



FLYTECH

CATEGORY

FINAL STAGE RULES

BAKU 2025

1. Introduction

The FlyTech category aims to introduce students to modern technologies, develop their STEAM-based thinking skills, and provide them with technical skills that can be applied in real life. This competition encourages young people interested in technology to think creatively in the fields of engineering and design, as well as to work on technological solutions that benefit society.

Within this category, participants learn practically how drone technologies can be used in emergency situations during forest fires through the task called “Fire Fighting and Rescue.” The task involves the drone first intervening in a fire zone along a specially designated route, and then bringing people in that area to a safe zone through a rescue operation.

The competition develops not only technical skills, but also critical thinking, decision-making, responsible behavior, and teamwork in students as they complete this mission. Participants also learn about engineering, mechanics, flight stability, load-carrying mechanisms, and the principles of safe driving, giving them a clear understanding of how technology can benefit society.

2. Teams

- 2.1. Teams must consist of 4 people (1 team leader, 3 students).
- 2.2. The students on the team should have the following division of duties:
 - Field pilot
 - Co-pilot
 - Simulation pilot
- 2.3. The team leader must be over 18 years old, and the students must be between 13 and 17 years old.
- 2.4. Each student can only participate in one team.
- 2.5. Each team leader can only lead one team in another category.
- 2.6. After registration is complete, a selection round will be held among the teams and the teams that will advance to the finals will be determined.
- 2.7. Any team wishing to participate in the competition can join by preparing a drone under the conditions set out in sections **10** and **11** .

3. Race description

- 3.1. The competition consists of 2 parts. In the first part, the team's Simulation pilot demonstrates his flying skills in an FPV simulation. The simulation used in this part of the competition is **the FPV Freerider** simulation.

- 3.2. Link to download the simulation: <https://fpv-freerider.itch.io/fpv-freerider>



- 3.3. The mission competition here is **Desert** , and each team will compete with their own remote control or **the FlySky** branded remote control in the competition.
- 3.4. **the Demo version** in terms of accessibility , so each team should prepare accordingly.
- 3.5. In the first stage, teams will show their pilot skills behind a monitor in three-man formation.
- 3.6. The simulation pilot must only perform this task; he does not have the right to control the drone in the field.
- 3.7. The field pilot does not have the right to perform the simulation task.
- 3.8. If the Simulation Pilot is unable to participate in the first stage of the competition for an excused reason, his duties may be performed by the co-pilot.
- 3.9. In the second stage of the competition, teams must perform tasks in a closed net area measuring 12 meters wide, 24 meters long, and 6 meters high.
- 3.10. The field pilot and co-pilot must participate in the second stage of the competition.
- 3.11. If the co-pilot is unable to participate in the second stage of the race for an excused reason, his simulation pilot may replace him.
- 3.12. For the second stage of the competition, teams must prepare their drones in advance using drone elements that meet the requirements and land directly in landing zone number 2 through any of the flags number 4 in the grid area, or through shield number 5 into landing zone number 2, in an enclosed space measuring 12 meters wide, 24 meters long, and 6 meters high. Doing both during these flights does not give extra points. The co-pilot must then place the fireball on the drone and exit the area.
- 3.13. Fireballs will be provided by the race organizers.
- 3.14. The pilot must fly the drone through ring number 3 and over the "Passage to Fire Zone" sign number 7 to the fire zone and release the fireballs into the fire zones while maintaining altitude. After the first fireball is released, the drone must be brought to landing zone number 2 by the shortest route, and the co-pilot must place the second fireball on the drone and exit the area.
- 3.15. For the next firefighting operation, they must pass through ring number 3, pass over sign number 7 "Passage to Fire Zone" and enter the fire zone, maintaining their height and releasing fireballs into the fire zones.

- 3.16.** The second throw is free, meaning the team can finish the race without doing this task.
- 3.17.** After at least one fire extinguisher has been released into the fire zone, the rescue operation can begin.
- 3.18.** For the rescue operation, the object placed in special places in the fire zone must be picked up by the drone only and brought to the landing zone without physical contact between the participants.
- 3.19.** Participants must perform mathematical calculations, evaluate physical processes, and apply agility and other knowledge to ensure drones fly correctly and safely.
- 3.20.** The time for the race is 3 minutes and the time is kept after the drone's propellers come to a complete stop during landing.



