

Common Rules & Regulations

Challenge Booklet 2027

Organised by:

DSO NATIONAL LABORATORIES

SCIENCE CENTRE singapore

Supported by:

MINDEF SINGAPORE

SAFMC 2027 Common Rules and Regulations CHANGE LOG

Version	Release Date	Description
1.0	21 Sep 2026	Official challenge booklet release

SAFMC 2027 COMPETITION SCHEDULE

Date	Event	Platform/Venue
28 February 2027	Team Challenge video submission (For Categories Man-Machine Teaming, High-Speed Drone Flock and Swarm)	Email
25 March 2027	Category Radio Control Flight – Fixed Wing: Challenge	Annexe Hall, Science Centre Singapore
29 March & 30 March 2027	Category High-Speed Drone Flock: Challenge	
30 March to 1 April 2027	Category Man-Machine Teaming: Challenge	
2 April & 5 April 2027	Category Paper Planes: Presentation & Challenge	
2 April & 5 April 2027	Category Smart Drones Beginner: Presentation & Challenge	
2 April & 5 April 2027	Category Smart Drones Intermediate: Challenge	
31 March & 1 April 2027	Category Swarm: Challenge	Marquee Hall, Science Centre Singapore Note: Registration at Annexe Hall
5 April 2027	Category First Person View Flight – Advanced: Challenge	
6 April & 7 April 2027	Category First Person View Flight – Novice: Challenge	
6 April & 7 April 2027	Category Unpowered Gliders: Presentation & Challenge	Annexe Hall, Science Centre Singapore
9 April 2027	Combined Presentation for Category Unpowered Gliders, Smart Drones Intermediate, RC Fixed Wing, Man-Machine Teaming, High-Speed Drone Flock and Swarm	
17 April 2027	Awards Presentation Ceremony	

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1. INTRODUCTION

The Singapore Amazing Flying Machine Competition (SAFMC) is an exciting and unique event organised by DSO National Laboratories and Science Centre Singapore and supported by Ministry of Defence (MINDEF). Open to all schools and participants who are keen to explore the science behind flight and create their very own flying machines, this annual competition promises a fun-filled learning journey with special talks, workshops and live demonstrations.

2. CATEGORIES AND SPECIFIED EDUCATIONAL LEVELS

CATEGORY PAPER PLANES *(Primary Schools)*

Each team must consist of TWO (2) to THREE (3) members.

Design and fold paper planes to achieve the longest, farthest or most accurate flight.

CATEGORY SMART DRONES[1] *(Primary Schools / Secondary Schools / Integrated Programme Year 1-4, Junior Colleges)*

Each team must consist of TWO (2) to FOUR (4) members.

Work as a team to code your programmable drone to perform tasks under given mission scenarios.

CATEGORY UNPOWERED GLIDERS *(Secondary Schools / Integrated Programme Year 1-4)*

Each team must consist of TWO (2) to FIVE (5) members.

Design and build small unpowered bungee-launched gliders to achieve the farthest and most precise flight.

[1] At least 30% of the registered team members must be Singapore Citizens.

CATEGORY RADIO CONTROL (RC) FLIGHT - FIXED WING *(Secondary Schools / Integrated Programme / Junior Colleges / Institute of Technical Education)*

Each team must consist of TWO (2) to FIVE (5) members.
Design and build a small remote-controlled fixed-wing air platform to navigate an obstacle course.

CATEGORY FIRST PERSON VIEW (FPV) FLIGHT - NOVICE *(All Schools)*

Each team must consist of ONE (1) to TWO (2) members.
Bring, or design and build, a ducted (shielded propeller) FPV drone to compete in an obstacle course.

CATEGORY FPV FLIGHT - ADVANCED *(All Schools)*

Each team must consist of ONE (1) member.
Bring, or design and build, a FPV drone to compete in an obstacle course.

CATEGORY MAN-MACHINE TEAMING *(Integrated Programme/ Junior Colleges/ Polytechnics / Universities)*
Each team must consist of TWO (2) to FIVE (5) members.
Design and build ONE (1) to THREE (3) drone(s) equipped with a customized mechanism to perform payload delivery tasks.

CATEGORY HIGH-SPEED DRONE FLOCK[1] *(Integrated Programme/ Junior Colleges/ Polytechnics /Universities)*
Each team must consist of TWO (2) to TEN (10) members.

Design or acquire TWO (2) to THREE (3) autonomous small air platforms capable of fast coordinated flight through an indoor course.

[1] At least 30% of the registered team members must be Singapore Citizens.

CATEGORY SWARM[1] *(Integrated Programme/ Junior Colleges/ Polytechnics /Universities)*

Each team must consist of TWO (2) to TEN (10) members.

Bring, or design and build, a swarm of TEN (10) to TWENTY-FIVE (25) drones to compete in a search-and-rescue mission.

