MODEL AERONAUTICAL ASSOCIATION OF AUSTRALIA

FIRST PERSON VIEW (FPV) AND SELF GUIDED MODEL AIRCRAFT POLICY

MOP066

APPROVED: MAAA PRESIDENT

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Amendments made to MOP066

Version	Paragraph	Brief description of change	Change incorporated by	Signed
A	6	POLICY: For model aircraft over 2kg and operating above 100Ft AGL	MAAA Secretary Aug 2015	
	7	POLICY: For model aircraft under 2kg and operating below 100Ft AGL		
	8	FPV Racing		
B	5	Safety Concerns: Par 5.4 added	MAAA Secretary Aug 2016	
	9	Inclusion of Self-Guided Model Aircraft requirements from MOP067		
	10	Inclusion of Return to Home requirements from MOP067		
C	5	Inclusion of safety related items for FPV Racing	MAAA Secretary Feb 2018	
	7	Inclusion of RTH elements		
	8	Refinement of FPV Racing		
D	3	Inclusion of Drone (FPV) Racing Definition	MAAA Secretary August 2019	
	3	Addition of Applicability Section for MOP066		
	4	MAAA Club and Affiliated flying site definition		
	5	Addition of RTH features applicable		
	5-12	Refer to procedure determined for handover to PIC		
	8	Failsafe checks by flight line director or event coordinator during racing events		
	8	Track monitoring during races		

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FIRST PERSON VIEW (FPV) POLICY

1. INTRODUCTION

1.1 First Person View (FPV) flying makes use of video piloting equipment. It is a system whereby a radio control model aircraft is piloted, not through direct line of sight, but by using a live video downlink from an on-board camera allowing the pilot to experience a 'cockpit view' and to control the aircraft from the visual perspective of the on-board camera.

The latest generation of lightweight camera equipment combined with developments in data transmission have enabled this type of flying to be carried out cost effectively and with small lightweight airframes.

Equipment is now commercially available which allows the on-board camera to be gimbal mounted and driven by servo motors which are in turn linked to a gyro sensing headset worn by the operator. This allows the pilot to point the camera mounted on the aircraft in almost any direction with a head movement.

2. PURPOSE

2.1 The purpose of this publication is to document the MAAA policy with respect to First Person View (FPV) flying, Drone Racing and Self-Guided Model Aircraft for ONLY MAAA Members and affiliate members.

3. APPLICABILITY

3.1 This Manual of Procedure (MOP066) is only applicable to MAAA Affiliate members flying at MAAA Clubs and Affiliated flying sites.

4. DEFINITIONS

ACMA …… Australian Communications and Media Authority

Affiliate Member …… A person properly affiliated with a Club that is properly affiliated to an MAAA Ordinary Member

CASR……..Civil Aviation Safety Regulations

CASA …… Civil Aviation Safety Authority

Club …….. A Club properly affiliated with a State Association

Club Member ……..…… A financial member of a Club

FPV(Drone) Racing…… Using First Person View for the purposes of racing small (<25kg) aircraft around a defined course with other First Person View aircraft or conducing freestyle routine.

FPV…… First Person View

First Person View …… A system whereby a radio control model aircraft is piloted, not through direct line of sight, but by using a live video downlink from an on-board camera allowing the pilot to

experience a 'cockpit view' and to control the aircraft from the visual perspective of an on-board camera.

Pilot in Command …… The sole pilot of the aircraft, or the pilot authorised on a Permit to Fly, or the supervising pilot if a pilot does not comply with the Bronze Wings requirement, or the supervising pilot if one is required under any MAAA MOP. In all cases the Pilot in Command shall be a current Affiliate Member of the MAAA.

Recreational Aviation Administration Organisation (RAAO)…… CASA recognises the MAAA as a Recreational Aviation Administration Organisation to administer and regulate the operation of Model Aircraft under CASR (1998) Part 101.

MAAA …….. Model Aeronautical Association of Australia Inc.

MAAA Clubs and affiliated sites…… MAAA listed clubs and affiliated sites are a detailed list of club locations and affiliated flying sites utilised by MAAA members.

MAAA Ordinary Member…. A State Association properly affiliated with the MAAA Inc.

Model Aircraft ……. Any machine less than 150kg flown for sport and recreation only

MOP …… MAAA Manual of Procedures

Ordinary Member ……. See MAAA Ordinary Member

Return to Home (RTH)……. The capability to select or automatically engage a flight mode whereby the aircraft will automatically fly back safely to a predetermined location.

SGMA ……..... Self Guided Model Aircraft.

Self Guided Model Aircraft ...A model aircraft that has the capability of flying without the direct inputs of a human pilot including both general flight and the capability to Return to Home as a specific implementation either manually or automatic.

