Singapore
Amazing Flying Machine
Competition 2025

# Category C2/C3
# Challenge Booklet 2025

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# SAFMC 2025 CAT C2/C3 CHALLENGE BOOKLET CHANGE LOG

| Version | Release Date | Description |
|---|---|---|
| 1.0 | 08 Nov 2024 | Official challenge booklet release |
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**CONTENTS**

# 1.    INTRODUCTION

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

For Category C2 and C3, the teams are expected to bring, or design and build, an FPV drone to compete in an obstacle course.

# 2.    CATEGORY C2/C3 AWARDS

Awards listed below will be given out during the SAFMC 2025 Awards Presentation Ceremony. All scoring decisions made by the judges are final. For arbitrary cases, the organising committee will have the final say.

| CATEGORY C2 (NOVICE) | | | | |
|---|---|---|---|---|
| **Awards** | **Medals** | **Trophy** | **Cash Prize** | **Remarks** |
| Cat C2 Championship Award - 1st Place | ✓ | ✓ | $ 180.00 | Only 1st to 3rd Place will receive both medals and cash prizes |
| Cat C2 2nd Place | ✓ | | $ 160.00 | |
| Cat C2 3rd Place | ✓ | | $ 140.00 | |
| **Awards** | **Prize(s)** | **Awards** | | **Prize(s)** |
| Cat C2 4th Place | $130.00 | Cat C2 11th Place | | $60.00 |
| Cat C2 5th Place | $120.00 | Cat C2 12th Place | | $50.00 |
| Cat C2 6th Place | $110.00 | Cat C2 13th Place | | $45.00 |
| Cat C2 7th Place | $100.00 | Cat C2 14th Place | | $40.00 |
| Cat C2 8th Place | $90.00 | Cat C2 15th Place | | $35.00 |
| Cat C2 9th Place | $80.00 | **Best Lap Bonus** | | $35.00 |
| Cat C2 10th Place | $70.00 | | | |

| CATEGORY C3 (ADVANCE) | | | | |
|---|---|---|---|---|
| Awards | Medals | Trophy | Cash Prize | Remarks |
| Cat C3 Championship Award - 1st Place | ✓ | ✓ | $ 600.00 | Only 1st to 3rd Place will receive both medals and cash prizes |
| Cat C3 2nd Place | ✓ | | $ 500.00 | |
| Cat C3 3rd Place | ✓ | | $ 400.00 | |
| Awards | Prize(s) | Awards | | Prize(s) |
| Cat C3 4th Place | $350.00 | Cat C3 7th Place | | $200.00 |
| Cat C3 5th Place | $300.00 | Cat C3 8th Place | | $150.00 |
| Cat C3 6th Place | $250.00 | **Best Qualifier Bonus** | | $150.00 |

Note: Prizes may not be given out if 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.

## 3.    CATEGORY C2/C3 CHALLENGE

The pilot is expected to fly and manoeuvre a multi-rotor aircraft through first-person view (FPV) remote control and guide the craft through a series of air gates in a pre-defined course.

It is recommended that those new to FPV flying to participate in the C2 category as opposed to C3, as the latter involves more powerful and complicated drones that requires more experience.

Students who had participated as the **pilot** in SAFMC **C2 more than twice** are **not eligible** to compete in the C2 category again. If you had participated as the pilot in SAFMC C2 and is one of the **top 10 winners of previous SAFMC C2** events, you are also **not eligible** for C2. We highly encourage these students to take part in the C3 category instead.

While Category C2 and C3 do not require presentation nor proof of flight videos, Category **C2 participants** are required to **demonstrate** basic handling of their equipment to **change Raceband frequencies**.

### 3.1.    COMPETITION CATEGORIES

| Category C2 (Novice) | Category C3 (Advance) |
|---|---|
| This category is perfect for **beginner** FPV drone pilots to hone their skills and gain experience in a competitive context. The course is designed to be easily navigated by the junior pilot while still providing a high-paced and fun challenge. | This category tests the skill of the more **advanced** FPV drone pilot. With a course designed to be more technical, it is sure to stretch the abilities of the pilot while providing a fun challenge. |

Participants who are new to FPV flying may wish to refer to Section 9 for useful resources. Be sure to check our website regularly for updates on useful workshops catering to this category!

