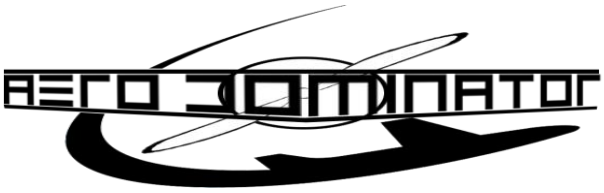
SAE-VIT
SAE INDIA |STUDENT CHAPTER

graVITas '19
UNLEASH YOUR GENIUS



AERO DOMINATOR 6.0

Rule Book

VIT®
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

graVITas 2019

VIT University, Vellore

INTRODUCTION

Aero Dominator 6.0 is an all-electric class aero design competition to be held in VIT during gravitas'19. The event will feature micro class competition.

The micro class aims to help the students understand how to design an aircraft based on two different factors – aircraft that has that least possible empty weight but at the same time can lift the maximum possible payload fraction.

MISSION REQUIREMENTS

Round Attempts –

Only two launch attempts is allowed per round. The second launch attempt will be given only if the aircraft lands before the first cone. If it crosses the first cone then no more chances will be given in the same round.

Launching Criteria –

Run up can be taken within the prescribed circular take-off area and then launched by holding the aircraft by their hand from the fuselage. Only

one person is allowed for the same. Only one step may be taken for the launching within the circle.

Aircraft Configuration requirement during the attempt –

All the aircraft parts need to remain intact during the take-off, flight path and during landing. No part of any kind should leave the aircraft during the flight path.

EXEMPTION – A broken propeller during landing is allowed and does not invalidate the flight attempt.

Take off requirements –

- Team may use the entire launch circle to get airborne. Two launch attempts per round will be given to each team. Each team will have 2 mins of time to prepare for take-off.
- Bounce and take off is allowed if the bounce occur within the prescribed take-off area.

Landing Requirements –

Landing is defined as the activity which begins as the aircraft initially touches the ground to the point where it comes to complete rest. A crash

landing is not allowed and it invalidates the complete flight round of your team. Touch down should be within the desired circular limits. However, rolling out or sliding beyond the limit is permissible provided that the flight lands in the circular region. Touch and go landing are also not allowed.

MISSION REQUIREMENTS

1. **Time Limit for Aircraft Launch**

Micro Class aircraft should be assembled prior to entering the launch zone.

I. Each team will have 60 seconds to complete preflight checks, energize the propulsion system, and check the controls and hand-launch the aircraft.
II. Only one takeoff launch attempt is permitted per round.

2. Aircraft Takeoff and Circuit

Takeoff for Micro Class is defined as the point at which the aircraft departs the hand of the person throwing the aircraft. Once takeoff occurs, Micro Class aircraft are required to:

I. Remain airborne and fly past the designated turn point before turning approximately 180 degrees in heading.
II. Flying past a second designated turn point, turning 180 degrees in heading.

III. Land in the designated landing zone. Aircraft should be prepared to land on either a paved landing zone or an unpaved landing zone.
IV. Takeoff direction will be determined by the judges, and normally selected to face into the wind.

Micro Class Design Requirements

The aircraft is to be designed in such a way that it travels quickly in air, is easily manoeuvrable and can carry the maximum payload.

- Gearboxes in Micro Class are allowed. Multiple motors, multiple propellers, propeller shrouds, and ducted fans are allowed.
- Gyroscopic assist or other forms of stability augmentation are not allowed.
- Competing designs are limited to fixed wing aircraft only. No lighter-than-air or rotary wing aircraft such as helicopters will be allowed to compete.
- The payload must consist of a support assembly and payload plates. All payloads carried for score must be carried within the cargo bay(s). The support assembly must be constructed so as to retain the weights as a homogeneous mass.
- The payload should not provide any addition to the strength of the wings and fuselage or any aerodynamics advantage for e.g. steel rods to strengthen the wings are not allowed.

- Usage of Ready-to-Fly (RTF) and Almost-Ready-to-Fly (ARF) kits is strictly prohibited.
- **Payload bay is mandatory for flying.**
- Batteries should be limited to maximum 3 cells and 2000mAh.
- Metal propellers are not allowed.
- Lead can't be used as payload or any other part of manufacturing.
- Anyone found not following the above rules will be disqualified

NOTE- If you are bringing two or more aircrafts for the competition, you are requested to send the design reports of all your aircrafts. Only the aircrafts whose design reports sent before will be allowed to participate in the competition. Also, the specifications of the aircraft(s) need to be the same as in design report(s).

