UAV – cup

2025

Competition rules

Table of Contents

Game principles

The aim of the competition is to use an autonomously controlled UAV (drone) to deliver a payload of tennis balls to predefined areas (targets) in the shortest possible time and safely return the UAV to the take-off point (heliport). The payload is delivered by dropping it from the UAV at a defined altitude, delivering the payload to five different targets in one flight.

The overall flight time from take-off to landing, the reliability of delivery graded according to the difficulty of reaching each area, the return of the UAV to the take-off point, and compliance with other flight rules are evaluated. During the execution of the flight, maximum attention is paid to the safety of all participants and the safe landing of the UAV.

In the event of an imminent incident, the organiser is authorised to order the team to terminate the flight or take control of the UAV or immediately terminate the flight in serious cases.

To guarantee comparable conditions for all competing teams and especially due to the restrictions resulting from the rules on the operation of unmanned aerial vehicles in the common airspace within the EU, the competition will be held in the indoor sports hall. For this reason, teams do not need to be qualified for UAV operation or UAV registration for autonomous flights.

Flight rules

The drone leaves the heliport after the timer starts and must autonomously hit 5 targets on the playing field with tennis balls.

The targets will be randomly placed in the game area and clearly distinguished from the floor by colour markings.

The drone will be judged on the number of hits, flight time, and landing at the heliport

The end of the flight time is considered as landing on the heliport or playfield. Landing or flying off the field disqualifies a team from the game round.

The drone must be controlled by only one command to start the flight; other interventions will be considered as the end of the round.

The drone must be above the minimum flight level of 3.5 m for the duration of the flight. The team will be warned if it violates this level. If the total time is more than 1 minute below this level, the team will be disqualified.

Minimum flight level except FATO 0.5 m

Maximum flight level 5 m.

Targets hit during flight below this level are not counted.

The ball was thrown.

The drone will drop a regular tennis ball with a diameter of 6,35 to 6,67 cm and a weight of 57 g.

Game rounds

There will be 3 rounds of games. Each team must participate in all rounds, even if it means that the drone does not take off.

In each round, a team has two attempts.

- First round
  - The heliport will always be on the left side of the playfield.
  - The first target will always be on the left side of the playfield.
  - A white line will lead to the first target from the heliport.
  - Additional targets will be placed in a predefined matrix.
  - The target placement and matrix will be the same for all teams.
  - The number of targets will always be 5.

- Second round
  - Heliport will be in a position to be selected by the head referee by draw of lots on the day of the round.
  - The targets will be in a position to be selected by the head referee by draw of lots on the day of the round.
  - All targets will be randomly placed in a predefined matrix.
  - All teams will have the same target and heliport locations.
  - The number of targets will always be 5.
- Third round
  - Heliport will be in a position to be selected by the head referee by draw of lots on the day of the round.
  - All targets will be randomly placed according to the positions chosen by the head referee by drawing lots on the day of the round.
  - All targets will be placed anywhere on the target matrix lines and junctions.
  - All teams will have the same heliport location.
  - The number of targets will always be 5.

Scoring

Preparation at the station 5 minutes.

Each target can be hit only once.

The main criterion is the score from hitting the targets. If there are two teams with the same score, the fastest time will decide the ranking in the round.

The total time window for flight execution is 600 s.

The UAV must be at least 3,5 m above the playing field.

Points only count for a drop above the minimum flight level.

After each round, the teams are ranked in performance order and scored in descending order from best to worst with win points. The winner of the competition is the team with the most win points in all rounds. Should two teams have the same number of points, the lowest total of seconds for all rounds will decide.

- 1m target to which the line leads — 1 point
- 1m target — 2 points
- 0,5m target — 3 points
- 0,35m target — 4 points
- Landing back at the heliport — 1 point

Competition area

The competition area is located in the designated indoor areas of the sports hall, which for the purposes of this text is called the playfield. The horizontal boundaries of the area are defined by the markings on the ground and the vertical boundaries of the area are defined by the height above the floor of the hall. UAV operations are only permitted in this area, and only one active UAV may be within the area.

