

High-Speed Drone Flock

Challenge Booklet 2027

Organised by:

DSO NATIONAL LABORATORIES

SCIENCE CENTRE singapore

Supported by:

YANG PERTAMA DAN UTAMA
MINDEF SINGAPORE

SAFMC 2027 CATEGORY HIGH-SPEED DRONE FLOCK

CHALLENGE BOOKLET CHANGE LOG

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

CONTENTS

1. INTRODUCTION 5
2. CATEGORY HIGH-SPEED DRONE FLOCK AWARDS 5
   2.1. CHAMPIONSHIP AWARD 6
   2.2. JUDGES' COMMENDATION 6
   2.3. INSTAGRAM REEL CHALLENGE 6
   2.4. PRIZES 9
3. CATEGORY HIGH-SPEED DRONE FLOCK MISSION 9
   3.1. MISSION TASKS 10
   3.2. PLAY FIELD 11
      3.2.1 LAYOUT 11
      3.2.2 GATES 12
      3.2.3 START/END ZONE 13
   3.3. MISSION RULES 15
      3.3.1 GENERAL 15
      3.3.2 NAVIGATIONAL AIDS 17
      3.3.3 SAFETY 18
   3.4. MISSION SCORING 19
   3.5. PENALTIES 23
4. OVERALL SCORING 24
   4.1. TEAM CHALLENGE VIDEO (V) 25
   4.2. TEAM LIVE PRESENTATION (P) 25
      4.2.1 PROPOSED STRATEGY 26
      4.2.2 LEARNING OUTCOMES AND INSIGHTS 26
   4.3. MISSION (M) 26

5. FLOW OF EVENTS 27
5.1. PRESENTATION SEGMENT 27
5.2. TEAM CHALLENGE VIDEO 29
5.3. CHALLENGE SEGMENT 31
5.4. KEY RULES TO NOTE 33
6. TECHNICAL RULES & REGULATIONS 35
6.1. AVIONICS SYSTEM 36
6.2. BATTERY 36
7. STARTER KIT 36
ANNEX A 37
ANNEX B 39

1. INTRODUCTION

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

For Category High-Speed Drone Flock[1], teams of **TWO (2) to TEN (10)** members are expected to design and build **TWO (2) to THREE (3)** drones capable of executing autonomous flight in a circuit as a coordinated high-speed flock.

At least 30% of the team members must be Singapore Citizens. For example, a team of SEVEN (7) members must include at least THREE (3) Singapore Citizens.

2. CATEGORY HIGH-SPEED DRONE FLOCK 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 High-Speed Drone Flock is listed in the subsequent sections.

2.1. CHAMPIONSHIP AWARD

This is the pinnacle award any team can win and is bestowed on the team that achieves the highest total score across all areas. For Category High-Speed Drone Flock, 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. JUDGES' COMMENDATION

This award is given out to Category High-Speed Drone Flock 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 Prizes may be awarded for the whole Category High-Speed Drone Flock.

2.3. INSTAGRAM REEL CHALLENGE

2.3.1 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!

2.3.2 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

2.3.3 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 winning team will receive **S$200 in vouchers**.

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

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.

2.4. PRIZES

CATEGORY HIGH-SPEED DRONE FLOCK				
Awards	**Medals**	**Trophy**	**Cash Prize**	**Remarks**
Championship Award	✓	✓	$15,000	Cash
1st Runner Up	✓		$7,500	Cash
2nd Runner Up	✓		$5,000	Cash
3rd and 4th runners up	✓			
Judge's Commendation	✓		$500	Voucher, up to two teams can win this award
Instagram Reel Challenge			$200	Voucher

3. CATEGORY HIGH-SPEED DRONE FLOCK MISSION

Teams are required to design a system that consists of a flock of **TWO (2) to THREE (3)** drones to autonomously navigate through a known indoor course, flying through a series of gates in a sequence determined by the team as quickly as possible whilst staying together as a group

The detailed descriptions of the play field, mission tasks, as well as the scoring criteria are found in Section 3.4. Teams are advised to read through these sections in detail to develop a strategy and identify key design requirements, before designing the drones to execute the mission. The technical rules for the drones are found in Section 6.

3.1. MISSION TASKS

The mission requires the flock of drones to fly through a series of gates in a sequence determined by the team, as fast as possible while staying together as a group. All drones in the flock must follow the same gate sequence.

The key phases of the mission are:

1. Take off from within the START/END Zone.
2. Begin the lap by passing through either START/END gate.
3. Fly through the required play field gates in the sequence determined by the team as quickly as possible.
4. Stay together as a flock while flying through the gates.
5. Complete the lap by passing through either START/END gate.

3.2. PLAY FIELD

3.2.1 LAYOUT

The layout of the play field is shown in Figure 1. The play field is approximately 20m x 20m with safety nets surrounding the perimeter.

