



**SOCIETY OF MECHANICAL ENGINEERS**

# ***UAV DRONE Rule Book***



## ***Description***

Drones are objects that the world is looking up to. TechNITi'23 presents the UAV Drone challenge, A multi-level competition that involves various challenges and obstacles in increasing order of difficulty which would screen out the most agile drone.

## 2. General Specifications for Drone

Guidelines to provide competitive standards within a typical race day.

### 2.1. Drone Specifications

- Max Frame size: It should fit in a box of dimension 500 x 500 and max frame size should be 500mm.
- Weight Limit: maximum 2kgs including battery
- Battery Min~Max: 3S~6S
- Turtle Mode is allowed to flip and recover.
- Use of metallic props is prohibited.

### 2.2. Batteries & Equipment

- Pilots should carry a minimum of 2 batteries
- Pilots will carry their own battery chargers, charging points would be provided.
- Pilots should bring their own soldering and other materials.

## 3. Pre-Competition Safety Requirements

### 3.1. Safety Requirement

- Each participant attests to the fact that he/she has the appropriate experience to participate in the event, or will be assisted by an experienced participant during any and all flights in which he/she may participate. All drones must be successfully test-flown and are therefore qualified to be flown in the presence of fellow participants, event officials, and all others who may be in the arena during the event period.

### 3.2. Pre-Flight Inspection

- Each participant must have their drone inspected for airworthiness. Technical Inspectors/ Safety officers/ Event Technical Coordinator will ensure materials and workmanship shall be of satisfactory standards. It must not be modified or changed; otherwise, it will need to be re-inspected.

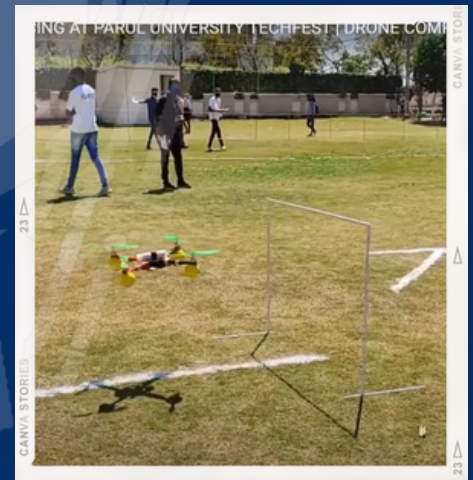


The Event Convenor / Organizing Head may disqualify any drone which, in his or her opinion, is not safe and airworthy in terms of materials, workmanship, radio installation, radio function, design details or evidence of damage. During the pre-flight inspection, pilots will be asked to remove props and demonstrate that their aircraft is programmed for arming/disarming switches and failsafe.

## 4. Participant Guidelines

### 4.1. Guidelines for Everyone

- Listen and follow ALL instructions from the Contest Director or Race Director or Event Convenor or Organizing Head.
- NEVER walk onto the course while drones are flying.
- The course's flight line defines where the pilot or spectator area ends and the course begins.
- This flight line is not to be crossed as it will be well marked and highly visible
- When you retrieve a drone after a completed race, ensure you cut-off its power immediately.
- Location of the first aid kit will be shared with the participants on the event spot.



- Pilots MUST NOT assume any change of race time until it is officially announced by the organizers.
- Pilots must contain all equipment and airframes within the pilot pit area and must not solder, weld or cause any spark within the pit area. There will be established workbench areas for soldering, repairs and modifications.
- Pilots are required to bring their own battery chargers to the race and any other tools/equipment required to setup, program or repair their quads such that their quads are always in the ready to fly state.

### 4.2. Pilot Guidelines

- Pilots must adhere to all rules within the competition venue, and will not fly in any other part of the venue unless it is a designated flight zone.
- Pilots must arrive at the venue with their complete setup 1 hour before the official race time and must be in complete READY-TO-GO state 15 mins before race time.
- Pilots will NOT be given any practice sessions during the 30 mins before race starts.
- Pilots who are not in READY-TO-GO state 15 mins prior to race start will be disqualified from participating in the race.

- General charging of electronic devices including radios or any device with a self-contained power supply is permitted.
- All batteries must be stored in a LiPo-safe bag or in an approved, fire resistant container.

