

Man-Machine
Challenge Booklet 2027

Organised by:

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MINDEF SINGAPORE

SAFMC 2027 CATEGORY MAN-MACHINE CHALLENGE BOOKLET CHANGE LOG

Version	Release Date	Description
1.0	21 Sep 2026	Official challenge booklet release
2.0	XX Nov 2026	Additional information on payload pickup (Section 3.3.4) New constraint on payload release (Section 3.3.5) Clarification on drone repair rules (Section 3.3.6) Addition of reporting details for presentation segment (Section 5.1) New section on equipment loan (Section 8)

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1. INTRODUCTION

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

For Category Man-Machine, each team, which consists of **TWO (2)** to **FIVE (5)** members, is expected to design and build at least **ONE (1)** drone equipped with a customised mechanism to perform payload pickup and delivery tasks.

2. CATEGORY MAN-MACHINE 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, and 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 Category Man-Machine is listed in the subsequent sections.

2.1. CHAMPIONSHIP AWARD

This is the pinnacle award any local team can win and is bestowed on the team that achieves the highest total score across all areas. For the Category Man-Machine, there will be **FIVE (5)** Awards: **ONE (1)** Championship Award winner and **FOUR (4)** runners-up. The scoring and weightage can be found in Section 4.

2.2. BEST INTERNATIONAL TEAM AWARD

This award is given to the best international team in Category Man-Machine. The SAFMC organising committee recognises that international teams can bring a wide spectrum of unique designs and innovations and would like to award the best international team in this category if the minimum standard is met.

2.3. JUDGES' COMMENDATION AWARD

This award is given out to Category Man-Machine teams exhibiting a high quality in design and/or performance. Teams that have won any of the top 3 prizes will not be considered for the Judges' Commendation Prizes. Overall scores may be taken into consideration for this award. Up to **TWO (2)** Judges' Commendation Awards may be given for the whole Category Man-Machine.

2.4. INSTAGRAM REEL CHALLENGE

2.4.1 CHALLENGE OVERVIEW

The Instagram Reel Challenge is a supplementary challenge and will **not** contribute to the teams' overall competition scores.

Show off your team's SAFMC experience through a viral Instagram reel! The reel with the most likes when the challenge concludes at the end of **9 April 2027** wins S$200 in vouchers!

2.4.2 REEL THEMES

Your reel must focus on **ONE (1)** of the following themes:

- Our Biggest Fail
- Our Biggest Challenge
- Our Innovation Journey

For a more engaging reel, teams are encouraged to:

- Keep the reel under **ONE (1)** minute
- Ensure a good hook within the first **TWO (2)** seconds

2.4.3 PARTICIPATION REQUIREMENTS

Participating teams are invited to showcase their SAFMC experience by creating and posting an Instagram reel. The qualifying reel with the highest number of likes as at **2359hrs on 9 April 2027, Singapore time**, will win the Instagram Reel Challenge.

The Instagram Reel Challenge is open only to teams participating in any of the following SAFMC 2027 categories:

- Man-Machine
- High-Speed Drone Flock
- Swarm

There will be **ONE (1)** winner from **each** category, and winning teams will receive **S$200 in vouchers**.

To qualify for the challenge, teams must fulfil **ALL** of the following requirements:

1. The reel must be posted using an Instagram account belonging to a member of the participating team.

2. The Instagram account must be set to **public**. Reels posted from private accounts will not be eligible, as the relevant engagement statistics cannot be viewed by the SAFMC organising committee.
3. The Instagram account must follow **@safmc_official**.
4. The reel must be posted on the account's feed from **15 to 24 March 2027, Singapore time**. **Reels posted outside this period will not qualify.**
5. The reel caption must include the team name.
6. The reel caption must include both hashtags: **#safmc** and **#safmcigchallenge**
7. When posting the reel, teams must use Instagram's collaboration function by selecting **Tag people > Invite collaborators** and inviting **@safmc_official** as a collaborator.
8. @safmc_official will accept qualifying collaboration invitations on **25 March 2027**.
9. The qualifying reel with the highest number of likes as at **2359hrs on 9 April 2027, Singapore time**, will be declared the winner.

Posting earlier within the submission period may provide teams with more time to receive likes before the challenge closes.

2.5. AWARDS & PRIZES

CATEGORY MAN-MACHINE				
Awards	**Medals**	**Trophy**	**Prize**	**Remarks**
Championship Award	✓	✓	$4,000	Cash
1st Runner Up	✓		$3,000	Cash
2nd Runner Up	✓		$2,000	Cash
3rd and 4th Runner Up	✓			
Best International Team Award	✓	✓	$4,000	Cash
Judge's Commendation Award	✓		$500	Voucher; Up to two teams can win this award
Instagram Reel Challenge			$200	Voucher

3. CATEGORY MAN-MACHINE MISSION

Teams are required to design at least **ONE (1)** drone equipped with a customised mechanism for payload pickup and delivery. Teams are allowed to have **TWO (2)** additional backup drones during the mission that are identical to the main drone, but only **ONE** (**1**) drone should be in flight at any point in time. The drone is to be controlled by a single team member, which will be designated as the pilot. The drone(s) can consist of customised or Commercial-Off-The-Shelf (COTS) products.

