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FlyTech
CATEGORY

RULES OF THE FINAL STAGE

BAKU 2024

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1. Introduction

The Fly Tech competition encourages young people and technology enthusiasts to learn and use STEAM knowledge encourages to do, to experiment with drone technology, to explore the working principles of future technology, to The goal is to gather   develop design practices and independent thinking, to achieve engineering results. knowledge, learn to collaborate, compete, and have fun at the same time.

2. Teams

2.1. Teams should consist of 4 people (1 team leader, 2 or 3 person student).

2.2. The team leader must be over 18 years old, and the students must be 14-17 years old.

2.3. Each student can participate in only one team.

2.4. Each team leader can lead only one team in another category

2.5. After the end of the registration, a selection round will be held between the teams and the final teams will be determined.

2.6. Anyone who wants to participate in the competition can join under the conditions and under the condition that they do not deviate from the equipment set for drone training.

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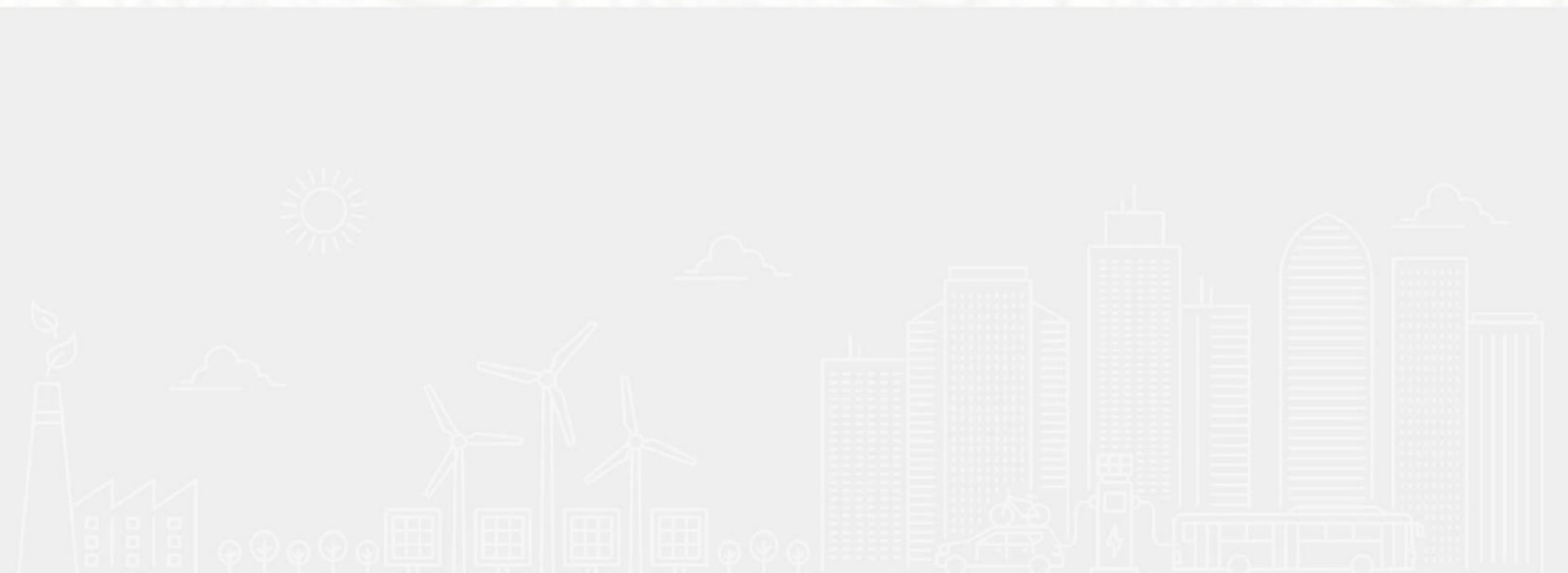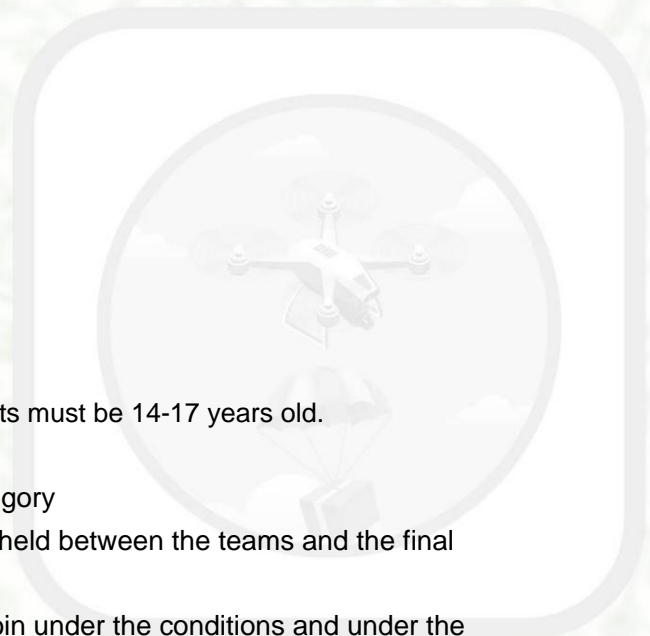
3. Description of the competition

