



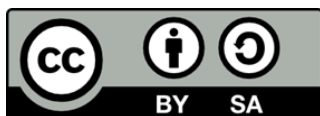
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MODULE 01

TRAINING PROGRAMME

DRONE REGULATION





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1. Objectives of the module

This module covers the information the learner will require to gain a basic understanding of the **relevant UAS regulations** governing the safe operation of drones in Europe. It will identify and describe the relevant **drone categories** (Open, Specific & Certified) to which a particular drone operation relates in accordance with UAS Regulations. Identify **key terminology** used within the UAS regulations with respect to the safe operation of drones in Europe. Finally, it will help to develop an understanding of the types of risk assessment methodologies (**SORA, PDRA**, etc) and mitigation measures that may be employed to ensure drone operations may be carried out safely.

2. Governing body for civil aviation and drone regulations in Europe

The European Union Aviation Safety Agency (**EASA**) is responsible for ensuring civil aviation safety throughout the European Union. Headquarter in Cologne Germany, EASA provides the European Commission with the technical, scientific and administrative support necessary to carry out its aviation safety obligations including those for unmanned aviation.



Figure 5 European Airspace Governance & Designated Bodies

EASA is the primary legal agency responsible for the development of the new ***European Unmanned Aircraft System (UAS) regulatory system*** which has been adopted by the European Commission for the safe operation and use of drones across the EU. The new UAS regulatory framework provides for a ***single European Sky and market unifying standards*** across all member states with respect to drones and drone operations. At a **national level**, the UAS regulations give authority to **designated bodies** who are responsible for the implementation and administration of the UAS regulations within each respective member state.

2.1 Drone Specific Regulations

The UAS regulations have standardised the rules, limitations, permissions and certification for the use of drones and drone operations across Europe. The UAS regulatory framework came into effect on January 1st, 2021, and includes two distinct but interlinked regulations namely:

Regulation 2019/9472 - rules and procedures for the operation of unmanned aircraft. This is referred to as the *implementing regulation* and sets out rules for:

- the **operation of drones** (referring to an unmanned aircraft and the equipment to control it) and for personnel, including remote pilots and organisations involved in such operations.

Regulation 2019/9453 - Unmanned aircraft systems – design and manufacture requirements. The *delegated regulation* covers three main issues:

- the **technical requirements** for drones and for remote identification add-ons;
- the rules for drones, accessories kits and remote add-ons available on the European Union (EU) market;
- the rules for non-EU drone operators conducting drone operations in the single European sky airspace.

2.2 Categories of Drone Operations

The guiding principle of Regulation 2019/947 is that the rules and procedures for a UAS operation should be proportionate to the ***nature and risk of the activity***. The regulations are ***safety centric*** however due to the unique capabilities of UAS, due consideration is also given to the ***potential privacy, security and data protection issues***. There are three categories of drone operations which may be summarised in Figure 2. Refer to Sections 3, 4 & 5 for a more detailed description of each:

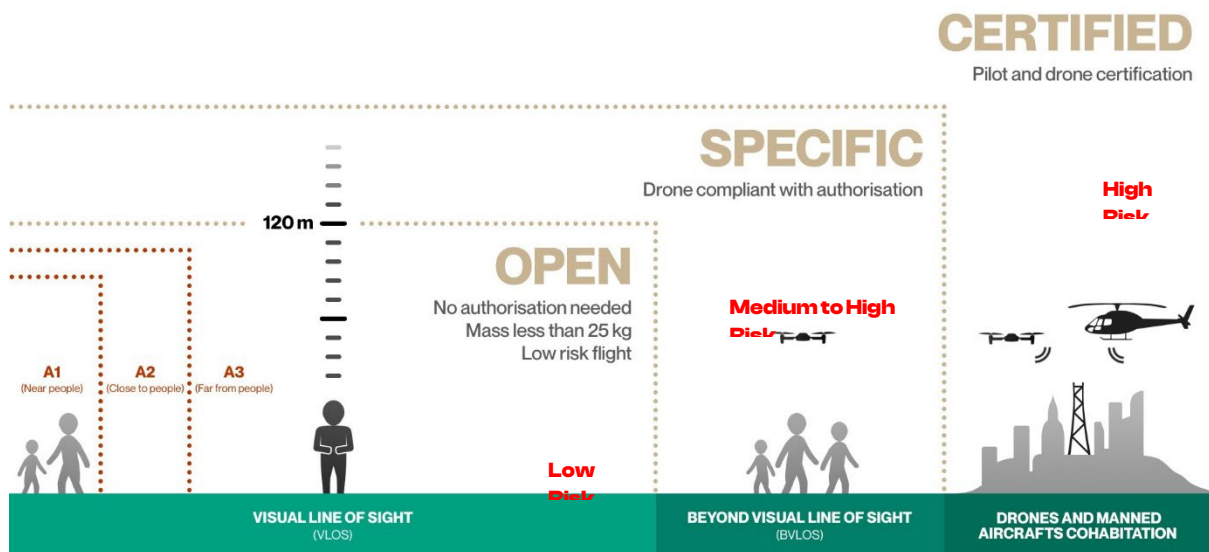


Figure 6 Categories of Drone Operations as per UAS Regulation 2019/947¹

Open Category: These are low risk operations that are characterised by simple rules followed by a sufficiently trained remote pilot. No authorisation from an aviation authority is required, the drone mass must not exceed 25kg and must always be in the visual line of sight (VLOS) of the remote pilot. There are three subcategories within the open category of operation. The A1/A3 subcategory requires basic pilot training in the form of a theoretical exam due to its low risk. Category A2 requires additional training and a theoretical exam as it has a slightly higher risk and allows the UAS to fly closer to people or buildings under controlled circumstances. Refer to section 2.7 for description of training requirements.

Specific Category: These are medium to high risk operations that fall outside of the limitations of the Open Category. Beyond line of sight operations are possible within this category and authorisation to fly from the national designated authority is generally required. When seeking authorisation, a risk assessment for the drone operation must be carried out for review and approval of the designated authority. Remote pilots are required to undertake a more detailed theoretical exam in conjunction with a practical flight examination. Refer to section 2.7 for description of training requirements.

Certified Category: Most complex operation which presents a very high risk similar to manned aviation. The remote pilot requires extensive formal training and licencing. Includes the transport of people and dangerous materials.

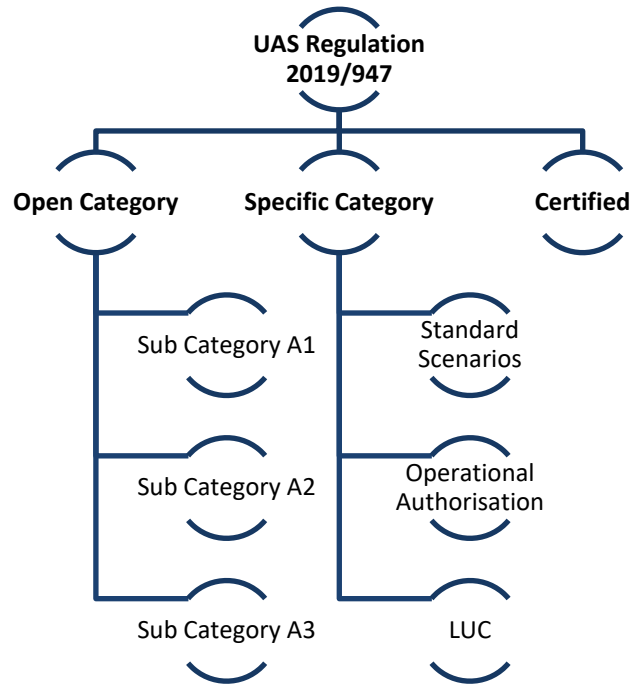


Figure 8 UAS Regulation 2019/947 Framework

2.3 Key terminology for Drone Operations from UAS regulations

Unmanned Aircraft – Any aircraft that is designed to be remotely piloted without a pilot on board or one that that may operate autonomously.

Operation – The action of flying a drone

Drone – Internationally adopted term to refer to unmanned aircraft.

RPA – Remotely piloted aircraft

UAS - Unmanned aircraft system refers to the combination of drone, pilot and any other ancillary equipment involved in the operation.

UAV – Unmanned Aerial Vehicle. A historical term used for drones which has now ***been replaced by UAS in the regulations 2019/945 & 2019/947.***

UAS Operator – may be “***natural person***” (example: recreational pilot or sole trader (commercial)) or a “***legal person***” (example: Public Authority or private company) operating a UAS. This is the ***legal person*** or ***legal entity*** responsible for the drone operation and for ensuring the ***correct insurances*** are in place. A person can be both an operator and remote pilot if it's the same person who flies the UAS.

Remote Pilot – is a “natural person” with responsibility for flying the drone safely in accordance with approved operational manual and or any approved risk assessment and within the parameters of the drone category. Should be suitably qualified and trained for the category of operation.

C Marked Drones - Drones are defined into classes from C0 to C6 which classify parameters such as mass and speed (or joules energy). The UAS regulations clearly identifies which class of drone is permitted for a given drone operation.