\*\*\* Any pilot not obeying this rule will be immediately disqualified from the entire race and will be asked to leave the pit area \*\*\*

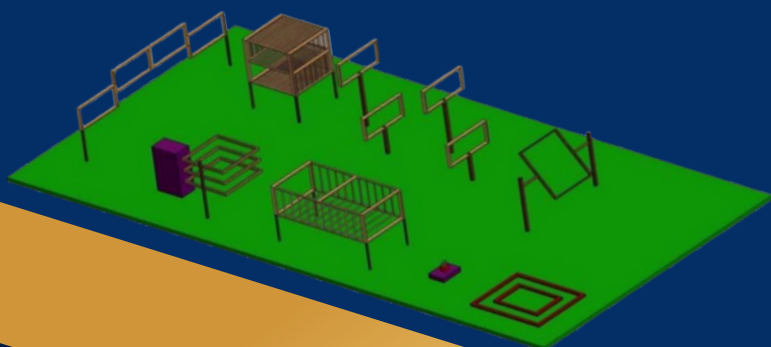
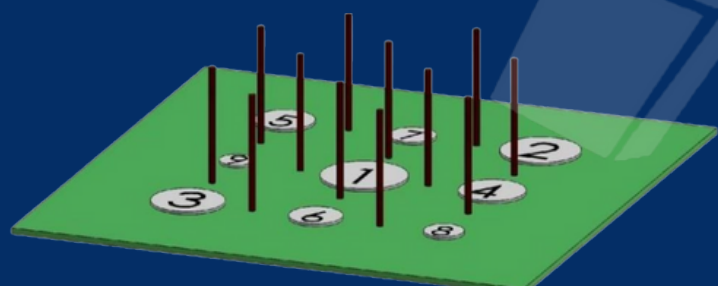


### 4.3. Spectator Etiquette

- The event is fun to watch and discuss. However, please stay away from the pilots within the Pilot Area while they are flying (unless you are acting as a spotter). Clear communication is essential with the pilots for accurate lap scoring, penalties and hazard warnings.

### 4.4. Number of Models

- Each competitor may use a maximum of 2 models for the entire event with same specification after verifying it with the Inspection/Verifying Committee.
- A model can be used by only one TEAM/COMPETITOR.
- In case of an infringement to that rule, all concerned competitors will be disqualified from the event by the event director.
- The competitor can change the model:
  - Before the start of the race as long as the competitor hasn't left the preparation area.
  - Between two rounds of the 1st stage and 2nd stage.