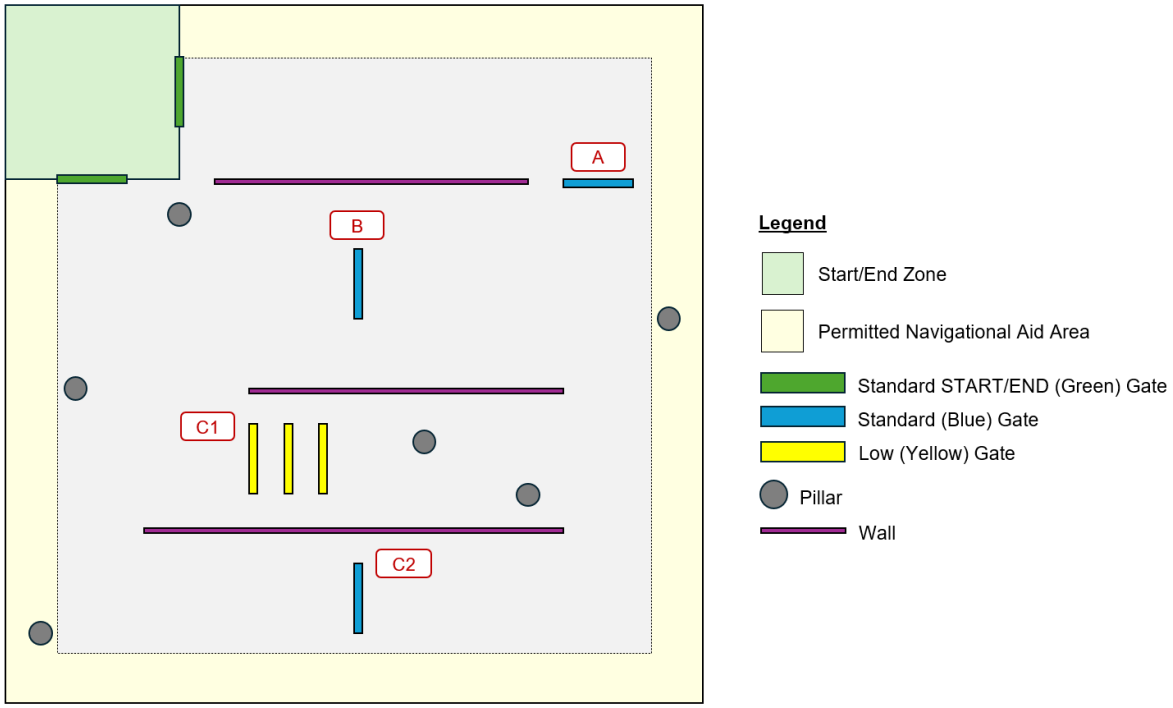


Figure 1 – Overall Play Field Layout

When referring to the above diagram, note that:

- The layout is **not drawn to scale**.
- The play field will be set up following the measurements shown in Figure 5 in ANNEX A.
- An enlarged version of the Figure 1 play field is included in ANNEX A.

The approximate dimensions of the play field elements are shown below.

Play Field Element	**<u>Approximate</u> Dimensions**
Start Area	5m x 5m
Centre Walls	• 2x 9m Length x 2.5m Height • 1x 11m Length x 2.5m Height
Perimeter Net	20m x 20m along the perimeter of the play field
Gates	See Section 3.2.2

3.2.2 GATES

There will be THREE (3) types of gates positioned around the play field: Green START/END Gates, Blue Play Field Gates and Yellow Play Field Gates

START/END Gates

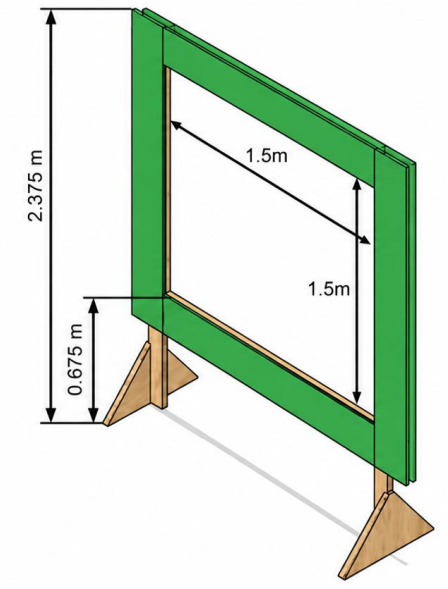


Figure 2 – START/END Gates in green

START/END gates, illustrated in Figure 2, will be positioned along the perimeter of the START/END area as shown in Figure 1.