Uninvolved Person –are persons who do not participate or are not involved in the UAS operation and do not know the instructions and procedures of the UAS operator. A person is involved if he/she decides to take part in UAS operations and knows the associated risks

Visual Line of Sight VLOS - It is a type of operation in which the remote pilot can maintain continuous visual contact without assistance with his drone. This allows him to control the flight path of it in relation to other aircraft, from people and obstacles, to avoid collisions.

Assembly of people - Is a gathering of people who cannot disperse due to population density. Examples of crowds include: Sports, cultural, religious, or political events, Crowded beaches or Parks Streets, street shops, etc

MTOM – Maximum take-off Mass which includes the weight of drone and any payload

2.4 Registration as a drone operator

The UAS regulations do not make any distinction between commercial (paid professional) or recreational flight (unpaid amateur). The UAS to be used in the drone operation and its proximity to people or buildings is all that matters when assessing:

- the risks,
- any authorisation requirements that may apply and
- or the certification and training that is required.

Whether a public body, private company or sole trader, the enterprise carrying out the drone operations is required to be **designated and registered as the UAS Operator with the national designated authority**. Article 14 – Registration of UAS Operators and certified UAS, of regulation 2019/947², outlines a **requirement for UAS Operators to register themselves**:

1. when operating within the 'open' category, any of the following unmanned aircraft:
 - a. 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**;
 - b. that is **equipped with a sensor** able to capture personal data, unless it complies with Directive 2009/48/EC (Toy).
2. **when operating within the 'specific' category** an unmanned aircraft of any mass.

Registration is typically carried out through online portals operated by the National Designated agencies. Examples include:

1. Ireland - Mys RS (My Safety Regulatory System) [Sign in / Mys RS](#)
2. France - Alpha Tango [Login | AlphaTango \(aviation-civile.gouv.fr\)](#)
3. Germany - LBA [LPLUS Test Studio \(lba-openuav.de\)](#)
4. Spain - AESA [Drone Operator Registration/UAS | AESA](#)
5. Austria - [dronespace.at - the Austro Control drone platform - Registration](#)

2.5 Exemptions from the UAS regulations

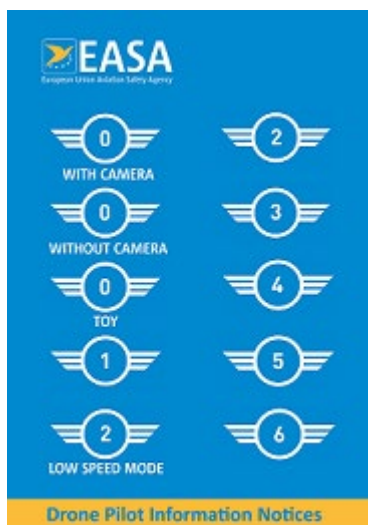
The majority of drone operations whether for commercial or recreational purposes, will **require the ability to record data** of some description (visual, audio, etc) **thereby necessitating registration** as a drone operator with the designated authority.

The **only exception** being for drone operations with a UAS that is **privately built, less than 250g**, has **no sensors** capable of capturing data and **operating within the Open Category**.

For all other drone operations with UAS greater than 250g and or with sensors, the operators (whether legal or natural) need to be registered with the designated national authority.

2.6 Drone classification as per UAS regulations

UAS regulation 2019/945³ specifies new requirements for the design, manufacture and retailing of UAS and has introduced for the first time the concept of class identification (C-Marking). **C-Markings** enables drones to be grouped into classes based on their weight and speed amongst others technical characteristics which will help to clearly identify the type of drone operation a C-marked drone may be used for. The C-marking classification system has a particular focus on the open category of operation to enhance safety where 7 separate classes of drones are identified.



C Marking	Category
C0, C1	Open A1
C2	Open A2
C3, C4	Open A3
C5, C6	Specific Category

Figure 9. ASA UAV C-Markings and Associated Operation Categories

With the recent introduction of the UAS regulations in 2019, up until recently, the C-Marking Acceptable Means of Compliance (AMC) standards document was not available for UAS manufactures and so no C-Marked drones were available on the market. A transition period is in operation therefore where once C-marking is introduced, **drones not designed and manufactured to meet the requirements of 2019/945³** will be referred to as **legacy drones**.

2.7 UAS Drone Operation Training

A1/A3 Drone Operations – Open Category

To conduct drone operations within these categories, **free online A1/A3 national training** must be undertaken. The training is in the form of short online animations, slides and is focused on the theoretical aspects of UAS flight safety and regulations. It **should not be considered as Pilot training**, such skill is only acquired by pilots through the accumulation of flight hours using UAS. Upon completion of the training, a **free online exam** must be undertaken which **contains 40 questions** related to the training material. A **75% pass mark** must be achieved however there are no limits as to the number of times a trainee can take the exam.

While the training is free, some countries such as Ireland have a registration fee (€40 for Ireland) to facilitate registration of drone operators to fly within the A1/A3 category.

A2 Drone Operations – Open Category

To conduct drone operations within the A2 category, trainees must first have completed the A1/A3 training. Following this, **trainee pilots must self-train to fly** (supervised training by an instructor is more advisable but not mandatory) to be able to master the UAV well enough for the requirements set out in the A2 category. It is recommended trainees keep a log of their flying activities (flight log) and place themselves in an A3 scenario, 150m from people and a built-up area, on private land with permission of the owner and outside of any restricted flying areas. Once self-certified, trainees can apply for A2 training with a RTE (recognised training entity) formally a DUTO (Declared UAS training organisation) which involves further theoretical training to the A1/A3 category with three additional subjects. Upon completion of the theoretical training, a **30-question online exam** must be passed and a **75% pass mark** must be achieved. The assessment begins with a declaration of having completed self-pilot training.

Specific Category Training

Specific category training requirements are met through commercial UAS trainers known as RTE (recognised training entity) formally known as DUTO (Declared UAS training organisation). These courses typically contain three components including:

- **Theoretical Course** (Focused on more advanced topics of safety, regulations, flying and risk assessments – PDRA & SORA)
- **Theory Exam** (40 Online Questions)
- **Practical Skill Assessment** (Instructor supervised UAS flying course) with training certificate

The theoretical element of the training is typically delivered over 2 days followed by an online exam. The practical skill assessment is carried out following completion of the exam. A1/A3 training needs to be completed prior to undertaking specific category training.

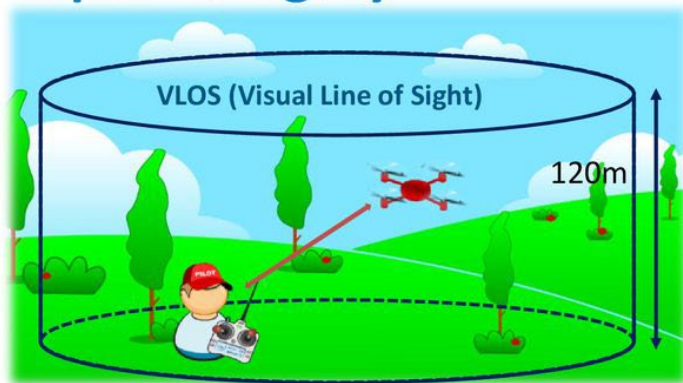
3. Open category

3.1 General definition

Open category operations do not require any authorisation from an aviation authority or declaration by the operator before the flight. These are considered as sufficiently **low risk operations** categorised by simple rules followed by sufficiently competent and trained remote pilots. There are three key subcategories (A1, A2 & A3) within the open category where the mass and type of the UAS and distance from 'uninvolved persons' are explicitly specified. The rules that are common amongst each of the subcategories within the Open Category include:

- Operations are restricted to **visual line of sight (VLOS) only**, beyond line of sight (BLOS) is outside of the scope of these operations.
- The maximum take-off mass (**MTOM**) of the UAS must **be less than 25kg**. Refer to subcategories A1, A2 & A3 for the allowable UAS masses and allowable speeds for each subcategory.
- The UAS must be maintained within a **120m altitude** from the closest point on the Earth's surface.
- The UAS must be maintained at a **minimum horizontal distance** from an uninvolved person. Refer to subcategories A1, A2 & A3 for further details.

Open category



- MTOM < 25 Kg
- Remote pilot minimum age 16, unless supervised (it may be reduced to 12, no minimum age for toys)
- No carriage of dangerous goods
- No dropping of material
- No autonomous operations

➤ Additional limitations based on operational subcategory:

- [A1 fly over people](#)
- [A2 fly close to people](#)
- [A3 fly far from people](#)

Privately built with MTOM<250g



Privately built with MTOM<25kg



Figure 10 Open Category - Common Restrictions within the Open Category Subcategory

- The *minimum age* for the operation of drones is *16 years*. A member state may lower the remote pilot age to as young as 12 years where supervision is present. The lowered age limit will only be applicable in that state.
- No dropping of objects from the drone

- No transport of dangerous objects

The rules and restrictions for safe aviation within subcategories A1, A2 & A3 of the Open Category may be summarised in the following table.