Figure 1. Competition area.

The width of the competition area is **12 meters** and the length is **24 meters** .

The competition area is covered with a **6-meter-high** safety net.

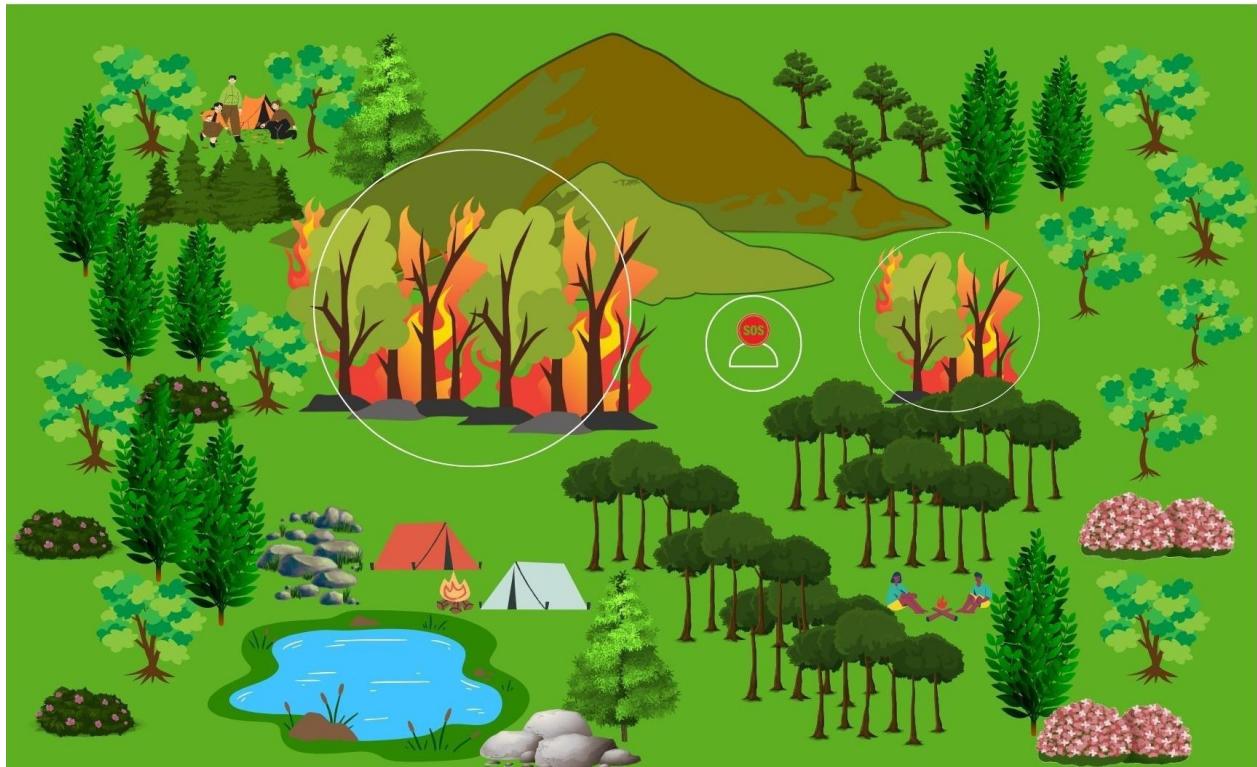


Figure 2. Fire zone.

It is 4 meters wide and 6 meters long. There are 2 fire areas inside. The diameter of the first fire area is **160 cm** . The diameter of the second fire area is **100 cm** . In the center of these two fire areas is a rescue area with a diameter of **50 cm** . There is a circular object with **SOS** written on it .



Figure 3. Fireball

Diameter **70mm**, weight **100g**. Material Slime.



Figure 4. Object.

