

## TATA UAV CHALLENGE

**Note:** Both of the Problem Statements given below are Individual Problem statements from TATA SONS GTIO

### **1) Fully Autonomous UAV with Terrain Navigation capability using PIXHAWK flight controller:**

#### **Problem Statement- 1:**

Design a multi-copter capable of carrying **minimum 10kg** payload in fully autonomous mode (i.e. without any manual intervention) using **PIX hawk** flight controller. The UAV must be capable of precise navigation along with advanced terrain following capability.

High Accuracy in terrain navigation is particularly important in emerging class of low altitude missions, such as aerial spraying and may require use of additional hardware or software.

The Design must meet following criteria:

- Fully autonomous UAV capable of carrying 0-10Kg or more, **higher payload capacity fetches bonus points.**
- Terrain Navigation Speed: Up to 5m/S
- Mission altitude: minimum 1m from ground.
- Terrain Accuracy: better than 10cm.
- Use of off-the-shelf **components** (not entire solution!) is allowed but teams must clearly define their contribution in the proposed solution including justification of selection of components, details of integration and programming and validation.
- **Cost effectiveness** will be major evaluation criteria.
- Horizontal Navigation Accuracy: +/-0.5m.
- Minimum endurance: 5 min

## 2) Multi-rotor UAV Launch Pad:

### Problem Statement 2-

Design a portable, light weight launch pad capable of adapting to uneven ground conditions of up to 250 mm in altitude variations. Multi rotor UAV of large frame size and high payload capacity requires flat and dry surface condition for safe take off and landing. For example, agricultural UAVs operate in uneven ground conditions which is often littered with debris. Hence the purpose is to design a launch pad which can support safe operation of such large frame UAVs on uneven surface. This will also help reduce clearance required for operation. Figure below shows an illustrative design of the concept.

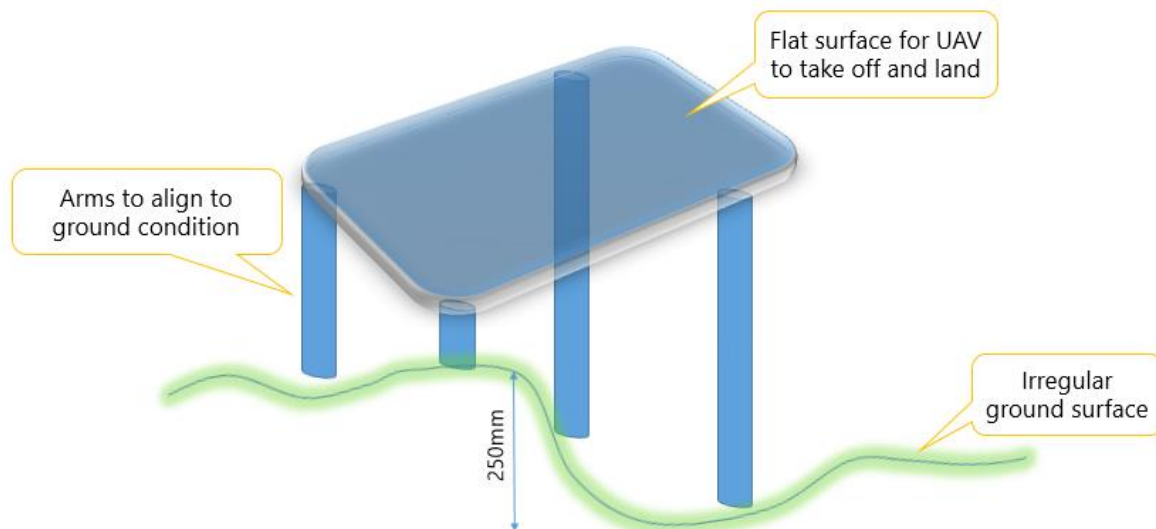


Figure 1: An illustrative adaptable launch pad design

The capability to adapt to uneven ground surface could be implemented manually or using semi or fully automatic mechanisms. Teams are expected to pay special attention to selection of material and design a light weight platform which could be deployed within specified time frame (see below). The launch pad is aimed to support multirotor UAV's of maximum frame size of up to 2 m in diameter and payload capacity of 25 Kgs. Maximum unevenness between the crests and troughs on the ground, to which the launch pad must align, is 250 mm and maximum

allowable inclination on the top surface is less than 2 degrees. During transit, the launch pad should allow itself to be packed such that it can fit within the dimension specified in requirements (see below). It should also weigh no more than 3 Kgs (for manual) or 4kgs (for automatic).