Play Field Gates (A, B, C1 and C2)

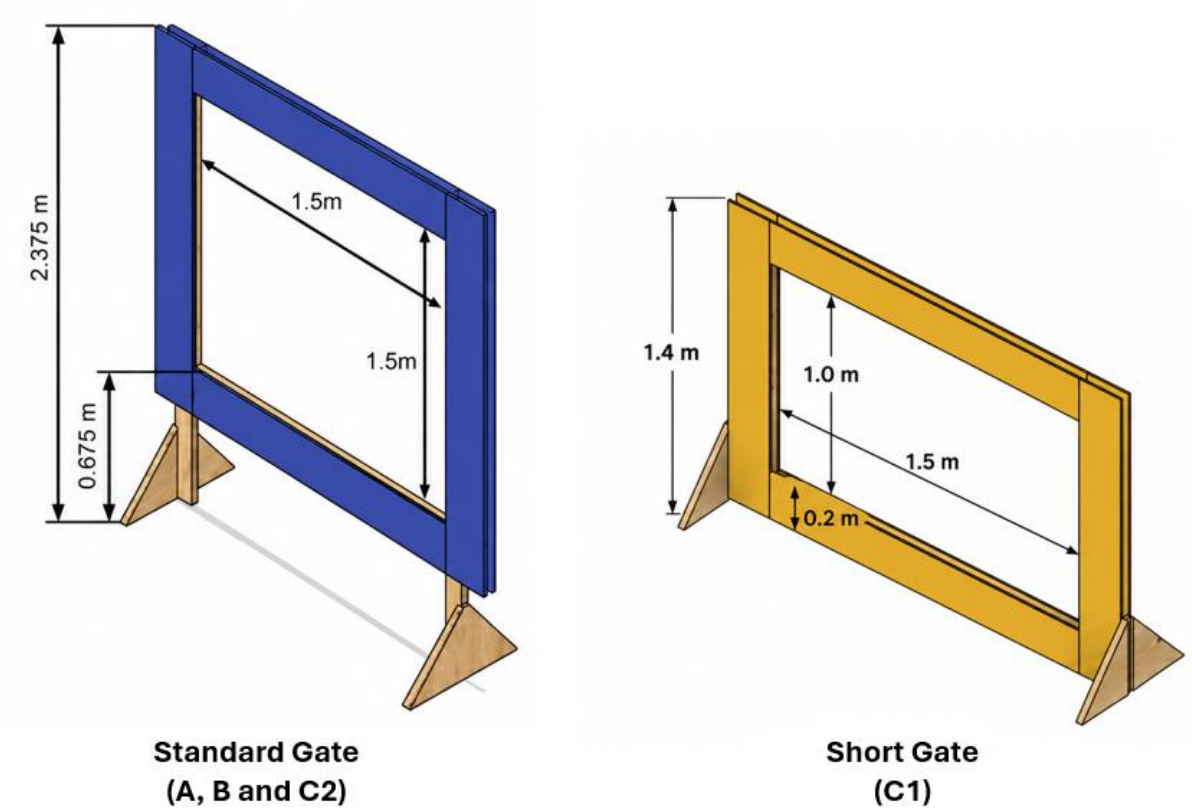


Figure 3 – Play Field Gates in blue for standard gate and yellow for short gate

TWO (2) types of play field gates, illustrated in Figure 3, will be positioned around the play field as shown in Figure 1. There will be a total of FOUR (4) play field gates, labelled A, B, C1 and C2.

Gate C1 will consist of THREE (3) of the short gates shown in Figure 3 in placed 1.0m apart from each other as shown in Figure 1.

3.2.3 START/END ZONE

An area within the play field will be demarcated as the START/END Zone. The floor will not be coloured and only the perimeter of the zone will be

demarcated. The location and dimensions of the zone is shown in Figure 5 in ANNEX A.

3.3. MISSION RULES

3.3.1 GENERAL

1. Teams must consist of **TWO (2) to TEN (10**) members.
2. The duration of the entire challenge is 35 minutes, consisting of:
    a. **15 minutes setup and practice time**
    b. **20 minutes mission time**
3. Teams may conduct functional checks of their drone(s) through manual or autonomous flight during the setup and practice time, provided they obtain permission from the referee. These runs will not be scored.
4. Runs will only be scored during the mission time.
5. Mission time segment will start immediately after the setup time segment. No time extension will be given **even if setup is incomplete**.
6. **Unlimited runs** are permitted within the mission time, with each run receiving an independent score. The final score will be the highest score achieved in a single run, and not a cumulative total of all runs.
7. A **maximum of THREE (3)** drones is allowed per run.
8. At the start of each run, all drones must begin within the **START/END Zone**. A run's timing begins when the first drone crosses either **START/END gate** to begin its lap.
9. Before the start of each run, teams must inform the referees of:
    a. The sequence in which the drones will pass through the play field gates.
    b. The **START/END gate** that the drones will pass through to **begin** their laps.
    c. The **START/END gate** that the drones will pass through to **complete** their laps.