## 4.     COMPETITION ARENA LAYOUT

The competition layouts may be revised at the discretion of the Chief Referee and/or the Category C2 and C3 Technical Chairperson.
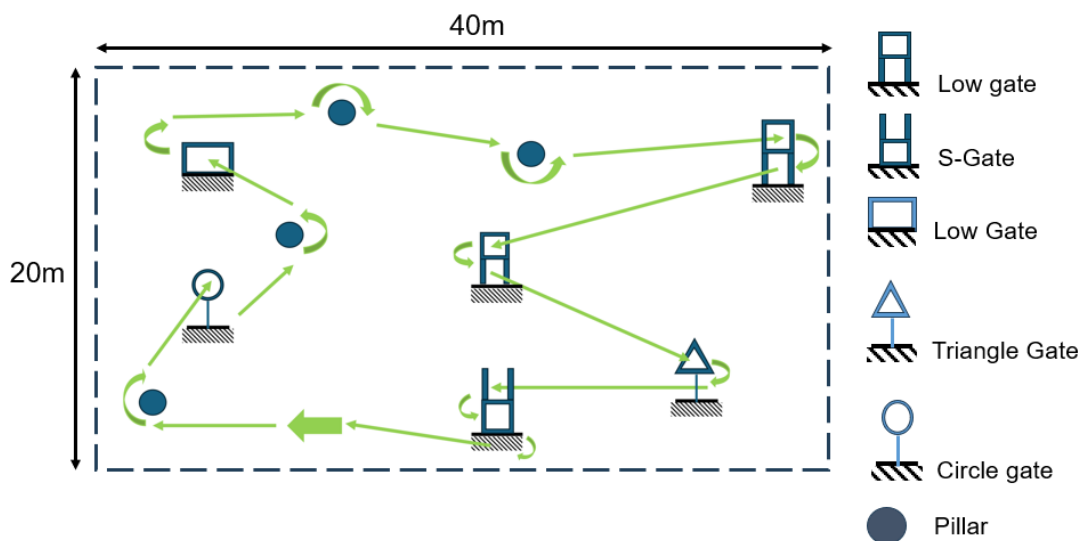
### 4.1.    C2 LAYOUT

The figure below shows the course layouts for C2 category.
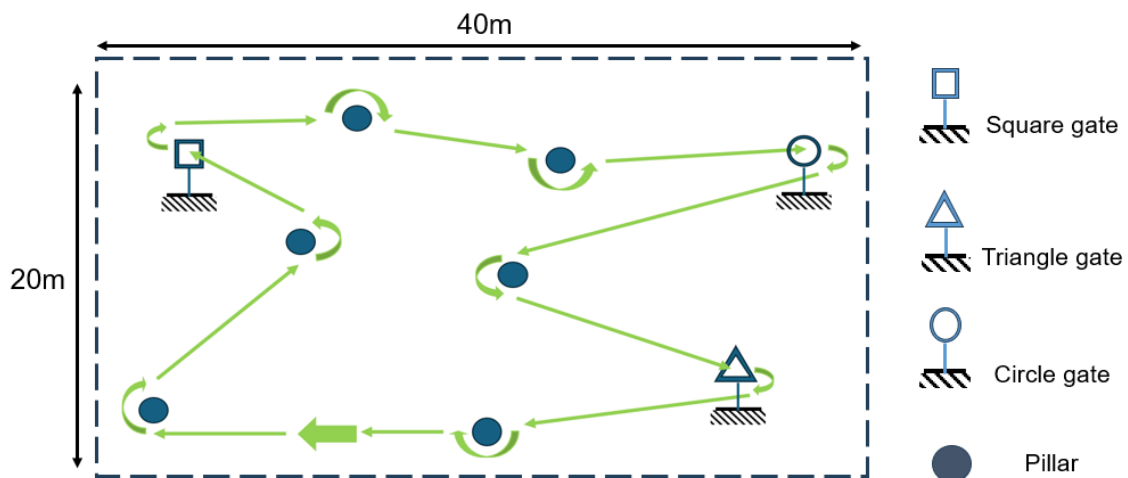


### 4.2.    C3 LAYOUT

The figure below shows the course layouts for C3 category.

