Theoretical knowlegde training courses for UAS pilots

Subcategories A1/A3

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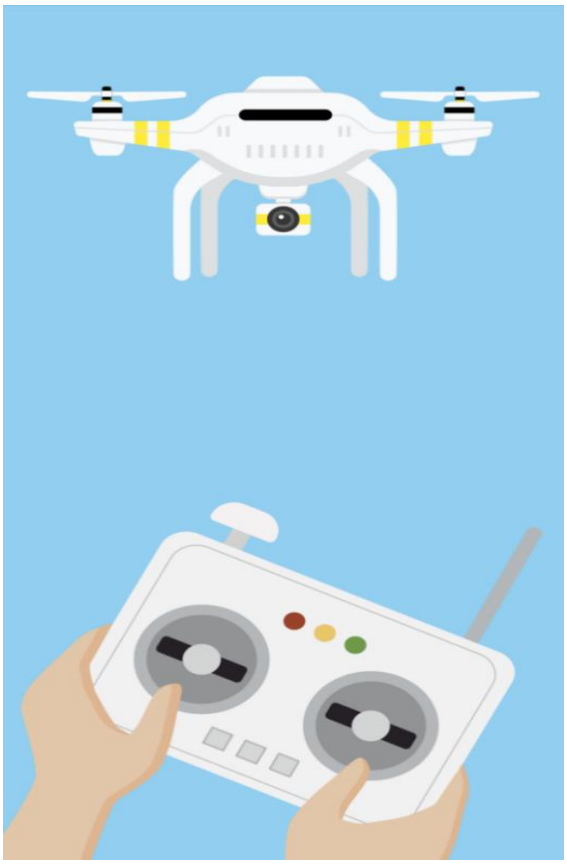
1. Air safety

1.1 Non-reckless behaviour, safety precautions for UAS operations and basic requirements regarding dangerous goods



WHAT MUST A PILOT KNOW WHEN CONDUCTING OPERATIONS WITH UNMANNED AIRCRAFT

Before conducting operations, the pilot of an unmanned aircraft must be familiar with the rules and regulations related to use of unmanned aircraft in Montenegro, especially in terms of safety, privacy, data protection, liability, insurance, security, and environmental protection.

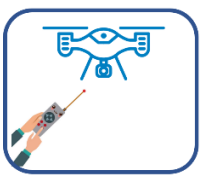
Areas over which unmanned aircraft operations may not be carried out:

- Assemblies of people
- Penal/correctional facilities
- Military installations
- Facilities of the highest and higher levels of government
- Protected natural areas
- Hospitals
- Industrial plants
- Certain parts of the transportation infrastructure.

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.

Operator of UAS and pilot of UAS – what is the difference?

A UAS operator is any person, or organization (private or legal entity), who owns or rents one or more registered drones. Drone manufacturers and/or retailers don't register drones. You need to take the initiative yourself to register with Civil Aviation Agency.



A UAS pilot is the person actually flying the drone, without necessarily owning or renting the drone.

And yes, you can be both, a drone operator and a drone pilot if you own or rent a drone and also fly one.

All combinations are possible. An operator may decide not to be a pilot but will have responsibility for the drone(s) and what is done with it or them. For example, s/he can have a fleet of drones under his/her charge for a small business and employ one or various pilots.

Also, a person can be only a pilot without owning a drone themselves, and therefore not be an operator.

Unmanned Aircraft - UA means any aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board.

Remote pilot (UAS pilot) means a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change the course at any time.

Unmanned Aircraft System - UAS means an unmanned aircraft and the equipment to control it remotely.

Unmanned aircraft system operator (UAS operator) means any legal or natural person operating or intending to operate one or more UAS.

Eequipment to control unmanned aircraft remotely means any instrument, equipment, mechanism, apparatus, appurtenance, software or accessory that is necessary for the safe operation of an unmanned aircraft, which is not a part, and which is not carried on board of that unmanned aircraft.

UAS OPERATOR MUST TAKE THE FOLLOWING PRECAUTIONS FOR UNMANNED AIRCRAFT OPERATIONS

- develop operational procedures adapted to the type of operation and the risk involved
- ensure that all operations effectively use and support the efficient use of radio spectrum in order to avoid harmful interference
- ensure that remote pilots and all other personnel performing a task in support of the operations are familiar with manufacturer's instructions provided by the manufacturer of the UAS,

- ensure that remote pilots have appropriate competency in the subcategory of the intended UAS operations, that remote pilots are fully familiar with the UAS operator's procedures and that remote pilots are provided with the information relevant to the intended UAS operation concerning any geographical zones
- update the information into the geo-awareness system according to the intended location of operation and that all involved persons present in the area of the operation have been informed of the risks and have explicitly agreed to participate.

DANGEROUS GOODS

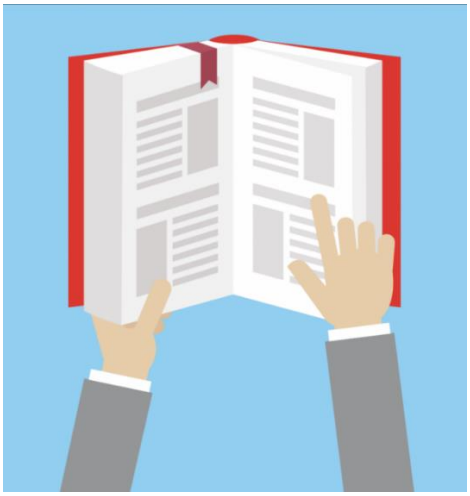
means articles or substances, which are capable of posing a hazard to health, safety, property or the environment in the case of an incident or accident, that the unmanned aircraft is carrying as its payload, including in particular:

- **explosives** (mass explosion hazard, blast projection hazard, minor blast hazard, major fire hazard, blasting agents, extremely insensitive explosives)
- **gases** (flammable gas, non-flammable gas, poisonous gas, oxygen, inhalation hazard);
- **flammable liquids** (flammable liquids; combustible, fuel oil, gasoline);
- **flammable solids** (flammable solids, spontaneously combustible solids, dangerous when wet);
- **oxidising agents and organic peroxides**;
- **toxic and infectious substances** (poison, biohazard);
- **radioactive substances**
- **corrosive substances**.

Articles and substances which would otherwise be classified as dangerous goods (e.g. fuel, batteries and other goods used during the flight to supply energy to the drone's system) but which are required to be on board the aircraft for the propulsion of the UAS or for the operation of its specialised equipment during transport, or which are required in accordance with the pertinent operating requirements should not be considered as transported dangerous goods and their safety should verified during the design verification of the UAS..

In the open category, unmanned aircraft are not allowed to carry dangerous goods.

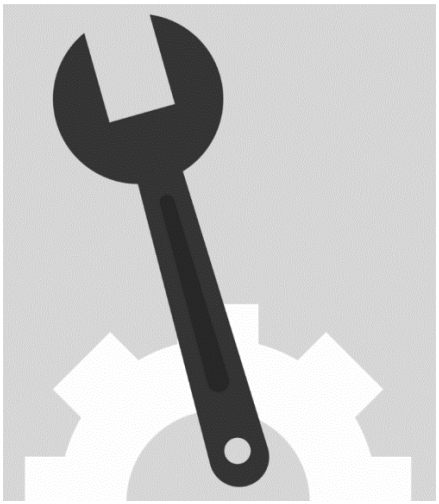
1.2 Starting or stopping the operations taking into account environmental factors, UAS conditions and limitations, remote pilot limitations and human factors



MAKE SURE YOU KNOW WHAT YOUR UNMANNED AIRCRAFT SYSTEM CAN AND CANNOT DO

Read the manufacturer's instructions (user manual) before deciding to fly the unmanned aircraft.
Key informations include:

- how far your unmanned aircraft can fly
- what is the wind resistance of your unmanned aircraft
- how long your unmanned aircraft can fly before the battery is drained or the fuel is used up
- whether your unmanned aircraft system has a 'Return to Home' function, meaning it can return to the pilot in case of problems.



MAKE SURE THAT YOUR UNMANNED AIRCRAFT SYSTEM IS READY FOR FLIGHT

Check the fuel level or battery charge.
Pay special attention to ensuring that the fuel level or battery charge is sufficient for the entire planned flight. This includes additional fuel or electrical power you may need in case of an contingency situation or poor weather conditions for flying, such as strong winds.
Don't forget to check the battery level of the remote controller.
Ensure that the software of the unmanned aircraft system is up to date.

Check that:

- the unmanned aircraft has no visible damage,
- the rotating parts are free to move,
- all electrical and radio cables are securely connected,
- the batteries are not overheated,

- the payload and antennas are securely fastened.

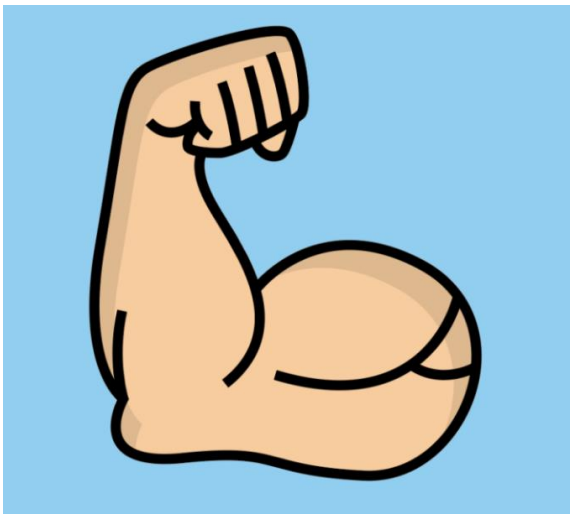
DO NOT FLY IN WEATHER CONDITIONS THAT MAY ADVERSELY AFFECT THE FLIGHT

Some of the weather phenomena that can adversely affect the flight of your unmanned aircraft include:

- wind can blow your unmanned aircraft off the desired path or make it difficult to control,
- surface wind often differs significantly in direction and strength from wind at higher altitudes,
- Rain, snow, and low temperatures can disable the operation of your unmanned aircraft or its components,
- fog, as well as direct sunlight, can disable visual contact with your unmanned aircraft and other airspace users in the area where you are conducting operations.

Pay attention to the manufacturer's instructions to determine the temperature range within which your unmanned aircraft system can operate.

Low temperatures can severely impact battery capacity and significantly reduce available flight time.



BE SURE THAT YOU ARE IN A GOOD PSYCHO-PHYSICAL CONDITION FOR FLYING

During the flight, remote pilot may not perform duties under the influence of psychoactive substances or alcohol, or when they are unfit to perform their tasks due to injury, fatigue, medication, sickness or other causes. For example, consumption of alcohol can affect the pilot of the unmanned aircraft in terms of the safety.

Do not consumpt alcohol before or during the flight.

