



Problem Statement

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EVENT DESCRIPTION

INTRODUCTION

World is full of chaos with increasing un-stability of governments, risk of falling nuclear weapons in the hands of extremists, increased risk of global warming, concentration of carbon particles in the environment, exponential rise in world population, limited fossil fuels and depleting energy reserves. We are also on the verge of third world war due to scarcity of drinking water. So to tackle these issues and we have to either learn to rehabilitate ourselves quickly or search and explore life on other planets, to check for rising concerns so as to minimize threat to humanity and make human a interplanetary species.

For all of these solutions, we will need aerial vehicle for surveillance, immediate help to remote areas, exploring other planets and sample them aerially, quick transportation between continents and other important aerospace application.

In this format of event, you have to either build a glider or a multi-copter which is capable of to perform some basic maneuverability.

FORMAT OF THE COMPETITION

There will be four round to this event. **All the rounds are cumulative, though not necessary to participate in. One can directly participate in or miss any of the round. No elimination will be done in any rounds.**

Round 1:

It will be a quizzing round which will require basic knowledge of the aerospace and space sector. The questions may be related to

- a) ISRO missions,
- b) Missile technology,
- c) ISS (International Space Station),
- d) Current affairs,
- e) Aerospace terminology,
- f) NASA and SpaceX, Worldwide space agencies.

This event will be spot round for MNNIT students and will be online for non-MNNITians.

→ Scoring Criteria and Rules:

- ◆ There will be a total of about 20 questions which will carry 5 marks each.
- ◆ No negative marking.
- ◆ Questions may or may not be objective.
- ◆ All the team members have to take individual test in case you are giving it online.

Round 2: Fictional Concept Design

We will release a live problem and you will have to **design a concept of a fully functional aircraft with all of its mandatory design (viz., aerodynamics and structure, materials to be used), controls (viz., navigation and other important sensors that can be added to increase its value).** This event is to check your imagination power of solving an aerospace design problem and fictional thinking to solve real issues with space exploration.

→ Rules:

- ◆ **You will have 48 hours once the problem is live to design the concept and mail it to us at aeroclub@mnnit.ac.in**
- ◆ After the deadline, we will have a board presentation of your concept. PowerPoint presentation is not necessary. Handmade designs and concepts will be sufficient.
Note: Since this round is planned a week before Avishkar, so the outside candidates who will be unable to attend will be given additional 24 hours to make a PowerPoint presentation of their concept and mail it to us at aeroclub@mnnit.ac.in
- ◆ We expect the **concept to be in a document format or a pdf** consisting of **handmade sketches**.
- ◆ Design related to SolidWorks or any other designing software is not required. Although, if you provide one, it would be appreciated.
- ◆ We basically expect you to dig more and more on fictional design, technology, onboard flight controllers (name as many hardware that can be used) and sensors, materials, weight, structure, strength, flexibility of design and communication systems. Condition is that they must be compatible.
- ◆ You are suggested to make a multidisciplinary team (all branches) to cope with the event structure and score well.

→ Scoring criteria:

- ◆ Design based on aerodynamics.
- ◆ Power and fuel economy.
- ◆ Control and sensor capabilities.
- ◆ Approximate weight of body.
- ◆ Total cost of the design.
- ◆ Technical details of the parts.

Round 3: Hands on Experiment (Paper planes)

Teams have to make their own power less gliding vehicle which can be launched via a launcher. Gliding vehicle can be made with using paper or cardboard except metallic parts.

Example: Paper plane

→ Rules:

- ◆ Gliding vehicle can be **launched from a maximum height of 7 ft.**, if a team member is throwing. (A platform of fixed height can be provided if asked for)
- ◆ If a launcher is used then **maximum height of the launcher must be 2ft. No constraints on the angle of throw.**

→ Scoring criteria:

- ◆ Based on weight (minimum weight will have maximum score)
Score1 = Weight (in grams) X 10
- ◆ Based on glide time
Score2 = time in seconds X 50
- ◆ Based on economy
Score3 = cost X 30
- ◆ **Total = Score1 + Score2 - Score3**

