UAS classifications

The Aviation Law 1 module deals with the relevant technical and operational classifications of unmanned aerial vehicles in the open category.

An unmanned aerial vehicle is any aircraft that is **not operated by an on-board pilot** . This means either that no pilot controls the UAS at all (in the case of autonomously flying drones, drone taxis, packet drones) or that a remote pilot has control of the flight from the ground using a suitable remote control.

Some unmanned aerial vehicles even have passengers on board - and yet they are called unmanned aerial vehicles. Unmanned aerial vehicles are officially called "UAS". This is an abbreviation for " *Unmanned Aircraft System* ".

Below we will discuss the various drone categories, classes and associated rules.

UAS classification

The operation of unmanned aerial vehicle systems can be categorized in different ways. The EASA regulations apply to most UAS, which divide the operation of UAS into **three categories** :

- The open category (OPEN)
- The special category (SPECIFIC)
- The category requiring certification (CERTIFIED)

In addition, there are **special cases** that are not covered by the EASA regulations:

- UAS that are operated indoors (e.g. mini drones for the living room), and

- unmanned aircraft used by the military, police, fire brigade, border guards, customs and coast guard, for example.

A UAS falls under the **open category if it:**

- weighs less than 25 kg,
- is not operated over crowds of people; A crowd of people is defined as a large number of people standing so close together that it is almost impossible for a single person to remove himself from this crowd,
- does not exceed a flight altitude of 120 m above the ground (AGL – " *Above Ground Level "),*
- is only operated in direct line of sight - the so-called *Visual Line of Sight* (VLOS) and
- no dangerous goods or people transported.

A UAS falls under the **special category** if it meets one of the following criteria:

- the weight exceeds 25 kg,
- the operation takes place above 120 m AGL or in special airspaces or
- the operation takes place outside of the direct line of sight - in English *Beyond Visual Line of Sight* (BVLOS).

A UAS falls into the **category requiring certification** if it meets one of the following criteria:

- the operation takes place through crowds of people,
- high-risk dangerous goods are being transported or
- people are transported.

In these teaching materials, we deal exclusively with the open category.

Open Categories

The OPEN category is the category of UAS that is subject to the **"simplest" regulations** . However, the term OPEN category must not be misinterpreted - there are indeed regulations, also for this category!

The operation of UAS in the OPEN category usually does not require any prior declaration (declaration), nor **any prior approval** or certification. A flight in the OPEN category may be performed if:

- the UAS meets the technical requirements,
- the remote pilot complies with the operating rules,
- the remote pilot is adequately qualified and
- the operator is registered (if necessary).

Depending on the area over which the flight is to take place, the operation also falls into one of the sub-categories **A1, A2** or **A3** . In addition, depending on the maximum take-off mass and the technical equipment, UAS are divided into one of the following "technical classes", which are also assigned to a subcategory: **C0, C1, C2, C3 or C4** .

The risks associated with the operation of an unmanned aircraft always depend on several factors. The main factors are the mass of the UAS and the area of application, eg the degree of colonization. A small, light UAS usually causes little damage and can therefore be operated in the vicinity of people. A large, heavy UAS could even kill a person in the event of a crash, which is why a minimum safety distance must be maintained.

The operating rules therefore depend on the UAS class (C0 – C4) and the area of application (A1-A3).

Subcategory A1 is the least restrictive category - it allows UAVs to operate even in densely populated areas and over isolated people (but not over crowds!). In return, only very light UAS (< 250 g or < 900 g) may be used for such operations, which minimizes the risk of personal injury. No qualification is required for light UAS < 250 g, online training and an online examination are required for UAS between 250 g and 900 g.

Subcategory A2 only allows the operation of unmanned aerial vehicles at a safe distance from people, but with heavier, larger UAS (up to 4 kg). In addition to the online training and the online exam, practical self-training and a theory exam must be completed. In Austria, this theory test is taken at Austro Control, in Germany at appropriately recognized bodies.

Unterkategorie	UAS-Klasse	Erlaubter Betriebsbereich	Qualifikation
A1 Nahe Menschen	C0 < 250 g	Überflug unbeteiligter Personen	keine
	C1 < 900 g	Kein Überflug unbeteiligter Personen	Online-Training & Online-Prüfung
A2 Sichere Distanz zu Menschen	C2 < 4 kg	30 m / 5 m Sicherheitsabstand zu unbeteiligten Personen	Online-Training & Online-Prüfung Praktische Selbstschulung Theorieprüfung vor Ort
A3 Weit von Menschen entfernt	C3 < 25 kg	Keine unbeteiligten Personen gefährden – 150 m Sicherheitsabstand	Online-Training & Online-Prüfung
	C4 < 25 kg		

Flights with unmanned aerial vehicles weighing up to 25 kg are permitted in **subcategory A3** . As a safety precaution, however, a large safety distance from all people, populated areas, recreational areas, industrial plants, etc. must be maintained with such large UAS. Online training and an online exam are required as qualifications.