Alcohol will significantly impair your judgment and piloting skills.

Do not fly under the influence of drugs or medication.

Check with your doctor or in the medication guide if the medication you are taking may affect your ability to operate the unmanned aircraft (machines in the manual) safely. Do not fly if the doctor's opinion or the medication instructions state that your ability may be impaired.
Do not fly if you are tired or unwell. Your judgment and ability may be impaired if you are tired or unwell.
Cold and precipitation can affect your ability to operate the unmanned aircraft system safely.
Direct sunlight can adversely affect your ability to focus on flying as well as the visibility of the control screen (display).

TAKE FAST AND SAFE ACTION IF THE SITUATION IN THE AIR OR ON THE GROUND CHANGES

Always be prepared to land the unmanned aircraft and wait until conditions for safe flying are restored.

For example, if:

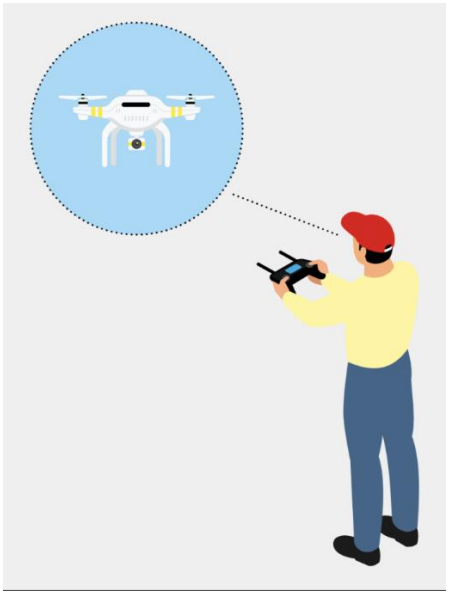
- a group of people or animals appears in the operating area,
- you are being obstructed during operations,
- you do not feel well,
- weather conditions get worse to the point that they could adversely affect flight safety,
- you notice abnormal behavior of the aircraft or have difficulty controlling it
- **emergency response activities such as firefighting, search and rescue operations, or similar activities begin in the operating area...**

Flying unmanned aircraft near or inside areas where an emergency response effort is ongoing is strictly prohibited without prior approval from responsible emergency response services.

1.3 Operation in visual line of sight (VLOS)

- Keeping a safe distance from people, animals, property, vehicles, and other airspace users
- The identification of assemblies of people
- A code of conduct in case the UA encounters other traffic

- respecting the height limitation, especially if you notice nearby operations involving airplanes, helicopters, gliders, etc.
- Use of a UA observer, responsibilities and communication between the remote pilot and the UA observer.



Always maintain in direct visual contact with the unmanned aircraft and ensure a full visual scan of the airspace in the surroundings. This way, you will notice hazards in the air or on the ground nearby and avoid collisions.

The distance at which the pilot of an unmanned aircraft can fly a UAS is the distance at which 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. Therefore, the pilot of the unmanned aircraft must clearly see the UAS without technical aids and must observe the airspace.

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.

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.
Unmanned aircraft that you are operating must be visible to you without using aids such as:

- Binoculars
- photographic lenses
- electronic vision equipment, such as smartphones, tablets, or video glasses.

To maintain visual contact with the unmanned aircraft, you can use glasses or contact lenses.

An accompanying observer can assist in flying the unmanned aircraft.

The remote pilot shall 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. For this purposes, remote pilots may be assisted by an UA observer.

In such case, clear and effective communication shall be established between the remote pilot and the UA observer.

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.

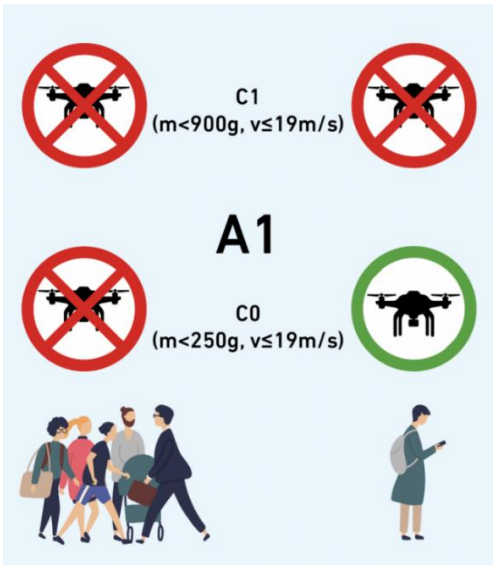
As the UA observer is situated alongside the remote pilot and they must not use aided vision (e.g. binoculars), their purpose is not to extend the range of the UA beyond the VLOS distance from the remote pilot. Exceptions are emergency situations, for instance, if the pilot must perform an emergency landing far from the pilot's position, and binoculars can assist the pilot in safely performing such a landing.

Aspects related to safety during pre-flight checks include:

- 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 above uninvolved persons, and the potential overflight above critical infrastructure
- identification of a safe area where the remote pilot can perform a practice flight
- 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.
- Checking the condition of the UAS.

If during your flight, operation poses a risk to animals, property, vehicles, and other airspace users, you must discontinue the flight.

Your flight becomes risky for animals, property, vehicles, and other airspace users when there is a possibility that your unmanned aircraft could approach them closely enough to disturb, frighten, or even cause a collision with another aircraft or object, including animals.



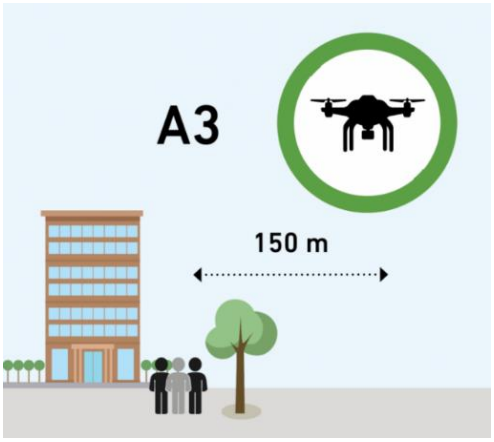
Always maintain the unmanned aircraft at a safe distance from uninvolved persons during operations.

Remote pilot may overfly univolved person, with an unmanned aircraft that has an MTOM, including payload, of less than 250 g and a maximum operating speed of less than 19 m/s, marked as class C0 or privately built UAS that has an MTOM, including payload, of less than 250 g and a maximum operating speed of less than 19 m/s.

Overfly assemblies of people is not allowed in the open category.

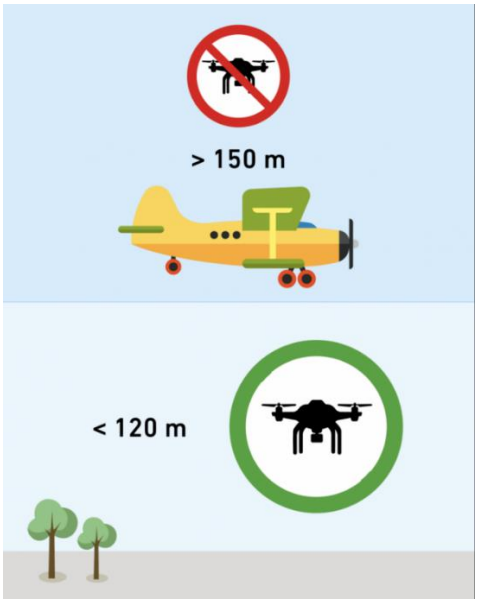
If you are flying a C1 class unmanned aircraft (less than 900g, speed ≤ 19m/s) in subcategory A1, you must not overfly individuals not involved in the operation, nor groups of people.

When using the "follow me" mode, ensure that the aircraft does not stray more than 50m away from you.



Flying in subcategory A3 of the open category is allowed only in areas where the presence of uninvolved persons is not expected and at a safe horizontal distance of at least 150 meters from residential, commercial, industrial, or recreational areas.

If a UAS operation is conducted in subcategory A2 or A3, the operator must ensure that all involved persons present in the operational area are informed of the risks of the operation and explicitly agree to participate in the operation.



By adhering to altitude restrictions, you avoid endangering other airspace users.

The minimum allowed flight altitude for manned aircraft is 150 meters above ground level. The maximum allowed height for unmanned aircrafts is limited to 120 meters from the closest point of the surface of the earth. This ensures a safety buffer of 30 meters between manned aircraft and unmanned aircraft.

Operating a UAS above the limited height (120 meters) can potentially interfere with general air traffic. Therefore, height restrictions are imposed by regulations in the open category to mitigate this risk.

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.
If during your flight you encounter an obstacle taller than 105 meters within a horizontal distance of 50 metres from the obstacle, the maximum height of the UAS operation may be increased up to 15 metres above the height of the obstacle.
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.
Two measures have been put in place to reduce the risk:

- 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.
- The maximum height above the remote pilot is limited to 120 m, which reduces the air risk.

Always maintain the unmanned aircraft at a safe distance from individuals who are not involved in the operation.

Assemblies of people means gatherings where persons are unable to move away due to the density of the people present.
Operations of UASs above assemblies of people (e.g., sports activities or other mass public events) are never allowed in the open category.

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.
A person may be considered to be 'involved' in the UAS operation when the following conditions are met before flight:

- the person has given explicit consent (it may be verbal) 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
- the person has 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.

1.4 Familiarisation with the operating environment

Assessment of the presence of uninvolved persons in the overflown area and informing involved individuals

THE UNMANNED AIRCRAFT PILOT MUST CHECK THE AREA ABOVE WHICH THEY PLAN TO FLY IN THE WAY THAT:

- secure the designated area to prevent entry of uninvolved persons.
- minimize the overflight time over uninvolved individuals.
- maintain the maximum possible distance between the UAS and uninvolved individuals or attempt to position the UAS above areas where there are no uninvolved individuals.

BEFORE STARTING THE OPERATIONS THE PILOT WILL INFORM ALL PERSONS INVOLVED:

- about the duration of the operation,
- about the positions they must occupy,
- about the objectives of the UAS operations,
- familiarize them with emergency procedures, and
- they must explicitly agree to participate.