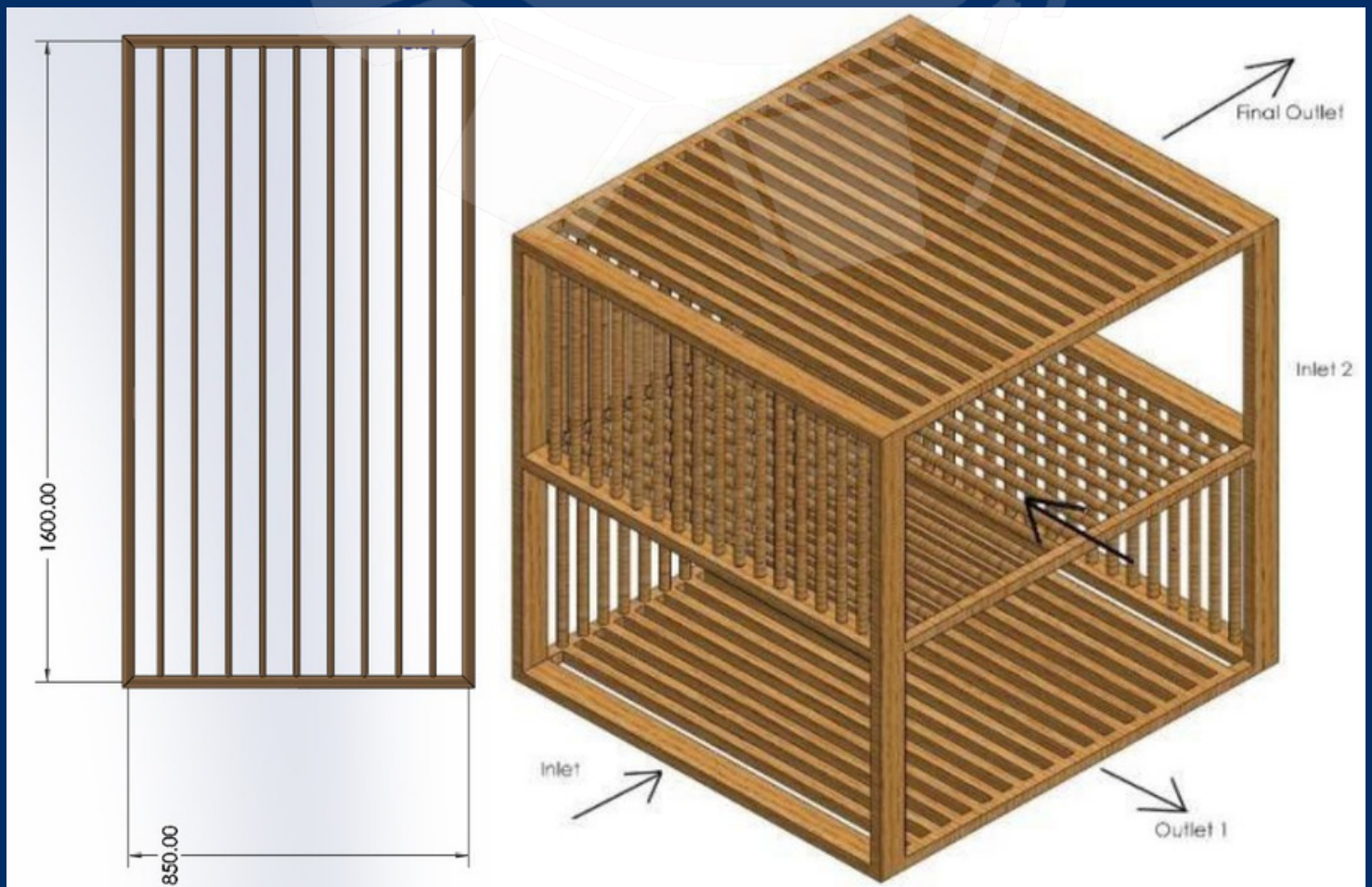
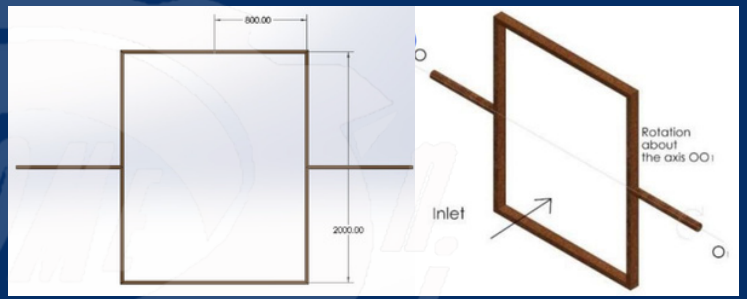
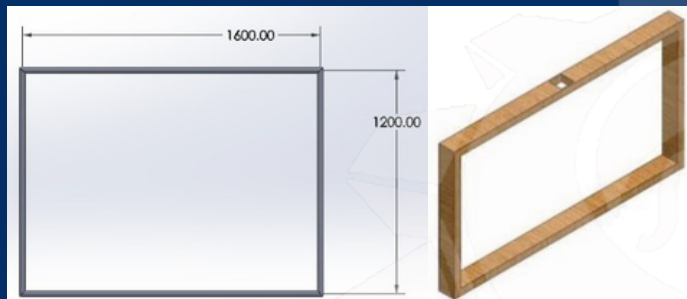
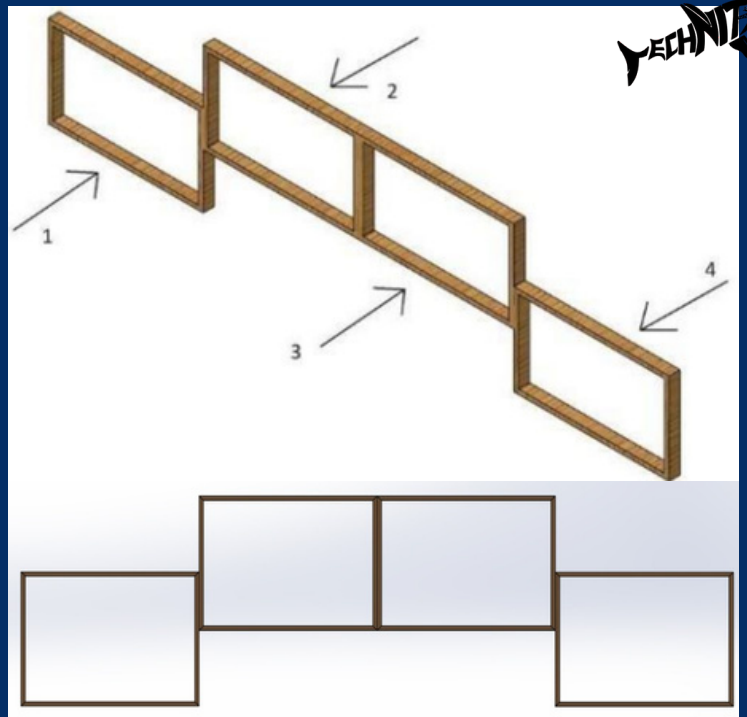
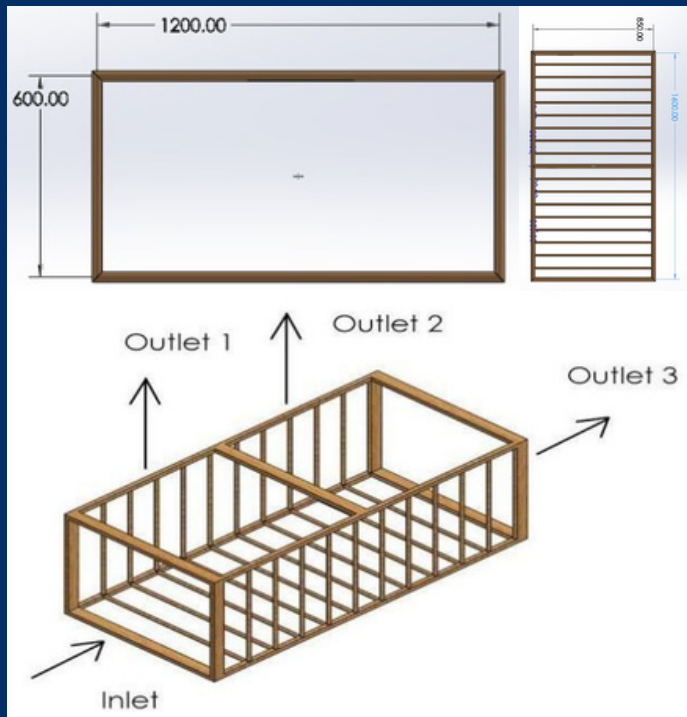
## 5. General Drone Racing Rules & Arena Type