Table 1 Open Category Limitations and Training Requirements

Drone Category	Drone Type/C Mark	Distance from Uninvolved Persons	Pilot Training Competency	Flight over assemblies of People	Operating Airspace	Operating Area
A1	Private Built <250g <19m/s 'legacy' (placed on market before 01 Jan 2024) <250g (Article 20 Operations) C0** C1**	Fly Overhead Fly Overhead Fly Overhead No Intentional Flight Overhead People	Read User Manual Read User Manual Read User Manual A1/A3 Proof of Online Training Certificate A1/A3 Proof of Online Training Certificate	Not Permitted	Uncontrolled Airspace Controlled Airspace within Height Restriction Zones. Some Restricted or Prohibited Geographic Zones with Permission from the Controlling Authority (e.g., Prison Service)	Populated & Sparsely Populated
A1 Transition Period	'legacy' <500g* (Article 22 Operations)					
A2	C2**	30m Horizontally 5m with Low-Speed Mode	Open A2 Certificate of Competency	Not Permitted	Uncontrolled Airspace Controlled Airspace within Height Restriction Zones. Some Restricted or Prohibited Geographic Zones with Permission from the Controlling Authority (e.g., Prison)	Populated & Sparsely Populated
A2 Transition Period	'legacy' 500g to <2kg* (Article 22 Operations)	50m Horizontally	Open A2 Certificate of Competency			

A3	Private Built 250g to <25kg C3* & C4* 'legacy' (placed on market before 01 Jan 2023) 250g to <25kg** (Article 20 Operations)	No uninvolved persons in the flight area No uninvolved persons in the flight area No uninvolved persons in the flight area	A1/A3 Proof of Online Training Certificate A1/A3 Proof of Online Training Certificate A1/A3 Proof of Online Training Certificate	Not Permitted	Uncontrolled Airspace Controlled Airspace within Height Restriction Zones. Some Restricted or Prohibited Geographic Zones with Permission from the Controlling Authority (e.g., Prison	Flight area 150m horizontally from Residential, Commercial, Industrial & Recreational areas.
A3 Transition Period	'legacy' to <25kg (Article 22 Operations)					

**From 01 Jan 2024 the Transition Period ends, and 'legacy' unmanned aircraft placed on the market before 01 Jan 2024 weighing 250g or greater are restricted to A3 Subcategory only (Article 20 Operations). **C Class unmanned aircraft may not be available on the market until late 2023 or after⁵*

3.2 Open category transition period to C-marked drones

Starting from **1 January 2024** operations in the open category must be conducted either with a drone bearing a **C0 to C4 class identification** label, or being privately built or even without class identification label but only if purchased before 31 December 2023. Drone pilots will be able to operate them as described in the menu below. Be aware that 'privately built' means that you built the drone for your own personal use; it does not refer to UAS assembled from sets of parts placed on the market as a single, ready-to-assemble kit.

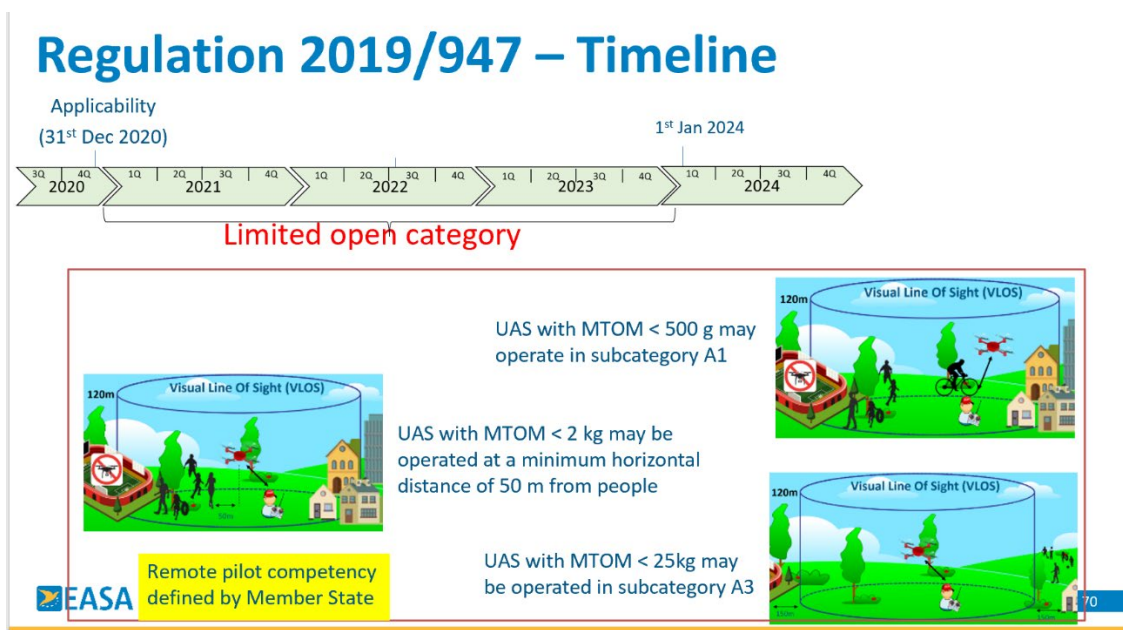


Figure 11 EASA Regulation Timeline

After 1 January 2024, if you have purchased a drone before that date without a class identification label, you will still be able to fly it in subcategory A1 if it weighs up to 250g or in subcategory A3 if it weighs is up to 25kg.

3.3 Subcategory A1 – fly over people

The A1 subcategory within the Open Category of Drone operations is identified as being very low risk of harm to *'uninvolved persons'* due to the very low weight of unmanned aircraft permitted for use in the subcategory. The operating area for this subcategory may be defined as sparsely populated areas in uncontrolled airspace or controlled airspace with height restrictions. Refer to **Table 1** for the **operating conditions, remote pilot training requirements** and **drone classes** permissible for use in the Open Category.

Drone certified CO or C1.

Register on the local authority website and take the online training course, followed by the A1/A3 test - very easy.

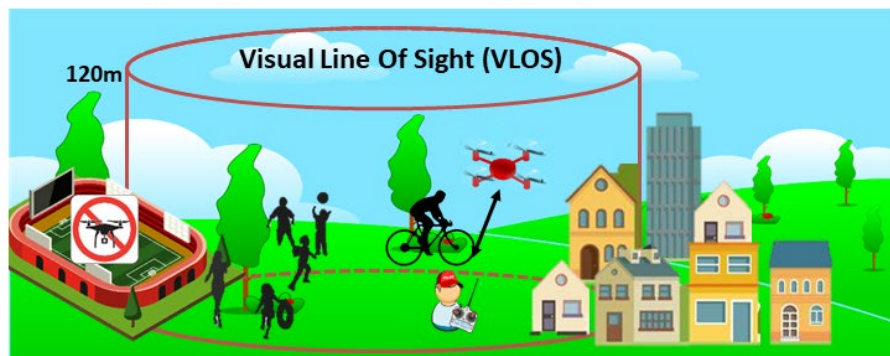
Subscribe drone insurance.

Always carry all 3 documents (drone certification, A1/A3 certificate, insurance).

It is still forbidden to fly over gatherings of people (concerts, events, fairs... even on private land and even with the authorization of the owner or organizer).

It is possible to fly over people who are not involved, but "reasonably", cautiously, and not permanently.

Open category - Subcategory A1



- **No fly over assembly of people**
- reasonably expect that no uninvolved person is overflown. In case of unexpected overfly over uninvolved persons, the remote pilot shall reduce as much as possible the time during which the unmanned aircraft overflies those persons

Figure 12 Open SubCategory A1

3.4 Open category A2 – fly close to people

The A2 subcategory within the Open Category of Drone operations permits use of larger and more sophisticated UAS. Risk to uninvolved persons or assemblies of people is managed through specified minimum horizontal distances that the remote pilots must maintain. There is also an additional competency standard and training (A2 Category Training) that the remote pilot must achieve in comparison to operations within the A1 & A3 subcategories. Refer to **Table 1** for the **operating conditions, remote pilot training requirements** and **drone classes** permissible for use in the Open Category.

C2-certified drone.

Take a more comprehensive A2 theory course, or train on your own, then take the online test with the national agency; gain flight experience, logging your flights as A3 (or A1), and get listed as A1/A2/A3. Together, they form the A2 open-category qualification for drone pilots.

Subscribe drone insurance.

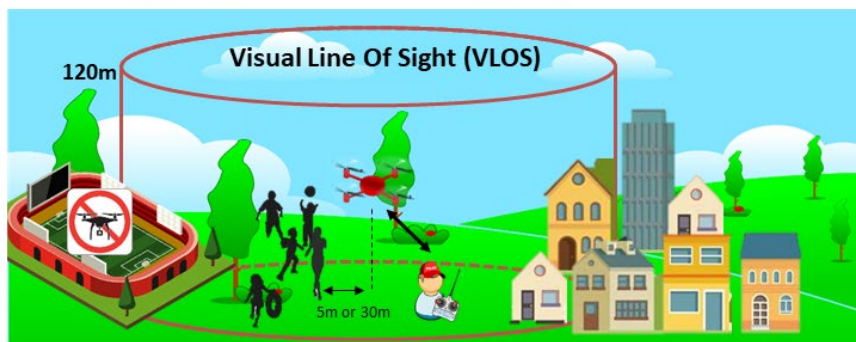
Always carry all 3 documents (drone certification, A1/A2/A3 certificate, insurance).

It is still forbidden to fly over gatherings of people (concerts, demonstrations, fairs... even on private land and even with the authorization of the owner or organizer).