2. Airspace restrictions

2.1 Obtaining up-to-date information on published restrictions or conditions

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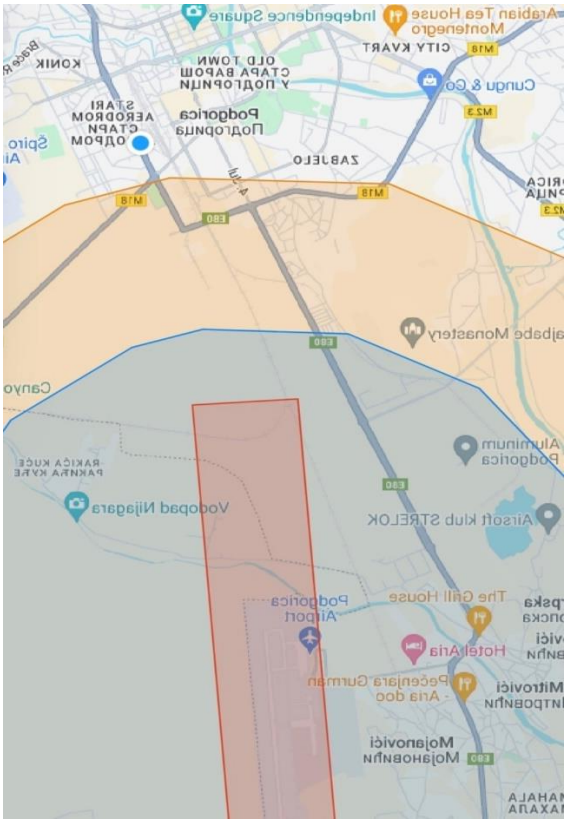


MAKE SURE YOU HAVE DATA AVAILABLE FOR LOADING INTO THE GEO AWARENESS SYSTEM BEFORE FLIGHT

The operator of the unmanned aircraft is obliged to provide you with the latest version of the geographical zones for the unmanned aircraft, and you are obliged to upload the data to the geoawareness system.

Information about geographical zones is publicly available so that you can be informed about the airspace in which you intend to conduct operations.

Geographical zones for unmanned aircraft are established in order to:

- prohibit certain or all UAS operations, request particular conditions for certain or all UAS, operations or require a prior flight authorisation for certain or all UAS operations;
- subject UAS operations to specified environmental standards;
- allow access to certain UAS classes only;
- allow access only to UAS equipped with certain technical features, in particular remote
- identification systems or geo awareness systems;
- allowed access under certain conditions and with the consent of the competent authorities.

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.

Airspace restrictions are applicable to the operations of UAS - The information in the geo-awareness function must be updated when applicable to the intended location of operation.

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.

An update of the geo-awareness information is necessary only when applicable changes at the location of operation are made.

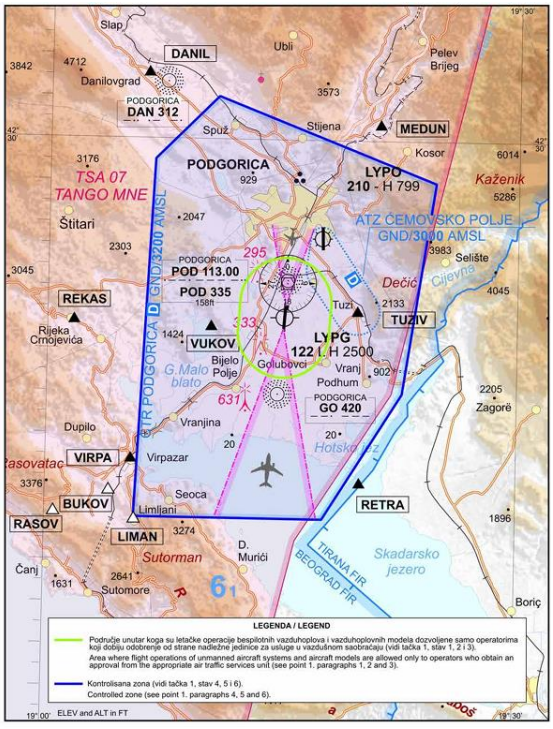
Flights within a UAS geographical zones are allowed in accordance with the conditions and/or restrictions of the zones.

Geographical zones are established in the vicinity of the airport in order to protect aircraft arriving and departing from the airport.

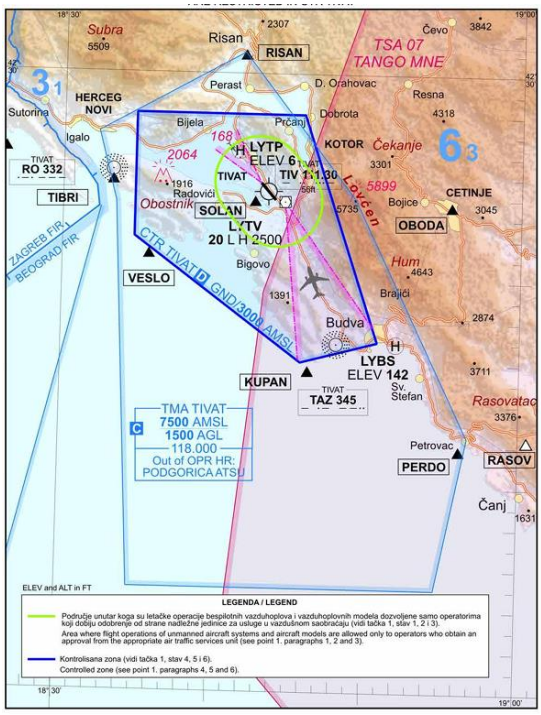
2.2 Types of geographical zones and the procedures for receiving a flight authorisation

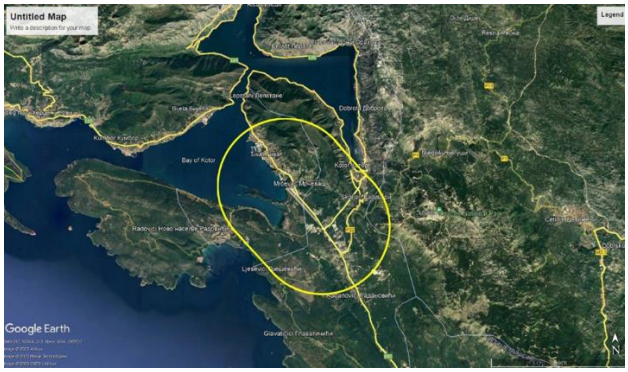
Operations that pose a high risk, from the aspect of endangering the safety of other users of airspace, are operations within control zone airport Tivat and Podgorica.

Zones (areas) where flight operations are restricted can be found on the following link:



Map of areas with flight restrictions in the CTR Podgorica





Map of areas with flight restrictions in the CTR Tivat

- Within areas marked with a green line, operations are allowed only with prior approval from the appropriate air traffic services unit.
- Within areas marked with a blue line is allowed up to 50 m, and from 50 m to 120 m only with prior approval from the appropriate air traffic services unit (AMC unit).
- The request for an approval of flight operations in restricted zones shall be submitted to the appropriate air traffic services unit at least two working days prior to planned flight operations.

3. Aviation regulations

3.1. Introduction to aviation system

The Implementing Regulation (EU) 2019/947 was transposed by Regulation on conditions for the safe operation of unmanned aircraft and it shall take effect from July 1, 2024.

IMPORTANT!!!

EXAMINATION CERTIFICATES, REGISTRATION CERTIFICATES, INSURANCE POLICIES AND SECURITY REGULATIONS ARE VALID ONLY IN MONTENEGRO.

In the application of the Regulation 2019/947, solutions determined by the decisions of the Executive Director of the European Union Aviation Safety Agency (EASA) shall be used, which contain Acceptable Means of Compliance (ACM) and instructions (Guidance Material - GM) of EASA.

The regulations prescribe regulatory requirements that must be met. AMC and GM prescribe methods on the basis of which it is possible to comply with the regulatory requirements from the Regulation. You can find the Regulation on the conditions for the safe operation of unmanned aircraft systems (transposed EU Regulation 2019/947) in the Official Gazette of Montenegro and on the website of the Civil Aviation Agency of Montenegro.

https://www.caa.me/me/bespilotni-vazduhoplovi

3.2. Regulation on conditions for the safe operation of the unmanned aircraft systems

The provisions of this regulation shall not apply:
- when operations with unmanned aircraft systems are operated in a closed space, and
- on UAS, while under the control and responsibility of the State they perform military, customs or police activities, search and rescue activities, fire-fighting activities, border surveillance activities, coast guard activities or similar activities and services, which are undertaken in the public interest by the competent State authority or are undertaken on its behalf, as well as personnel and organizations involved in the activities and services performed by those aircraft.

Any UAS operator that does not operate in accordance with the regulations will be subject to the penalties established by the Law on Air Transport and the Law on Inspection control.

UNMANNED AIRCRAFT OPERATIONS ARE PERFORMED IN OPEN, SPECIFIC AND CERTIFIED CATEGORY.

Open category is divided into subcategories:

- **A1**
- **A2**
- **A3**

Unmanned aircrafts are marked with class C0 – C4.

- When flying in subcategory A1 your unmanned aircraft shall be marked with class C0 or C1
- When flying in subcategory A2 your unnamed aircraft shall be marked with class C0, C1 or C2
- When flying in subcategory A3 your unmanned aircraft shall be marked with class C0, C1, C2, C3 or class C4.

Until June 30, 2025, UAS that do not have a Class C designation can be used in the "open" category. For example: Unmanned aircraft weighing between 500 g and 2 kg can be used in the A2 and A3 subcategories during the transitional period.

The open category of operations requires operator registration and certification of pilot competence, and compliance with category operational limitations.

The following are required to register in the open category:

- UAS operators whose MTOM is greater than 250g and less than 25 kg,
- UAS operators whose MTOM is less than 250 g if they are equipped with data collection sensors (e.g. camera or microphone)
- UAS operators who, in the event of an impact on a person, can transfer kinetic energy greater than 80 joules.

Responsibilities of UAS operator

- develop operational procedures adapted to the type of operation and the risk involved and that pilots are familiar with procedures
- ensure that all operations effectively use and support the efficient use of radio spectrum in order to avoid harmful interference
- designate a remote pilot for each UAS operation
- ensure that the remote pilots and all other personnel performing a task in support of the operations have appropriate competences for subcategory in which pilot will perform operations
- the related class identification label is affixed to the unmanned aircraft
- that remote pilots are provided with the information relevant to the intended UAS operation concerning any geographical zones
- 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.

Responsibilities of the remote pilot

- ensure that the UAS is in a condition to safely complete the intended flight and capable of maintaining control of the unmanned aircraft, unless contact has been lost or the unmanned aircraft is in free flight,
- operate the UAS in accordance with the user's manual provided by the manufacturer, including any applicable limitations
- 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,
- 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,
- comply with the operational limitations in geographical zones,
- ensure, if the UAS is operated at night, that it is equipped with a green flashing light,
- not to 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,

  not to 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.

DISCONTINUATION OF FLIGHT IF THE OPERATION PRESENTS A RISK TO OTHER AIRCRAFT

The rules require for a pilot of unmanned aircraft to maintain a detailed visual scan (surveillance) of the airspace to avoid any risk of collision with a manned aircraft. This means that the remote pilot of the unmanned aircraft is primarily responsible for avoiding collisions. The reason is that the remote pilot(s) of the manned aircraft may not be able to see the unmanned aircraft due to its small size. Therefore, the remote pilot of the unmanned aircraft should assess the risk of collision and take appropriate measures.