State Association …… See MAAA Ordinary Member

Visual Control Range ……The maximum range at which the Pilot in Command can clearly determine the orientation and also manually control the Model Aircraft in sustained flight, without the aid of vision enhancing devices such as binoculars. CASR (1998) Part 101 (101.073) states that an unmanned aircraft is being operated within the visual line of sight of the person operating the aircraft if the person can continually see, orient and navigate the aircraft to meet the person's separation and collision avoidance responsibilities, with or without corrective lenses, but without the use of binoculars, a telescope or other similar device.

5. GENERAL

As well as complying with this MOP, all operators of Model Aircraft using FPV techniques shall comply with all other relevant MAAA MOPs, as well as CASA and ACMA requirements. To comply with CASA's regulations, the person operating a model aircraft has to be able to see it continuously. Pilots flying FPV model aircraft, except in the manner outlined in the policy, cannot do this as they are virtually inside the model.

The following MAAA documents are of relevance to FPV operations:
MOP014: General Rules and Guidelines for the Operation of Model Aircraft *(which provides all Affiliate Members a ready reference to their obligations and to regulations as required under Commonwealth Law and MAAA Rules and Procedures, for the operation of Model Aircraft),* ***MOP044: Internal Navigation and Stabilisation Policy****,* ***MOP056: Safe Flying Code****,* ***MOP057: Insurance Conditions****, and* ***CASR (1998) Part 101 subsections A,B,C and G*** *and the* ***ACMA Class Licence*** *for the frequency band being used for the video down link.*

In the event that the definition of FPV in this MOP is not adequate to determine whether an aircraft is considered to be FPV equipped, the MAAA Secretary should be contacted to make a ruling

6. SAFETY CONCERNS

6.1 The FPV equipment described potentially presents the pilot with the opportunity to fly the aircraft out of normal unaided visual range by utilising the 'cockpit view'.

6.2 Where an aircraft is being flown either using a headset or a monitor screen there is cause for concern in any emergency situation, either due to pilot error (disorientation, or unsure of position) or systems failure (loss of data link), as the pilot may not be able to re-acquire the aircraft visually with sufficient speed to prevent a crash resulting in possible damage to property or injury to persons.

6.3 The pilot using FPV has a view looking forward and to an extent to the right and left with head tracking but is unable to see the entire flight envelope of what is occurring around the model such as the location of other model aircraft, obstructions and persons.

6.4 The pilot of any FPV equipped model must be able to control and fly the model without loss of orientation under normal visual conditions.

6.5 When operating under FPV Racing conditions (see section 8) the key safety control as directed by the observer, is the immediate disarming of the motors. This only applies during racing conditions as the aircraft are operating within a defined area at low altitude.

6.6 When operating a Model Aircraft in accordance with this MOP the Return to Home function (RTH) is the system which provides onboard automated assistance for returning a drone to the location of take-off in the event of transmission loss, low battery or pilot disorientation under FPV conditions. RTH applicability and key requirements include:

- confirmation that home (launch) location has been acquired by the model aircraft/drone.
- presence of onboard GPS system;
- presence of onboard stabilisation system;
- ability of RTH to be activated by the controller or the model aircraft/drone itself;

7. POLICY: For model aircraft over 2kg or operating above 100Ft AGL

7.1 An FPV equipped Model Aircraft shall be flown by two Affiliate Members utilising a buddy-box system, or equivalent. The Pilot in Command shall not use the FPV down link for controlling the aircraft.

7.2 As an alternative to a buddy-box, it is acceptable that a Return to Home system is fitted, functional and active to be controlled by a single transmitter. All other requirements of the policy in this MOP shall still apply.

7.3 The Pilot in Command shall have flown the model via LOS prior to FPV operations and be of Silver Wings standard.

7.4 The Pilot in Command shall maintain the model within Visual Control Range and shall be able to immediately assume control of the model in the event of a problem without any action from the other party.

7.5 The operational range and flight path of the model shall be limited to the Pilot in Command's Visual Control Range.

7.6 The Pilot in Command shall be solely responsible for the safety of the flight.

7.7 FPV equipment shall only be used in aircraft that DO NOT require a Large Model or Gas Turbine Permit to Fly.

7.8 Reliable operation of the buddy-box or Return to Home with a clear handover procedure to the Pilot in Command shall be established prior to every flight.

7.9 A successful radio equipment ground range check with camera equipment turned both on and off shall be completed before the first flight of the day. This shall ensure that the range of the model control system is not significantly degraded by the operation of the FPV equipment.

7.10 Before a Video Transmitter is powered up, the pilot must make certain the channel set on the Video Transmitter is not already in use at the flying facility.