3.1. The competition consists of 2 parts. In the first part, teams will demonstrate their flying skills in FPV
simulation. The FPV used here is Freerider simulation.

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

3.3.

3.4. The race to be used here is the Desert, and each team will race with their own remote control or the FlySky
brand remote control in the race.

3.5. The simulation version in this part of the race with the Demo version in terms of accessibility
is planned, so every team should prepare accordingly.

3.6. In the first stage, the teams will show their piloting skills behind the monitor in three formations.

3.7. For the 2nd stage of the competition, the teams use drone elements according to the requirements
should prepare their own drones in advance and the size is 12 meters wide, 24 meters long and
in a closed space with a height of 6 meters, they must pass through obstacles number 3, 4 and 5 in
the net area and descend to landing zone number 2. Then one of the team members
must place the parachute box on the drone and leave the field. The pilot must fly the drone to the checkpoint
of Target Zone 7, aim at target 6 and parachute the box.
should be released to the target with After landing the parachute, the drone must return to landing
zone 2, pick up parachute 2 again and enter the target zone. After performing the second parachute
drop task, the pilot must bring the drone to the landing zone by the shortest route.

3.8. The second shot is free, which means that the team can finish the race without doing this task.

3.9. Participants must perform mathematical calculations, evaluate physical processes, apply dexterity and other
skills to fly drones accurately and safely.

3.10. The shortest path to the drone Landing Point after the payload has landed in the target zone (or outlying area).
must return and land with

**3.11. The time for the race is 3 minutes and is timed after the drone's propellers come to a complete stop
during landing.**

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Figure 1. **Race field.**

The width of the racing field is **12 meters,** and the length is **24 meters.**

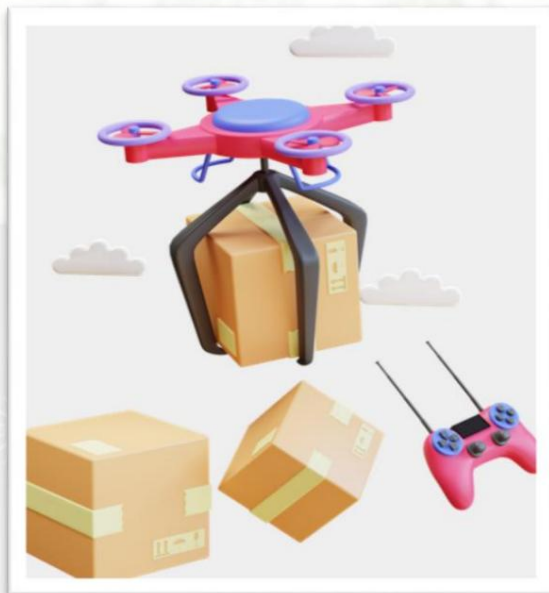The competition area is covered with a net **6 meters** high .
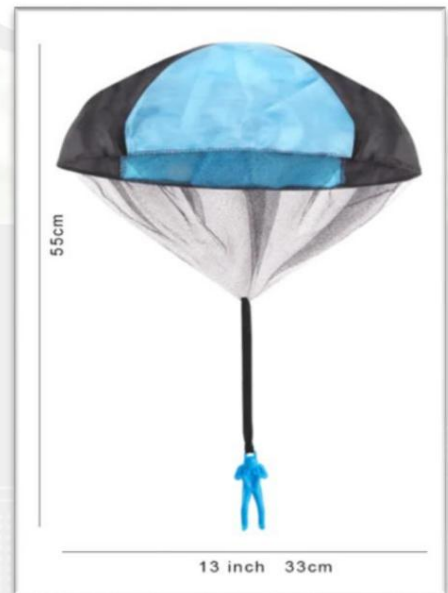