10. All drones participating in the same run must follow the same declared gate sequence.
11. Teams need to obtain the referee's permission before starting any run.
12. Each drone is only allowed to complete **ONE (1)** lap per run.
13. The declared gate sequence must include:
    a. Gate **A** exactly once.
    b. Gate **B** exactly once.
    c. **Either** Gate **C1** or Gate **C2** exactly once.
14. A lap concludes under any of the following conditions, whichever occurs first:
    a. **Complete Lap**: The drone passes through a **START/END gate** to begin its lap, passes through all required play field gates in the sequence declared by the team, and subsequently passes through the declared **START/END gate** to complete its lap. For example: **START/END, A, B, C1, START/END**.
    b. **Incomplete Lap**: The drone passes through a play field gate out of the sequence declared by the team. For example, where the declared sequence is **A, B, C1**, the drone passes through **A** followed by **C1**.
    c. **Incomplete Lap**: The drone contacts the floor outside of the **START/END Zone**.
15. Gates will only be scored when they are passed in the sequence declared by the team. If a drone passes through a gate out of sequence, that gate and any subsequent gates passed by that drone will not be scored for that lap.
16. A run concludes under any of the following conditions, whichever occurs first:
    a. The team issues a command for all drones to land.

b. The referees instruct the team to land all drones and end the run. Referees may issue this instruction at any time.
c. All drones land outside the **START/END Zone**.
d. All drones have completed or otherwise concluded their respective laps.

17. Drones are not allowed to fly above any gates (except the yellow Short Play Field Gates) or walls.
18. Drones are not allowed to fly above **2.5 m** from the ground.
    a. Referees will instruct teams to land all drones and end the current run if drones are observed flying above **2.5 m**.
19. Teams are not allowed to input any commands after the first drone crosses the **START/END gate**, unless instructed or permitted by the referees.
20. Teams are not allowed to repair or troubleshoot the drones during the run.
21. Any drone that malfunctions or lands during a run will be out for that run. The run may continue if the remaining drones are deemed safe by the referees.
22. Ground robots are not allowed.
23. Teams are only allowed to repair their drones or change batteries outside of runs.
24. Permission referred to in these rules is not guaranteed and remains subject to the referees' approval.
25. Cameras may be placed within the play field to record the runs.

3.3.2 NAVIGATIONAL AIDS

1. An **unlimited** number of navigational aids (e.g. UWB, fiducials) will be allowed per run.

2. Navigational aids can only be rearranged between runs. Teams are not allowed to change the positions of the navigation aids during the run. Any navigation aids that are displaced or malfunction during the run cannot be adjusted until the run ends and all drones are disarmed.
3. Navigational aids may only be:
    a. Attached to walls or gates within the play field. Navigational aids placed on any of the gates or walls within the playfield should not protrude more than **5cm** from the surface to which they are attached.
    b. Placed on the floor **within 1.5 m of the play field boundary** within the **Permitted Navigational Aid Area**, as shown in Figure 1. This permitted area will be demarcated by markings on the floor.
4. **Any** navigational aid placed attached to the walls or gates within the playfield must not exceed **30cm X 30cm X 5cm (L X B X H).**
5. **Any** navigational aid (e.g. UWB, visual aids) placed within the **Permitted Navigational Aid Area** must not exceed **1m X 1m X 2m (L X B X H)**.
6. Additionally, all navigational aids must also be:
    a. Easily removable without leaving a mark.
    b. Properly secured, e.g. will not topple over.
    c. Not be secured to overhead structures.

3.3.3 SAFETY

1. Drones must be disarmed with batteries disconnected before resetting the runs.

2. Each team must have at least one safety pilot to manually disarm or take over control of the drone(s). Teams are to conform to either one of two possible setups:
    a. Each drone must have an assigned safety pilot who is capable of manually taking over control of the drone in case of emergency or when instructed by SAFMC officials.
    b. If a team does not maintain a one-to-one ratio of safety pilots to drones (e.g., 3 drones with only 2 safety pilots), each safety pilot must be capable of immediately disarming all drones and stopping all propulsion systems under the following conditions:
        i. When instructed by the SAFMC official to do so.
        ii. When any one drone requires an emergency landing.

    Failure to comply to the safety rules will result in penalties at the referee's discretion or **disqualification.**
3. Safety pilots are only allowed to follow the drones (line-of-sight) outside the safety net. The safety pilots need to demonstrate to the referees that the drones are in computer-in-control (CIC) mode before any drones take off.
4. Safety pilots must be on standby at all times for manual takeover, disarming the propulsion systems via an emergency kill switch during the runs.
5. Teams must declare if they are following the one-to-one ratio of safety pilot or otherwise before the challenge starts.

3.4. MISSION SCORING

The possible points that can be awarded are listed in the table below. The referees will make all scoring decisions, and their decisions are **final**. For arbitrary cases, the Chief Referee will have the **final** say.

