate on the UAS his name, registered trade name or registered trademark and the address at which he can be contacted. Exceptions should be provided for cases where the size of the UAS does not allow this. This includes cases where the importer would have to open the packaging to put his name and address on the UAS.

(23) Any economic operator that either places a UAS intended to be operated in the 'open' category on the market under his own name or trademark, or modifies a UAS intended to be operated in the 'open' category in such a way that compliance with the applicable requirements may be affected, should be considered to be the manufacturer and should assume the obligations of the manufacturer.

(24) Distributors and importers, being close to the market place, should be involved in market surveillance tasks carried out by the competent national authorities, and should be prepared to participate actively, providing those authorities with all the necessary information relating to the UAS intended to be operated in the 'open' category.

(25) Ensuring the traceability of a UAS intended to be operated in the 'open' category throughout the whole supply chain helps to make market surveillance simpler and more efficient. An efficient traceability system facilitates the market surveillance authorities' task of tracing economic operators who make non-compliant UAS available on the market.

(26) This Regulation should be limited to the setting out of the essential requirements. In order to facilitate the assessment of conformity of UAS intended to be operated in the 'open' category with those requirements, it is necessary to provide for a presumption of conformity for products, which are in conformity with harmonised standards that are adopted in accordance with Regulation (EU) No 1025/2012 of the European Parliament and of the Council[1] for the purpose of setting out detailed technical specifications of those requirements.

(27) The essential requirements applicable to UAS intended to be operated in the 'open' category should be worded precisely enough to create legally binding obligations. They should be formulated so as to make it possible to assess conformity with them even in the absence of harmonised standards or where the manufacturer chooses not to apply a harmonised standard.

(28) Regulation (EU) No 1025/2012 provides for a procedure for objections to harmonised standards where those standards do not entirely satisfy the requirements of the harmonisation legislation applicable to UAS intended to be operated in the 'open' category under this Regulation. This procedure should apply where appropriate in relation to standards which reference have been published in the Official Journal as providing presumption of conformity with the requirements laid down in this Regulation.

(29) To enable economic operators to demonstrate and the competent authorities to ensure that UAS intended to be operated in the 'open' category made available on the market comply with the essential requirements, it is necessary to provide for conformity assessment procedures. Decision No 768/2008/EC sets out modules for conformity assessment procedures, which include procedures from the least to the most stringent, in proportion to the level of risk involved and the level of safety required. In order to ensure inter-sectorial coherence and to avoid ad hoc variants of conformity assessment, conformity assessment procedures should be chosen from among those modules.

[1] Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation, amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/23/EC and 2009/105/EC of the European Parliament and of the Council and repealing Council Decision 87/95/EEC and Decision No 1673/2006/EC of the European Parliament and of the Council (OJ L 316, 14.11.2012, p. 12).

(30) Market surveillance authorities and UAS operators should have easy access to the EU declaration of conformity. In order to fulfil this requirement, manufacturers should ensure that each UAS intended to be operated in the 'open' category is accompanied either by a copy of the EU declaration of conformity or by the internet address at which the EU declaration of conformity can be accessed.

(31) To ensure effective access to information for market surveillance purposes, the information required to identify all applicable Union acts for UAS intended to be operated in the 'open' category should be available in a single EU declaration of conformity. In order to reduce the administrative burden on economic operators, it should be possible for that single EU declaration of conformity to be a dossier made up of relevant individual declarations of conformity.

(32) The CE marking indicating the conformity of a product is the visible consequence of a whole process of conformity assessment in the broad sense. The general principles governing the CE marking are set out in Regulation (EC) No 765/2008 of the European Parliament and of the Council[1]. Rules governing the affixing of the CE marking to UAS intended to be operated in the 'open' category should be laid in this Regulation.

(33) Some UAS classes intended to be operated in the 'open' category covered by this Regulation require the intervention of conformity assessment bodies. Member States should notify the Commission of these.

(34) It is necessary to ensure a uniformly high level of performance of bodies performing conformity assessments of UAS intended to be operated in the 'open' category throughout the Union, and that all such bodies perform their functions at the same level and under conditions of fair competition. Therefore, obligatory requirements should be set for conformity assessment bodies wishing to be notified in order to provide conformity assessment services.

(35) If a conformity assessment body demonstrates conformity of UAS intended to be operated in the 'open' category with the criteria laid down in harmonised standards, it should be presumed to comply with the corresponding requirements set out in this Regulation.

(36) In order to ensure a consistent level of conformity assessment quality, it is also necessary to set requirements for notifying authorities and other bodies involved in the assessment, notification and monitoring of notified bodies.

(37) Regulation (EC) No 765/2008 sets out rules on the accreditation of conformity assessment bodies, provides a framework for the market surveillance of products and for controls on products from third countries, and sets out the general principles of the CE marking. The system set out in this Regulation should be complemented by the accreditation system provided for in Regulation (EC) No 765/2008.

(38) Transparent accreditation as provided for in Regulation (EC) No 765/2008, ensuring the necessary level of confidence in certificates of conformity, should be used by national public authorities throughout the Union as the means of demonstrating the technical competence of conformity assessment bodies.

(39) Conformity assessment bodies frequently subcontract parts of their activities linked to the assessment of conformity or have recourse to a subsidiary. In order to safeguard the level of protection required for the UAS intended to be operated in the 'open' category to be placed on the Union market, it is essential that conformity assessment subcontractors and subsidiaries

[1] Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93 (OJ L 218, 13.8.2008, p. 30).

fulfil the same requirements as notified bodies do in relation to the performance of conformity assessment tasks. Therefore, it is important that the assessment of the competence and performance of bodies to be notified, and the monitoring of bodies already notified, also cover activities carried out by subcontractors and subsidiaries.

(40) It is necessary to increase the efficiency and transparency of the notification procedure and, in particular, to adapt it to new technologies so as to enable online notification.

(41) Since notified bodies may offer their services throughout the Union, it is appropriate to give the other Member States and the Commission the opportunity to raise objections concerning a notified body. It is therefore important to provide for a period during which any doubts or concerns as to the competence of conformity assessment bodies can be clarified, before they start operating as notified bodies.

(42) In the interests of competitiveness, it is crucial that notified bodies apply the conformity assessment procedures without creating unnecessary administrative burden for economic operators. For the same reason, and also to ensure equal treatment of economic operators, consistency in the technical application of the conformity assessment procedures needs to be ensured. This can best be achieved through appropriate coordination and cooperation between notified bodies.

(43) Interested parties should have the right to appeal against the result of a conformity assessment carried out by a notified body. It is important to ensure that an appeal procedure against all decisions taken by notified bodies is available.

(44) Manufacturers should take all appropriate measures to ensure that UAS intended to be operated in the 'open' category may be placed on the market only if, when properly stored and used for their intended purpose or under conditions, which can be reasonably foreseen, it does not endanger people's health or safety. UAS intended to be operated in the 'open' category should be considered as non-compliant with the essential requirements set out in this Regulation only under conditions of use which can be reasonably foreseen, that is when such use could result from lawful and readily predictable human behaviour.

(45) In order to ensure legal certainty, it is necessary to clarify that the rules on Union market surveillance and control of products entering the Union market provided for in Regulation (EC) No 765/2008, including the provisions regarding the exchange of information through the Rapid Alert System (RAPEX), apply to UAS intended to be operated in the 'open' category. This Regulation should not prevent Member States from choosing the competent authorities to carry out those tasks. In order to ensure a smooth transition as regards the implementation of this Regulation, appropriate transitional measures should be provided.

(46) UAS whose operation present the highest risks should be subject to certification. This Regulation should therefore define the conditions under which the design, production and maintenance of UAS should be subject to certification. Those conditions are linked to a higher risk of harm to third persons in case of accidents and therefore certification should be required for UAS designed to transport people, UAS designed to transport dangerous goods and for UAS that has any dimension above 3 m and is designed to be operated over assemblies of people. Certification of UAS used in the 'specific' category of operations defined in Implementing Regulation (EU) 2019/947 should also be required if, following a risk assessment, an operational authorisation issued by the competent authority considers that the risk of the operation cannot be adequately mitigated without the certification of the UAS.

(47) UAS placed on the market and intended to be operated in the 'open' category and bearing a class identification label should comply with the certification requirements for UAS operated in the 'specific' or 'certified' categories of operations, as applicable, if those UAS are used outside the 'open' category of operations.

(48) UAS operators that have their principal place of business, are established, or are resident in a third country and that conduct UAS operations within the single European sky airspace should be subject to this Regulation.

(49) The measures provided for in this Regulation are based on Opinion No 01/2018[1] issued by the European Union Aviation Safety Agency (EASA) in accordance with Article 65 of Regulation (EU) 2018/1139,

HAS ADOPTED THIS REGULATION:

[1] EASA Opinion No 01/2018 'Introduction of a regulatory framework for the operation of unmanned aircraft systems in the "open" and "specific" categories' (RMT.0230), available at https://www.easa.europa.eu/document-library/opinions

CHAPTER I – GENERAL PROVISIONS

Article 1 - Subject matter

Regulation (EU) 2019/945

1. This Regulation lays down the requirements for the design and manufacture of unmanned aircraft systems ('UAS') intended to be operated under the rules and conditions defined in Implementing Regulation (EU) 2019/947 and of remote identification add-ons. It also defines the type of UAS whose design, production and maintenance shall be subject to certification.

2. It also establishes rules on making UAS intended for use in the 'open' category and remote identification add-ons available on the market and on their free movement in the Union.

3. This Regulation also lays down rules for third-country UAS operators, when they conduct a UAS operation pursuant to Implementing Regulation (EU) 2019/947 within the single European sky airspace.

Article 2 - Scope

Regulation (EU) 2019/945

1. Chapter II of this Regulation applies to the following products:

   (a) UAS intended to be operated under the rules and conditions applicable to the 'open' category of UAS operations pursuant to Implementing Regulation (EU) 2019/947, except privately built UAS, and bearing a class identification label as set out in Parts 1 to 5 of the Annex to this Regulation indicating to which of the five UAS classes referred to in Implementing Regulation (EU) 2019/947 it belongs to;

   (b) remote identification add-ons as set out in Part 6 of the Annex to this Regulation.

2. Chapter III of this Regulation applies to UAS operated under the rules and conditions applicable to the 'certified' and 'specific' categories of UAS operations pursuant to Implementing Regulation (EU) 2019/947.

3. Chapter IV of this Regulation applies to UAS operators that have their principal place of business, are established, or reside in a third country, if the UAS are operated in the Union.

4. This Regulation does not apply to UAS intended to be exclusively operated indoors.

Article 3 - Definitions

Regulation (EU) 2019/945

For the purposes of this Regulation, the following definitions apply:

(1) 'unmanned aircraft' ('UA') means any aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board;

(2) 'equipment to control unmanned aircraft remotely' means any instrument, equipment, mechanism, apparatus, appurtenance, software or accessory that is necessary for the safe operation of a UA other than a part and which is not carried on board that UA;

(3) 'unmanned aircraft system' ('UAS') means an unmanned aircraft and the equipment to control it remotely;

(4) 'unmanned aircraft system operator' ('UAS operator') means any legal or natural person operating or intending to operate one or more UAS;

(5) 'open' category' means a category of UAS operations that is defined in Article 4 of Implementing Regulation (EU) 2019/947;

(6) 'specific' category means a category of UAS operations that is defined in Article 5 of Implementing Regulation (EU) 2019/947;

(7) 'certified' category means a category of UAS operation that is defined in Article 6 of Implementing Regulation (EU) 2019/947;

(8) 'Union harmonisation legislation' means any Union legislation harmonising the conditions for placing products on the market;

(9) 'accreditation' means accreditation as defined in paragraph 10 of Article 2 of Regulation (EC) No 765/2008;

(10) 'conformity assessment' means the process demonstrating whether the specified requirements relating to a product have been fulfilled;

(11) 'conformity assessment body' means a body that performs conformity assessment activities including calibration, testing, certification and inspection;

(12) 'CE marking' means a marking by which the manufacturer indicates that the product is in conformity with the applicable requirements set out in Union harmonisation legislation providing for its affixing;

(13) 'manufacturer' means any natural or legal person who manufactures a product or has a product designed or manufactured, and markets that product under their name or trademark;

(14) 'authorised representative' means any natural or legal person established within the Union who has received a written mandate from a manufacturer to act on his behalf in relation to specified tasks;

(15) 'importer' means any natural or legal person established within the Union who places a product from a third country on the Union market;

(16) 'distributor' means any natural or legal person in the supply chain, other than the manufacturer or the importer, who makes a product available on the market;

(17) 'economic operators' means the manufacturer, the authorised representative of the manufacturer, the importer, and the distributor of the UAS;

(18) 'making available on the market' means any supply of a product for distribution, consumption or use in the Union market in the course of a commercial activity, whether in exchange of payment or free of charge;

(19) 'placing on the market' means the first making available of a product on the Union market;

(20) 'harmonised standard' means a harmonised standard as defined in point (c) of Article 2(1) of Regulation (EU) No 1025/2012;

(21) 'technical specification' means a document that establishes technical requirements to be fulfilled by a product, process or service;

