AEROTHON 2025

UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST

Rule Book

Revision 1
March 2025

REVISION HISTORY

Revision	Date	Description
1	March 2025	First Issue

FOREWORD

Welcome to SAEINDIA AEROTHON – UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST 2025. The system requirements are developed to align with real-world Uncrewed Aerial Vehicle (UAS) requirements to provide industrial exposure to Students.

The contest is planned in two phases:

1. Phase 1: Design Report & Presentation
2. Phase 2: Flying Competition

The student teams must submit a design report of their UAS in Phase 1, adhering to the contest design rules and guidelines, and give a presentation to the jury. The top performing teams from the Phase 1 will qualify for the Phase 2 of the contest in which the qualified teams are required to build an Uncrewed Aircraft System and successfully complete the missions as described in the rulebook during the flying competition. Winners will be awarded as per the announcement made by the Organising Committee. Please refer to AeroTHON 2025 webpage in SAEINDIA site.

Universities/Institutions can nominate any number of teams as long as they meet the team formation requirements listed in this document.

Lastly, contesting teams are requested to pay special attention to the bold and italicized fonts throughout this document. These are important updates and clarifications on a variety of aspects pertaining to the design. Please read these rules carefully. Watch out for official announcements and updates concerning this contest and rule interpretations in SAEINDIA website.

Best of luck to you all!!

SAEINDIA Aerospace Forum
SAEINDIA
AEROTHON 2025 Organising Committee

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1.0. CONTEST DETAILS

1.1 OVERVIEW

AeroTHON 2025 continues to be a crucial initiative for engineering students in India as the country accelerates its push to become a global leader in the Uncrewed Aircraft System (UAS) or drone industry by 2030. This aligns with the government's Atmanirbhar Bharat Abhiyan, which is striving to make India self-reliant in advanced technologies, including UAS.

Globally, the UAS market is experiencing exponential growth. India's drone industry is expected to reach INR 500 billion (approximately USD 6.8 billion) in the next five years, driven by advancements in technology, growing commercial and consumer applications, and policy support. Countries around the world are also heavily investing in drone technology, with China, the US, and the EU being key players, continuously pushing the boundaries of drone use in fields such as autonomous delivery, agriculture, disaster management, and urban mobility.

SAEINDIA Aerospace Forum is organizing SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST named as AeroTHON 2025 for students with a primary focus on developing skills to design and build an UAS to prepare them to be industry-ready in the emerging market. This contest provides a real-life engineering exercise to undergraduate and graduate engineering students. The contest has been designed to expose the students to the real-life work environment of engineers in the industry.

In this contest, students will perform trade studies and make decisions to arrive at a design solution that will meet the mission requirements and conform to the defined specification and build a flightworthy UAS. In a nutshell, AeroTHON 2025 provides an opportunity for the students to experience the complete design and build cycle of a UAS that meets the specified mission requirements and a flight demonstration in the flying event.

The importance of practical and interpersonal communication skills is often overlooked by engineers. It is important to note that, apart from technical knowledge, written and communication skills are vital in the engineering workplace. To help the students develop these skills, the contest has been divided into two phases:

1. Phase 1: Design Report & Presentation
2. Phase 2: Flying Competition

Phase 1: Design Report & Presentation

In the first phase, students will focus on designing a UAS that adheres to current technical standards and mission requirements. The trade-off decisions made here reflect the cutting-edge technology being developed globally. Students will also focus on producing a detailed design report and presentations, reflecting the growing importance of documentation and communication skills in the engineering workplace, whether presenting to stakeholders, clients, senior engineers or regulatory authorities.

Phase 2: Flying Competition

The second phase will require students to build and test a working UAS that meets the mission requirements. In a competitive environment where safety and performance are paramount, the students' designs will be put to the test. Drones capable of performing complex tasks like thermal imaging, real-time data processing, and autonomous disaster situation identification will be key to success.

1.2 OBJECTIVES

1. To inculcate innovation mindset among the student community in emerging technologies like Uncrewed aerial vehicles (UAS)
2. Incubate and nurture skills and capabilities of aero design in young minds and prepare them towards Atmanirbhar Bharat in critical aerospace technologies.
3. To provide a platform for Aero-passionate students to demonstrate UAS design expertise
4. To help develop the next generation of entrepreneurs

1.3 RULES AND ORGANIZER AUTHORITY

1.3.1 General Authority

SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST committee reserves the right to revise the schedule of any contest and/or interpret or modify the contest rules at any time and in any manner that is, in their sole judgment, required for the efficient operation of the event.

1.3.2 Rules Authority

SAEINDIA Aerospace Forum owns the responsibility and authority of the rules of SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST and it has been issued under the authority of the SAEINDIA. Official announcements from the SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST Organizing Committee shall be considered part of and have the same validity as these rules. Ambiguities or questions concerning the meaning or intent of these rules will be resolved by the officials, SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST Organizing Committee or SAEINDIA Staff.

1.3.3 Rules Validity

The SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST Rules posted on the SAEINDIA Website and dated for the calendar year of the contest are the rules in effect for the contest. Rule sets dated for other years are invalid.

1.3.4 Rules Compliance

By entering the SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST, the team members, faculty advisors and other personnel of the participating university/institute has agreed to comply with and be bound by the rules, interpretations or procedures issued or announced by SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST Committee. All team members, faculty advisors and other university representatives are requested to cooperate and follow all instructions from the contest organizers, officials and the jury.

1.3.5 Understanding the Rules

The participating student teams are responsible for reading and understanding the rules in their entirety, their effect on the contest in which they are participating. The section and paragraph headings of these rules are provided to facilitate the reading and will not affect the paragraph contents.

1.3.6 Consideration of “Participation” in the contest

Teams, team members as individuals, faculty advisors, and other representatives of a registered university who are listed as team members while registering their team are “participating” in the contest from the time they register for the event until the conclusion of the contest or earlier, in case of withdrawing.

1.3.7 Violations of Rule Intent

The violations of the intent of a rule will be considered a violation of the rule itself. Questions about the intent or meaning of a rule may be addressed to the SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST Committee or SAEINDIA Staff.

1.3.8 Conditions and Penalties

Organizers have the right to modify the points and/or penalties listed in the various event descriptions to better reflect the design of their events, or any special conditions unique to the contest.

1.3.9 Mode of Communication

The official mode communication is through the registered email address for the event available in https://saeindia.org/aerothon2025/. The teams are requested to monitor the email from this email periodically. Communication from any WhatsApp group is only for convenience and used only for alerts. Action can be taken on the teams if they are found to reach out to industry experts via social media.

1.3.10 Force Majeure

The AEROTHON organizing committee and SAEINDIA shall not be held responsible for non-fulfillment of their obligations under this agreement due to the exigency of one or more of the force majeure events such as but not limited to the acts of God, war, flood, earthquake, strikes, lockouts, pandemics, epidemics, riots, civil commotion, scarcity, of water, electricity or such other basic facilities, etc., and shall inform the participating teams on the occurrence and cessation of the event within one week of such decision being made. If running the event is not feasible either due to unreasonable duration of force majeure conditions or any other reasons, the event may be cancelled for the year (“Force Majeure Events”)

- Earthquake, flood, inundation and landslide, storm, tempest, hurricane, cyclone, lightning, thunder, pandemics, epidemics or other extreme atmospheric disturbances or any other act of God
- Strikes, labor disruptions or any other industrial disturbances not arising on account of the acts or omissions of the organisers, war, hostilities (whether declared or not), invasion, an act of a foreign enemy, terrorism, rebellion, riots, weapon conflict or military actions, civil war, ionising radiation, contamination by radioactivity from nuclear fuel, any nuclear waste, radioactive toxic explosion, volcanic eruptions or other such occurrences beyond the control of the organisers
- Acts of expropriation, compulsory acquisition or takeover by any government agency of the said venue where the event is to be held or any part thereof
- Any prohibitory order of any Court

1.4 ELIGIBILITY

1.4.1 Team member

Members of a Team must be undergraduate or postgraduate student, and every member of the team must be a member of SAE India.

