2020 Collegiate

Design Series

SAEINDIA
SOUTHERN SECTION

SAE ISS
Aero Design Challenge 2020

Rules

Foreword

It is our great pleasure to welcome you all to SAE ISS Aero Design Challenge 2020. This is the fourth year Aero design competition of SAE ISS with some changes in the rules. The design constraints and scoring strategies were formulated to align with real light weight unmanned air vehicle requirements and provide a most realistic platform for undergraduate engineering students. The scoring calculation is made to given equal importance for both the design process and interpersonal communication skills.

First, in micro class the carrying case (where the aircraft is packed in) is required to be a cubic box measuring less than or equal to 3 feet all sides. This makes for a robust, easy to carry, and portable system. You will also find that improving portability, by reducing the size of the box, yields a higher score. Second, assembly and launch of the aircraft is a timed event during the first flight round of competition. This assures the aircraft are truly flight worthy after the assembly demonstration. Third, performance of the aircraft is still an important metric and the weight lifting performance is scored by the payload fraction, or ratio of payload lifted to total weight. And finally, reliability is also still critical. The successful team will achieve the highest score through achieving the best combination of these performance metrics along with the workshop score. All Micro Class aircraft are required to be hand launched.

SAE ISS Aero Design Challenge competition has been at capacity in recent years. To help student's teams multiple entries from one institute/college/university has been put into effect. This means that an institute/college/university can have a maximum Regular Class and Micro Class participation. For those institutions with larger teams we encourage you to pool resources and exercise your project management skills to bring together the larger team and execute on the project.

There are many other changes that will only be revealed by careful reading. We have rewritten the rules format. It should provide for easier reading and comprehension.

Our sincere advice…read the rules carefully until you are VERY familiar with them…then read them again.
All the very best to all of you!!

SAE ISS Aero Design Rules Committee Members, Aerospace Development Council

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SECTION 1

INTRODUCTION

The study of Unmanned Aerial Vehicles (UAV) is parallel to the growing interest in the development of Robotics, as a replacement for expensive manned piloted systems. A distinct advantage of UAV is cost-effectiveness. Owing to advances in sensor devices, processing, and battery technologies in the recent past, unmanned aircraft systems (UAS) have become smaller and economical. In specific, readily available light weight, inexpensive sensors based on microelectromechanical systems have contributed to the development of UAS autopilots for several domains. Successful applications include military and non-military use, academic research, law enforcement and limited recreation. They can be designed, developed, and run at a fraction of the cost, compared to that of manned air vehicles. The absolute savings in engine, air platform, power consumption.

The purpose of the SAEISS Aero Design Challenge is to promote and develop Indian expertise and experience in unmanned systems technologies at the university and college levels. Even small scale unmanned vehicles are complex systems requiring a well planned and executed design approach. In addition, safety considerations are important factors in this competition as in any other vehicle design project.

The competition is intended to provide undergraduate and graduate engineering students with a real-life engineering challenge. It has been designed to provide exposure to the kinds of situations that engineers face in their real-life work environment. Each team is required to conceive, design and develop a prototype of fixed wing UAV meeting the mission requirements. First and foremost a design competition, students will find themselves performing trade studies and making compromises to arrive

at a design solution that will optimally meet the mission requirements while still conforming to the configuration limitations.

The importance of interpersonal communication skills is sometimes overlooked, yet both written and oral communication skills are vital in the engineering workplace. To help teams develop these skills, a high percentage of a team's score is devoted to the design report and the oral presentation required in the competition.

SAEISS Aero Design features two classes of competition - Regular and Micro. Regular Class continues to be the class with the purpose to develop the fundamental understanding of flight and the goal is to lift as much payload as possible. Micro Class teams are required to make trades between two potentially conflicting requirements, carrying the highest payload fraction possible, while simultaneously pursuing the lowest empty weight possible.

The Competition also provides multiple opportunities for teams from all over India to showcase the extraordinary talents of engineering students while encouraging them to develop innovative ideas towards development of improved systems for UAVs.

There are two parts to each competition, each with their own series of events. These parts are known as Static and Dynamic Events. The events award the team points towards a grand total. The team with the greatest total wins the competition overall. Some events, such as tech inspection, award no points but are required in order to proceed to other events for safety reasons.

SECTION 2

REQUIREMENTS FOR ALL CLASSES

2.1 OFFICIAL ANNOUNCEMENTS AND COMPETITION INFORMATION

SAEISS Aero Design features two classes of competition— Regular and Micro.

- The Regular Class Aircraft (RCA) is an all-electric class with the purpose to develop the fundamental understands of flight.
- The Micro Class Aircraft (MCA) is an all-electric class designed to help students engage in trades between two potentially conflicting requirements, carrying the highest payload fraction possible, while simultaneously pursuing the lowest empty weight possible.

SAE Aero Design Rules and Organizer Authority

Rules Authority

The SAE ISS Aero Design Challenge Rules are the responsibility of the SAE ISS Aero Design Challenge Committee and are issued under the authority of the SAE ISS Aerospace Development Council. Official announcements from the SAE ISS Aero Design Challenge Committee, SAE ISS Aerospace Development Council 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, SAE ISS Aero Design Challenge Rules Committee or SAE ISS Staff.

Rules Validity

The SAE ISS Aero Design Challenge Rules posted on the SAE ISS Website and dated for the calendar year of the competition are the rules in effect for the competition. Rule sets dated for other years are invalid.

Understanding the Rules

Teams are responsible for reading and understanding the rules in its entirety effect for the competition in which they are participating. The section and paragraph headings in these rules are provided to facilitate reading: they do not affect the paragraph contents.

Loopholes

It is virtually impossible for a set of rules to be so comprehensive that it covers all possible questions about the plane's design parameters or the conduct of the competition.

Please keep in mind that safety remains paramount during any SAE ISS competition, so any perceived loopholes should be resolved in the direction of increased safety/ concept of the competition.

Participating in the Competition

Teams, team members as individuals, faculty advisors and other representatives of a registered university who are present on-site at a competition are considered to be "Participating in the competition" from the time they arrive at the event site until they depart the site at the conclusion of the competition or earlier by withdrawing.

Violations of 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 SAE ISS Officials, Competition Organizers or SAE ISS Staff.

Right to Impound

SAE ISS and the other competition organizing bodies reserve the right to impound any on-site vehicle/plane at any time during a competition for inspection and examination by the organizers, officials and technical inspectors.

General Authority

SAE ISS Aerospace Development Council and the competition organizing bodies reserve the right to revise the schedule of any competition and/or interpret or modify the competition rules at any time and in any manner that is, in their sole judgment, required for the efficient operation of the event or the SAE ISS Aero Design Challenge series as a whole.

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 site.

2.2 TEAM MEMBER ELIGIBILITY

Teams are required to read the articles posted on the SAE ISS Website published by SAE ISS Aerospace Development. Teams must also be familiar with all official announcements concerning the competitions and rule interpretations released by the SAE ISS Aero Design Challenge Rules Committee.

2.3 SOCIETY MEMBERSHIP

Individual team members must be members of SAE India. Proof of membership, such as a membership card, is required at the event.

For membership details please visit www.saeindia.org

2.3.1 Pilots

Pilots are not required to be students or SAE India members.

2.3.2 Liability Waiver and Insurance Requirements

All on-site participants and faculty advisors are required to sign a liability waiver upon registration. Individual medical and accident insurance coverage is the sole responsibility of the participant.

2.4 RINGERS PROHIBITED

In order to maintain the integrity of a fair competition, the faculty advisor must prohibit ringers. A ringer is someone that has exceptional skills related to the competition (e.g., a professional model builder) that cannot be a legal member of the team but helps the team win points.