(22) 'privately built UAS' means a UAS assembled or manufactured for the builder's own use, not including UAS assembled from a set of parts placed on the market by the manufacturer as a single ready-to-assemble kit;

(23) 'market surveillance authority' means an authority of a Member State responsible for carrying out market surveillance on its territory;

(24) 'recall' means any measure aimed at achieving the return of a product that has already been made available to the end-user;

(25) 'withdrawal' means any measure aimed at preventing a product in the supply chain from being made available on the market;

(26) 'single European sky airspace' means airspace above the territory to which the Treaties apply, as well as any other airspace where Member States apply Regulation (EC) No 551/2004 of the European Parliament and of the Council[1] in accordance with paragraph 3 of Article 1 of that Regulation;

(27) 'remote pilot' means a natural person responsible for safely conducting the flight of a UA by operating its flight controls, either manually or, when the UA flies automatically, by monitoring its course and remaining able to intervene and change its course at any time;

(28) 'maximum take-off mass' ('MTOM') means the maximum UA mass, including payload and fuel, as defined by the manufacturer or the builder, at which the UA can be operated;

(29) 'payload' means any instrument, mechanism, equipment, part, apparatus, appurtenance, or accessory, including communications equipment, that is installed in or attached to the aircraft, and is not used or intended to be used in operating or controlling an aircraft in flight, and is not part of an airframe, engine, or propeller;

(30) 'follow-me mode' means a mode of operation of a UAS where the unmanned aircraft constantly follows the remote pilot within a predetermined radius;

(31) 'direct remote identification' means a system that ensures the local broadcast of information about a UA in operation, including the marking of the UA, so that this information can be obtained without physical access to the UA;

(32) 'geo-awareness' means a function that, based on the data provided by Member States, detects a potential breach of airspace limitations and alerts the remote pilots so that they can take effective immediate and action to prevent that breach;

(33) 'sound power level L_{WA}' means the A-weighted sound power in dB in relation to 1 pW as defined in EN ISO 3744:2010;

(34) 'measured sound power level' means a sound power level as determined from measurements as laid down in Part 13 of the Annex; measured values may be determined either from a single UA representative for the type of equipment or from the average of a number of UA;

(35) 'guaranteed sound power level' means a sound power level determined in accordance with the requirements laid down in Part 13 of the Annex which includes the uncertainties due to production variation and measurement procedures and where the manufacturer, or his authorised representative established in the Community, confirms that according to the technical instruments applied and referred to in the technical documentation it is not exceeded;

(36) 'hovering' means staying in the same geographical position in the air;

(37) 'assemblies of people' means gatherings where persons are unable to move away due to the density of the people present.

[1] Regulation (EC) No 551/2004 of the European Parliament and of the Council of 10 March 2004 on the organisation and use of the airspace in the single European sky (OJ L 96, 31.3.2004, p. 20).

CHAPTER II – UAS INTENDED TO BE OPERATED IN THE 'OPEN' CATEGORY AND REMOTE IDENTIFICATION ADD-ONS

SECTION 1 – PRODUCT REQUIREMENTS

Article 4 - Requirements

Regulation (EU) 2019/945

1. The products referred to in paragraph 1 of Article 2 shall meet the requirements set out in Parts 1 to 6 of the Annex.
2. UAS that are not toys within the meaning of Directive 2009/48/EC shall comply with the relevant health and safety requirements set out in Directive 2006/42/EC only in relation to risks other than those linked to the safety of the UA flight.
3. Any updates of software of the products that have already been made available on the market may be made only if such updates do not affect the compliance of the product.

Article 5 - Making available on the market and free movement of products

Regulation (EU) 2019/945

1. Products shall only be made available on the market if they satisfy the requirements of this Chapter and do not endanger the health or safety of persons, animals or property.
2. Member States shall not prohibit, restrict or impede, for the aspects covered by this Chapter, the making available on the market of products that comply with this Chapter.

SECTION 2 – OBLIGATIONS OF ECONOMIC OPERATORS

Article 6 - Obligations of manufacturers

Regulation (EU) 2019/945

1. When placing their product on the Union market, manufacturers shall ensure that it has been designed and manufactured in compliance with the requirements set out in Parts 1 to 6 of the Annex.

2. Manufacturers shall draw up the technical documentation provided for in Article 17 and carry out the relevant conformity assessment procedure referred to in Article 13 or have it outsourced.

   Where compliance of the product with the requirements set out in Parts 1 to 6 of the Annex has been demonstrated by that conformity assessment procedure, manufacturers shall draw up an EU declaration of conformity and affix the CE marking.

3. Manufacturers shall keep the technical documentation and the EU declaration of conformity for 10 years after the product has been placed on the market.

4. Manufacturers shall ensure that procedures are in place for series production to remain in conformity with this Chapter. Changes in product design, characteristics or software, and changes in the harmonised standards or in technical specifications by reference to which conformity of a product is declared shall be adequately taken into account.

   When deemed appropriate with regard to the risks presented by a product, manufacturers shall, to protect the health and safety of consumers, carry out sample testing of marketed products, investigate, and, if necessary, keep a register of complaints, of non-conforming products and product recalls and shall keep distributors informed of any such monitoring.

5. Manufacturers of UAS shall ensure that the UA bears a type within the meaning of Decision 768/2008/EC and a unique serial number allowing for its identification, and if applicable, compliant with the requirements defined in the corresponding Parts 2 to 4 of the Annex. Manufacturers of remote identification add-ons shall ensure that the remote identification add-on bears a type and a unique serial number allowing for their identification and compliant with the requirements defined in Part 6 of the Annex. In both cases, manufacturers shall ensure that a unique serial number is also affixed to the EU declaration of conformity or to the simplified EU declaration of conformity referred to in Article 14.

6. Manufacturers shall indicate on the product their name, registered trade name or registered trademark, website address and the postal address at which they can be contacted or, where that is not possible, on its packaging, or in a document accompanying it. The address shall indicate a single point at which the manufacturer can be contacted. The contact details shall be indicated in a language easily understood by end-users and market surveillance authorities.

7. Manufacturers shall ensure that the product is accompanied by the manual and information notice required by Parts 1 to 6 of the Annex in a language which can be easily understood by consumers and other end-users, as determined by the Member State concerned. Such manual and information notice, as well as any labelling, shall be clear, understandable and legible.

8. Manufacturers shall ensure that each product is accompanied by a copy of the EU declaration of conformity or by a simplified EU declaration of conformity. Where a simplified EU declaration

of conformity is provided, it shall contain the exact internet address where the full text of the EU declaration of conformity can be obtained.

9. Manufacturers who consider or have reason to believe that products which they have placed on the market are not in conformity with this Chapter shall immediately take the corrective measures necessary to bring that product into conformity, to withdraw it or recall it, if appropriate. Where the product presents a risk, manufacturers shall immediately inform the market surveillance authorities of the Member States in which they made the product available on the market to that effect, giving details, in particular, of the non-compliance, of any corrective measures taken and of the results thereof.

10. Manufacturers shall, further to a reasoned request from a competent national authority, provide it with all the information and documentation in paper or electronic form necessary to demonstrate the conformity of the product with this Chapter, in a language which can be easily understood by that authority. They shall cooperate with that authority, at its request, on any action taken to eliminate the risks posed by the product which they have placed on the market.

Article 7 - Authorised representatives

Regulation (EU) 2019/945

1. A manufacturer may, by a written mandate, appoint an authorised representative.

   The obligations laid down in paragraph 1 of Article 6 and the obligation to draw up the technical documentation referred to in paragraph 2 of Article 6 shall not form part of the authorised representative's mandate.

2. An authorised representative shall perform the tasks specified in the mandate received from the manufacturer. The mandate shall allow the authorised representative to do at least the following:

   (a) keep the EU declaration of conformity and the technical documentation at the disposal of national market surveillance authorities for 10 years after the product has been placed on the Union market;

   (b) further to a reasoned request from a market surveillance or border control authority, provide that authority with all the information and documentation necessary to demonstrate the conformity of the product;

   (c) cooperate with the market surveillance or border control authorities, at their request, on any action taken to eliminate the non-conformity of the products covered by the authorised representative's mandate or the safety risks posed by it.

Article 8 - Obligations of importers

Regulation (EU) 2019/945

1. Importers shall only place products compliant with the requirements set out in this Chapter on the Union market.

2. Before placing a product on the Union market, importers shall ensure that:

   (a) the appropriate conformity assessment procedure referred to in Article 13 has been carried out by the manufacturer;

   (b) the manufacturer has drawn up the technical documentation referred to in Article 17;

(c) the product bears the CE marking and, when required, the UA class identification label and the indication of the sound power level;

(d) the product is accompanied by the documents referred to in paragraph 7 and 8 of Article 6;

(e) the manufacturer has complied with the requirements set out in paragraphs 5 and 6 of Article 6.

Where an importer considers or has reasons to believe that a product is not in conformity with the requirements set out in Parts 1 to 6 of the Annex, he shall not place the product on the market until it has been brought into conformity. Furthermore, where the product presents a risk for the health and safety of consumers and third parties, the importer shall inform the manufacturer and the competent national authorities to that effect.

3. Importers shall indicate on the product their name, registered trade name or registered trademark, website and the postal address at which they can be contacted or, where that is not possible, on its packaging or in a document accompanying the product. The contact details shall be in a language easily understood by end-users and market surveillance authorities.

4. Importers shall ensure that the product is accompanied by the manual and information notice required by Parts 1 to 6 of the Annex in a language which can be easily understood by consumers and other end-users, as determined by the Member State concerned. That manual and information notice, as well as any labelling, shall be clear, understandable and legible.

5. Importers shall ensure that, while the product is under their responsibility, its storage or transport conditions do not jeopardise its compliance with the requirements set out in Article 4.

6. When deemed appropriate with regard to the risks presented by a product, importers shall, in order to protect the health and safety of end-users and third parties, carry out sample testing of products made available on the market, investigate, and, if necessary, keep a register of complaints, of non-conforming of products and product recalls, and shall keep distributors informed of any such monitoring.

7. Importers who consider or have reason to believe that a product which they have placed on the market is not in conformity with the applicable Union harmonisation legislation shall immediately take the corrective measures necessary to bring that product into conformity, to withdraw it or recall it, if appropriate. Furthermore, where the product presents a risk, importers shall immediately inform the market surveillance authorities of the Member States in which they made the product available on the market to that effect, giving details, in particular, of the non-compliance and of any corrective measures taken.

8. Importers shall, for 10 years after the product has been placed on the market, keep a copy of the EU declaration of conformity at the disposal of the market surveillance authorities and ensure that the technical documentation can be made available to those authorities, upon request.

9. Importers shall, further to a reasoned request from the competent national authority, provide it with all the information and documentation in paper or electronic form necessary to demonstrate the conformity of the product in a language which can be easily understood by that authority. They shall cooperate with that authority, at its request, on any action taken to eliminate the risks posed by the product which they have placed on the market.

Article 9 - Obligations of distributors

Regulation (EU) 2019/945

1. When making a product available on the Union market, distributors shall act with due care in relation to the requirements set out in this Chapter.

2. Before making a product available on the market, distributors shall verify that the product bears the CE marking and, when applicable, the UA class identification label and the indication of the sound power level, is accompanied by the documents referred to in paragraphs 7 and 8 of Article 6 and that the manufacturer and the importer have complied with the requirements set out in paragraphs 5 and 6 of Article 6 and in paragraph 3 of Article 8.)

   Distributors shall ensure that the product is accompanied by the manual and information notice required by Parts 1 to 6 of the Annex in a language which can be easily understood by consumers and other end-users, as determined by the Member State concerned. That manual and information notice, as well as any labelling, shall be clear, understandable and legible.

   Where a distributor considers or has reason to believe that a product is not in conformity with the requirements set out in Article 4, he shall not make the product available on the market until it has been brought into conformity. Furthermore, where the product presents a risk, the distributor shall inform the manufacturer or the importer to that effect, as well as the competent market surveillance authorities.

3. Distributors shall ensure that, while a product is under their responsibility, its storage or transport conditions do not jeopardise its compliance with the requirements set out in Article 4.

4. Distributors who consider or have reasons to believe that a product which they have made available on the market is not in conformity with the applicable Union harmonisation legislation shall make sure that the corrective measures necessary to bring that product into conformity, to withdraw it or recall it, if appropriate, are taken. Furthermore, where the product presents a risk, distributors shall immediately inform the market surveillance authorities of the Member States in which they made the product available on the market to that effect, giving details, in particular, of the non-compliance and of any corrective measures taken.

5. Distributors shall, further to a reasoned request from the competent national authority, provide it with all the information and documentation in paper or electronic form necessary to demonstrate the conformity of the product. They shall cooperate with that authority, at its request, on any action taken to eliminate the risks posed by the product which they have made available on the market.

Article 10 - Cases in which obligations of manufacturers apply to importers and distributors

Regulation (EU) 2019/945

An importer or distributor shall be considered a manufacturer for the purposes of this Chapter and shall be subject to the obligations of manufacturers pursuant to Article 6, where they place a product on the market under their name or trademark or modify the product already placed on the market in such a way that compliance with this Chapter may be affected.

