
RobotChallenge - AirRace Rule

Revised on September 15, 2025

Introduction: The flying robot must perform a continuous figure-8 flight movement around two poles placed several meters apart. The robot must be able to fly quickly and accurately in this three-dimensional space.

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1. Automatic Air Race

The flying robot must autonomously complete a continuous figure-8 flight movement around two poles placed several meters apart, without remote control. The robot must be able to fly quickly and accurately in this three-dimensional space.

Group

A. Adult

1.1. Robot Requirements

1.1.1. Robot Specifications

- A. The robot must be an aircraft.
- B. Aircraft designs include fixed-wing aircraft, rotary-wing aircraft (helicopters, multi-rotor aircraft), ornithopters, or airships.
- C. The total weight of fixed-wing aircraft in level flight shall not exceed 0.5 kg. Helicopters shall not exceed 1 kg. The total weight of all other designs shall not exceed 2 kg.
- D. No competing robot shall exceed a maximum speed of 10 meters per second.
- E. Airship designs must fit within a rectangular prism of 1m x 1m x 2m. All other robot designs must fit within a cube with 1-meter sides.

1.1.2. Robot Requirements

- A. The robot must be autonomous. Any control mechanism can be used as long as there is no remote control of the robot's control mechanism.
- B. An external computer may be used to communicate wirelessly with the robot.
- C. Other navigation aids may be used, including dashed lines on the floor, active or passive navigation aids within the competition area, or additional navigation markers on the field surface.
- D. Navigation aid equipment (e.g., infrared beacons) must operate on their own power source; no power outlets are available.
- E. The navigation setup must be completed within the preparation time.
- F. Within 2 minutes after the end of the race, the team must remove any residual navigation markers.

1.1.3. Safety Notes

- A. Failure to comply with safety rules may result in the team's disqualification and the robot being barred from further competition.
- B. Equipment and operations must comply with Chinese laws and regulations.
- C. Only electrically powered robots are permitted. Batteries must have standard data specifications.
- D. The robot must display its competition ID.
- E. The robot shall have no sharp or potentially dangerous structures, except for propellers and helicopter blades.
- F. Only non-flammable gases may be used for buoyancy.

- G. Team members must be able to take control of the robot at any time in case of emergency.
- H. After the referee has cleared the field, only one team member (the robot operator) is allowed to enter the preparation area via the field entrance.
- I. Teams must always follow the referee's instructions and may only enter the flight area with the referee's permission.
- J. The referee may halt the flight based on field conditions.
- K. Team members must answer safety questions posed by the referee.

1.1.4. Safety Inspection

- A. Before debugging/competition, the robot must undergo a battery inspection. Batteries must have clear production qualification marks, otherwise, the robot cannot compete.
- B. All competing robots must pass inspection before competing. This inspection will be conducted before the first flight and cover all issues listed below.
- C. During the competition, the team member controlling the robot (the operator) must demonstrate the ability to control the machine safely.
- D. The robot must comply with all safety requirements.

1.2. General Requirements

1.2.1. Field Specifications

- A. As shown in Figure 1, the competition field size is at least 10m long, 5m wide, and 3m high. It is covered by a safety net. Two red round poles are placed inside the field, at least 5m apart. The poles are 3m high with a diameter of 11cm. There must be at least 2m of clear space around each pole.