Figure 2 - Drone

Figure 3 - Parachute and load (55x33cm and 50g)

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4. Structure of the competition

4.1. The competition consists of two stages. In the first stage, teams must come individually to the Jury evaluation
room in a pre-planned manner and present their drones.
They should explain the design and working principle of the drone made there. After the evaluation,
the team must take their place in the flight area and wait for their flight turn.

4.2. In the second stage, the team must demonstrate their piloting skills.

4.3. In this phase, teams must first practice their FPV flight skills in a simulation and then perform a given task
with a real drone on the competition field

4.4. In the simulation, the competition will consist of **1** round and each team will be given 3 chances.

4.5. In the simulation, 60 seconds are given for each stage of the race. If the team in **60** seconds
if at least **2** obstacles are passed, the flight of that team is accepted and evaluated as **60** seconds.

4.6. If the team has passed less than **2** obstacles during the flight in the simulation and the time has completed
60 seconds, the flight of that team is not accepted and is evaluated with **0** points.

4.7. Each aspect **is given 1 chance in the simulation.** When the team's drone crashes during flight
that flight is not counted and is evaluated with **0 points .**

4.8. In the simulation, the drone control team can freely choose the flight mode.

4.9. Team flight time using the race timer in the simulation
will be calculated. The flight time is added to the total score by calculating the flight time based on a
special rule and is recorded as the team's final score.

**4.10. The team called to the flight area is given 1 minute. The attempt of the team that does not make the
drone ready for flight within 1 minute is stopped and considered unsuccessful. Then the
next team is called to the field.**

4.11.

4.12. During the real flight, the teams will start the competition with the Start whistle and **3** minutes
during the race, they will complete the tasks in the competition area and land in the landing zone.
(picture 1).

4.13. For pilots to move and fly their drones around the airfield as they please
they can choose suitable positions.

4.14. Time is not stopped if teams land their drone outside the landing zone. If
if the drones crash into an obstacle or fall down during the competition, participants can restart the drone
from the location indicated by the judge (some distance back from the point where the drone crashed).
Each participant is given this chance twice, if on the 3rd time the drone hits an obstacle or falls down
for some other reason, then only the points accumulated by the participant until that moment are saved.

4.15. Drones must take turns passing through obstacles along a given trajectory.

4.16. Participants can stop the race at any time before the end of the time allotted for the race and
they can land their drones in the landing zone without completing obstacle courses. At this time,
the points collected by the participants until that moment are added up and the end time of the
competition is marked as **3** minutes.

4.17. Drone landing zone scores are complete or incomplete within the drone's landing zone
determined according to location.

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4.18. In the competition, each team is given **3** chances and the result of each chance (score and time) is recorded. The highest score obtained by the team in 3 chances is recorded as the total final score.

4.19. If the pilot loses control during the race, he must voluntarily hand over the control to the judge can At this time, the time is kept and the score of the team is recorded.

4.20. If the parachute opens unplanned during the race, the drone must return to the landing zone and the team one of the members must place that parachute on the drone.

5. Obstacles and Precincts

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1. Starting point.

The diameter is 200 cm.
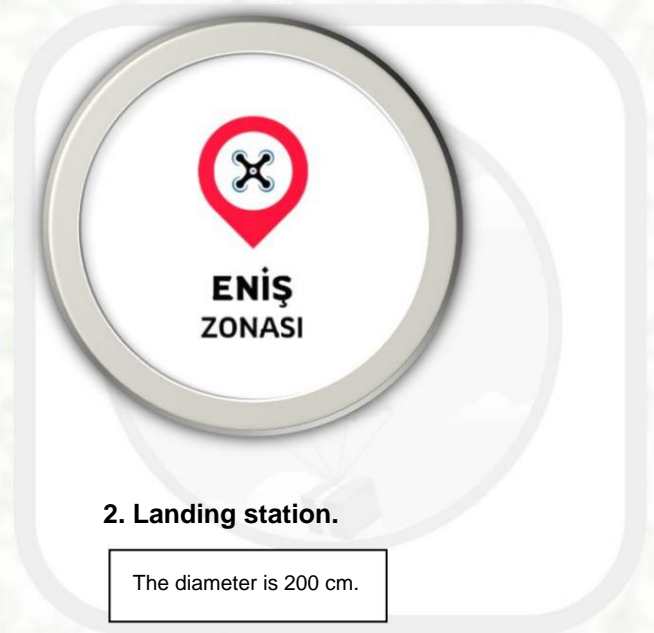
2. Landing station.