1.4.2 Society membership

A university or institute can nominate as many teams as they wish by paying the requisite fee for each team. However, each team must work independently.

The registration fees indicated in the Section 1.8 are required to be paid within 15 days of registration for offline registrations. For online registrations, the fee payment must be made at the time of registration.

1.5 OFFICIAL LANGUAGES

The official language of the SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST is English. Document submissions, presentations, and discussions in English are acceptable during all the phases of the contest.

1.6 CONTEST PHASES

1.6.1 Phase 1: Design Report & Presentation

- This phase invites innovative designs from the participant teams
- The innovative designs will be evaluated by industry and academic experts
- The top performing teams in Phase 1 will be shortlisted for Phase 2.

The AEROTHON organizing committee reserves the right to select the top-performing teams from Phase1 to advance to Phase 2, with the number of teams varying based on performance in Phase 1.

1.6.2 Phase 2: Flying Competition

- Students will construct a physical prototype based on their design.
- A flight test will be carried out.
- Awards will be presented to the top performing teams.

1.7 IMPORTANT DATES

Kindly refer to the AeroTHON 2025 website for the latest updates on the dates and timelines (https://saeindia.org/aerothon2025/)

* SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST Organizing Committee reserves right to alter any of the dates. Watch out the website for the latest updates.

1.8 REGISTRATION AND FEES

A team can comprise a maximum of ten students and one faculty advisor. Please note all student participants must be SAEINDIA members to participate in the events or contests by SAEINDIA. Faculty advisors are advised to become members of SAEINDIA, though it is not mandatory.

The **Registration fee** for AEROTHON is **Rs.20,000/- (Rupees Twenty Thousand only) per team excluding 18% GST**. To register for AEROTHON and registration guidelines visit: https://saeindia.org/aerothon2025/

Steps to become a SAEINDIA Member

If you are not a SAEINDIA member, go to www.saeindia.com and select the "Membership" link. Students need to select the "Student Membership" link and provide the details as indicated. Alternate link to sign up for SAEINDIA membership https://www.saeindia.org/become-a-member. Faculty members who wish to become SAEINDIA members should choose the "Professional Membership" link.

1.9 CANCELLATION OF CONTEST REGISTRATION

Registration fees are not refundable and non-transferrable to other team or to subsequent year's competition. Teams registering for SAEINDIA AEROTHON – UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST are required to submit a design report on the design of the UAS.

Failure to submit the Design report on or within the specified date will constitute an automatic withdrawal of your team from the contest. Your team will be notified the next day of the due date about non-submission, your team's registration will be cancelled after two days of this notification and no refund will be given.

1.10 EXPECTATIONS

1.10.1 Design with no professional's involvement

The UAS must be designed solely by SAEINDIA student members, without direct involvement from faculty members or professionals. Students may refer to any literature or information related to UAS or aircraft design, construction, or guidance from industry mentors or professors, provided it is presented as a discussion of alternatives with their pros and cons and properly acknowledged in the references section of the design report. Professionals may not make design decisions or contribute to the drawings, report, or construction of the UAS. The Faculty Advisor must sign the Statement of Compliance in Appendix A.

1.10.2 Original design

Any UAS presented in the contest must be an original design whose configuration is conceived by the student team members. Photographic scaling of an existing model UAS design is not allowed.

1.10.3 Unique designs

Universities or institutions may register more than one team in SAEINDIA AEROTHON

- UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST, but each entry must be with a unique design, significantly different from each other. If the UAS designs were not significantly different based on the assessment by the organising committee, then the university/institution will be considered to have a single entry and one of the team will be allowed to participate in the contest. For example, two designs with the same motor configurations and dimensions would not be considered significantly different.

1.10.4 Faculty advisor

Each team is expected to have a Faculty Advisor from the registered university or institution. Non-faculty members are not allowed to be advisors. The Faculty Advisor will be considered as the official university representative for that team by contest organisers. Faculty Advisors may advise their teams on general engineering and engineering project management theory but should not be directly involved in the design of any part of the vehicle nor directly participate in the development of any documentation or presentation. They may review the design reports and provide suggestions and guide the team prior to the report submission and flying competition.

2.0. UAS DESIGN AND FLIGHT EQUIREMENTS

The objective of this year's contest is to design, build, and operate a multirotor UAS capable of completing two key missions. In **Mission 1**, teams will manually navigate the obstacle course while carrying a fragile payload, ensuring safe delivery and placement of the payload at a designated location upon completion of the course. In **Mission 2**, the UAS will autonomously conduct a survey of the area, identifying, classifying, and counting objects while also assessing disaster situations. After completing the survey, the UAS will autonomously drop the fragile payload at the specified target. Teams must design their UAS to carry the payload securely, navigate obstacles, and perform both manual and autonomous operations for the survey, object identification, classification, and disaster situation assessment.

2.1 DESIGN REQUIREMENTS

The design requirements of the UAS are listed in Table 2 and the payload dimensions for missions 1 and 2 are shown in Figure 1.

Table 1: UAS Design Requirements

Sl. No.	Parameter	Requirement/Limitation
1.	UAS Type	Multirotor
2.	UAS Category	Micro UAS (i.e., Take-off weight < 2kg)
3.	UAS MTOW	2 kg
4.	Payload Capacity	200 Grams
5.	Propulsion Type	Electric
6.	Communication System Range	At least 1 km

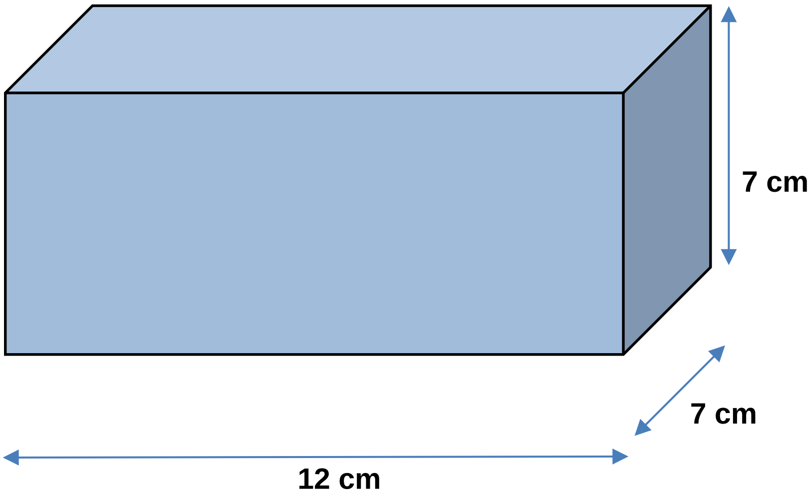

Figure 1: Payload Dimensions – Missions 1 & 2

Note: This contest is only for multirotor UASs. Fixed wings and VTOL Fixed wings are not allowed. Students are expected to bring innovation in the payload dropping method and mechanism to ensure a safe and precision delivery of payload to the target point. Provide design and analysis details of various systems and sub-systems, selection of Commercially Off the Shelf (COTS) items like batteries, motors etc. Students should consider safety of the platform and the environment in the design and highlight the risks and how they have been mitigated in the design

3.0. PHASE 1: DESIGN REPORT & PRESENTATION

In Phase 1, participating teams are required to submit a comprehensive Technical Design Report of their Unmanned Aerial System (UAS), adhering to the design requirements and constraints outlined in Section 2.0 of this rulebook. The report should clearly demonstrate the technical feasibility, innovation, and efficiency of the proposed design.