3. GENERAL RULES

1. The deadline for registration is **12 February 2027**.
2. Each category has a maximum capacity. Registration for a category will close immediately once that capacity is reached, even if this occurs before the stated deadline. Submission of a registration form or payment of any fee does not guarantee acceptance into the competition.
3. Participants registered under a school must be a full-time student at the point of competition.
4. Home-schooled participants from Singapore and teams consisting of participants from different schools in Singapore should be registered as “Independent” teams.
5. A team’s participation is confirmed only when the Team Manager receives an official acceptance email from the Organiser. Applications will be assessed and places allocated in accordance with the published registration and allocation policy.
6. Each person can only participate in one team within a category. However, the person can participate as a member in different categories, i.e. a person can be a member of a team in Category

Unpowered Gliders and another team in Category RC Flight – Fixed Wing but the person cannot be a member for two teams in Category Unpowered Gliders.

[1] At least 30% of the registered team members must be Singapore Citizens.

7. Teams are allowed to take part in categories beyond the specified educational level, i.e. Primary school students are allowed to take part in Category Unpowered Gliders, Category Swarm, etc.
8. Participants of Category FPV Flight - Novice are not eligible to participate in Category FPV Flight – Advanced, and vice versa.
9. Members and immediate family members of the SAFMC organising committee are not allowed to participate in the SAFMC.
10. The SAFMC organising committee reserves the right to amend the rules and regulations. In the event of changes, all teams will be informed at least **FOUR (4)** weeks prior to the start of the competition.
11. Prizes will be issued to the Team Manager.
12. Prizes may not be given out if the minimum standard is not met or if there are insufficient participants. The SAFMC organising committee will have the final say and the decision made is final.
13. A safety perimeter net will be set up around the play field at the competition venue. This includes a top net which will limit the maximum flight altitude of flying machines. During the challenge attempts, teams are encouraged to fly their flying machine(s) away from the net to avoid accidental entanglement.
14. The SAFMC organising committee will not be held responsible for any damage to or the loss of any flying machine(s) throughout the entire competition.

15. Participants are responsible for their flying machine(s) for the duration of the entire competition. The SAFMC organising committee reserves the right to ground the flying machine(s) of any team at any point in the competition.

16. For queries regarding the competition, please send an email with the subject line stating the category in question *(e.g.: [Category Swarm] - Clarification about task locations)* to the following email address: SAFMC@science.edu.sg

4. FORMAT OF COMPETITION

1. Once the teams have confirmed their registrations for the competition, they are expected to start work on the different segments of the competition - the Challenge and the Presentation. For Categories FPV Flight – Novice and Advanced, there will be no presentation segment.

2. Teams are encouraged to provide equal attention to both the challenge and the presentation segments.

3. The top team from each category will be presented with the Championship Award at the SAFMC 2027 Awards Presentation Ceremony.

4. 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.

4.1. PRESENTATION SEGMENT

1. Teams will be allocated a specific time slot to showcase their flying machine(s) physically during the challenge day. Teams will present their flying machine design and learning journey to a panel of judges and be assessed for several awards.
2. The presentation segment is essential for teams who wish to compete for the SAFMC Championship Award. Teams that do not show their flying machines during the presentation segment may be penalised on their presentation segment. The detailed requirements for the presentation segment can be found in the challenge booklets of the respective categories.
3. The Chief Referee or Judge for each category reserves the right to deduct points if the flying machine(s) used in the challenge segment are materially different from the flying machine presented at the presentation segment.

4.2. CHALLENGE SEGMENT

1. Teams are required to design, build and fly their flying machines to overcome various challenges for the different SAFMC categories. The challenge segment constitutes the actual in-venue flight on the challenge day. For Categories Man-Machine, High-Speed Drone Flock and Swarm, it will also consist of a team video challenge.
2. The team video challenge serves as a prelude to the team’s flying machine(s) capabilities and flightworthiness. The challenge day allows teams to accomplish the mission tasks in a live capacity in front of an audience.

3. On the challenge day, tables will be provided within the main competition venue for teams to work on their flying machines. Alternatively, teams may be assigned a designated area instead.

4. Teams should expect the following during the challenge day:

   a. Only registered team members of the participating teams can enter the team booths/holding areas.

   b. Only registered members of the participating team may enter the pilot booths or playfield, and only with the permission of the competition officials.

   c. Teams are expected to fully comply with safety rules. Failure to comply with safety rules after the initial warning will result in **immediate disqualification** and/or exclusion from future SAFMC competitions. The SAFMC organising committee will not be responsible for any injuries or mishaps if any participant has disregarded the safety rules.

   d. No trial flights will be allowed in the play field unless specified by the officials.

   e. By registering for the competition, the participants acknowledge that there will be variations in environmental conditions between teams, despite best efforts to control them.

   f. For all Categories involving RC flight, all flying machines and their transmitting devices must be presented to SAFMC officials for inspection upon arrival.

   g. For all Categories involving RC flight, video transmitting devices, including spares, must not be powered on in the competition venue unless specified by the SAFMC officials. Teams may request for approval from the Chief Referee or

the Category Technical Chairperson to perform power-on checks.