The diameter is 200 cm.

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3. Horizontal ring.

Height 200 cm.

Diameter 200 cm, Quantity
1 piece.

4. Flag.

Height 450 cm.

Width 50 cm, Quantity 3 pieces.
number.
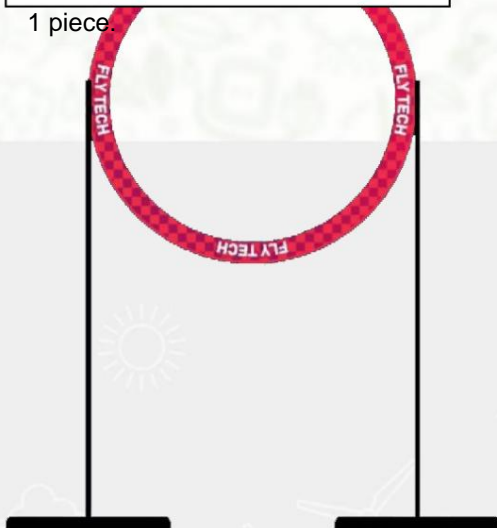
5. Vertical ring.

Height 400 cm. The diameter is 200
cm. Count 1 piece
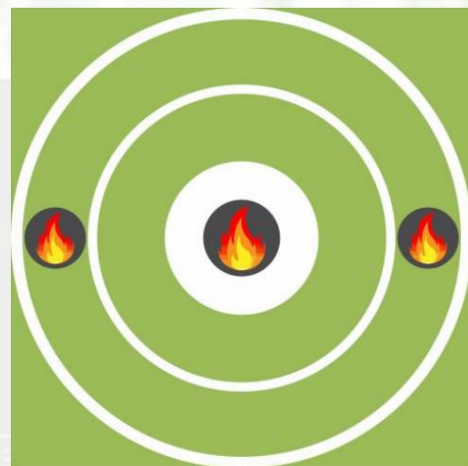
6. Objectives.

Inner diameter 200cm, Middle diameter

400cm, Outer diameter 600cm in the center

and two edges of the rings 8

there is a fire zone with a diameter of 1 meter

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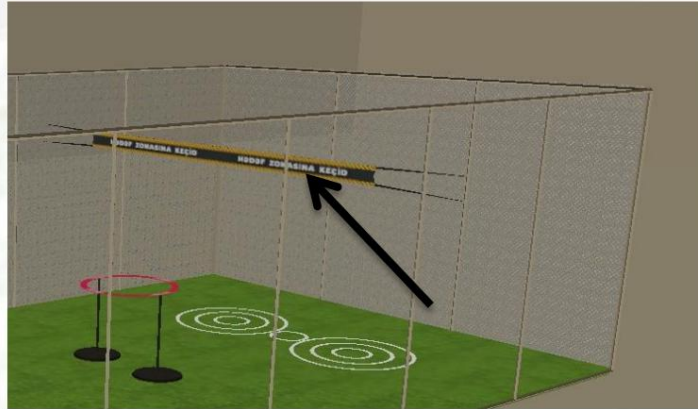
7. Target zone transition board.
It is 5 meters high, 50 cm wide, and 6 meters long.

8. Location of elements in the race field.

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9. The route of execution of tasks in the field of competition.