Additionally, teams will be required to present their designs to a panel of industry professionals and academic experts. This presentation will be evaluated based on factors such as technical rigor, creativity, alignment with the provided constraints, and overall potential of the design.

3.1 TECHNICAL DESIGN REPORT

The **Design Report** serves as the main tool for teams to communicate to the judges how their Uncrewed Aircraft System (UAS) was designed to best accomplish the intended mission. The report should outline the team's design decisions, demonstrating how the UAS is specifically suited to perform the required tasks. It should explain the team's thought processes and engineering philosophy that guided their choices, along with a detailed description of the methods, procedures, and calculations used to reach the final design solution.

Teams are required to submit the Design Report as per the timeline given in Section 1.7 and prepare a detailed presentation (Microsoft Power Point Format) and present it to the jury panel. The design report and presentation must have the following contents:

a) Conceptual Design

- **High-Level Physical Overview**
  Provide a detailed description of the primary physical elements of the UAS and their arrangement, illustrating the overall design approach.

b) Detailed Design

- **Preliminary Weight Estimation**
  Estimate the initial weight of the UAS, considering all components and their contributions.

- **Thrust Requirements Estimation**

  Calculate the thrust required for optimal UAS performance based on design specifications.

- **Propulsion System Selection**

  Select and justify the choice of propulsion system (e.g., motors, engines), ensuring compatibility with the overall design.

- **UAS Sizing**

  Provide detailed sizing parameters for key components, including:

  - Wheelbase
  - Rotor arm length
  - Hub size
  - Propeller clearance
  - Landing gear dimensions

- **UAS Performance Estimation**

  Estimate critical performance metrics, including:

  - Power requirements
  - Battery selection
  - Endurance estimation

- **Material Selection**

  Justify the choice of materials for the UAS structure, considering weight, strength, and durability.

- **Subsystem Selection**

  Identify and justify the selection of key subsystems, such as:

  - Communication system
  - Control & navigation systems
  - Avionics and sensors

- **Center of Gravity (C.G.) Estimation & Stability Analysis**

  Calculate the center of gravity and conduct a stability analysis to ensure proper flight dynamics.

- **Preliminary CAD Model**

  Provide preliminary 2D drafts (front, top, and side views) and a 3D CAD model of the UAS design.

- **Computational Analysis**

  Conduct computational analysis to verify design performance and efficiency, including simulations.
- **Optimized Final Design**

  Present a summary of any design changes or optimizations made, with:
  - Final CAD model
  - Final 2D drafting
  - Updated C.G. analysis
- **Detailed Weight Breakdown & C.G. Analysis**

  Provide a detailed breakdown of the final UAS weight distribution and a thorough center of gravity analysis.
- **UAS Performance Recalculation**

  Recalculate performance metrics including:
  - Thrust-to-weight ratio
  - Power requirements for the mission
  - Endurance calculation

c) Final UAS Specifications and Bill of Materials (BoM)

- Submit a detailed specification of the final UAS design, along with an exhaustive Bill of Materials (BoM), listing all components used in the construction of the UAS.

d) Methodology for Autonomous Operations

- Provide a detailed methodology for implementing autonomous flight, addressing the following:
- Surveying method and autonomous data collection process
- Techniques for autonomous object or target identification
- Payload delivery and drop methodology in disaster scenarios, ensuring precise positioning after identifying the target.

e) Summary of Innovations

- Summarize the innovative aspects of the overall UAS design, highlighting new features, technologies, and unique approaches that distinguish the design.

Refer to Sections 5.0, 6.0, and 7.0 for detailed information on the evaluation criteria, Technical Design Report submission requirements, and presentation guidelines.

3.2 DESIGN PRESENTATION

In addition to the Design Report, teams are required to present their UAS design to the jury members, which include industry experts, subject matter specialists, and academia professionals. The presentation should effectively communicate the key elements of the team's design process, emphasizing how the UAS meets the competition objectives. Teams should clearly outline the design decisions, methodologies, and the reasoning behind their choices. The presentation should be structured to engage an audience with diverse expertise, ensuring that it is both technically thorough and easily understood. Visual aids, such as slides, diagrams, or models, are encouraged to help explain the design and technical details. Teams should also be prepared to answer questions and defend their design decisions based on the expertise of the jury members.

4.0. PHASE 2: FLYING COMPETITION

Phase 2 of the SAEINDIA AEROTHON – UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST 2025 will consist of two stages:

1. Technical Inspection
2. Flying Competition

4.1 TECHNICAL INSPECTION

All Uncrewed Aircraft Systems (UAS) will undergo a **Technical Inspection** conducted by designated UAS technical inspectors before being permitted to participate in any flight demonstrations. The inspection will assess compliance with both technical and safety standards in accordance with general industry safety guidelines. The decisions of the UAS inspector(s) are final.

The **Technical and Safety Inspection** will verify the following:

1. **Compliance with UAS Design Requirements:**
   - Ensuring adherence to the specified UAS design criteria as outlined in Phase 1
2. **Overall Safety and Airworthiness:**
   - Evaluation of the UAS's structural integrity, safety features, and flight readiness.

All UASs must successfully pass the **Technical and Safety Inspection** to be eligible for the flying competition. Teams are strongly encouraged to perform a self-inspection prior to arrival at the contest to ensure compliance.

During the **Technical Inspection**, the following checks will be conducted:

- **UAS Dimensions:** Verification that the UAS conforms to the 2D drawings submitted during Phase 1.
- **Component Verification:** Ensuring the use of components as specified in Phase 1, including:
  - Propulsion system: Motor, Electronic Speed Controller (ESC), Propeller, and Power System (Battery)
  - Control & Communication System: Flight Controller, Radio Transmitter, and Receiver

- **Take-off Weight:** Confirmation that the UAS weight matches the value reported in the design report.
- **Structural Integrity:** Examination of the UAS's structure, including:
  - Proper securing of components, appropriate wiring (no hanging wires, use of proper wire gauge and connectors)
  - Secure fasteners (locknuts or thread locker used, no loose or shaking components)
  - Propeller and payload attachment integrity
- **Other Checks:**
  - Control system responsiveness (motor RPM) to radio controller inputs
  - Motor/propeller rotation direction
  - Radio range check
  - Motor arming and disarming check
  - FPV video transmission check
  - Any deviations from the above checks must be addressed through the Change Request Process as outlined in APPENDIX B

A detailed technical inspection will be conducted prior to the first flight, while subsequent flights will be subject to a visual inspection, provided the UAS remains incident-free. If the UAS is damaged during a mission or trial, a detailed inspection will be performed again. It is recommended that teams bring strategically selected spare parts and components in the event of any unforeseen incidents during transit or the competition.

4.1.1 UAS Conformance to 2D Drawing

During Technical Inspection, the UAS will be inspected and measured for conformance to the 2D drawing presented in the Design Report.

a) At a minimum, UAS arm length, landing gear height and UAS height dimensions will be measured and compared to the 2D drawing.
b) All teams must have a hard copy of their design report with them during technical inspection.
c) UAS actual empty CG will be compared to the empty CG presented in the design report's 2D drawing.