The detailed descriptions of the playfield, available tasks, as well as the scoring criteria are found within Section 3 and Section 4. Teams are advised to read through these sections in detail to develop a strategy and identify key design requirements before designing the drone(s) to execute the mission. The technical rules for the drone(s) are found in Section 6.

3.1. MISSION TASKS

This mission simulates the scenario of preparing a dish in a kitchen: ingredients must be collected from a pantry, transported to different cooking stations, and then put together at a serving counter.

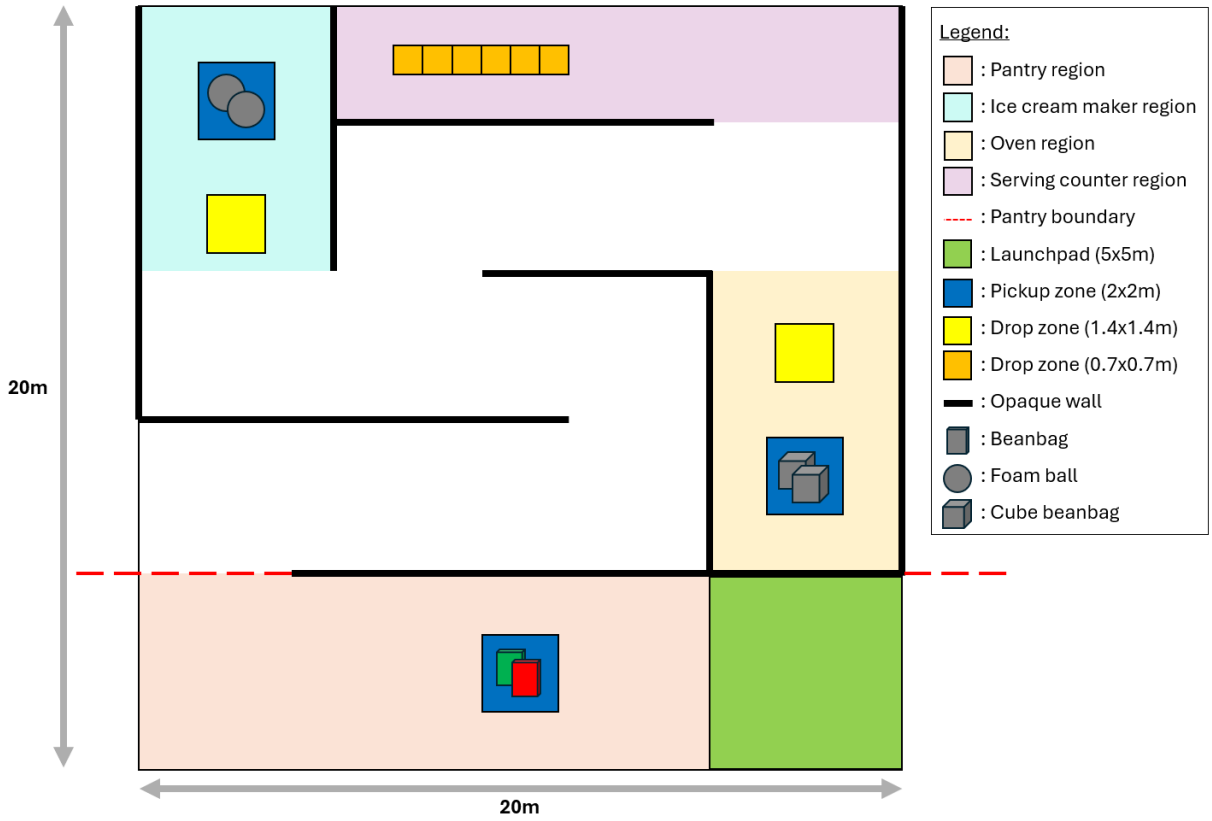
This requires the drone to pick up and deliver payload(s) of various shapes at the corresponding designated zones.

The key tasks of the mission are:

- **Pick up** green beanbags (sugar) from the pantry and **drop off** in the ice cream maker.
- **Pick up** foam balls (ice cream) from the ice cream maker and **drop off** in the serving counter.
- **Pick up** red beanbags (flour) from the pantry and **drop off** in the oven.
- **Pick up** cube beanbags (brownie) from the oven and **drop off** in the serving counter.

Tasks can be completed in any order, subject to the rules in Section 3.3.1.