As soon as the pilot of an unmanned aircraft sees another aircraft or a parachute or any other user of the airspace, he/she must immediately take measures to keep the unmanned aircraft at a safe distance from him/her and land if the unmanned aircraft is on the path of another object.

For example, if a remote pilot sees a manned aircraft flying at a very high altitude (i.e. 1km or more), since the remote pilot will always keep its unmanned aircraft below 120m, the operation can be continued.

If the pilot observes an aircraft passing through the sky at a low altitude, at which interaction with the unmanned aircraft may occur, he/she must immediately reduce the altitude of the unmanned aircraft (e.g. to less than 10 m above the ground) and keep the unmanned aircraft in an area that is remote (not less than 500 m) from another aircraft. If they cannot provide such a distance, the unmanned aircraft should land immediately.

Each UAS operator should report to the competent authority occurrences that endanger or which, if not corrected or resolved, may endanger the aircraft, the persons on board and all other persons, equipment or installations that affect the operations of the aircraft and also, they should report other relevant information related to security in that context.

Upon receipt of such information, the competent authority shall undertake the necessary measures. Occurrences are reported when they relate to a condition that endangers, or which, if not corrected or resolved, would endanger the aircraft, its passengers, any other person, equipment or installation that affects the operations of the aircraft.

In the event of a death or serious personal injury or a close encounter between an unmanned aircraft and a manned aircraft, you are obliged to notify the Civil Aviation Agency within 72 hours.

All occurrences should be reported at the following e-mail address mor@caa.me.

4. Human performance limitations

4.1 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

THE REMOTE PILOT SHALL NOT PERFORM OPERATIONS IF HE/SHE IS UNDER THE INFLUENCE OF PSYCHOACTIVE SUBSTANCES OR ALCOHOL OR WHEN FOR ANY OTHER REASON HE/SHE IS UNFIT TO PERFORM THE PLANNED OPERATION IN A SAFE MANNER, BECAUSE OF:

- The negative impact of alcohol includes lengthening of mental and physical reaction time, making of more mistakes and reducing the possibility of successful completion of operations.
- Psychoactive substances have a significant negative impact on the performance of operations, reduce working capacity because they affect the ability to concentrate, retain data and make reasonable decisions.
- If the pilot is tired, sick, uses drugs that reduce the speed of reaction or has personal problems that could affect the safe performance of the operation and because of which there is a possibility that the reactions would not be timely, the pilot should postpone the planned operation.

Fatigue and stress are also factors that affect a pilot's ability.

4.2 Human perception (observation)

- Factors influencing VLOS
- Distance of obstacles and the distance between the UA and obstacles
- Evaluation of the speed of the UA
- Evaluation of the height of the UA
- Situational awareness
- Night Operations.

WHEN PERFORMING UAS OPERATIONS WITHIN THE VISUAL LINE OF SIGHT, THE REMOTE PILOT SHALL TAKE CARE OF THE FOLLOWING:

- **The influence on the pilot's VLOS** can be: weather conditions, lighting, visual aids on the UA, size of the UA.

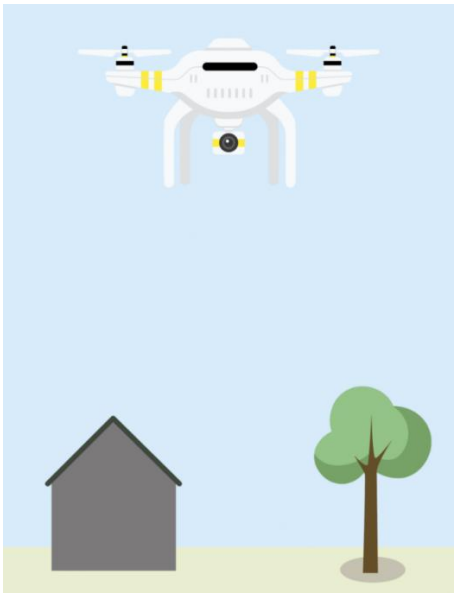
- **Considerations of Flight Termination**– in emergency situations, the pilot may be required to land the unmanned aircraft outside of the planned landing location, or to destroy the unmanned aircraft by controlled impact, water landing, or other means. Even though, there are no people in the unmanned aircraft, the pilot is still responsible for the protection of people and property on the ground or in another aircraft. The risk of accidental activation of the flight termination system must also be considered.
- **Obstacles at the location** - the pilot must perform pre-flight procedures, i.e. come to the location before the operation, and check the operation area and spot all obstacles and assess at what height and distance from them he/she must fly in order to avoid unwanted consequences. This especially applies to artificial obstacles, and the area should also be checked for non-involved persons.
- **Speed of the unmanned aircraft** - the pilot will adjust the speed of the unmanned aircraft depending on the area where UAS operations are planned to be carried out, that is, on the situation at the location before the operation. The pilot can hardly accurately define the distance between obstacles and the unmanned aircraft.
- **The height of the unmanned aircraft** - since the height of the flight in relation to the take-off point can always be seen on the screen, the pilot must periodically check at which height he is flying and adjust the height so that he/she always flies lower than the maximum permitted height. The pilot can hardly accurately define the height of the UA.
- **Awareness of the situation** - the pilot must during the whole UAS operation take into account the situation in the airspace in which he/she is performing the operations and monitor the situation in it. Special attention must be paid to the presence of other aircraft, especially manned aircraft. A pilot's situational awareness consists of the pilot's ability to perceive, understand and react to every possible risk in the operational environment.
- **Night operations** – before performing UAS operations at night, the pilot must check the situation at the planned location, make a flight plan that will list all obstacles at the location and ensure that all required lights (flashing green) on the unmanned aircraft are working. The pilot's capabilities are reduced at night because human perception is weaker due to low visibility.
- Handover

Control of an unmanned aircraft can be switched in flight between pilots at the same control station, between control panels at the same control station, or between physically separate control stations. Handovers can represent a particular risk, related to errors in the way the system works and in the interruption of coordination. Where an unmanned aircraft can remain in the air for a long time and where handovers can be made between several pilots during one flight, consequently the level of risk increases with each handover.

5. Operational procedures

5.1 Pre-flight

- 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 above uninvolved persons, and the potential overflight above critical infrastructure
- identification of a safe area where the remote pilot can perform a practice flight;
- 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
- checking the condition of the UAS.



CHECK AREA OF INTENDED OPERATIONS BEFORE FLIGHT

Familiarisation with the environment and obstacles should be conducted, when possible, by walking around the area where the operation is intended to be performed. When the area of operation is hilly and includes obstacles (trees, buildings, etc.), the best technique for assessing the presence of uninvolved persons is for the UAS pilot to conduct a walking inspection of the area of operation.

In the area of intended operations, try to spot:

- the terrain
- possible obstacles
- obstacles (disturbances) for maintaining an unmanned aircraft in the pilot's VLOS
- possible overflight of non-involved persons
- possible overflight of critical infrastructures.

Plan your flight so that:

- you are able to avoid terrain and obstacles at all times
- you have an aircraft in your visual line of sight at all times
- you do not fly over non-involved persons if this is not allowed in the category of operations you are performing
- you enable safe overflight or avoidance of critical infrastructures, such as buildings, poles, antennas, transmission lines etc.

To assess the area of operation of the UAS, the pilot should check the existence of roads, poles, wind generators (windmills) and the existence of footpaths.

For footpaths near the UAS area of operation, the pilot must avoid flying over non-involved persons.

With a UAS designated as Class C0 in Subcategory A1, the pilot may fly over uninvolved persons, but may never fly over assemblies of people.

With a UAS designated as Class C1 in Subcategory A1, the pilot flies the UAS in such a way that a remote pilot of the unmanned aircraft does not overfly assemblies of people and reasonably expects that no uninvolved persons will be overflown.

Information on UA performance limitations can be obtained from the pilot in the UAS user manual.

UAV pilots can use a pre-flight checklist to ensure safe and legal UAS operation.

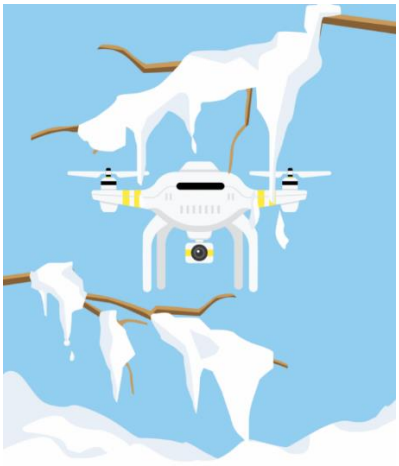
A checklist is a structured list of necessary items, things to do or points to consider. It can be used for pre-flight inspections, emergency procedures, maintenance.

After assessing the area, but before starting the UAS operation, if the process is not automated, the pilot should calibrate the UA compass and adjust the RTH parameters, primarily the flight height, in order to overcome the obstacles.

PRE-FLIGHT ASSESSMENT OF THE SURROUNDING AREA

In the area of the intended operations, try to see if there are infrastructure or other objects that could cause electromagnetic interference, such as transmission lines, antennas, transmitters and similar.

If you notice the existence of objects that could electromagnetically interfere with your aircraft's signal, such as transmission lines, antennas, power plants, substations, transmitters, etc., do not start operations.



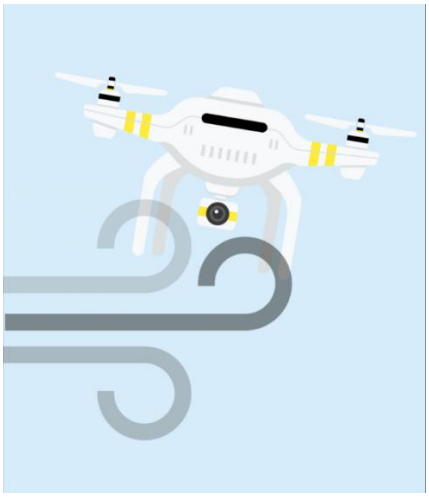
PRE-FLIGHT ASSESSMENT OF METEOROLOGICAL CONDITIONS IN THE AREA OF INTENDED OPERATIONS

In the area of intended operations, try to see what the weather conditions are.

A weather forecast is a prediction of the future weather for a specific time and location. Among other things, temperature, wind, humidity, precipitation are data that can be useful for UAS operation.

Negative and even low positive temperatures <6°C, with the presence of moisture in the air, can cause the formation of ice on the surfaces of the aircraft, icing. The accumulation of ice on the surfaces of the unmanned aircraft makes it difficult and hinders the even flow of air around the surfaces of the unmanned aircraft. This significantly reduces its performance, and sometimes makes it completely impossible to maintain the unmanned aircraft in flight.

Do not fly in icing conditions.