**5.     FLOW OF EVENTS**

Once the teams have confirmed their registration for the competition, they are expected to commence on meeting the various competition requirements.

**5.1.     PRE-RACE ADMINISTRATION & INSPECTION**

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

1.  Teams are to arrive at their designated reporting time.

2.  Tables will be provided within the main competition hall for teams to work on their flying machines.

3.  At the allocated competition schedule, the team shall report to the safety inspection point.

4.  A Technical Inspector will check the aircraft for any violation of the category rules and regulations. Teams who do not pass the inspection will **not** be allowed to fly their aircraft. The inspection will include, but is not limited to, the following checks:

    a.  The maximum take-off weight (MTOW) and size of the aircraft.

    b.  Competition worthiness of aircraft. No exposed wires and connectors are permitted.

5.  C2 teams **must** demonstrate the following to a Technical Inspector to be considered eligible for the competition.

    a.  Changing the settings of their Goggle or Monitor to receive different Raceband frequencies.

    b.  Changing the settings of their VTX to transmit different Raceband frequencies.

### 5.2.   CONTROLLED PRACTICE

1.   There will be at least **TWO** (2) controlled practice sessions for C2 and **TWO** (2) controlled practice sessions for C3.

2.   Pilots will be given **TWO** (2) minutes to practice and familiarise themselves with the course during each practice run.

3.   Pilots will not be given additional time should they fail to complete their intended run, i.e. crashing out.

4.   Pilots will report for their controlled practice runs as per the detailed competition schedule. Failure to report timely for any of the runs will result in the forfeiture of that run.

5.   No lap timings from these practice runs will be considered for the eventual rankings.

6.   No open self-practice is allowed at any time.

7.   No Pilot will be allowed to power on their VTX at the pit area.

8.   All decisions during the course of the runs by the Race Director or their designees will be final.


### 5.3.   BEFORE THE START OF A RUN

1.   All aircraft must be staged with the propellers parallel to the ground during the staging period. During arming period, pilots may angle their aircraft in preparation of launch but falling off or tipping over will be charged as a false start.

2.   A pilot may notify the Race Director before the start of the run if he or she is unable to start, i.e. due to aircraft damage. The Race Director will then exercise discretion to either delay the start of the

run by up to TWO (2) minutes or move the pilot to another run. All decisions made are final.

3.    A pilot will need to be ready for his or her run by the stipulated timings. Failure to do so will result in the forfeiture of the run.

## 5.4.    STARTING A RACE

1.    False starts will result in a restart or a ONE (1) lap penalty at the Race Director's discretion.

2.    If the aircraft fails to take off, it is deemed that the pilot is out of the particular run and not eligible for a re-run.

3.    Crashing into aircraft will result in the pilot being taken out of the race with no re-run permissible.

4.    The Race Director will exercise discretion for "Loss of video" scenarios to determine if a re-run is necessary.

5.    Contact or crash just before the timing or start/finish gate will result in a restart or re-run as decided by the Race Director.

6.    The Race Director has full authority to decide for other scenarios not stipulated above.

## 5.5.    DURING A RUN

1.    In the event of a collapsed obstacle or situations affecting part of the course, the Race Director will make a decision.

2.    The Race Director will make a decision for incidents or disputes arising during the course of a run.

## 6. RANKING AND SCORING

### 6.1. CATEGORY C2 - MOST LAPS WINS

1. No qualifying rounds

2. **TWO** (2) controlled practice rounds

3. **TWO** (2) mission runs

4. Final score from the best run out of **TWO** (2) mission runs.

5. Fixed time: **TWO** (2) minutes per run.

6. Only valid/completed laps are counted.

7. Finish last lap after timer sounds (lap is counted if it is finished)

8. Championship Award Winner has most laps from his/her best run.

9. Ties are determined by the fastest time of the best run.


### 6.2. CATEGORY C3 – QUALIFIERS & KNOCK-OUT SYSTEM

1. **TWO** (2) controlled practice rounds

2. **TWO** (2) qualifying runs

3. Score from the best run out of **TWO** (2) qualifying runs.

4. Fixed time: **TWO** (2) minutes per run.

10. Only valid/completed laps are counted.

11. Finish last lap after timer sounds (lap is counted if it is finished)

12. Top **EIGHT** (8) with the greatest number of completed laps, from the qualifying runs, will compete in the semi-finals run.