Dimensions of the Playfield

The dimensions are based on the dimensions for a tennis court of 11 x 23 m.

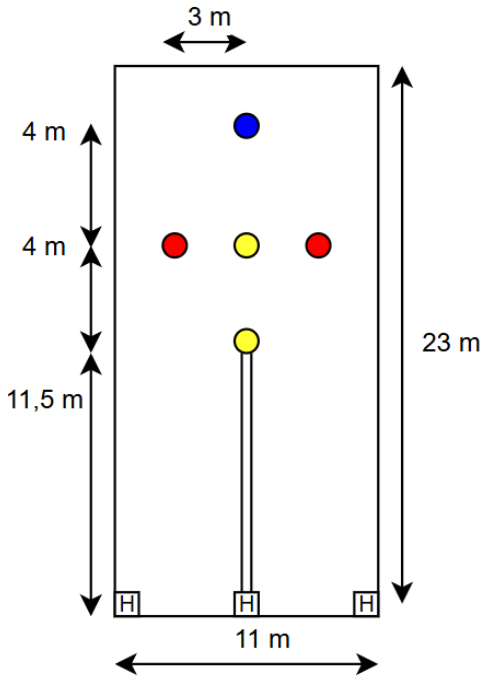
Borders

The playing area is marked with a 50 mm wide white stripe.

Background

A black rubber carpet will be laid over the entire area.

Indicative sketch of the playfield



Heliport

The heliport is used for the take-off and landing of UAVs.

Operation

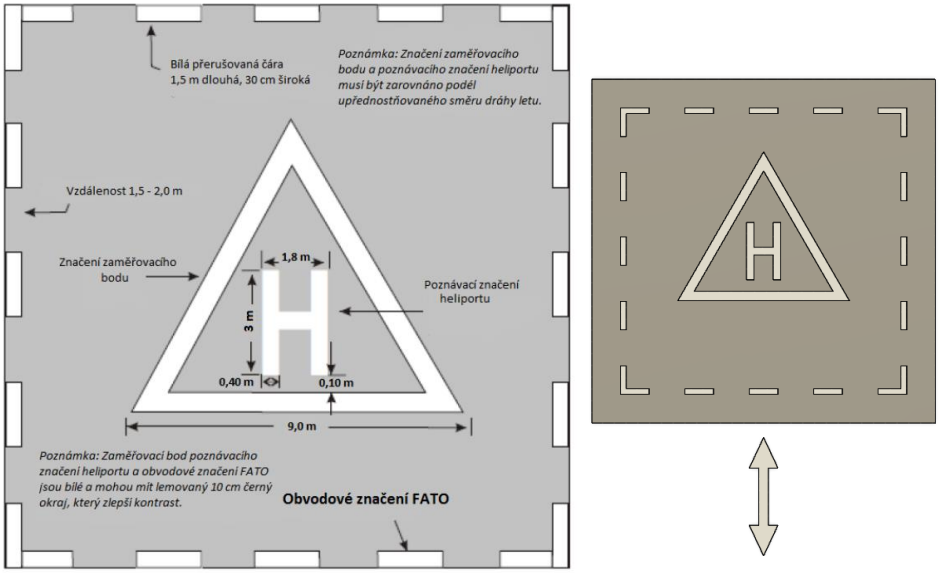
The maximum size of the UAV can be a 1 m wheelbase.

Dimensions

FATO 1,2 x1,2 m

Marking

The background will be black, the lines white according to the attached picture.



According to the L14H scale 1:15

Target

Dimensions

The impact area is in the shape of a circle with a **diameter** of 1000 mm, 500 mm, and 350 mm. The height from the floor of the playfield will be 6 cm.

Colour coding

The top of the target will consist of a compressible pad of three colours and a black perimeter mat.

- 0,35m target #3C00FB
- 0,5m target #FC2A1B
- 1m target #FAFF37

Impact Identification

The impact will be confirmed by lighting the white LED around the perimeter of the target.

