



Category C1 Challenge Booklet 2025

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SAFMC 2025 CAT C1 CHALLENGE BOOKLET CHANGE LOG

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1. INTRODUCTION

Competition Schedule, General Rules and Regulations can be found in the “General Rules and Regulations” Booklet.

For Category C1, the teams are expected to **design and build their own radio-controlled fixed-wing plane or kite plane** to navigate an obstacle course in the play field.

Each participating team shall be allowed to bring up to **TWO (2) IDENTICAL fixed-wing planes or kite planes**.

2. CATEGORY C1 AWARDS

Award winners will be selected based on either presentation scores, performance on the competition’s challenge day, or a combination of both.

There is no limit to the number of awards that a team can win, but there may not be a winner for every award.

All scoring decisions made by the judges are **final**. For cases that require arbitration, the Singapore Amazing Flying Machine Competition (SAFMC) organising committee will have the **final** say.

The list of awards for Cat C1 is listed in the subsequent sections.

2.1. CHAMPIONSHIP AWARD

Award	Weightage
Creativity	15%
Theory of Flight	15%
Presentation	15%
Performance	55%
Total	100%

This is the pinnacle award that any team can win. It is bestowed on the team that embodies the spirit of SAFMC. Teams are considered for the Championship Award based on their overall excellent performance during the presentation and actual challenge.

2.2. THE MOST CREATIVE AND THEORY OF FLIGHT AWARD

Criteria	Areas of Consideration
Creativity	<ul style="list-style-type: none">• Uniqueness in Appearance• Innovative Design• Environment Considerations• Functionality
Theory of Flight	<ul style="list-style-type: none">• Lift Generation• Stability & Control• Weight and Balance• Overall design and Aerodynamic

For the team that shows the most innovative and original design in their remote-controlled fixed wing or kite platform and demonstrates a sound understanding and application of aerodynamic design principles.

2.3. THE BEST PRESENTATION AWARD

Criteria	Areas of Consideration
Presentation	<ul style="list-style-type: none"> • Creativity • Fluency • Confidence and Flair

For the teams that best exhibit creativity, fluency, confidence, and flair in the presentation and demonstrate "WOW" factors during the interview sessions.

2.4. THE BEST PERFORMANCE AWARD

This is awarded to the team that attains the highest score in the challenge segment. The best score attained among the two attempts shall be taken as the final score for the mission. The time taken for each attempt to complete all the tasks will be taken into consideration if there is a tie-in score.

2.5. PRIZES

CATEGORY C1				
Awards	Medals	Trophy	Cash Prize(s)	Remarks
Cat C1 Championship Award	✓	✓	\$ 1200	
Cat C1 1st Runner Up	✓		\$ 800	
Cat C1 2nd Runner Up	✓		\$ 400	
Cat C1 Best Performance Award	✓	✓	\$ 500	1st and 2nd Runner up will receive only Medals.
Cat C1 Best Presentation Award	✓	✓	\$ 400	
Cat C1 Most Creativity and Theory of Flight Award	✓	✓	\$ 200	

3. CATEGORY C1 CHALLENGE

For Category C1, it comprises of:

- a. A physical presentation.
- b. An actual in-venue flight challenge.

3.1. PRESENTATION SEGMENT

On the scheduled date of presentation, a specific time slot shall be allocated to each team to present their flying machine. The team shall present the work they have done, such as flying machine design and their learning journey, to the judges.

The team may present either in PowerPoint slides format or hard copy poster format. If the team is presenting in PowerPoint format, the slides should not be more than 4 slides (including the cover slide). The team must ensure their laptop is fully charged and equipped with an HDMI output socket. Alternatively, each team shall be allowed a maximum of TWO (2) A1-size posters as a visual aid for their presentation.

Each team is given only **TEN (10) minutes** that comprises of:

- **FIVE (5) minutes** for presentation.
- **FIVE (5) minutes** for Questions and Answers (Q&A).