2.5 DESIGN AND FABRICATION

The airplane must be designed and built by the SAE INDIA student members without direct involvement from professional engineers, radio control model experts, pilots, machinists, or related professionals. The students may use any literature or knowledge related to R/C aircraft design and construction and information from professionals or from professors as long as the information is given as discussion of alternatives with their pros and cons and is acknowledged in the references in the design report. Professionals may not make design decisions, nor contribute to the drawings, the

report, or the construction of the airplane. The faculty advisor must sign the Statement of Compliance given in Appendix.

2.6 ORIGINAL DESIGN

Any aircraft presented for competition must be an original design whose configuration is conceived by the student team members. Photographic scaling of an existing model aircraft design is not allowed. Use of major components such as wings, fuselage, or empennage of existing model aircraft kits is prohibited. Use of standard model aircraft hardware such as engine mounts, control horns, and landing gear is allowed.

2.7 OFFICIAL LANGUAGES

The official language of the SAE ISS Aero Design Challenge series is English. Document submissions, presentations and discussions in English are acceptable at all competitions in the series.

2.8 UNIQUE DESIGNS

Universities/Colleges may enter more than one team in each SAE ISS Aero Design Challenge competition, but each entry must be a unique design, significantly different from each other. If the aircraft are not significantly different in the opinion of the rules committee and organizer, then the university will be considered to have only a single entry and only one of the teams and its aircraft will be allowed to participate in the competition. For example, two aircraft with identical wings and fuselages but different empennage would likely not be considered significantly different.

2.9 AIRCRAFT CLASSIFICATION/DUPLICATE AIRCRAFT

Aircraft may only compete in one class. Simultaneous entry in Regular, and Micro Class, with the same aircraft, is not allowed. When a team has an identical aircraft

as a back-up, the back-up aircraft must go through inspection with the primary aircraft. If the entire back-up aircraft is used in competition, previously earned flight points are forfeited and flight point scoring starts over.

2.10 AIRCRAFT ELIGIBILITY

Aircraft will only be allowed to compete during a single academic year, but that same aircraft may not be used in either competition during the following year.

2.11 REGISTRATION INFORMATION, DEADLINES AND WAITLIST

Teams intending to participate in the 2020 SAE ISS Aero Design Challenge competitions must register online from 23th August 2019 to 30th September 2019.

The registration fee is non-refundable and failure to meet these deadlines will be considered a failure to qualify for the competition.

Individual Registration Requirements – ACTION REQUIRED

If you are not an SAE India member, go to www.saeindia.org and select the "Membership" link. Students will need to select the "Student Membership" link and then follow the series of questions that are asked Please note all student participants must be SAE India members to participate in the events.

Faculty members who wish to become SAE India members should choose the "Professional Membership" link. Please note: this is not mandatory for faculty advisors.

Waitlist

Once an event fills, all registered team's slots, a waitlist option will open. The waitlist is capped at 40 available spaces per event and will close on the same day as registration. Once another team withdraws from an event, an SAE ISS Staff member will inform your team by email (the individual who registered the team to the waitlist) that a

spot on the registered teams list has opened. You will have 24 hours to accept or reject the position and an additional 24 hours to have the registration payment completed or process for payment begun. Waitlisted teams are required to submit all documents by the deadlines in order to be considered serious participants and any team that does not submit all documents will be passed over.

2.12 POLICY DEADLINE (FAILURE TO MEET DEADLINES)

Teams registering for SAE ISS Aero Design Challenge competitions are required to submit a number of documents prior to the competition including a Design Report and Payload Predication Graph that the event judges need to evaluate the team during the competition. When these documents are not submitted our judges cannot properly assess the team. Additionally, teams that do not submit a Design Report typically do not come to the competition. Teams that do not notify us that they are withdrawing create the following problems

(1) They are included in the static event schedules and judging time is wasted.

(2) Their unused registration slot cannot be offered to a team on the waitlist. Additionally, failure to submit the required Design Report is a clear violation of the rules (Need ruling where you cannot fly unless competed design submission)

Therefore SAE ISS will be placing the policy into effect… that failure to submit the required Design Report and Payload Prediction Graph within 10 days of the deadline will constitute an automatic withdrawal of your team. Your team will be notified after the 9th day of no submission that we have not received your documents and after the 10 days your team's registration will be cancelled and no refund will be given.

2.13 FACULTY ADVISOR

Each team is expected to have a Faculty Advisor appointed by the university. The Faculty Advisor is expected to accompany the team to the competition and will be

considered by competition officials to be the official university representative. Faculty Advisors may advise their teams on general engineering and engineering project management theory, but may not design any part of the vehicle nor directly participate in the development of any documentation or presentation. Additionally Faculty Advisors may neither fabricate nor assemble any components nor assist in the preparation, maintenance, or testing of the vehicle. In Brief - Faculty Advisors may not design, build or repair any part of the plane.

2.14 QUESTIONS, COMPLAINTS AND APPEALS

2.14.1 Questions

Any questions or comments about the rules should be brought to the attention of the Rules Committee via the SAE ISS Aero Design Challenge email: adcsaeiss@gmail.com

2.14.2 Complaints

Competition officials will be available to listen to complaints regarding errors in scoring, interpretation, or application of the rules during the competition. Competition officials will not be available to listen to complaints regarding the nature, validity, or efficacy of the rules themselves at the competition. In other words, the Organizer will not change the rulebook at the field.

2.14.3 Appeal / Preliminary Review

A team can only appeal issues related to own-team scoring, judging, venue policies, and/or any official actions. Team Captain(s) and/or faculty advisor must bring the issue to the Organizer's or SAE ISS staff's attention for an informal preliminary review before filing an official appeal.

A team cannot file an appeal to cause harm to another team's standing and/or score.

Cause for Appeal

A team may appeal any rule interpretation, own-team scoring or official actions) which the team feel has caused some actual, non-trivial, harm to own-team, or has had a substantive effect on their score.

Teams may not appeal rule interpretations or actions that have not caused them any substantive damage.

2.14.4 Appeal Format

If a faculty advisor or team captain(s) feel that their issue regarding an official action or rules interpretation was not properly addressed by the event officials, the team may file a formal appeal to the action or rules interpretation with the Appeals Committee.

All appeals must be filed in writing to the Organizer by the faculty advisor or team Captain only.

All appeals will require the team to post twenty five (25) points as collateral. If the appeal is successful and the action is reversed, the team will not forfeit the twenty five (25) collateral points. If the appeal is overruled, the team will forfeit the twenty five (25) collateral points.

All rulings issued by the Appeals Committee are final.

2.15 PROFESSIONAL CONDUCT

Unsportsmanlike Conduct

In the event of unsportsmanlike conduct by team members or that team's faculty advisor, the team will receive a warning from a Competition Official. A second violation will result in expulsion of the team from the competition and loss of any points earned in all aspects of the competition.

Arguments with Officials

Arguments with or disobedience toward any competition official may result in the team being eliminated from the competition. All members of the team may be immediately escorted from the grounds.

Alcohol and Illegal Material

Alcoholic beverages, illegal drugs, firearms, weapons, or illegal material of any type are not permitted on the event sites at any time during the competition. Any violations of this rule will result in the immediate expulsion of all members of the offending school, not just the individual team member in violation. This rule applies to team members and faculty advisors. Any use of illegal drugs or any use of alcohol by an underage person must be reported to the local law enforcement authorities for prosecution.

Organizer's Authority

The Organizer reserves the exclusive right to revise the schedule of the competition and/or to interpret the competition rules at any time and in any manner which is required for efficient operation or safety of the competition.

SECTION 3

MISSION REQUIREMENTS

3.1 ROUND ATTEMPT

Teams are allowed one (1) flight attempt per round.