It is a plastic material with a diameter of 10cm, a thickness of 3 mm, and a weight of 50 grams. It has 4 magnets on it

4. Competition structure

- 4.1. The competition consists of two stages. In the first stage, teams must individually present their drones to the Jury for evaluation based on a pre-planned list. There, they must explain the design and working principle of the drone they are preparing. After the evaluation, the team must take its place in the flight area and wait for its turn to fly.
- 4.2. In the second stage, the team must demonstrate their pilot skills.
- 4.3. In this stage, teams must first practice their FPV flight skills in a simulation and then perform the task with a real drone on the competition field.
- 4.4. Each team will be given 3 attempts in the simulation.
- 4.5. During the simulation flights, each pilot will be given **60** seconds of preparation and flight adaptation time. After that, they can start the competition according to the judge's instructions.
- 4.6. **60** seconds are given for each stage of the competition . If a team passes at least **2 obstacles in 60 seconds** and does not crash, that team's flight is accepted and is evaluated as **60** seconds.
- 4.7. **2 obstacles** during the simulation flight and the time limit is 60 seconds, the team's flight is not accepted and is scored **0 points**.
- 4.8. **1 chance is given** for each attempt . If a team's drone crashes during a flight, that flight is not counted and is scored with **0 points** .
- 4.9. In the simulation, the team controlling the drone can freely choose the flight mode.
- 4.10. The team's flight time will be calculated using the simulation's race timer. The flight time is calculated according to a special rule, and the flight score is added to the total score and recorded as the team's final score.
- 4.11. **The team called to the flight area is given 60 seconds. If the team fails to prepare the drone for flight within this time, the attempt is stopped and considered a failure. The next team is called to the area.**
- 4.12. During the real flight, teams will start the competition with the Start whistle and will finish the competition by landing in the landing zone, completing the tasks in the competition area within **3 minutes (picture 1)**.
- 4.13. Pilots can move around the perimeter of the flight area as they wish and choose suitable positions to fly their drones.
- 4.14. If teams land their drones outside the landing zone, time is not stopped. If the drones hit an obstacle or fall to the ground for any other reason during the competition, participants can restart the drone. Each participant is given this chance twice; if the drone hits an obstacle or falls to the ground for the third time, only the points accumulated by the participant up to that point are counted.
- 4.15. Drones must take turns passing obstacles along a given trajectory.

- 4.16.** Participants can land their drones at the landing zone at any time. At this point, the points the participants have earned up to that point are added up and the end time of the competition is set at **3 minutes**.
- 4.17.** Each team is given **3 chances** in the competition and the result (score and time) of each chance is recorded. The highest score the team gets in the 3 chances is recorded as the overall final score.
- 4.18. loses control** during a race, he/she may voluntarily hand over control to the referee. In this case, the time is kept at 3 minutes and is recorded against the team's points.
- 4.19.** If a fireball is accidentally dropped during the race, the drone must return to the landing zone and one of the team members must place the fireball on the drone.

5. Obstacles and Points



1. Starting (Home) point.

Diameter **200cm**. Quantity 1 piece ,On the floor



2.Landing point.

Diameter **200cm**, Height **100cm**. Quantity 1 piece ,



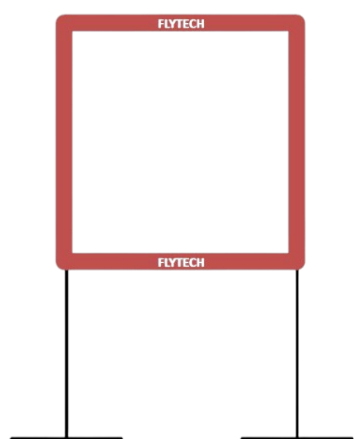
3. Horizontal ring .

Height **200cm**. Diameter **200cm**
Quantity 1 pieces



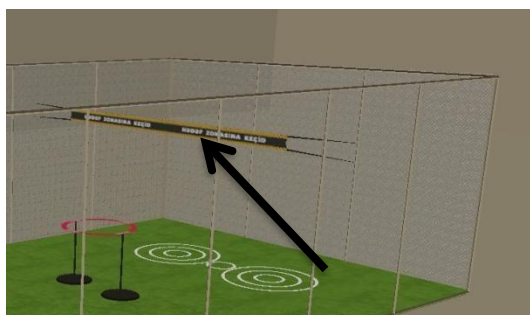
4.Flag.