4.1.2 Deviations from 2D Drawing

Any deviation in construction of the UAS from the submitted 2D drawing since submission of the Design Report must be reported in writing.

- Each design change must be documented separately using the Modification Change Request (CR).
- Only one design change may be submitted per CR form.
- Jury will assess penalty points for design changes.

4.1.3 Inspection of Spare UAS Components

- All spare UAS components (structural parts, motors, propeller, batteries etc.) must be presented for inspection at the same time of the UAS inspection.

4.1.4 Inspection Requirements throughout the Contest

- All UAS must meet all Technical and Safety Inspection requirements throughout the contest.
- Any official may request that an UAS be re-inspected if a general or safety requirement problem is seen on an UAS at any time during the event.
- This includes any unintended errors or omissions made by officials during inspection.

4.1.5 Technical and Safety Inspection Penalties

- Points are allotted for the Technical and Safety Inspection.
- Teams may only lose points because of errors and problems encountered during the inspection process. Any penalties assessed during Technical Inspection will be applied to the overall contest score.

4.2 FLYING COMPETITION

The flying competition is tentatively scheduled for 14^{th} and 15^{th} November 2025, and it is anticipated to run from 7:00 AM to 5:00 PM on the mentioned dates. Detailed schedule for the inspection and flying competition will be shared on 14^{th} November 2025 during Team registration for AeroTHON2025. It is advised to strictly adhere to this schedule to ensure the event progresses as planned.

4.2.1 General Mission Requirements

The objective of AeroTHON 2025 is for teams to design, build, and fly a multirotor Uncrewed Aircraft System (UAS) capable of completing an obstacle navigation course and safely placing a fragile payload during Mission 1. In Mission 2, the UAS will autonomously identify, count, and classify objects, then deliver a payload to a specified target point upon the identification of a disaster situation through image processing.

Aircraft Consistency:

- The aircraft must remain substantially identical to the design documented in the submitted report.

Timely start:

- The teams are requested to be at the assigned field as per the schedule. If the team is not available at the field or not able to take off within 5 minutes of taking the podium, there will penalty due to the delay. The penalty will be communicated and may vary from negative marks to even forfeiting the mission.

Flight Missions:

The competition will consist of two distinct flight missions:

- Mission 1: Advanced Obstacle Navigation & Fragile Payload Delivery with Precision Placement – Manual Operation
- Mission 2: Autonomous Object Classification, Disaster Situation Identification & Payload Drop – Autonomous Operation

Scoring:

- Scoring will be awarded individually for each mission: one for manual operation and one for autonomous operation.

Damage and Repairs:

- If the UAS is damaged after an unsuccessful flight mission, teams may carry out necessary repairs, provided that no modifications are made that deviate from the design submitted in Phase 1. However, the UAS must undergo a re-inspection and be cleared as airworthy before the next mission attempt. Failure to pass the inspection will result in disqualification from the next mission attempt.

In the Event of Irreparable Damage:

- If the UAS is damaged beyond repair or deemed unfit for flight by the UAS inspectors, the team will forfeit their opportunity to attempt the next mission.

Design Deviations:

- Any deviation from the original design submitted in Phase 1 during repairs or overhauling will be grounds for disqualification, subject to the decision of the Jury Panel.

4.2.2 Flying Competition Chronology

- The flying schedule will be sent via email to all teams at least two days ahead of the demonstration event, as outlined in Section 1.7, also a copy of schedule will be shared with the Teams during Phase 2 event registration. Teams are expected to follow this schedule during their flight presentations.

  The schedule must be adhered to without exception. Teams that do not attempt the flying event at their designated time will get penalty and opportunity would be given upon Technical Committee advise.

- Each team will have a 15-minute window to complete their mission. If a team encounters issues during their scheduled attempt due to the following reasons, they can overhaul the UAS and try again, as long as their initial flight time is under 2 minutes:
  - UAS failed to take off
  - UAS took off but landed immediately
  - UAS took off and crashed

Note: Jury members hold the authority to make final decisions in these cases

Inability to Engage in Phase 2 Scenarios

- If any team is unable to attend the flying competition due to conflicts with examination schedules, medical emergencies, or similar reasons, a delegate or substitute may be permitted to fly the UAS at the venue, provided a letter is issued by the Institute's HoD, Principal, or Faculty Advisor.
- The delegate or substitute must be from the same university but does not have to be from the same team.
- Teams must notify SAEINDIA in writing, along with the letter, at least 10 days in advance.

- The SAEINDIA AeroTHON 2025 Organizing Committee reserves the right to approve requests for delegates or substitutes. The committee's decision will be final and binding for all teams.

4.2.3 Flight Mission 1 – Advanced Obstacle Navigation & Fragile Payload Delivery with Precision Placement - Manual Operation

Mission Details:

- In this mission, the drone must transport a fragile payload through a challenging course filled with static obstacles such as walls, barriers, and narrow passages. The primary objective is to navigate these obstacles with high precision while ensuring the payload remains undamaged.
- Upon reaching the target zone, the drone must land carefully and place the fragile payload on the ground without causing any damage. After the successful placement, the drone must then return to the takeoff point or designated home base, ensuring safe and efficient navigation back through the course. The mission is complete once the payload is placed securely, and the drone successfully returns to the home base.

Mission Tasks:

- **Fragile Payload Handling:** Transport the fragile item securely throughout the course, ensuring no damage occurs during flight.
- **Static Obstacle Navigation:** Navigate a course filled with static obstacles that require careful planning and precise flight adjustments.
- **Environmental Challenges:** Overcome environmental factors such as wind or lighting changes that could affect stability and visibility, requiring quick adaptation.
- **Precision Payload Placement:** Land and carefully place the payload in the target zone, ensuring gentle and secure placement.
- **Return to Home:** After the payload is placed, navigate the course back to the home base or takeoff point, avoiding obstacles and ensuring a safe return.
- **Time Constraints:** Complete the mission within a 10-minute time slot.

Operation:

- **In Takeoff and Navigation:** The UAS must take off and fly towards the starting point of the obstacle course.
- **Obstacle Navigation:** The pilot must maneuver the UAS through various obstacles without causing damage. If a collision or crash occurs, one team

member may assist in reviving the UAS after receiving the jury's approval, but a penalty will apply.

- **Payload Handling:** The fragile payload must remain secure during the obstacle navigation.
- **Payload Drop:** After the obstacle course, the pilot will identify the target zone and carefully drop the payload at Ground Zero.
- **Return and Landing:** After the drop, the UAS must return to the takeoff point and land safely.
- **Scoring:** A successful flight requires completing the obstacle course, placing the payload, returning to the home base, and landing safely. See Section 5.5 for scoring details.
- **Flight Time:** Teams have 10 minutes to complete the mission, starting when throttle input for takeoff is increased.
- **FPV Option:** Teams may use a First-Person View (FPV) camera to aid navigation, but it's not mandatory.
- **Telemetry Data:** Telemetry data will be reviewed for timing and performance analysis.
- **Field Conditions:** Actual conditions may vary slightly from those depicted in Figure 2.