1. Regular class: Without violating other take-off restrictions, a team can have multiple attempts to become airborne within the team's prescribed time limit respective class identified in section 3.5

2. Micro class: only one hand launch attempt is allowed per round.

3.2 MOTOR RUN-UP BEFORE TAKEOFF

Aircraft may be throttled up/run up for takeoff, subject to the following conditions:

1. Regular class: Use of a helper to hold the aircraft is allowed. Main wheels must be placed on the takeoff line for Regular class. The helper may not push the aircraft upon release.

2. Micro class: aircraft must be run up and hand launched within the launch circle for Micro class.

3.3 AIRCRAFT CONFIGURATION AT LIFTOFF AND DURING THE FLIGHT ATTEMPT

The aircraft must remain intact during takeoff, the circuit of the field and landing.

1. No parts of any kind may leave the aircraft during the flight attempt.

2. Exception: a broken prop during landing is allowed and does not invalidate the flight attempt.

3.4 COMPETITION CIRCUIT REQUIREMENTS

1. During departure and approach to landing, the pilot must not fly the aircraft in a pattern that will allow the aircraft to enter any of the no-fly zones.

2. No aerobatic manoeuvres will be allowed at any time during the flight competition in any competition class.

3. Regular and Micro Class aircraft must successfully complete a minimum of one 360° circuit.

3.5 TIME LIMITS AND MULTIPLE FLIGHT ATTEMPTS

1. Multiple takeoff attempts are allowed for RCA within the time limit as long as the aircraft has NOT become airborne during an aborted attempt.

2. If an airborne aircraft returns to the ground after airborne and beyond the take-off limits, the flight attempt will be disqualified for that round.

Table 3.1

Class	**Time Limit (sec)**	**Can make multiple takeoff attempts if:**			**Definition of Takeoff is defined as the point at which:**
		Still within the Time Limit	**Bounce within required take-off distance**	**Bounce outside the required take-off distance**	
Regular	180	Yes	Yes	No	The main wheels leave the ground
Micro	120	No	No	No	The launcher is no longer in contact with The aircraft

3.6 TAKE-OFF

Takeoff direction will be determined by the Air Boss, and will be selected to face into the wind if possible.

1. Regular class aircraft must remain on the runway during the takeoff roll.
2. Micro class must be launched from the designated launch circle.
3. Distance requirements are defined in Table 3.2
4. Making the initial turn before passing the "distance from start before initial turn" requirement will disqualify that flight attempt. (Table 3.2)

Table 3.2

Class	Take-Off Distance Limits (ft.)	Distance from start before initial turn (ft.)	Description
Regular	200 ft.	400 ft.	Aircraft must be airborne within the prescribed take-off distance.
Micro	Launch Circle	100 ft.	Team may use the entire launch circle per attempt to get the aircraft airborne. Only one (1) launch attempt per round is allowed

3.7 LANDING

A successful landing is defined as a controlled return to the ground inside the landing zone for that class and remaining on the ground through rollout. A failed landing attempt will result in no score for the round.

3.8 LANDING ZONE

The landing zone is a predetermined fixed area for each class for the purpose of returning a flying aircraft back to the ground. See Table 3.3 for class requirements.

1. The landing zones will be visibly marked at each event site prior to the start of the competition.
2. It is the team and team pilot's responsibility to be aware of the class specific landing zone dimensions at the event site.

1. Allowed during Landing

1. Controlled rollout beyond the landing zone is allowed provided the aircraft touches the ground inside the landing zone.
2. Controlled run-off to the side of the runway within the landing zone is allowed provided the aircraft touches the ground inside the landing zone.
3. Controlled run-off to the side of the runway beyond the landing zone is allowed provided the aircraft touches the ground inside the landing zone.

2. Not Allowed during Landing

1. Touchdown outside the landing zone for that class.
2. Uncontrolled runoff or bouncing across the boundary at the end of the landing zone is not allowed and will be judged as a failed landing attempt.
3. Touch-and-goes are not allowed and will be judged as a failed landing attempt.
4. Uncontrolled runoff or a bouncing run-off to the side of the runway is not allowed and will be judged as a failed landing attempt.

Table 3.3: Landing Distance Limit

Class	**Landing Distance Limits (ft.)**	**Description**
Regular	400 ft.	Aircraft must land in the same direction as takeoff within a designated landing zone
Micro	200 ft.	Aircraft must land in the same direction as takeoff within a designated landing zone

3.9 GROUNDING AN AIRCRAFT

1. An aircraft will be grounded if it is deemed non-flight-worthy or not in compliance with class rules by any SAE ISS official, event official or a designated technical/safety inspector.

2. Until the non-flight-worthy or out of compliance condition has been addressed and has been cleared by re-inspection, the aircraft will not be allowed to fly in the competition.

3.10 NO-FLY ZONE

Each competition will have venue-specific no-fly zones. The no-fly zones will be defined during the all hands briefing at the event and during the pilot's briefings.

1. At no time will an aircraft enter the no-fly zones, whether under controlled flight or uncontrolled.
2. First infraction for crossing into the no-fly zone will result in an invalidated flight attempt and zero points will be awarded for that flight.
3. Second infraction will result in disqualification from the entire event and loss of all points.
4. It is the team and team pilot's responsibility to be aware of the venue-specific no-fly zones and to comply with all venue specific rules.
5. If a team is unable to directionally control their aircraft and it is headed towards or is in a no fly zone, the Judges and/or Flight boss may order the pilot to intentionally crash the aircraft to prevent it from endangering people or property. This safety directive must be followed immediately if so ordered by the officials.

3.11 FLIGHT RULES ANNOUNCEMENT

Flight rules will be explained to all teams before the flight competition begins, either during the pilots' meeting or during activities surrounding the technical inspections and oral presentations.

3.12 FLIGHT RULES VIOLATIONS

1. Violation of any flight rule may result in the team being eliminated from the competition.

2. All members of an eliminated team may be escorted from the grounds.

3.13 LOCAL FIELD RULES

In addition to competition rules, the local flying club may have additional rules in place at the event flying field.

1. Club rules will be obeyed during the flight competition.
2. In the event that club rules conflict with competition rules, it is the responsibility of the team captain and/or faculty advisor to bring attention to the conflict and follow the appeals process to resolve the conflict.

SECTION 4

REGULAR CLASS REQUIREMENTS

Design Objective:

The objective of Regular Class is to design an aircraft that can lift as much weight as possible while observing the available power and aircraft's length, width, and height requirements.

Accurately predicting the lifting capacity of the aircraft is an important part of the exercise, as prediction bonus points often determine the difference in placement between competing teams.

The Regular Class will be divided into 3 phases (PHASE-1 & PHASE-2 ARE CONSIDERED AS VIRTUAL AERO DESIGN CHALLENGE) as follows:

Phase 1: Design Report

Teams will electronically submit their proposals for competition detailing how their design has met or exceeded the design requirements.

Phase 2: Technical Presentation

Phase 2A – Payload Loading Demonstration (timed event during Oral Presentation). Phase 2B – Payload Unloading Demonstration (timed event during Oral Presentation) Phase 2C – Oral Presentation

Phase 1 & Phase 2 will be conducted prior to Phase 3. Phase 1 & Phase 2 is combined as a separate event (Virtual Aero Design Challenge).

Phase 3: Flight Round and Technical Inspection

Technical inspection will be carried out before the flight round.

Dates for Virtual Aero Design can be checked on the aerospace development council web link in http://saeiss.org/student-members/aero-design-challenge/.

4.1 NO LIGHTER-THAN-AIR OR ROTARY WING AIRCRAFT

Competing designs are limited to fixed wing aircraft only. No lighter-than-air or rotary wing aircraft such as helicopters or autogyros will be allowed to compete.