### 5.1. Arena Type

- The ARENA IS TOTALLY OUTDOOR. If there is rain on the day of the event, then the arena would be Indoor, which will be communicated to each team/competitor at the time of entry verification or before the time of the practice session.

### 5.2. Race Format

- All races will be governed by an appointed team of judges/organizers.
- All races will follow the general rules and regulations of the competition.
- Each race will be monitored by judges, cameras, timing/lap systems, and volunteers to maintain fair and accurate competition.
- There will be two Rounds in total.
- The 1st round will only be an elimination round, so there will be no points given in this round.
- Whereas the 2nd round will be a decisive round, points will be allocated at the end of both laps and points will be summarised to form the final ranking list.
- Total of 2/3rd participants will be selected for the 2nd round and the rest will be directly eliminated.
- In each round, the pilot will be given a chance to set their fastest recorded time.



9. The point will be allocated on the bases of their timing. There will be two leader board one will be of timings and another one will be of points.
10. The points will be allocated on the basis of ranking, starting from 5 in descending up to 0.
11. 2nd round will run for 2 laps which usually lasts for 8-10 mins
12. If the points are equal then the fastest timing will be considered.
13. In the end there will be a total of three podium holders
  - A. Winner
  - B. 1st Runner-up
  - C. 2st Runner-up
14. In the event of a mid-air collision after the start gate, pilots can resume the race if they are able to take off again without intervention, otherwise, their lap is considered a DNF (Did not finish).
15. Any practice or behaviour deemed unsafe, (i.e. flying above the max ceiling height) will result in an immediate disqualification.

### 5.3. Racetrack/ Racing Circuit

#### Round-1:

1. This is a Qualifying Round (based on the completion time only).
2. Model has to be landed over 9 circles of different diameters in a particular orientation which will be arranged in a given order.
3. Circles will be placed at a distance of 2 meters in both direction (front/back and left/right).
4. Circles are numbered according to their decreasing size. You have to start from the 1st circle and follow 1, 2, 3...9 in succession without skipping any of them. The endpoint will again be the 1st circle.
5. 1st circle has a diameter of 130 cm, 2nd is 120 cm, 3rd is 110 cm, and so on till the 9th being the smallest in diameter (50cm).
6. When the model lands, its centre should lie inside the circle to be able to proceed to the next in succession.
7. In case the centre of the model is outside when it lands, the model has to be lifted again and should be landed properly. This will go on until the centre lies inside the circle.
8. A specific number of teams with the best completion times will go on to the 2nd round.