13. Only **ONE** (1) semi-final run of **TWO** (2) minutes.

14. Top **FOUR** (4) with the greatest number of completed laps, from the semi-finals run, will compete in the finals run.

15.     Only **ONE** (1) finals run of **TWO** (2) minutes.

16.     Championship Award Winner has most laps from the finals run.

17.     Ties are determined by the fastest time completing the laps.


## 6.3.    <u>SCORING FOR GATES OR FLAGS</u>

1.      Pilots must go back and fly thorough missed gates or flags. Pilots are advised to navigate near the flag so that judges can accurately assess the turn.

2.      The opening of a gate is defined as the interior perimeter of the opening that is perpendicular to the race line. The aircraft needs to breach this front plane for it to count as a pass.

3.      Missing one or more gates or flags will invalidate the count of that particular lap towards the overall lap count.

## 7. RULES AND REGUALTIONS

### 7.1. GENERAL GUIDELINES

1.  Pilots shall follow ALL instructions from the Race Director or their designees.

2.  All flying areas will be out of bounds while flying is undergoing.

3.  Retrieval of aircraft can only be done upon the end of each run and when it has been powered down.

4.  Pilots are only allowed to fly at designated areas and during designated times.

5.  Pilots are to start and end their runs at the designated landing/take-off areas.

6.  Pilots must be seated at the designated piloting area.

7.  Pilots can only power up their aircraft/video transmitters during their runs. No powering up of aircraft/video transmitters are permitted at the pit area.

### 7.2. KEY OFFICIALS

1.  The Race Director and their designees will have absolute authority in all decisions regarding disputes or situations requiring immediate controls.

2.  The Technical Inspector will be responsible for all preflight inspections to ensure the competition worthiness of all participating aircraft.

3.  Course Safety Officer will be stationed to manage the flying zone as well as provide support for downed aircraft.

## 7.3.  KEY POINTS 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 playing field at any one time, when the aircraft is not airborne.

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.

3.  All teammates are required to remain outside of the playing field and be behind the safety net when the aircraft is airborne.

4.  Team members may enter the field to collect their aircraft, or to bring it out of the playing field to modify or repair (including changing batteries) after it has landed, and all aircrafts have been disarmed. Entry into the playing field is only allowed upon confirmation with SAFMC officials.

5.  Multiple video receivers are allowed. Only ONE (1) video transmitter is allowed for each aircraft.

6.  No radio control transmitters, datalink transmitters and video transmitters and receivers are to be switched on within the competition hall, unless permitted to do so in the holding area or playing 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.

7.	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.

8.	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.

9.	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 potential blacklisting from the competition. The organiser will also not be responsible for any injures or mishaps if any participant has disregarded the safety rules.

10.	No trials will be allowed in the flying area unless specified by the officials.

11.	The participants will acknowledge that there will be variations in environmental conditions between teams, despite best efforts to control them.

## 7.4.	RACE COURSE SAFETY

1.	The Race Course will be cordoned off to ensure safety.

2.	No individuals, except for safety officials will be allowed within the Race Course when any multi-rotor is in flight.

3.	Pilots will only take-off and land at the designated take-off/landing area.

4.   Flying will only take place at designated timings as decided by the Race Director or their designees.

5.   Retrieval of downed aircraft shall only be done by safety officials after flying has ceased.

6.   All pilots will fly the same pre-defined course for both the controlled practice and mission runs.

7.   No form of flying will take place outside the cordoned area.

8.   Pilots operating their aircraft during their runs will only do so from the designated Pilot Area.

9.   Human traffic areas will be cordoned off accordingly to manage flow.

10.  Appropriate safety signs, fire mitigating aids and any necessary safety aids will be set-up within these areas.

## 8. TECHNICAL RULES & REGULATIONS

Participants are allowed to bring along either their homebuilt platforms or commercial off-the-shelf (COTS) platforms to the competition. Modifications to COTS platforms are also allowed. The racing platform must conform to the following specifications.

|  | C2 – Novice | C3 - Advance |
|---|---|---|
| **Frame** | Ducted | No Restrictions |
| **Motor** | Brushed / Brushless | Brushless |
| **Propellers** | Diameter < 45mm | Diameter < 85mm |
| **Weight** | < 80g (with LiPo) | < 200g (with LiPo) |
| **Battery** | Max 2s LiPo | No Restrictions |
| **VTX (5.8Ghz)** | 25mW ||

1. For safety considerations, the total weight of the flying machine **cannot exceed** 80g (with LiPo) for C2 category and 200g (with LiPo) for C3 category.