A **short video clip is required** to showcase the built flying machine flying along the border of the badminton court for at least 15 seconds. The team shall bring their laptop or tablet which can be used as the tech platform to showcase the short video clip during the presentation.

NO setup time shall be allocated, the team is expected to load and be ready for presentation before they enter the presentation room.

3.2. CHALLENGE SEGMENT

The team is expected to design and build its own radio-controlled fixed-wing plane or kite plane. The built flying machine is to fly and manoeuvre through a series of obstacles in the play field.

Figures 1 and 2 show the competition setup for Category C1. The designated take-off/landing area is 3 meters x 4 meters. The flying machine must take off from the designated take-off/landing area and land on the designated take-off/landing area after completion of the flying.

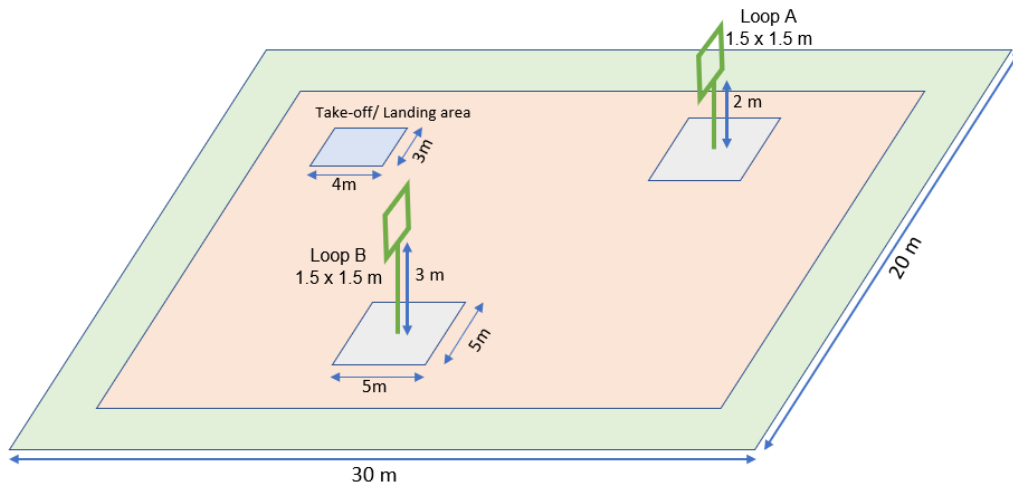


Figure 1 Competition Setup of Category C1

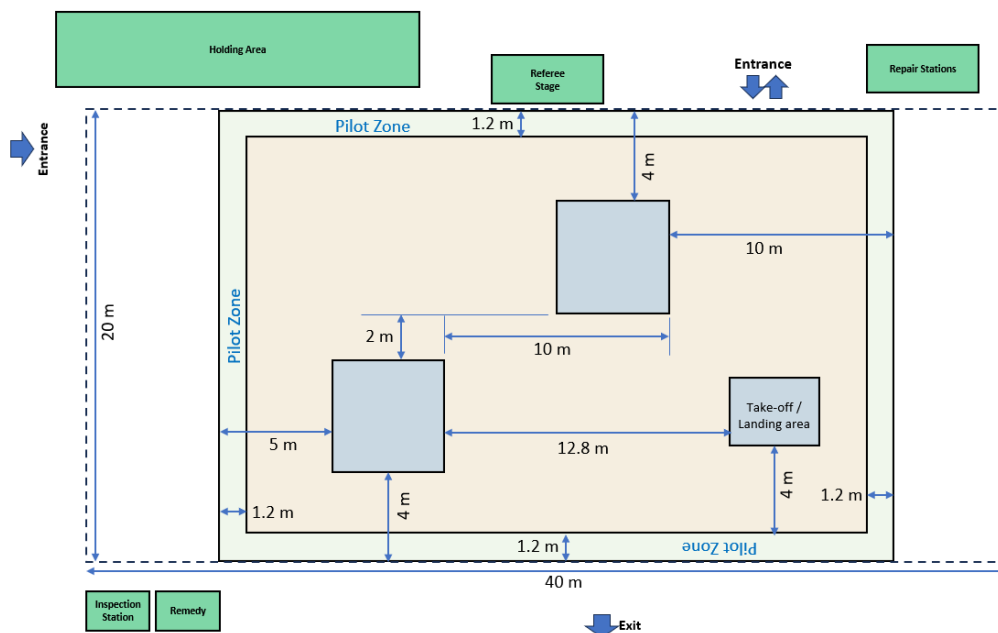


Figure 2 Competition Setup of Category C1 (Plan View)