3.2. PLAYFIELD



Top View of Playfield

The layout of the playfield is shown above. When referring to the above diagram, note that:

- The layout is **not drawn to scale and is FOR ILLUSTRATION PURPOSES ONLY.**
- The layout is **subject to change without notice**.
- The playfield dimensions are 20m x 20m.
- The minimum distance between wall-to-wall and wall-to-net is at least 3m.
- During the mission, no team member is allowed to cross the red dotted line, whether inside or outside of the netted area. Hence, the team **will not have line of sight** beyond the pantry region. This means the pilot must solely rely on the drone's camera to position the drone for payload pickup at the ice cream maker and oven.

- There will be **SIX (6)** payloads of each shape: green beanbags, red beanbags, foam balls and cube beanbags.

3.3. MISSION RULES

3.3.1 OBJECTIVES

The team's objective is to deliver as many payloads as possible to their appropriate drop zones.

Based on the principle that placing a raw item in the appropriate cooking station creates a cooked item, note the following:

- The green and red beanbags can be picked up at any time and in any order.
- Each successfully deposited green beanbag allows the team to pick up one foam ball. If the number of foam balls picked up exceeds the number of green beanbags deposited, the team would have to drop the excess foam balls before leaving the ice cream maker region.
- Each successfully deposited red beanbag allows the team to pick up one cube beanbag. If the number of cube beanbags picked up exceeds the number of red beanbags deposited, the team would have to drop the excess cube beanbags before leaving the oven region.

Foam balls and cube beanbags are to be deposited in the **SIX (6)** serving counters in a specific combination. This combination varies between rounds and will be announced at the start of each round.

Teams will be limited to a total of **SIX (6)** trips out of the pantry per mission attempt. A trip is counted each time a drone, regardless of whether it is carrying payload(s) or not, crosses the red dotted line and exits the pantry.

3.3.2 COMPETITION SEQUENCE

There will be two competition stages – qualifying stage and knockout stage.

For the qualifying stage, each team will perform the mission on their own in **TWO (2)** back-to-back attempts. If time does not permit, the number of qualifying attempts may be reduced to **ONE (1)** at the discretion of the referee. Each attempt consists of 15 minutes of setup time to perform any setup required for their drone(s) and payloads, immediately followed by 15 minutes of mission time to perform the mission. Teams are allowed to exceed the setup time, but the mission time will start regardless. Considering the best of two attempts, the **EIGHT (8)** teams with the highest number of points will proceed to the knockout stage.

For the knockout stage, teams will play against each other in a series of rounds. There is **ONE (1)** attempt per round, and the round ends when either team correctly fills all serving counters or 15 minutes of mission time is up, whichever is first. The team with the higher number of points will move on to the next knockout round.

3.3.3 PLATFORM AND FLIGHT

1. Teams are allowed to use up to **THREE (3)** identical drones for each mission attempt. Only **ONE (1)** drone can be in flight at any point in time.

a. All drone(s) must be placed in the Launchpad at the start of the mission.
b. If multiple drones are used, they must be of the same design and configuration including their pickup mechanism. Any differences must be approved by the Chief Referee.

2. Each drone **must not exceed 2.5kg** (inclusive of max capacity of carriable payloads), and measure **less than 1m** in any direction (includes maximum diameter of propeller circles).
   a. Teams are allowed to control their drone using any form of control method.
   b. The drone is not allowed to be fully autonomous.
3. Pilots are allowed to fly their drone using remote sensors (e.g. video link).
   a. The pilot will be confined to the pilot booth and will not have line of sight to the drone.
   b. The rest of the team must stay below the red dotted line that demarcates the pantry.
4. The drone(s) are not allowed to be in contact with the floor, except in the Launchpad and the pickup zones in the pantry, ice cream maker and oven.
5. Drone(s) cannot fly over or above the walls.

3.3.4 PAYLOAD PICKUP AND CARRIAGE

1. On the challenge day, teams will be provided the following payloads:
   a. **TWELVE (12)** regular beanbags (6 green, 6 red). The beanbags weigh 85g and measure 12cm along each side. They can be found at https://www.javysports.com/tossing-

aiming/452-834-bean-bags.html#/413-bean_bag-soft_pu_with_reinforced_stitching/414-quantity-set_of_4.

b. **SIX (6)** foam balls. The foam balls weigh 42g and have a diameter of 9cm. They can be found at https://javysports.com/foam-balls/778-multi-purpose-foam-ball-9cm-set-of-6.html.

c. **SIX (6)** cube beanbags. The cube beanbags weigh 30g and measure 6cm along each side. They can be found at https://javysports.com/tossing-aiming/795-1611-cube-bean-bags.html#/696-quantity-set_of_4.

2. Teams must ensure that their pickup and delivery system does not damage the payloads.

3. Drones are required to pick up payloads without direct human interaction other than through remote controlling devices. Pre-loading of payloads on drones is also not allowed.

4. The pickup system may comprise any of the following categories of parts, each subject to its own restrictions. A pickup system need not include every category.

   a. **Pickup mechanism:** the part permanently attached to the drone. The pickup mechanism is considered part of the drone, which must comply with all constraints in Section 3.3.3.

