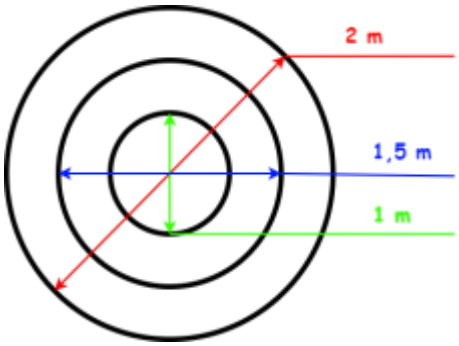
MILITARY SECTION

CHALLENGE 1 – EXPLOSIVE PAYLOAD RELEASE ACCURACY

Test your precision and coordination!

In this challenge, teams will **manually** pilot a multirotor UAS equipped with a simulated standard explosive payload (a "dummy" grenade weighing approximately 250 g). The objective is to release the payload into a marked target area located at a **distance between 100 and 300 m** from the take-off/landing point, from three different altitude levels: **h1 > 60 m, h2 > 80 m, and h3 > 100 m.** The target area consists of three concentric circles with diameters of **Φ1 = 1 m**, **Φ2 = 1.5 m**, and **Φ3 = 2 m**, respectively, each assigned a specific score based on landing accuracy.



- **Maximum score:** 100 points;
- **Time bonus:** awarded to the team that completes the challenge in the shortest time and successfully hits the target at least once, regardless of which concentric circle is hit;
- **Equipment:** video cameras capable of transmitting real-time video streaming to enable optimal control of the payload release;
- **Remarks:** teams are allowed to choose the number of flights performed between the take-off/landing area and the target area for equipping the aerial platform with simulated munition elements or for battery replacement. From the start of the challenge until the final landing (end of the challenge), a maximum duration of **10 minutes must not be exceeded**; otherwise, **10 points** will be deducted for each additional minute exceeded. The simulated explosive payloads will be handed over to the teams prior to the start of the challenge. The **STL format** files of the challenge 1 payload can be downloaded from the official competition website: https://msmf.ro/ **.**

Scoring criteria for challenge 1:

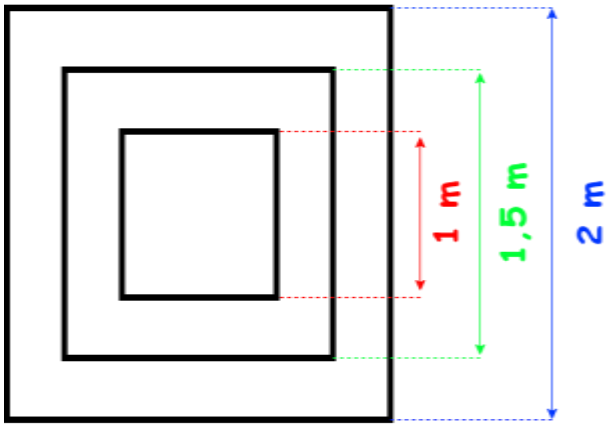
Scoring criterion	Score
Target hit inside the 1 m diameter circle	*30 pt*
Target hit inside the 1.5 m diameter circle	*20 pt*
Target hit inside the 2 m diameter circle	*10 pt*
Time bonus*	*10 pt*
TOTAL - Challenge 1 score (Sc_1)	**100 pt**

** the time bonus is applied only under the conditions described above.*

CHALLENGE 2 – PLACEMENT OF THE FIRST AID KIT

Demonstrate your precision, coordination, and planning skills!

In this challenge, teams will showcase navigation and accuracy skills by placing an individual first aid kit within a clearly defined target area. The area is marked by three concentric squares with side lengths of l_1 = 1 m, l_2 = 1.5 m, and l_3 = 2 m, respectively, with the center located at a **maximum distance of 800 meters** from the takeoff / landing point.



- **Maximum score:** 100 points;
- **Main objective:** Placement of the first aid kit inside the target area, according to the provided coordinates (WGS 84 system);
- **Equipment:** The first aid kit consists of a **fragile**, translucent plastic box with dimensions **L × W × H = 150 mm × 50 mm × 130 mm**, containing three test tubes with antiseptic solution and having a **total mass of 250 g**. The simulated first aid kit will be handed over to the teams prior to the start of the challenge. The **STL format** files of the challenge 2 payload can be downloaded from the official competition website: https://msmf.ro/ **.**
- **Number of runs:** Teams will perform two timed runs; the final score considered will be the one achieved in the run with the best result;
- **Time bonus:** A time bonus will be awarded to the team that completes the mission in the shortest time and successfully places the payload on the target;
- **Remarks:** Any damage to the first aid kit or its contents will result in the team's disqualification for that specific run.