Article 11 - Identification of economic operators

Regulation (EU) 2019/945

1. Economic operators shall, on request, identify the following to the market surveillance authorities:

   (a) any economic operator who has supplied them with a product;

   (b) any economic operator to whom they have supplied a product.

2. Economic operators shall be able to present the information referred to in paragraph 1:

   (a) for 10 years after they have been supplied with the product;

   (b) for 10 years after they have supplied the product.

SECTION 3 – CONFORMITY OF THE PRODUCT

Article 12 - Presumption of conformity

Regulation (EU) 2019/945

A product which is in conformity with harmonised standards or parts thereof, the references of which have been published in the *Official Journal of the European Union*, shall be presumed to be in conformity with the requirements covered by those standards or parts thereof set out in Parts 1 to 6 of the Annex.

Article 13 - Conformity assessment procedures

Regulation (EU) 2019/945

1. The manufacturer shall perform a conformity assessment of the product using one of the following procedures with a view to establishing its compliance with the requirements set out in Parts 1 to 6 of the Annex. The conformity assessment shall take into account all intended and foreseeable operating conditions.

2. The procedures available to conduct the conformity assessment shall be the following:

   (a) internal production control as set out in Part 7 of the Annex, when assessing the compliance of a product with the requirements set out in Parts 1, 5 or 6 of the Annex, subject to the condition that the manufacturer has applied harmonised standards, the references of which have been published in the *Official Journal of the European Union*, for all the requirements for which such standards exist;

   (b) EU-type examination followed by conformity to type based on internal production control as set out in Part 8 of the Annex;

   (c) conformity based on full quality assurance as set out in Part 9 of the Annex, excepted when assessing the compliance of a product which is a toy within the meaning of Directive 2009/48/EC.

Article 14 - EU declaration of conformity

Regulation (EU) 2019/945

1. The EU declaration of conformity referred to in paragraph 8 of Article 6 shall state that compliance of the product with the requirements set out in Parts 1 to 6 of the Annex has been demonstrated and, for UAS, identify its class.

2. The EU declaration of conformity shall have the model structure set out in Part 11 of the Annex, shall contain the elements set out in that Part and shall be continuously updated. It shall be translated into the language or languages required by the Member State in which market the product is placed or made available.

3. The simplified EU declaration of conformity referred to in paragraph 8 of Article 6 shall contain the elements set out in Part 12 of the Annex and shall be continuously updated. It shall be translated into the language or languages required by the Member State in which the product is placed or made available on the market. The full text of the EU declaration of conformity shall be available at the internet address referred to in the simplified EU declaration of conformity in a language or languages required by the Member State in which the product is placed or made available on the market.

4. Where a product is subject to more than one Union act requiring an EU declaration of conformity, a single EU declaration of conformity shall be drawn up in respect of all such Union acts. That declaration shall contain the identification of the Union acts concerned, including their publication references.

5. By drawing up the EU declaration of conformity, the manufacturer shall assume responsibility for the compliance of the product with the requirements laid down in this Chapter.

Article 15 - General principles of the CE marking

Regulation (EU) 2019/945

The CE marking shall be subject to the general principles set out in Article 30 of Regulation (EC) No 765/2008.

Article 16 - Rules and conditions for affixing the CE marking, the identification number of the notified body, the UAS class identification label and the indication of the sound power level

Regulation (EU) 2019/945

1. The CE marking shall be affixed visibly, legibly and indelibly to the product or to the data plate attached to it. Where that is not possible or not warranted on account of the size of the product, it shall be affixed to the packaging.

2. The UA class identification label shall be affixed visibly, legibly and indelibly to the UA and its packaging and shall be at least 5 mm high. The affixing to a product of markings, signs or inscriptions which are likely to mislead third parties regarding the meaning or form of the class identification label shall be prohibited.

3. The indication of the sound power level provided for in Part 14 of the Annex shall be affixed, when applicable, visibly, legibly and indelibly on the UA, unless that is not possible or not warranted on account of the size of the product, and on the packaging.

4. The CE marking and, when applicable, the indication of the sound power level and the UA class identification label shall be affixed before the product is placed on the market.

5. The CE marking shall be followed by the identification number of the notified body where the conformity assessment procedure set out in Part 9 of the Annex is applied.

   The identification number of the notified body shall be affixed by the notified body Itself or, under its instructions, by the manufacturer or his authorised representative.

6. Member States shall build upon existing mechanisms to ensure correct application of the regime governing the CE marking and shall take appropriate action in the event of improper use of that marking.

Article 17 - Technical documentation

Regulation (EU) 2019/945

1. The technical documentation shall contain all relevant data and details of the means used by the manufacturer to ensure that the product complies with the requirements set out in Part 1 to 6 of the Annex. It shall, at least, contain the elements set out in Part 10 of the Annex.

2. The technical documentation shall be drawn up before the product is placed on the market and shall be continuously updated.

3. The technical documentation and correspondence relating to any EU-type examination procedure or the assessment of the quality system of the manufacturer shall be drawn up in an official language of the Member State in which the notified body is established or in a language acceptable to that body.

4. Where the technical documentation does not comply with paragraphs 1, 2 or 3 of this Article, the market surveillance authority may ask the manufacturer or the importer to have a test performed by a body acceptable to the market surveillance authority at the expense of the manufacturer or the importer within a specified period in order to verify compliance of the product with the requirements set out in Parts 1 to 6 of the Annex which applies to it.

SECTION 4 – NOTIFICATION OF CONFORMITY ASSESSMENT BODIES

Article 18 - Notification

Regulation (EU) 2019/945

Member States shall notify the Commission and the other Member States of bodies authorised to carry out third-party conformity assessment tasks under this Chapter.

Article 19 - Notifying authorities

Regulation (EU) 2019/945

1. Member States shall designate a notifying authority that shall be responsible for setting up and carrying out the necessary procedures for the assessment and notification of conformity assessment bodies and the monitoring of notified bodies, including compliance with Article 24.
2. Member States may decide that the assessment and monitoring referred to in paragraph 1 shall be carried out by a national accreditation body within the meaning of Regulation (EC) No 765/2008.
3. Where the notifying authority delegates or otherwise entrusts the assessment, notification or monitoring referred to in paragraph 1 to a body which is not a governmental entity, that body shall be a legal entity and shall comply mutatis mutandis with the requirements laid down in Article 20. In addition, it shall have arrangements to cover liabilities arising out of its activities.
4. The notifying authority shall take full responsibility for the tasks performed by the body referred to in paragraph 3.

Article 20 - Requirements relating to notifying authorities

Regulation (EU) 2019/945

1. A notifying authority shall:
   (a) be established in such a way that no conflict of interest with conformity assessment bodies occurs;
   (b) be organised and operated so as to safeguard the objectivity and impartiality of its activities;
   (c) be organised in such a way that each decision relating to notification of a conformity assessment body is taken by competent persons different from those who carried out the assessment;
   (d) not offer or provide any activities that conformity assessment bodies perform or consultancy services on a commercial or competitive basis;
   (e) shall safeguard the confidentiality of the information it obtains;
   (f) have a sufficient number of competent personnel at its disposal for the proper performance of its tasks.

Article 21 - Information obligation on notifying authorities

Regulation (EU) 2019/945

1. Member States shall inform the Commission of their procedures for the assessment and notification of conformity assessment bodies and the monitoring of notified bodies, and of any changes thereto.

2. The Commission shall make that information publicly available.

Article 22 - Requirements relating to notified bodies

Regulation (EU) 2019/945

1. For the purposes of notification, a conformity assessment body shall meet the requirements laid down in paragraphs 2 to 11.

2. A conformity assessment body shall be established under national law of a Member State and have legal personality.

3. A conformity assessment body shall be a third-party body independent of the organisation it assesses.

   A body belonging to a business association or professional federation representing undertakings involved in the design, manufacturing, provision, assembly, use or maintenance of the product which it assesses may, on condition that its independence and the absence of any conflict of interest are demonstrated, be considered such a body.

4. A conformity assessment body, its top-level management and the personnel responsible for carrying out the conformity assessment tasks shall not be the designer, manufacturer, supplier, installer, purchaser, owner, user or maintainer of the product which they assess, nor the representative of any of those parties. This shall not preclude the use of the assessed product that is necessary for the operations of the conformity assessment body or the use of such product for personal purposes.

   A conformity assessment body, its top-level management and the personnel responsible for carrying out the conformity assessment tasks shall not be directly involved in the design, manufacture or construction, the marketing, installation, use or maintenance of that product, or represent the parties engaged in those activities. They shall not engage in any activity that may conflict with their independence of judgement or integrity in relation to conformity assessment activities for which they are notified. This shall, in particular, apply to consultancy services.

   Conformity assessment bodies shall ensure that the activities of their subsidiaries or subcontractors do not affect the confidentiality, objectivity or impartiality of their conformity assessment activities.

5. Conformity assessment bodies and their personnel shall carry out the conformity assessment activities with the highest degree of professional integrity and the requisite technical competence in the specific field and shall be free from all pressures and inducements, particularly financial, which might influence their judgement or the results of their conformity assessment activities, especially as regards persons or groups of persons with an interest in the results of those activities.

6. A conformity assessment body shall be capable of carrying out all the conformity assessment tasks assigned to it by Part 8 or 9 of the Annex in relation to which it has been notified, whether

those tasks are carried out by the conformity assessment body itself or on its behalf and under its responsibility.

At all times and for each conformity assessment procedure and each kind or category of product in relation to which it has been notified, a conformity assessment body shall have at its disposal the necessary:

(a) personnel with technical knowledge and sufficient and appropriate experience to perform the conformity assessment tasks;

(b) descriptions of procedures in accordance with which conformity assessment is carried out, ensuring the transparency and the ability of reproduction of those procedures; it shall have appropriate policies and procedures in place that distinguish between tasks it carries out as a notified body and other activities;

(c) procedures for the performance of activities which take due account of the size of an undertaking, the sector in which it operates, its structure, the degree of complexity of the product in question and the mass or serial nature of the production process.

A conformity assessment body shall have the means necessary to perform the technical and administrative tasks connected with the conformity assessment activities in an appropriate manner and shall have access to all necessary equipment or facilities.

7. The personnel responsible for carrying out conformity assessment tasks shall have the following:

(a) sound technical and vocational training covering all the conformity assessment activities in relation to which the conformity assessment body has been notified;

(b) satisfactory knowledge of the requirements of the assessments they carry out and adequate authority to carry out those assessments;

(c) appropriate knowledge and understanding of the requirements, of the applicable harmonised standards and of the relevant provisions of Union harmonisation legislation;

(d) the ability to draw up EU-type examination certificates or quality system approvals, records and reports demonstrating that assessments have been carried out.

8. The impartiality of the conformity assessment bodies, their top-level management and of the personnel responsible for carrying out the conformity assessment tasks shall be guaranteed.

The remuneration of the top-level management and of the personnel responsible for carrying out the conformity assessment tasks of a conformity assessment body shall not depend on the number of assessments carried out or on the results of those assessments.

9. Conformity assessment bodies shall take out liability insurance unless liability is assumed by the Member State in accordance with national law, or the Member State itself is directly responsible for the conformity assessment.

10. The personnel of a conformity assessment body shall observe professional secrecy with regard to all information obtained in carrying out their tasks under Parts 8 and 9 of the Annex or any provision of national law giving effect to them, except in relation to the competent authorities of the Member State in which its activities are carried out. Proprietary rights shall be protected.

11. Conformity assessment bodies shall participate in, or ensure that their personnel responsible for carrying out the conformity assessment tasks are informed of, the relevant standardisation activities, the regulatory activities in the area of UAS and frequency planning, and the activities

of the notified body coordination group established under the relevant Union harmonisation legislation and shall apply, as general guidance, the administrative decisions and documents produced as a result of the work of that group.

Article 23 - Presumption of conformity of notified bodies

Regulation (EU) 2019/945

Where a conformity assessment body demonstrates its conformity with the criteria laid down in the relevant harmonised standards or parts thereof, the references of which have been published in the *Official Journal of the European Union*, it shall be presumed to comply with the requirements set out in Article 22 in so far as the applicable harmonised standards cover those requirements.

Article 24 - Subsidiaries of and subcontracting by notified bodies

Regulation (EU) 2019/945

1. Where a notified body subcontracts specific tasks connected with conformity assessment or has recourse to a subsidiary, it shall ensure that the subcontractor or the subsidiary meets the requirements set out in Article 22 and shall inform the notifying authority accordingly.
2. Notified bodies shall take full responsibility for the tasks performed by subcontractors or subsidiaries, wherever these are established.
3. Activities may be subcontracted or carried out by a subsidiary only with the agreement of the client.
4. Notified bodies shall keep at the disposal of the notifying authority the relevant documents concerning the assessment of the qualifications of the subcontractor or the subsidiary and the work carried out by them under Parts 8 and 9 of the Annex.

Article 25 - Application for notification

Regulation (EU) 2019/945

1. A conformity assessment body shall submit an application for notification to the notifying authority of the Member State in which it is established.
2. The application for notification shall be accompanied by a description of the conformity assessment activities, the conformity assessment module or modules, and the product for which that body claims to be competent, as well as by an accreditation certificate issued by a national accreditation body attesting that the conformity assessment body fulfils the requirements laid down in Article 22.