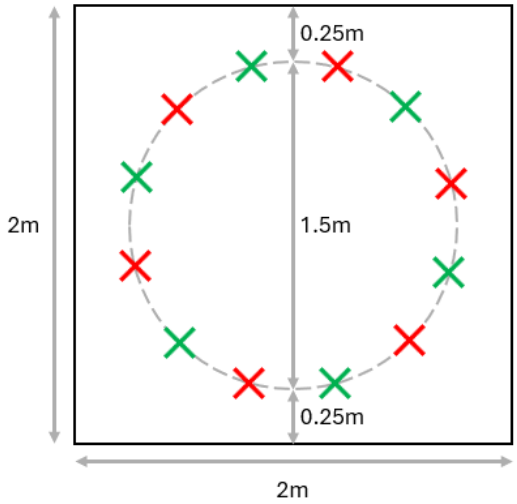
   b. **Payload carrier:** a container that holds **ONE (1)** payload. The carrier and payload must be picked up and delivered to the drop zone as one unit. The carrier must measure **at most 20cm** in any direction and weigh **at most 250g** (excluding payload). After the challenge, the payload must be removable from the carrier undamaged.

c. **Ground support equipment:** equipment that remains in contact with the ground at all times. It is not subject to the restrictions in 4a and 4b, but must be placed within the pickup zones.

5. The arrangement of payloads is as follows:

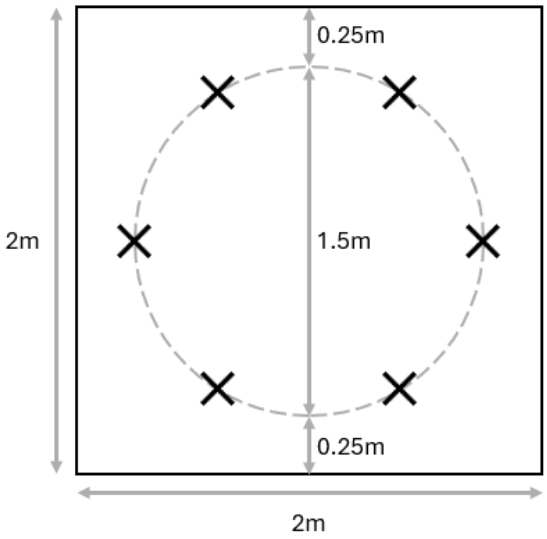
a. Pantry: **TWELVE (12)** beanbags must be equally spaced along the circumference of a **1.5m diameter circle** on the ground within the pantry pickup zone at the start of the challenge. The beanbags must be placed on the crosses as shown in the diagram below, **alternating between green and red**.

Pantry:



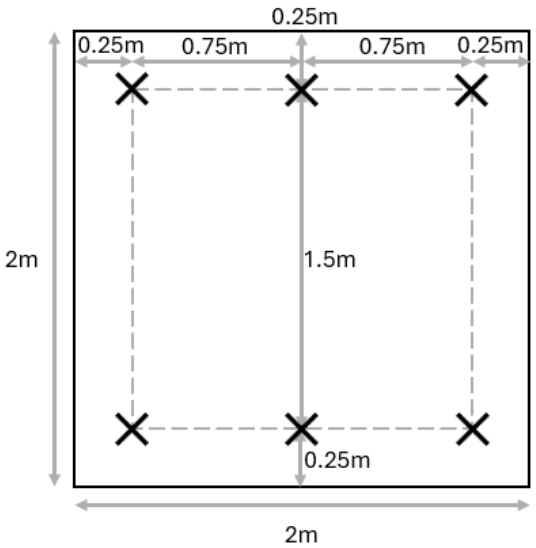
b. Ice cream maker: **SIX (6)** foam balls must be equally spaced along the circumference of a **1.5m diameter circle** on the ground within the ice cream maker pickup zone at the start of the challenge. The foam balls must be placed on the crosses as shown in the diagram below.

Ice cream maker



c. Oven: **SIX** (**6)** cube beanbags must be placed in a **3x2 arrangement** on the ground within the oven pickup zone at the start of the challenge. The cube beanbags must be placed on the crosses as shown in the diagram below.

Oven:



6. Before pickup, the lowest point of the payload (excluding any carrier) must be no more than **1cm** above the ground.
7. Once teams have started the mission, no direct human intervention to adjust the positions of the payloads is allowed.

8. Each drone may pick up its payload without landing. No direct human physical intervention is allowed when loading the payload. A single drone may carry multiple payloads.
9. Payloads must not be dragged on the ground outside the pantry and pickup zones.
10. No payload pickup is allowed outside of the pickup zones.

3.3.5 PAYLOAD RELEASE

1. Each payload must be released while the drone is in the air.
2. If the payload is released when the drone has landed, it will not count as a valid drop.
3. Payloads cannot be connected to one another and must be dropped **one at a time**.
4. If the payload does not land cleanly within a drop zone/serving counter, it will not be counted as a successful drop. Only the final position of the payload after it ceases motion will be used for scoring.