Similar to real-world scenarios, teams may face unexpected issues during the challenge segment. They should not expect the conditions or layout of the challenges to be fully defined beforehand or to remain identical for each attempt between competitors. Factors such as venue conditions and other uncontrollable elements can also influence competition results.

Each team has **TWO (2) attempts ONLY** to challenge the flying circuit. Each attempt is allocated **THREE (3) minutes**.

NO exchanging of identical flying machines is allowed during the attempt.

The team will challenge the flying circuit by navigating the flying machine through a series of obstacles in the play field as follows:

- a. Take-off or hand launched from the designated take-off/landing area. The plane can fly in any orientation.
- b. Perform as many rounds as possible by flying through the two loops in sequence in the flight zone of the play field. The fly machine is to fly in only one direction around the two loops. (e.g. clockwise flying: Loop A -> Loop B -> Loop A ...; Counterclockwise flying: Loop B -> Loop A -> Loop B ...)
- c. Points shall be awarded for every completed round of flying through Loop A and B in sequence (Up to 15 rounds).
- d. Touch down successfully onto the designated landing area.

Once the **THREE (3) minutes** of flight time is up, the pilot shall land the flying machine immediately. If the total flight time taken is less than three (3) minutes, the best attempt total time will be recorded and used for consideration in the event of a tie situation.

4. **SCORING**

The referees or judges reserve the right to deduct points if the flying machines used in the Challenge are drastically different from the flying machines presented at the Presentation.

All scoring decisions made by the judges and referees are **FINAL**. For arbitrary cases, the organising committee will have the **FINAL** say.

4.1. **PRESENTATION SEGMENT (45 POINTS)**

The presentation plays an integral part for teams who wish to compete for the SAFMC Championship Award. In addition, the teams will be assessed for different awards listed in Section 2.

The judging criteria for the presentation are as follows:

Criteria	Areas of Consideration
Creativity	<p>Uniqueness in Appearance</p> <ul style="list-style-type: none">- Originality in the design of the flying machine, being one of its kind design.- Visually different, distinct, or appealing. <p>Innovative Design</p> <ul style="list-style-type: none">- Effect to brainstorm other ideas or ideas from unusual sources and trying to be different <p>Environmental Considerations</p> <ul style="list-style-type: none">- Knowledge of structural design that incorporates eco-friendly features or materials. <p>Functionality</p> <ul style="list-style-type: none">- Workable flying machines with unique features and designs.

<p>Theory of Flight</p>	<p>Lift Generation</p> <ul style="list-style-type: none"> - Wing Design that is able to generate sufficient lift such as the shape, size, and airfoil design. <p>Stability and Control</p> <ul style="list-style-type: none"> - Intelligent use of flight control surfaces in maintaining stability and control in flight. <p>Weight and Balance</p> <ul style="list-style-type: none"> - Consideration of the centre of gravity and Centre of lift. <p>Overall Design and Aerodynamic</p> <ul style="list-style-type: none"> - Knowledge of structural design and aerodynamic efficiency. - Show a video clip to showcase their flying capability.
<p>Presentation</p>	<p>Creativity</p> <ul style="list-style-type: none"> - “WOW” Presentation - Poster design <p>Fluency</p> <ul style="list-style-type: none"> - Time management and presentation sequence. <p>Confidence and Flair</p> <ul style="list-style-type: none"> - Savvy-ness knowledgeable responses to queries - Nervous/state of ease and relaxation - Showmanship and Presentation style

4.2. CHALLENGE SEGMENT (55 POINTS)

Scores shall be awarded to the team based on the sum of all points allocated to tasks completed by the flying machine during the flying mission.