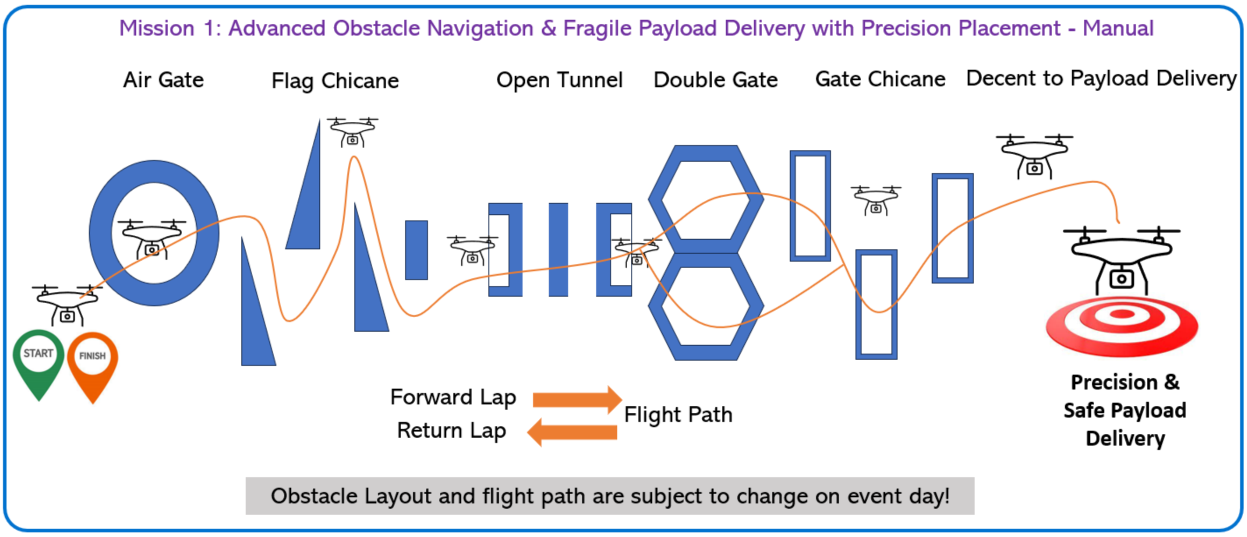

Figure 2 - Flight Mission 1 – Manual Mission Profile

The flight path will be clearly marked on the ground to assist the pilot in navigating the obstacle course and accurately delivering the payload. Additionally, a debrief will be provided before the mission commences.

4.2.4 Flight Mission 2 – Autonomous Object Classification, Disaster Situation Identification & Payload Drop – Autonomous Operation

Mission Details:

- In this mission, the drone will autonomously scan, classify, and assess objects within a predefined area using onboard sensors and algorithms. The objects will vary in shape, size, color, and structure, and may be partially obscured, presenting challenges for detection and classification. Once the objects are classified, the drone will identify potential disaster scenarios, such as flooding, fire, or damaged infrastructure, within the same area.
- Upon detecting a disaster situation, the drone will autonomously deliver a medical supply or food payload to the designated target zone. The drone must accurately navigate to the target, determine the optimal drop location, descend to 10 meters (from a 15-meter mission altitude), and deliver the payload safely. It must then return to the home point, maintaining a 15-meter altitude during the return.

Mission Tasks:

- **Object Classification:** Scan, classify, and count objects in the environment based on features such as shape, size, color, and structure (including both 2D and 3D objects).
- **Disaster Situation Identification**: Detect and analyze disaster conditions (e.g., flooding, fire, or damage) using image processing and sensing technology.
- **Payload Delivery:** Once a disaster is identified, deliver medical supplies or food to the target zone by performing a precise drop from 10 meters altitude while maintaining the overall mission altitude of 15 meters.
- **Autonomous Operation:** The mission requires full autonomy. The drone must complete the entire process—object classification, disaster identification, and payload delivery—without manual intervention.

Operation:

- The UAS must autonomously navigate from the takeoff point, classify objects at two designated locations, assess disaster situations, drop the payload, and return to the takeoff point to land safely without any manual intervention.
- **Geo-fencing:** Coordinates for the geo-fence boundary will be provided. Teams must program these into the ground station software to ensure the UAS stays within the designated area.

- **Object detection and counting** will be performed using computer vision and image processing algorithms. The drone must autonomously recognize and classify objects in two areas within the geo-fence without receiving specific coordinates for these zones.
- **Flight Time:** Each team will have 10 minutes to complete the mission. Scoring will be based on mission success.

Criteria for a Successful Flight:

A flight will be deemed successful only if the UAS:

- Takes off and reaches 15 meters altitude.
- Identifies, classifies, and counts objects in the survey area.
- Identifies a disaster situation and performs a payload drop from 10 meters.
- Returns to the takeoff point and lands safely.
- Please refer to Section 5.6 for detailed scoring criteria. The course for autonomous operations is shown in Figure 3; however, field conditions may vary.

Specific Requirements:

- The UAS must initially reach an altitude of 15 meters.
- It should fly at 15 meters to survey and classify objects in zones 1 and 2.
- The UAS must be equipped to transmit live data to the Ground Station, which should display and print object shapes and counts.
- After identifying and classifying objects, the UAS will continue surveying to detect the disaster situation. Upon identifying the disaster, the drone should descend to 10 meters and drop the payload.
- After the payload drop, the UAS must climb back to 15 meters and return to the home point, landing safely.
- The UAS should be equipped to record flight data and share it with the jury panel once the mission is completed.