4.2 AIRCRAFT DIMENSION REQUIREMENT

Fully configured for takeoff, the free standing aircraft shall have a maximum combined length, width, and height (L+W+H) of 170 inches. Aircraft exceeding this design requirement will be disqualified from the competition.

Length is defined as the maximum distance from front to the aft of the aircraft. Width is the span or the maximum distance from wingtip to wingtip. Height is defined as the maximum distance perpendicular to the ground to the highest part of the aircraft (propeller not included).

Note: Modifications to the aircraft to meet the Length + Width + Height limitations during technical inspection are subjected to design change penalties.

4.2.1 Aircraft Weight Limit (Excluding Payload)

Regular Class aircraft (RCA) may not weigh more than five kilo gram (5 kg) and not less than two kilo gram (2 kg).

4.2.2 Aircraft Identification

Team number as assigned by SAEISS must be visible on both the top and bottom of the wing, and on both sides of the vertical stabilizer or other vertical surface in 4-inch numbers. The University/College name must be clearly displayed on the wings or fuselage. The University/College initials may be substituted in lieu of the University name provided the initials are unique and recognizable.

The assigned aircraft numbers will be displayed in the page “Registered Teams” of http://saeiss.org/student-members/aero-design-challenge/.

4.2.3 Name and Address

Regular Class aircraft must be identified with the department/school name and address either on the outside or the inside of the aircraft.

4.2.4 Material Restriction

The use of Fibre-Reinforced Plastic (FRP) is prohibited on all parts of the aircraft. The only exception is the use of a commercially available motor mount and propeller. Exploration of other materials and building methods are greatly encouraged.

In addition, the use of lead in any portion of the aircraft (payload included) is strictly prohibited.

4.3 AIRCRAFT SYSTEM REQUIREMENT

4.3.1 Propulsion Requirements

Regular class aircraft are restricted to electric motor propulsion only. There are no restrictions (make or model) on the electric motor. Only a single motor configuration is allowed (no multiple motors).

4.3.2. Gear boxes, Drives, and Shafts

Gearboxes, belt drive systems, and propeller shaft extensions are allowed as long as a one-to-one propeller to motor RPM is maintained.

4.3.3. Aircraft Propulsion System Battery

Regular Class aircraft must be powered by a commercially available Lithium-Polymer battery pack.

- Required: 4cell (14.8 Volt) - 6 cell (22.2 volt) Lithium Polymer (Li-Po) battery pack.
- Homemade batteries are NOT allowed.

4.3.4. Radio System Battery

If a separate battery is used for the radio system, the battery pack must have enough capacity to safely drive all the servos in the aircraft, taking into consideration the number of servos and potential current draw from those servos.

- A battery pack with a minimum capacity of 1000 mAh must be used for the radio system.
- Battery voltage regulators or Battery Eliminator Circuit (BEC) are allowed.

4.4 PAYLOAD REQUIREMENTS

4.4.1 Payload and Payload Support

The payload must consist of a support assembly and payload plates. All payloads carried for score must be carried within the cargo bay. The support assembly must be constructed so as to retain the weights as a homogeneous mass. There is no required configuration for the payload plates. The design of the support assembly will depend upon the configuration of the payload plates. The payload must be secured to the airframe to ensure the payload will not shift or come loose in flight. The total payload consists of the plates plus the support assembly. It is the responsibility of each team to provide its own payload plates.

Again, no lead weights will be allowed as payload.

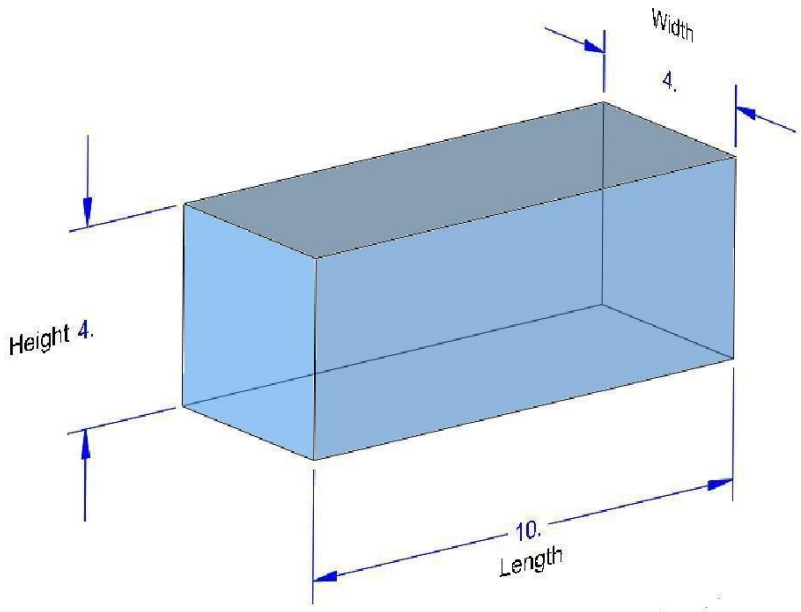
4.4.2 Payload Bay Dimensions

Regular Class aircraft has a “Closed” payload bay dimensional requirements for the 2017 design year. A “Closed” payload bay is defined as having four sides, a bottom

and a top. The top can be a hatch or the wing once installed on the aircraft. The payload bay must be fully enclosed within the fuselage and the aircraft must be structurally airworthy with and without the payload installed. No penetrations are allowed through the payload bay except for the payload support assembly, in which case the support assembly MUST be made removable. It must be removable so that the test block can be inserted into the payload bay during technical inspection. The removable payload support assembly will be considered as payload.

Enclosed Payload Bay Interior Dimensions:

Length	Width	Height	Tolerance
10.00"	4.00"	4.00"	+ 0.125", - 0.000"



- Each team is allowed only 1 payload bay per aircraft
- Teams must provide their own payload for all portions of the competition.
- During Technical Presentation (timed event)
    - Team must demonstrate their design provides the capability to load and secure payload (Ready for Flight) in less than 1 minute.

- Team must demonstrate their design provides the capability to unload the payload in less than 1 minute.
- Ready for Flight shall be defined by a completely assembled aircraft with all latches engaged and nuts/bolts tightened. NO power connected (i.e. red arming plug dis-engaged).

4.4.3 Payload Distribution

The payload cannot contribute to the structural integrity of the airframe, and must be secured to the airframe within the cargo bay so as to avoid shifting while in flight.

4.4.4 Aircraft Ballast

Aircraft ballast is allowed to be used as teams desire with the following exceptions:

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

4.5 GENERAL REQUIREMENTS

4.5.1 Radios

The use of 2.4 GHz radio is required for all aircraft competing.

4.5.2 Spinners or Safety Nuts Required

All aircraft must utilize either a spinner or a rounded safety nut.

Prop savers are not allowed in regular Class due to the high power propulsion system used.

4.5.3 Metal Propellers Prohibited

Metal propellers are not allowed.

4.5.4 Control Surface Slop

Aircraft control surfaces must not feature excessive slop. Sloppy control surfaces lead to reduced controllability in mild cases, or control surface flutter in severe cases.

4.5.5 Servo Sizing

Analysis and/or testing must be described in the Design Report that demonstrates the servos are adequately sized to handle the expected aerodynamic loads during flight.

4.6 Regular Class Competition Scoring

In order to participate in the flight portion of the competition, each team is required to have submitted and received a score for their Design Report and Technical Presentation.

Any penalties assessed during Design Report Submission**,** Technical Inspection, and Aircraft Modifications will be applied to the overall competition score.