Strong wind can make it very difficult, and sometimes completely impossible, to control the unmanned aircraft.
Keep in mind that an aircraft, flying against the direction of the wind, travels more slowly and uses much more energy, so plan your flight accordingly. It is often the case that the aircraft on the way back to the landing place runs out of battery or fuel before arriving at the destination, due to a headwind that the pilot did not take into account when planning the flight.

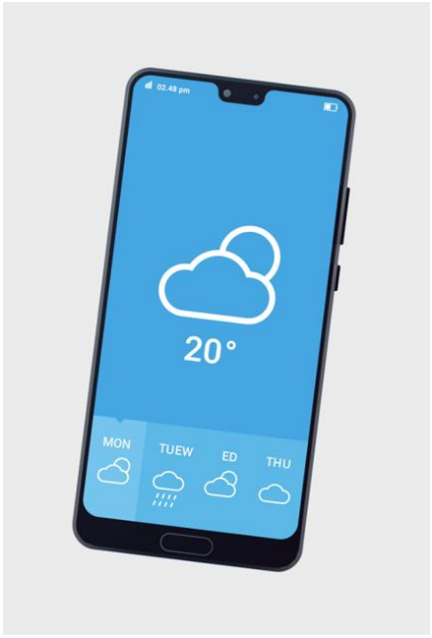
Meteorological information that the pilot needs to take into account is the wind speed near the ground. The wind becomes stronger with increasing altitude.

The attention needs to be paid also to visibility. Fog can significantly reduce your ability to maintain the unmanned aircraft in visual line of sight, just like using the aircraft's camera to help determine your position.

During rain, the remote pilot should take into account that moisture can damage unmanned aircraft.

Do not fly in conditions of reduced visibility.

If any of the meteorological parameters are outside the limits given for your aircraft by the manufacturer in the instructions for use, do not start operations until all the meteorological parameters are within the specified limits.



Gather meteorological information from all available sources.

You can gather general meteorological information from the media, but also by direct observation.

However, it is recommended to use official sources of aviation meteorological data.

There are also a number of smartphone applications that are used to collect and interpret aviation weather reports, such as AeroPlus, NOAA Aviation Live Sky Weather, Easy Aviation weather, My Altitude.

PRE-FLIGHT CHECK OF THE CONDITION OF THE UAS

Information on mandatory checks for your unmanned aircraft system can be found in the user manuals produced by the unmanned aircraft system manufacturer.

Strictly adhere to the manufacturer's instructions when conducting a pre-flight inspection, as the manufacturer knows your unmanned aircraft system best.

Some of the typical pre-flight checks of an unmanned aircraft system are:

Aircraft and steering parts	Original and in good condition
Remote control, battery	Fully loaded
Camera lens (if used)	Free from dirt and foreign objects
Micro SD card (if used)	Inserted
Gimbal (if used)	Free to spin before starting
Propellers	Attached to the motors and they rotate freely
Engines	They start and work normally
Compass	Calibrated according to the manufacturer's instructions
Aircraft and remote control software and firmware	Updated
Obstacle avoidance sensors	Clean
Battery	Checking the battery temperature and making sure it is in the safe temperature range

5.2 In flight

- Normal procedures
- Contingency procedures

NORMAL PROCEDURES USED BY THE PILOT IN UAS OPERATIONS ARE:

- the unmanned aircraft must always be in the visual line of sight
- in case of an unexpected flyover of non-involved persons (if not allowed), the remote pilot should reduce as much as possible the time during which the UA flies over those persons.
- during the operations, a remote pilot must not answer calls, messages or do things that would distract them from the operations
- performing operations under the influence of alcohol or drugs is not allowed
- it is not recommended to fly near reflective surfaces such as water or snow, because such terrains can affect the operation of the visual positioning system
- Monitor low battery warnings, and react in accordance with the warning, especially in the case of a warning that the pilot must land as soon as possible
- after landing, first stop the engines (if they do not stop automatically), then turn off the flight battery, and then turn off the control station,
  if the pilot flies the UAS under the bridge, in canyons and other semi-enclosed spaces, problems with the compass and loss of GPS may occur.

THE EMERGENCY PROCEDURES TO BE USED BY THE PILOT IN UAS OPERATIONS ARE:

- in case of engine failure in flight, keep the unmanned aircraft in balance and land the unmanned aircraft in the emergency landing zone as soon as possible,
- if the GPS signal is weakened or completely lost, the operation should be continued cautiously or interrupted (stopped),
- in case of uncontrolled flight, land immediately,
- if visual contact with the unmanned aircraft is lost, turn on the RTH function,
- in the event of a sudden change in weather conditions, land immediately
- in case of loss of control due to shifting of the center of gravity, maintain the unmanned aircraft and land it in the shortest possible time,
- when losing control due to loss of orientation, switch to autopilot and start automatic landing or RTH function.

Flying over non-involved persons, flying near the no-fly zone are not "abnormal situations" but violations.

"Contingency" as it relates to unmanned aircraft operations is a situation in which the maneuverability of the unmanned aircraft is reduced due to one or more unforeseen circumstances.

Loss of C2 connection can probably lead to "abnormal situation" during UA operation. When it comes to the "unforeseen situation", the pilot should generally take into account that all UAS are different, and the specifics should be checked in the user manual for the UAS before use.

In the event of loss of C2 communication, the pilot should attempt to re-establish communication by approaching the VLOS UAS, or properly position the antennas at the control station. In principle, if there are two antennas, they should be facing the unmanned aircraft, and the angle of the antennas can also be adjusted.

In the event of a loss of control, the procedure for loss of C2 connection can also be used to prevent flying away.

Loss of connection between the remote controller and the UAS is associated with:

- the distance between the UAS and the remote control
- sources of electromagnetic radiation that can interfere with the signal
- terrain configuration.

When damage to the aircraft's structure is detected during flight, the pilot should attempt to steer and land safely.
The UA is considered defective until further notice if the UA is damaged in a collision.
If the UA gets too close to another aircraft (lack of airspace separation), the pilot should lower altitude, perform evasive maneuvers and initiate landing, activate RTH if necessary, and report the occurrence.

5.3 Post flight

- Maintenance
- Recording flight data

REMOTE PILOT UPON LANDING SHALL:

- stop the engines
- disconnect the battery on the unmanned aircraft
- turn off the control station
- separate the battery from the unmanned aircraft and place it in a safe location (if the battery is defective or damaged, it may overheat and such battery must be replaced)
- check the battery temperature and ensure that it is within the safe temperature range
- check the temperature of the engine under the rotor (which is generally lower than the temperature of the unmanned aircraft's batteries)
- check all components for visible damage and note if any component needs to be repaired (e.g. frame, rotors, engines, gimbal, indicator light, screws, GPS, undercarriage, batteries, electronic speed controller, compass, wires, camera)
- wipe the unmanned aircraft with a cloth
- prepare the unmanned aircraft for the next operation

Upon each flight, propellers and batteries should be checked for damage.
For the UAS to operate safely, the pilot needs to check and maintain the UAS after each flight.
After the flight, the batteries should be charged and stored separately from the device.
After each flight, the maintenance work that the pilot needs to do is to check for damage, clean and remove the batteries.
Batteries (lithium polymer) should be stored in a dark place, at a temperature of 15°C - 25°C, on a non-flammable surface.
Swollen or damaged batteries should be removed by the pilot from the device, discharged and disposed of.
The pilot needs to replace the damaged batteries/components, otherwise there is a risk of an accident.

THE DATA THAT THE UNMANNED AIRCRAFT OPERATOR MUST KEEP FOR EACH FLIGHT ARE:

- name and surname of the pilot
- data on the unmanned aircraft (manufacturer, model/type, serial number)
- date, time, location of take-off and landing
- flight duration
- total number of flight hours/cycle (takeoff and landing)
- data on the performed operation (add the reference of the Statement of Work or approval number, if applicable)
- any significant occurrences or accidents that occurred during the operation
- that the pre-flight check of the unmanned aircraft was performed
- all faliures and limitations
- all repairs and changes in the configuration of the unmanned aircraft.

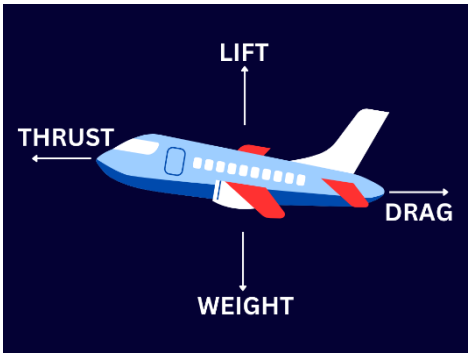
Data backup and storage (telemetry) is important for the reconstruction of completed flights.
The pilot must save/backup flight data to reconstruct the flight.
Save/backup flight data on a secure memory card for data storage.
The flight data that should be kept are: waypoints, flight altitude, flight date, take-off and landing place and time of take-off and landing.

Note: The above data shall be kept for operations in a specific category.

6. General Knowledge on UAS

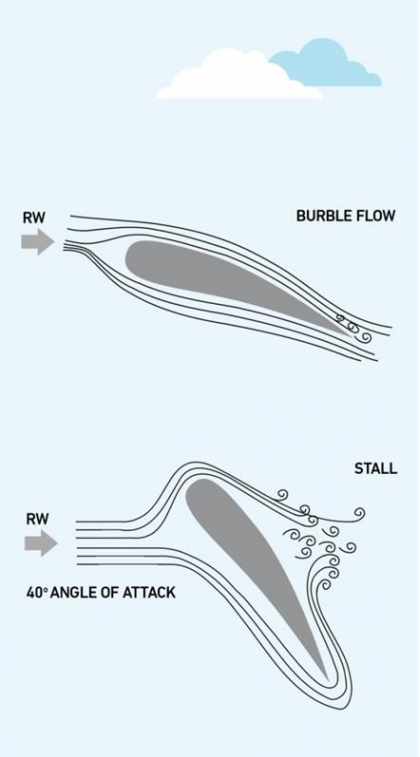
6.1. Basic flight principles

Yaw, pitch and roll are movements performed by the aircraft.
Movement around the vertical axis of the quadcopter's rotor is yaw.
UAS has certain limitations in surrounding (range of operating temperature, maximum wind resistance, weather conditions, etc.). Pilot can find these information in user's manual.
Main function of piloting and controlling is creation of required movements and guidance of UA.
The most often frequencies for data transfer for unmanned aircraft are 2,4 GHz and 5,8 GHz.
Najčešće frekvencije veze za prenos podataka za bespilotne vazduhoplove su 2,4 GHz i 5,8 GHz.
Before any flight pilot should review UAS main elements. The function of this review ensures that the UAS is in good condition and that it is safe for flight.
Pilot learns how to control UA in all phases of flight by studying UA user's manual.
Function of the geo-caging system is to define volume in which unmanned aircraft will operate and which they can't leave.
Function of Geo-fencing system is to define volume in which unmanned aircraft can't fly.
For the purpose of good flight planning, before flight you need to set parameters of lost connection, to set maximum flight height, enter data on geographic zone in geo-awareness system and enter registration number of UAS operator into direct remote identification system. Procedures for setting and reading of these data into unmanned aircraft can be seen in user's manual for the UAS provided by the manufacturer.
The pilot knows the maintenance required for the UA by looking at the UAS maintenance instructions.
UAS maintenance is necessary to perform while taking into consideration maintenance instructions.