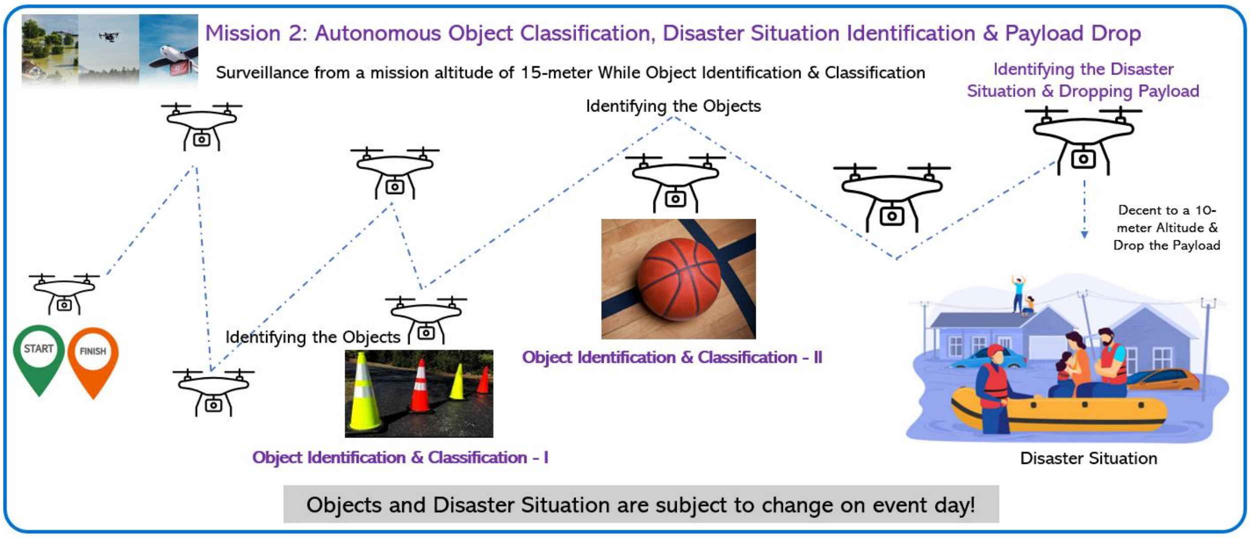

Figure 3 - Flight Mission 2 – Autonomous Mission Profile

5.0. EVALUATION CRITERIA

5.1 PHASE 1, DESIGN REPORT SUBMISSION

PHASE 1, DESIGN REPORT EVALUATION – 75 Marks		
Parameter		Score
1	Technical Content (30)	
1.1	Conceptual Design Process	2
1.2	Product Benchmark	2
1.3	Preliminary Weight Estimation	3
1.4	Thrust Required Estimation & Propulsion System Selection	3
1.5	Aircraft Sizing (Rotor Arm, Hub, Wheelbase, Propeller Clearance, Landing Gear)	5
1.6	Aircraft Performance (Power Estimation, Battery, Endurance)	3
1.7	Material Selection	3
1.8	Subsystem Selection (Communication, Control, Navigation)	3
1.9	Autonomous Navigation System Hardware & Software	3
1.10	C.G. Calculation & Stability Analysis	3
2	Computational Analysis	15
Computational Analysis (CFD, FEM, MATLAB, etc.)		
3	Methodology for Autonomous Operation	15
3.1	Autonomous Flight Algorithm.	5
3.2	Autonomous Object Detection and Counting Algorithm	5
3.3	Autonomous Payload Drop Mechanism including algorithm, hardware, and system selection	5
4	Flight Safety	5
4.1	Safety Features & SORA Assessment	5
Assesses the implementation of flight safety features, such as Return-to-Home, battery fail-safe, telemetry fail-safe, and radio fail-safe		
5	Innovation	10
Participants must bring innovative solutions to address challenges in the drone industry, such as battery life, safety, and regulations. Innovation should span the UAS life cycle—design, manufacturing, testing, operations, and maintenance—focusing on efficiency, autonomy, and sustainability. Solutions should leverage advanced materials, AI, and smart systems to enhance performance and overcome current limitations.		

5.2 PHASE 1, PRESENTATION

PHASE 1, PRESENTATION – 25 Marks		
Parameter		**Score**
1	Technical Content	7
Comprehensiveness, Accuracy, Relevance & Innovation		
2	Methodology for Autonomous Operation	7
Clarity of Approach, Feasibility, Safety and Reliability, & Innovation in Autonomy		
3	Structure of Presentation	5
Logical flow of ideas, with a clear introduction, explanation, Supporting Visuals, conclusion & Time Management.		
4	Presentation Skills	6
Clear, confident, and engaging speaking style, Interaction with Judges, Team Collaboration & Professionalism		

5.3 PHASE 1, TOTAL SCORE

PHASE 1, TOTAL SCORE – 100 Marks		
EVENTs		**Score**
1	**TECHNICAL DESIGN REPORT**	75
2	**PRESENTATION**	25
	TOTAL SCORE	100

5.4 PHASE 2, TECHNICAL INSPECTION – 30 Marks

PHASE 2, TECHNICAL INSPECTION – 30 Marks		
Parameter		Score
1	Aircraft Dimensions Conformance to 2D Drawings (5)	
1.1	Verification of Dimensions against Phase 1 design submitted values	5
The design of the frames and their dimensions should strictly adhere to the Phase 1 design specifications. There will be significant penalty points if the UAS does not conform to the Phase 1 design, potentially leading to disqualification.		
2	Use of Same Components as Selected in Phase 1 (1.5)	
2.1	Propulsion System: Motor, ESC, & Propeller	0.5
2.2	Power System: Battery	0.5
2.3	Control & Communication System: Flight Controller, Radio Transmitter & Receiver	0.5
3	Take-off Weight Consistency with Design Report (7)	
3.1	Weight Difference < 50g	7
3.2	Weight Difference > 50g & < 100g	5
3.3	Weight Difference > 100g & < 200g	2
3.4	Weight Difference > 200g	0
4	Structural Integrity (5)	
4.1	Components Secured Properly	1
4.2	Proper Wiring (No wires hanging, use of appropriate gauge wires and connectors)	1
4.3	Secure Fasteners (use of locknuts, thread locker)	1
4.4	Proper Payload Attachment	1
4.5	No Loose or Shaking Structural Components	1
5	Static System Checks (4)	
5.1	**Motor & Propeller Check**: Inspect mounting and ensure no visible damage.	1
5.2	Battery Inspection (secure attachment, no visible damage, proper wiring)	1
5.3	**Controller System Check**: Ensure the flight controller is secure and wiring is intact.	1
5.4	**Radio Range Check**: Move the transmitter to a set distance to test UAS communication.	1
6	Fail-Safe Systems Check (6)	
6.1	**RTL on Low Battery**: Ensure low battery return-to-launch functionality is configured.	2
6.2	**RTL on Datalink Loss**: Ensure automatic return is configured in case of data loss.	2
6.3	**Geo-Fence Check: Verify geo-fence limits and configurations.**	2
7	Aesthetics (1.5)	
7.1	**Inspector Marks**: Based on build quality, attention to detail, and system integrity.	1.5

5.5 PHASE 2, FLIGHT MISSION 1, Manual Operation – 30 Marks

PHASE 2, FLIGHT MISSION 1 – 30 Marks		
Parameter		Score
1	Takeoff & Maintain Mission Altitude	2
UAS successfully takes off and maintains the required mission altitude throughout the obstacle navigation course.		
2	Obstacle Navigation (Forward Lap)	8
UAS skillfully navigates through the obstacles on the forward lap without causing damage to the UAS or obstacles. Points are awarded based on precision and smoothness. Penalties are applied for collisions or crashes, with up to -2 points subtracted for each incident.		
3	Target Identification and Approach for Payload Delivery	1
Points are awarded for successfully identifying the target location and accurately approaching it for the payload delivery.		
4	Payload Placement	6
4.1	Successful Payload Placement	3
Points are awarded for successfully placing the fragile payload at Ground Zero (target point). The more accurate the placement, the higher the score.		
4.2	No Damage to Fragile Payload	3
Points are awarded for ensuring that the fragile payload remains undamaged throughout the mission. Any visible damage to the payload will result in a deduction of points.		
5	Obstacle Navigation (Return Lap)	8
UAS skillfully navigates through the obstacles during the return lap. Points are awarded based on the pilot’s ability to control the UAS during the return leg of the course. Penalties for collisions or crashes apply here as well, with up to -2 points subtracted for each incident.		
6	Return to Take-off Point & Land Safely	1
The UAS returns to the takeoff point and lands safely, without issues.		
7	Within Time Completion & Start	4
The UAS completes the mission within the allotted 10-minute flight time.		

<u>Note:</u>

The above scoring criteria are preliminary and may be updated for the Phase 2 Flying Competition. Final evaluation criteria will be shared after Phase 1 to ensure fair and transparent assessment.

5.6 PHASE 2, FLIGHT MISSION 2, Autonomous Operation – 40 Marks

PHASE 2, FLIGHT MISSION 2 – 40 Marks		
Parameter		Score
1	Takeoff and Altitude Achievement	4
UAS successfully takes off and maintains the required altitude throughout the mission.		
2	Object Identification and Classification (Zone 1)	8
The UAS correctly identifies and classifies all objects in Zone 1, counts them accurately, and transmits the data to the Ground Station for display and print. Marks will be awarded proportional to the partially successful objectives stated above.		
3	Object Identification and Classification (Zone 2)	8
The UAS correctly identifies and classifies all objects in Zone 1, counts them accurately, and transmits the data to the Ground Station for display and print. Marks will be awarded proportional to the partially successful objectives stated above.		
4	Disaster Situation Identification	4
The UAS successfully identifies a disaster situation (e.g., flooding, fire, or damage) within the defined area based on image sensing and analysis and flags it to the ground station. Marks will be awarded proportional to the partially successful objectives stated above.		
5	Payload Delivery Accuracy	8
The UAS delivers the payload accurately to the target zone and drops it from 10 meters. Marks will be awarded proportional if any deviation from the drop altitude or far from the disaster area.		
6	Return to Takeoff Point and Safe Landing	3
The UAS successfully returns to the takeoff point and lands safely autonomously. Partial marks will not be awarded if the landing requires some manual intervention.		
7	Mission Completion Within Time	5
The UAS completes the mission within the allotted 10-minute flight time. The marks will be proportional to how quickly the mission is completed.		