2. Teams can bring similar backup aircraft to replace any aircraft that has become incapable of flight. No changing of aircraft during runs is allowed. Teams can only change aircraft between runs.

3. Only electric-based flight propulsion is allowed. Both brushed and brushless motors are allowed. No modification to the motors is allowed.

4. No internal combustion or gasoline engines are allowed.

5.   No tethering or umbilical wires to the aircraft are allowed during flight.

6.   External aids such as markers, indicators etc. will be allowed **only** in the playing field and can only be placed when there are no platforms flying.

7.   For safety considerations, the swarm must be able to stop the mission and power down.
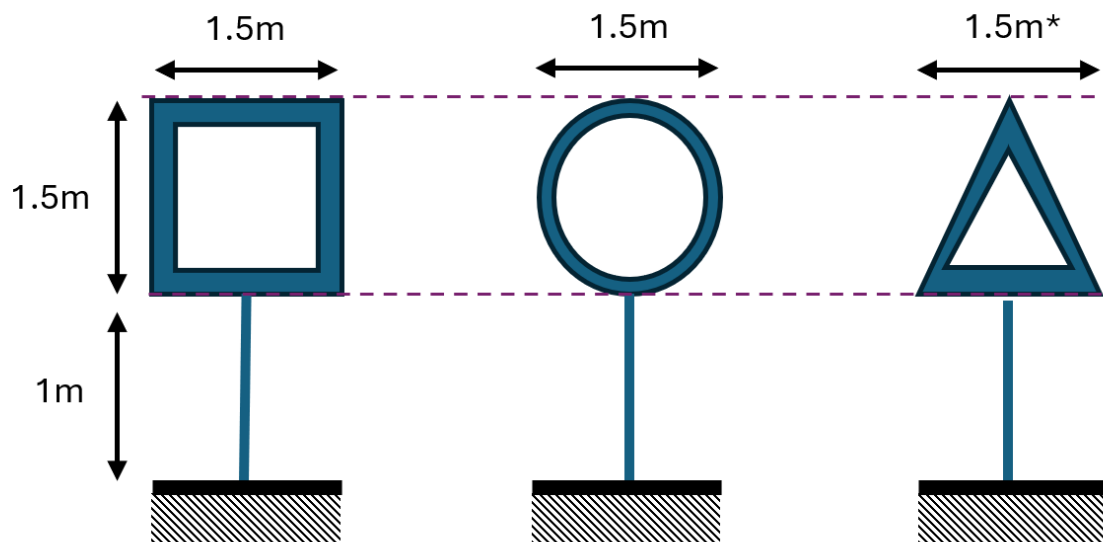
## 8.1.   AIR GATE SPECIFICATIONS

All High Gates/Split S-Gates shall be at least 1m above the floor.

Low Gates will have at least 1m in width and 1m in height.

Beams are 30cm by diameter and 2m in height.

Below are the specifications for Square, Circle and Triangle Gates:



*1.5meter is for the longest width of the triangle

## 8.2. <u>BATTERY</u>

There is no limit on the number of batteries used, in series or parallel. Participants should size their batteries and aircraft appropriately for the respective mission. Lithium-Polymer (LiPo) batteries are preferred.

Batteries must be properly strapped or locked onto the aircraft before launch.

## 8.3. <u>FREQUENCY MANAGEMENT</u>

No broadcasting of video is allowed unless consent is given by the Race Director. Pilots found to be broadcasting video when they are not supposed will be given a first warning and are subjected to disqualification for subsequent infractions as this will affect pilots currently flying.