Overall Competition Score = Workshop Score + Design report + Technical Presentation + Flight Demonstration - Penalty Points

RCA Score	
Description	**Maximum Score**
Workshop	100
Design report	150
Technical Presentation	100
Flight Round	150
Penalty for Late Submission of Design Report	
For One Day	5
Penalty during Oral Presentation	
Oral presentation exceeds 10 minutes	25
Penalty during Technical Inspection	
1. Deviation from Design (Aerodynamic Changes)	
a) 1 - 5 %	10
b) 6 - 10 %	20
c) 11 - 20 %	40
2. Structural Changes	20
3. Electronics	20
Misc	10
Failure to Report Design Changes	10

SECTION 5

MICRO CLASS REQUIREMENTS

Design Objectives:

The objective of Micro Class is to design light-weight, UAV style aircraft that can be quickly deployed from a small package. Reliability to perform the mission is measured by an operational availability bonus. The first assembly of the competition is a timed event. Payload fraction is still at the core of the class and may be considered as a measure of performance.

Micro class will be divided into 3 phases as follows:

Phase 1	**Design report** **Teams will electronically submit their Design Report for competition detailing how their design has met or exceeded the design requirements.**
Phase 2	**Technical Presentation**
Phase 3A	**Aircraft assembly Demonstration & Technical Inspection**
Phase 3B	**Flight Round**

Phase 1 & Phase 2 will be conducted prior to Phase 3. Phase 1 & Phase 2 is combined as a separate event (Virtual Aero Design Challenge).

5.1 AIRCRAFT REQUIREMENTS AND RESTRICTIONS

Micro Class aircraft (MCA) should not weigh more than 1.5 kg excluding payload.

5.1.1 No lighter-than-air or rotary wing aircraft

Competing designs are limited to fixed wing aircraft only. No lighter-than-air or rotary wing aircraft such as helicopters or autogiros will be allowed to compete.

5.1.2 Aircraft Identification

Team number as assigned by SAE ISS must be visible on both the top and bottom of the wing, and on both sides of the vertical stabilizer or other vertical surface in 3-inch numbers. The University/College name must be clearly displayed on the wings or fuselage. The University/College initials may be substituted in lieu of the University name provided the initials are unique and recognizable.

MCA identification shall include both of the following:

- School name, address, and contact phone number either inside or outside of the aircraft fuselage.
- School name, address and contact phone number on the outside of the shipping and storage container

5.1.3 Aircraft Assembly

For Round 1 only: The assembly demonstration for Round 1 is optional. If a team elects to perform the demonstration, the MCA must be assembled within the specified time-constraint of 90 seconds, in order to receive an assembly demonstration bonus. If the aircraft is not assembled within the specified time, the assembly demonstration bonus will be zeroed, and the team will have the option to move to the back of the line, finish assembly, and attempt a Round 1 flight.

Teams may elect not to perform the assembly demonstration. If this is the case, there are no timed assembly requirements. The aircraft must be assembled but not armed prior to entering the launch zone. MCA must be airborne within the specified time constraints in accordance with 5.10.2.

For Round 2 thru Round n: there are no timed assembly requirements. The aircraft must be assembled but not armed prior to entering the launch zone. MCA must be airborne within the specified time constraints in accordance with 5.10.2.

5.2 AIRCRAFT SYSTEMS REQUIREMENTS

5.2.1 Propulsion Requirements

Micro class aircraft are restricted to electric motor propulsion only.

5.2.2 Propeller and Gearbox

Gearboxes on a Micro class aircraft where the propeller RPM differs from the motor RPM are allowed. Multiple motors, multiple propellers, propeller shrouds, and ducted fans are allowed in Micro class.

5.2.3 Aircraft propulsion system battery

The maximum flight battery pack allowed for Micro class is a 3 cell lithium polymer battery pack. Batteries having less cells are also permitted.

5.2.4 Gyroscopic Assist Allowed

Gyroscopic assist and other forms of stability augmentation are allowed in Micro class.

5.3 PAYLOAD REQUIREMENTS

5.3.1 Payload and Payload Support

The payload must consist of a support assembly and payload plates. All payloads carried for score must be carried within the cargo bay. The support assembly must be constructed so as to retain the weights as a homogeneous mass. There is no required configuration for the payload plates. The design of the support assembly will depend

upon the configuration of the payload plates. The total payload consists of the plates plus the support assembly. It is the responsibility of each team to provide its own payload plates.

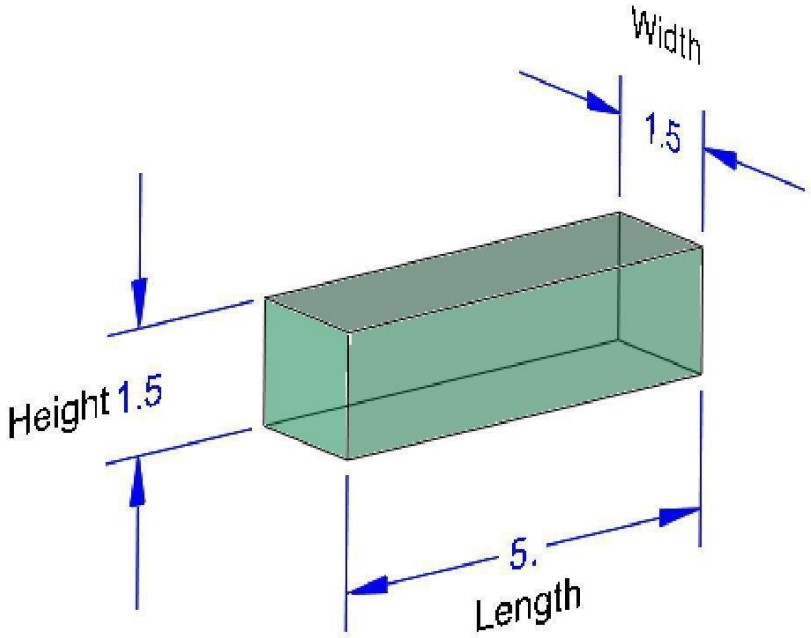
5.3.2 Payload Distribution

The payload cannot contribute to the structural integrity of the airframe, and must be secured to the airframe within the cargo bay so as to avoid shifting while in flight.

5.3.3 Payload bay dimensions

Enclosed Payload Bay Interior Dimensions

Length	Width	Height	Tolerance
5.00″	1.50"	1.50″	+/- 0.100"



The payload shall not contribute to aircraft structural integrity.

The payload bay may be adjusted forward or aft to adjust aircraft stability.

Compliance with this requirement will be demonstrated during technical inspection by inserting a gauge block measuring 5 inches by 1.5 inches by 1.5 inches. Aircraft, which cannot accept the provided gauge, shall be required to revise their airframe and submit the engineering change request (ECR) or shall be disqualified from further competition.

The verification gauge shall be easily installed/extracted without application of excess force.

5.3.4 Payload Material

The use of lead in any portion of the aircraft (payload included) is strictly prohibited.

5.4 AIRCRAFT LAUNCH METHOD

The MCA shall be hand tossed (launched) by throwing the aircraft using one (1) hand grasping the fuselage. There is no limit on number of steps taken during the launching action, but the person must remain inside the launch zone before and after releasing the aircraft.

- Only one (1) member of the team can enter pre-marked launch zone.
- The pilot must be outside the pre-marked launch zone during the tossing action.
- The aircraft can only be tossed by one (1) person; team member.

The following actions are not permitted and will invalidate the flight attempt and score for the round:

- Using more than one hand to toss the aircraft
- Tossing the aircraft from any other part of the aircraft other than the fuselage

- Running with the aircraft during launch
- Pilot launching (tossing) the aircraft

5.5 MCA HAND-LAUNCH SAFETY REQUIREMENTS

Safety gears must be used by the designated person performing the aircraft toss. Safety gear shall consist of:

- Safety Glasses
- Hard hat
- Shoes (open toe shoes are not allowed)

5.6 GENERAL REQUIREMENTS

5.6.1 Radios

The use of 2.4 GHz radio is required for all aircraft competing.