Note:

The above scoring criteria are preliminary and may be updated for the Phase 2 Flying Competition. Final evaluation criteria will be shared after Phase 1 to ensure fair and transparent assessment.

5.7 PHASE 2, TOTAL SCORE

PHASE 2, TOTAL SCORE – 100 Marks		
EVENT / MISSIONs		Score
1	TECHNICAL INSPECTION	30
2	FLIGHT MISSION - 1	30
3	FLIGHT MISSION - 2	40
	TOTAL SCORE	100

5.8 TIGER'S CAVE- BUSINESS PLAN PROPOSAL

This year AEROTHON organising committee has included a new stage specially for developing entrepreneur mindset. Through this stage, we are looking for teams that have an appetite to not just solve challenges but also set new trends of growth and success in Drone industry.

During this event, teams would pitch their product in front of notable jury from successful drone start-ups and related industries and gain insights from them. This opportunity to pitch your product in front of industry trailblazers is a win in itself, the best team will be awarded a special category prize.

The team will be presenting to a panel of 3-4 tigers with a time limit of 15 minutes (10 mins presentation & 5 mins Q&A). The team is free to decide on the format of their presentation, props, display parts to make an impact.

The evaluation criteria are not defined as the winning team decided by the tigers, but the recommended topics to cover could be:

- Business plan proposal
- Capability of your UAS- key points
- Key Technical aspects and differentiators
- Practical market/ use case to which your system could be implemented.
- Market survey on the scope and growth of your use case
- USP of your design.
- Innovations used in your product which sets it apart from other teams.
- Financials, fund raising, sponsorships so far, plan to scale up.
- Team's structure for future success

These are just helping points to start with, but the teams are free to decide what points to cover and present it. Think of it as a shark tank experience.

This is an imagination exercise of what your product could be!!

Note: ***Scores of this stage will not be included in overall contest score.***

6.0. DESIGN REPORT GUIDELINES FOR PHASE 1

6.1 INTRODUCTION

Technical report writing is a skill that is different from informal writing – letters, notes, email – and, like all skills, needs the practice to master them. The SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST 2025 provides an excellent opportunity for students to exercise this skill. This document provides guidelines to help design teams write clear, concise, and data-rich reports.

6.2 ORIGINAL WORK

The Technical Design Report shall be the team's original work for the current contest year. Resubmissions of previous and current year's design reports will not be accepted. Recitation of previous year's work is acceptable if and only if appropriately cited and credited to the original author(s). Plagiarism is forbidden in industry and academic practice. All references, quoted text and reused images from any source shall have an appropriate citation within the text and within the Technical Design Report's table of references, providing credit to the original author and editor.

Reports may be checked against previous and current years' submissions to determine if re-use, copying, or other elements of plagiarism are indicated.

For the SAEINDIA AEROTHON – UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST, plagiarism is defined as any of the following:

a) Use of information from textbooks, reports, or other published material without proper citation
b) Use of sections or work from previous SAE Aero Design contests without proper citation

If plagiarism is detected in the design report, the team will be disqualified, or points will be deducted as deemed by the rules committee/ jury depending on the amount of plagiarized content present in the design report.

The SAEINDIA AEROTHON – UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST Rules Committee & SAEINDIA has the sole discretion to determine whether plagiarism is indicated, and the above rules are enacted. The above rules may be implemented at any time before, during, or for up to six (6) months after the contest.

6.3 ORGANIZATION OF CONTENTS

Reports are written for a person or group to read, and these readers have a purpose for reading the report. In the SAE contest, the readers are the jury, and their purpose in reading is to grade the paper. Therefore, the design team authors should write the design report using techniques that make it easy for the jury to grade them. Organizing the report for the reader's purpose is the first technique for effective technical writing.

Outline - The judge’s grading criteria predominantly depend on the technical aspects. So, the teams are expected to,

- Explain the team’s thought processes and engineering philosophy that drove them to their conclusions.
- Detail the methods, procedures, and where applicable, the calculations used to arrive at the presented solution.
- Cover these topics
    - ❖ UAS configuration selection
    - ❖ UAS design including rotor arm, hub, landing gear, etc.
    - ❖ Subsystem Selection
    - ❖ UAS Performance
    - ❖ UAS C.G., stability, and control
    - ❖ Computational Analysis
    - ❖ Other as appropriate

It also covers the administrative aspects of the report – page limits, formats, and specific graphs and drawings. Although it may be harder to write the report to this outline, it will be easier for the jury to grade it. This outline also forces the team to address topics the jury **must** grade and develop necessary data.

6.4 WRITING PROCESS

Writing a multi-page design report can be made less daunting by using a multi-step process. The first step is described above, generating an outline that addresses the reader’s purpose. The next steps, described below, help in generating a data-rich, well-edited design report.

Allocate Pages – Allocate 40 pages to the sections of the outline. The allocations should reflect the emphasis areas of the team's design. Do this before writing begins and adjust after reviewing the first draft. For each page of the design report, define the topic to be discussed and the message to be delivered. Make writing assignments for each page. Giving authors page-by-page assignments makes it easier to attack the writing – they are writing only one page at a time.

Create the Figures – Most juries will be engineers, and engineers are graphically inclined - they can understand a concept more easily when looking at a picture. Therefore, build each page around at least one figure. Create the figures first and review them before starting to write. Each figure needs a message which should be summarized in the figure title. Make the figures data-rich, but legible (9-point font is a minimum size - another advantage of using figures is that the rules do not constrain type font or spacing on figures). Equations can be incorporated in figures to save space.

Draft the Text - Use text to highlight, explain, or further develop the major points of the figure. Writing guidelines for clarity and succinctness are presented in a subsequent section.

Edit the Text and Figures – Take the time to edit the document at least twice. A good approach is to perform one edit cycle based on a group review of the draft document (called a Red Team). Have the Red Team members read the document as juries, supplying them with a scoring sheet and a copy of the rules.

Create the Final Document – Although several persons may contribute to the writing process, one team member should make the final version. This person works to achieve a consistent style to the text and to make the messages consistent.

Schedule the Effort – Although this is the first step, it is described last so that the reader can see what the team needs to schedule! A good report takes more than a week to create. One month is a guideline for the duration of the writing effort. Create a schedule of the above tasks and status it regularly. An efficient method is to establish the outline, page allocations, and figures early in the project, so the team can generate the necessary data as the design progresses. This reduces both the last-minute cram and the amount of unused documentation.

6.5 DESIGN REPORT SPECIFICATIONS

6.5.1 Page Limit

The design report must not exceed forty (40) single-spaced, typewritten pages, cover page, table of contents and appendix. The maximum limit of the document is given below:

Document	Max. Number of Pages
Main content	30
Appendix- additional supporting material	10

Note: Statement of Compliance will not be counted toward the 40-page limit.