LET'S RECALL HOW THE AIRCRAFT FLIES! WHAT FORCES AFFECT AIRCRAFT IN FLIGHT? -LIFT
Aircraft needs lift to fly. Different aircraft achieve lift in different ways, but if we speak about largest number of unmanned aircraft, lift is achieved by airflow around surface of wings or propeller blades.

Namely, air particles have the feature to return to the place from which they were moved in the shortest possible term and trajectory.
Because of that feature and due to larger curvature of upper area of wing or propeller blade, the air flowing above the wing moves with bigger speed than the air flowing below the wing. The air traveling above a surface makes lower pressure on it than static air or air traveling at a lower speed relative to the surface. Therefore, lift on a wing or rotor blade occurs due to the difference in air pressure between their upper and lower surfaces.



ATTENTION! THE LIFT CAN BE LOST!

Wing or propeller blade shall generate sufficient lift only when air around them flows undisturbed and with required speed.

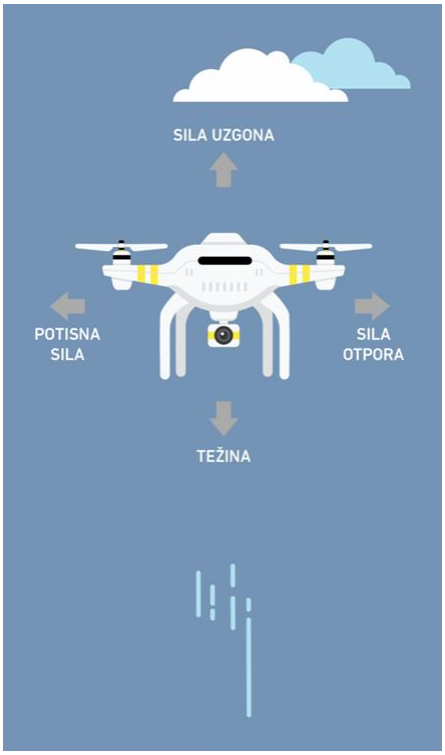
Air can stop flowing around the wings or propeller blades undisturbed or fast enough for more reasons:

- too large angle of attack of the wing or propeller blades related to the air flow,
- contamination (ice and other material),
- to small speed of wing or propeller blades,
- damage of wing or propeller blades.

Iz tog razloga uvijek vodite računa da tokom leta:

- na krilima ili na krakovima propelera nema kontaminacija,
- da krilo i/ili krakovi propelera nisu oštećeni,
- održavate potrebnu brzinu bespilotnog vazduhoplova, ako se radi o vazduhoplovu sa čvrstim krilima,
- održavate potrebnu brzinu rotirajućih kraka propelera u slučaju multirotora.
- održavate odgovarajući napadni ugao krila u odnosu na struju vazduha.

ATTENTION! LOSS OF LIFT COULD RESULT IN AIRCRAFT CRASHING!



THERE ARE ADDITIONAL FORCES THAT AFFECT AIRCRAFT IN FLIGHT

Drag force

Drag is the force that affects an aircraft and impedes its forward movement.

Drag affects the aircraft in flight in the directon opposite to the moving direction, parallel to relative airflow and affects flight speed by limiting the effect of engine thrust.

Drag consists of:

- resistance of friction and shape (parasitic resistance), that grows exponentially with the speed of aircraft movement,
- induced resistance, that declines with the speed of aircraft moving.

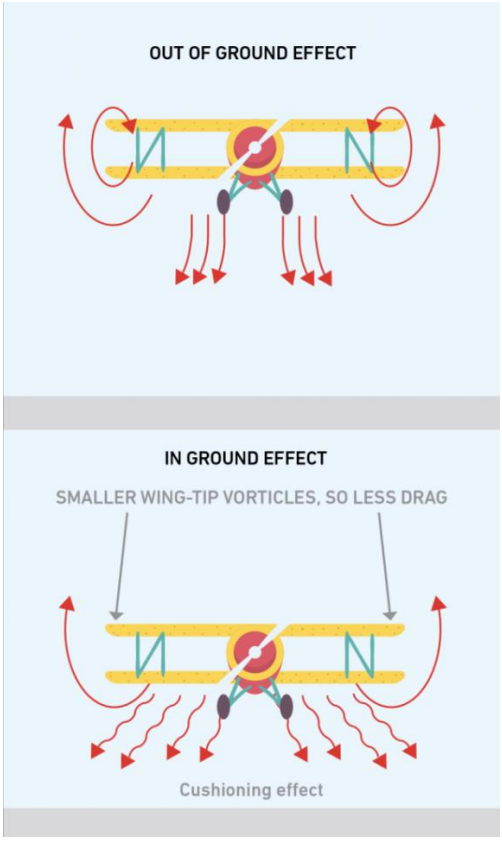
Thrust force

- Force of aircraft engine that moves aircraft.

Gravity force

- Force caused by Earth gravity.

The aircraft flies with constant speed and at constant height when the thrust force is equal to resistance force, and lift force is equal to force of gravity. Change of relations of these forces affects direction, speed and height of aircraft flight.



GROUND EFFECT

When the wing or propeller blade gets near the ground surface, cushioning effect is generated between them, which leads to increase of air pressure to the lower surface of wing or propeller blades.

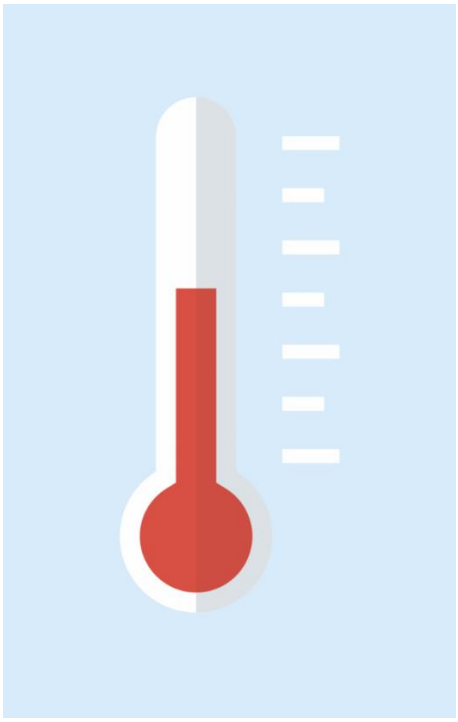
For fixed-wing aircraft, the ground effect causes increase of lift generated by the wing when flying near ground surface. When landing, the aircraft "floats", so it can surprise a pilot who tries to land on surface of limited dimensions.

When taking-off it enables acceleration of aircraft by flying low above take-off surface, while using ground effect until reaching safe climbing speed. For multirotor, floating low above ground surface enables more efficient use of throttle, which results in possibility of lifting heavier cargo.

6.2. Influence of surrounding conditions to UA performances

THERE ARE VARIOUS FACTORS AFFECTING AIRCRAFT PERFORMANCES

The most often, aircraft mass is the only factor that we can influence on. Majority of other factors originates from the surrounding and the pilot can't have influence on them (wind, temperature, air density…). For this reason, it is extremely important that the pilot has good knowledge how those factors affect performances of his aircraft.



TEMPERATURE

Temperature affects air density. As the temperature increases, the air density decreases.

As air density decreases, engine thrust also decreases.

With assumption of unchanged throttle, excess of power that the engine can develop in high outer (external) temperature is lower, therefore the aircraft performances are smaller. Reaction of aircraft to pilot commands will be harder and slower.

The reverse is also true, at lower outside (external) temperatures the performance of the aircraft is better. However, do not forget that low temperatures have a bad effect on battery performance!

When temperatures are low (<6°C) and with humidity in the air, the freezing can occur. Ukoliko se led nakupi na kontrolnim površinama vazduhoplova, krilima, propelerima, može doći do odvajanja struje vazduha od tih površina i posledično sloma uzgona, što može završiti padom vazduhoplova.

If the ice accumulates on aircraft control surfaces, wings, propellers, there may be separation of the airflow from those surfaces and, consequently, lift breakdown, which may result the aircraft falling.

Check and verify limitations for operational temperature range laid down by manufacturer of your aircraft in aircraft user's manual (instruction) or equivalent document! Do not fly in freezing conditions!

ALTITUDE

Altitude also influences air density.

With increasing of altitude, air density reduces.

With reducing of air density, available engine throttle reduces as well.

With assumption of unchanged required throttle, excess of power that can be developed by the engine at higher altitude is smaller, so the aircraft performances are smaller as well.

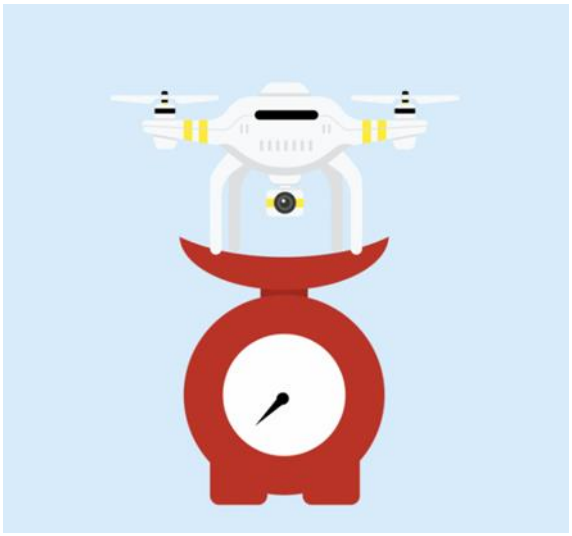
Reaction of aircraft to pilot commands will be harder and slower.

WIND

The speed and direction of the wind have a significant impact on aircraft flight. For aircraft with fixed wings, a headwind improves takeoff and climb performance, and also enables quicker deceleration during landing. Conversely, tailwind has completely opposite effect. Therefore, such aircraft should always take off and land into the wind.

Check the wind speed and direction at the operation location before deciding on takeoff and continuing the flight! Strong winds can pose a challenge in maintaining control of both fixed-wing and multirotor aircraft.

Check and follow wind speed limitations for your aircraft laid down by the manufacturer in user's manual (instructions) or equivalent document!



MASS OF AIRCRAFT

The mass of the aircraft significantly affects its performance. A lighter aircraft will respond better and faster to pilot commands, whereas with a heavier aircraft, the opposite will occur. Overloading the aircraft can lead to loss of control and potential aircraft crash.