Height **450cm**. Width **50cm**, Quantity 3 pieces



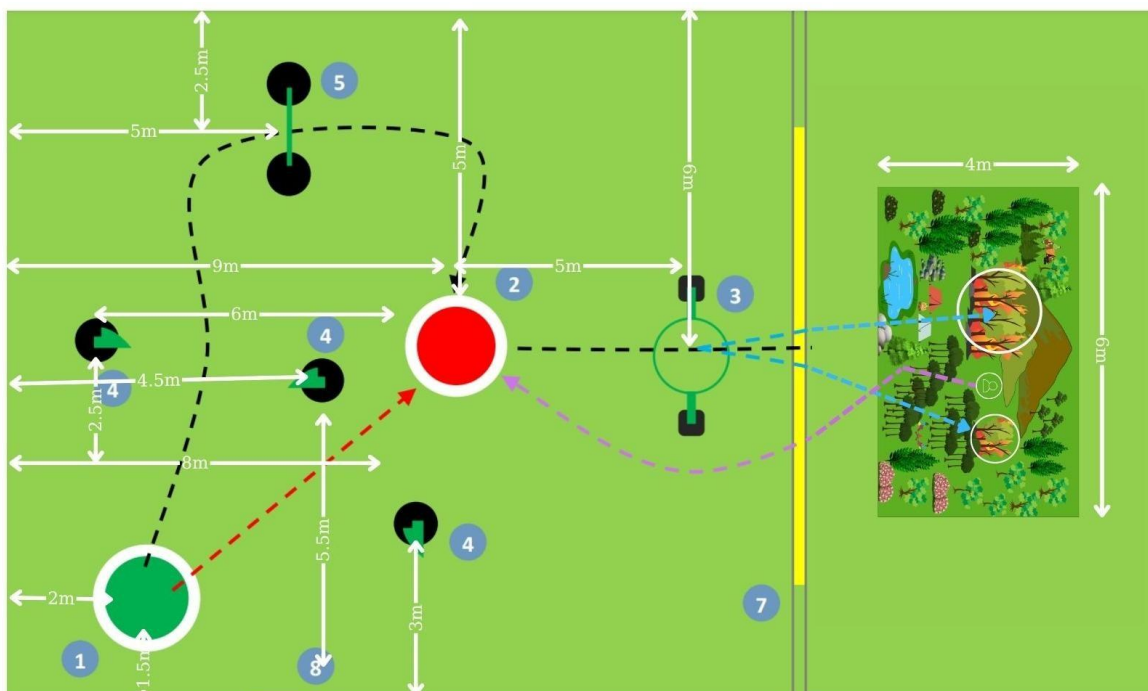
5. Vertical hoop.

Height of the bottom of the frame from the ground **200cm**. Width and length **150cm**. Quantity 1