Each run will be scored based on three components: gates passed, fastest lap time and coordination. Scoring for these components are detailed in the tables below.

Scoring Components:

Before the start of each run, teams must inform the judges of the sequence in which their drones will pass through the play field gates. **All drones in the run must follow the declared gate sequence.**

During each run, the following items will be tracked and used for scoring:

1. The time at which the first drone crosses a **START gate**.
2. The time at which **EACH** drone crosses an **END gate**, after passing through the required play field gates in the sequence determined by the team.
3. The number of gates that **EACH** drone passes in the sequence determined by the team.

Scoring examples are included in ANNEX B.

Gates Passed (GP)

Teams are awarded points for each gate that each drone passes in the sequence declared by the team. The points awarded increase with each gate passed, as shown in the table below. A gate will only be scored if the drone has passed all preceding gates in the declared sequence.

Points are cumulative for each drone. A drone that completes the full declared sequence will receive 15 points, calculated as 1 + 2 + 3 + 4 + 5. The total Gates Passed (GP) score for a run is the sum of the points awarded to all drones in that run.

Gate	Points
START/END gate at the start of the lap	+1
First play field gate	+2
Second play field gate	+3
Third play field gate	+4
START/END gate at the end of the lap	+5

Fastest Lap Time (FLT)

Teams are awarded points based on the lap time of each drone that completes a lap. The lap time of each drone is measured from the time the first drone crosses a START/END gate to begin the run until that drone crosses a START/END gate to complete its lap.

For each successive five-second interval, the points awarded are reduced by 5 points for the 1st drone, 10 points for the 2nd drone, and 15 points for the 3rd drone to complete the lap, subject to a minimum score of 50 points per drone.

Only completed laps will be timed and scored.

1st Drone to Complete		2nd Drone to Complete		3rd Drone to Complete	
Time	Points	Time	Points	Time	Points
<30 s	+150	<35 s	+250	<40 s	+350
30 s to <35 s	+145	35 s to <40 s	+240	40 s to <45 s	+335
35 s to <40 s	+140	40 s to <45 s	+230	45 s to <50 s	+320
...	...	...	...	...	...

125 s to <130 s	+55	130 s to <135 s	+60	135 s to <140 s	+65
≥130 s	+50	≥135 s	+50	≥140 s	+50

Coordination (C)		
Teams are awarded points based on the time intervals between consecutive drones completing their laps by passing through a START/END gate. For a flock of THREE (3) drones, the time intervals are measured between the 1st and 2nd drones, and between the 2nd and 3rd drones, to complete their laps. For a flock of TWO (2) drones, only the time interval between the 1st and 2nd drones is considered. Only runs in which at least TWO (2) drones complete their laps will be awarded points for this component.		
Time between 1st and 2nd Drone	Time between 1st and 3rd Drone	Points awarded
<5 s	<10 s	+100
5 s to <15 s	10 s to <20 s	+50
15 s to <25 s	20 s to <30 s	+25
All other timings	All other timings	0

NOTE: The **highest score** attained across the runs will be taken as the mission score.

3.5. PENALTIES

The referees will make all penalty decisions, and their decision is **final**. For arbitrary cases, the Chief Referee will have the **final** say. Further correspondence will not be entertained.

S/N	DESCRIPTION	PENALTY
1	Exceeding the 15 minutes setup time.	Mission time will start regardless.
2	Use of external markers outside of the play field.	Referee's discretion or **disqualification**
3	Internal markers within the play field unable to be removed or leave a mark after being removed.	Referee's discretion or **disqualification**
4	Interrupting the competition by potentially interfering with other competitors, e.g. switching on your platform's VTX, transmitters, etc.	Referee's discretion or **disqualification**
5	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**
6	Violation of any Safety Rules during the competition.	Referee's discretion or **disqualification**
7	Violation of any Mission Rules in Section 3.3.	Referee's discretion or **disqualification**

4. OVERALL SCORING

The scoring components for Category High-Speed Drone Flock are:

1. Team Challenge **V**ideo (V)

2. Team Live **P**resentation (P)

3. **M**ission (M)

The first two components (V and P) will be assessed by our Category High-Speed Drone Flock Judges, while the Mission (M) will be computed from the highest attained score from the challenge attempts.

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:

Component	**Weightage**
Team Challenge Video	15%
Team Live Presentation • Strategy – 30% • Presentation Quality – 10%	40%
Mission	45%
Total	**100%**

For **CATEGORY HIGH-SPEED DRONE FLOCK,** the total score **T** is computed as T = V + P + M.