Article 26 - Notification procedure

Regulation (EU) 2019/945

1. Notifying authorities may only notify conformity assessment bodies which have met the requirements laid down in Article 22.
2. They shall notify conformity assessment bodies to the Commission and the other Member States using the electronic notification tool developed and managed by the Commission.
3. The notification shall include full details of the conformity assessment activities, the conformity assessment module or modules, and the product concerned and the relevant accreditation certification.

4. The body concerned may perform the activities of a notified body only where no objections are raised by the Commission or the other Member States within 2 weeks of a notification.

5. Only such a body shall be considered a notified body for the purposes of this Chapter.

6. The notifying authority shall notify the Commission and the other Member States of any subsequent relevant changes to the notification.

Article 27 - Identification numbers and lists of notified bodies

Regulation (EU) 2019/945

1. The Commission shall assign an identification number to a notified body.

2. It shall assign a single such number even where the body is notified under several Union acts.

3. The Commission shall make publicly available the list of the bodies notified under this Regulation, including the identification numbers that have been assigned to them and the activities for which they have been notified.

   The Commission shall ensure that the list is kept up to date.

Article 28 - Changes to notifications

Regulation (EU) 2019/945

1. Where a notifying authority has ascertained or has been informed that a notified body no longer meets the requirements laid down in Article 22, or that it fails to fulfil its obligations, the notifying authority shall restrict, suspend or withdraw the notification as appropriate, depending on the seriousness of the failure to meet those requirements or fulfil those obligations. It shall immediately inform the Commission and the other Member States accordingly.

2. In the event of restriction, suspension or withdrawal of the notification, or where the notified body has ceased its activity, the notifying Member State shall take appropriate steps to ensure that the files of that body are either processed by another notified body or kept available for the responsible notifying and market surveillance authorities at their request.

Article 29 - Challenge of the competence of notified bodies

Regulation (EU) 2019/945

1. The Commission shall investigate all cases where it has doubts, or doubt is brought to its attention, about the competence of a notified body or the continued fulfilment by a notified body of the requirements and responsibilities to which it is subject.

2. The notifying Member State shall provide the Commission, on request, with all the information relating to the basis for the notification or the maintenance of the competence of the notified body concerned.

3. The Commission shall ensure that all sensitive information obtained in the course of its investigations is treated confidentially.

4. Where the Commission ascertains that a notified body does not meet or no longer meets the requirements for notification, it shall inform the notifying Member State accordingly and request it to take the necessary corrective measures, including de-notification if necessary.

Article 30 - Operational obligations of notified bodies

Regulation (EU) 2019/945

1. Notified bodies shall carry out conformity assessments in accordance with the conformity assessment procedures provided in Parts 8 and 9 of the Annex.

2. Conformity assessments shall be carried out in a proportionate manner, avoiding unnecessary burdens for economic operators. Conformity assessment bodies shall perform their activities taking due account of the size of an undertaking, the sector in which it operates, its structure, the degree of complexity of the product in question, and the mass or serial nature of the production process.

   In doing so, they shall nevertheless respect the degree of rigour and the level of protection required for the compliance of the UA or UAS with this Chapter.

3. Where a notified body finds that the requirements set out in Parts 1 to 6 of the Annex or in corresponding harmonised standards or other technical specifications have not been met by a manufacturer, it shall require the manufacturer to take appropriate corrective measures and shall not issue an EU-type examination certificate or a quality system approval.

4. Where, in the course of the monitoring of conformity following the issue of an EU-type examination certificate or a quality system approval, a notified body finds that a product no longer complies, it shall require the manufacturer to take appropriate corrective measures and shall suspend or withdraw the EU-type examination certificate or the quality system approval if necessary.

5. Where corrective measures are not taken or do not have the required effect, the notified body shall restrict, suspend or withdraw any EU-type examination certificates or quality system approvals, as appropriate.

Article 31 - Appeal against decisions of notified bodies

Regulation (EU) 2019/945

Notified bodies shall ensure that a transparent and accessible appeal procedure against their decisions is available.

Article 32 - Information obligation on notified bodies

Regulation (EU) 2019/945

1. Notified bodies shall inform the notifying authority of the following:

   (a) any refusal, restriction, suspension or withdrawal of an EU-type examination certificate or a quality system approval in accordance with the requirements of Parts 8 and 9 of the Annex;

   (b) any circumstances affecting the scope of, or conditions for, notification;

   (c) any request for information which they have received from market surveillance authorities regarding conformity assessment activities;

   (d) on request, conformity assessment activities performed within the scope of their notification and any other activity performed, including cross-border activities and subcontracting.

2. Notified bodies shall, in accordance with the requirements of Parts 8 and 9 of the Annex, provide the other bodies notified under this Chapter carrying out similar conformity assessment activities covering the same categories of UA or UAS with the relevant information on issues relating to negative and, on request, positive conformity assessment results.

3. Notified bodies shall fulfil information obligations under Parts 8 and 9 of the Annex.

Article 33 - Exchange of experience

Regulation (EU) 2019/945

The Commission shall provide for the organisation of exchange of experience between the Member States' national authorities responsible for notification policy.

Article 34 - Coordination of notified bodies

Regulation (EU) 2019/945

1. The Commission shall ensure that appropriate coordination and cooperation between bodies notified under this Chapter are put in place and properly operated in the form of a sectorial group of notified bodies.

2. Notified bodies shall participate in the work of that group, directly of by means of designated representatives.

SECTION 5 – UNION MARKET SURVEILLANCE, CONTROL OF PRODUCTS ENTERING THE UNION MARKET AND UNION SAFEGUARD PROCEDURE

Article 35 - Market surveillance and control of products entering the Union market

Regulation (EU) 2019/945

1. Member States shall organise and perform surveillance of the products that are placed on the Union market in accordance with paragraph 3 of Article 15 and Articles 16 to 26 of Regulation (EC) No 765/2008.

2. Member States shall organise and perform control of the products that enter the Union market in accordance with paragraph 5 of Article 15 and Articles 27, 28 and 29 of Regulation (EC) No 765/2008.

3. Member States shall ensure that their market surveillance and border control authorities cooperate with the competent authorities designated under Article 17 of Implementing Regulation (EU) 2019/947 on safety matters and shall establish appropriate communication and coordination mechanisms between them, making the best use of the information contained in the occurrence reporting system defined in Regulation (EU) No 376/2014 of the European Parliament and of the Council[1] and the information systems defined in Articles 22 and 23 of Regulation (EC) No 765/2008.

Article 36 - Procedure for dealing with products presenting a risk at national level

Regulation (EU) 2019/945

1. Where the market surveillance authorities of one Member State have taken action pursuant to Article 20 of Regulation (EC) No 765/2008, or where they have sufficient reason to believe that a product presents a risk to the health or safety of persons or to other aspects of public interest protection covered by this Chapter, they shall carry out an evaluation in relation to the product concerned, covering all applicable requirements laid down in this Chapter. The relevant economic operators shall cooperate as necessary with the market surveillance authorities for that purpose.

   Where, in the course of the evaluation referred to in the first subparagraph, the market surveillance authorities find that the product does not comply with the requirements laid down in this Chapter, they shall, without delay, require the relevant economic operator to take all appropriate corrective actions to bring the product into compliance with those requirements, to withdraw the product from the market, or to recall it within a reasonable period, commensurate with the nature of the risk, as they may prescribe.

   The market surveillance authorities shall inform the relevant notified body accordingly.

   Article 21 of Regulation (EC) No 765/2008 shall apply to the measures referred to in the second subparagraph of this paragraph.

[1] Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and repealing Directive 2003/42/EC of the European Parliament and of the Council and Commission Regulations (EC) No 1321/2007 and (EC) No 1330/2007 (OJ L 122, 24.4.2014, p. 18).

2. Where the market surveillance authorities consider that non-compliance is not restricted to their national territory, they shall inform the Commission and the other Member States of the results of the evaluation and of the actions which they have required the economic operator to take.

3. The economic operator shall ensure that all appropriate corrective action is taken in respect of all products concerned that it has made available on the market throughout the Union.

4. Where the relevant economic operator does not take adequate corrective action within the period referred to in the second subparagraph of paragraph 1, the market surveillance authorities shall take all appropriate provisional measures to prohibit or restrict the product being made available on their national market, to withdraw the product from that market or to recall it.

   The market surveillance authorities shall inform the Commission and the other Member States, without delay, of those measures.

5. The information referred to in paragraph 4 shall include all available details, in particular the data necessary for the identification of the non-compliant product, the origin of the product, the nature of the non-compliance alleged and the risk involved, the nature and duration of the national measures taken and the arguments put forward by the relevant economic operator. In particular, the market surveillance authorities shall indicate whether the non-compliance is due to either of the following:

   (a) failure of the product to meet the requirements set out in Article 4;

   (b) shortcomings in the harmonised standards referred to in Article 12.

6. Member States other than the Member State initiating the procedure under this Article shall, without delay, inform the Commission and the other Member States of any measures adopted and of any additional information at their disposal relating to the non-compliance of the product concerned, and, in the event of disagreement with the adopted national measure, of their objections.

7. Where, within three months of receipt of the information referred to in paragraph 5, no objection has been raised by either a Member State or the Commission in respect of a provisional measure taken by a Member State, that measure shall be deemed justified.

8. Member States shall ensure that appropriate restrictive measures, such as withdrawal of the product from the market, are taken in respect of the product concerned without delay.

Article 37 - Union safeguard procedure

Regulation (EU) 2019/945

1. Where, on completion of the procedure set out in paragraphs 3 and 4 of Article 36, objections are raised against a measure taken by a Member State, or where the Commission considers a national measure to be contrary to Union legislation, the Commission shall, without delay, enter into consultation with the Member States and the relevant economic operator or operators and shall evaluate the national measure. On the basis of the results of that evaluation, the Commission shall decide whether the national measure is justified or not.

   The Commission shall address its decision to all Member States and shall immediately communicate it to them and the relevant economic operator or operators.

2. If the national measure is considered justified, all Member States shall take the necessary measures to ensure that the non-compliant product is withdrawn or recalled from their market, and shall inform the Commission accordingly. If the national measure is considered unjustified, the Member State concerned shall withdraw that measure.

3. Where the national measure is considered justified and the non-compliance of the product is attributed to shortcomings in the harmonised standards referred to in point (b) of paragraph 5 of Article 36 of this Regulation, the Commission shall apply the procedure provided for in Article 11 of Regulation (EU) No 1025/2012.

Article 38 - Compliant product which presents a risk

Regulation (EU) 2019/945

1. Where, having carried out an evaluation under paragraph 1 of Article 36, a Member State finds that, although the product is in compliance with this Chapter, it presents a risk to the health or safety of persons or to other aspects of public interest protection covered by this Chapter, it shall require the relevant economic operator to take all appropriate measures to ensure that the product concerned, when placed on the market, no longer presents that risk, to withdraw the product from the market or to recall it within a reasonable period, commensurate with the nature of the risk, as it may prescribe.

2. The economic operator shall ensure that corrective action is taken in respect of all the products concerned that he has made available on the market throughout the Union.

3. The Member State shall immediately inform the Commission and the other Member States. That information shall include all available details, in particular the data necessary for the identification of the product concerned, the origin and the supply chain of product, the nature of the risk involved and the nature and duration of the national measures taken.

4. The Commission shall, without delay, enter into consultation with the Member States and the relevant economic operator or operators and shall evaluate the national measures taken. On the basis of the results of that evaluation, the Commission shall decide whether the national measure is justified or not and, where necessary, propose appropriate measures.

5. The Commission shall address its decision to all Member States and shall immediately communicate it to them and the relevant economic operator or operators.

Article 39 - Formal non-compliance

Regulation (EU) 2019/945

1. Without prejudice to Article 36, where a Member State makes one of the following findings concerning products covered by this Chapter, it shall require the relevant economic operator to put an end to the non-compliance concerned:

   (a) the CE marking has been affixed in violation of Article 30 of Regulation (EC) No 765/2008 or of Article 15 or Article 16 of this Regulation;

   (b) the CE marking or type has not been affixed;

   (c) the identification number of the notified body, where the conformity assessment procedure set out in Part 9 of the Annex is applied, has been affixed in violation of Article 16 or has not been affixed;

   (d) the UA class identification label has not been affixed;

(e) the indication of the sound power level if required has not been affixed;

(f) the serial number has not been affixed or has not the correct format;

(g) the manual or the information notice is not available;

(h) the EU declaration of conformity is missing or has not been drawn up;

(i) the EU declaration of conformity has not been drawn up correctly;

(j) technical documentation is either not available or not complete;

(k) manufacturer's or importer's name, registered trade name or registered trademark, website address or postal address are missing.

2. Where the non-compliance referred to in paragraph 1 persists, the Member State concerned shall take all appropriate measures to restrict or prohibit the product being made available on the market or ensure that it is withdrawn or recalled from the market.

