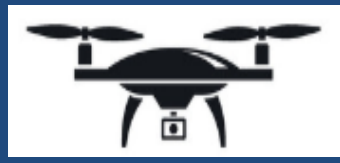
UAS Regulation Requirements



Overview

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EASA
European Aviation Safety Agency

UAS Regulations and AMC & GM

- EASA published the following 2 regulations for UAS:

1. **Commission Delegated Regulation (EU) 2019/945** of 12 March 2019:
   - on **unmanned aircraft systems and on third-country operators of unmanned aircraft systems**
   - entered into force & **became applicable on 1 July 2019;**
2. **Commission Implementing Regulation (EU) 2019/947** of 24 May 2019:
   - on the rules and procedures for the operation of unmanned aircraft
   - entered into force on 1 July 2019 & **became applicable on 31st December 2020;**

- EASA also published:
  1. Acceptable Means of Compliance (AMC) and Guidance Material (GM) to Commission Implementing Regulation (EU) 2019/947;
  2. Acceptable Means of Compliance (AMC) and Guidance Material (GM) to Part-UAS;
- The **Regulations** (both the Implementing and the Delegated) are **hard law, i.e. binding in their entirety** whereas the **AMC and GM (Acceptable Means of Compliance and Guidance Material) are soft law, i.e. non-binding;**
- These laws are **applicable in all EASA Member States** and **are available on the Official Journal of the European Union website (www.eur-lex.europa.eu).**

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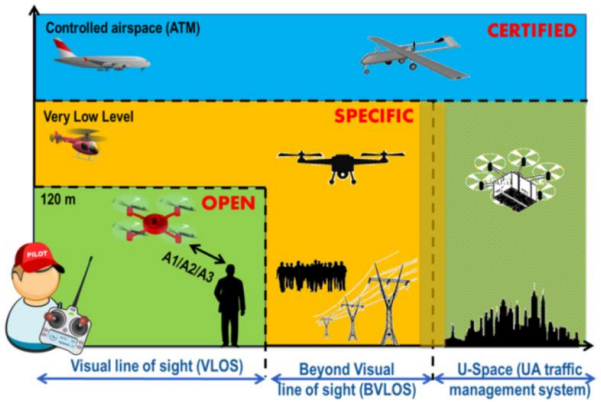
Overview of UAS Regulation 2019/947

- Does **not apply to UAS operated exclusively indoors**;
- EASA adopted a **risk-based approach** classifying UAS operations into **3 categories,** depending on the level of risk:

Category	Level of Risk	Safety Assurance
Open	Low	• Safety ensured through UA compliance & operational limitations, e.g. MTOM <25kg, Height <120m, VLOS;
Specific	Medium	• Authorisation by NAA following risk assessment performed by operator;
Certified	High	• Requirements compared to manned aviation – **certification of aircraft & operator, & licensed remote pilot**; • Oversight by NAA & EASA;



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Open Category – Overview

- **UA** divided into **5 classes: C0 – C4**;
- **Operations** divided into **3 subcategories: A1 – A3**, on the basis of operational limitations, requirements for the remote pilot and technical requirements for UAS;

Requirements:

- **MTOM (Maximum Take-Off Mass) < 25 kg**;
- UA does **not carry dangerous goods**;
- UA does **not drop any material**;
- **No autonomous operations** *(see next slide for definition of 'autonomous')*;
- **Remote pilot minimum age 16**, unless supervised (otherwise 12); no min. age for 'toys';
- Remote pilot keeps the UA in **VLOS (Visual Line Of Sight)** at all times except when flying in follow-me mode or when using an observer;
- UA does **not fly over "assemblies of people"** ***(see next slide for definition of "assemblies")***;
  - additional limitations based on subcategory:
    - A1 fly over people; A2 fly close to people; A3 fly far from people;
- UA is maintained within **120 m from the closest point of the surface of the earth**, except when overflying an obstacle (permission required from entity responsible for obstacle);
- **Registration of the UAS Operator** (not the UAS itself!) if the UAS weighs more than 250 g, or less than 250 g but is equipped with a recording device such as a camera or microphone, unless the UAS is classified as a 'toy' (i.e. complies with 'toy' Directive);
- Maximum height AGL (Above Ground Level) is **120m but may be lower if required by the specific Member State.**

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Important Terminology

- **"Assemblies of people":**
- The EASA regulations do not specify the number of persons for an 'assembly', 'crowd' or 'gathering' of people, but defines these terms as "gatherings where persons are unable to move away due to the density of the people present."

