

TECHFEST 2021-22

AL-VTOLA

Aerially Launched Vertical Take-Off and Landing Aircraft

UAVs today are used for a variety of applications, ranging from recreational flight to front-line national defence. Despite the myriad of uses and applications, modern UAVs are plagued with the same age old problem of limited range, thanks to the battery power. Studies have suggested that most of the power is consumed during the vertical take-off and landing phase. In order to minimize this, a possible solution can be implemented in the form of aerially launched UAVs. This will potentially reduce the power lost during vertical ascent and landing and this effectively increase the range.

TASK

Team must design an unmanned aircraft capable of executing this aerial launching and landing sequence against the given operating requirements.

PROBLEM STATEMENT

The system will consist of a UAV to be launched from an aerial platform. The aircraft is expected to launch from the platform, execute the said mission and come back to the landing pad. Following this action, the aircraft will then be docked on to the platform and the batteries will be replaced. The UAV will then fly off with the new batteries for its new mission.

The method of docking, battery swapping, and the platform recognition systems are beyond the scope of this project. The students are expected to design an aircraft capable of executing this. Certain preliminary requirements are a part of this request for proposal and the rest should be determined by the students themselves.

GENERAL RULES

- Every team has to register online on our website for the competition. A Team ID will be allocated to the team on registration which shall be used for future references.
- A team can register at any point of time before 14th November 2021
- The decision of the organizers or judges shall be treated as final and binding on all. Techfest has all the rights to verify the identity and accuracy of the details provided by the participants.
- No responsibility will be held by Techfest, IIT Bombay for any late, lost or misdirected entries.
- The idea presented by the teams should be original (not protected by means of patent/copyright/technical publication by anyone else).
- Note that at any point of time the latest information will be that which is on the website. However, registered participants will be informed through mail about any changes on the website.

- All modes of official communication will be through the Techfest e-mail.

REQUIREMENTS

Parameter	Value
Surveillance Area*	50 km ²
Max Take-off weight	Up to 4.5 Kg
Endurance*	90 minutes
Flight Controller	Pixhawk 4 or equivalent
VTOL Capability	Yes
Payload	Up to 0.5 Kg
Service Ceiling*	1000 m
Platform Height	100 m

* - The values are approximate and slight deviation is permissible.

Some points to remember:

- Under no circumstances should the maximum take-off weight exceed 7 kg
- The UAV should be able to vertical take-off and land from the platform
- This VTOL capability should not come at the cost of aerodynamic performance in forward flight.
- Cruising speed and range should be decided taking the surveillance area in mind.
- The values are approximate and slight deviation is permissible.

Eligibility:

- Individuals or teams from the following categories are allowed:
 - Students/research scholars of authorized institutions (students have to show their Valid College/School ID)
 - Upto 3 years old college pass-outs.
- A team is allowed to have a maximum of 4 members.

ROUND 1: ABSTRACT SUBMISSION

An abstract of the project has to be sent by the students. Abstract shouldn't contain more than 3500 words. The abstract should contain the following:

- The chosen configuration of the UAV with justification
- The tentative mission profile in form of a schematic
- Tentative mission plan with approximate values

Participants are supposed to submit an abstract in pdf format with team_ID as the name of the pdf format to "alvtola@techfest.org".

ROUND 2: FINAL REPORT

The final report has to be submitted by the students before the deadline. There is no such word limit to the final report. All the calculations have to be done in detail ranging from the sizing and dimensioning of the aircraft to the justification for the components chosen like motor, propeller and so on. This final report is meant to solidify the things shown in the abstract.

The final report submissions have to be in the form of AIAA Journal Paper format, and output in the form of categorized emails to "alvtola@techfest.org"

FINAL ROUNDS

Top 15 teams will be selected and will get the chance to present their model/idea in the form of live presentation at Final Round at Techfest, IIT Bombay which is from 17th to 19th December 2021. Participants will get a slot for presenting their model/idea to the Judges based on which they will be evaluated.

REFERENCE MATERIAL

We would suggest you to go through these for basic understanding and configurations of Aeromodelling.

- 1)[*Unmanned Aircraft Systems: UAVS Design, Development and Deployment*](#)
- 2)[*Designing Unmanned Aircraft Systems: A Comprehensive Approach, Second Edition | AIAA Education Series*](#)

COMPETITION TIMELINE

Last date of Registration	19 November
Deadline for Abstract Submission	19 November
Result Announcement	23 November
Deadline for Final Report Submission	15 December
Final Rounds	18/19 December



REGISTRATION AND SUBMISSION

The Participants have to register on the official Techfest Website and fill all the necessary details. www.techfest.org ->(Hover on) Competitions-> Competitions -> AL-VTOLA -> Explore More -> Register -> Fill all your details -> Now you must create/Join a team.

CERTIFICATE POLICY

Only those teams that are shortlisted for the finals and also give a final presentation about their work during Techfest 2021-22 would be awarded an E-Certificate of Participation. The top entries from this event would be provided with a Certificate of Excellence.

PRIZES

The prize money will be awarded to top 3 winners via NEFT and will be processed within 3 working days after receiving the prize money from sponsors. Winners have to mail the following information (immediately after the announcement of results) to kunal@techfest.org.

FORMAT OF MAIL

Subject: AL-VTOLA, TeamID, Position (example: AL-VTOLA, AL211003, 1st Position)

Body of mail

1. Account Holder's Name
2. Account Number
3. Bank name and Branch name.
4. IFSC Code
5. Photograph of Bank Passbook as a proof