CHAPTER III – UAS OPERATED IN THE 'CERTIFIED' AND 'SPECIFIC' CATEGORIES

Article 40 - Requirements for UAS operated in the 'certified' and 'specific' categories

Regulation (EU) 2019/945

1. The design, production and maintenance of UAS shall be certified if the UAS meets any of the following conditions:

   (a) it has a characteristic dimension of 3 m or more, and is designed to be operated over assemblies of people;

   (b) it is designed for transporting people;

   (c) it is designed for the purpose of transporting dangerous goods and requiring a high level of robustness to mitigate the risks for third parties in case of accident;

   (d) it is used in the 'specific' category of operations defined in Article 5 of Implementing Regulation (EU) 2019/947 and the operational authorisation issued by the competent authority, following a risk assessment provided for in Article 11 of Implementing Regulation (EU) 2019/947, considers that the risk of the operation cannot be adequately mitigated without the certification of the UAS.

2. A UAS subject to certification shall comply with the applicable requirements set out in Commission Regulations (EU) No 748/2012[1], (EU) 2015/640[2] and (EU) No 1321/2014[3].

3. Unless it needs to be certified in accordance with paragraph 1, a UAS used in the 'specific' category shall feature the technical capabilities set out in the operational authorisation issued by the competent authority or in the standard scenario defined in Appendix 1 to the Annex of Implementing Regulation (EU) 2019/947 or as defined by the Light UAS Operator Certificate (LUC) pursuant to Part C of the Annex of Implementing Regulation (EU) 2019/947.

[1] Commission Regulation (EU) No 748/2012 of 3 August 2012 laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations (OJ L 224, 21.8.2012, p. 1).

[2] Commission Regulation (EU) 2015/640 of 23 April 2015 on additional airworthiness specifications for a given type of operations and amending Regulation (EU) No 965/2012 (OJ L 106, 24.4.2015, p. 18).

[3] Commission Regulation (EU) No 1321/2014 of 26 November 2014 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organisations and personnel involved in these tasks (OJ L 362, 17.12.2014, p. 1).

CHAPTER IV – THIRD-COUNTRY UAS OPERATORS

Article 41 - Third-country UAS operators

Regulation (EU) 2019/945

1. UAS operators that have their principal place of business, are established, or reside in a third country, shall comply with Implementing Regulation (EU)2019/947 for the purpose of UAS operations within the single European sky airspace.

2. The competent authority for the third-country UAS operator shall be the competent authority of the first Member State where the UAS operator intends to operate.

3. By way of derogation from paragraph 1, a certificate of the remote pilot competency or UAS operator in accordance with Implementing Regulation (EU) 2019/947, or an equivalent document, may be recognised by the competent authority for the purpose of operation within, to, and out of the Union provided that:

   (a) the third country asked for such recognition;

   (b) the certificate of the remote pilot competency or the UAS operator's certificate are valid documents of the State of issue; and

   (c) the Commission, after consultation of EASA, has ensured that the requirements on the basis of which such certificates have been issued provide the same level of safety as this Regulation does.

CHAPTER V – FINAL PROVISIONS

Article 42 - Entry into force

Regulation (EU) 2019/945

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 12 March 2019.

For the Commission

The President

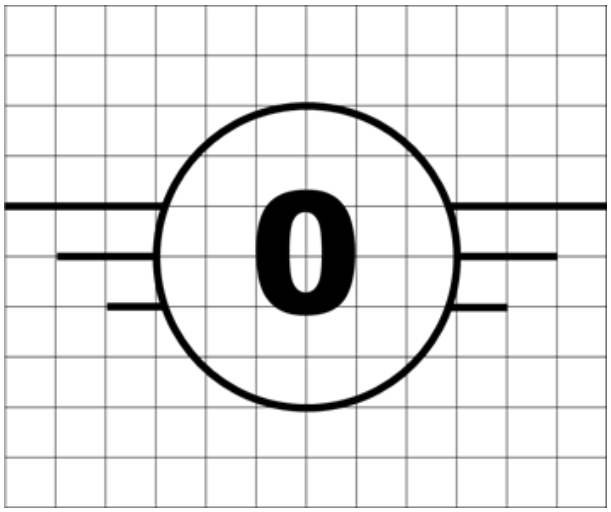
Jean-Claude JUNCKER

ANNEX TO DELEGATED REGULATION (EU) 2019/945

PART 1 – Requirements for a class C0 Unmanned aircraft system

Regulation (EU) 2019/945

A class C0 UAS bears the following class identification label on the UA:



A class C0 UAS shall comply with the following:

(1) have an MTOM of less than 250 g, including payload;

(2) have a maximum speed in level flight of 19 m/s;

(3) have a maximum attainable height above the take-off point limited to 120 m;

(4) be safely controllable with regards to stability, manoeuvrability and data link performance, by a remote pilot following the manufacturer's instructions, as necessary under all anticipated operating conditions including following the failure of one or, if appropriate, more systems;

(5) be designed and constructed in such a way as to minimise injury to people during operation, sharp edges shall be avoided, unless technically unavoidable under good design and manufacturing practice. If equipped with propellers, it shall be designed in such a way as to limit any injury that may be inflicted by the propeller blades;

(6) be powered by electricity and have a nominal voltage not exceeding 24 V direct current (DC) or the equivalent alternating current (AC) voltage; its accessible parts shall not exceed 24 V DC or the equivalent AC voltage; internal voltages shall not exceed 24 V DC or the equivalent AC voltage unless it is ensured that the voltage and current combination generated does not lead to any risk or harmful electric shock even when the UAS is damaged;

(7) if equipped with a follow-me mode and when this function is on, be in a range not exceeding 50 m from the remote pilot, and make it possible for the remote pilot to regain control of the UA;

(8) be placed on the market with a user's manual providing:

(a) the characteristics of the UA including but not limited to the:

— UA class

— UA mass (with a description of the reference configuration) and the maximum take-off mass (MTOM);

— general characteristics of allowed payloads in terms of mass dimensions, interfaces with the UA and other possible restrictions;

— equipment and software to control the UA remotely;

— and a description of the behaviour of the UA in case of a loss of data link;

(b) clear operational instructions;

(c) operational limitations (including but not limited to meteorological conditions and day/night operations); and

(d) appropriate description of all the risks related to UAS operations adapted for the age of the user.

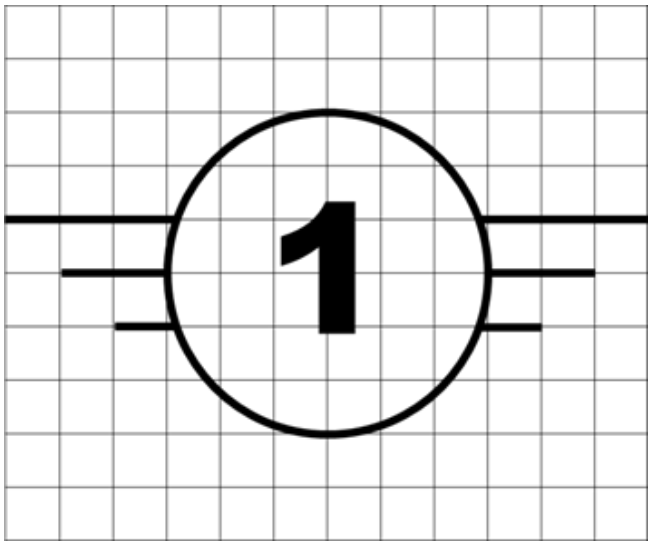
(9) include an information notice published by the European Union Aviation Safety Agency (EASA) providing applicable limitations and obligations, in accordance with Implementing Regulation (EU) 2019/947.

(10) Points 4, 5 and 6 do not apply to UAS that are toys in the meaning of Directive 2009/48/EC on the safety of toys.

PART 2 – Requirements for a class C1 Unmanned aircraft system

Regulation (EU) 2019/945

A class C1 UAS bears the following class identification label on the UA:



A class C1 UAS shall comply with the following:

(1) be made of materials and have performance and physical characteristics such as to ensure that in the event of an impact at terminal velocity with a human head, the energy transmitted to the human head is less than 80 J, or, as an alternative, shall have an MTOM of less than 900 g, including payload;

(2) have a maximum speed in level flight of 19 m/s;

(3) have a maximum attainable height above the take-off point limited to 120 m or be equipped with a system that limits the height above the surface or above the take-off point to 120 m or to a value selectable by the remote pilot. If the value is selectable, clear information about the height of the UA above the surface or take-off point during flight shall be provided to the remote pilot.

(4) be safely controllable with regards to stability, manoeuvrability and data link performance, by a remote pilot following the manufacturer's instructions, as necessary under all anticipated operating conditions including following the failure of one or, if appropriate, more systems;

(5) have the requisite mechanical strength, including any necessary safety factor, and, where appropriate, stability to withstand any stress to which it is subjected to during use without any breakage or deformation that might interfere with its safe flight;

(6) be designed and constructed in such a way as to minimise injury to people during operation, sharp edges shall be avoided, unless technically unavoidable under good design and manufacturing practice. If equipped with propellers, it shall be designed in such a way as to limit any injury that may be inflicted by the propeller blades;

(7) in case of a loss of data link, have a reliable and predictable method for the UA to recover the data link or terminate the flight in a way that reduces the effect on third parties in the air or on the ground;

(8) unless it is a fixed-wing UA, have a guaranteed A-weighted sound power level L_{WA} determined as per Part 13 not exceeding the levels established in Part 15;

(9) unless it is a fixed-wing UA, have the indication of the guaranteed A-weighted sound power level affixed on the UA and/or its packaging as per Part 14;

(10) be powered by electricity and have a nominal voltage not exceeding 24 V DC or the equivalent AC voltage; its accessible parts shall not exceed 24 V DC or the equivalent AC voltage; internal voltages shall not exceed 24 V DC or the equivalent AC voltage unless it is ensured that the voltage and current combination generated does not lead to any risk or harmful electric shock even when the UAS is damaged;

(11) have a unique physical serial number compliant with standard ANSI/CTA-2063 Small Unmanned Aerial Systems Serial Numbers;

(12) have a direct remote identification that:

(a) allows the upload of the UAS operator registration number in accordance with Article 14 of Implementing Regulation (EU) 2019/947 and exclusively following the process provided by the registration system;

(b) ensures, in real time during the whole duration of the flight, the direct periodic broadcast from the UA using an open and documented transmission protocol, of the following data, in a way that they can be received directly by existing mobile devices within the broadcasting range:

i the UAS operator registration number;

ii the unique physical serial number of the UA compliant with standard ANSI/CTA-2063;

iii the geographical position of the UA and its height above the surface or take-off point;

iv the route course measured clockwise from true north and ground speed of the UA; and

v the geographical position of the remote pilot or, if not available, the take-off point;

(c) ensures that the user cannot modify the data mentioned under paragraph (b) points ii, iii, iv and v;

(13) be equipped with a geo-awareness system that provides:

(a) an interface to load and update data containing information on airspace limitations related to UA position and altitude imposed by the geographical zones, as defined by Article 15 of Implementing Regulation (EU) 2019/947, which ensures that the process of loading or updating such data does not degrade its integrity and validity;

(b) a warning alert to the remote pilot when a potential breach of airspace limitations is detected; and

(c) information to the remote pilot on the UA's status as well as a warning alert when its positioning or navigation systems cannot ensure the proper functioning of the geo-awareness system;

(14) if the UA has a function that limits its access to certain airspace areas or volumes, this function shall operate in such a manner that it interacts smoothly with the flight control system of the UA without adversely affecting flight safety; in addition, clear information shall be provided to the remote pilot when this function prevents the UA from entering these airspace areas or volume;

(15) provide the remote pilot with clear warning when the battery of the UA or its control station reaches a low level so that the remote pilot has sufficient time to safely land the UA;

(16) be equipped with lights for the purpose of:

(a) the controllability of the UA,

(b) the conspicuity of the UA at night, the design of the lights shall allow a person on the ground, to distinguish the UA from a manned aircraft;

(17) if equipped with a follow-me mode and when this function is on, be in a range not exceeding 50 m from the remote pilot, and make it possible for the remote pilot to regain control of the UA;

(18) be placed on the market with a user's manual providing:

(a) the characteristics of the UA including but not limited to the:

— class of the UA;

— UA mass (with a description of the reference configuration) and the maximum take-off mass (MTOM);

— general characteristics of allowed payloads in terms of mass dimensions, interfaces of with the UA and other possible restrictions;

— equipment and software to control the UA remotely;

— reference of the transmission protocol used for the direct remote identification emission;

— sound power level;

— and a description of the behaviour of the UA in case of a loss of data link;

(b) clear operational instructions;

(c) procedure to upload the airspace limitations;

(d) maintenance instructions;

(e) troubleshooting procedures;

(f) operational limitations (including but not limited to meteorological conditions and day/night operations); and

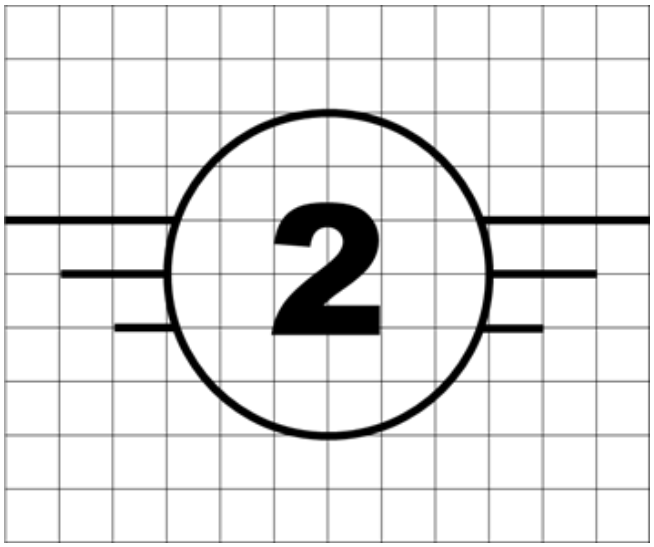
(g) appropriate description of all the risks related to UAS operations;

(19) include an information notice published by EASA providing applicable limitations and obligations under EU law.