5. 6.2 Spinners and Safety Nuts Required

All MCA must utilize either a spinner or a rounded model aircraft type safety nut.

5. 6.3 Metal Propellers Prohibited

Metal propellers are not allowed.

5. 6.4 Control Surface Slop

Aircraft control surfaces must not feature excessive slop. Sloppy control surfaces lead to reduced controllability in mild cases, or control surface flutter in severe cases.

5. 6. 5 Servo Sizing

Servos must be adequately sized to handle the expected air loads during flight. Qualification flights are not required.

5. 7 STORAGE AND TRANSPORT CONTAINER

Micro class aircraft must fit in a storage and transport container with size limitations. The required container may be either purchased or constructed. Compliance with the following requirements will be confirmed during technical inspection.

1. The aircraft container shall be of height, width & length to less than 3feet cubic / cuboid box.

2. The fully packed aircraft system container shall weigh no more than four and a half (4.5) kilo gram (kg).

3. The aircraft container must include a shoulder strap and a carrying handle.

4. The container must be one-man portable.

5. The aircraft container must have school name, team name and team number the outside surface of the container.

5.8 AIRCRAFT SYSTEM PACKAGING GENERAL REQUIREMENTS

The aircraft system container must contain the following:

1. All components of the flight ready aircraft including airframe, propulsion system battery, payload assembly, payload plates and any other part(s) required for flight must be packaged within the constraints of the aircraft system container.

2. The propulsion system battery must not be pre-installed in the aircraft

3. The red arming plug must not be pre-installed in the aircraft

4. The propulsion system battery must be contained in its own partitioned space in the aircraft system container.

5. The transmitter and any spare parts are not required to be in the aircraft system container.

5.9 TIMED AIRCRAFT ASSEMBLY

5.9.1 Assembly Demonstration Bonus (Round 1 Only)

The timed Micro class assembly demonstration for Round 1 is optional. If a team elects to perform the demonstration, the Micro class aircraft must be assembled within the specified time-constraint in order to receive an assembly demonstration bonus.

1. The timed assembly demonstration can ONLY be performed during Round 1.

2. If the aircraft is not assembled within the specified time, the assembly demonstration bonus will be zeroed, and the team will have the option to move to the back of the line, finish assembly, and attempt a Round 1 flight.

3. The assembly demonstration is considered complete when all tasks required for flight have been performed with the exception of:

- Installing the Red Arming Plug,
- Performing preflight controls checks
- Hand launching the Micro class aircraft.

4. Performing preflight controls checks is limited to validation of adequate control movements and range. Disassembling the aircraft during the pre-flight control checks will invalidate the Aircraft Demonstration Bonus.

5. Teams may elect not to perform the assembly demonstration. If this is the case, there are no timed assembly requirements. The aircraft must be assembled but not armed prior to entering the launch zone.

6. For Round 2 thru Round n: there are no timed assembly requirements. The aircraft must be assembled but not armed prior to entering the launch zone. Micro class aircraft must be airborne within the specified time constraints in accordance with Section 3.5

7. The Assembly Demonstration Bonus is only applicable if the ensuing flight is successful. A failed flight attempt in Round 1 will result in a zero Assembly Demonstration Bonus.

Note: Round 1 is defined as the first round on the first day of the competition, not the team's first attempt to fly at the competition.

5.10 MISSION REQUIREMENTS

5.10.1. Process for Assembly Demonstration Bonus

1. Two team members tasked with assembling the aircraft will be located immediately outside the launch circle in a designated area. At this time, the fully packaged, non-energized aircraft, with flight battery NOT installed, must be held over the shoulder using the required shoulder strap. (Failure to have the Red Arming Plug removed at this time will result in a zero bonus and a disqualified flight.)

2. The head judge give a "Go" command to begin assembly. Two scoring official will start the time.

3. When the aircraft is fully assembled, with the flight battery installed, the team will give the "DONE" command to signal the timers to stop the timer.

4. After the "DONE" command is given by the assembling team, no further assembly may continue.

5. The official will inspect the aircraft to confirm aircraft flight ready status and the time is recorded in seconds

6. Head judge will give the instruction to install the Red Arming Plug. (Any further assembly of the aircraft after the clock has stopped will result in zero for the bonus.)

7. The team will then step into the launch circle to begin their flight attempt. At this time, upon signal given by the Air Boss, a team will have 120 seconds (2 minutes) to accomplish a successful launch. During these 120 seconds, the pilot can do a final test on the controls. If the officials witness additional assembly in the launch circle, the assembly demonstration bonus will be zeroed.

5.10.2 Time Limit for Aircraft Launch

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

1. Each team will have 120 seconds to complete preflight checks, energize the propulsion system, and check the controls and hand-launch the aircraft.

2. Only one takeoff launch attempt is permitted per round.

3. If the team exceeds 120 seconds penalty points will be incurred in flight round score.

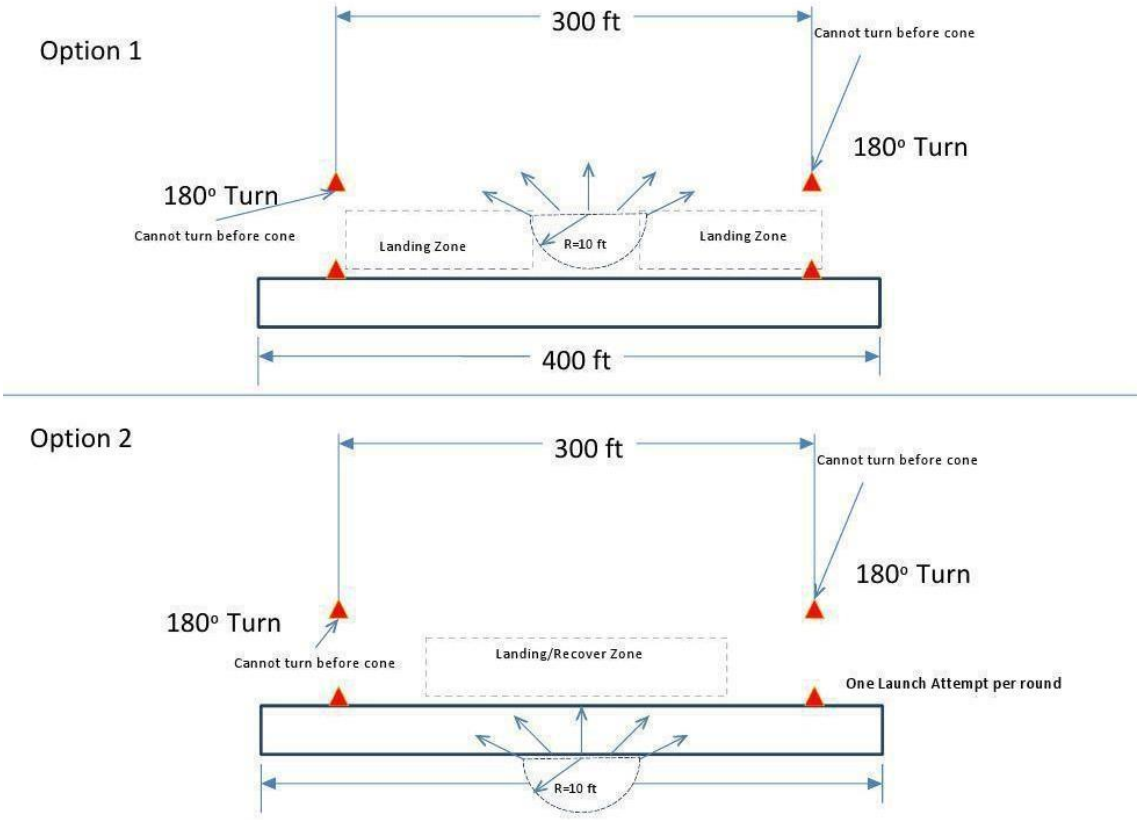
5.10.3. Aircraft Takeoff and circuit

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

1. Remain airborne and fly past the designated turn point before turning approximately 180 degrees in heading.
2. Flying past a second designated turn point, turning 180 degrees in heading,
3. Land in the designated landing zone for Micro class (see Micro class course diagram below).