Round 4: Action based Glider

The competition requires the participants to **design a RC (Remote-Controlled) plane (no readymade planes are allowed) and perform a set of maneuvers.** The event will be conducted **at the ground of MNNIT** and participants will need to **bring their aircraft and all necessary equipment to the venue.** There will be two rounds of the competition

- a) Qualifier Round
- b) Maneuver Round (Final Round)

A) Qualifier Round

The best measure of the design of an aircraft can be done by its climbing and gliding time. To examine this, participant's **glider has to climb for 30 seconds.** After this, they need to perform a **dead stick flight** (throttle = 0 or Gliding). The plane however **can be maneuvered while it's gliding.** The teams will be graded based on the Glide time.

$$\text{Score1} = \text{Glide time (in seconds)} \times 10$$

B) Final Round

- a) In this round participants are expected to perform an act of **dropping an object in a specified circle** and the points will be allotted according to the accuracy of the drop. Plane will be carrying a dead mass of dimension 2cm X 2cm X 2cm weighing less than 50 grams.
- b) **After dropping** the object, the participant is allowed to **perform “horizontal figure 8” maneuver across two rods**, at 25 meters. A **maximum time of 4 minutes** will be given to **complete dropping the object, maneuver-set and land**. One can **only perform Horizontal 8 maneuver after dropping the object**. Once the object is dropped, the participant can **perform as many horizontal figure of 8 maneuvers as he/she can within the time limit of 4 minutes and then land** at a specified location (**Bonus points will be awarded if plane lands in the take-off zone. No points for crashing or landing anywhere in the field**).

Score2 = (Number of horizontal loops X 25) - (bomb drop distance from center of specified circle (in meters) X 10)

Total = Score1 + Score2

→ Rules:

- ◆ 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.
- ◆ The **timer will start from the moment the aircraft is in the air** for both the rounds.

→ Design Constraints:

- ◆ The RC plane should measure as **maximum of 1.0 m along any direction**.
- ◆ **T/W = 0.75** (if excess thrust is found, it will be neutralized by adding weight below the planes center of gravity)
- ◆ The use of **IC engines is prohibited**. Only **electrical motors are allowed**
- ◆ The **maximum voltage between any two points on the plane should be 12V** at any given point of time.
- ◆ Use of **gyroscopes (gyros) is prohibited**.
- ◆ One of the team members should fly the aircraft and another should call the stunts just before they are performed.

General Information:

- ◆ 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.
- ◆ 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.)
- ◆ **Metal propellers are not allowed.**
- ◆ The models can have powered take-off with a landing gear or can be launched manually by a person standing at ground level.
- ◆ Plane should be **built from scratch and not purchased models.**
- ◆ A team member **can't be a part of more than one team** at any one given competition.
- ◆ **Bring your college/student I-Card at the time of competition.**
- ◆ If any of the above mentioned **rules are found to be violated**, the concerned team will **not be allowed to participate** in the event.
- ◆ Team members of the team should be preferably interdisciplinary to make our work easier. **Only same college members are allowed per team.**
- ◆ Maximum of 5 members per team is allowed.

Note:

S. No.	Date	Time	Event	Venue
01.	21 Sept. 2018	1800 to 2000 hours IST.	Round 1 (Quizzing)	LHC, CSED
02.	21 Sept. 2018	2200 hours IST.	Problem Statement for Round 2 will be released.	Email or FB page
03.	23 Sept. 2018	1000 hours IST .	Deadline for sending the design (MNNIT students only)	aeroclub@mnnit.ac.in
04.	23 Sept. 2018	1500 hours IST onwards	Presentation round (MNNIT Students Only).	LHC, CSED
05.	24 Sept. 2018	2100 hours IST.	Deadline for sending the design (other students) with PPT	aeroclub@mnnit.ac.in
06.	27 Sept. 2018	0600 to 0900 hours IST.	Round 3 (Paper Plane Round)	Athletic Ground
07.	28 Sept. 2018	0600 to 0900 hours IST.	Round 4	Athletic Ground

Revisions

Any revisions to the Scope of the Competition would be intimated to all the participants via registered email and on the website of Avishkar-2018.

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