Race-band frequencies (R1 to R8) will be preassigned. The list of frequencies is listed below:

| Band | CH1 | CH2 | CH3 | CH4 | CH5 | CH6 | CH7 | CH8 |
|------|------|------|------|------|------|------|------|------|
| R | 5658 | 5695 | 5732 | 5769 | 5806 | 5843 | 5880 | 5917 |

Pilots will only be given opportunities to change their frequencies at the Race Director's discretion.

## 9. AVAILABLE RESOURCES

**Disclaimer**: All approximate prices indicated correct as of 10 October 2022 and meant to serve as a guide (exclusive of shipping where applicable).

## Basic Quad (Mass participation and learning the basics. Can be upgraded for FPV racing in Cat C2)

| | Description | Price | Sellers | Remarks |
|---|---|---|---|---|
| 1 | Eachine E010 Quad | $24.42<br><br>$29.90 | BangGood (Online)<br><br>65drone (Online) | Quad w/ Basic Tx |
| 2 | Eachine E011 Quad | $22.98<br><br>$33.00 | Eachine (Online)<br><br>65drone (Online) | Quad w/ Basic TX * 7mm motor |
| 3 | JJRC H36 Quad | $33.99 | GearBest (Online) | Quad w/ Basic Tx |
| 4 | Furybee F36 Quad | $20.03 | GearBest (Online) | Quad w/ Basic Tx |
| 5 | Armor 80 Lite RTF | $120.56 | 65drone (Online) | Quad w/ Basic Tx |
| 6 | Armor 65 Lite RTF | $130.00 | 65drone (Online) | Quad w/ Basic Tx |

## FPV Racing Peripherals (Equipment upgrade for FPV racing in Cat C2)

| | Description | Price | Sellers | Remarks |
|---|---|---|---|---|
| 1 | Eachine TX02 Cam/Vtx | $37.92 | BangGood (Online) | Cam/Vtx |
| 2 | Furibee F05 Cam/Vtx | $45.88 | GearBest (Online) | Cam/Vtx |
| 3 | Eachine EV800D Goggle | $175.06 | BangGood (Online) | Box goggle |
| 4 | Furibee FB100 Goggle | $191.19 | GearBest (Online) | Semi pro goggle |
| 5 | Eachine EV100 Goggle | $183.82 | BangGood (Online) | Semi pro goggle |
| 6 | Aomway Commander V1 Goggle | $286.91 | Getfpv (Online) | Pro goggle |
| 7 | Fatshark Dominator HDO 2 FPV goggle | $717.29 | Getfpv (Online) | Pro goggle |
| 8 | Flysky FSi6 Transmitter | $81.69 | BangGood (Online) | Hobby grade Tx |
| 9 | iRangeX iRX6 Multi Module | $10.07 | BangGood (Online) | For pairing FSi6 with Eachine and JJRC drones |

## Complete Racing Quad (Complete package for FPV racing in Cat C2)

| | Description | Price | Sellers | Remarks |
|---|---|---|---|---|
| 1 | Eachine E013 | $131.29 | BangGood (Online) | W/ VR006 Box goggle |
| 2 | EMAX Ez Pilot | $344.29 | Getfpv (Online) | W/ transporter 2 Goggles and transmitter |

Note:

1) If targeting for entry level mass participation for students to learn to fly line-of-sight (LOS), selection of entry level equipment with the lowest cost could be an option.



Example of Quad with basic Transmitter – <u>Entry level mass participation</u>

2) Upgrading of entry level equipment is possible and recommended if the student wants to learn to fly by first person view (FPV). FPV racing peripherals, such as transmitter, Cam/Vtx, monitor or googles, could be considered. Hobby grade transmitter allows more precise control and a more robust Radio Frequency link between the Quad and Tx (Pilot).



Example of Quad with Hobby Grade Tx and Multi module – <u>Upgrade</u>.

3) With the addition of a Cam/Vtx, Goggle or Monitor, the student will have the basic equipment for participation in SAFMC Cat C2 event. It is assumed that these students are handy with a soldering iron and willing to research and/or google for instructions on how to put the upgrades together.



Example of Quad with Hobby grade Tx, Multi module, Cam/Vtx, Goggle or Monitor screen – <u>Basic requirements for SAFMC Cat C2 competition</u>.