Black direction - passing between 2 flags, entering the vertical position No. 5 and landing in the landing zone No. 2. After the load of the side is placed, it passes through ring No. 3 and goes to the target zone. When the target releases the fire extinguishing charge, it should come to the landing zone in the purple direction, pick up the next fire extinguishing charge, pass through ring No. 3, come to the target zone, release the charge to the area where there is a fire, and in the same manner, the shortest path should arrive at the landing zone. This process is performed 3 times in total.
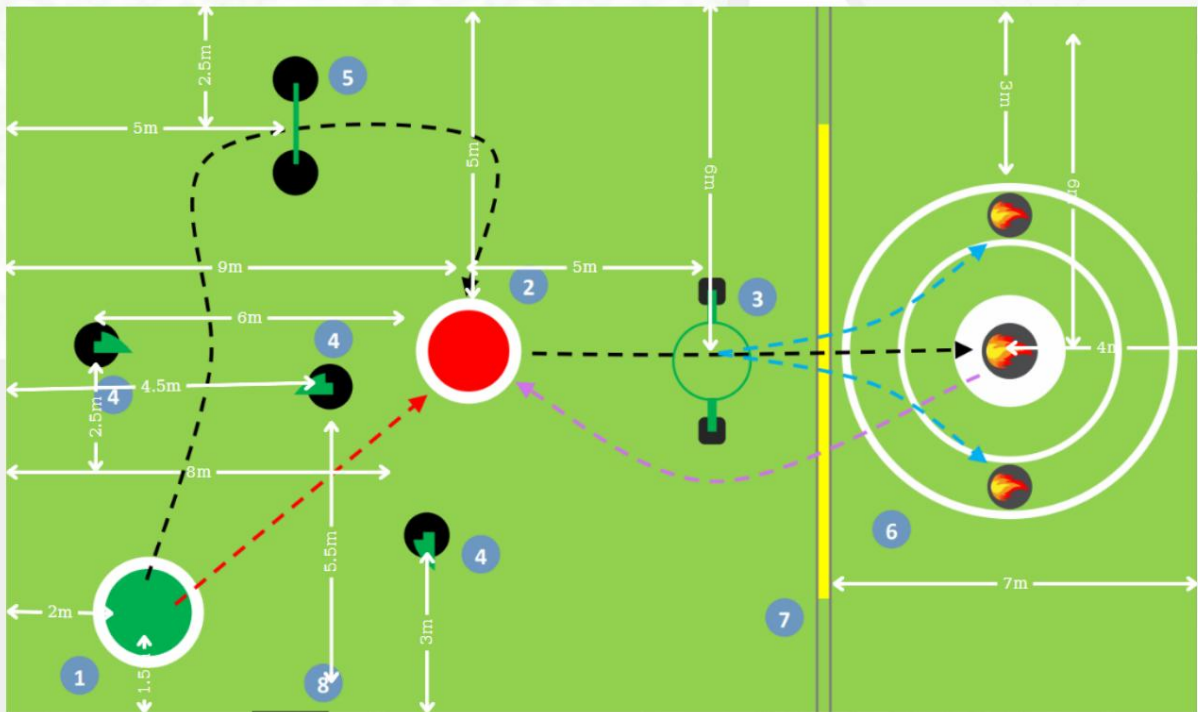
Red direction - must pass between 2 flags and come to the landing zone. Here, the transition from ring number 5 is already prohibited, and other tasks must be continued in the same order.

6. Evaluation

6.1. The assessment will consist of **3** stages:

6.2. Jury evaluation, FPV simulation and task execution.

6.3. The team should be able to explain the drone's development technology and show its advantages. Here, the materials used to build the drone, the design, and the team's parachute launch technology are evaluated. The team's score during the jury evaluation **is added** to the score it will score in the 2nd round
not done!

6.4. The team that gets **20** passing points from the jury evaluation is allowed to the flight zone.

6.5. The team with the highest score during the jury evaluation is nominated for Best Designer will be evaluated.

6.6. During the race, the drones must be programmed to perform the task and a control should be controlled from the center.