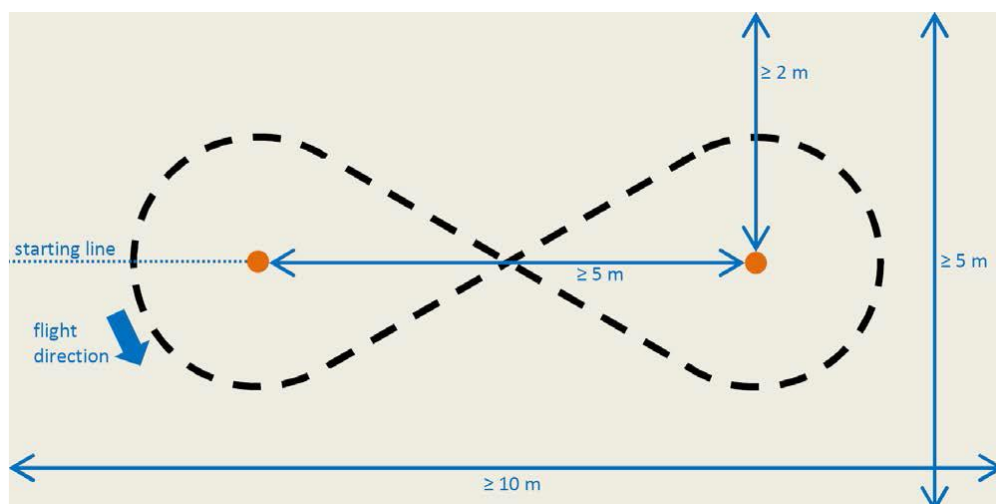


Figure 1: Air Race Field Layout (Top View)

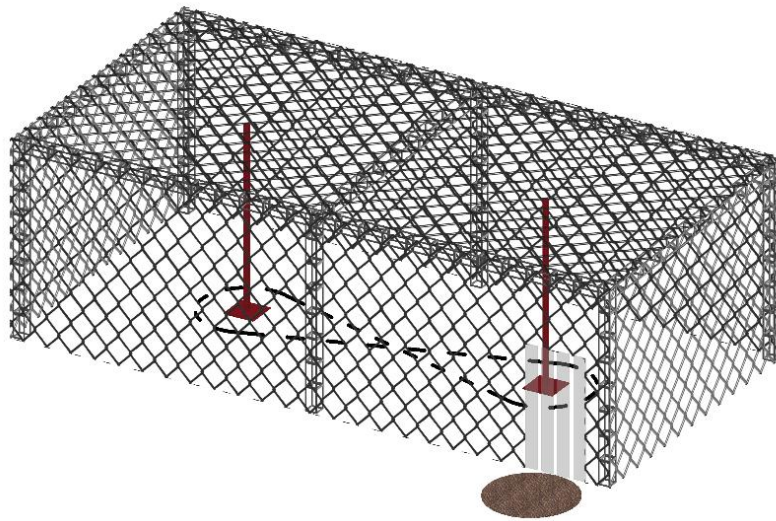


Figure 2: Air Race Field 3D Schematic

- B. The black dashed line on the field floor is a navigation aid. The line is 5cm wide. Each dash is 30cm long, and the gap between two dashes is 10cm. This line forms a figure-8 shape around the two poles.
- C. The field safety net has an entrance for team members to enter and exit the field.

1.3. Competition Rules

1.3.1. Competition Objective

- A. Within a 10-minute race time, the robot should complete as many consecutive autonomous figures-8 laps as possible.

1.3.2. Starting the Race

- A. Each team has 5-10 minutes of preparation time (specific time announced before the competition). During preparation time, one team member (the robot operator) is allowed to enter the competition area to prepare.
- B. When preparation ends, the referee starts the 10-minute flight timer, and the robot operator may start the robot.
- C. At the start, the robot must be launched from the starting line.
- D. For safety, the flight robot operator must leave the competition area during the race.
- E. Battery changes are allowed during the race, but the 10-minute countdown continues.

1.3.3. Restarting

- A. If the robot touches the ground or safety net, or if the robot operator decides to abort the flight, the robot can be restarted, but the timer continues.
- B. Multiple restarts are allowed within the flight time. The robot operator may re-enter the competition area to restart the robot. The operator must leave the field before starting the robot.



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1.3.4. End of Race

The race ends when the flight timer expires or when the referee stops the competition.

1.4. Scoring

- A. The robot must follow the correct figure-8 path.
- B. The robot scores 1 point for each correctly completed figure-8 lap.
- C. The effective score for the robot is the number of points obtained from consecutive figure-8 laps completed without violations within the 10-minute race time.
- D. If the robot has multiple effective consecutive flight sequences within the 10 minutes, the referee will take the highest score as the final score. If the highest scores are tied, the next highest score will be used as a tiebreaker.
- E. The number of competition rounds will be announced before the competition.

