



Boeing & IITs present

National Aero-Modeling Competition

Problem Statement

Rules on Team structure

1. Maximum of 4 members in a team
2. Members of a team may be from same college or different (UG or PG)
3. Any number of teams can participate from one college
4. Professionals are not allowed (Only students can participate)

Design Constraints

1. $T/W = 0.75$ (if excess thrust is found, it will be neutralized by adding weight below the plane at center of gravity)
2. Propeller diameter should not be greater than 10 inches
3. Battery weight should not be more than 120 gm
4. The use of IC engines is prohibited. Only electrical motors are allowed
5. Use of gyroscopes (gyros) and programming assistance in receivers is prohibited
6. One of the team members should fly the aircraft and another should call the stunts as they are performed (just before)

Abstract Submission

1. All the participants need to submit an abstract on their aircraft, which would be a **no longer than 2 pages** (A4 size 1.5 line spacing) long with standard formatting. The Abstract would document the basic design of the aircraft (dimensions, wing areas, velocity, etc.) and would also explain how their design is suitable for given problem
2. Participants have to also send a zip file containing at-least 5 and no more than 10 photographs of plane while it's being built along with the Abstract
3. The Abstract has to be submitted to the respective Zonal competition 20 days in advance of the Zonal event date. E.g. For a Zonal happening on the 4th of January, the Abstract deadline is the 15th of December and so on.



Format of the Competition

The competition requires the participants to design and fabricate a RC plane (no Readymade Planes are allowed) and perform a set of maneuvers. Propellers, Motors, ESC, Servos, Receiver and Transmitter are allowed as off-the-shelf items. The event will be conducted at the grounds of the respective IITs and participants will need to bring their aircraft and all necessary equipment to this venue. The arena will be an open ground. There will be two rounds of the competition.

A. Qualifier Round

B. Maneuver Round

A. Qualifier Round

The best measure of the design of an aircraft can be done by climb and gliding time. To examine this, participants have to climb for 20 seconds. After this, they need to perform a dead stick flight (throttle=0 or Gliding) and land at a specified location. The plane however can be maneuvered while its gliding.

The teams will be graded based on

- Smooth Climb (35%)
- Glide Time (65%)

Final score = smooth climb (out of 35) + $0.65 \times 2 \times \text{glide time (in sec)}$

Smooth climb will be decided by the judges.

Top 30 teams from the qualifier round will qualify to Maneuver Round. Along with qualification to next round, qualifying teams will get a reimbursement of INR 5000 per team towards material costs for their models.

B. Maneuver Round

The Arena consists of 2 vertical poles separated by a distance of 25 meters and 2 gates - "entry gate" and "exit gate" separated by a distance of 18 meters. Entry gate has a horizontal bar at 4 meters height from ground and Exit gate has two horizontal bars at 4 meters and 7 meters height from ground forming a rectangular loop. Each gate would have enough space for planes to pass through, yet the skills of pilot could only guarantee a swift maneuver. The Arena will be at around 30 meters from Take Off zone to Landing Zone. The gates and poles will be separated by a distance of 30 meters. (For better understanding of the arena - look into the arena diagram (figure 1))

The participants get the scoring as below

a	A horizontal figure of eight around the 2 vertical poles	25 points per loop (none for incomplete loop)
b	Fly-in through the entry gate and fly-out from below bottom horizontal bar of the exit gate	25 points
c	Fly-in through the entry gate and fly-out through the rectangular loop of the exit gate	65 points



d	Fly-in through the entry gate and fly-out from above the rectangular loop of the exit gate	35 points
e	- Safe landing before completion of 4 mins in the landing zone	35 points (no points for landing before the landing zone or a crash landing anywhere in the field)

Teams will have to perform the following mandatory maneuvers at least once (not necessarily in the given order):

- Maneuver A
- Maneuver B
- Maneuver C or Maneuver D

After having completed all the mandatory maneuvers, the teams can perform the above maneuvers repeatedly in any extra time they have remaining before landing for extra points.

A maximum time of 4 minutes will be given to take off, complete the maneuver-set and land. Taking as many laps are allowed within 4 minutes but, the option has to be called before performance. Any further instructions would be given before the competition, on the spot. As soon as the timer crosses given time, only the points gathered by the aircraft till that moment are considered.

If there is a tie, winner will be decided based on a separate round in which time taken to complete one eight loop will be considered. Judges' decisions would be considered final in all cases.

Rules

1. Each team would be given 2 chances for each of the rounds and the best score is considered as per the scoring procedure mentioned above for each round
2. The timer will start from the moment the aircraft is in the air for both the rounds

Revisions

Any revisions to the Scope of the Competition would be intimated to all the participants via registered email and on the websites of the respective festivals at-least 45 days before the event takes place.