#### Round-2:

1. The model has to successfully cross a range of obstacles.
2. The model will pass through a tunnel having 3 outlets each outlet carrying different points. You can choose any one of them.
3. The model will have to pass through some rectangular frame in a zigzag fashion. Successful passing through each frame will fetch points.
4. Next the model has to pass through the obstacle as shown in the figure. It will enter the structure and move to the upper portion and exit the structure through the other end.



5. Next the model has to pass through a rectangular frame.
6. Then the model has to pass through a rotating rectangular frame (rpm will be provided).
7. There will be a total of 2 laps after which the model has to land in a designated area to end.
8. A racing circuit (or track) has a start line, obstacles to be crossed or avoided, and a finish line with appropriate pilot seating/standing area.
9. The racing circuit can be a closed loop where several laps must be completed or an open loop to be flown once. In both cases, the track can be divided into sectors to facilitate timekeeping.
10. The minimum length of a racing circuit from the start line to the end line, including all laps.

### 5.4. Unsafe Flying

During the pilot briefing the Race Director will inform the pilots of the safety boundaries (if they exist). If you fly out of the safety boundary, your round will be disqualified.

### 5.5. Race Rules

- Drone must be kept at the take-off point (defined location).
- Only one extra chance will be facilitated in case of
  - a) Pilot Jumps the Start Buzzer or Starts Early (False start)
  - b) Drone does not take off
  - c) Crash into an obstacle
- In case of a crash, and when the drone cannot go on, the drone must stay on the ground with the motors cut off.
- After the competition of a lap, pilots will immediately land and disarm only on the specified landing zone/ landing pad.
- Given race circumstances, all pilots have to say yes to a suggested modification for the rule to be applied to that race.
- Pilots must adhere to the prescribed launch sequence. No movement before the starting signal. False starts will incur a penalty. (Penalty of (-1) will be added in the points )
- Pilots must maintain control of their aircraft at all times and only fly within their skill level. Any pilot who exhibits unsafe flying procedures may be disqualified at any time.
- Once pilots have successfully completed all laps, they must return to the start/finish pad, land and DISARM.
- Race tracks would have gates, pilots must successfully fly through all gates, around the flags, and other obstacles (if any) on the course. If a pilot misses an obstacle or gates, they must safely turn around and attempt the obstacle again. If they don't turn around and continue to race, that entire lap would not be counted.
- If a pilot due to any reason, knowingly/unknowingly/accidentally goes out of bounds then pilots first priority should be to get the drone back in the bounds. And continue to race. If such an incident occurred multiple times, then organizers have full right to disqualify the pilot from round or the whole event.
- In the event of a crash or the inability to resume flight safely, the pilot must immediately DISARM their aircraft and give the Thumbs Down signal. For that lap pilot is deemed as does not finish (DNF).

- Pilots will NOT be given any Retries.
- Modifications to any of the above or new Race Rules require a majority vote in the judging an Executive Committee of NITJ-SOME.

### **5.6. Finishing a Race**

- Drone is needed to clear finish line for full completion of lap/round. Timings/points will be evaluated on the bases of completion of race.

## **6. Team General Safety and Conduct**

- No teams will be allowed in the Team Pit Area or on the Flight Line unless it is their time to stage for their next race, or it is their round. All above rules and conditions must be followed the pilot and all fellow mates team members.

## **7. Practice Rounds**

- A practice session will be scheduled on ONE DAY BEFORE for local participant but with prior Approval from the event Coordinator. ( For outside Jalandhar team they need to reach the venue 2 hours prior the event commencement timing )
- Practice flights on the racing circuit other than those authorized by the organizer are strictly forbidden under threat of being disqualified from the event.
- Each competitor will only enter this practice session when he or she has finished model's registration and processing.
- The organizer defines the conditions of the practice session.
- Only registered players/ team can practice with an allocated time identical for each group.
- The allocated time and the number of competitors per group will be defined by the organizer.
- The number of practice flights is defined by the organizer and must be the same for all groups.
- In any case, each competitor can do as many circuit laps as he/she wants within the allowed practice time.
- Once the practice time is over, competitors still in flight can complete their ongoing circuit lap before landing.
- In case of a crash, and when the model cannot go on, the model must stay on the ground with motors cut off until the end of the practice session.
- The competitor cannot request another practice time except if the reason for the crash cannot be attributed to him/her.