Technical Classes

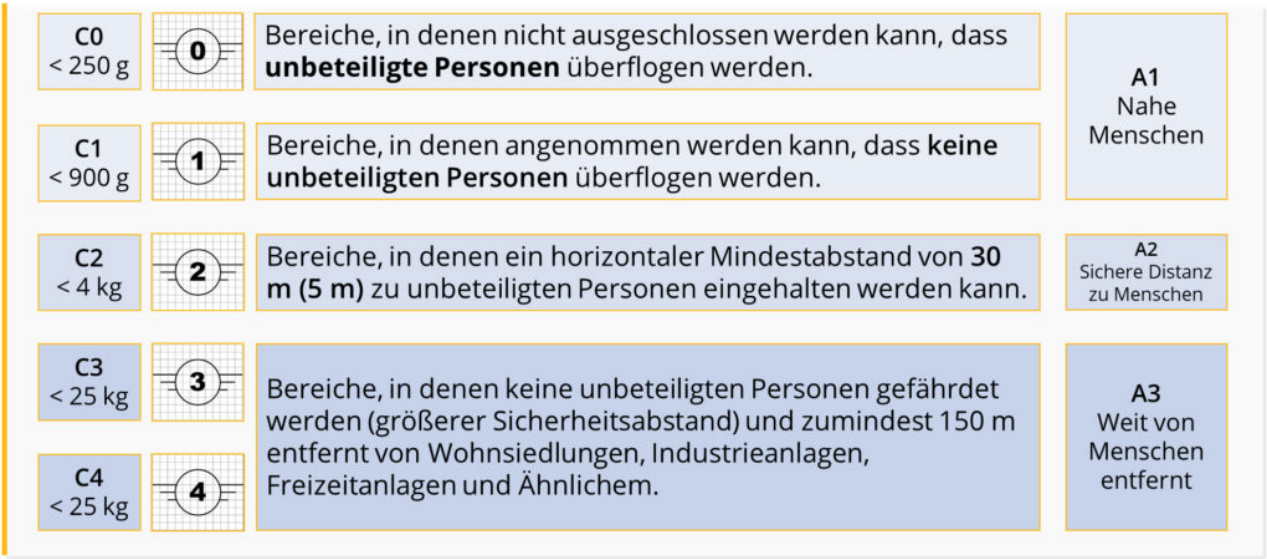
In order to be allowed to be sold in the European Union, products require a "CE" mark. This sign certifies that the product meets the relevant standards for the European market. In addition to the CE marking, unmanned aerial vehicles must also carry a **class identification** mark , which assigns them to one of the classes C0 to C4. Transitional rules for UAS manufacturers will apply here until January 1st, 2023.

One of the main factors in deciding which class of UAS to buy should be the area of **operation** . Different classes of UAS make sense depending on whether an unmanned aerial vehicle is operated close to or far from people. As a general rule, always make sure to buy a UAS that has a CE mark and a Class ID mark. Only such products may also be flown in European airspace.

Let's first look at the **typical areas of application** of the different UAS classes.

- Class C0 UAS can be used in areas where it cannot be ruled out that **uninvolved persons** will be overflown.
- With class C1 UAS, on the other hand, the long-distance pilot can assume, based on an assessment, that **no uninvolved persons** are being flown over.

- With class C2 UAS, it must be ensured that a **minimum horizontal distance of 30 m (5 m** in slow flight mode **)** to bystanders can always be maintained.
- Class C3 and C4 UAS may only be operated in areas where **no bystanders are endangered** and they must be flown **at least 150 m away** from residential areas, industrial plants, leisure facilities and the like.



These conditions correspond to the subcategories of the open category that we have already met.

In addition, the classes C5 and C6 were added by EASA, which, however, are generally of no importance for the open category.

The **maximum take-off mass** (MTOM - *Maximum Take-Off Mass*) is specified by the manufacturer and describes the maximum mass that a UAS including all equipment, batteries, antennas, cameras, etc. may weigh at take-off.

For classes C0 and C1, there is a **maximum speed limit** of 19 m/s. This is the value that specialists have calculated, up to which a collision with a person should not cause serious injuries. Classes C2 to C4 have no speed limit. In those classes - due to the larger mass - every collision with a person would be a great risk. Therefore, only class C0 and C1 UAS may be flown in the vicinity of bystanders.