2. Remote Air Race

The flying robot must perform a continuous figure-8 flight movement around two poles placed several meters apart under remote control, and must pass through two fixed-height circles in sequence, successfully complete 10 laps, and finally land at the starting point. The shortest time wins. The robot must be able to fly quickly and accurately in this three-dimensional space.

Group

- B. Junior
- C. Senior
- D. Adult

2.1. Robot Requirements

2.1.1. Robot Specifications (Junior)

Remote Air Race Junior	
model	Quadcopter (Prohibit the use of FPV drones)
Motor type	Coreless motor
Propeller type	Two-blade propeller
Takeoff weight	≤120g (excluding protective cover and battery)
Flight safety protection design	With emergency propeller stop function, half-enclosed or fully enclosed protective cover
Auxiliary flight sensor	Does not support auxiliary sensors such as GPS, optical flow, camera, ultrasonic wave, etc.
Battery	1S Battery, the battery must have a clear production qualification mark
remote	no limit
No restrictions on drone brands, finished drones only need to meet the parameter requirements (No modification is allowed for drones, except for graffiti)	

2.1.2. Robot Specifications (Senior & Adult)

- A. The robot must be an aircraft.
- B. Aircraft designs include fixed-wing aircraft, rotary-wing aircraft (helicopters, multi-rotor aircraft), ornithopters.
- C. The total weight of fixed-wing aircraft in level flight shall not exceed 0.5 kg. Helicopters shall not exceed 1 kg. The total weight of all other designs shall not exceed 2 kg.
- D. No competing robot shall exceed a maximum speed of 10 meters per second.
- E. All robot designs must fit within a cube with 1-meter sides.

2.1.3. Robot Requirements

The robot must be remotely controlled. Any remote controller can be used.

2.1.4. Safety Notes

- A. Failure to comply with safety rules may result in the team's disqualification and the robot being barred from further competition.



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- B. Equipment and operations must comply with Chinese laws and regulations.
- C. Only electrically powered robots are permitted. Batteries must have standard data specifications.
- D. The robot must display its competition ID.
- E. The robot shall have no sharp or potentially dangerous structures, except for propellers and helicopter blades.
- F. Only non-flammable gases may be used for buoyancy.
- G. Team members must be able to take control of the robot at any time in case of emergency.
- H. After the referee has cleared the field, only one team member (the robot operator) is allowed to enter the preparation area via the field entrance.
- I. Teams must always follow the referee's instructions and may only enter the flight area with the referee's permission.
- J. The referee may halt the flight based on field conditions.
- K. Team members must answer safety questions posed by the referee.

2.1.5. Safety Inspection

- A. Before debugging/competition, the robot must undergo a battery inspection. Batteries must have clear production qualification marks, otherwise, the robot cannot compete.
- B. All competing robots must pass inspection before competing. This inspection will be conducted before the first flight and cover all issues listed below.
- C. During the competition, the team member controlling the robot (the operator) must demonstrate the ability to control the machine safely.
- D. The robot must comply with all safety requirements.

2.2. General Requirements

2.2.1. Field Specifications

- A. The competition field size is at least 10m long, 5m wide, and 3m high, covered by a safety net. Two red round poles are placed inside the field, at least 5m apart. The poles are 3m high with a diameter of 11cm. There must be at least 2m of clear space around each pole.
- B. A robot launch area, a 1.2m x 1.2m rectangular frame, is set up within the field.
- C. As shown in Figure 3, the 3D field schematic, two circles (diameter 1-1.2m, bottom height 0.5m-1m) will be placed at positions 1 and 2 as obstacles for the remote control race. The robot must follow the designated route, passing through circle 1 first, then circle 2, to complete the figure-8 flight. Obstacle dimensions will be announced on-site.
- D. The field safety net has an entrance for team members to enter and exit the field.