4.1. TEAM CHALLENGE VIDEO (V)

The Team Challenge Video provides a proof-of-flight insight into how the flock performs before the challenge day. The video should include:

1. Flightworthiness
    a. Demonstrate stable and sustained flight of up to **THREE (3)** drones.
    b. Demonstrate on-demand failsafe functionality of drone(s).
        i. If controlled landing is chosen as a failsafe function on the challenge day, it must be demonstrated in the challenge video.
2. Mission-readiness
    a. Demonstrate autonomous flight as a flock of **TWO (2)** to **THREE (3)** drones.
    b. Demonstrate autonomous flight of up to **THREE (3)** drone(s) through gates.
    c. Teams are highly encouraged but not required to show both 2a. and 2b. together.
3. Creativity
    a. Resourcefulness in re-creating competition layout to showcase similar mission requirements.

4.2. TEAM LIVE PRESENTATION (P)

Teams should present their **proposed strategy and learning outcomes and insights**. Additionally, teams would be assessed on the overall quality of presentation.

4.2.1 PROPOSED STRATEGY

Teams are to explain how their drones, sub-systems, and algorithms help in their mission strategy. These include, but are not limited to:

1. Choice of sensor suite used to tackle the mission.
2. Obstacle and collision avoidance method.
3. Localisation method.
4. Method of coordinating drones in the flock.
5. Method of communication between drones in the flock.
6. Any other algorithms used in completion of the mission.

Teams are also encouraged to utilise and present unique concepts, which may include:

1. Robust and intelligent methods of autonomous control.
2. Unconventional ideas and methods to complete the mission.
3. Methods to achieve greater flight speeds.

4.2.2 LEARNING OUTCOMES AND INSIGHTS

Teams are to share about their experience preparing for the competition. These include:

1. Challenges faced and lessons learnt.
2. Key decisions made during the design process and their rationale.

4.3. MISSION (M)

The challenge segment scores on the challenge day will form the **Mission (M)** score. Please refer to Section 3.4 and Section 3.5 for the mission scoring and penalties.

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 9 April 2027**. 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 **FIFTEEN (15) minutes per visiting judge**, comprising:

- **TEN (10) minutes** for the team presentation; and
- **FIVE (5) 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 disqualification.

Please refer to **Section 4.2** for the scoring factors for the Presentation Segment.

6. Presentation Requirements

During the Presentation Segment, teams are required to:

a. Bring each unique drone to be used for the challenge
b. Teams are to prepare **ONE (1)** presentation in the form of **TWO (2)** A0 posters OR up to **FIFTEEN (15)** slides. The time limit for the presentation is 10 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 4.1.

Videos should be uploaded to YouTube and set as "Unlisted". The link to the video should be sent to SAFMC@science.edu.sg with title subject: "[CAT HIGH-SPEED DRONE FLOCK] - [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, 2359 (Both dates and time inclusive)**	50% deduction of Team Challenge Video score
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 flight worthiness and 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 challenge segment:

1. Teams are to arrive at their designated reporting time.
2. At the allocated competition schedule, the team shall report to the safety inspection point. An SAFMC official will check the drones for any violation of the category rules and regulations. Teams who do not pass the inspection will **not** be allowed to fly their drones in the challenge mission 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 drones.
    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 drones; loose items should be tied down and kept away from the propellers.

e. For drones operating on semi-autonomous / autonomous modes, it should allow complete manual pilot override on-demand via RC or GCS.

f. The drones must demonstrate failsafe capability in the event of a loss of link between the RC/GCS and the drones. 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.

    (3) Throttle will be applied to spin the motors. While the motors are still spinning in the same flight mode, the Wi-Fi 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.

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

h. The drones must demonstrate failsafe capability upon operator command. The failsafe check procedure is as follows:
    (1) All propellers and releasable payloads are to be removed from the platform.
    (2) Flight motors will be armed and throttled up.
    (3) While the motors are still spinning in the same flight mode, the operator 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.
i. At the end of each mission attempt, the radio control transmitter, datalink transceiver, video receiver and any other wireless device for the flying machine 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 play field 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 operator/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 play field **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 play field must don the appropriate Personal Protective Equipment (PPE), which will be provided.
5. Team members may enter the field to collect their drones, or to bring it out of the play field to modify or repair (including changing batteries) **after** it has landed, and all drones have been disarmed. Entry into the play field is only allowed upon confirmation with 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 play field. All repairs / maintenance / troubleshooting should be done in Raceband channel 8 with VTX set to either 25mW or 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 and should arrive at least **TEN (10)** minutes before any allocated timing. Latecomers may have their mission times shortened or may be **disqualified**.

6. TECHNICAL RULES & REGULATIONS

Each team is to design and build or acquire a flock based on the following guidelines:

1. Off-the-shelf products and components are allowed in the competition.
2. For safety considerations, the MTOW of an aerial drone **must not exceed 2.5kg.** The platform **cannot not exceed 75cm** in any direction (this measurement includes the maximum diameter of the propeller circles and propeller guards).
3. Participants are only allowed to use between to **TWO (2) TO THREE (3)** aerial drones for mission attempt. Teams can bring similar backup drones to replace any drones that has become incapable of flight. No additional time will be given to replace the drones.
4. Only electric-based flight propulsion is allowed. Both brushed and brushless motors are allowed. No modification to the motors is allowed.
5. No internal combustion or gasoline engines are allowed.
6. No tethering or umbilical wires to the drones are allowed during flight.
7. External aids such as markers, indicators etc. will be allowed only in the play field and can only be placed when there are no drones armed or in flight.
8. For safety considerations, the drones must be able to perform full RC manual pilot override and RC failsafe on demand.