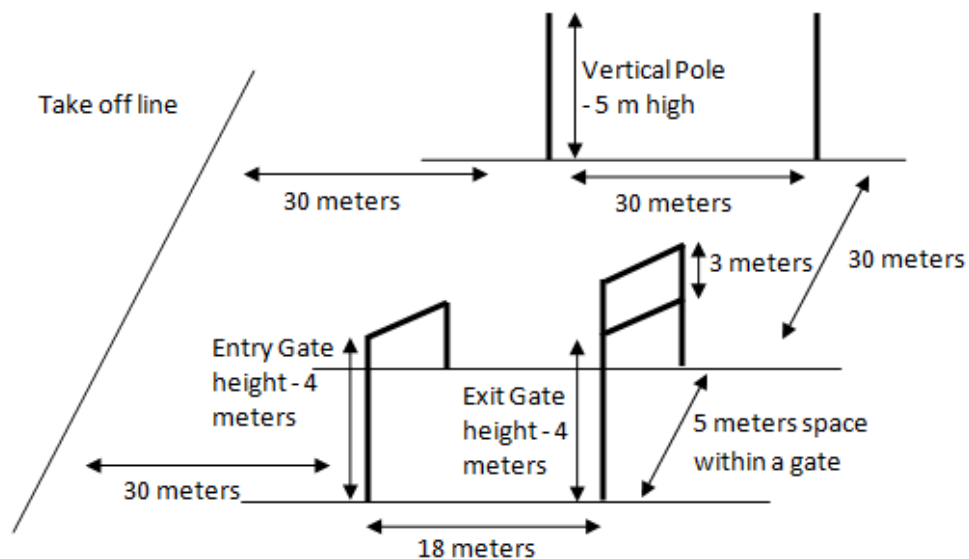
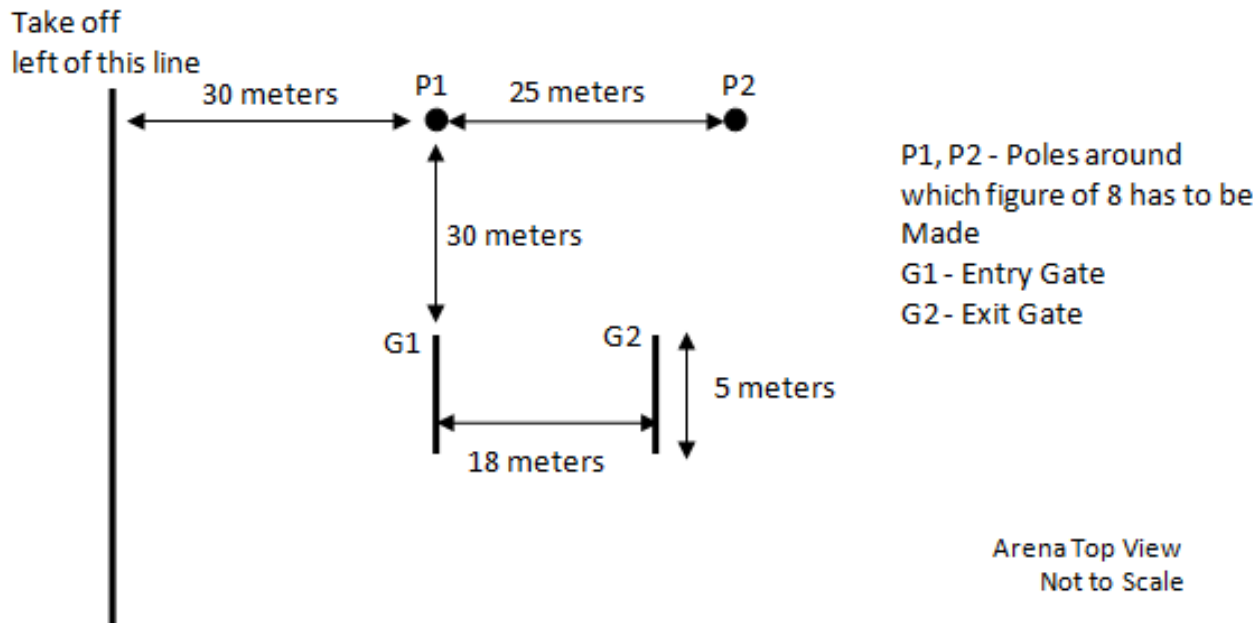


General Information

1. The use of 2.4 GHz radio is required for all aircraft competing in the competition. If the participants want to use any other frequency, they will have to inform the organizers in advance.
2. A limited number of 2.4 GHz radios will be available with the organizers for use by the teams. Teams who do not have access to radios can inform the organizers in advance to request use of these radios.
3. Receivers installed in the aircraft have to be in 'receiver mode only'
4. All the systems (Servos, motor, etc.) will be checked by organizers for functionality before the competition. If found not working, teams will be dismissed from the competition.
5. Pilot can position himself at any point in the arena to fly the aircraft during the rounds
6. Metal propellers are not allowed
7. The models can have powered take-off with a landing gear or can be launched manually by a person standing at ground level
8. Plane should be built from scratch and not purchased models
9. Winners (Top 3 teams) from one zonal level are not allowed to participate in other zones, but others teams can participate again in other zonal competitions
10. Teams who have claimed reimbursement in one Zonal cannot claim it in other Zonal
11. A team member can't be a part of more than one team at any one given competition
12. Bring your college/student I-Card at the time of competition
13. Travelling allowance for grand finale will be given to the successful teams
14. Any of the above mentioned rules, if found violated, teams would not be allowed to participate in the competition



Arena Information



Arena Isometric View
Not to Scale

Figure 1: Schematic of the Arena