Guidance track

The first target is reached by a straight white guide track, starting behind the marker indicating the direction of arrival and departure to the heliport.

Prohibited areas

All areas outside the outer perimeter of the field are off limits, and UAVs are not allowed to enter them.

Borders

The competition area will be marked with white tape.

Radionavigation equipment

The permitted communication frequency bands are in accordance with the applicable European Union regulations.

UAV

Flight Control and Operation of UAVs

To compete, the UAV must be in fully autonomous flight mode.

The UAV must only have computational assets onboard.

The UAV will be placed at the takeoff site by the team prior to takeoff

The team must be able to limit/terminate the flight at the organiser's prompt or take over the UAV in manual mode.

The team must be able to immediately abort the flight on the instruction of the organiser.

Takeoff

Take-off will be made on the person (delegate by organiser) instruction after the start of the timer.

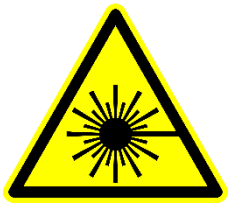
Landing

Landing will be considered the moment the drone reaches the heliport.

Restrictions

The UAV size limitation is 1 m wheelbase.

- MTOW 5 Kg - UAV will be weighed with 5 balls.
- Nonelectric propulsion is prohibited in all flight modes.
- The team is responsible for the execution of the flight.
- The team must be able to terminate the flight on the organiser's instructions.
- Fixed propellers only
    - Adjustable, folding, and similar types of propellers are prohibited
    - Does not apply to UAVs using a rotor head and a number of rotors less than or equal to 2
- 3D prints of propellers are prohibited.
- A protective cover for the rotors is recommended.



Nonionizing Radiation

Laser safety

According to IEC 60825-1 max Class 2 (2M), UAVs using a laser must be marked according to IEC 60825-1 and the relevant laser class

Ionising radiation

The use of a system that uses ionising radiation is prohibited.

Radio communication and similar equipment

Radio communication, radionavigation, and radar equipment must comply with Czech/EU regulations.

The radio navigation equipment of the team must not be placed on the playfield. It is the responsibility of the team to ensure the location and safe operation of the equipment around the playfield.

Ground-based radar is not permitted as single transmitting and receiving sensor with its own computational power.

The organiser does not guarantee the conditions for signal distribution or the availability of communication means.

Composition of competition teams

A competition team is made up of a maximum of 6 members who can be listed as part of the team in the documents. The number of people supported in the competition is limited to 3.

Supported person means a person with access to the competition facilities, depot, playfield and communicating with the organisers on matters related to the competition.

An individual must be assigned the role of pilot on the competition team. The pilot role can be changed during the competition and must be communicated to the organiser before the UAV takes off. The pilot must be able to communicate with the competition organisers at least at a level that allows him/her to receive instructions to safely terminate the flight, take over the controls, or immediately abort the flight.

Team composition

- Students of the bachelor's degree max. 6
- Master's students max. 4
- Ph.D. students max. 1

Safety

General rules

- The pilot is responsible for the execution of the flight.
- The pilot must be able to take control of the machine at every stage of the flight.

Playfield

Entry to the playfield and movement on the sides is only allowed to the team that is currently conducting test flights. Entry to the playfield is prohibited during the timed round.

Operation of UAVs in the VŠB-TUO campus

The operation of UAVs on the premises of VŠB-TUO is allowed only in the hall where the competition is held.

Operation of UAVs outside the VŠB-TUO premises

For UAV flights outside buildings outside the VSB campus, the general rules on the use of unmanned vehicles in shared airspace apply. See the following documents:

- Background to the EU regulatory framework for unmanned systems
- Aeronautical Regulation L2 - Appendix X
- Drones and vertical take-off and landing aircraft

Technical Acceptance

The drone will be inspected the day before the first round to ensure it complies with the competition rules. The referee has every right not to allow the UAV to take off if it does not comply with all the rules.

- dimensions
- MTOW level
- propeller inspection
- communication frequencies used
- laser and radar used