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 drones.

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.

ANNEX A

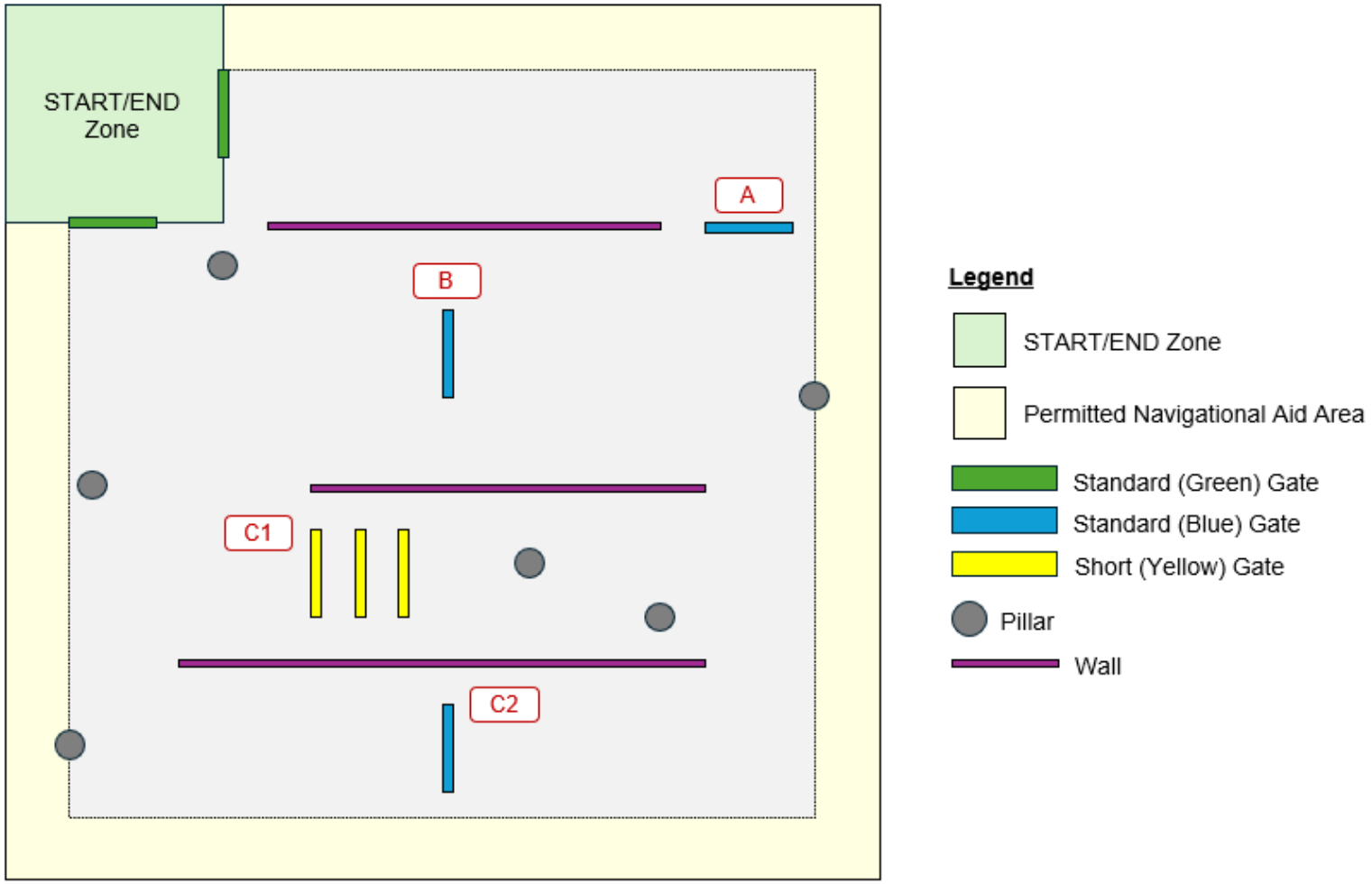


Figure 4 – Enlarged Overview of Play Field Layout

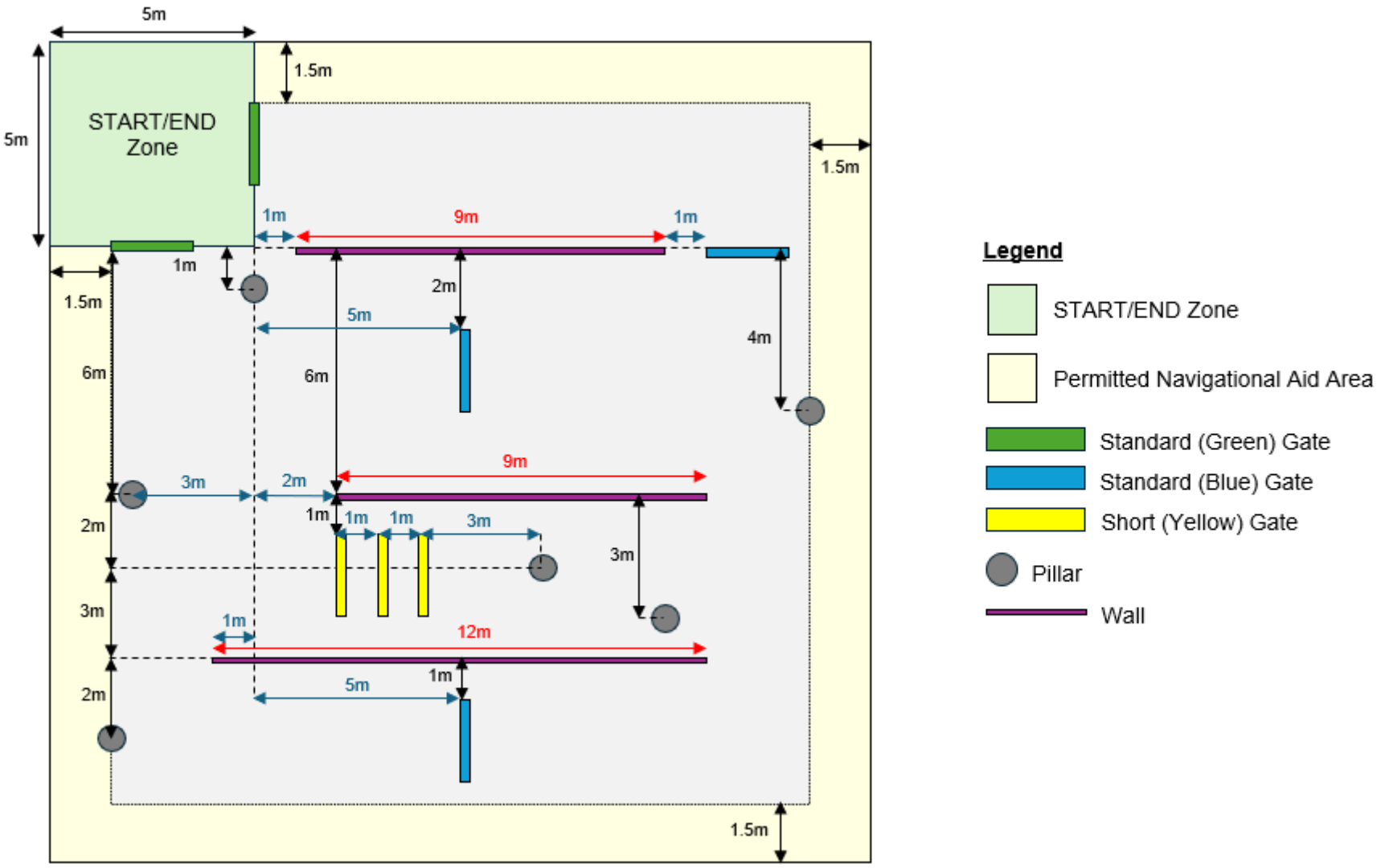


Figure 5 – Enlarged Detailed Play Field Layout with dimensions

ANNEX B

The following table details some scoring examples.

Scoring Examples											
No.	**START Time (s)**	**Number of Gates Passed by Drone**			**END Time (s)**			**Point Awarded**			
		1st Drone	**2nd Drone**	**3rd Drone**	**1st Drone**	**2nd Drone**	**3rd Drone**	**GP**	**FLT**	**C**	**Total**
1	0.0	Complete Lap	4	3	59.0	DNF	DNF	15 + 10 + 6 = **31**	**120**	**0**	**151**
2	0.0	Complete Lap	Complete Lap	N/A	100.0	115.0	DNF	15 + 15 = **30**	75 + 80 = **155**	**25**	**210**
3	0.0	4	N/A	N/A	DNF	DNF	DNF	**10**	**0**	**0**	**10**
4	0.0	Complete Lap	Complete Lap	Complete Lap	125.0	140.0	150.0	15 + 15 + 15 = **45**	55 + 50 + 50 = **155**	25 + 50 = **75**	**275**
5	0.0	Complete Lap	Complete Lap	Complete Lap	60.0	70.0	85.0	15 + 15 + 15 = **45**	115 + 170 + 200 = **485**	50 + 50 = **100**	**630**