4. Takeoff direction will be determined by the Air Boss, and normally selected to face into the wind.

Micro class course diagram:



Take-off will occur from a semi-circular launching zone measuring 10 feet in radius. The take-off zone will be positioned on a grass surface; as close to the runway as possible.

5.10.4 Landing

Landing is defined as occurring from initial touchdown to the point at which the aircraft stops moving. Initial touchdown is defined as the point at which any part of the aircraft touches the ground.

Micro Class aircraft shall land in a designated landing zone measuring 200 feet in length. The width of the landing zone will be approximately the width of the runway and will be determined by the competition organizers at the time of the event.

A good landing for a successful flight is defined as touching down and coming to rest within the designated landing zone after the aircraft has completed the required flight circuit. Any part of the aircraft overhanging the landing zone will invalidate the flight and will result in zero score for the round.

The aircraft must take off and land intact to receive points for the flight. All parts must remain attached to the aircraft during flight and during the landing maneuver. Broken propellers are allowed, and will not invalidate a flight attempt.

5.11 MICRO CLASS COMPETITION SCORING

In order to participate in the flight portion of the competition, each team is required to have submitted and received a score for their Design Report and Technical Presentation.

Any penalties assessed during Design Report Submission, Technical Inspection, and Aircraft Modifications will be applied to the overall competition score.

Overall Competition Score = Workshop Score + Design report + Technical Presentation + Flight Demonstration – Penalty Points

MCA Score	
Description	**Maximum Score**
Workshop	100
Design report	150
Technical Presentation	100
Aircraft assembly Demonstration	50
Flight Round	100
Penalty for Late Submission of Design Report	
For One Day	5
Penalty during Oral Presentation	
Oral presentation exceeds 10 minutes	25
Penalty during Technical Inspection	
1. Deviation from Design (Aerodynamic Changes)	
a) 1 - 5 %	10
b) 6 - 10 %	20
c) 11 - 20 %	40
2. Structural Changes	20
3. Electronics	20
Misc	10
Failure to Report Design Changes	10

SECTION 6

DESIGN REPORT

The Design Report is the primary means in which a team conveys the story of how their aircraft is the most suited design to accomplish the intended mission. The Design Report should explain the team's thought processes and engineering philosophy that drove them to their conclusions.

Some topics that are important to cover are: selection of the overall vehicle configuration, wing plan form design including airfoil selection, drag analysis including three-dimensional drag effects, aircraft stability and control, power plant performance including both static and dynamic thrust, and performance prediction. Other topics as appropriate may be included.

6.1 SUBMISSION DEADLINES

The Technical Design Report, 2D drawing, and supplemental Tech Data Sheet (TDS) must be electronically submitted to **adcsaeiss@gmail.com** no later than the deadlines indicated on **http://saeiss.org/student-members/aero-design-challenge**/. Neither the Organizer nor the SAE ISS is responsible for any lost or misdirected reports, drawings, or server routing delays. The SAE ISS will not receive any hard/scanned copies of the reports through regular mail or email.

6.2 DESIGN REPORT REQUIREMENTS

The deliverable content of the Technical Design Report is specified in Table 6.1

1. The Technical Design Report shall not exceed thirty (30) pages. If the design report exceeds thirty (30) pages, the judges will only score the first thirty (30) pages.
2. The Technical Design Report shall be typewritten and double-spaced.

3. The report font shall be 12 pt. proportional; or 10 char/in. non-proportional font.
4. The report margins shall be: 1” Left, 0.5” right, 0.5” top, and 0.5” bottom.
5. All report pages will be LETTER (81/2 x 11 inches) page format.

Table 6.1

Description	**Page Count**	**Regular Class**	**Micro Class**
Design Report (Cover page, Table of Content, Statement of Compliance and Appendices)	28	100 pts	100 pts
2D Drawings	1	25 pts	25 pts
TDS: Theoretical Payload Prediction	1	25 pts	-
TDS: Aircraft Weight Build-up Schedule	1	-	25 pts
Total	**30**	**150 pts**	**150 pts**

6.3 2D DRAWINGS

1. 2D Format and Size

The 2D drawing must be A3 sized page (PDF) format (11 x 17 inches).

1. Drawing shall consist of one (1) page
2. Markings Required

The 2D drawing must be clearly marked with:

1. Team number
2. Team name
3. University / College name

2. Views Required

The 2D drawing must include a standard aeronautical three-view of the aircraft arranged as described below:

1. Left side view in the lower left with the nose pointing left.

2. Top view above the left side view also with the nose pointing left.

3. Front view in the lower right.

3. Dimensions Required

At a minimum, all aircraft drawings must have the following dimensions clearly shown:

1. Aircraft length, width and height.

2. Drawing shall have CG locations clearly dimensioned in reference to the aircraft datum.

3. All drawing dimensions must be in inches and decimal inches, to an appropriate level of precision.

4. Summary Data Information Required

The 2D drawings must contain a table with a summary of pertinent aircraft data. The minimum data to be shown in the table is:

1. Wingspan

2. Empty weight

3. Specifications of Motor and Propeller (Including make and model)

5. Weight and Balance Information

The drawing shall contain the required weight and balance information listed below, including a weight and balance data table with a summary of pertinent aircraft equipment and other data as indicated below.

1. All 2D aircraft drawings must have a designated aircraft datum clearly indicated on the 2D drawings.

2. Minimum list of equipment to be shown in the weight and balance table is:

3. Motor, battery (s), payload, ballast (if used) and electronics.

4. Each item listed in the table must show its location from the aircraft datum in inches, moment arm and resultant moment of force.

5. The following Center of Gravity (CG) information must be clearly shown in the drawing:

1. Forward CG limit
2. Aft CG limit
3. Empty CG, ready to fly (no payload, no fuel if applicable)
4. Fully loaded CG (maximum expected payload and fuel, if applicable)

6.4 TECH DATA SHEET: THEORETICAL PAYLOAD PREDICTION (REGULAR CLASS ONLY)

The Regular Class payload prediction bonus is derived from the payload prediction curve. The curve represents engineering estimate on aircraft's lift performance based on density altitude.