5. IMDA REGULATIONS

1. Adherence to guidelines published by Infocomm Media Development Authority (IMDA) will help ensure safe operation of the flying machines and transmitting devices used during SAFMC.
2. The Singapore Spectrum Management Handbook (Chapter 7, Issue 1 Rev 2.16, June 2022) provides the full list of approved radio frequencies and corresponding power limits. Users are exempted from IMDA's licensing requirements if their devices are operated within the approved guidelines. The limits stated in this section are regulatory limits. Where a category booklet specifies a lower competition limit, the lower competition limit shall apply.

5.1. RADIO CONTROL (RC) AIRCRAFT

1. RC aircraft typically contains short range devices (SRDs) for purpose of control or communication to other devices.
2. The following are the commonly used radio frequencies and their corresponding approved power limits.
    a. 433.05 - 434.79 MHz, ≤ 10mW Effective Radiated Power (ERP)
    b. 2.4000 - 2.4835 GHz, ≤ 100mW Equivalent Isotropically Radiated Power (EIRP)
    c. 5.725 – 5.850 GHz, ≤ 100mW EIRP

3. Please refer to the *Singapore Spectrum Management Handbook* on the IMDA website for more details on the spectrum allocation and for the latest approved range of frequencies.

5.2. DATALINK / VIDEOLINK / WIRELESS LINK TYPES

1. The following frequencies are approved by IMDA for radio telemetry:
    a. 433.05 - 434.79 MHz, ≤ 10mW ERP
    b. 866 - 869 MHz, ≤ 500mW ERP
    c. 920 – 925MHz, ≤ 2000mW ERP
2. Wireless Wi-Fi routers will be allowed in this competition. Participants are to bring their own wireless routers.
3. Setup of external wireless device(s) is / are allowed. However, teams can only turn on their wireless routers and transmitters during the setup and flight phases (same restriction as RC transmitters).
4. The following frequencies are approved by IMDA for wireless data communications / video transmitters / LAN:
    a. 72.080, 72.200, 72.400, 72.600 MHz, ≤ 1000mW ERP
    b. 158.275 / 162.875 MHz, ≤ 1000mW ERP
    c. 158.325 / 162.925 MHz, ≤ 1000mW ERP
    d. 2.4000 - 2.4835 GHz, ≤ 200mW EIRP
    e. 5.150 - 5.350 GHz. ≤ 200mW EIRP
    f. 5.470 - 5.725GHz, ≤ 1000mW EIRP
    g. 5.725 – 5.850 GHz, ≤ 4000mW EIRP
    h. 10.50 – 10.55 GHz, ≤ 117dBμV/m @ 10m

i. 24.00 – 24.25 GHz, ≤ 100mW EIRP

j. 57 – 66 GHz, ≤ 10W EIRP

5. Please refer to the *Singapore Spectrum Management Handbook* on the IMDA website for more details on the spectrum allocation and for the latest approved range of frequencies.

5.3. ULTRA-WIDEBAND (UWB) DEVICES

1. The following frequencies are approved by IMDA for UWB devices:
   a. 3.4 – 4.8 GHz
   b. 4.2 – 4.8 GHz
   c. 6 – 8.5 GHz
2. The following are the allowable radiated emission limits by IMDA for UWB devices:

Frequency Range (GHZ)	Max mean e.i.r.p. density (dBm/MHz)	Max peak e.i.r.p. density (dBM/50 MHz)
Below 1.60	- 90	- 50
1.60 – 2.70	- 85	- 45
2.70 – 3.40	- 70	- 36
3.40 – 4.20	- 70 (2)	- 30
4.20 – 4.80	- 41.3	0
	(To be replaced by more restrictive conditions beyond 31 Dec 2010.)	
4.80 – 6.00	- 70	- 30
6.00 – 8.50 (1)	- 41.3	0
8.50 – 10.60	- 65	- 25
10.60 – 21.65	- 85	- 45
21.65 – 29.50	- 41.3	0
29.50 – 77.00	- 85	- 45

77.00 – 81.00	- 3	55
Above 81.00	- 85	- 45

(1) The extension of this band from 6.0 to 9 GHz is also acceptable in the light of potential new applications.

(2) UWB devices with mitigation techniques are allowed to operate at a level of -41.3 dBm/MHz in the band from 3.4 to 4.2 GHz (with peak level emissions in 50 MHz bandwidth not exceeding 0 dB e.i.r.p.). Otherwise, the emission limit is capped at 70 dBm/MHz.

3. Please refer to the Technical Specification for UWB Devices on IMDA website for more details on the spectrum allocation and for the latest approved range of frequencies.

6. CAAS REGULATIONS

1. Participants are to ensure that they have registered their aircraft if the weight exceeds 250g.
2. For educational purposes, if the total weight of the aircraft exceeds 1.5kg, but is less than 7kg, a UA Basic Training Certificate or a UA Pilot License is required.
3. Please refer to the UA Regulatory Requirements on the CAAS Website for more details on Unmanned Aircraft regulations.