PART 3 – Requirements for a class C2 Unmanned aircraft system

Regulation (EU) 2019/945

A class C2 UAS bears the following class identification label on the UA:



A class C2 UAS shall comply with the following:

(1) have an MTOM of less than 4 kg, including payload;

(2) have a maximum attainable height above the take-off point limited to 120 m or be equipped with a system that limits the height above the surface or above the take-off point to 120 m or to a value selectable by the remote pilot. If the value is selectable, clear information about the height of the UA above the surface or take-off point during flight shall be provided to the remote pilot;

(3) be safely controllable with regards to stability, manoeuvrability and data link performance, by a remote pilot with adequate competency as defined in Implementing Regulation (EU) 2019/947 and following the manufacturer's instructions, as necessary under all anticipated operating conditions including following the failure of one or, if appropriate, more systems;

(4) have the requisite mechanical strength including any necessary safety factor and, where appropriate, stability to withstand any stress to which it is subjected to during use without any breakage or deformation that might interfere with its safe flight;

(5) in the case of a tethered UA, have a tensile length of the tether that is less than 50 m and a mechanical strength that is no less than:

(a) for heavier-than-air aircraft, 10 times the weight of the aerodyne at maximum mass;

(b) for lighter-than-air aircraft, 4 times the force exerted by the combination of the maximum static thrust and the aerodynamic force of the maximum allowed wind speed in flight;

(6) be designed and constructed in such a way as to minimise injury to people during operation, sharp edges shall be avoided, unless technically unavoidable under good design and manufacturing practice. If equipped with propellers, it shall be designed in such a way as to limit any injury that may be inflicted by the propeller blades;

(7) unless tethered, in case of a loss of data link, have a reliable and predictable method for the UA to recover the data link or terminate the flight in a way that reduces the effect on third parties in the air or on the ground;

(8) unless tethered, be equipped with a data link protected against unauthorised access to the command and control functions;

(9) unless it is a fixed-wing UA, be equipped with a low-speed mode selectable by the remote pilot and limiting the maximum cruising speed to no more than 3 m/s.

(10) unless it is a fixed-wing UA, have a guaranteed A-weighted sound power level L_{WA} determined as per Part 13 not exceeding the levels established in Part 15;

(11) unless it is a fixed-wing UA, have the indication of the guaranteed A-weighted sound power level affixed on the UA and/or its packaging as per Part 14;

(12) be powered by electricity and have a nominal voltage not exceeding 48 V DC or the equivalent AC voltage; its accessible parts shall not exceed 48 V DC or the equivalent AC voltage; internal voltages shall not exceed 48 V DC or the equivalent AC voltage unless it is ensured that the voltage and current combination generated does not lead to any risk or harmful electric shock even when the UAS is damaged;

(13) have a unique physical serial number compliant with standard ANSI/CTA-2063 Small Unmanned Aerial Systems Serial Numbers;

(14) unless tethered, have a direct remote identification that:

(a) allows the upload of the UAS operator registration number in accordance with Article 14 of Implementing Regulation (EU) 2019/947 and exclusively following the process provided by the registration system;

(b) ensures, in real time during the whole duration of the flight, the direct periodic broadcast from the UA using an open and documented transmission protocol, of the following data, in a way that they can be received directly by existing mobile devices within the broadcasting range:

i the UAS operator registration number;

ii the unique physical serial number of the UA compliant with standard ANSI/CTA-2063;

iii the geographical position of the UA and its height above the surface or take-off point;

iv the route course measured clockwise from true north and ground speed of the UA; and

v the geographical position of the remote pilot;

(c) ensures that the user cannot modify the data mentioned under paragraph (b) points ii, iii, iv and v;

(15) be equipped with a geo-awareness function that provides:

(a) an interface to load and update data containing information on airspace limitations related to UA position and altitude imposed by the geographical zones, as defined by Article 15 of Implementing Regulation (EU) 2019/947, which ensures that the process of loading or updating of this data does not degrade its integrity and validity;

(b) a warning alert to the remote pilot when a potential breach of airspace limitations is detected; and

(c) information to the remote pilot on the UA's status as well as a warning alert when its positioning or navigation cannot ensure the proper functioning of the geo-awareness system;

(16) if the UA has a function that limits its access to certain airspace areas or volumes, this function shall operate in such a manner that it interacts smoothly with the flight control system of the UA without adversely affecting flight safety; in addition, clear information shall be provided to the remote pilot when this function prevents the UA from entering these airspace areas or volumes;

(17) provide the remote pilot with clear warning when the battery of the UA or its control station reaches a low level such that the remote pilot has sufficient time to safely land the UA;

(18) be equipped with lights for the purpose of:

(1) controllability of the UA;

(2) conspicuity of the UA at night, the design of the lights shall allow a person on the ground to distinguish the UA from manned aircraft;

(19) be placed on the market with a user's manual providing:

(a) the characteristics of the UA including but not limited to the:

— class of the UA;

— UA mass (with a description of the reference configuration) and the maximum take-off mass (MTOM);

— general characteristics of allowed payloads in terms of mass dimensions, interfaces with the UA and other possible restrictions;

— equipment and software to control the UA remotely;

— reference of the transmission protocol used for the direct remote identification emission;

— sound power level;

— and a description of the behaviour of the UA in case of a loss of data link;

(b) clear operational instructions;

(c) procedure to upload the airspace limitations;

(d) maintenance instructions;

(e) troubleshooting procedures;

(f) operational limitations (including but not limited to meteorological conditions and day/night operations); and

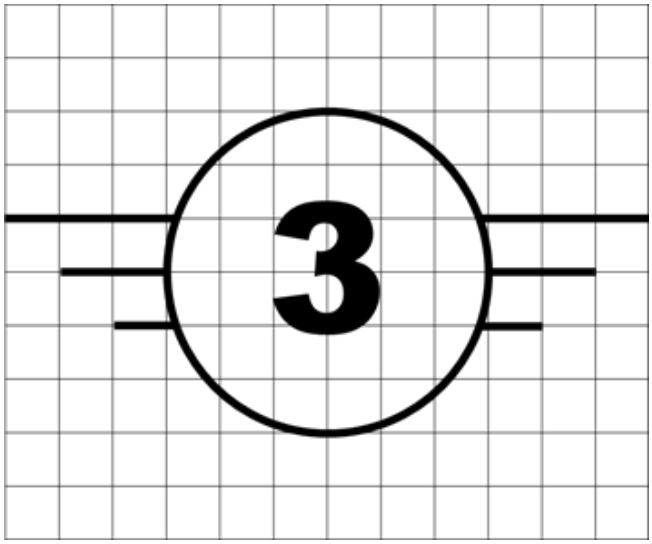
(g) appropriate description of all the risks related to UAS operations;

(20) include an information notice published by EASA with applicable limitations and obligations under EU law.

PART 4 – Requirements for a class C3 Unmanned aircraft system

Regulation (EU) 2019/945

A class C3 UAS bears the following class identification label on the UA:



A class C3 UAS shall comply with the following:

(1) have an MTOM of less than 25 kg, including payload, and have a maximum characteristic dimension of less than 3 m;

(2) have a maximum attainable height above the take-off point limited to 120 m or be equipped with a system that limits the height above the surface or above the take-off point to 120 m or to a value selectable by the remote pilot. If the value is selectable, clear information about the height of the UA above the surface or take-off point during flight shall be provided to the remote pilot;

(3) be safely controllable with regards to stability, manoeuvrability and data link performance, by a pilot with adequate competency as defined in Implementing Regulation (EU) 2019/947 and following the manufacturer's instructions, as necessary under all anticipated operating conditions including following the failure of one or, if appropriate, more systems

(4) in the case of a tethered UA, have a tensile length of the tether that is less than 50 m and a mechanical strength of no less than:

(a) for heavier-than-air aircraft, 10 times the weight of the aerodyne at maximum mass;

(b) for lighter-than-air aircraft, 4 times the force exerted by the combination of the maximum static thrust and the aerodynamic force of the maximum allowed wind speed in flight;

(5) unless tethered, in case of a loss of data link, have a reliable and predictable method for the UA to recover the data link or terminate the flight in a way that reduces the effect on third parties in the air or on the ground;

(6) unless it is a fixed-wing UA, have the indication of the guaranteed A-weighted sound power level L_{WA} determined as per Part 13 affixed on the UA and/or its packaging as per Part 14;

(7) be powered by electricity and have a nominal voltage not exceeding 48 V DC or the equivalent AC voltage; its accessible parts shall not exceed 48 V DC or the equivalent AC voltage; internal voltages shall not exceed 48 V DC or the equivalent AC voltage unless it is ensured that the voltage and current combination generated does not lead to any risk or harmful electric shock even when the UAS is damaged;

(8) have a unique physical serial number compliant with standard ANSI/CTA-2063 Small Unmanned Aerial Systems Serial Numbers;

(9) unless tethered, have a direct remote identification that:

(a) allows the upload of the UAS operator registration number in accordance with Article 14 of Implementing Regulation (EU) 2019/947 and exclusively following the process provided by the registration system;

(b) ensures, in real time during the whole duration of the flight, the direct periodic broadcast from the UA using an open and documented transmission protocol, of the following data, in a way that they can be received directly by existing mobile devices within the broadcasting range:

i the UAS operator registration number;

ii the unique physical serial number of the UA compliant with standard ANSI/CTA-2063;

iii the geographical position of the UA and its height above the surface or take-off point;

iv the route course measured clockwise from true north and ground speed of the UA; and

v the geographical position of the remote pilot;

(c) ensures that the user cannot modify the data mentioned under paragraph (b) points ii, iii, iv and v.

(10) be equipped with a geo-awareness function that provides:

(a) an interface to load and update data containing information on airspace limitations related to UA position and altitude imposed by the geographical zones, as defined by Article 15 of Implementing Regulation (EU) 2019/947, which ensures that the process of loading or updating of this data does not degrade its integrity and validity;

(b) a warning alert to the remote pilot when a potential breach of airspace limitations is detected; and

(c) information to the remote pilot on the UA's status as well as a warning alert when its positioning or navigation cannot ensure the proper functioning of the geo-awareness system;

(11) if the UA has a function that limits its access to certain airspace areas or volumes, this function shall operate in such a manner that it interacts smoothly with the flight control system of the UA without adversely affecting flight safety; in addition, clear information shall be provided to the remote pilot when this function prevents the UA from entering these airspace areas or volumes;

(12) unless tethered, be equipped with a data link protected against unauthorised access to the command and control functions;

(13) provide the remote pilot with clear warning when the battery of the UA or its control station reaches a low level such that the remote pilot has sufficient time to safely land the UA;

(14) be equipped with lights for the purpose of:

(1) controllability of the UA;

(2) conspicuity of the UA at night, the design of the lights shall allow a person on the ground to distinguish the UA from a manned aircraft;

(15) be placed on the market with a user's manual providing:

(a) the characteristics of the UA including but not limited to the:

— class of the UA;

— UA mass (with a description of the reference configuration) and the maximum take-off mass (MTOM);

— general characteristics of allowed payloads in terms of mass dimensions, interfaces with the UA and other possible restrictions;

— equipment and software to control the UA remotely;

— reference of the transmission protocol used for the direct remote identification emission;

— sound power level;

— and a description of the behaviour of the UA in case of a loss of data link);

(b) clear operational instructions;

(c) procedure to upload the airspace limitations;

(d) maintenance instructions;

(e) troubleshooting procedures

(f) operational limitations (including but not limited to meteorological conditions and day/night operations); and

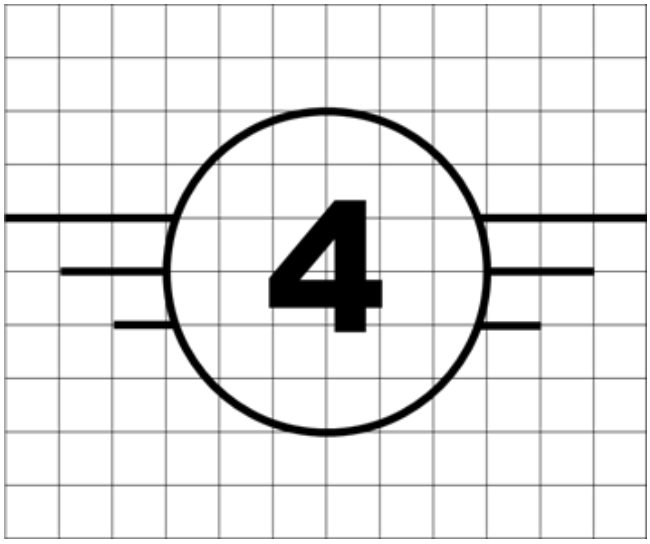
(g) appropriate description of all the risks related to UAS operations;

(16) include an information notice published by EASA providing applicable limitations and obligations under EU law.

