



Laws of Motion

INTRODUCTION

Laws of Motion National Aeromodelling Competition for all aeromodelling enthusiasts in India sponsored by Boeing, and conducted in collaboration with Kshitij, IIT Kharagpur. The competition is launched with the vision to provide a unified national platform for students interested in aerospace and related engineering disciplines - to demonstrate their aeromodelling expertise.

PROBLEM STATEMENT

ROUND1

1. A team must design, fabricate and demonstrate a fixed wing aircraft system that can perform tasks mentioned in following rounds with given constraints.
2. The aim of the Round1 is to select top 30 teams to the Round2. Since the theme is payload capability, the qualifier round's objective is to select those teams who built aircraft with good payload carrying capability and can fly safely while carrying the payloads.
3. The aircraft should carry one or more than one payloads (golf balls of weight - 45g, diameter - 43mm - will be supplied by the organizers during the competition) as they can and fly for a minimum time of 30 seconds. The aircraft should then land with the entire payload in it - Payload should not come out of the aircraft until touchdown.
4. The payload should be mounted inside the aircraft and should not be exposed externally. Judges will examine the aircraft and will allow take-off only when they are satisfied with the payload mounting mechanism.

Score: $\text{Weight of Payload Carried} \times 100 / \text{Weight of Aircraft without Payload}$

5. Those aircraft which will not be able to fly for 30 seconds with the payload will get a 0 score. A maximum time of 2 minutes will be given between the take off and the landing and the aircraft should complete the round within the time limit. Top 30 teams, based on the score, will qualify to Main Round from the Qualifier Round. Along with qualification to next round, qualifying teams will get a reimbursement of INR 5000 per team towards material costs for their models.



ROUND2

1. The aircraft should carry one or more than one payloads (golf balls of weight - 45g, diameter -43mm - will be supplied by the organizers during the competition) and drop them in a circular drop zone of 20m diameter.
 - The drop should be performed after a minimum flight time of 45 seconds after take-off
 - All the payloads in/on the aircraft should be released in a single drop. The payloads should fall as independent objects and should not be joined together as one bigger payload (sticking them together or dropping a box with multiple payloads in it etc. are not allowed).
 - Entire payload should be released using only one channel in the transmitter
2. The drop zone is at 40m from the take-off and landing zone. (For a better understanding of the arena, refer to the illustrations on the right).

Score: Weight of Payload Dropped in the zone*100 / Weight of Aircraft without Payload

3. A maximum time of 3 minutes will be given between the take off and the landing and the aircraft should complete the drop and land within the time limit.

Final Score: Score in Qualifier Round*0.25 + Score in Main Round*0.75

4. Teams with highest final score will be declared as winners. If there is a tie, winner will be decided by a separate round framed by the Judges on the spot. Judges' decisions would be considered final in all cases. Top 3 teams will be invited to IIT Delhi for the finals. The problem statement for the final round will be launched in Feb 2020.



INSTRUCTIONS

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 in advance.
2. A limited number of 2.4 GHz radios will be available for use by the teams. Teams who do not have access to radios can inform the in advance to request use of these radios.
3. Receivers installed in the aircraft must 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. In view of stringent safety requirements, if a pilot flies out of the designated flying zone which includes overhead of the event organizing and control section, as mentioned at the venue, he/ she is disqualified and has to immediately turn back and land safely.
7. Teams are suggested to carry additional components (motors, batteries, propellers etc.) as needed to avoid last minute surprises at the venue. You will lose time/ attempt if you are not ready at the time of your turn.
8. Please do not share any part of your aircraft (motors, ESC, Battery etc.) with other teams. Each team is expected to carry all the equipment needed to participate in the competition.
9. Metal propellers are not allowed.
10. The models can have powered take-off with a landing gear or can be launched manually by a person standing at ground level.
11. A team member cannot be a part of more than one team.

DESIGN CONSTRAINTS

- The competition requires participants to design and fabricate an RC aircraft. Readymade models, like RTF, ARF, BNF etc., are not allowed.
- **T/W ≤ 0.75 without payload** (If excess thrust is measured, it will be neutralized by adding weight below the aircraft at centre of gravity)
- Propeller diameter should not be greater than 13 inches
- Total wingspan should be a maximum of 1.2 m
- Only electrical motors are allowed. The use of IC engines or any other means of providing thrust is prohibited.
- Use of gyroscopes (gyros) and programming assistance in receivers is prohibited



ABSTRACT SUBMISSION

- All the participants need to submit an abstract on their aircraft, which should be no longer than 15 pages (A4 size 1.5 line spacing) with standard formatting. The Abstract must document the basic design of the aircraft (dimensions, wing areas, velocity, etc.) and should also explain how their design is suitable for the given problem.
- Along with the abstract, participants must also send a zip file containing atleast 5 and no more than 10 photographs of the aircraft while it is being built
- The Abstract has to be submitted as per the standard format (you can download the standard format from the respective IIT websites)
- The Abstract must be submitted 20 days in advance of the competition date
- The Abstract must be submitted as per the format mentioned by sending an email to the corresponding email id for each zonal (you can get it from respective IIT websites)
- The shortlisted teams based on abstract to participate in the zonal rounds would be announced 15 days before the competition date

Rules and Regulation

- Each team must have four members in order to participate (Including the captain).
- Members of a team may be from same college/school or different (School/UG/PG).
- Participants are required to get a bona fide certificate signed by the respective HoD/Dean/Principal in addition to their school/college ID Card.
- Any number of teams can participate from one college/school
- A safety pilot might be available at the ground and, if needed, have control on your aircraft in case of emergency.
- All the teams are required to bring the registration receipt with them.
- All Participants are required to report 30 min before the event starts, to the reporting desk.
- Each team would be given two attempts in Qualifier round and two attempts in Payload Round. Best score from both attempts will be considered as score for each round.
- The timer will start after 30 seconds of previous team completing their attempt. The participants need to be prepared in time and launch without delay after entering the take-off zone.
- Same aircraft should be used in both the rounds and it should be the same one in the abstract. In case of damages during the competition, teams can repair the same aircraft but are not allowed to use a replacement. The repaired aircraft should be ready in time for the turn.
- Any misbehaviour of participant during event/rounds may lead to disqualification.
- Participants must be present during the event at the specified time. Absent participants will be automatically disqualified.



- In case of any disputes, final wording will remain with the organizers. Decision of the judges is final.
- No questions over the evaluations of the participants by the judges will be entertained.
- Any damage to college property will be seen to by higher authority and dealt with accordingly.

CERTIFICATION

- Boeing.
- IITs (as applicable).

Merit Award recipients will receive additional Merit Certificates.

PRIZE MONEY

The Prize money will be awarded to Winners via NEFT and will be processed within four working weeks.

The Winner have to mail the following information (immediately after the announcement of results) to vidhan.kashyap@ktj.in.

Subject: Event Name, Team id- Position (example- LawsOfMotion, LOM1003- 1st Position)

Body of mail-

- Account Holder's Name
- Account Number
- Bank name and Branch name.
- IFSC Code