### **Multi-rotor UAV launch pad requirements**

- Compact and Light weight system - to be carried along with the large or agricultural UAV platform
- To accommodate UAV frame size of: 2m diameter
- Launch Pad dimensions: 1.5m x 1.5m dimension
- Support UAV platform including payload: 25kg weight
- Assembly time: less than 1min by one person
- Dimension when folded: 0.5m x 0.5m and capable of being carried by one person
- Launch pad weight: 3 kg for manual and 4kgs for automatic
- Maximum ground variation: 250 mm
- Maximum inclination on top surface: < 2 degree

### **Structure**

Competition will take place in 3 phases

**1. Phase I-** Submission of detailed theoretical description of the solution including proposed approach to develop it. Successful submissions must have the technical specs mentioned.

**2. Phase II-** Selected teams will move to phase II. Here the proposed solution need to be developed (modeled & simulated or PoC).

These teams will have an opportunity to submit design report and present their solution to Tata team to receive feedback. Successful submissions must have clearly outlined the approach to develop the prototype.

**3. Phase III-** Selected teams will move to phase III. Here the proposed prototype will be developed and demonstrated to a panel of reviewers.

### Timeline (for both Problem Statements)

1. Last date for registration: 20<sup>th</sup> September 2017
2. Last date for Theoretical Report of Stage-1 (for all registered teams): 20<sup>th</sup> September 2017
3. Results and Shortlisting of teams after Stage 1: 30<sup>th</sup> September 2017
4. Last date for Submitting Design report for stage 2: 15<sup>th</sup> November 2017
5. Results and Shortlisting of teams after Stage 2: 20<sup>th</sup> November 2017
6. Presentation of your complete project and prototype: 29<sup>th</sup>-31<sup>st</sup> December 2017 at Techfest, IIT Bombay

### Registration and Submission

The Participants have to register on the official Techfest Website and fill all the necessary details : [www.techfest.org](http://www.techfest.org) > Competitions > TATA Pioneer's Makerthon > TATA UAV Challenge > Register!

#### **Abstract Submission:**

Teams will be required to submit one report to [tatauavchallenge@techfest.org](mailto:tatauavchallenge@techfest.org) . This report should contain the idea they are looking forward to work on.

#### **Abstract Template–**

Should contain complete details about your solution to the problem. Please download and edit the template from the following link: [www.techfest.org/resources/uavtemplate.docx](http://www.techfest.org/resources/uavtemplate.docx)

#### **Submission Format-**

The project report should be emailed to [tatauavchallenge@techfest.org](mailto:tatauavchallenge@techfest.org) with the subject UAV Challenge Report: Team Id (For example: UAV Challenge: UA1234). Teams must follow the following details for the submission:

1. The abstract must be submitted in pdf format only
2. Font: Arial
3. Size: 11
4. Spacing between two lines: 6 pts
5. Spacing between two paragraphs: 10 pts
6. Bottom margin: 1 inch

## SHORTLISTING

**Top teams** will be selected and would get the chance to participate in the Final Round at Techfest, IIT Bombay which is from 29th-31st December, 2017.

## General Rules

1. 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.
2. A team can register at any point of time before 25<sup>th</sup> September 2017 and can submit final abstract and video (as mentioned in the structure).
- 3. 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.**
4. No responsibility will be held by Techfest, IIT Bombay for any late, lost or misdirected entries.
- 5. The idea presented by the teams should be original** (not protected by means of patent/copyright/technical publication by anyone).
6. 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.

### **Eligibility:**

All students with a valid identity card of their respective educational institutions are eligible to participate.

### **Team Specifications:**

- One team can have a maximum of 4 members.
- Students from different institutes can be in the same team.

### **CERTIFICATE POLICY:**

- Top three teams in the grand finale will be awarded Certificate of Excellence.
- E-Certificate of participation will be given to the teams scoring more than the critical marks which will be decided later.

**Prizes:**

The Prize money will be awarded to Winners via NEFT and will be processed within 20 working days after the receiving the Prize Money from Sponsors.

The Winner have to mail the following information (immediately after announcement of results) to [prithviraj@techfest.org](mailto:prithviraj@techfest.org).

Subject: Compi Name, team id- your position (example- Vise Clutch, VI1003- 3<sup>rd</sup> Position)

Body of mail-

- 1.Account Holder's Name
- 2.Account Number
- 3.Bank name and Branch name.
- 4.IFSC Code