PART 5 – Requirements for a class C4 Unmanned aircraft system

Regulation (EU) 2019/945

A class C4 UAS bears the following label on the UA in a visible manner:



A class C4 UAS shall comply with the following:

(1) have an MTOM of less than 25 kg, including payload;

(2) be safely controllable and manoeuvrable by a remote pilot following the manufacturer's instructions, as necessary under all anticipated operating conditions including following the failure of one or, if appropriate, more systems;

(3) not be capable of automatic control modes except for flight stabilisation assistance with no direct effect on the trajectory and lost link assistance provided that a pre-determined fixed position of the flight controls in case of lost link is available;

(4) be placed on the market with a user's manual providing:

(a) the characteristics of the UA including but not limited to the:

— class of the UA

— UA mass (with a description of the reference configuration) and the maximum take-off mass (MTOM);

— general characteristics of allowed payloads in terms of mass dimensions, interfaces with the UA and other possible restrictions;

— equipment and software to control the UA remotely;

— and a description of the behaviour of the UA in case of a loss of data link;

(b) clear operational instructions;

(c) maintenance instructions;

(d) troubleshooting procedures;

(e) operational limitations (including but not limited to meteorological conditions and day/night operations); and

(f) appropriate description of all the risks related to UAS operations;

(5) include an information notice published by EASA providing applicable limitations and obligations under EU law;

PART 6 – Requirements for a direct remote identification add-on

Regulation (EU) 2019/945

A direct remote identification add-on shall comply with the following:

(1) allows the upload of the UAS operator registration number in accordance with Article 14 of Implementing Regulation (EU) 2019/947 and exclusively following the process provided by the registration system;

(2) has a physical serial number compliant with standard ANSI/CTA-2063 Small Unmanned Aerial Systems Serial Numbers, affixed to the add-on and its packaging or its user's manual in a legible manner;

(3) ensures, in real time during the whole duration of the flight, the direct periodic broadcast from the UA using an open and documented transmission protocol, of the following data, in a way that they can be received directly by existing mobile devices within the broadcasting range:

i the UAS operator registration number;

ii the unique physical serial number of the add-on compliant with standard ANSI/CTA-2063;

iii the geographical position of the UA and its height above the surface or take-off point;

iv the route course measured clockwise from true north and ground speed of the UA; and

v the geographical position of the remote pilot or, if not available, the take-off point;

(4) ensures that the user cannot modify the data mentioned under paragraph (3) points ii, iii, iv and v;

(5) is placed on the market with a user's manual providing the reference of the transmission protocol used for the direct remote identification emission and the instruction to:

(a) install the module on the UA;

(b) upload the UAS operator registration number.

PART 7 – Conformity assessment Module A – Internal production control

Regulation (EU) 2019/945

1. Internal production control is the conformity assessment procedure whereby the manufacturer fulfils the obligations set out in points 2, 3 and 4 of this Part, and ensures and declares on their sole responsibility that the products concerned satisfy the requirements set out in Parts 1, 5 or 6 which apply to them.

2. **Technical documentation**

The manufacturer shall develop the technical documentation in accordance with Article 17 of this Regulation.

3. **Manufacturing**

The manufacturer shall take all measures necessary so that the manufacturing process and its monitoring ensure compliance of the manufactured product with the technical documentation referred to in point 2 of this Part and with the requirements set out in Parts 1, 5 or 6 which apply to them.

4. **CE marking and EU declaration of conformity**

(1) In accordance with Articles 15 and 16 of this Regulation, the manufacturer shall affix the CE marking and, when applicable, the UA class identification label, to each individual product that satisfies the applicable requirements set out in Parts 1, 5 or 6 which apply to them.

(2) The manufacturer shall draw up a written EU declaration of conformity for each product model and keep it together with the technical documentation at the disposal of the national authorities for 10 years after the product has been placed on the market. The EU declaration of conformity shall clearly identify the product for which it has been drawn up.

A copy of the EU declaration of conformity shall be made available to the relevant authorities upon request.

5. **Authorised representative**

The manufacturers' obligations set out in point 4 may be fulfilled by an authorised representative, on their behalf and under their responsibility, provided that they are specified in the mandate.

PART 8 – Conformity assessment Modules B and C – EU-type examination and conformity to type based on internal production control as per Annex II to Decision No 768/2008/EC

Regulation (EU) 2019/945

When reference is made to this Part, the conformity assessment procedure shall follow Modules B (EU-type examination) and C (Conformity to type based on internal production control) of this Part.

Module B

EU-type examination

1. EU-type examination is the part of a conformity assessment procedure in which a notified body examines the technical design of the product and verifies and attests that the technical design of the product meets the applicable requirements set out in Parts 1 to 6.

2. EU-type examination shall be carried out by an assessment of the adequacy of the technical design of the product through examination of the technical documentation and supporting evidence referred to in point 3, plus examination of specimens, representative of the production envisaged, of one or more critical parts of the product (combination of production type and design type)

3. The manufacturer shall lodge an application for EU-type examination with a single notified body of his choice.

The application shall include:

(1) the name and address of the manufacturer and, if the application is lodged by the authorised representative, his name and address as well;

(2) a written declaration that the same application has not been lodged with any other notified body;

(3) the technical documentation. The technical documentation shall make it possible to assess the product's conformity with the applicable requirements of this Regulation and shall include an adequate analysis and assessment of the risk(s). The technical documentation shall contain, wherever applicable, the elements set out in Article 17 of this Regulation;

(4) the specimens representative of the production envisaged. The notified body may request further specimens if needed for carrying out the test programme;

(5) the supporting evidence for the adequacy of the technical design solution. This supporting evidence shall mention any documents that have been used, in particular where the relevant harmonised standards and/or technical specifications have not been applied or have not been applied in full;. The supporting evidence shall include, where necessary, the results of tests carried out in accordance with other relevant technical specifications by the appropriate laboratory of the manufacturer or by another testing laboratory on his behalf and under his responsibility.

4. The notified body shall:

For the product:

(1) examine the technical documentation and supporting evidence to assess the adequacy of the product's technical design.

For the specimen(s):

(2) verify that the specimen(s) has (have) been manufactured in conformity with the technical documentation, and identify the elements which have been designed in accordance with the applicable provisions of the relevant harmonised standards and/or technical specifications, as well as the elements which have been designed without applying the relevant provisions of those standards;

(3) carry out appropriate examinations and tests, or have them carried out, to check whether, where the manufacturer has chosen to apply the solutions in the relevant harmonised standards and/or technical specifications, these have been applied correctly;

(4) carry out appropriate examinations and tests, or have them carried out, to check whether, where the solutions in the relevant harmonised standards and/or technical specifications have not been applied, the solutions adopted by the manufacturer meet the corresponding essential requirements of the legislative instrument;

(5) agree with the manufacturer on a location where the examinations and tests will be carried out.

5. The notified body shall draw up an evaluation report that records the activities undertaken in accordance with point 4 and their outcomes. Without prejudice to its obligations as provided in point 8, the notified body shall release the content of this report, in full or in part, only with the agreement of the manufacturer.

6. Where the type meets the requirements of this Regulation, the notified body shall issue an EU-type examination certificate to the manufacturer. This certificate shall contain the name and address of the manufacturer, the conclusions of the examination, the relevant aspects of the requirements covered by the examination, the conditions (if any) for its validity, and the data necessary for the identification of the approved type. The certificate may have one or more annexes attached to it.

   The EU certificate and its annexes shall contain all relevant information to allow the conformity of manufactured products with the examined type to be evaluated and to allow for in service control.

   Where the type does not satisfy the applicable requirements of this Regulation, the notified body shall refuse to issue an EU-type examination certificate and shall inform the applicant accordingly, giving detailed reasons for its refusal.

7. The notified body shall keep itself apprised of any changes in the generally acknowledged state of the art which indicates that the approved type may no longer comply with the applicable requirements of this Regulation, and shall determine whether such changes require further investigation. If so, the notified body shall inform the manufacturer accordingly.

   The manufacturer shall inform the notified body that holds the technical documentation relating to the EU-type examination certificate of all modifications to the approved type that may affect the product's conformity with the essential requirements of this Regulation or the conditions for the certificate's validity. Such modifications shall require additional approval and attached to the original EU-type examination certificate.

8. Each notified body shall inform its notifying authority concerning the EU-type examination certificates and/or any additions thereto which it has issued or withdrawn, and shall, periodically or upon request, make available to its notifying authority the list of certificates and/or any additions thereto refused, suspended or otherwise restricted.

   Each notified body shall inform the other notified bodies concerning the EU-type examination certificates and/or any additions thereto which it has refused, withdrawn, suspended or otherwise restricted, and, upon request, concerning the certificates and/or additions thereto which it has issued.

   The Commission, the Member States and the other notified bodies may, on request, obtain a copy of the EU-type examination certificates and/or additions thereto. On a reasoned request, the Commission and the Member States may obtain a copy of the technical documentation and the results of the examinations carried out by the notified body.

   The notified body shall keep a copy of the EU-type examination certificate, its annexes and additions, as well as the technical file including the documentation submitted by the manufacturer for 10 years after the product has been assessed or until the validity of the certificate expires.

9. The manufacturer shall keep a copy of the EU-type examination certificate, its annexes and additions together with the technical documentation at the disposal of the national authorities for 10 years after the product has been placed on the market.

10. The manufacturer's authorised representative may lodge the application referred to in point 3 and fulfil the obligations set out in points 7 and 9, provided that they are specified in the mandate.

Module C

Conformity to type based on internal production control

1. Conformity to type based on internal production control is the part of a conformity assessment procedure whereby the manufacturer fulfils the obligations laid down in points 2 and 3, and ensures and declares that the products concerned are in conformity with the type described in the EU-type examination certificate and satisfy the applicable requirements of this Regulation.

2. Manufacturing

   The manufacturer shall take all measures necessary so that the manufacturing process and its monitoring ensure conformity of the manufactured product with the approved type described in the EU-type examination certificate and with the applicable requirements set out in Parts 1 to 6.

3. CE marking and EU declaration of conformity

   (1) The manufacturer shall affix the CE marking and, when relevant, the UA class identification label in accordance with Articles 15 and 16 of this Regulation to each product that is in conformity with the type described in the EU-type examination certificate and satisfies the applicable requirements set out in Parts 1 to 6.

   (2) The manufacturer shall draw up a written EU declaration of conformity for each product type and keep it at the disposal of the national authorities for 10 years after the product has been placed on the market. The EU declaration of conformity shall clearly identify the product type for which it has been drawn up.

   A copy of the EU declaration of conformity shall be made available to the relevant authorities upon request.

4. Authorised representative

   The manufacturer's obligations set out in point 3 may be fulfilled by their authorised representative, on their behalf and under their responsibility, provided that this is specified in the mandate.

PART 9 – Conformity assessment Module H – Conformity based on full quality assurance as per Annex II to Decision No 768/2008/EC

Regulation (EU) 2019/945

1. Conformity based on full quality assurance is the conformity assessment procedure whereby the manufacturer fulfils the obligations set out in points 2 and 5, and ensures and declares on his sole responsibility that the product concerned satisfies the applicable requirements set out in Parts 1 to 6.

2. Manufacturing

   The manufacturer shall operate an approved quality system for design, manufacture, final inspection and testing of the product concerned as specified in point 3 and shall be subject to surveillance as specified in point 4.

3. Quality system

   (1) The manufacturer shall lodge an application for the assessment of his quality system with the notified body of their choice, for the product concerned.

The application shall include:

(a) the name and address of the manufacturer and, if the application is lodged by the authorised representative, their name and address as well;

(b) the technical documentation for each type of product intended to be manufactured, containing the elements set out in Part 10 where applicable;

(c) the documentation concerning the quality system;

(d) a written declaration stating that the same application has not been lodged with any other notified body.

(2) The quality system shall ensure compliance of the product with the requirements of this Regulation.

All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic and orderly manner in the form of written policies, procedures and instructions. This quality system documentation shall permit a consistent interpretation of the quality programmes, plans, manuals and records.

The documentation shall, in particular, contain an adequate description of:

(a) the quality objectives and the organisational structure, responsibilities and powers of the management with regard to product design and quality;

(b) the technical design specifications, including standards, that will be applied and, where the relevant harmonised standards will not be applied in full, the means that will be used to ensure that the requirements of this Regulation are met;

(c) the design control and design verification techniques, processes and systematic actions that will be used when designing the products pertaining to the product type covered;

(d) the corresponding manufacturing, quality control and quality assurance techniques, processes and systematic actions that will be used;

(e) the examinations and tests that will be carried out before, during and after manufacture, and the frequency with which they will be carried out;

(f) the quality records, such as inspection reports and test data, calibration data, reports concerning the qualifications or approvals of the personnel concerned, etc.;

(g) the means of monitoring the achievement of the required design and product quality and the effective operation of the quality system.

(3) The notified body shall assess the quality system to determine whether it satisfies the requirements referred to in point 3(2).