3.3.6 SAFETY AND ADMIN

1. Each team must consist of **TWO (2)** to **FIVE (5)** members.
2. Each team must comply with all applicable CAAS requirements. Any drone weighing more than 250 g must be registered and display a valid CAAS registration label. For drones above 1.5kg, the pilot must have completed UA Basic Training (UABT). Any disregard for CAAS regulations will result in **disqualification**.
3. All drones must be inspected by an SAFMC official before the team's competition slot.

4. The drone can only take off when there are no people within the playfield.
5. During the mission attempt, team members are allowed to enter the pantry region of the playfield to change flight batteries or bring drone(s) out of the playfield for repair. These drone(s) will be then reset at the Launchpad. However, mission time will continue. If any drone(s) malfunction or crash outside the pantry region, teams are only able to retrieve their malfunction/crashed drone(s) after the mission attempt ends. Team members may only enter the playfield after all drone(s) have landed and have been disarmed, **and** after getting permission from an SAFMC official.
6. In the case where all the drones in one of the teams are taken out of the game, the opponent has to continue to attempt to win the game. In the event that all the opponent's drones are also inoperable or if the mission time is up, the scores up to that point will be considered.
7. Teams with inoperable drone(s) are allowed to repair in between mission attempts. If the drone is deemed incapable of flight, a new identical copy of the drone can be used for the next attempt. There will be no restriction on the number of spare drones the team can prepare. However, only a maximum of **THREE (3)** drones can be used within each mission attempt.
8. In the knockout round, each team will be allocated one playfield by the referee, which will be separated from the other playfield by nets. If **any part** of the team's drone crosses to the other team's playfield, the offending team may be **disqualified** from the competition.
9. Only **digital** video transmitter (VTX) systems are allowed for the competition. Teams with analog VTX systems will be **disqualified**.
10. Teams are required to set their VTX to broadcast at a RaceBand frequency which will be allocated at the start of each race. Other

teams (not competing) are not allowed to turn on their VTX when a race is ongoing.

11. The allowable VTX power limit will be capped at 100 mW.
12. Teams are permitted to power on their drone(s) and VTX for testing during the set-up time but are not allowed to fly out of the Launchpad. No one is to be in the playfield while there is any airborne drone during this time. Offending teams will be **disqualified**.
13. At the start of the mission time, any drones that are not at the Launchpad will have to return to the Launchpad first before any action will be recorded. The mission time will continue to run throughout.
14. The radio transmitter must have an emergency kill switch to terminate the operation of all the drones, and teams are required to demonstrate this during inspection.
15. In case of doubt, the Chief Referee or the Category Man-Machine Technical Chairperson has the final decision. Any team that fails to comply with the above rules may be disqualified or prevented from participating at the discretion of the Chief Referee.

3.4. MISSION SCORING

The referees will make all scoring decisions and their decision is **final**. In case of any dispute, the Chief Referee will have the **final** say. Mission scores take up 40% of the total Championship Score.

For each regular beanbag delivered to the correct drop zone, 1 point will be awarded to the team.

For each foam ball or cube beanbag delivered to the correct drop zone, 2 points will be awarded to the team.

For every serving counter order fully completed, 2 bonus points will be awarded to the team.

For any food wrongly delivered, the item will be ignored in the computation of points. No points will be deducted.

For the knockout rounds, the team with more points will proceed to the next round. In the event of a tie, the team that took the shortest time to score their last point will proceed to the next round. Knockout rounds will continue until a single team is left standing and is declared the winner.
The mission score awarded to a team is dependent on their relative ranking, not the absolute number of points scored in any round. The winning team will receive the full mission score (40%). This will be followed by the 2nd team receiving 35%, the 3rd and 4th teams receiving 30%, the 5th to 8th teams receiving 25%, and the rest receiving 20% each.

3.5. PENALTIES

The sum of penalties will be deducted from the final mission score. The referees will make all scoring decisions and their decision is **final**. In case of any dispute, the Chief Referee will have the **final** say. Further correspondence will not be entertained.

LIST OF MISSION PENALTIES

S/N	DESCRIPTION	PENALTY
1	Exceeding the 15 minutes setup time for Category Man-Machine.	Mission time will start regardless.

2	Drone flying over or above the walls.	Referee's discretion or **disqualification**
3	Use of external markers/hardware outside of the playfield and pilot booths.	Referee's discretion or **disqualification**
4	Use of external markers/hardware outside of the pickup zones.	Referee's discretion or **disqualification**
5	Interrupting the competition by potentially interfering with other competitors, e.g. switching on your drone's VTX, transmitters, etc.	Referee's discretion or **disqualification**
6	Drone crossing into opposing team's playfield.	Referee's discretion or **disqualification**
7	Attempting to subvert competition rules or gain an unfair advantage over other teams, e.g. receiving assistance from spectators, etc.	Referee's discretion or **disqualification**

4. SCORING

There is a total of **FIVE (5)** scoring components for the competition, namely: Aerial Platform **(A)**, Creativity **(C)**, Learning Journey **(L)**, Team Challenge Video **(V),** and Mission **(M)**. The first four components (A, C, L, and V) will be assessed by our Category Man-Machine judges, while the Mission (M) factor will be computed as described in Section 3.4.