You can get as close as 30m to people, and even as close as 5m if you engage the "slow speed 3m/s" mode.

This category is ideal for photogrammetry, lidar and surveys, as C2 drones weigh up to 4kg and can fly close to buildings, with the owner(s)' authorization.

Open category - Subcategory A2



- **No fly over uninvolved people**
- UAS at a horizontal distance of at least 30 metres from uninvolved persons, or up to a of 5 metres when low speed mode function is activated

Figure 13 Open SubCategory - A2

3.5 Open category A3 – fly far from people

The A3 subcategory of the Open Category of Drone operations is considered as low risk as it permits large and heavy unmanned aircraft (up to 25kg) to be flown in flight areas that over 150m from residential, commercial, industrial, and recreational areas. Flying operations are restricted to uncontrolled airspace or controlled airspace with height restrictions. Risk to an uninvolved person is effectively eliminated by the requirement to have no uninvolved person in the flight area. Refer to **Table 1** for the **operating conditions, remote pilot training requirements and drone classes** permissible for use in the Open Category.

Drone certified C0 to C4

Register on the national website and take the online training course, followed by the A1/A3 test - very easy.

Subscribe drone insurance.

Always carry all 3 documents (drone certification, A1/A3 certificate, insurance).

Open category - Subcategory A3

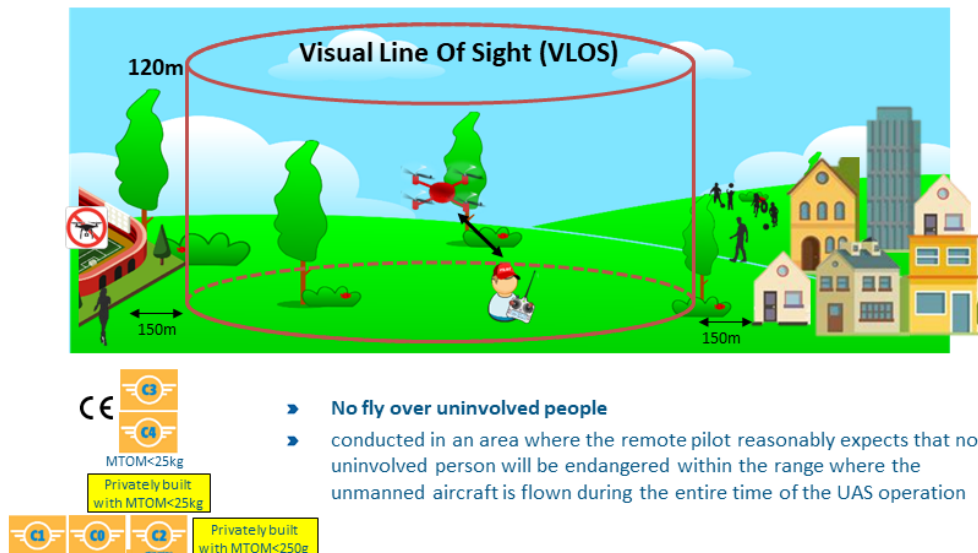


Figure 14 Open subcategory A3

3.6 Summary of Open Category

For the Open category UAS operations, it can be convenient to summarise the restrictions/limitations of such operations based on:

- UAS Max Weight – See Table 2 (page 18)
- UAS C-Marking Class – See Table 3 (page 19)

3.7 Basic rules for Professional use in the Open Category

The drone operator must be suitably insured. Regulation (EU) 2019/947² requires UAS Operators comply with applicable European Union or national rules relating to aircraft insurance. Regulation (EC) 785/2004⁶ on insurance requirements for air carriers and aircraft operators, requires aircraft operators, including unmanned aircraft operators, have a minimum of 3rd party liability insurance. The insurance regulation sets a minimum value for insurance based on the unmanned aircraft's maximum take-off weight. This minimum value is approximately €1m for the lowest weight covered (500kgs). An operations manual must also be in place to clearly identify the company policy necessary for safety procedures and maintenance.

Unless purchased before 12/31/2023, a C mark drone is required for professional use. Class definitions are based mainly on weight, and manufacturers are responsible for certification.






WHAT TYPE OF DRONE CAN I FLY?						
Operation			Drone Operator / pilot			
C-Class	Max Take off mass	Subcategory	Operational restrictions	Drone Operator registration?	Remote pilot qualifications	Remote pilot minimum age
Privately build	<250g 	A1 Not over assemblies of people (can also fly in subcategory A3)	Operational restrictions on the drone's use apply (follow the QR code below)	Yes No if toy or not fitted with camera/sensor 	Read user's manual	No minimum age (certain conditions apply)
legacy < 250g C0						
C1	<900g 	A2 Fly close to people (can also fly in subcategory A3)		Yes	Check out the QR code below for the necessary qualifications to fly these drones	16
C2	<4kg 					
C3	<25kg					
C4		A3 Fly far from people				
Privately build Legacy drones (art 20)						



Figure 15 Simplified presentation of C-marking

Table 2 Open Category UAS C-Marking¹

UAS		Operation		Drone Operator/pilot		
Class	MTOM	Subcategory	Operational restrictions	Drone Operator registration	Remote pilot competence	Remote pilot minimum age
Privately built	< 250 g	A1 (can also fly in subcategory A3)	<ul style="list-style-type: none"> - may fly over uninvolved people (should be avoided when possible) - no fly over assemblies of people 	No, unless camera / sensor on board and a drone is not a toy	- no training needed	No minimum age
0					- read user's manual	16*, no minimum age if drone is a toy
Legacy drones (art. 20)						16*
1	< 900 g		<ul style="list-style-type: none"> - No expected fly over uninvolved people (if happens, should be reduced) - no fly over assemblies of people 	Yes	<ul style="list-style-type: none"> - read user's manual - complete online training - pass online theoretical exam 	16*
2	< 4 kg	A2 (can also fly in subcategory A3)	<ul style="list-style-type: none"> - no fly over uninvolved people - keep horizontal distance of 30 m from uninvolved people (it can be reduced to 5 m if low speed function is activated) 	Yes	<ul style="list-style-type: none"> - read user's manual - complete online training - pass online theoretical exam - conduct and declare a self-practical training - pass a written exam at the CAA (or at recognized entity) 	16*
3	< 25 kg	A3	<ul style="list-style-type: none"> - fly away from people - fly outside of urban area (150 m distance) 	Yes	<ul style="list-style-type: none"> - read user's manual - complete online training - pass online theoretical exam 	16*
4						
Privately built Legacy drones (art. 20)						

4. Specific category

4.1 General definition

The **Specific Category** of operations as defined by EASA specifies UAS operations that fall outside of the operational limitations of the Open Category previously described in section 3. Operations under the Specific Category typically **require operational autorisation** from the **national designated body (NDB)** in the EU member state where the operation is taking place (see section two for examples of NDB in Europe). The Specific Category caters for UAS operations where the risks may be considered as medium to high risk operations.

To acquire operational authorisation to fly under this category, a risk assessment and operation manual is required that will outline in detail the operational procedures to be undertaken. Nationally, both public and private sector companies will require to be registered with the aviation authority in order to operate in this category; this also applies to all remote pilots as does the requirement to have Specific Category training.

Registration is based on a specific person/entity rather than the UAS itself and needs to be done in operator`s country.

Here are some examples of UAS operations under Specific Category:

- Operation where pilots that are unable to see the UAS for part of for whole time of operation – this is defined as **Beyond Visual Line of Sight operation** or in short **BVLOS**.
- Operations including **dropping payloads**.
- Operations involving **UAS** that are **25kg or more**.
- Operations in **controlled or geographical zones not permitted for Open category**.
- Operation where **maximum altitude exceeds 120m** from the closest point to ground surface.
- For **operations in built up and densely populated areas**.

Geographical Zones definition relates to an area where there is an authorisation required and issued by authority in charge of that zone. This is independent of category of operations. Example of this scenario could be UAS service providers operating in prison protected zone.

4.2 Operation authorisation under specific category

Authorisation is required to operate under the Specific Category according to *Article 11 of 2019/947² Regulations which outlines the “Rules for conducting an operational risk assessment”*.

Criteria for risk assessments as identified in Article 11 includes the requirement to:

Define the operation - operator needs to describe the type of the operation that will be conducted, including safety objectives but also the environment for the operation. It is also required to identify the operation lead together with their level of competency.

Safety Assessment – operator needs to identify all possible risks on the ground and in the air. Additionally, it is crucial to propose all operational and technical risk mitigations strategies. The latter step is to assure highest possible safety levels of operations.

According to EASA there are **four possible scenarios** for operation within Specific Category

1. No authorisation required – (**STS**) – European Standard Operating Scenario – **applicable for C-Marked drones only**, highly prescriptive, operator is only required to declare intention to adopt STS to Aviation Authority rather than seek authorisation (limited to 120m in height). See section 4.3 for more detail
2. Authorisation required with Predefined Risk Assessment – **PDRA**
3. Authorisation without PDRA using Specific Operations Risk Assessment - **SORA**
4. Obtaining **LUC**– Light UAS operator certificate

4.3 Standard scenarios

Qualification: to fly in STS, you need to pass a more advanced theoretical exam than the A2 open category, online, the validity of which is supplemented by practical training at a certified centre.