6.5.2 Electronic Report Format

All reports must be submitted in (.PDF) format only. The document should be submitted electronically, and no handwritten documents will be accepted.

6.5.3 Font

The minimum font size and type is Arial 12 point proportional.

6.5.4 Margin

The report margins shall be: 1” Left, 0.5” right, 0.5” top, and 0.5” bottom. Each page, except the cover page, Certificate of Compliance, 2D Drawing and technical data sheet shall include a page number.

6.5.5 Page size

All report pages shall be A4 portrait format.

6.5.6 Cover page

All Design Reports must feature a cover page that states the team’s name, college or university, and team number. The cover page will count against the 30-page limit.

6.5.7 Submission of Reports

Teams are required to upload technical report in PDF file by the deadline date at the web link.

6.6 ELECTRONIC DOCUMENT SPECIFICATIONS

6.6.1 Format Size

Plan sheet must be in A3 page (PDF) format (11 x 17 inches). Plans must only consist of one (1) page and must have the US-standard third-order projection.

6.6.2 Required Views

The plans shall consist of a standard aeronautical three-view, using a US-standard third-order projection; i.e., right side view in the lower left with the nose pointing right, top view above the right-side view also with the nose pointing right, and front view in the lower right.

6.6.3 Dimensions

At a minimum, the UAS must have the length, width, height, and CG location marked clearly and dimensioned in the submitted engineering drawings. All dimensions must be in Metric units to an appropriate level of precision. (Hint: four decimal places are too many!)

6.6.4 Summary Data

The plans must also contain a table with a summary of pertinent UAS data such as dimensions, empty weight, motor/engine make and model.

6.6.5 Weight and Balance Data

The plans must also contain a weight and balance table with a summary of pertinent UAS equipment (motor, battery, payload, etc.), location from datum in metric units, moment arms and resultant moment of CG.

- All UAS must have a designated UAS datum indicated on the 2D drawings.
- All UAS drawings must indicate the following static CG margins: forward CG limit, aft CG limit and empty weight CG. Hint: Weight and Balance worksheet should correspond with static margins on 2D drawings.

6.6.6 Other Required Markings

The plans must be marked with the team’s name and university or institute name.

6.7 SUBMISSION DEADLINES

The Design Report and 2D drawing plans must be electronically submitted to SAEINDIA no later than the date indicated on the Action. Neither the Organizer nor the SAEINDIA is responsible for any lost or misdirected reports, plans, or Server routing delays. SAEINDIA will not receive any paper copies of the reports through regular mail or email.

7.0. PRESENTATION GUIDELINES FOR PHASE 1

7.1 INTRODUCTION

Creating slides for presentation is a skill that is different from design report. PowerPoint Presentations skill is one of the effective visual communication tools that create the best first impression among the targeted audience. The SAEINDIA AEROTHON - UNCREWED AIRCRAFT SYSTEM (UAS) DESIGN, BUILD AND FLY CONTEST 2025 provides an excellent opportunity for students to master their presentation skills and showcase their project to Jury.

7.2 GENERAL

Presentation slides should effectively capture the work of the team. Follow a logically sound structure to organize the presentation. Here are some tips for making an effective presentation

- Plan and prepare your presentation professionally to deliver an effective message.
- Use visual points effectively, do not overwhelming your audience. A good PowerPoint presentation visual shouldn't complicate your message.
- Practice to perfection; rehearse your timing and delivery so that your points land as practiced with the Jury.
- Present with a relaxed calm and confident outward projection. Give your audience warmth, excitement, and energy.
- Avoid typos, cheesy clip art, and miscues like reading directly from your slides.

The team can identify preferably one or two team members to present their work in a compelling and influential manner to the Jury.

7.3 ORGANIZATION OF CONTENTS

Similar to the design report the presentation must all contain the following,

- Explain the team's thought processes and engineering philosophy that drove them to their conclusions
- Detail the methods, procedures, and where applicable, the calculations used to arrive at the presented solution
- Cover these topics
  - ❖ UAS configuration selection
  - ❖ UAS design including rotor arm, hub, landing gear, etc.
  - ❖ Subsystem Selection
  - ❖ UAS Performance
  - ❖ UAS C.G., stability and control
  - ❖ Computational Analysis
  - ❖ Other as appropriate

Note: The teams/students shall have all the CAD and CAE files in the PC or Laptop they will be using during the presentation. During the presentation, the teams can open the CAD model files and Computational analysis files in the appropriate software and present them to the jury for validation. The teams are expected to have the following documents ready during their presentation

1. **CAD files of the UAS**
2. **FEA input file along with format details**
3. **CFD input file along with format details**.

7.4 TIME LIMIT

While there is no limit on the number of PowerPoint slides, Teams needs to complete their presentation within the allotted 15 minutes. In case teams are unable to complete their whole presentation, they would be stopped at whatever point they are at after the end of 15 minutes. Post completion of the presentation, there would be 10 minutes Q&A with Jury.

8.0. REFERENCE BOOKS

1. Introduction to UAS Systems - Paul Fahlstrom and Thomas Gleason
2. Unmanned Aircraft Systems: UASS Design, Development and Deployment - Reg Austin
3. Advanced Aircraft Design: Conceptual Design, Analysis and Optimization of Subsonic Civil Airplanes - Egbert Torenbeek
4. Aircraft design: A conceptual approach - Daniel P. Raymer
5. Introduction to Flight- John D. Anderson
6. Fundamentals of Aerodynamics - John D. Anderson
7. Airplane Performance and Design - John D. Anderson
8. Flight stability and automatic control, Robert C. Nelson
9. Airframe stress analysis and sizing – Michael Chun-Yung Niu
10. Aircraft Structures, T.H.G. MEGSON (4th Edition)
11. https://docs.px4.io/master/en/concept/ (Ty Audronis , Designing Purpose-Built Drones for Ardupilot Pixhawk 2.1: Build drones with Ardupilot)

APPENDIX A

STATEMENT OF COMPLIANCE

8.1.1.1.1 Certification of Qualification

Team Name: ________________

University/Institute: ___________

Faculty Advisor: ______________

Faculty Advisor’s Email: _______

Statement of Compliance:

As Faculty Advisor, I certify that the registered team members are enrolled in collegiate courses. This team has designed the UAS for the SAE AEROTHON 2025 contest, without direct assistance from professional engineers, R/C model experts or pilots, or related professionals.

__________________________ __________________________

Signature of Faculty Advisor Date

8.1.1.1.2 Team Captain Information:

Team Captain’s Name: ________________________________

Team Captain's E-mail: ________________________________

Team Captain’s Phone: ________________________________

Note:

A copy of this statement needs to be included in your Design Report as page 2

APPENDIX B

Engineering Change Request Form

Change Request	
Team Name:	Team ID:
Institute:	
Change Requester:	Date:
Change Requests information (Fill in appropriate information)	
Change Description:	
Details of Change:	
Alternates considered before selecting this change:	
Impact to previous Design:	
Why proposed change request should be approved? Explain	
What are the consequences if proposed change (s) is not implemented? Explain	

I have reviewed the information contained in this change request form and agree

Signature of Team Lead ***Signature of Faculty Advisor***

**Use additional sheets if the information cannot be accommodated in above form*

APPENDIX C

Geofence Information

The specific geofence parameters for Phase 2 will be made available to all qualified teams following the completion of Phase 1. These details will be shared in advance to ensure teams have sufficient time to prepare for the subsequent phase of the competition. Only teams that successfully qualify for Phase 2 will receive the necessary geofence information to proceed.