- **"Involved" vs "uninvolved" people:**
- An uninvolved person is a person who is not participating in the UAS operation or who is not aware of the instructions and safety precautions given by the UAS operator.
- A person is considered involved if he/she decides to be a part of the operation, understands the risk and is able to check the position of the drone while it is flying.

- **Autonomous vs automated operation:**
- An autonomous operation is one in which the remote pilot cannot intervene, whereas an automated operation is when the UAS is programmed to fly automatically without requiring the remote pilot to fly it, however, the remote pilot is able to intervene at any time.

- **Geo-fencing vs geo-caging:**
- Geo-fencing is a volume which a UAS is not allowed to enter whereas geo-caging is a volume which a UAS is not allowed to leave.

Class labels in Open Category (after Jan 2023)

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)	- may fly over uninvolved people (should be avoided when possible) - no flying over assemblies of people	No, unless camera / sensor on board **and** a drone is not a toy	- no training needed	No minimum age
C0					- read user manual	16*, no minimum age if drone is a toy
C1	< 900 g		- No flying expected over uninvolved people (if it happens, should be minimised) - no flying over assemblies of people	Yes	- read user manual - complete online training - pass online theoretical exam	16*
C2	< 4 kg	A2 (can also fly in subcategory A3)	- no flying over uninvolved people - keep horizontal distance of 30 m from uninvolved people (this can be reduced to 5 m if low speed function is activated)	Yes	- read user manual - complete online training - pass online theoretical exam - conduct and declare a self-practical training - pass a written exam at the NAA (or at recognized entity)	16*
C3	< 25 kg	A3	- do not fly near people - fly outside of urban areas (150 m distance)	Yes	- read user manual - complete online training - pass online theoretical exam	16*
C4						
Privately built						

Figure 2 - Open category after January 1, 2023

Open Category for drones without class labels (between Jan 2021 - Jan 2023)

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)	- No flying expected over uninvolved people (if it happens, should be minimised) - no flying over assemblies of people	No, unless camera / sensor on board **and** a drone is not a toy	- no training needed	No minimum age
Drones without class identification label	< 500 g			Yes	- read user manual - complete the training and pass the exam defined by your national competent authority	16*
Drones without class identification label	< 2 kg	A2 (can also fly in subcategory A3)	- no flying over uninvolved people - keep horizontal distance of 50 m from uninvolved people (this can be reduced to	Yes	- read user manual - complete the training and pass the exam defined by your national competent authority	16*
Drones without class identification label or privately built	< 25 kg	A3	- do not fly near people - fly outside of urban areas (150 m distance)	Yes	- read user manual - complete the training and pass the exam defined by your national competent authority	16*

Figure 1 - Limited open category valid until January 1, 2023, using drones without class identification label

Specific Category – Overview

- Where one of the requirements for 'Open' is not met, the operation is categorised as '**Specific**', e.g. BVLOS (Beyond Visual Line of Sight); or Altitude >120m; MTOM>25kg; in urban environment with MTOM>4kg or UA without CE mark; for dropping material.
- The UAS **operator shall obtain an Operational Authorisation (OA) from the national competent authority of the Member State of registration prior to commencing an operation, except** in the following 2 cases:
  1) for operations conducted in the framework of **authorised model aircraft clubs and associations**; or
  2) the UAS operator holds a **Light UAS Operator Certificate (LUC)** with the appropriate privileges.
- The UAS operator shall perform and submit an **operational risk assessment,** or:
  1) for UAS operations with **lower intrinsic risks**, an **Operational Declaration** may be submitted when the **operations comply with the Standard Scenarios (STSs)** listed in the Appendix to the UAS Regulation;
  2) 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 the AMC to the UAS Regulation.

Certified Category – Overview

- Requires:
  1) **certification of aircraft,**
  2) **certification of the operator, and**
  3) **licensing of remote pilots**;
- UAS operations are always considered to be in the 'certified' category when they:
  1) are conducted **over assemblies of people** with a UA with **characteristic dimensions ≥ 3m**; or
  2) involve the **transport of people**; or
  3) involve the **carriage of dangerous goods** that may result in a high risk for third parties in the event of an accident (e.g. not in crash-protected container etc.).
- 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:
  1) certification of the **airworthiness of the UAS**;
  2) certification of the UAS operator; and
  3) licensing of the remote pilot, unless the UAS is fully autonomous.
- N.B.: **flying over assemblies of people with a UAS with characteristic dimension < 3 m may be in the 'specific' category unless the risk assessment concludes that it is in the 'certified' category.**

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Overview of TM-CAD Drone Management System