Class C0 UAS are equipped with a function that limits the **maximum achievable flight altitude** to 120 m above the take-off point. While this cannot completely eliminate airspace violations, it helps to avoid unnecessary violations of maximum altitude regulations and reduces the risk of collision with other aircraft. Class C1, C2 and C3 UAS allow long-distance pilots to also set a higher limit – e.g. in areas with relaxed regulations, in model flight areas or due to special permits.

In the classes C1, C2 and C3, an **altimeter** is also mandatory - i.e. a display on the controller that shows long-distance pilots the current flight altitude at all times. The following should be considered here: The maximum flight altitude for UAS is 120 m,

measured from the nearest point on the earth's surface. There can therefore be situations in which the altimeter shows less than 120 m, but the drone is already more than 120 m from the ground - think of steep mountain slopes, for example!

The remote identification system **allows** people on the ground to determine which UAVs are in the area, where the remote pilot is located and who the operator is. Such a system must be installed in class C1, C2 and C3 UAS. It continuously sends data about the UAS operator, serial number, geographic position of UAS and remote pilot, as well as speed and current altitude. The system thus allows people on the ground to determine who is flying above them, which UAS it is, who owns it, where the remote pilot is and at what altitude the unmanned aerial vehicle is moving. So keep in mind that you are not anonymous if you observe and film the surroundings with a camera.

If the UAS is equipped with a **geo-awareness** system, it automatically carries out a data comparison between the geographical zones published by the authority (e.g. flight bans for UAS) and the respective current position. As soon as the unmanned aerial vehicle determines that it is flying in a prohibited zone, the remote pilot automatically receives a notification.

A **geo-fencing** system goes even further: it not only provides an indication, but also prevents flight in such an area or entry. According to EU regulations, geo-fencing systems are possible, but not mandatory. Geo-awareness systems are mandatory for classes C1, C2 and C3.

	0	1	2	3	4
Max. Abfluggewicht	< 250 g	< 900 g	< 4 kg	< 25 kg	< 25 kg
Max. Geschwindigkeit	19 m/s	19 m/s	-	-	-
Max. Höhe	120 m	120 m / Einstellung	120 m / Einstellung	120 m / Einstellung	-
Höhenmesser	nein	ja	ja	ja	nein
Fern-identifizierung	nein	ja	ja	ja	nein
Geo-Sensibilisierung	nein	ja	ja	ja	nein

There are also transitional regulations for a **transitional period** of two years, so that unmanned aircraft that have already been purchased can continue to be operated for a limited period of time. These regulations are described in detail in Article 22 of the Implementing Regulation (EU) 2019/947.

Open category A1

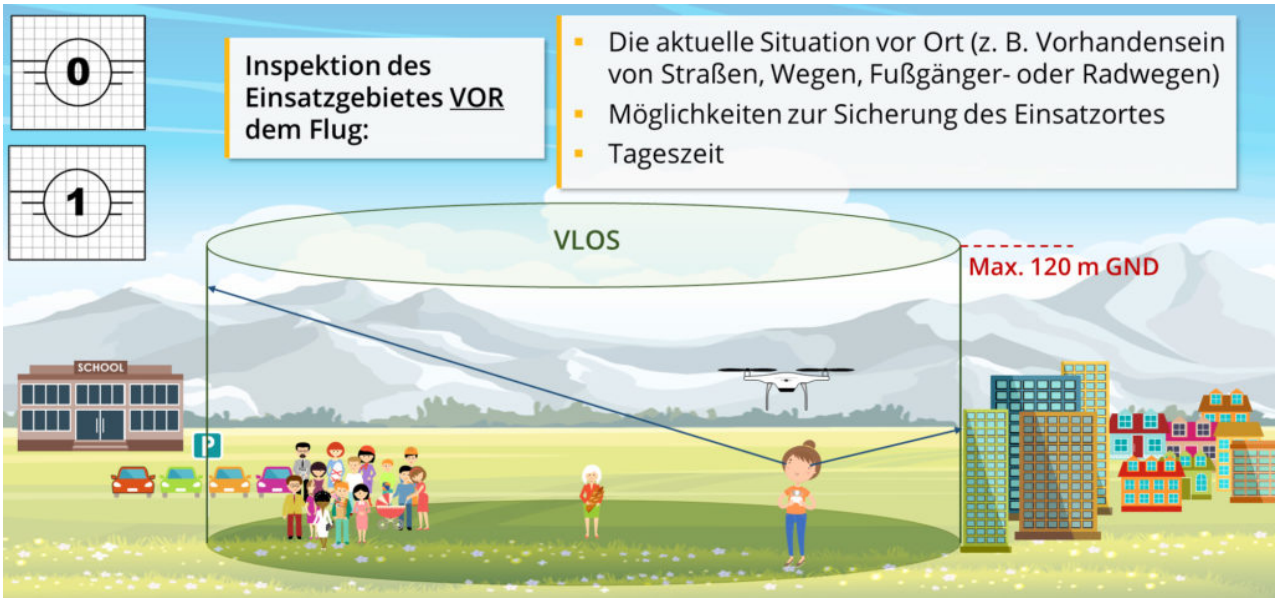
Subcategory A1 has the fewest restrictions. Unmanned aircraft of **classes C0 and C1** may be operated in this subcategory.