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7. Jury evaluation criteria

Evaluation criteria	Honey
• Parachute cargo release mechanism (must be remotely controlled)	5-10
• Appearance of the drone (fit of arms, torso and legs)	5-10
• Creativity and problem solving (decorative, protective or safety measures)	5-10
Identifying details (name and designation of all elements used in the development of a drone) 5-10	
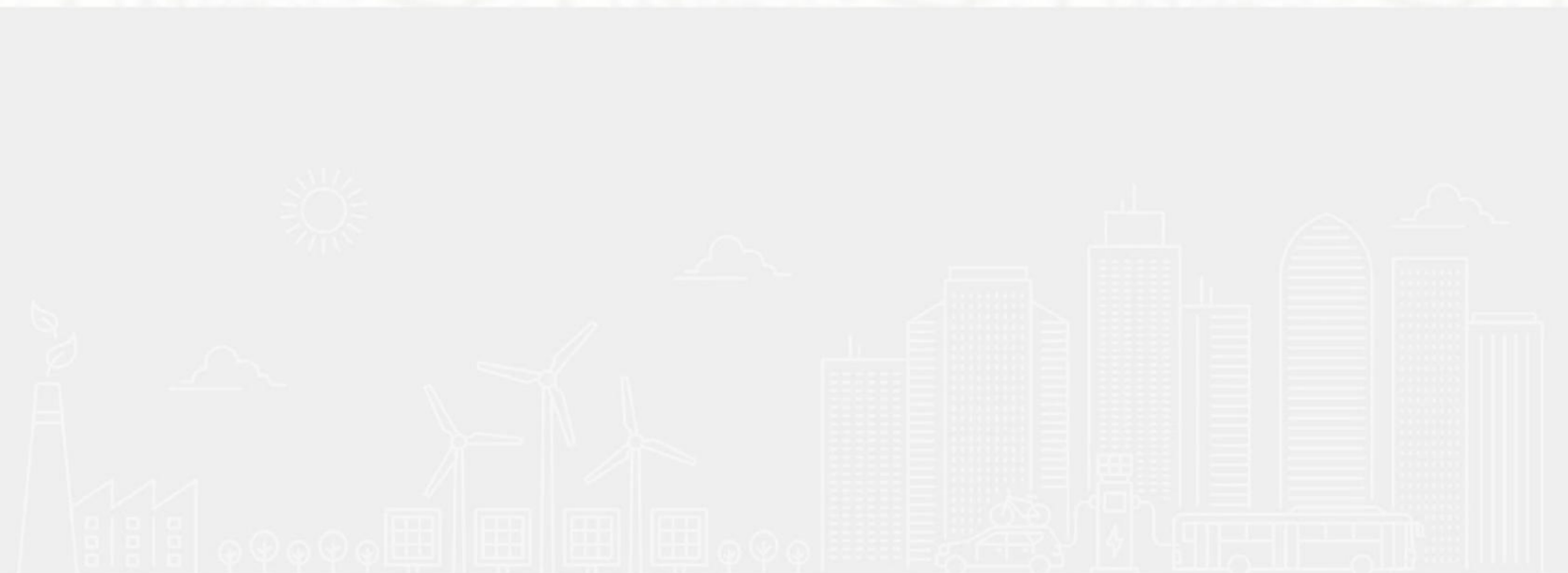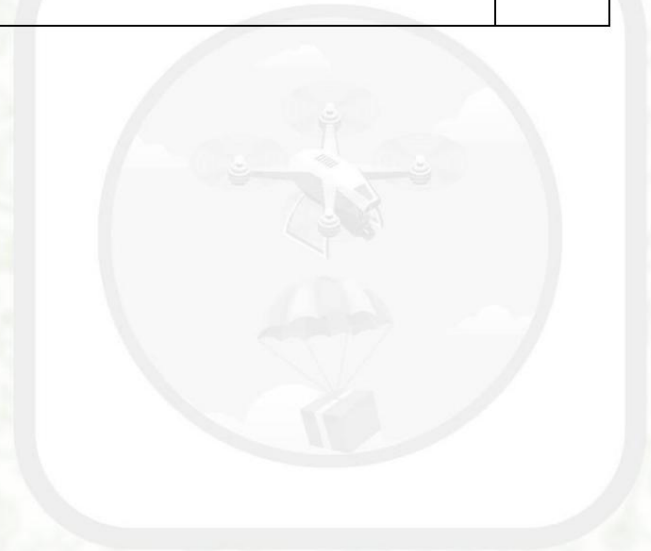
8. Execution of the task and calculation of points.

8.1. FPV Simulation. The stopwatch function of the program will be used here.

The team's round completion time will be calculated as follows:

2000 / time = flight score *(where 2000 is the total time-score factor)*

8.2. For example. If the team completes the round in 40 seconds, its flight score will be 2000/40=50.

8.3. Rise. 5 points for the take-off of the participants' drones

is evaluated. The participants follow the given trajectory of the drone after it takes off

they should move.

8.4. Obstacles. Flag. Participants must maneuver through the part of the flag obstacle, which has two flags. Each

double flag is worth **10 points .**

8.5. Vertical ring. 15 points are awarded for passing through this ring , and you cannot go to the next flag

obstacle without crossing this ring. At this time, the points collected by the team will not be counted.