There are **TWO (2) attempts ONLY** for the flying mission and the best score among the two attempts shall be taken as the final score. The time taken for each attempt to complete all the tasks will be taken into consideration if there is a tie-in score.

Flying Tasks	Allocated Points
<u>Taking-off</u> a. Proper roll take-off from the designated Take-off/landing area, or b. Hand Launch from designated take-off/landing area.	5 points or 3 points
Number of completed rounds through the 2 loops in sequence (e.g. Loop A followed by Loop B).	3 points per cycle (a maximum of 15 cycles)
Proper landing (touched down) onto the designated take-off/landing area.	5 points
Final Score	55 Points (Max)

5. FLOW OF EVENTS

On the scheduled competition day, teams shall proceed to the presentation segment followed by the challenge segment.

All teams shall be ready and report 15 minutes before their designated timeslot. Teams shall be guided by the SAFMC usher to their respective areas after they have reported for the competition.

5.1. PRESENTATION SEGMENT

Teams will present their built flying machine and learning journey to a panel of judges.

1. Upon registration, the team shall be ushered to the Presentation Holding Area.
2. The R/C transmitter shall be handed over and placed in a box provided by the SAFMC official to quarantine at the storage area.
3. Every team shall be ushered to the respective room for their presentation.
 - a. Besides the presentation, teams are required to:
 - i. Bring the flying machine to showcase to the panel.
 - ii. Present a video clip (15 seconds) to showcase the flying capability of the flying machine. The team shall bring their own laptop or tablet to showcase the short video clip.
4. After the completion of the presentation, the team shall proceed to the Inspection station.

5.2. CHALLENGE SEGMENT

Each team has TWO (2) attempts for the challenge course.

1. At the Inspection station, an SAFMC official shall check the flying machine for any violation of the category rules and regulations. Refer to Section 6 for more details provided.
2. The team will demonstrate to the SAFMC official the functionality of “¹Fail-safe” mode. Testing of “Fail-safe” mode is as follows:
 - a. Power up the system and verify the flying machine is functional.
 - b. Advance the throttle to allow the propeller(s) to start spinning and ensure normal control stick movements are observed.
 - c. Two conditions to trigger “Fail-safe” mode to stop the propeller(s) from operating:
 - i. Power off the R/C transmitter.
 - ii. Trigger “Fail-safe” mode switch on the R/C transmitter.
3. The team shall demonstrate to the SAFMC official the “Fail-safe” Test to qualify for the challenge segment.
4. At the Challenge Holding Area, the SAFMC referee will hand over the R/C transmitter back to the team for preparation while waiting for your turn for the competition.

DO NOT power on the R/C transmitter and flying machine until your team is told to set up the flying machine.

¹ A Fail-safe mode is a setup to disable the propeller(s) from operating when an emergency condition occurs. When “Fail-safe” mode is triggered, the servomotor driving the propeller is power-off and stopped spinning.

5. The team is given **THREE (3) minutes** to complete each attempt. The start of the attempt is defined as the flying machine performing a rolling take-off or hand launch from the Take-off/landing area inside the flight zone of the play field.
 - a. Points will be awarded according to Section 4.
 - b. During the attempt, **ONLY TWO (2) members** (the pilot and one (1) assistant) are allowed in the play field.
 - c. During each attempt, the team is given a maximum of **ONE (1) minute** to set up their flying machine. If the team is not ready to take off within the given time, the team is deemed to have executed and completed the attempt.
 - d. When the first attempt is completed, the team shall be given **THREE (3) minutes** to repair or prepare the flying machine for the second attempt.

An SAFMC referee will be with the pilot during the challenge attempt. The referee may give instructions to the pilot depending on the behaviour of the flying machine. The pilot is to comply immediately with all such instructions, which may include the activation of the failsafe to ground the flying machine.