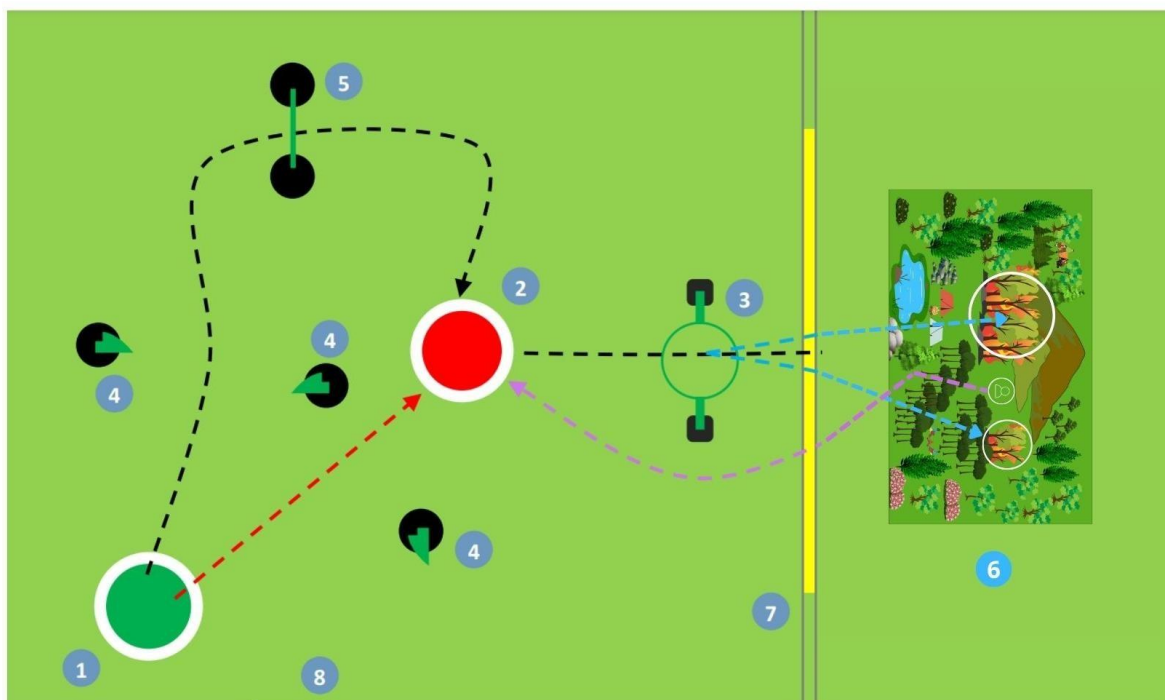


7. Fire zone access sign.

Height from the ground is **5 meters**, Width is **50 cm**, Length is **6 meters**.



8. Position of elements on the racetrack.



9. Route for completing tasks in the competition area.

Black direction - passes between 2 flags, enters vertical position number 5 and lands in landing zone number 2. After the fireball is placed, passes through ring number 3 in the **blue** direction and goes to the Fire zone. Fireballs are released into the fire areas. There are 2 fire areas in the fire zone. After at least 1 of the released balls falls into the fire area, the rescue operation is started. The pilot drone must land in a zone with a diameter of 50 cm in the center of the fire areas, pick up the human model from there and bring it to the landing zone in **the purple** direction.

Red direction - must pass between 2 flags and arrive at the landing zone. Here, passage through ring number 5 is no longer prohibited and other tasks must be continued in the same order.

6. Evaluation

- 6.1. Evaluation It will consist of 3 stages:
- 6.2. Jury evaluation, FPV simulation and task execution.
- 6.3. **are not added** to the points it will earn in the 2nd stage of the competition !
- 6.4. Teams deemed suitable by the jury are allowed into the flight zone.
- 6.5. During the jury evaluation, teams will be evaluated by nominations.
- 6.6. During the competition, drones must be programmed to perform a task and controlled from a control center.

7. Jury evaluation criteria

Evaluation criteria	Point
Rejected load release mechanism (must be remotely controlled)	5-10
Drone appearance (fit of arm, torso, and leg parts)	5-10
Creativity and problem solving (decorative, protective or security measures)	5-10
Identifying parts (name and purpose of all elements used in the construction of the drone)	5-10

8.Task execution and scoring.