8.6. Landing zone. The drone must fly along the given trajectory, arrive at the landing zone and land. If the

landing is not at least incomplete it will not count as a landing. At this point, the drone must take off

and land again. The landing zone score is valid only for landings made to finish the race.

8.7. Parachute. After the drone lands on the landing zone, its propellers must come to a complete stop.

A team member standing ready outside the field after the propellers have come to a complete stop

should deploy the parachute to the drone. After the team member is completely out of the flight area, the

pilot can take the drone into the air.

8.8. Horizontal ring. After the parachute is attached to the drone, the drone must pass through this ring from

bottom to top. At this time, the team scores **15** points. It is forbidden to pass to the target zone without

passing through this ring.

8.9. Transition to the target zone. With the parachute inside the drone, it must cross ring number 3 and

transition to the Target zone. ***Note***: *at this time, the pilot must control the drone as it reaches the maximum*

height.

8.10. Target. The drone arrived at the target area and aimed at the parachutes while maintaining its height in the air

should release. 3 parachutes should alternately drop loads for each side. With a parachute

together, the point value of the area where the load falls will be written to the team. If you load 2 sections

if it hits the line between and a certain part touches the inner ring, the calculation will be done according

to the inner ring. If the altitude of the drone is low during parachute release, it must come back and

repeat the   , a dropped parachute will not count. At this time, the drone returns to the landing zone

process again. Time does not stop in any case.

8.11. Landing. After the parachute has fully landed on the ground, the drone must land on the landing zone by the shortest route.

For drones to be considered fully landed in the landing zone, each of their parts in contact with the ground

must touch the platform. If any part of the drone touching the ground does not touch the platform, then the

drone is considered to have landed incompletely.

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9. Evaluation table of the task stage

| No	Task phase	Honey
1	When the drone takes off **2** When	5
	it passes between the 2 flag barriers number 4 When it passes	10
3	through the ring barrier number 5	15
4	When the cargo is placed on the drone with a	5
	parachute **5** When it passes through the ring obstacle number 3	15
6	When moving into the target zone	5
7	When the cargo is parachuted into the target area	10
8	When the load lands in a zone with a diameter of 600-400cm	15
9	When the load lands in a zone with a diameter of 400-200cm	25
10	When the load lands in a zone with a diameter of 200-100cm	30
11	**Load to the outer fire zone with a diameter of 100cm** **when it comes down**	40
12	**When the load lands in the central fire zone between the fields**	50
13	When the drone is fully landed (4 legs)	10
14	When the drone lands incompletely (3 and 1 leg)	5

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10. Equipment for making a drone

A drone with 4 or 6 motors should be made without going beyond the list given below. **Use the following items or less items when making the drone can be done.** Learn by clicking on the links to sample views of the elements you can

| An example product name	Feature	Num	Internet connection example
Flight controller	Pixhawk 2.4.8	1	https://aliexpress.ru/item/32947890087.html?sku_id=12000018133053511&spm=a2g2w.productlist.search_results.1.42614aa6cTRCon
Wireless control	FlySky or other	1	https://aliexpress.ru/item/32630763392.html?sku_id=66505928739&spm=a2g2w.productlist.search_results.0.3b4d4aa6jrZlHA
Propeller	8 and 10 inches	4-6	https://aliexpress.ru/item/1005001473893815.html?sku_id=12000016268768832&spm=a2g2w.productlist.search_results.0.39c64aa6RJe2IY
Electronic Speed Regulator	30-60A	4-6	https://aliexpress.ru/item/1005001511077102.html?sku_id=12000016406384264&spm=a2g2w.productlist.search_results.2.83eb4aa6EifvRr
Brushless motor	900-1400 sq	4-6	https://aliexpress.ru/item/1005001511077102.html?sku_id=12000016406384264&spm=a2g2w.productlist.search_results.2.83eb4aa6EifvRr
Servo motor	9g	1-3	https://aliexpress.ru/item/1005004634510404.html?sku_id=12000029915670107&spm=a2g2w.productlist.search_results.3.37514aa6g7lxRc
Camera and monitor	FPV goggles or monitor (Optional)	1	https://aliexpress.ru/item/32810053781.html?sku_id=12000029707909310&spm=.search_results.0.1e0d4aa6BT6LYp
Carbon elements	(not essential)	1-10	https://aliexpress.ru/item/1005003030660554.html?spm=a2g2w.detail.rcmdprod.1.4d124965C6qyZj&mixer_rcmd_bucket_id=UnknownMixerAbId&ru_algo_pv_id=5e8630-40a3c7-9fc34d-
Battery	2000-4200mAh	1-3	https://aliexpress.ru/item/4000598794681.html?sku_id=10000003740243770

11. Drone preparation conditions

11.1. The equipment given to the drone must be prepared without going beyond the list.

11.2. The form or function of the drone depends on the team's thinking should be

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

11.4. The body materials used must be individually designed and manufactured. (!)Premade drone body parts are not accepted.