- Malta implemented a Drone Management System available online at tmcad.idronect.com.
- UAS Operators are initially required to **register**, and obtain a UAS Operator Registration Number. This number is to be affixed to each UAS belonging to the same Operator.
- Upon registration, Operators are also requested to upload a valid insurance cover.
- It should be noted that EASA regulations do not mandate insurance but leave it up to the individual member states, however, **Malta mandates a valid third-party insurance cover** in view of the nature of its airspace, all of which is "controlled".
- Prior to flight, Operators and/or remote pilots are requested to submit a flight request on this same system. Flights which meet certain requirements are automatically authorised, whereas those exceeding these requirements will be evaluated on a case-by-case basis by TM-CAD.
- Each EASA member state has defined geographical zones which are **restricted for UAS operations for safety, security or environmental** purposes.
- For Malta, these restricted areas are available on the map in the Drone Management System, and include the airport area and approaches, embassies, power plants, correctional facilities, environmental reserves etc.
- In these areas, a flight request is not auto-authorised but needs to be authorised by TM-CAD, provided that if required, evidence is provided to TM-CAD that permission from the owner of the premises has been obtained.

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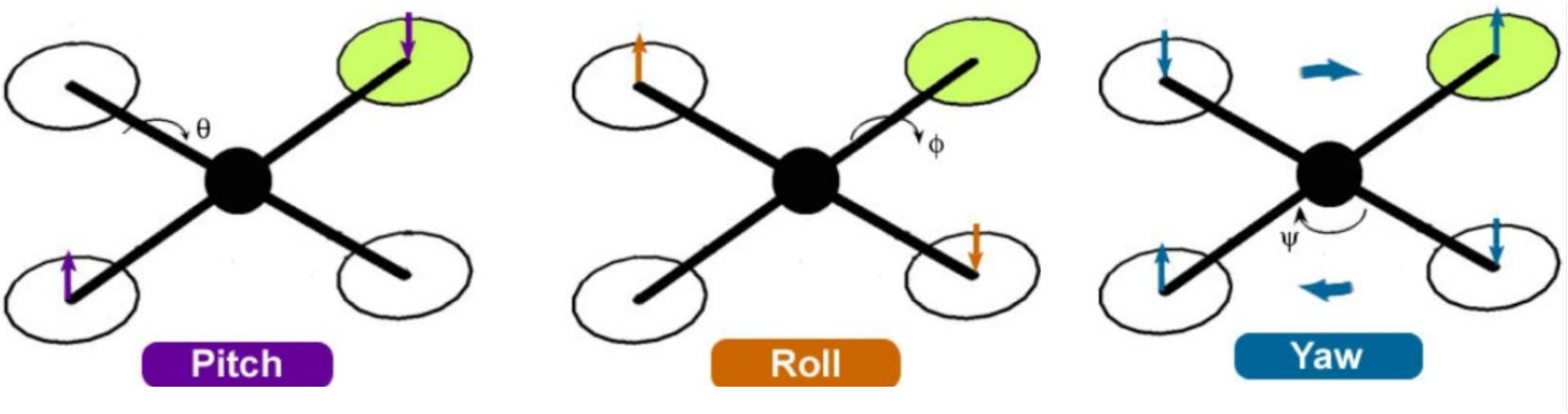
Responsibilities of Pilot prior to/during/after Flight

- Prior to flight, the UAS pilot needs to **check/scan the area of operation**, especially to **check the presence of people and/or anything which might cause interference** (power lines / metal structures etc.).
- UAS Operators and/or pilots are also requested to **check the weather forecast (METAR)**. Weather affecting UAS operation includes **wind, temperature, humidity and precipitation (rain)**.
- UAS pilots should be aware that **alcohol can always affect their behaviour**.
- A key safety checklist to ensure the UAS pilot is able to perform a safe flight may be represented by **"I'M SAFE" (Illness Medication Stress Alcohol Fatigue Emotion)**.
- During the flight, UAS pilots **must always give way to manned aviation**, and in **emergency/abnormal situations, must try to navigate and land safely**.
- UAS pilots must **respect GDPR & privacy rules**; although they **may take photos or videos of people** using their UAS, they must **not target individuals**.
- After each flight, UAS pilots must **check the propellers and batteries for damage and fatigue**, in order to operate UAS safely.
- It is also important to **save/backup the flight data** to **review and analyse the flights performed**. This data may be saved **on any appropriate means** including on apps, SD-cards or printed and filed.