- 8.1. **FPV Simulation.** The stopwatch function of the program will be used here. The team's score will be calculated based on the time it takes to complete the flight round as follows:
 $2000 / \text{time} = \text{flight score}$ (where **2000** is the total time-score coefficient)
- 8.2. For example, if a team finishes the round in 40 seconds, its flight score will be $2000/40= 50$.
- 8.3. **Takeoff** . Participants' drone takeoff performance is scored as **5 points**. Once the drone takes off, participants must fly it along a given trajectory.
- 8.4. **Flag** . Competitors must maneuver between any two flags in the flag obstacle. Each double flag is worth **10 points** .
- 8.5. **Vertical ring** . Passing through this ring is worth **15 points** and you must pass this ring along the given route.
- 8.6. **Landing zone** . The drone must fly along a given trajectory, reach the landing zone and land. If all of the drone's legs are above the top of the landing zone during landing, it will be considered a complete landing and will be scored with **10 points** . The landing zone score is only valid for landings made to end the competition.
- 8.7. **Fireball** . After the drone lands on the landing zone, its propellers must come to a complete stop. After the propellers come to a complete stop, the Co-Pilot, who is waiting outside the area, places the fireball on the drone , which is scored with **5 points** . After the Co-Pilot has completely left the flight area, the pilot can lift the drone into the air.
- 8.8. **Horizontal ring.** After attaching the fireball to the drone, the drone must pass through this ring from bottom to top. At this point, the team will score **15** **It is forbidden to enter the Fire Zone without passing through this ring** .
- 8.9. **Crossing the Fire Zone.** Crossing the Fire Zone by passing through ring number 3 with the fireball inside the drone is scored with **5 points** . **Note** : *At this time, the pilot must operate with caution as the drone reaches its maximum height.*
- 8.10. **Fire zone.** The drone that has arrived at the fire zone must maintain its altitude and release the fireball into the fire area. For each side, it must drop 2 fireballs in turn. The point value of the area where the fireball falls will be recorded for the team. If the load falls into an area with a diameter of **160 cm** , **it will be** scored with a point, and if it falls into an area with a diameter of **100 cm** , it will be scored with a point.
- 8.11. If the thrown fireball lands on or touches the white border of the area, the shot will not count!
- 8.12. If a fireball is thrown into the rescue area, **5 points** will be deducted from the team as a penalty.
- 8.13. If the height of the drone is below the bottom of the "Passage to Fire Zone" sign when the fireball is released, the fireball will not be counted. In this case, the drone must return to the landing zone and repeat the process again. Under no circumstances is the time stopped.
- 8.14. **Rescue.** After the drone releases a fireball into the fire zone, landing on an area with a diameter of 50cm and retrieving **the SOS** ring there is scored with **15 points** . Then, bringing the ring to the Landing Zone in the shortest possible way is scored with an additional **10 points** . If the ring separates from the drone and falls to the ground while bringing the ring to the Landing Zone, the rescue will be considered a failure and no points will be recorded.
- 8.15. A ring that falls to the ground cannot be picked up again.

8.16. If the team wants to use additional equipment for the rescue operation, they can only attach that equipment to their drone after landing it at the landing zone.

8.17. Landing. After the fireball is released, the drone must land in the landing zone using the shortest route. Landing after a firefighting operation will be scored with **10 points** . A firefighting operation is counted when the drone passes at least into the Fire Zone. In order for drones to be considered fully landed in the landing zone, each of their ground-contacting parts must touch the platform. If any of the ground-contacting parts of the drones does not touch the platform, the drone is considered to have made an incomplete landing.

8.18. Final landing . If the drone lands with the ring after the rescue operation, it will be evaluated with **20 points** . If the drone is completely and partially above the landing zone during the rescue, the landing will be accepted.

9. Assignment stage evaluation table

No.	Task stage	Point
1	When the drone takes off	5
2	When number 4 passes through the 2 flag barrier	10
3	When passing through the ring barrier number 5	20
4	When a fireball is placed on a drone	5
5	When passing through the ring barrier number 3	15
6	When entering a fire zone	5
7	When a fireball is thrown into the rescue zone	-5
8	When the ball is thrown into the 160cm zone	15
9	When the ball is thrown into the 100cm zone	25
10	When the drone lands in the rescue zone and picks up the SOS ring	20
11	When you bring the SOS ring to the landing zone	20
12	When the drone lands fully (4 legs)	10
13	When the drone makes an incomplete landing (3 and 1 leg)	5

Sample table for calculating the team's final score

Team name: Team X						
Stage	Simulation			Task		
Points	20	30	40	75	85	95
The best	40			95		
Conclusion	135 points					

10. Basic equipment for drone preparation

When designing a drone, the following equipment and features must be taken into account. In addition to the main elements mentioned, other electronic elements can be used.