Drone: only C5 and C6-certified drones can fly in STS, featuring remote engine cut-off and remote parachute release in addition to the other markings.

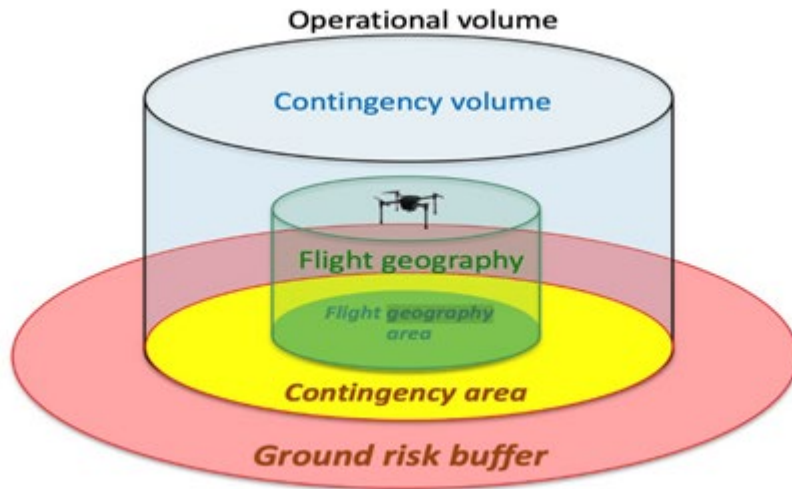
Declaration: it is necessary to submit a declaration to the national aviation authority (specific to each EU country) stating that the operator will carry out the operation in accordance with STS requirements, at a specific location. The authority does not send an explicit authorization, only an acknowledgement of reception if the application is complete.

STS 01- Visual Line of Sight (VLOS) over ground area in populated environment

As noted in section 4.2, STS are highly prescriptive pre-defined scenarios described in Appendix 1 to Regulation 2019/947 that allow UAS pilots to operate once the conditions of the STS are fulfilled. Additionally, there is a requirement to submit a declaration to National Aviation Authority (specific for each EU country) that the operator will carry out the operation in line with the requirements of the STS.

- Operation needs to be conducted within **Visual line of sight VLOS**
- UAS need to be **class C5** - UAS class requirements are defined in the annex to Commission Delegated Regulation (EU) 2019/945.
- Maximum speed 5m/s relative to the ground
- Maximum altitude of 120m, including in urban areas, except if flying over an obstacle over 105m high at a distance of less than 50m: up to 15m above the obstacle (agreement required from the owner or person in charge of the obstacle). If flying in CTR (around airports): 50m
- The operator must ensure that no uninvolved persons are present in the **controlled area** on the ground, marked out against intrusion, as shown below. This area comprises a part reserved for flight, **flight geography**, then a 10m **contingency zone** (in which emergency procedures are triggered), and around it a "buffer" zone, **ground risk buffer**, where the drone is likely to land once the emergency procedure has been triggered.

Maximum height above ground	Minimum distance to be covered by the ground risk buffer for untethered unmanned aircraft	
	with an MTOM up to 10 kg	with an MTOM above 10 kg
30 m	10 m	20 m
60 m	15 m	30 m
90 m	20 m	45 m
120 m	25 m	60 m



- Involved Person: has been briefed on the drone operations in progress and the safety precautions to be taken, and has given his or her explicit agreement (this does not have to be in writing, but can be used as proof of agreement).

Operational Declaration

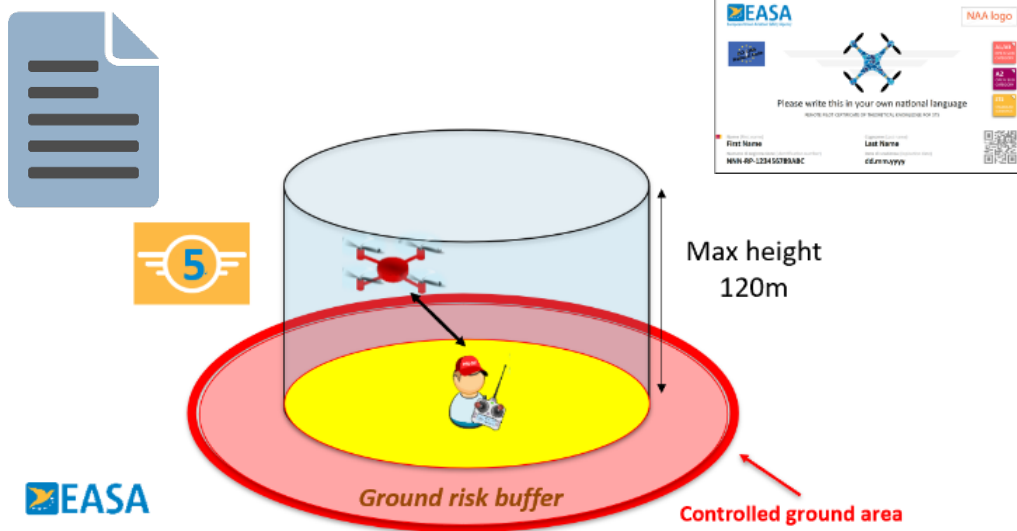


Figure 16 European Standard Scenario STS-01

STS 02 – Beyond Visual Line Of Sight (BVLOS) over ground area in populated environment

Similar to STS-01, STS-02 is a highly prescriptive pre-defined scenario described in Appendix 1 to Regulation 2019/947². The rules outlining the safe operation in this category of operation include:

- **Beyond Visual line of sight** (BVLOS) up to 1km distance from the operator or 2km if airspace observer (person who assists the remote pilot aiding the operation in scanning airspace within which operation is carried out) is used.
- **Max altitude 120m** (not in urban environment) or 50m in CTR
- UAS needs to be **class C6** - UAS class requirements are defined in the annex to Commission Delegated Regulation (EU) 2019/945.
- Same as for STS-01; ensure no uninvolved persons are present in the controlled ground area.

Operational Declaration

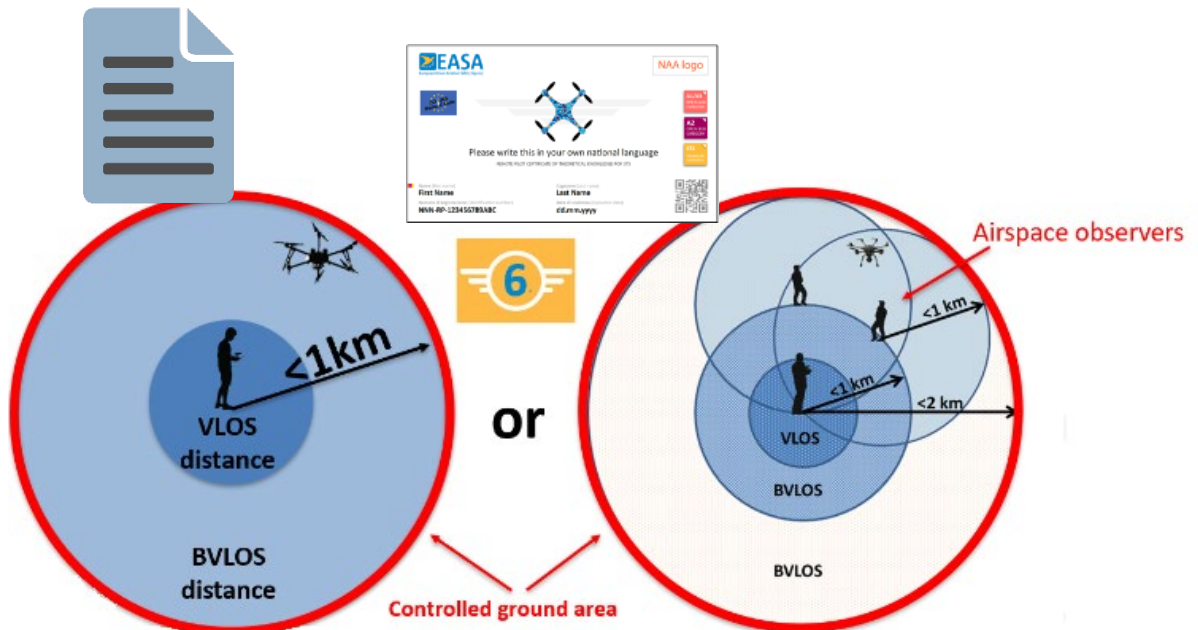


Figure 17 European Standard Scenario STS-02

Both scenarios are presented in detail in Appendix 1 Chapter 1 (STS 01) and Chapter 2 (STS 02) to Regulation (EU) 2019/947. The regulation should be used to check the full list of requirements in order to ensure compliance to operations under STS scenarios.

4.4 PreDefined Risk Assessment – PDRA

PDRA (Predefined Risk Assessment) is an operational scenario for which EASA has already carried out the risk assessment and has been published as an acceptable means of compliance (AMC) to the Article 11 (risk assessment) of Regulation (EU) 2019/947². It is intended that these scenarios are for more common types of operation. For a UAS operator to use a PDRA, the operator needs to check if the planned operation is fully covered by the criteria listed in one of 5 published PDRA scenarios which include:

- **PDRA S-01** – "mirror" of the STS01 without a C5 marked drone
- **PDRA S-02** – "mirror" of the STS02 without a C6 marked drone
- **PDRA G-01** – BVLOS long range ops
- **PDRA G-02** – BVLOS in reserved airspace
- **PDRA G-03** – BVLOS under 30m in populated areas

Once one of the above options is applicable, the operator needs to fill:

- a) PDRA table/checklist together with
- b) application form and
- c) Operator`s manual submitted to NAA.