Micro Class Judging Formula

Final Flight Score (FFS) =

$$\left[\frac{\mathbf{1}}{\boldsymbol{n}}\sum_{\mathbf{1}}^{\boldsymbol{n}}\frac{W_{pay}}{\sqrt{W_{Total}}}(in\ grams)\right] + \left[\frac{1}{L_w^2+L_l^2} * 10\ (l\ in\ meters)\right] + \left[\frac{DRS}{8}\right]$$

Where,

W_{pay}= Payload weight in grams

W_{tot} = Total aircraft weight in grams

L_w = Wing span in meters

L_l = Tip to tail length in meters

DRS= Design Report Score

n = Number of rounds

Payload and its requirements –

The payload must consist of a support assembly and payload plates. All payload carried for score must be carried within the **cargo bay**. The support assembly must be constructed to retain the weights as a homogeneous mass. There is no required configuration for the payload plates. The design of the support assembly will depend upon the configuration of the payload plates. The payload must be secured to the airframe to ensure the payload will not shift or come loose in flight. The total payload consists of the plates plus the support assembly. You are requested to bring your own payloads for the competition.

NOTE:

1) It is the responsibility of each team to have their **own payload plates**.

2) No lead weights will be allowed as payload.

3) The plane needs to be balanced in both conditions – with payload and without payload.

Payload Bay Requirements –

- Micro Class aircraft requires a "Closed" payload bay. A "Closed" payload bay is defined as having four sides, a bottom and a top. The top can be a hatch or the wing once installed on the aircraft. The payload bay must be fully enclosed within the fuselage and the aircraft must be structurally airworthy with and without the payload installed. No penetrations are allowed through the payload bay except for the payload support assembly, in which case the support assembly MUST be made removable. It must be removable so that the test block can be inserted into the payload bay during technical inspection. The removable payload support assembly will be considered as payload.
- Closed Payload bay volume dimension shall be
  1.5 inch* 1.5 inch* 5 inches.
- Each team is allowed with only one payload bay per aircraft.
- Teams will be given five to ten minutes of time for making their flight ready for the technical inspection. The payloads must be

loaded and unloaded during inspection and the time required for the same will be a judging criterion. The aircraft should get ready within five minutes.

Aircraft ballast -

An Aircraft Ballast can be used by a team with the following exceptions:

1. Ballast cannot be used in the closed payload bay.
2. Ballast stations must be indicated on the 2D drawings.
3. Cannot use lead as ballast.
4. Ballast must be secured to avoid shifting or falling off the aircraft and causing a CG problem.
5. Ballast will never be counted as payload.

This should also be shown in the design report submitted.

Total penalty points(T)– Any penalties incurred during the design report submission, technical inspection or aircraft modifications will be applied to the final score.

General Competition Rules

1. The score of a team stands valid only if the aircraft follows the designated path as given in the rulebook.
2. The Event will be held in two sessions. First session will be in morning and second session will be after lunch. In each session, there will be one round and the teams will be provided a chance to fly their aircraft in both the rounds. The best score out of the two rounds will be used for the final judgement.
3. A maximum of 3 minutes will be given to complete the circuit.
4. Technical inspection of the aircraft should be completed before 9am itself on the event day. Failing to which penalty will be incurred to the team.
5. The final judgement and authority lies within the hands of SAE-VIT and all teams and participants should obey and respect it.
6. **Payload bay is mandatory for flying.**

Design Report Submission

All teams need to submit a report on their plane before 9th October, 2019 12pm. The report submission is mandatory for all teams. It will be made sure that the designs are kept classified and won't be leaked to any 3rd party. The report should be sent in pdf format by the registered E-mail ID to sae@vit.ac.in

- Some topics that are important to be included in the report are – overall vehicle configuration, wing plan form design including airfoil selection, drag analysis including 3-D drag effects, aircraft stability and control and other appropriate information.
- The report should not exceed 10 pages.
- The cover page should consist of team name, team members names and the institution name.
- All the reports should consist of length, width, height and CG location clearly marked and dimensioned onto their drawing sheet.

Technical Design Report

Cover Page **Certificate of Compliance** **Design Report**	**40 pts**
2D Drawing	**10 pts**

Certificate Policy

The top three teams will be awarded with a cash prize and the top three teams will also be given certificate of excellence. A cash award will also be awarded to a team with

1. Best design report.
2. Best Pilot (based on time)

Registration Policies for Micro Class

1. Registration fee per team is Rs 3000/-.
2. A team should consist of a minimum of 1 member and a maximum of 5 members.
3. Captain of the team should register on the graVITas'19 portal and should inform the organisers about the details of the team.

NOTE -The registration fee of Rs 3000/- is a fixed amount for a team. Whether there is only one member or 5 members in the team, the fee of Rs 3000/- needs to be paid compulsorily.

Pilot

It is **mandatory** that the teams bring their own pilot. No pilots will be provided by us under any circumstances.

Accommodation

Accommodation registration will be open as soon as you register for the event SAE-VIT wish you all the best of luck this year and hope to see you soon. Be safe and have fun. For further information, like our Facebook page https://www.facebook.com/aerodominator