Equipment name	Feature	Quantity
Pixhawk 2.4.8	Flight controller	1
Propeller	8 - 10 inches	4-6
Electronic Speed Controller	30 - 60A	4-6
Brushless motor	900 – 1400kv	4-6
Battery	2000-4200mAh and 3-4S	1

11. Drone preparation conditions

11.1. The drone must be prepared without going beyond the basic equipment list provided.

11.2. If any element fails during the race, it can only be replaced with the same element.

11.3. The body materials used are individually designed and manufactured.

11.4. F450 and other ready-made drone body parts are not accepted!

11.5. Additionally, you can create an auxiliary function or decorative element with 1 Arduino.

11.6. The number of propellers on the drone must be **4** or **6**. Other numbers are not accepted.

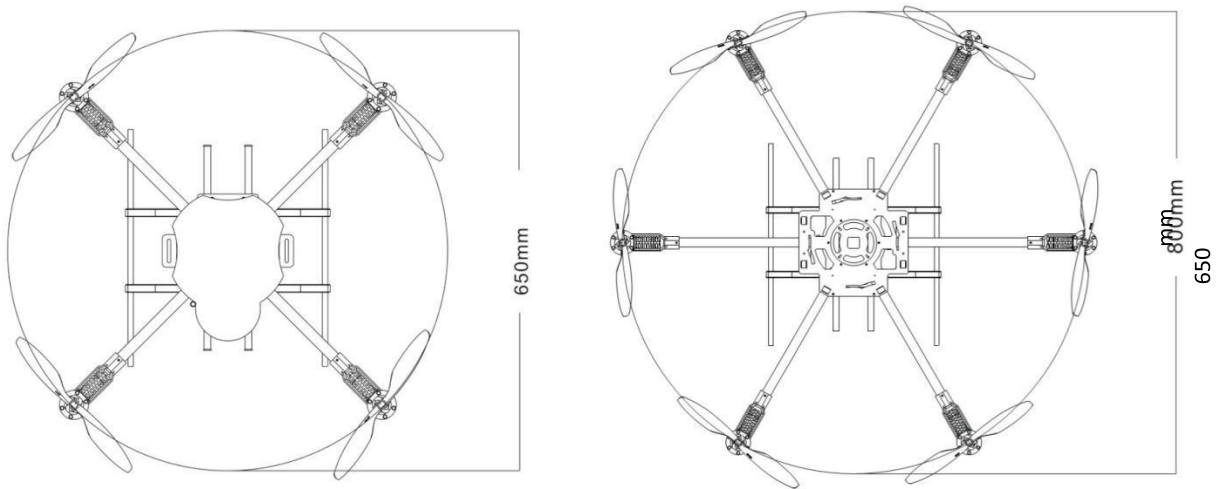
11.7. All parts of the drone must be taken into the air in the form in which they are presented.

11.8. The drone must stand on its feet. The payload release mechanism must not touch the ground.

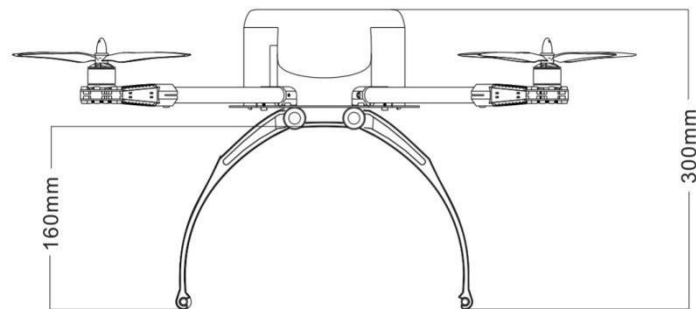
11.9. Each participant must write their team name so that it will be visible on the drone. **11.10.**

The total weight of the drone should not exceed **1500 grams**.

12. Allowed size range of the drone



12.1. The diagonal distance of the drone's arms should not exceed **650 mm** .



12.2. The distance from the plane where the drone's legs touch to the element on its top should not exceed **300 mm** . **The drone's legs** should not exceed **160 mm** .