PDRA S-01 - Equivalent to STS-01 for drones without C5 marking (AMC4 /Article 11/Regulation 2019/947)

- UAS do not need to be marked as Class C5
- Visual line of Sight operations- VLOS
- Below 120m or 150m (also in urban environment)
- UAS meeting technical requirements defined in the PDRA
- Ensure no uninvolved persons are present in the controlled ground area.

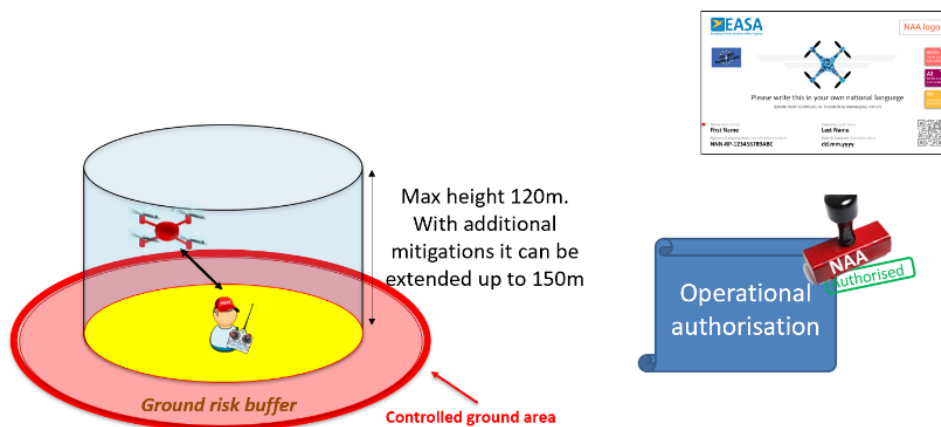


Figure 18 PDRA - S-01

PDRA S-02 - Equivalent to STS-02 for drones without C6 marking (AMC5 /Article 11/Regulation 2019/947)

- UAS do not need to be marked as Class C6
- Beyond Visual line of Sight operations- BVLOS
- Below 120m or 150m (not in urban environment)
- UAS meeting technical requirements defined in the PDRA
- Ensure no uninvolved persons are present in the controlled ground area.

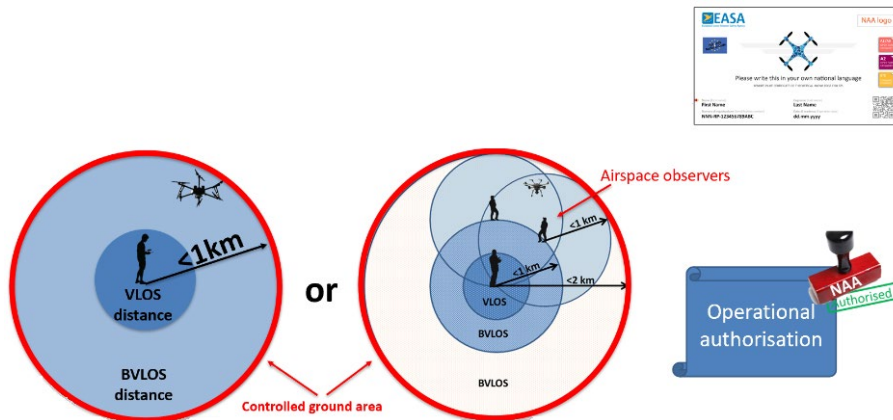


Figure 19 PDRA S-02

PDRA G-01 – BVLOS, long range (AMC2 /Article 11/Regulation 2019/947)

- Beyond Visual line of Sight operations- BVLOS
- Uncontrolled airspace below 120m or 150m (over sparsely populated area)
- With UAS max. dimensions <3m, meeting the technical requirements defined in the PDRA
- Several observers can be used for long range operations, but only one pilot and no pilot relay
- Surveillance, long range cargo ops

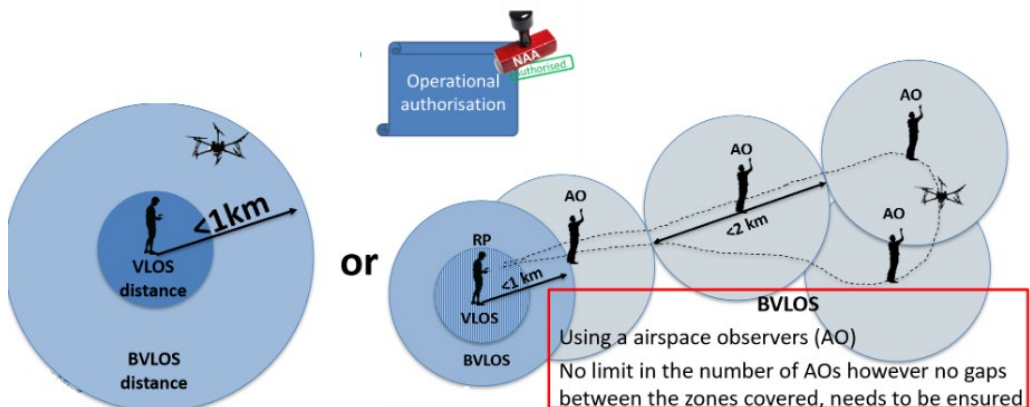


Figure 20 PDRA G-01

PDRA G-02 - BVLOS in reserved airspace (AMC3 /Article 11/Regulation 2019/947)

- Beyond Visual line of Sight operations- BVLOS in the range of the direct C2 link (radio line of sight)
- In reserved/segregated airspace over sparsely populated area
- With a UAS max dimensions <3m, meeting the technical requirements defined in the PDRA
- Agricultural works, short range cargo ops

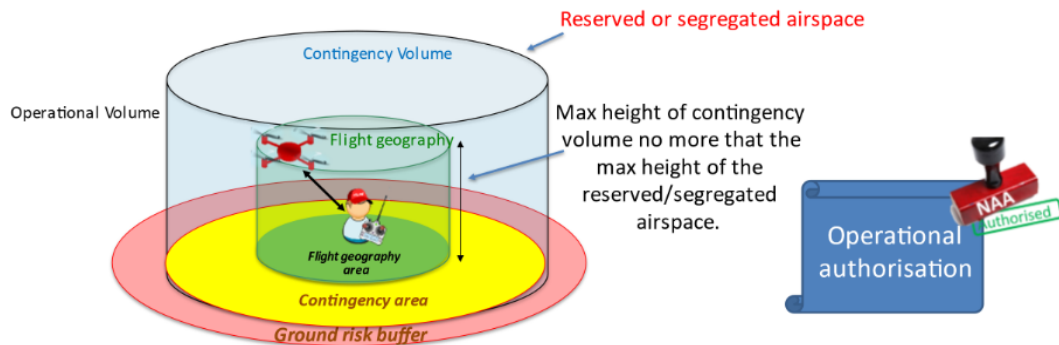


Figure 21 PDRA G-02

PDRA G-03- BVLOS below 30m in populated areas (AMC6 /Article 11/Regulation 2019/947)

- Beyond Visual line of Sight operations- BVLOS in the range of the direct C2 link (radio line of sight)
- Controlled or uncontrolled airspace,
- Below 30m or close to obstacles over sparsely populated area
- With a UAS max dimensions <3m, meeting the technical requirements defined in the PDRA
- Linear inspections, agricultural works

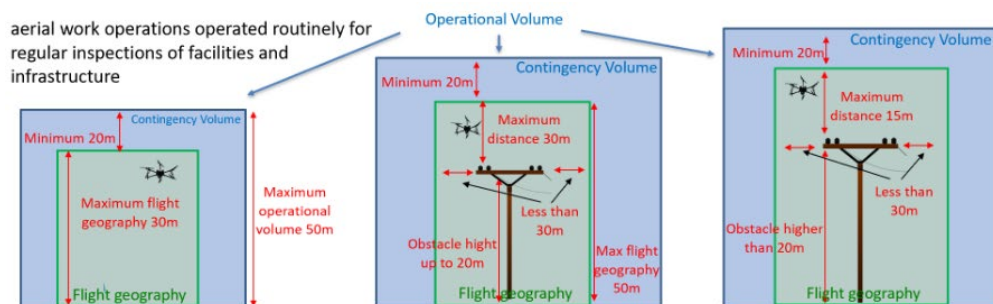


Figure 22 PDRA G-03

4.5 Specific Operations Risk Assessment – SORA

When considering the less common scenarios where the UAS operation is not sufficiently covered or applicable to the STS or PDRA criteria, the operator is required to take a number of steps:

- Conduct a risk assessment.
- Recognise mitigations.
- Align with safety objectives.

The risk assessment mentioned and designed for such purpose is called a SORA (Specific Operations Risk Assessment). The methodology comprises of 10 steps and focuses on classification of the risk during UAS operation (for specific category), definition of the mitigation and meeting safety objectives. It is also crucial to include the technical requirements for the drone and as part of an operator manual to develop appropriate operational procedures.