Scoring criteria for challenge 2:

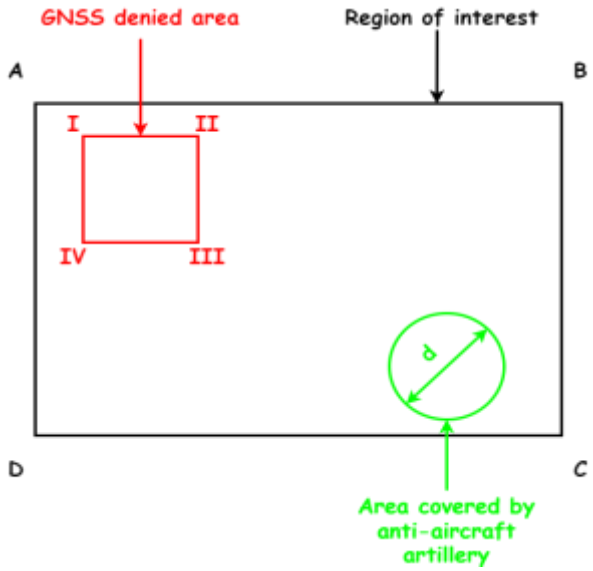
Scoring criterion	Score
Release of the first aid kit inside the square with a side length of 1 m	*75 p*
Release of the first aid kit inside the square with a side length of 1.5 m	*50 p*
Release of the first aid kit inside the square with a side length of 2 m	*25 p*
Time bonus*	*25 p*
TOTAL - Challenge 2 score (Sc_2)	**100 p**

** the time bonus is applied only under the conditions described above.*

CHALLENGE 3 – ISR MISSION IN HOSTILE TERRITORY

Test your piloting, navigation, planning, and strategy skills!

In challenge 3, teams will face a classic ISR (Intelligence, Surveillance, and Reconnaissance) mission scenario, which involves scanning a specified perimeter in order to detect and identify potential ground targets, without entering **restricted areas**, which are considered a threat to the integrity of the system.



- **Maximum score:** 100 points;
- **Main Objective:** Detection, identification, and reporting of the coordinates of the designated targets, in accordance with the WGS 84 system;
- **Equipment:** UAS equipped with a camera (visible spectrum, IR, or multispectral) and onboard data storage systems. Real-time video data transmission to ground stations or the use of RTK/PPK systems is **strictly prohibited;**
- **Mission execution:** The coordinates of the mission area (ROI – Region of Interest: latitude–longitude A, latitude–longitude B, latitude–longitude C, latitude–longitude D) will be provided during the initial briefing **at least 2.5 hours before the start of the mission**; mission which will last a maximum of **20 minutes**. At the same time as the coordinates of the mission area, teams will also be provided with the coordinates of the restricted areas (latitude–longitude I, latitude–longitude II, latitude–longitude III, latitude–longitude IV, as well as the latitude–longitude of the anti-aircraft artillery emplacement and its coverage radius), included within the region of interest and over which the aerial vehicle is not permitted to transit. A restricted area is thus defined as a zone covered by hostile anti-aircraft artillery or an area affected by GNSS jamming, where the physical integrity of the aerial vehicle or the successful completion of the mission is at risk. The **post-mission report** shall be prepared in accordance with NATO STANAG 3596, Edition 5 (2003). It must be submitted electronically, together with the mission route planned by each team, within **60 minutes of the start of the post-mission analysis**. The documents shall be sent to the panel of judges at the email address communicated prior to the start of the test. The post-mission report template can be downloaded in **PDF format** from the competition website: https://msmf.ro/ **.**

- **Number of runs:** Each team is entitled to perform a single run, with the order of participation determined by a random draw;

Scoring criteria for challenge 3:

A total of **20 points** will be awarded for each target that is **correctly identified** and located with a **minimum positional accuracy of 3 m**. For any deviation greater **than 3 m**, **1 point will be deducted for each additional meter**.

A target is considered correctly identified if its description accurately reflects the on-site reality and leaves no room for interpretation.

The maximum score can only be achieved if the mission planning complies with both the Region of Interest (ROI) and the restricted areas. Failure to do so will result in a **20-point penalty** deducted from the total score obtained in this challenge.