Overview of UAS Quadrotors

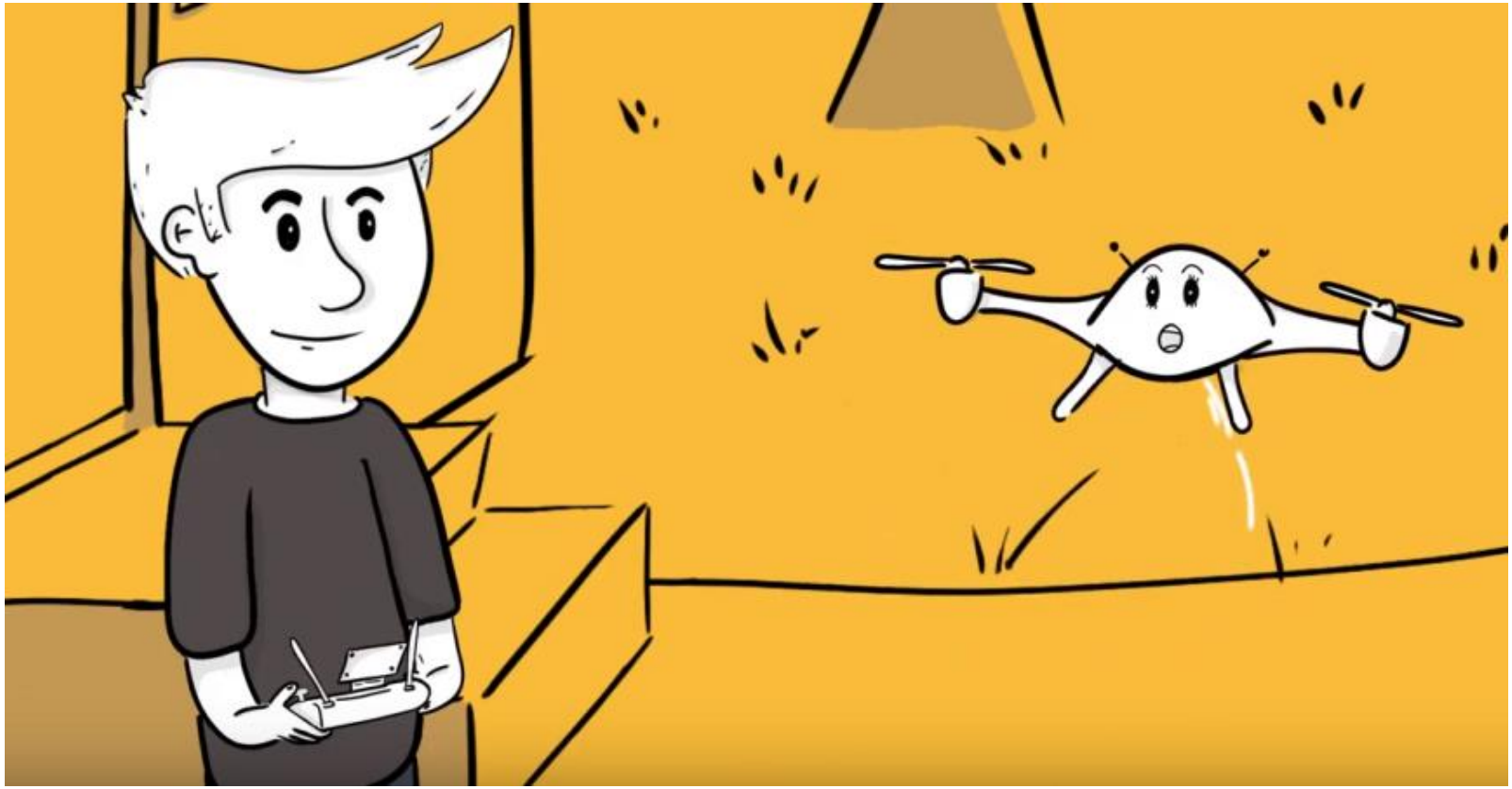
- The UA is controlled through a **Command and Control (C2) Link**.
- The most common **datalink frequencies are 2.4 GHz and 5.8 GHz**.
- Information specific to the UA, including procedures to follow in case of emergencies or abnormal situations, are found in the **manufacturer's/user's manual**.
- The motions of a quadrotor are depicted in the image below :



Motions of a Quadrotor

(image reproduced from https://www.intechopen.com/books/motion-control/intelligent-flight-control-of-an-autonomous-quadrotor)

Meet Paul and Donnie!



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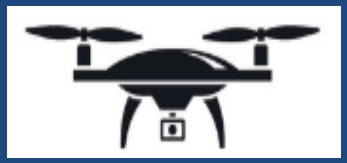
THANK YOU



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