11.5. Additionally, making an auxiliary function or decorative element with 1 arduino can

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

11.7. All parts of the drone must take off as presented.

11.8. The team that does not know the names and functions of the elements of the drone is not allowed to compete.

11.9. The control of the drone should be done manually by only 1 pilot.

11.10. When the drone arrives at the target zone, it must release the payload to the target with the payload release mechanism.

11.11. The size of the cargo will be **7x7x7cm .** The size of the carrying case should be at least **9x9x9cm** to be able to carry that load.

11.12. The height line for cargo release is 5m

11.13. The drone must stand on its feet. The parachute mechanism must not touch the ground.

11.14. Each participant must mark his team name so that it is visible on the drone.

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

11.16. The parachute on the drone will be provided by us along with the cargo

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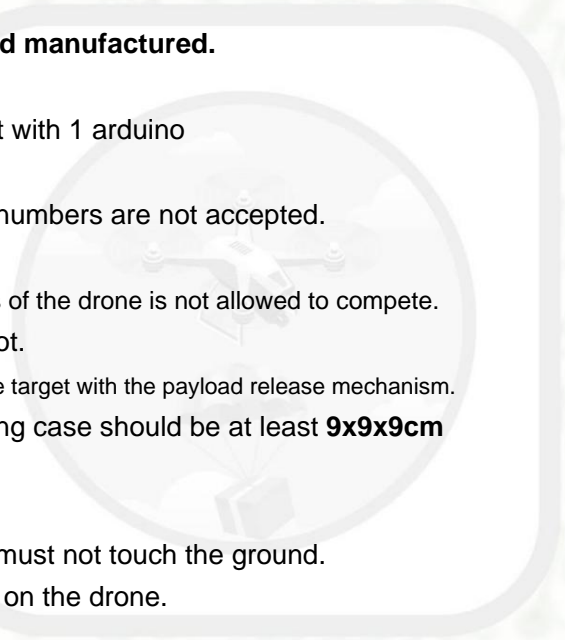
12. Permissible size range of the drone
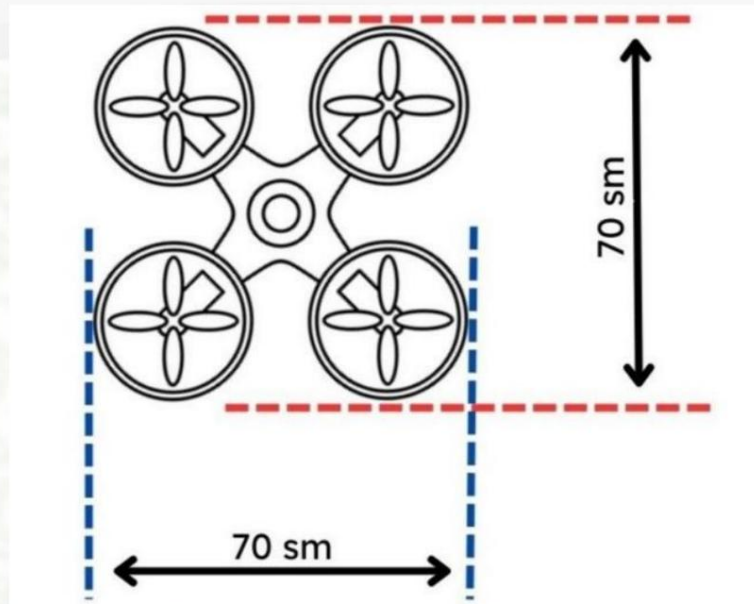
12.1. The width of the 2 side-by-side propellers of the drone at the maximum opening should not exceed **70** cm.

12.2. The distance from the plane the drone is on to the top of its top element
It should not be more than **30** cm.