With class C1 UAS, the long-distance pilot must inspect the area of operation before the start of the flight and ensure that no uninvolved person is flown over. This “ **situation assessment** ” should take into account the following:

- the current situation on site (e.g. presence of roads, paths, pedestrian or cycle paths),
- Ways to secure the site and
- the daytime.

Should **uninvolved persons** accidentally be flown over , the duration of the overflight must be kept as short as possible. For example, the UAS could be flown higher and again at a greater distance from the bystanders as quickly as possible. In any case, there must be a line of sight to the UAS and a height of **120 m above the ground** must not be exceeded.

With class **C0 UAS or self-made UAS under 250 g** it is allowed to fly over bystanders with extreme caution. However, this should be avoided if possible.



Open category A2

Operations in sub-category A2 are subject to the **most restrictions** as this is the category with the greatest risk. Relatively heavy UAS (up to 4 kg) are operated in the vicinity of people. Therefore, not only are the technical requirements for class C2 unmanned aircraft (which can be operated in subcategory A2) the highest, but also the requirements for long-distance pilots.

Since the risk of injury from UAVs increases when their speed is higher (e.g. due to the greater risk of control errors and higher impact energy), **the safety distance depends on the flight speed** of the UAS. This amounts to:

- in slow flight operations 5 m and
- otherwise 30 m.

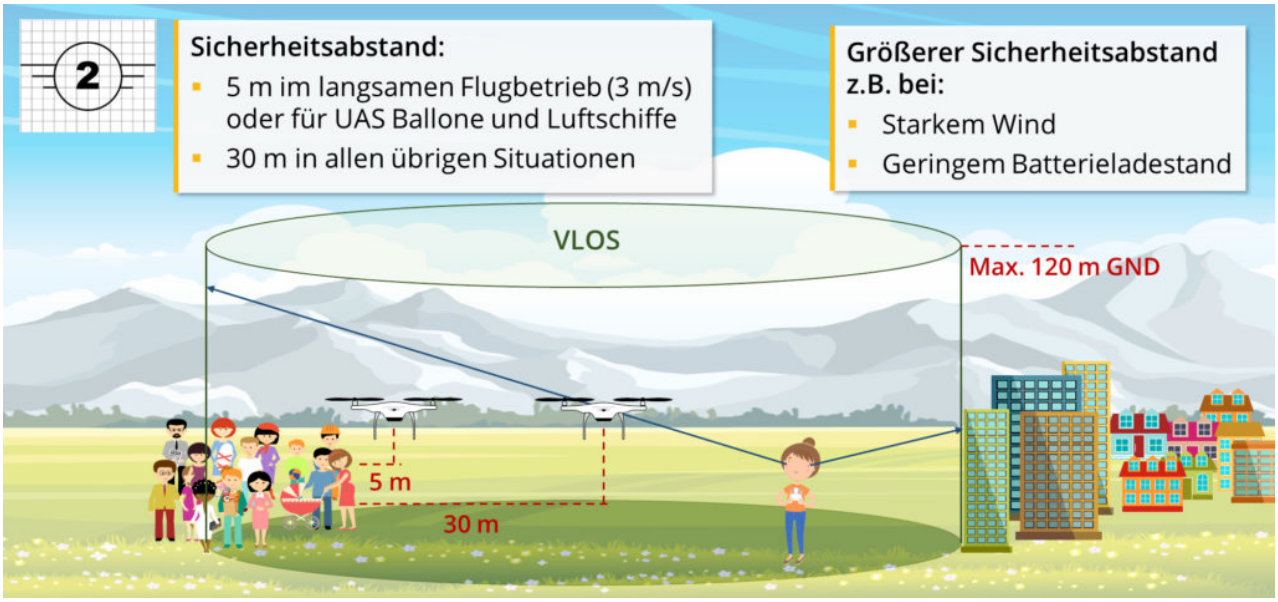
Slow **flight operations** are when the speed does not exceed 3 m/s (10 km/h) or when the UAS is designed as a balloon or airship.