6. During an attempt, the team is NOT allowed to change direction of flight (refer to Section 3.2).
7. If the flying machine touches the ground or hits any object within the play field during the attempt, the team can recover the flying machine and continue the challenge until it is non-airworthy.

8. During the recovery of the flying machine, the flight crew shall observe the following:
 - a. The pilot stationed in the pilot zone is to ensure the flying machine is throttled down (propeller(s) stopped spinning).
 - b. **ONLY** the assistant is allowed to enter the flight zone of the play field. The assistant can only relaunch the flying machine from its last landed location.
9. The completion of an attempt is described when the flying machine has:
 - a. landed back on the designated take-off/landing area when it has completed the obstacle course, or
 - b. landed outside the flying field, or
 - c. hit the safety net or barrier and cannot resume flight, or
 - d. declared it is non-airworthy by the challenging team, or
 - e. completed **THREE (3) minutes** of flight time.
10. Once the **THREE (3) minutes** of flight time is up, the pilot shall land the flying machine immediately. If the total flight time taken is less than three (3) minutes, the best attempt total time will be recorded and used for consideration in the event of a tie situation.
11. At the end of the challenge, the R/C transmitter of the flying machine **MUST** be switched off immediately. The team shall return the empty box and vacate the competition area immediately.

5.3. KEY RULES TO NOTE

Rules for personnel movement and communication during the setup time and the challenge attempt are dictated in the following points:

1. **ONLY TWO (2) members** of the participating team are allowed to be inside the play field at any one time.
2. **NO outside communication or assistance** from the audience/spectators is allowed at any point. **NO headphones or earpieces** are allowed to be worn by the operator/pilot. Communication among teammates is allowed. Teams who flout this rule may be removed from the competition.
3. During the recovery of the flying machine, the referee may follow the assistant into the flight zone to observe the safety of the assistant.
4. The other teammates are required to remain outside of the play field and be behind the safety net when the aircraft is airborne.
5. The team are responsible for the safe flying of their flying machine(s) for the duration of the entire competition. The referees reserve the right to ground the flying machine(s) of any team at any point in the competition.
6. All repairs/ maintenance/ troubleshooting should be done in the Repair Area. The teams who flout this rule may be removed from the competition.

6. TECHNICAL RULES & REGULATIONS

6.1. GENERAL RULES

Each team consists of TWO (2) to FIVE (5) students.

Each team is to design and build a radio-controlled flying machine based on the following guidelines:

1. Most parts of the fixed-wing plane or kite plane must be fabricated by the teams. NO kits or off-the-shelf flying models are allowed.
2. The fixed-wing plane or kite plane must be radio-controlled by off-the-shelf radio systems.
3. Only electric flight is allowed. Both brush and brushless motors are allowed. NO MODIFICATION to the motors is allowed.
4. NO internal combustion or gasoline engines shall be allowed.
5. Each participating team shall be allowed to bring up to TWO (2) IDENTICAL fixed-wing planes or kite planes into the competition hall.

6.2. RULES ON FIXED-WING PLANE OR KITE PLANE

Teams with interesting designs that may potentially infringe the written rules are strongly encouraged to send enquiry emails with pictures and descriptions to SAFMC@science.edu.sg with the title “[CAT C1] - Enquiries on Rules”.

6.3. DESIGN

- **NO Vertical Take-off Landing (VTOL)** flying machine is allowed.
- **NO balloon and airship design** will be allowed. No gaseous substance lighter than air will be allowed.
- The flying machine must **NOT EXCEED a maximum all-up weight (AUW) of 250 grams**.
- All flying machines **MUST either conduct rolling take-off or be hand-launched** at the flying field.

6.4. BATTERY

- There is no limit on the number of batteries used, in series or parallel.
- **ONLY** Lithium Polymer (Li-Po), Nickel Metal Hydride (Ni-MH) or Nickel Cadmium (Ni-Cd) batteries are allowed.

6.5. SPEED CONTROLLER

- **ONLY** an Electronic Speed Controller is allowed.

6.6. SERVO

- **ONLY** standard R/C servos are allowed. There is no limit on the number of servos used.