The 10 Steps of SORA

As previously mentioned, SORA focuses on evaluation of specific ground and air risk.

Table 3 General Types of for Ground and Air Risks¹

Type of Risk	Ground Risk	Air Risk (risks in airspace)
Influencing factors	<ul style="list-style-type: none"> - the population density - the type of operation - VLOS; or BVLOS - the drone's size - the mitigations applied 	<ul style="list-style-type: none"> - the density of manned air traffic in the airspace - the mitigations applied

Table 3 presents general types for air and ground risks to be considered when taking SORA approach.

In practice EASA presents a 10 steps methodology presented below in Figure 18 **Erreur!**
Source du renvoi introuvable.

SORA methodology- 10 Steps

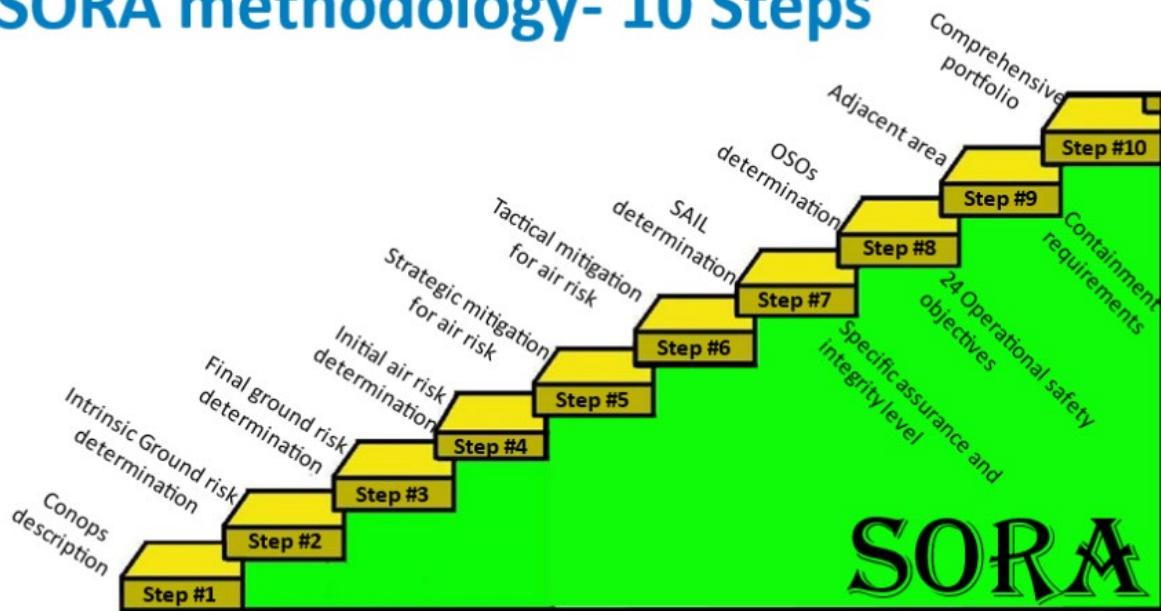


Figure 23 SORA Methodology

Step #1 ConOps (Concept of Definitions) Description – this phase is to define and provide operation scenario for UAS mission.

- Accurate mission description,
- Operators' safety.

Amongst others, the main content of ConOps is the information regarding:

- Organisations (safety, design and production, training, maintenance, crew etc.),
- Operations (type of, strategies, operation procedures, contingencies, reporting, limits and ERP (Emergency Response Plan),
- Remote Crew training,
- UAS description,
- UAS Control Segment (navigation, autopilot, flight control systems etc.).

A more detailed template can be found in **Annex A to AMC1 to Article 11 of Regulation (EU) 2019/947²**

Step #2 Determination of the intrinsic UAS ground risk class (GRC) – this risk type defines and is related to a person being hit by an UAS. Based on maximum UA (unmanned Aircraft) characteristic such as wingspan or blade diameter etc., intrinsic GRC is establish.

Following that operator needs to determine:

- The operation volume (Operational Volume Figure 24),
- If it is a controlled ground area.
- Ground risk buffer with at least 1:1 rule (i.e. If UA is to be operating at 120m altitude, the ground risk buffer is to be 120m), or for UA rotary wing ballistic methodology is applied.

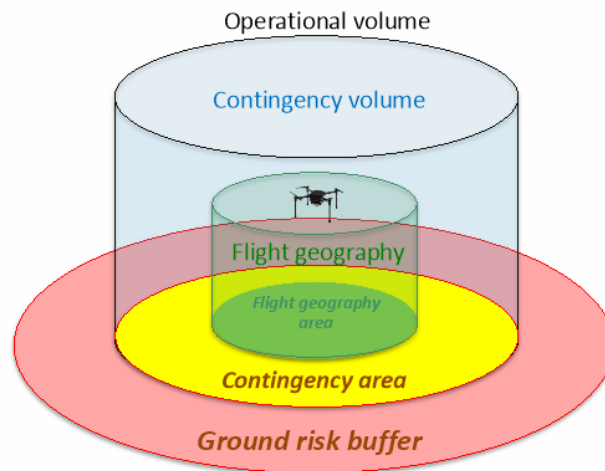


Figure 24 Operational Volume

For details, please see the table 2 in AMC1 Article 11 Rules for conducting an operational risk assessment defines Intrinsic UAS ground risk class.

Step #3 Final GRC determination – this final step is focused on mitigation for ground risk.

For more details, please see table 3 in AMC1 Article 11 Rules for conducting an operational risk assessment defines Intrinsic UAS ground risk class.

Step #4 Determination of the initial UAS air risk class (ARC) – in determining this step operator has two options:

Option 1 – Provision of map the airspace collision risks using airspace characterisation studies (i.e. ANSP or U-Space). Operator uses these to define ARC

Option 2 – No maps provided – operator uses figure below:

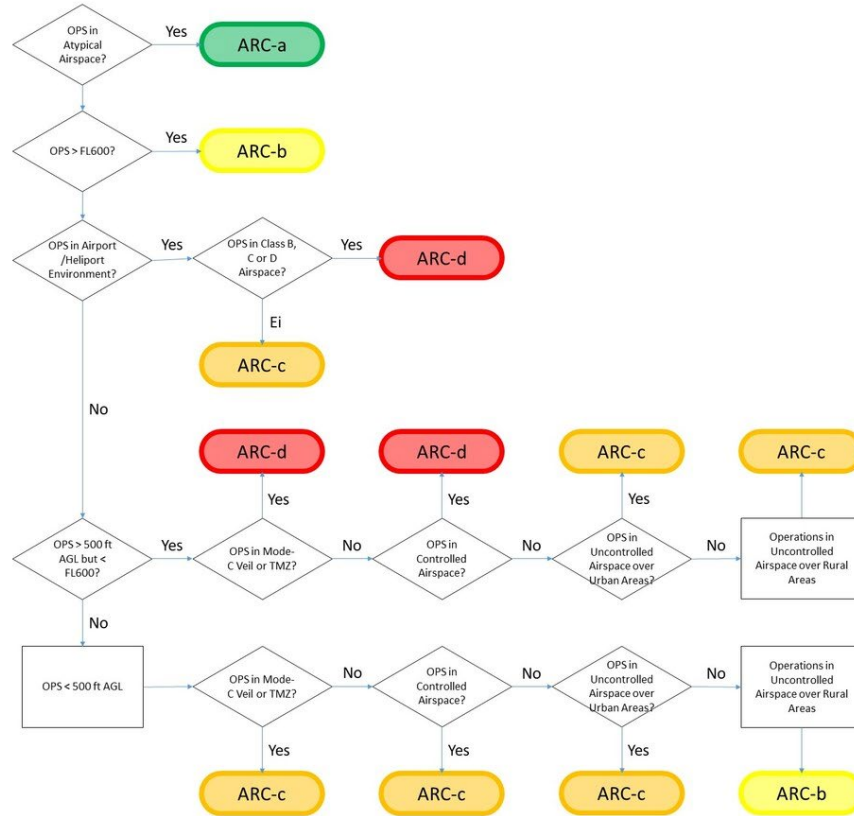


Figure 25 ARC Assignment Process¹

More details can be found in chapter 2.4.2 of AMC1 Article 11.

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

– in this step operator defines whether the initial ARC is correct or is too high.

Option 1 – if ARC seems too high for the condition – the operator should refer to Annex C² for ARC reduction process

Option 2 – Initial ARC becomes Residual ARC.

Step #6 TMPR (tactical mitigation performance requirement) and robustness levels

– this step allows to mitigate any residual risks of mid-air collisions. In simple terms, this step takes the two option approach:

Option 1 – Operation under VLOS/EVLOS (“see and avoid”) – Visual line of sight operations is considered acceptable, tactical means for all ARC levels, however operator should consider any additional risk to increase awareness to the operational volume.

In the case of multiple segments of the flight, part of VLOS operation do not need to meet TMPR, however, BVLOS do need to meet TMPR and its robustness.

EVLOS (Extended Visual Line of Sight) – VLOS approach is applicable, however some additional requirements might be applicable; EVLOS verification between a remote pilot and the operation observers, needs to be less than 15 seconds.