Scores will be awarded relative to the performance of other teams. Further details on the scoring components can be found below.

The weightage of the scoring components is listed as follows:

Segment	Factor	Weightage
Presentation	**A**erial Platform	20%
	Creativity	20%
	Learning Journey and Insight	10%
	Team Challenge **V**ideo	10%
Competition	**M**ission	40%
	Total	100%

4.1. AERIAL PLATFORM FACTOR (A)

The **Aerial Platform Factor (A)** will be awarded based on the ability of the teams to demonstrate a comprehensive understanding of the following areas and apply them when designing and constructing their flying machine. It carries a 20% weightage to the overall score.

No points will be deducted for wholesale usage of COTS products with little or no modification.

1. Platform Choice
    a. If a COTS product is used, teams are to explain:
        1. Choice of COTS products.
        2. Modifications to COTS products, in the form of payload mechanism.
    b. For custom-built drones, teams are to explain:
        1. Aerodynamic Design
        2. Centre of gravity placement
        3. Design factors affecting platform's flight stability, responsiveness, and controllability

4. Sizing for lift / thrust

2. Mechanical Design
    a. Quality of fabrication, workmanship, materials used
    b. Platform weight optimisation
3. Electronics Design
    a. Power / Battery sizing to meet mission objectives
    b. Explanation of choice of sensor suite for the given environment
    c. Explanation of choice of embedded computer / microprocessor
    d. Neatness of harnessing and aesthetics

4.2. CREATIVITY FACTOR (C)

The **Creativity Factor (C)** is based on:

1. What type of mechanism is used and how it is integrated with the drone to tackle the challenge.
2. How the different payloads are carried and how successful payload release/retrieval is achieved.

The above two criteria carry a 20% weightage to the total score. Teams are to explain in detail about the above during the presentation segment. Teams are also encouraged to utilise and present unique concepts.

4.3. LEARNING JOURNEY AND INSIGHT (L)

The **Learning Journey and Insight Factor (L)** is related to quality and content of the presentation. It carries a 10% weightage to the overall score.

1. Time management

- Finishing within the allotted time, with enough time allocated for each segment.

2. Delivery
   - Speakers are clear and concise.
   - Speakers are able to answer questions smoothly.
3. Content
   - Information presented is relevant to the flying machine and the team's project progress.
   - Team is able to explain the rationale behind design choices and major decisions.
   - Team is able to express what they have learnt through the process and their learning journey.
4. Teamwork
   - Presentation should highlight the work of all the team members, and how they have contributed and cooperated to the team.
5. Fun
   - Should be able to capture the attention of the judges.
   - The judges should enjoy your presentation.

4.4. TEAM CHALLENGE VIDEO (V)

The **Team Challenge Video (V)** scores provide a proof-of-flight insight into how the drone performs. It carries a 10% weightage to the overall score.

1) Flightworthiness
   - Drone must be shown to perform stable, sustained flight.

2) Mission-readiness
   - Demonstrate that drone(s) are shown to be able to fulfil mission requirements; retrieve different payloads, fly a route while

carrying the payloads and when the drone is hovering at a fixed point, able to release the payload successfully.

- Explain the on-board sensor suite for one of the drones to be used in the challenge segment.

3) Creativity

- How the mechanism is used to pick up the payloads and whether it can pick up multiple payloads.
- Delivery of video (i.e. how it is filmed/presented)

4.5. MISSION FACTOR (M)

The mission attempt scores will form the **Mission Factor (M)** score. Please refer to Section 3.4 for mission scoring and Section 3.5 for penalties. This carries a 40% weightage to the overall score.

5. FLOW OF EVENTS

Similar to real-world scenarios, teams may face unexpected issues during the competition. 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.

5.1. PRESENTATION SEGMENT

Teams are required to deliver their presentation **in-person to the assigned judges on the presentation day**. Teams are expected to be present in-person for the **full day**. All teams must participate in the Presentation Segment to receive a score for the presentation component of the competition.

1. Reporting Details

Teams are to report to Science Centre Singapore, Annexe Hall at 0830hrs on 9 April 2027 for the Presentation Segment.

2. Presentation Booth

Each team will be allocated a booth within the hall. The exact booth dimensions and specifications will be provided during the Q&A clinic session at a later date.

3. Presentation Booth Set-up

Teams will be given at least **20 minutes** to set up their presentation booth **on the presentation day.**

Presentation judging will commence after the booth set-up**.** Teams are required to complete their booth set-up before judging begins.

4. Power Supply

Each booth will be provided with **ONE (1) two-gang power socket**, allowing teams to connect up to **TWO (2) electrical devices** at any one time. For electrical and fire safety reasons, teams are strictly **not allowed to connect additional multi-plugs, power strips, or any other forms of electrical extensions**.

