Trailblazers

General Rules

- The competition consists of 4 rounds.
- There is no limit on the maximum number of people in a team. However, a team must have at least 3 people.
- All teams are required to design, fabricate, and fly an RC aircraft.
- Multiple teams from the same college are allowed, provided they do not enter multiple copies of the exact same RC plane.
- No readymade models, like RTF, ARF, BNF, etc., are allowed.
- No lighter-than-air systems and rotary systems are allowed. Only fixed-wing aircraft are permitted.
- Participants are permitted to make alterations and modifications between rounds only if their aircraft sustains damage during a flight run. Alterations can only be made after consulting the judges and must go through another technical inspection afterward.
- One lap will be along a right-angle triangle with sides of 80m, 100m, and 128m (subject to change depending on conditions on competition day).
- No aircraft must cross an altitude of 30m at any point due to proximity to the airport.
- Any calls regarding grey areas in the rules or updates to the rules are up to the judge’s discretion. The judge’s decision is final. Teams may not appeal any of the judges' decisions.

Report Submission

- A report must be drafted and submitted detailing the entire design process. Key components include:
    - Sensitivity analysis of the scoring statement.
    - Technical details explaining how and why the team chose that configuration.
    - Weight distribution.
    - Budget table.
    - Manufacturing details.

    - A 3-view aircraft drawing.
- The tentative date for report submission is **8th January 2025**.
- The report should be a minimum of 4 pages and a maximum of 10 pages in its entirety.
- Based on the viability of the design detailed in the report, the team will be invited to the fly-off.
- No significant design changes will be allowed in the final aircraft for the fly-off compared to the design detailed in the report.
- The top 3 reports will receive a 10% increase in their final score.

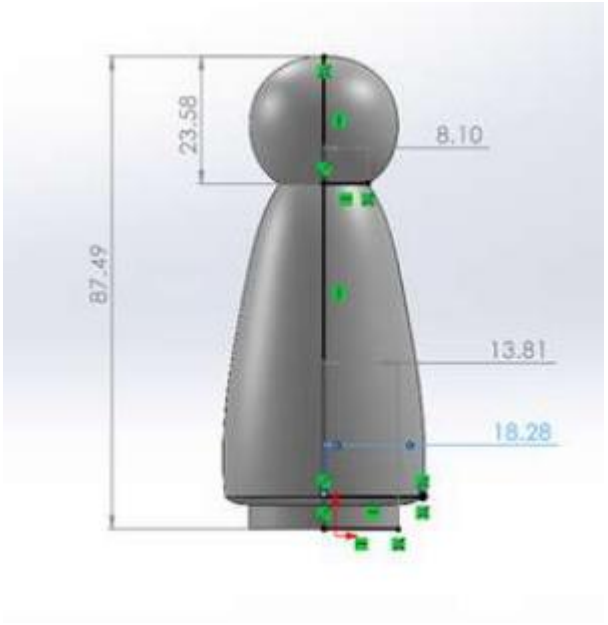
Aircraft Specifications

- The propeller diameter should not exceed 13 inches.
- Wingspan should be a maximum of 1.5 meters.
- Only electric motors (BLDC) are allowed. No IC engines or any other form of propulsion is permitted.
- Use of programming assistance in any way or form is prohibited (e.g., gyroscopes, flight control boards).
- There can be a maximum of one battery pack connected to a propulsion system. A propulsion system consists of:
    - One battery.
    - One or more electronic speed controllers (ESC).
    - One or more motors.
- The maximum energy capacity of the battery must not exceed 50 Watt-hours.
- A radio frequency of 2.4GHz must be used as the control link.

Technical Inspection (Round 0)

- This is a technical inspection round, and all teams must pass this round to qualify for further rounds.
- The payload for this year is a wooden doll passenger with dimensions in millimetres.

- The plane must house a minimum of 1 and a maximum of 5 passengers as per the team's choice. This number will be declared during the technical inspection and cannot be exceeded in any attempt.
- Passengers of the given dimensions will be provided on the mission field. They will be 3D printed out of regular PLA and weigh 21g. Teams may bring their own passengers; however, these will be inspected by the judges.
- The passengers must be carried internally to the aircraft. No part of the passengers can be part of or extrude outside of the airplane's external surfaces or features.



- Teams must fabricate a parachute-like attachment for the passengers. This attachment:
    - Should slow down the passengers' fall.
    - Must be removable.
    - Cannot use permanent adhesives like epoxy.
- A mechanism to drop the passengers from the payload bay in the aircraft via remote control must be demonstrated during the technical inspection.
- The aircraft's empty weight (including battery and all other non-payload components) must be less than 1500 grams.
- All the battery packs, motors, ESCs, transmitters, receivers, and other equipment to be used in subsequent rounds must be shown to the judges. Only inspected pieces of equipment will be allowed.
- Battery packs, motors, ESCs, and propellers must be commercially procured and not tampered with.
- Teams must clear the technical inspection to proceed to the main competition.

Mission 1

- The plane must complete 2 laps in less than 5 minutes.
- No payload is required for this round.
- The plane must be hand-launched.
- A successful landing is required for a score.

- **Score** = 1 for a successful mission.
- **Score** = 0 for an unsuccessful mission.

Ground Mission

- This mission will only be held if there is sufficient time.
- The team must prepare (attach parachute to passenger), load, and drop the passengers as fast as possible while the aircraft is on the ground.
- Only one team member can perform this mission.
- The team must perform this mission with the maximum passengers declared in the technical inspection.
- **Score** = (Best Team's Time) / (Your Time).

Mission 2 (Parachuting Passenger)

- The team can do up to 5 laps of the circuit. A minimum of one successful lap with a successful passenger drop must be performed for a valid score.
- The passenger must be released to land as slowly as possible. Passengers must be prepared with the parachute attachment and loaded in a 5-minute staging window prior to flight.
- The plane must be hand-launched and successfully landed for a score.
- Planes may not land mid-mission. The planes must have the ability to house and drop multiple passengers to maximize their score.
- The judges must be informed before the team releases the passengers. Passengers released without indication will be considered an unintentional drop and declared unsuccessful.
- The time will be counted from the release of a passenger until it touches the ground.
- Unsuccessful drops include instances where:
    - The judge loses sight of the passenger.
    - The judge is not informed of the drop.
    - The passenger does not touch the ground within 2 minutes.
    - The passenger touches the ground within 3.5 seconds.
    - The passenger gets stuck on a tree or power line.
    - The passenger veers out of the competition zone.

Scoring Formula:

Score = 1 + [(L × P × T) / (Best Team Score)]

Where:

- **L** = Number of Laps Completed.
- **P** = Number of Successful Passengers Dropped.
- **T** = Combined Total Time of All Successful Passenger Descents.

Final Formula: **Score** = (Laps Completed × Successful Passenger Drops × Sum of All Times).

Time is counted from the release of the cargo until it touches the ground.