Check and follow limitations of Maximum Take-off Masses (MTOM) for your aircraft laid down by the manufacturer in user's manual (instructions) or equivalent document!

6.3. Principles of command and control

Overview
Data link frequencies and spectrum
Automatic flight modes, override and manual interventions

OVERVIEW

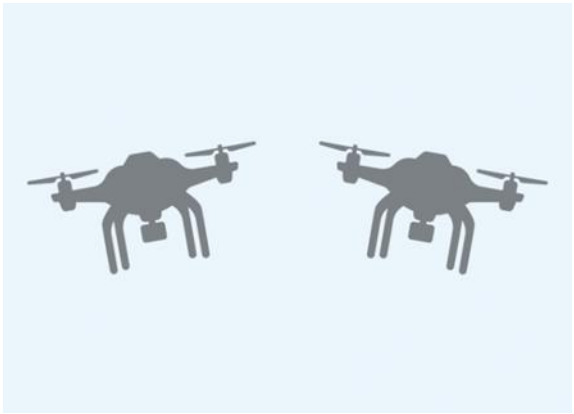
To control unmanned aircraft, the remote pilot uses a control station to manage flight parameters such as speed, altitude, direction, etc., as well as the operational modes (manual, gyro-assisted, GPS-assisted, etc.) of the UAS.

Control of movement and maneuvers is crucial for safe operation of unmanned aircrafts. This is achieved through efficient use of control stick and buttons on the UA remote controller. Each movement of a control stick corresponds to a command that affects a specific motion of the unmanned aircraft. Successful maneuvering is achieved by combining multiple commands simultaneously. Essentially, applying more pressure to the control stick on the remote controller causes the UA to move more forcefully in the desired direction.

There are four basic controls of unmanned aircraft:

- Turning around the longitudinal axis (roll)
- Turning around lateral axis (pitch)
- Turning around the vertical axis (yaw)
- Power (throttle)

For simplicity, this training implies that the left control stick of remote controller controls yaw and throttle, and the right one controls roll and pitch.



TURNING AROUND THE LONGITUDINAL AXIS (ROLL)

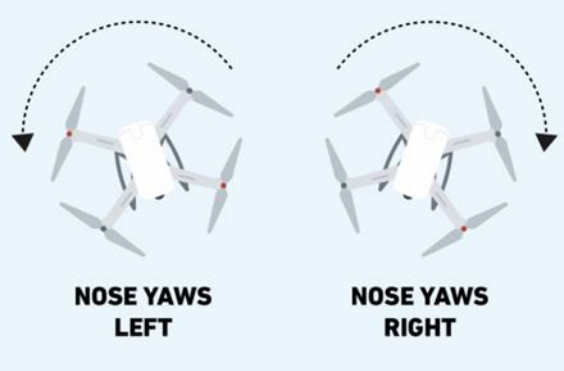
Turning around longitudinal axis moves aircraft left or right.

This is achieved by moving the right control stick on the remote controller to the left or right, causing the aircraft to lean to the corresponding side. In this leaned position, the aircraft's propellers push air in one direction, and the aircraft consequently moves in the opposite direction, as showen in the image.

TURNING AROUND THE LATERAL AXIS (PITCH)

Turning around the lateral axis moves the aircraft forward or backward.

This is achieved by moving the right control stick on the remote controller towards or away from oneself, causing the aircraft to lean forward or backward. In this leaned position, the aircraft's propellers push air in one direction, and the aircraft consequently moves in the opposite direction, as shown in the image.



TURNING AROUND THE VERTICAL AXIS (YAW)

Yaw rotates the aircraft clockwise or counterclockwise.

This is achieved by moving the left control stick on the remote controller to the left or right, causing the aircraft to rotate around its vertical axis in the corresponding direction.

POWER (THROTTLE)

The throttle command provides enough power to the aircraft's propellers for takeoff and flight. During flight, the throttle command is continuously applied. To increase power (mod 2), push the left control stick away from you, and to decrease power, pull it towards you. Be careful not to completely cut power until the aircraft is just a few centimeters above the landing surface!

DON'T FORGET!

When the aircraft is facing towards you, the horizontal movements commands (controls) have the opposite effect.

For example, if you push the right control stick to the right on the remote controller while controlling an aircraft flying towards you (mod 2), the aircraft will turn right relative to its direction of movement, but in relation with you it will appear to turn left.

Therefore, when you change flight direction of your aircraft, think how the aircraft will move, and not how the aircraft is oriented towards you!

DATA LINK FREQUENCIES AND SPECTRUM

To ensure the most efficient connection between the remote controller (transmitter) and the unmanned aircraft (receiver), frequencies of 2.4 GHz and 5.8 GHz are used because they enable high-quality transmission of signals and information. The receiver and transmitter automatically switch frequencies hundreds of times per second to operate on the frequency with the least interference and the longest range.
By utilizing the 2.4 GHz and 5.8 GHz bands, exclusively digital communication is used, and each receiver needs to be paired with a specific transmitter to ensure safe piloting.

Individuals and legal entities can use radio frequencies based on an authorization issued by the Agency for Electronic Communications and Postal Services, where applicable.

Certain bands can be used even without approval of the Agency for Electronic Communications and Postal Services. Those bands and conditions under which they can be used are defined by the Rulebook on radio-frequencies and conditions under which those radio-frequencies can be used without approval.

Pursuant to the Decision on the Radio-Frequency Spectrum Allocation Plan ("Official Gazette of Montenegro", No 89/20 and 104/20) and abovementioned Regulation it is as follows:

1) Band 922,7 – 927,7 MHz is not allowed for use.

2) Band 2,400 – 2,483 GHz can be used without obtaining approval by the Agency for Electronic Communications and Postal Services and emitted power must not exceed 100mW.

3) Band 5,725 – 5,825 GHz can be used without obtaining approval by the Agency for Electronic Communications and Postal Services and emitted power must not exceed 25mW.

AUTOMATIC FLIGHT MODES, TAKEOVER AND MANUAL INTERVENTION

Different unmanned aircraft systems have different possibilities of automatic flight mode. For marketing reasons, manufacturers have different names for operating modes of their systems. For the purpose of understanding, in this training we will use generic names for operating modes of unmanned aircraft systems. Pilot must know in entirety each operating mode of his unmanned aircraft system.

AUTOMATIC HEIGHT MAINTENANCE

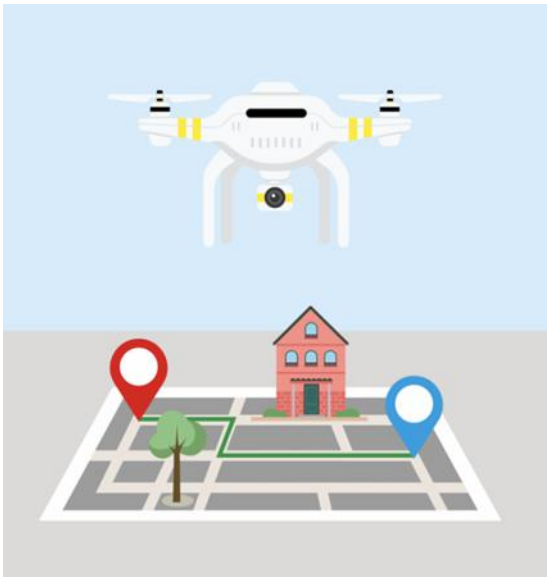
The most advanced unmanned aircraft systems are equipped with barometric sensors that detect changes in air pressure within their flight area. Using an algorithm that correlates air pressure with altitude, they can automatically recognize and maintain their current altitude. Maintained altitude may fluctuate due to wind gusts, causing the aircraft to lean in the direction of the wind, but it will continue to hold the specified height. Other flight parameters in this mode are controlled by the pilot.

MAINTENANCE OF THE POSITION WITH HELP OF GPS

This mode allows for maintaining both lateral and vertical positions and is ideal for learning how to operate an unmanned aircraft. A key feature of this mode is that upon releasing the control sticks on the remote controller, the aircraft holds its current position.

DO NOT FORGET!

This operating mode requires receiving of sufficient number of GPS satellites before take-off, so the time for preparation can last longer than usual.



PROGRAMMED FLIGHT

This operating mode of unmanned aircraft system enables autonomous conducting of flight on programmed route.

Applicable regulations distinguish two kinds of programmed operations:

1. Autonomous operation is unmanned aircraft operation on which the pilot can't have influence.

2. Automatic operation is the one where pilot at any moment can take over piloting of unmanned aircraft.

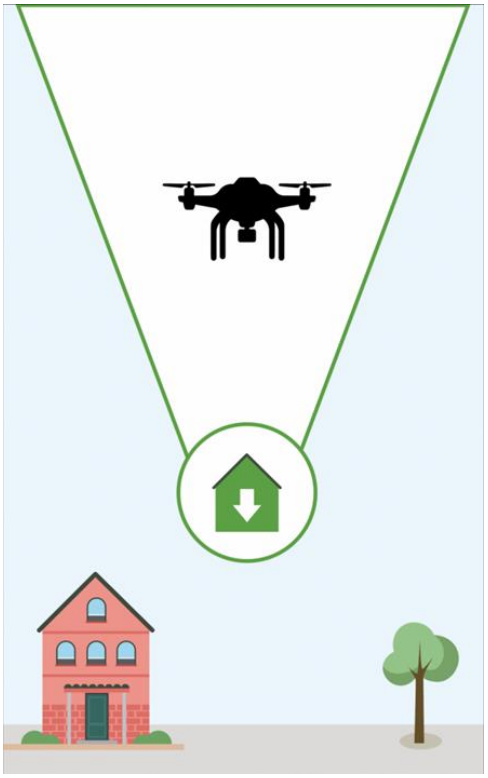
MANNER OF FREE AIRCRAFT ORIENTATION

When the aircraft is oriented with its flight direction towards the pilot, the controls have the opposite effect.

For example, if you push the right control stick to the right on the remote controller while controlling an aircraft flying towards you, the aircraft will turn right relative to its direction of travel; however, from your perspective, it will turn left.

This mode allows the pilot to control the aircraft relative to its position towards the pilot, rather than the direction of the aircraft's movement.

For example, if you push the right control stick to the right on the remote controller while controlling an aircraft flying towards you, the aircraft will turn right relative to you, even though this will be a left turn in relation to its direction of travel.



RETURN TO HOME (RTH)

This mode enables a safe, autonomous, and automatic return of the aircraft to its takeoff position when needed.

It can be activated manually or programmed to engage automatically when certain criteria are met, such as loss of radio signal or completely drains of the remote controller's battery.