1. Curve Requirements:

i). Graph shall be linearized over the relevant range ii). The linear equation shall be in the form of:

= +

where,

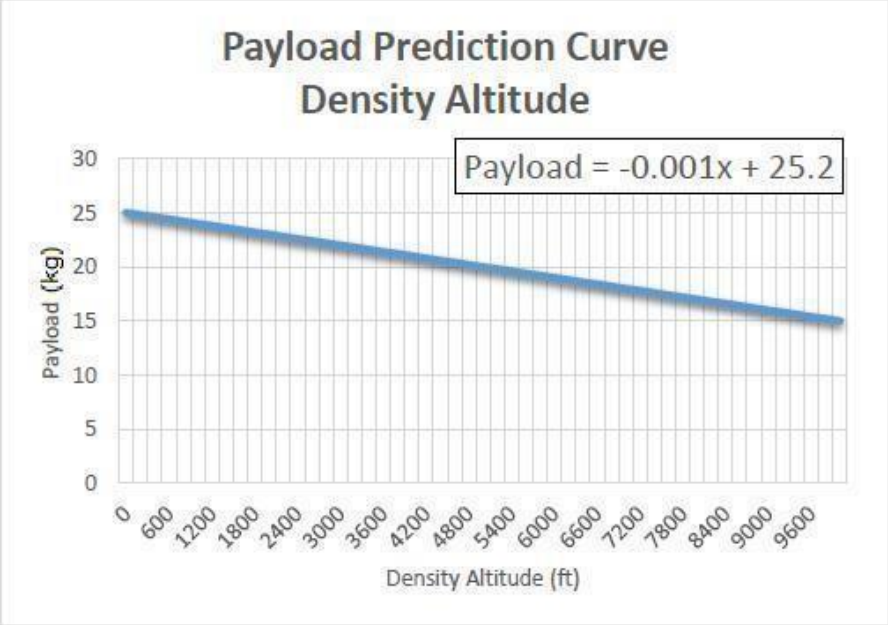
y = payload weight (lbs) X = Density Altitude (ft) m = Slope of the linear line b = y-intercept.

3. Only one curve, and hence one equation, may be presented on the graph.

4. Teams presenting multiple curves will receive zero (0) bonus points for payload prediction.

5. In scoring the payload prediction, the equation as printed on the prediction graph will be used to calculate the prediction bonus. In the event the line as printed on the graph contradicts the equation, the equation must be used to determine the

prediction bonus. Teams omitting the prediction curve equation from the prediction graph will receive zero (0) bonus points for payload prediction.



6.1 TECH DATA SHEET: WEIGHT BUILDUP (MICRO CLASS ONLY)

The Micro Class Weight & Balance Build-up schedule will help teams understand the important of managing aircraft weight to achieve safety of flight at the desired payload fraction.

Each team shall supply a one (1) sheet summary list of pertinent aircraft parts and weight (kg)

SECTION 7

TECHNICAL PRESENTATION

Like all professionals, engineers must possess a well-developed ability to synthesize issues and communicate effectively to diverse audiences. The technical portion of the aero-design competition is designed to emphasize the value of an ability to deliver clear, concise and effective oral presentations. Teams can obtain a maximum technical presentation score of fifty (100) points. Presentation score shall be comprised of scores from the presenter's delivery technique and the judges' evaluation of technical content, empirical analysis, and quality visual aide.

7.1 TECHNICAL PRESENTATION REQUIREMENTS

1. Technical presentation shall last ten (10) minutes and followed by a five (5) minute "Question and Answer" (Q&A) period.

2. Technical presentation shall be delivered in English.

3. Technical presentation shall address, but are not limit to, trade studies performed, design challenges, and manufacturing techniques.

4. Technical presentation is limited to student team members only. Non-team member pilot and faculty advisors can attend the technical presentation but are prohibited from participating in the setup, delivery, and/or the Q&A.

5. Assistance in the use of visual aids is advisable; Film clips, if used, may not exceed one-minute total duration; Film clips may not be accompanied by recorded narration.

6. Regular and Micro Class shall display their entry aircraft during technical presentation.

7. During the presentation and static display setup, the teams shall provide a single sheet (8.5" x 11") marketing/promotion piece to further detail aircraft's feature, capabilities, and unique design attributes.

7.2 REGULAR CLASS PAYLOAD LOADING AND UNLOADING DEMONSTRATION

Technical Presentation for Regular Class shall demonstrate the requirement to quickly load/secure and unload payloads. This is a timed activity and shall be performed by one (1) member of the team for the following time constraints.

1. One (1) minute to load/secure the payload for flight
2. One (1) minute to unload the payload

7.3 TECHNICAL PRESENTATION PROCESS AND PROCEDURES

Each presentation room shall have a lead judge with the responsibility to ensure compliance with competition rules and schedule. Lead judge will identify a timekeeper.

1. With agreement from the speaker, the timekeeper will give the speaker a one (1) minute warning prior to the ten (10) minute limit.
2. If the team exceed the ten (10) minute limit, the team will be assessed a five (25) point penalty for going over the time limit.
3. The presentation shall be stopped at the eleven (11) minute mark.
4. A team shall have five (5) minutes for Q&A immediately following the presentation.

Questions may be asked by any judge on the panel

5. Any time remaining or exceeding the ten (10) minutes shall be added to or subtracted from five (5) minute Q&A.
6. Presentation Time Breakdown

- 2 Minutes Setup presentation, visual aide, and/or static display
- 10 Minutes Perform Technical Presentation
- 5 Minutes Questions & Answers
- 1 Minute Loading Demonstration (Regular Class Only)
- 1 Minute Unloading Demonstration (Regular Class Only)
- 3 Minutes Pack-up presentation and static display

7.4 TECHNICAL INSPECTION

Technical and Safety inspection of all aircraft will be conducted using the published Technical and Safety Inspection checklists for each class for the current year**. The checklists can be found on the SAE ISS Aero Design home page under Downloads page in the website.**

Technical and Safety Inspection is the process of checking all aircraft for:

1. Compliance with all General aircraft requirements.
2. Compliance with all aircraft configuration requirements for their class.
3. Overall safety and airworthiness.

All aircraft must pass the Technical and Safety Inspection in order to compete.

It is strongly recommended to check the inspection checklist before arriving at the competition.

7.5 AIRCRAFT CONFORMANCE TO 2D DRAWING

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

1. At a minimum, aircraft length, wingspan and height dimensions will be measured and compared to the 2D drawing.
2. All teams must have a hard copy of their design report with them during technical inspection.
3. Aircraft will have their actual empty CG compared to the empty CG presented in the design report 2D drawing.

7.6 DEVIATIONS FROM 2D DRAWING

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

1. Each design change must be documented separately using the Engineering Change Request (ECR).
2. Only one design change may be submitted per ECR form.

3. Judges will assess penalty points for design changes as stated in RCA and MCA score tables.

7.7 FAILURE TO REPORT DESIGN CHANGES

In the case where a team fails to report a design change before inspection, an additional one (10) point penalty will be assessed for each unreported design change discovered during inspection.

7.8 SAFETY AND AIRWORTHINESS OF AIRCRAFT

Technical and Safety Inspection will be also be used to assess the general safety and airworthiness aspects of each aircraft by seeking any problems that could cause an aircraft to depart controlled flight. This assessment includes but is not limited to:

1. Unintentional wing warps
2. Control surface alignment
3. Correct control surface response to radio transmitter inputs
4. Structural and mechanical soundness

7.9 INSPECTION OF SPARE AIRCRAFT AND SPARE AIRCRAFT COMPONENTS.

1. All spare aircraft and spare aircraft components (wings, fuselages and tail surfaces) must be presented for inspection at the same time as the primary aircraft.

2. Any spare aircraft or spare aircraft components presented for inspection after the team has had their primary aircraft inspected may not be used in the competition.

7.10 AIRCRAFT MUST MEET ALL INSPECTION REQUIREMENTS THROUGHOUT THE COMPETITION.

1. All aircraft must meet all Technical and Safety Inspection requirements throughout the competition.

2. Any official may request that an aircraft be re-inspected if a general, class configuration or safety requirement problem is seen on an aircraft at any time during the event.

3. This includes any errors or omissions made by officials during inspection.

7.11 TECHNICAL AND SAFETY INSPECTION PENALTIES

No points are available to be scored as a result of the Technical and Safety Inspection: teams may only lose points as a result of errors and problems encountered during the inspection process. Any penalties assessed during Technical Inspection will be applied to the overall competition score.