8. POLICY: For model aircraft under 2kg or operating below 100Ft AGL

8.1 An FPV equipped Model Aircraft shall be flown by two Affiliate Members: The Pilot in Command shall not use the FPV down link.

8.2 The observer shall have flown the model prior to FPV operations and be familiar with all its various functions.

8.3 The observer shall maintain the model within Visual Control Range and shall be able to immediately assume control of the model in the event of a problem via a handover of the radio. If a Return to Home (RTH) function is available then the model aircraft should be placed into RTH mode and monitored.

8.4 The operational range and flight path of the model shall be limited to the observers Visual Control Range.

8.5 The observer shall be solely responsible for the safety of the flight. The first response in case of any identified operational issue should be to ground the aircraft immediately or enable the RTH function.

8.6 A clear handover procedure to the Pilot in command shall be established prior to every flight.

8.7 A successful radio equipment ground range check with camera equipment turned both on and off shall be completed before the first flight of the day. This shall ensure that the range of the model control system is not significantly degraded by the operation of the FPV equipment. Automatic failsafe functions must be enabled on the aircraft.

8.8 If the model has a Return to Home (RTH) function then this must be configured and calibrated before every flight. The RTH home position must be set to a safe position away from the pits and persons not associated with the operation of model aircraft.

8.9 In the event that an aircraft is operating as an SGMA aircraft and at the same time as an FPV then the conditions of this MOP shall be complied with.

8.10 FPV equipment shall only be used in aircraft that do not require either a Large Model or Gas Turbine Permit to Fly.

8.11 Before a Video Transmitter is powered up, the pilot must make certain the channel set on the Video Transmitter is not already in use or jeopardised at the flying facility.

9. FPV RACING

CONDITIONS FOR FPV RACING

9.1 The following FPV Racing rules apply only when the following conditions are met:

- At least one gate and one flag must be utilised for the FPV Racing course. Typically, a course utilises 5-8 gates and 3-10 flags for pilots to navigate around.
- Low latency video feed between the aircraft and video receiver.
- Racecourse is to be within a designated area with suitable run off area in the event of a crash or failsafe (recommended minimum 30m exclusion zone).
- Aircraft are operated lower than 100m (below the tree line). Racing wings may utilise a higher altitude than typical racing quadcopters but in accordance with a relevant instrument, CASR and Directive 96/17.

Note: Due to emerging styles of racing the MAAA Executive may vary the conditions for FPV racing when requested and approved by CASA.

SAFETY

9.2 The Event Director, Flight Line Director and other assistants must always take safety into consideration and ensure that participants, helpers and officials involved at the flying site comply with the safety rules defined by the organiser.

Pilots must be briefed on the racing conditions for that particular site prior to the commencement of any racing / flying activities. Example items to be highlighted in the safety briefing includes (but not limited to):

- All pilots must always obey the direction of the flight line director during the entirety of the racing, practise or testing.
- When individual spotters are in use then the pilot must follow the direction of the spotter.

- All aircraft must be operated within the safety zone and be aware of the minimum 30m buffer from any spectator or persons not associated with the operation of the aircraft.
- All aircraft must be configured with a switch-based arm switch and when disarmed must immediately stop all motors.
- All aircraft must be configured with a radio failsafe where in the event the aircraft loses signal all motors are stopped immediately (no 2-stage failsafe are allowed).
- Before the operation of any FPV Racing equipment the Event Coordinator or Flight Line Director are to ensure that all failsafe settings have been checked.
- All aircraft should operate below 100m (typically lower than the surrounding trees).
- No pilots are allowed on the field while other aircraft are in the air. Only when the Flight Line Director identifies that the track is clear are the aircraft able to be retrieved.
- Flight Line Director or Delage to monitor ALL track zones during an event to ensure no incursion into track by any persons.
- If there is any incursion into the exclusion and track zones then all flying must cease immediately and aircraft grounded safely or immediately disarmed.
- If a pilot hits and obstacle and is no longer in control they are to immediately disarm the motors.
- All pilots are to be aware of their video operating frequency and know how to correctly change their frequency of their aircraft and video receiver.
- If a pilot does not have clear video feed and they are unable to operate their aircraft safely they must land / disarm immediately.
- FPV operations under this MOP066 are to be conducted at MAAA flying clubs or affiliated flying sites.

Return to Home (RTH) must not be enabled on FPV Racing aircraft as this can create additional safety concerns due to the typically smaller racing track locations. Pilots either fly their aircraft safely back to the landing zone or disarm their quad and manually retrieve when the Flight Line Director has cleared the track as safe.

It is highly recommended to have designated start and finish landing areas away from the pilots flying location as this helps reduce video interference for aircraft on the start of landing area interfering with the flying aircraft.