FINAL SCORE CALCULATION

Following the completion of the three challenges, the winning team will be the one that achieves the highest final score, calculated according to the following formula:

$$\textbf{Final score} = Sc_1 * 0.3 + Sc_2 * 0.3 + Sc_3 * 0.3 + S_{id}$$

where, **Sc_1 - Final score challenge 1**
Sc_2 - Final score challenge 2
Sc_3 - Final score challenge 3
S_{id} – score for inovation and design

- **Note:** S_{id} may take values between **0** and **10**, in increments of **1 point**. A value of **0** indicates that the air vehicle structure and the auxiliary systems required for missions execution were **not designed by the team**, while a value of **10** indicates that the air vehicle structure and all auxiliary systems required for missions execution were **entirely designed by the team**, which must be able to demonstrate this through a **technical system presentation manual**. The S_{id} score is awarded based on the **complexity, level of innovation, and design quality** of the air vehicles, as well as of the **auxiliary systems installed onboard**.

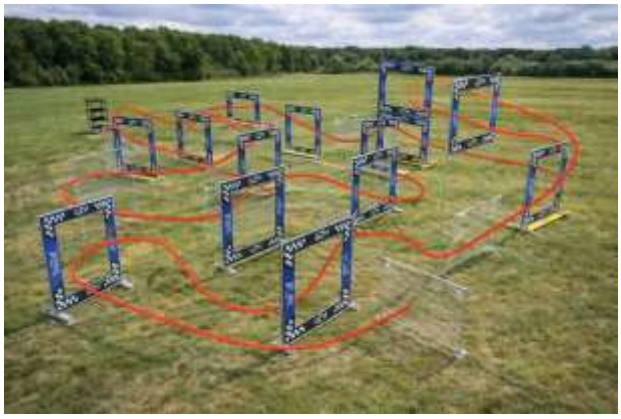
OPEN SECTION

FPV - Slalom with Obstacles

In the Open category, teams will compete in an individual time-trial event, flying a multirotor UAS through a complex obstacle course. Each team may bring its own UAS, either custom-built or commercially available, provided it is equipped with FPV capability and a fail-safe system that automatically stops the motors in case of emergency.

🔻 **Objective:** Complete a **300–500 m course** combining technical sections, tight turns, and straight segments.

🔻 **Obstacles:** Standard gates of various sizes **(600×600 mm, 600×1200 mm, 800×1200 mm)** and a slalom section between pylons, all course boundaries being clearly marked with safety tape.



Maintaining the optimal racing line is critical, and any gate contact, missed gate, missed obstacle, or deviation from the intended course will result in a time penalty added to the final recorded time. Penalties are applied as follows: **+10 seconds for each missed obstacle/gate**.

Each participant will complete **two official timed runs**, and the average of the total times (including penalties) will determine the final ranking. In addition, a practice session/lap is permitted for each competitor prior to the start of the official competition in order to familiarize themselves with the course.

The order of flight in the first run will be determined **by a random draw**. For the second run, the order **will be reversed**, meaning that teams will fly in an order inversely proportional to the time achieved in the first run.

Flights may be performed either **line-of-sight (LOS)** or using **FPV goggles**, with the condition that the pilot must remain stationary at a designated fixed position outside the course. Pilots are not allowed to move inside the course boundaries or around the course during the run.

All runs must be flown **100% manually**, with no assisted flight modes or sensor-based obstacle avoidance. Any “obstacle avoidance” or “auto-correction” features must be fully disabled.

Unlike other competition heats, this event is truly “Open”, welcoming participants from both military educational institutions and civilian institutions under the same rules and scoring criteria. This ensures that results depend solely on reflexes, stick discipline, and consistency when flying close to obstacles.

The track rewards smooth, flowing trajectories rather than aggressive, abrupt inputs, while remaining highly watchable for spectators. A clear pre-race briefing will be provided, covering safety requirements, the mandatory line, penalty criteria, and how gate passes are validated.

Awards & Prizes

Awards will be presented for each individual challenge, for the overall highest total score (Grand Winner) and for innovation and design, as follows:

1. Gold / Silver / Bronze Champions – Challenge 1
2. Gold / Silver / Bronze Champions – Challenge 2
3. Gold / Silver / Bronze Champions – Challenge 3
4. Gold / Silver / Bronze Champions – Overall Ranking
5. Gold / Silver / Bronze Champions – Open Section – Slalom with Obstacles
5. Design and Innovation Award
6. Worthy Opponent Award (designated by the participants' vote)

The prizes will be presented by sponsors from the UAV and aerospace industries for each award category and consist of monetary prizes or UAV-related equipment and tools.