An **even greater safety** distance must be maintained in unfavorable conditions (e.g. strong winds or a low battery level) or when the terrain or obstacles make it necessary.

In addition, the maximum height of 120 m above the ground must also be observed in this subcategory and operation must be guaranteed by sight.

Long-distance pilots in subcategory A2 must meet certain requirements in order to operate in this subcategory. You need to:

- have completed an online course and an online theory test,
- carry out practical training on your own initiative and
- pass an on-site theory test.



Open category A3

Subcategory A3 is where the largest and heaviest UAS are allowed to fly. While this sub-category is not as demanding as sub-category A2 in terms of remote pilot qualifications, it does require a significantly **greater safe** distance from anything that could be damaged by a UAS crash.

Accordingly, a **minimum distance of 150 m** must always be maintained in relation to industrial areas, residential areas, leisure and recreation areas.

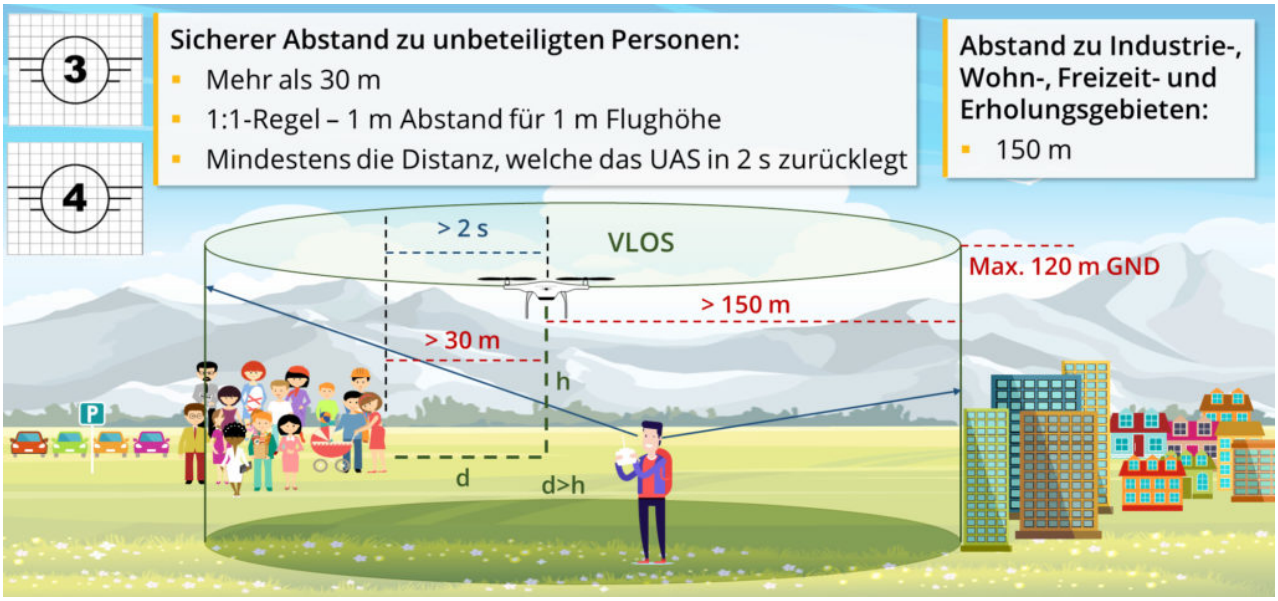
It must be ensured that no **uninvolved persons are** to be expected in the entire operating area. Should they nevertheless appear, a safe distance must be maintained. If it is not possible to maintain a safe distance from bystanders, you must land immediately.

A **safe distance** is:

- more than 30m,
- never less than the 1:1 rule states – 1 m distance for 1 m flight altitude and

- at least the distance that the UAS covers in 2 seconds, which roughly corresponds to the reaction time.

In addition, the maximum height of 120 m above the ground must also be observed in this subcategory and operation must be guaranteed by sight.



Summary - Shortcut

Summary Module 1 – Air Law

Read more & references

Basic Regulation: https://www.easa.europa.eu/document-library/regulations/regulation-eu-20181139

UAS Delegated Regulation: https://www.easa.europa.eu/document-library/regulations/commission-delegated-regulation-eu-2019945

UAS Implementing Regulation: https://www.easa.europa.eu/document-library/regulations/commission-implementing-regulation-eu-2019947

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