Failure to comply with this requirement will result in disqualification.

5. Presentation and Judging

Judges will visit each team's booth individually. Each team will be allocated a maximum of **TEN (10) minutes per visiting judge**, comprising:

- **SEVEN (7) minutes** for the team presentation; and
- **THREE (3) minutes** for Questions and Answers (Q&A).

Upon completion of each presentation and Q&A session, the visiting judge will award the team **ONE (1) completion stamp** to indicate that the session has been completed. The Presentation Segment will be considered complete only after the team has **collected ONE (1) completion stamp from each judge assigned to evaluate the team**.

Failure to obtain a completion stamp from every assigned judge will result in zero score for the Presentation Segment.

Please refer to **Section 4** for the scoring factors for the Presentation Segment.

6. Presentation Requirements

During the Presentation Segment, teams are required to:

1. Bring an aerial platform used during the Challenge to showcase to the judges.
2. Teams are to prepare **ONE (1)** presentation in the form of up to **TWO (2)** A0 posters OR up to **TEN (10)** slides. The time limit for the presentation is 7 minutes.

Teams may bring their own external monitor(s) for the presentation, provided that the setup is deemed **logistically feasible and does not pose any safety concerns**.

5.2. TEAM CHALLENGE VIDEO

Teams are to submit **ONE (1)** Team Challenge Video to the SAFMC organising committee. The video length should be no longer than **TEN (10)** minutes and should include the key components as stated in Section 4.

Videos should be uploaded to YouTube and set as "Unlisted". The link to the video should be sent to SAFMC@science.edu.sg with the subject: "[CAT MAN-MACHINE] - [Team Name] – Challenge Video" before the deadline. The deadline for submission is **28 February 2027, 2359hrs**. Video should be uploaded before the deadline, and any re-upload of the video detected past the deadline may result in **penalisation** or **disqualification**. You may write in to the SAFMC 2027 organising committee to request for a re-upload of the Team Video if necessary.

The weightage of penalisation is listed in the table below:

Submission Period	**Penalty**
Submission between **01 March 2027, 0000 to 07 March 2027,**	50% deduction of Team Challenge Video score

2359 (Both dates and time inclusive)	
Submission on **08 March 2027, 0000 and beyond**	Zero score for Team Challenge Video

The submitted video should adhere to the following guidelines:

1. Animations are **NOT** allowed to be used for the flight of the drone.
2. Computer-aided simulations may **NOT** be used to prove flightworthiness or mission-readiness.
3. Video must **NOT** be produced with the help of others outside of the team.
4. No offensive images or audio.
5. Narration and/or subtitles are allowed.
6. All videos must be original work conceived and created by the participants. No copyright materials (images, music, etc.) may be used in the video unless the participants own the copyright or have a license to use the material in the video.
7. If the participants have gained formal permission to use any copyright materials (images, music, etc.) under terms and conditions stipulated by the copyright owners, acknowledgements/credits must be included at the end of the video.
8. The use of logos including known commercial brands, institutional crests or trademarks, unless integral to the project, is not allowed.
9. Ownership of the underlying intellectual property of the video remains with the participant(s) of the individual/team project, with the following exception:

a. Participant(s) grant the SAFMC organising committee the right to use, distribute and display their videos without further compensation or notification to the participant(s).

b. Participant(s) grant the SAFMC organising committee the right to use their images and videos for publicity and advertising without further compensation or notification to the participant(s).

5.3. CHALLENGE SEGMENT

Teams are expected to comply with the following during the competition segment:

1. Teams are advised to arrive at least **TEN (10)** minutes before any allocated timing. Latecomers may have their mission times shortened or may be **disqualified**.
2. At the allocated timing in the competition schedule, the team shall report to the safety inspection point. An SAFMC official will check the drone(s) for any violation of the category rules and regulations. Teams who do not pass the inspection will **not** be allowed to fly their drone in the challenge segment and may face **immediate disqualification** from the competition. The inspection will include, but is not limited to, the following checks:
    a. The maximum take-off weight (MTOW) and size of the drone.
    b. RC / datalink / video link transmitter and receiver are operating on allowed frequencies.
    c. Electrical harnessing should be appropriately insulated and should not be chafed or broken. No exposed wires and connectors are permitted.

d. All major assemblies and critical components must be securely fastened to the drone; loose items should be tied down and kept away from the propellers.

e. The drones must demonstrate failsafe capability in the **event of a loss of link** between the RC/GCS and the drone. The failsafe check procedure is as follows:

   1. All propellers and releasable payloads are to be removed from the drones.
   2. Flight motors will be armed and throttled up.
   3. While the motors are still spinning in the same flight mode, the RC transmitter(s) / GCS router(s) will be switched off to simulate a link loss.
   4. All motors should come to a **complete stop immediately**. The drones should **not** attempt a hover / controlled descent / to return home.

f. An SAFMC official will be with the pilot during the mission attempt. The official may give instructions to the pilot depending on the behaviour of the drone (e.g. to land immediately if the drones appear to be uncontrollable). The pilot is to comply immediately with all such instructions, which may include the activation of the failsafe to ground the drones.

g. The drones must demonstrate **failsafe capability** upon **pilot command**. The failsafe check procedure is as follows:

   1. All propellers and releasable payloads are to be removed from the drones.
   2. Flight motors will be armed and throttled up.
   3. While the motors are still spinning in the same flight mode, the pilot must be able to activate a kill-switch.