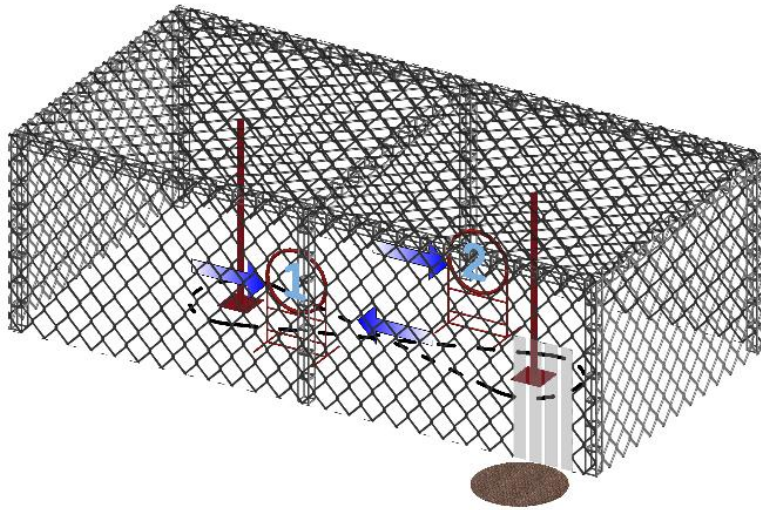


Figure 3: 3D Field Schematic

2.3. Competition Rules

2.3.1. Competition Objective

- A. The robot takes off by remote control from the start point, continuously completes 10 effective figure-8 laps (passing through the 2 circles in sequence each lap). The team with the shortest time ranks higher.

2.3.2. Starting the Race

- A. Each team will have on-site testing time before the race (specific time announced before the competition). During the race, one team member (the robot operator) is allowed to enter the competition area to prepare.
- B. When preparation ends, the team member leaves the field and goes to the remote control area outside the safety net. The referee announces the start of the race, starts the timer, and the operator starts the robot.
- C. At the start, the robot must be launched from the starting line.
- D. For safety, the flight robot operator must leave the competition area during the race.
- E. Battery changes are allowed during the race, but the race timer continues.

2.3.3. Restarting

- A. If the robot touches the ground or safety net, or if the robot operator decides to abort the flight, the robot can be restarted, but the timer continues.
- B. Multiple restarts are allowed within the time limit; the race timer continues. The operator must be outside the safety net before starting the robot.

2.3.4. End of Race

- A. The race ends when the robot completes 10 effective laps, or when the referee stops the competition.



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- B. The time limit for the race is 10 minutes. If 10 effective consecutive laps cannot be completed within 10 minutes, the time is recorded as 10:00.01.

2.4. Scoring

- A. The competition consists of 2 rounds. The best time from these rounds will be used as the final result for ranking.
- B. The robot must follow the correct figure-8 path, pass through the 2 circles in sequence, complete 10 consecutive effective laps (achieving the specified flight altitude, completing the designated flight path, without incidents like touching the net or ground), and land at the starting position, at which point the timer stops.
- C. Ranking is based on the recorded time, from shortest to longest.
- D. Effective Lap:
 - a. During the robot's flight, there are no incidents like touching the net or ground.
 - b. The robot must fly according to the designated route and must pass through the two circle obstacles.
 - c. After completing 10 effective laps, the robot must land stably within the launch area.
- E. Valid Result: A valid result is recorded when the robot starts from the launch area, completes 10 consecutive effective laps, and successfully lands back at the launch area. The timer stops at this moment.
- F. If the landing is outside the launch area, or if any part of the robot's vertical projection covers the rectangular frame, a 20-second penalty will be added to the time.
- G. Failure to complete the task within 10 minutes results in a time of 10:00.01.

3. Objections

3.1. Raising Objections

- A. There shall be no objection to the referee's judgment.
- B. If there is any misunderstanding during the application of the rules, the team captain may raise an objection with the referee.

4. Rule Flexibility

As long as the concepts and foundations of these rules are respected, the rules should be flexible enough to adapt to changes in the number of participants and the content of the competition.

5. Liability

- A. Competing teams are always responsible for the safety of their robots and for any accidents caused by their team members or machines.
- B. The RobotChallenge organizing committee and its personnel shall not be held liable for any accidents caused by participating teams or their equipment.