It shall presume conformity with those requirements in respect of elements of the quality system that comply with the corresponding specifications of the relevant harmonised standard.

In addition to experience in quality management systems, the auditing team shall have at least one member experienced as an assessor in the relevant product field and product technology concerned, and knowledge of the applicable requirements of this Regulation. The audit shall include an assessment visit on the manufacturer's premises. The auditing team shall review the technical documentation referred to in point 3(1)(b) to verify the

manufacturer's ability to identify the applicable requirements of this Regulation and to carry out the necessary examinations with a view to ensuring the product's compliance with these requirements.

The manufacturer or his authorised representative shall be notified of the decision.

The notification shall contain the conclusions of the audit and the reasoned assessment decision.

(4) The manufacturer shall undertake to fulfil the obligations arising out of the quality system as approved and to maintain it so that it remains adequate and efficient.

The manufacturer shall keep the notified body that has approved the quality system informed of any intended change to the quality system.

(5) The notified body shall evaluate any proposed changes and decide whether the modified quality system will continue to satisfy the requirements referred to in point 3(2) or whether a reassessment is necessary.

The notified body shall notify the manufacturer of its decision. The notification shall contain the conclusions of the examination and the reasoned assessment decision.

4. Surveillance under the responsibility of the notified body

(1) The purpose of surveillance is to make sure that the manufacturer duly fulfils the obligations arising out of the approved quality system.

(2) The manufacturer shall, for assessment purposes, allow the notified body access to the design, manufacture, inspection, testing and storage sites, and shall provide it with all necessary information, in particular:

(a) the quality system documentation;

(b) the quality records as provided for by the design part of the quality system, such as results of analyses, calculations, tests, etc.;

(c) the quality records as provided for by the manufacturing part of the quality system, such as inspection reports and test data, calibration data, reports concerning the qualifications of the personnel, etc.

(3) The notified body shall carry out periodic audits to make sure that the manufacturer maintains and applies the quality system and shall provide the manufacturer with an audit report.

(4) In addition, the notified body may pay unexpected visits to the manufacturer. During such visits, the notified body may, if necessary, carry out UA or UAS tests, or have them carried out, in order to check the proper functioning of the quality system. It shall provide the manufacturer with a visit report and, if tests have been carried out, with a test report.

5. CE marking and EU declaration of conformity

(1) The manufacturer shall affix the CE marking and, when relevant, the UAS class identification label in accordance with Articles 15 and 16 of this Regulation and, under the responsibility of the notified body referred to in point 3(1) of this Part, the latter's identification number to each individual product that satisfies the applicable requirements of this Regulation.

(2) The manufacturer shall draw up a written EU declaration of conformity for each product type and keep it at the disposal of the national authorities for 10 years after the product has been placed on the market. The EU declaration of conformity shall identify the product type for which it has been drawn up.

A copy of the EU declaration of conformity shall be made available to the relevant authorities upon request.

6. The manufacturer shall, for a period ending 10 years after the product has been placed on the market, keep at the disposal of the national authorities:

(1) the technical documentation referred to in point 3(1);

(2) the documentation concerning the quality system referred to in point 3(1);

(3) the change referred to in point 3(5), as approved;

(4) the decisions and reports of the notified body referred to in points 3(5), 4(3) and 4(4).

7. Each notified body shall inform its notifying authority of the quality system approvals issued or withdrawn, and shall, periodically or upon request, make available to its notifying authority the list of the quality system approvals it has refused, suspended or otherwise restricted.

Each notified body shall inform the other notified bodies of the quality system approvals which it has refused, suspended or withdrawn, and, upon request, of quality system approvals which it has issued.

8. Authorised representative

The manufacturer's obligations set out in points 3(1), 3(5), 5 and 6 may be fulfilled by their authorised representative, on their behalf and under their responsibility, provided that this is specified in the mandate.

PART 10 – Contents of the technical documentation

Regulation (EU) 2019/945

The manufacturer shall establish the technical documentation. The documentation shall make it possible to assess the product's conformity to the applicable requirements.

The technical documentation shall, wherever applicable, contain at least the following elements,:

1. a complete description of the product including:

(a) photographs or illustrations showing its external features, markings and internal layout;

(b) the versions of any software or firmware involved in compliance with the requirements set by this Regulation;

(c) user's manual and installation instructions;

2. conceptual design and manufacturing drawings and schemes of components, sub-assemblies, circuits and other relevant similar elements;

3. descriptions and explanations necessary for the understanding of those drawings and schemes and the operation of the product;

4. a list of the harmonised standards applied in full or in part, the references of which have been published in the Official Journal of the European Union, and, where those harmonised standards have not been applied, descriptions of the solutions adopted to meet the essential

requirements set out in Article 4, including a list of other relevant technical specifications applied. In the event of partly applied harmonised standards, the technical documentation shall specify the parts which have been applied;

5. copy of the EU declaration of conformity;

6. where the conformity assessment module in Part 8 has been applied, copy of the EU type examination certificate and its annexes as delivered by the notified body involved;

7. results of design calculations made, examinations carried out, and other relevant similar elements;

8. test reports;

9. copies of the documents that the manufacturer has submitted to the notified body if any involved;

10. the supporting evidence for the adequacy of the technical design solution. This supporting evidence shall mention any documents that have been used, in particular where the relevant harmonised standards and/or technical specifications have not been applied in full. The supporting evidence shall include, where necessary, the results of tests carried out by the appropriate laboratory of the manufacturer, or by another testing laboratory on his behalf and under his responsibility;

11. addresses of places of manufacture and storage.

PART 11 – EU declaration of conformity

Regulation (EU) 2019/945

1. The product (type, batch and serial number)

2. Name and address of the manufacturer or his authorised representative.

3. This declaration of conformity is issued under the sole responsibility of the manufacturer.

4. Object of the declaration *[identification of the product allowing traceability; it may include a colour image of sufficient resolution where necessary for the identification of the products]*.

5. The object of the declaration described above is of class … *[include for UAS the class number as defined by Parts 1 to 5 of this annex]*.

6. The guaranteed sound power level for this UAS equipment is …. dB(A) *[for non fixed-wing UAS classes 1 to 3 only]*

7. The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

   — *[include the reference to this Regulation and the Annex relevant to the class of the product]*;

   — or other Union harmonisation legislation where applicable.

8. References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared. References must be listed with their identification number and version and, where applicable, date of issue.

9. Where applicable, the notified body … *[name, number]* … performed … *[description of intervention]* … and issued the EU-type examination certificate.

10. Where applicable, a description of accessories and components, including software, which allow the unmanned aircraft or unmanned aircraft system to operate as intended and covered by the EU declaration of conformity.

11. Additional information:

Signed for and on behalf of: …

[place and date of issue]:

[name, function] [signature]:

PART 12 – Simplified EU declaration of conformity

Regulation (EU) 2019/945

The simplified EU declaration of conformity referred to in Article 14(3) shall be provided as follows:

— [Name of manufacturer] hereby declares that the UAS [*identification of the UAS: type or serial number]* is of class … … *[include the class number of the product as defined in Parts 1 to 5 of this Annex]* and has a guaranteed sound power level of …. dB(A) *[for non fixed-wing UAS classes 1 to 3 only]*

— and in compliance with Regulations … [list all the Regulations that the product complies with].

— The full EU declaration of conformity is accessible at the following website: [website address]

PART 13 – Noise test code

Regulation (EU) 2019/945

This Part lays down the methods of measurement of airborne noise that shall be used for the determination of the A-weighted sound power levels of UA classes 1, 2 and 3.

It lays down the basic noise emission standard and detailed test code for measuring the sound pressure level on a measurement surface enveloping the source and for calculating the sound power level produced by the source.

1. BASIC NOISE EMISSION STANDARD

   For the determination of the A-weighted sound power level L_{WA} of UA, the basic noise emission standards EN ISO 3744:2010 will be used subject to the following supplements:

2. INSTALLATION AND MOUNTING CONDITIONS

   Test area:

   The UA will be hovering above one reflecting (acoustically hard) plane. The UA shall be located at a sufficient distance from any reflecting wall or ceiling or any reflecting object so that the requirements given in Annex A of EN ISO 3744:2010 are satisfied on the measurement surface.

   Mounting of the noise source:

   The UA shall be hovering 0,5 m above the reflecting plane. The configuration of the UA (propellers, accessories, setting) will be the configuration of the UA as placed on the market.

   Sound measurement surface and microphone array:

   The UA will be completely enclosed in a hemispherical measurement surface as par § 7.2.3 of EN ISO 3744:2010.

The number and position of the microphones is defined by Annex F of EN ISO 3744:2010.

The measurement surface shall have its origin at the point O lying in the ground plane directly below the UA.

3. OPERATING CONDITIONS DURING TEST

The noise tests shall be carried out with the UA being flown in a stable position, laterally and vertically, 0,5 m above the origin of the measurement hemisphere (point (O) under MTOM, and with the battery of the UA fully charged.

If the UA is placed on the market with accessories that can be fitted to it, it will be tested with and without these accessories in all possible UA configurations.

4. CALCULATION OF SURFACE TIME-AVERAGED SOUND PRESSURE LEVEL

The A-weighted surface time-averaged sound pressure level shall be determined at least three times for each UA configuration. If at least two of the determined values do not differ by more than 1 dB, further measurements will not be necessary; otherwise the measurements shall be continued until two values differing by no more than 1 dB are obtained. The surface time-averaged sound pressure level to be used for calculating the sound power level of a UA configuration is the arithmetic mean of the two highest values that do not differ by more than 1 dB.

5. INFORMATION TO BE REPORTED

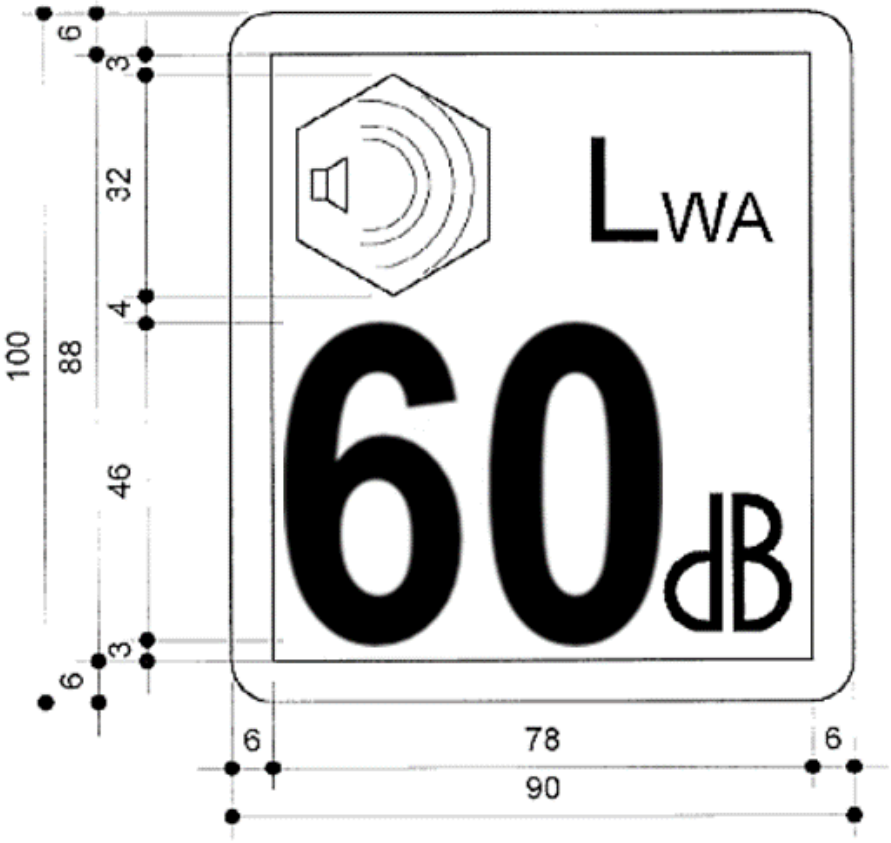
The report shall contain the technical data necessary to identify the source under test as well as the noise test code and the acoustical data.

The A-weighted sound power level value to be reported is the highest value of the different UA configurations tested rounded to the nearest whole number (less than 0,5 use the lower number; greater than or equal to 0,5 use the higher number).

PART 14 – Indication of the guaranteed sound power level

Regulation (EU) 2019/945

The indication of the guaranteed sound power level must consist of the single number of the guaranteed sound power in dB, the sign LWA and a pictogram taking the following form:



If the indication is reduced according to the size of the equipment the proportions given in the above drawing must be respected. However, the vertical dimension of the indication should, if possible, not be less than 20 mm.

PART 15 – Maximum sound power level per class of UA (including transition periods)

Regulation (EU) 2019/945

UA class	MTOM m in gram	Maximum sound power level L_{WA} in dB		
		as from entry into force	as from 2 years after entry into force	as from 4 years after entry into force
C1	250 ≤ m < 900	85	83	81
C2	900 ≤ m < 4 000	$85 + 18{,}5 \lg \frac{m}{900}$	$83 + 18{,}5 \lg \frac{m}{900}$	$81 + 18{,}5 \lg \frac{m}{900}$

Where ‘lg’ is the base 10 logarithm.