There are some additional details defining additional scenarios related to VLOS/EVLOS approach.

Option 2 – Operations under DAA (Detect and Avoid) system – TMPR (provision of alternative safety objectives) – for these operations there are 4 residual types of ARC. Table below defines its relations to TMPR and level of robustness:

Table 4 TMPRs and TMPR level of robustness assignment

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

Please see definitions for each ARC below:

- A. *“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).*
- B. *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.

- C. *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.*
- D. *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."*²

Step #7 SAIL determination – based on the association of ground and air risk analysis. SAIL (specific assurance and integrity level) defines the level of confidence of UAS being and staying under operators control during operation. SAIL determination methodology focuses on relationship between Final GRS ($1 \leq GRC \leq 7$) and residual ARC (a,b,c or d – see step 6). Table 5 below presents relationship between the Residual ARC and Final GRC.

Table 5 SAIL determination²

Final GRC	Residual ARC			
	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			

Step #8 Identification of the operational safety objectives (OSOs) – once SAIL is determined, there are number of OSOs that need to be applied for the operation. See table below detailed OSOs defined by EASA.

Table 6 Recommended OSOs²

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 ²³	O	O	L	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
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

Step # 9 – Adjacent area/air space considerations – this step takes into consideration the risks related to loss of control of an operation.

Safety requirements for containment of this scenarios are:

"No probable²⁴ failure²⁵ 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."²*

There are 3 safety requirements applicable to the enhanced containment:

1. Either contain assemblies of people (unless UAS is approved for that kind of operations), or areas are ARC-d (High TMRP)
2. Operational Volume is in a populated area where M1 mitigation has been applied to lower GRC or operation is carried out in a controlled area.
3. The UAS is designed to standards that are considered adequate by the competent authority and/or in accordance with a means of compliance that is acceptable to that authority such that:
 - *"The probability of the UA leaving the operational volume should be less than 10⁻⁴/FH; and no single failure²⁷ 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.

- 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".²

Step #10 — Comprehensive safety portfolio – compilation of all documentation (previous steps) delivered to competent authority.

SORA Summary

In order to summarised SORA methodology EASA provides graphical representation of its approach. See below for details.

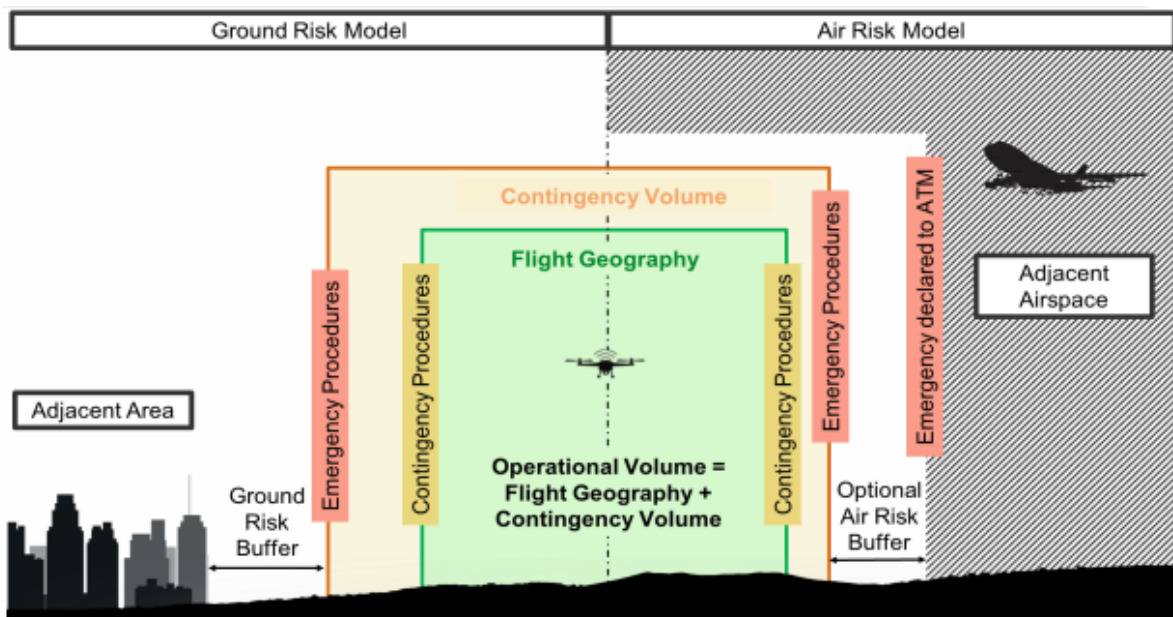


Figure 26 Graphical representation of the SORA semantic model

4.6 Light UAS operator Certificate – LUC

LUC is a certificate that can be granted by a National Aviation Authority. Once obtained by a legal entity, this privilege can give the possibility of operating without authorisations to NAA.

LUC privileges can be defined as:

- *The ability “to conduct operations covered by standard scenarios without submitting a declaration, or,*
- *To self-authorise operations conducted by the UAS operator and covered by a PDRA without applying for an authorisation, or,*
- *To self-authorise all operations conducted by the UAS operator without applying for an authorisation”.¹*

4.7 Requirements to fly in Specific Category – Summary

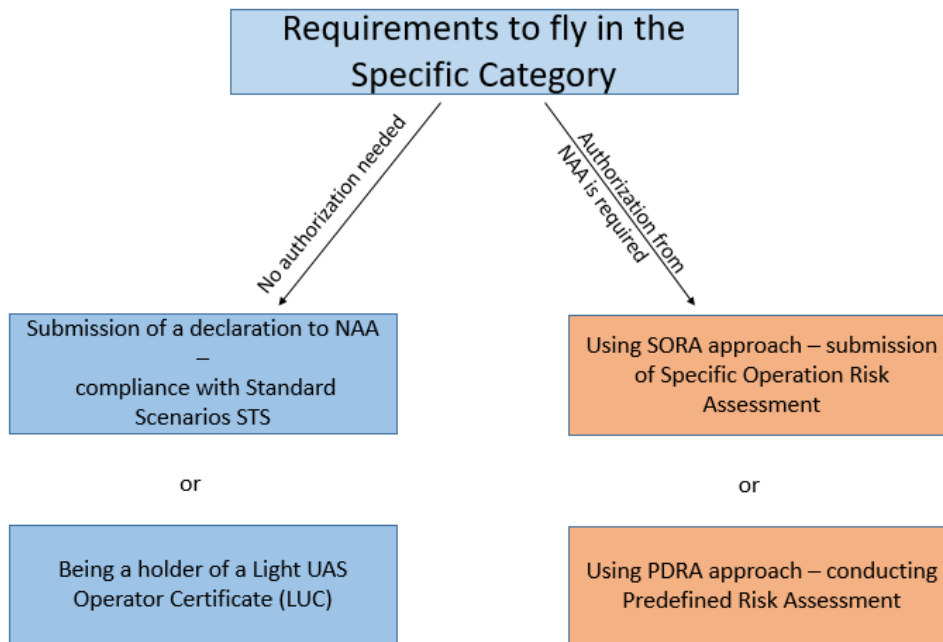


Figure 27 Summary of scenarios for Specific Category

5. Certified category

The highest risk of operation is the certified category. As much as some of these operations are present today, most of them will be widely available in near future.

As name of this category indicates anyone who wants to be an operator (under certified category) will require:

- For an UAV operator - approval given by competent authority
- For a remote pilot - will require a pilot license.

According to EASA there are 3 types of operations:

- **Operations type #1:** *International flight of certified cargo drones conducted in instrumental flight rule (IFR) in airspace classes A-C and taking-off and landing at aerodromes under EASA's scope. For example, an unmanned A320 transporting a cargo from Paris to New York.¹*
- **Operations type #2:** *Drone operations in urban or rural environments using pre-defined routes in airspaces where U-space services are provided. This includes operations of unmanned drones carrying passengers or cargo. For example, air-taxi or package delivery services that come directly to your balcony or the roof of your building or your front yard.¹*
- **Operations type #3:** *Operations as in type #2, but conducted with an aircraft with a pilot on board. Actually, this is expected to cover the first type of air taxi operations, where the pilot will be on board. In a second phase the aircraft will become remotely piloted (operations type 2)¹*

References

- 1) <https://www.easa.europa.eu/en/domains/civil-drones>
- 2) Commission Implementing Regulation (EU) 2019/947 ([EUR-Lex - 32019R0947 - EN - EUR-Lex \(europa.eu\)](#)) Accessed 27/11/23
- 3) Commission Delegated Regulation (EU) 2019/945 ([EUR-Lex - 32019R0945 - EN - EUR-Lex \(europa.eu\)](#)) Accessed 27/11/23
- 4) <https://www.parrot.com/en/drone-regulations/eu>
- 5) <https://smartdublin.ie/wp-content/uploads/2021/12/Regulations-Drone-User-Handbook-V1.pdf>
- 6) Regulation (EC) No 785/2004 of the European Parliament and of the Council of 21 April 2004 on insurance requirements for air carriers and aircraft operators [EUR-Lex - 32004R0785 - EN - EUR-Lex \(europa.eu\)](#) Accessed 27/11/23

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