4. All motors should come to a **complete stop immediately**. The drones should **not** attempt a hover / controlled descent / to return home.

h. Failsafe capability for the DJI Tello drones will be the OEM default failsafe logic. Any tampering or modifying of the OEM failsafe logic (unless to meet Point 2(e) and Point 2(g)), will result in a **disqualification**. Tello drones are exempt from Point 2(e) and Point 2(g), because:

1. The Tello SDK does not allow for the expected failsafe behaviour to be configured.
2. DJI Tello drones do not allow motors to function when propellers are removed.

i. At the end of each mission attempt, the radio control transmitter, datalink transceiver, video receiver and any other wireless device for the drones must be switched off.

5.4. KEY RULES TO NOTE

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

1. Only members of the participating team are allowed to be inside the playfield during their allocated 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 pilot. Teams who flout this rule may be **disqualified**. Communication amongst teammates is allowed. The Referee may require teams to surrender all communication devices for the duration of their challenge attempt.

3. The netted playfield **must** be clear of persons whenever any drone(s) are armed or in flight.
4. If any drone(s) are **connected to batteries**, persons entering the netted playfield **must** don the appropriate Personal Protective Equipment (PPE), which will be provided.
5. Team members may only enter the playfield after all drone(s) have landed and have been disarmed, **and** after getting permission from SAFMC officials.
6. Multiple video **receivers** are allowed. Only **ONE (1)** video transmitter is allowed for each drone.
7. No radio control transmitters, datalink transmitters and video transmitters and receivers are to be switched on within the competition venue, unless permitted to do so in the holding area or playfield. All repairs / maintenance / troubleshooting should be done in pit-stop mode. Non-compliance may lead to **disqualification**.
8. There will be a charging space allocated for teams to charge their batteries. Teams will have to bring their own charger/charging equipment should they plan to charge their batteries. At any point, there **MUST** be at least **ONE (1)** team member overseeing the charging. Failure to do so will result in **disqualification**.
9. Teams shall make sure that their designated representatives are contactable throughout the competition.

6. TECHNICAL RULES & REGULATIONS

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

1. Off-the-shelf products and components are allowed in the competition.
2. For safety considerations, the total weight of the flying machine **must not exceed 2.5kg** (including maximum number of payloads).
3. The platform **must measure less than 1 m** in any direction (this measurement includes the maximum diameter of the propeller circles).
4. Teams can bring similar backup components to repair any drones that have become incapable of flight.
5. Only electric-based flight propulsion is allowed. Both brushed and brushless motors are allowed. No modification to the motors is allowed.
6. No internal combustion or gasoline engines are allowed.
7. No tethering or umbilical wires to the drones are allowed during flight.

6.1. AVIONICS SYSTEM

There is no limit on the number of inertial measurement units (IMUs), flight controllers (FCs), and other electronics used in the drone(s). The only exception is the video transmitter, where only **ONE (1)** is allowed for each drone.

6.2. BATTERY

There is no limit on the number of batteries used, in series or parallel. Participants should size their batteries and drones appropriately for the respective mission. Lithium-Polymer (LiPo) batteries are preferred. Batteries must be properly strapped or locked onto the drones before launch.

7. STARTER KIT

Each team will be provided with **ONE (1)** starter kit from the Organising Committee. The starter kit is intended to support teams in preparing for and participating in the competition.

Starter kits will only be delivered to local Singapore addresses. Teams residing overseas may collect their starter kit in Singapore at a designated collection location, which will be communicated separately.

The final day for collection of the starter kit is **9 April 2027**. All starter kits that are not collected by the stipulated date will be considered forfeited.

The items provided in the starter kit are intended to assist participating teams in preparing for the Challenge. Use of the starter kit items is optional, and teams may choose to use only the items that are relevant to their preparation and execution of the Challenge.

8. EQUIPMENT LOAN

Each team is eligible to loan **ONE (1)** Digital VTX + VRX set for use during the competition. Details of the provided VTX and VRX can be found at: https://www.caddxfpv.com/products/walksnail-ascent-vrx-with-lite-vtx-kit. Teams will have to collect the set in-person during the Q&A clinic, and they are required to return it on the presentation day. Teams that wish to loan this VTX + VRX set should indicate so on the registration form.

It is the team's responsibility to thoroughly test and configure the provided VTX and VRX. The SAFMC Organising Committee is not liable for any VTX/VRX failure before and during the competition.