REMEMBER!
This mode can only be used if the pilot has ensured that a sufficient number of GPS satellites are being received before takeoff. Although the use of this mode is recommended as a safe way to conduct operations, it should be used cautiously, as obstacles and other situations can endanger the unmanned aircraft in this mode.
IMPORTANT!
Learn well about this operating mode, and particularly how the flight trajectory for return of aircraft to take-off position is programmed.

6.4. Upoznavanje sa uputstvima pruženim u korisničkom priručniku

- Familiarization with the basic parts of the unmanned aerial vehicle;
- Limitations (e.g., weight, speed, environment, battery duration, altitude, etc.);
- Control of the UA during all phases of flight (e.g., takeoff, hovering if applicable, performing basic flight maneuvers, and landing);
- Functions affecting flight safety;
- Establishing procedures in case of loss of connection with the UA;
- Setting the maximum allowed flight height;
- Procedures for uploading geographic zone data into the UA’s geo-awareness system;
- Procedures for uploading the operator's registration number into the remote ID system;
- Safety considerations;
- Instructions for securing cargo;
- Measures to protect against injuries from rotors and sharp edges;
- Safe battery handling;
- Maintenance instructions;

BEFORE CONDUCTING UAS OPERATIONS, THE PILOT MUST LEARN ABOUT UNMANNED AIRCRAFT USER'S MANUAL AND PARTICULARLY ABOUT:

- **basic parts of unmanned aircraft:**
  - flight controller, speed regulator, GPS, engines, propellers, antennas, frame, compass, battery, camera, gimbal, lights, control station

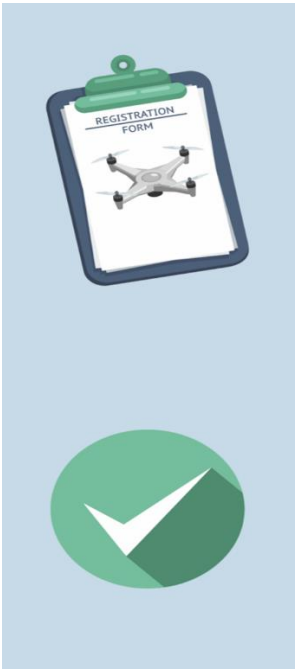
- **unmanned aircraft limitations regarding mass, speed, environment, battery autonomy and others, while taking care that:**
  - Do not use the unmanned aircraft in adverse weather conditions such as wind speeds over 10 m/s, snow or rain, or fog.
  - fly in open areas, as metal structures and large buildings can affect the accuracy of the compass and GPS system.
  - avoid obstacles, assemblies of people, power lines, trees, and water surfaces.
  - avoid flying near base stations and radio transmitting towers because of high level of electro-magnetism
  - flying at higher altitudes can impact battery performance and the UA's overall performance.

- **how to control unmanned aircraft during all phases of flight which includes the following:**
  - securing take-off and landing location
  - pre-flight technical check of system
  - observing take-off location
  - observing airspace in which operations are performed
  - monitoring flight parameters (battery, signal, GPS)
  - adjusting throttle for take-off and landing
  - use of flight commands when landing
  - landing to location previously secured for that.

- **how to safely perform operations with unmanned aircraft in the way that:**
  - pilot must always have enough flying experience
  - always fly at locations with no buildings or other obstacles
  - not to fly above assemblies of people
  - avoid flying at heights above 120m

- fly in moderate weather conditions at temperature between 0˚C and 40˚C
- not to fly unmanned aircraft if the wind speed is more than 10 m/s.

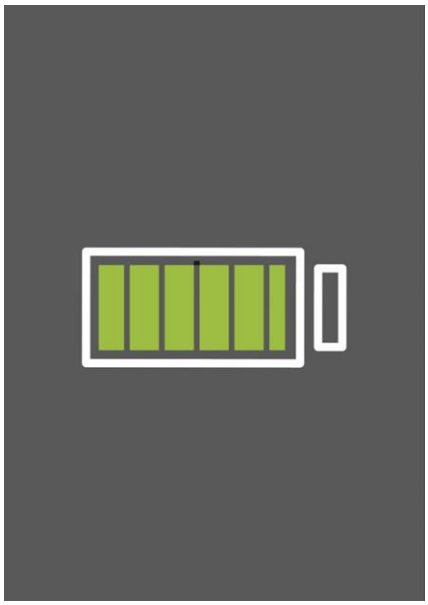
- **how to act if connection to unmanned aircraft is lost, it is required to:**
  - try to re-establish connection by moving control station towards unmanned aircraft
  - move from control place
  - point antennas of control station towards unmanned aircraft
  - keep all electronic devices as far as possible from control station of unmanned aircraft
  - ensure there are no obstacles between unmanned aircraft and control station
  - abort operation.
- **how to adjust highest allowed flight height:**
  - first one should enter general settings of the controller so to touch icon Flight Mode on main screen)
  - then, move to down in order to adjust highest flight height of 120m in relation to the ground.



- **how to load data on geographic zones in geo-awareness system:**
  - before the first flight of the day, the pilot loads and updates information regarding airspace restrictions relative to the unmanned aircraft position and height conditioned by the geographic area, ensuring the integrity and validity of this data are maintained during loading or updating.
- **how to enter the registration number of the operator into the direct remote identification system:**
  - all operators must enter their registration number in all unmanned aircraft with which they perform operations.

- **take into consideration matter of safety of conducting operations with accent on securing cargo, avoiding injuries from rotor and sharp edges and how to safely handle batteries:**
  - useful cargo means instrument, mechanism, equipment, part, device, accessories or additional equipment, including communication equipment, that are installed into aircraft or connected to it, and they are not in use nor there is an intention for their use for piloting aircraft or to control it during flight, and they are not part of structure of aircraft, engine or propellers;
  - before each flight, pilot must check that the cargo is:

        - set so that unmanned aircraft is balanced
        - properly installed on unmanned aircraft – secured that it can't fall out during flight
        - having mass in stipulated limits of manufacturer
    - uvijek osigurati da su svi na dovoljnoj udaljenosti od rotirajućih propelera
    - hands should never go close to rotating propellers
    - install propeller protections, if that is possible
    - batteries should never get in contact with liquids
    - only original batteries are used
    - damaged batteries are not used or charged
    - batteries on unmanned aircraft must not be installed or removed when it is turned on
    - batteries must be stored in stipulated manner



- **with instructions on maintenance of unmanned aircraft that include the following:**
    - clean frame from dust and mud
    - check for cracks on frame
    - check if all screws and bolts are screwed
    - check if the propellers are damaged
    - check if propellers rotate easily
    - check if engines are clean
    - check condition of wires and wirings
    - check if the camera is clean
    - check condition of the base
    - check condition of antennas
    - check condition of control station (antennas, frame, transmitter/receiver, telephone holder)
    - check battery charger
    - check battery condition
    - charge all batteries
    - update software data on unmanned aircraft and control station
    - keep records on unmanned aircraft system maintenance.

An Unmanned Aircraft System (UAS) is considered privately built when it is produced or assembled by the operator for their own use and is not placed on the market (i.e., there is no offer or contract, written or oral, for the transfer of its ownership or any other property rights).
In the context of the definition of privately built UAS, the terms 'manufactured' or 'assembled' by the operator refer to one of the following actions:

- complete manufacturing of the UAS or at least a major part of it

- assembling the UAS from parts or subassemblies sold separately
- modification of a UAS of class C4 (model aircraft).

Change of one or several UAS components with mark for identification of class (except C4 UAS) does not qualify it as privately built UAS, unless the change is described in manufacturer's instructions.

When forbidden by manufacturer or when placing cargo is not in compliance with characteristics stated in manufacturer's instructions, mark for class identification must be removed from the UAS.

UAS assembled from elements given in "ready to assemble kit" is also not considered as privately built.

7. Privacy and data protection

7.1. Understanding Privacy Risks and Data Protection

Personal information are all information related to natural person whose identity is established or may be established.
Expression “personal data” is very wide term covering any kind of information that relates to individual whose identity is verified or can be verified. As a result, each utilisation of unmanned aircraft used, for example, for recording of taking photo, and that can identify individual is subject to the legislation that refers to protection of data and it shall be sanctioned.

The criminal code of Montenegro defines penalty measures in case of unauthorised taking photo and unauthorised publishing and displaying other person's files, portrait or recording.

7.2. Leading principles for data protection

RULES OF DATA PROTECTION THAT SHOULD BE FOLLOWED ARE:

- consent (individual that can be identified at recording must allow collection of his/her data)
- right to access (individuals keep right to collected information)
- right to erase personal data related to him/her
- each person whose personal data are unlawfully collected is entitled to defend his/her own rights in front of national courts or to submit request for identifying violation of right to the body competent for data protection in his/her country.

8. Insurance

8.1. Responsibility in case of incident or accident

Aircraft is any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Unmanned aircraft system is unmanned aircraft and equipment for remotely piloting it.

The Law on Compulsory Traffic Insurance lays down that unmanned aircraft operators must hold an **insurance liability contract for damage incurred to third partied by the use of the unmanned aircraft or model aircraft.**

Aircraft owners or users shall enter into a liability insurance contract against damage caused to third parties and passengers by using such aircraft.

Operator of the unmanned aircraft system or model aircraft shall be obliged, when performing air operations with the unmanned aircraft or model aircraft of operative mass of 250 grams or more, or when performing flight operations that an independent legal person exercising public authorities (Civil Aviation Agency) in the area of air traffic issues permission, approval or any equivalent document, to hold an insurance liability contract for damage incurred to third partied by the use of the unmanned aircraft or model aircraft.

Insuring UAS is recommendable even when that is not required pursuant to the law.
Pilot should check in which conditions is insurance liability applicable to UAS flights.
Pilot can always be responsible in case of incident or accident.

9. Security

9.1. Understanding security risk

Disturbances of radio signals represent security risk.
Disturbances can be avoided by using only allowed frequencies for unmanned aircraft systems.
Number of UAS operators should be kept secret as much as possible.

Unlawful acts

- Unlawful seizure of unmanned aircraft
- Destruction of unmanned aircraft in operation
- Instalment of weapon into unmanned aircraft with intention for criminal purposes
- Use of unmanned aircraft for the purpose of causing death, severe physical injuries or serious material damages or environmental damages
- Distribution of fake information such as jeopardising safety with unmanned aircraft.

REGULATIONS APPLYING TO CONDUCTING UNMANNED AIRCRAFT OPERATIONS ARE:

Law on Air Transport
Regulation on conditions for safe use of unmanned aircraft systems (transposed EU Regulation 2019/947)
Regulation on requirements for use and classification of airspace
Regulation on method, rules and procedures for flight operations and operational air traffic services (transposed EU Regulation 923/2012)
Regulation on notifying, analysing and follow-up of occurrences in civil aviation (transposed EU Regulation 376/2014)
Regulation on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency (transposed EU Regulation 2018/1139)