All aircraft should be checked by the race organisers during scrutineering before flying commences to ensure a correctly operating failsafe and that the airframe and wiring are safe to operate. **If in doubt do not fly.**

PARTICIPANTS AND HELPERS

9.3 Each participant must comply with the national regulations such as (but not limited to): authorisation to fly FPV, pilot qualification, insurance, radio equipment. Unless specific agreement is obtained from authorities, the radio frequencies must comply with the regulations of the Australian Communication and Media Authority (ACMA).

VIDEO TRANSMITTER FREQUENCY ALLOCATION

9.4 Competitors must not power their video transmitter when not racing in order to avoid interference with competitors who are flying. Video transmitters are only allowed to be powered when at the starting location or during scrutineering for checks.

Powering a video transmitter on a channel being used by another competitor who is racing may cause the offender to be excluded from the event.

Before each race round, the competitors in that round need to ensure they are on a different video channel so as not to cause interference.

VIDEO TRANSMITTER FREQUENCY CONTROL

9.5 Before a Video Transmitter is powered up, the pilot must power his Video Ground Station and make certain the channel set on the Video Transmitter is not already in use. Failure to do so may cause the pilot to be excluded from the event.

At large events a Video Transmitter channel board may be used to help regulate channel allocations.

Competitors will only be allowed to power a Video Transmitter once on the starting line and only on a channel allocated for that heat.

MULTI – ROTOR EQUIPMENT

9.6 The multi-rotor must be equipped with a failsafe system that immediately cuts the motors as soon as radio signal is lost.

Carbon fibre or metal propellers are not allowed.

Size, battery type, prop size or other characteristics might be dictated by the club or race events.

RTH is not allowed.

FPV NIGHT RACING

9.7 FPV Night racing must apply to all the same rules as per operations during the day but must include the following additional rules:

- The flying area for the racetrack must contain outdoor lighting facilities to a level that allows for good visibility on the cameras used on the aircraft (this should be tested before race day with a variety of flight cameras).
- The model must always remain within the illuminated area .
- It is recommended to have illumination above the track area so that the light source does not dazzle the flight camera in the aircraft.
- The aircraft is to have external lights to ensure visibility for the flight line director and spotters. It is recommended to have different colour lighting for each aircraft to easily distinguish between pilots.
- Be operated in accordance with MOP018 Night Flying

10. GENERAL SGMA POLICY

10.1 For any model to operate under MAAA insurance it must be operated within all MAAA procedures including these requirements.

10.2 All aircraft operated under this policy must be for sport and recreation only, any commercial or commercially related operations are specifically **excluded**. The latter are required by CASA to operate under CASR 1998 Part 101 Sub Part F.

10.3 Turbine powered aircraft (either gas or electric) are not permitted to operate under this Clause 9 but may operate under Clause 7.

10.4 The MAAA requires that all aircraft with a dry mass greater than 7Kgs have a valid Permit to Fly.

10.5 The Pilot in Command shall be a current Affiliate Member and hold a minimum of Bronze or Silver Wings for the type of aircraft being flown.

10.6 The Pilot in Command shall be responsible for the safety of the flight.

10.7 The aircraft shall always remain within the Visual Control Range of the Pilot in Command . First Person View (FPV) shall not to be used by the Pilot in Command.

10.8 The minimum distance required, to either public roads or buildings where the public may be, under CASR Part 101 of 30 metres shall be maintained

10.9 Manual takeover (override) from self-guided control is mandatory and shall be possible within 1 second of being required.

10.10 The method of implementing manual takeover shall be by means of a dedicated switch on the transmitter not associated with any other control function. The operation shall be through a designed in function of the SGMA controller

10.11 A basic pre-flight check is mandatory before every flight. This shall include structural integrity, power plant and propeller integrity, control surface integrity, sufficient fuel and battery capacity for the flight, the function and correct direction of movement of all control surfaces, and correct operation of self-guided control system to the extent possible whilst on the ground. It is mandatory that the correct operation of the method of manual takeover is verified.

10.12 The take-off and landing shall be under manual control unless return to home has been activated.

10.13 No objects shall be deliberately dropped from the aircraft.

10.14 Clubs can impose additional safety rules on the operation of SGMA's above those mandated by the MAAA, including that they not be allowed to operate at their flying field.

10.15 In the event that an aircraft is operating as an FPV aircraft and at the same time as an SGMA then all the conditions this MOP shall be complied with.

10.16 In the event that the definition of operation as an FPV aircraft or as an SGMA in this Policy is not adequate, the MAAA Secretary should be contacted to make a ruling.

11. RETURN TO HOME POLICY

11.1 This Section relaxes the General SGMA Policy for the specific case of Return to Home.

11.2 Provided that the model aircraft can be flown under current MAAA policies there is no general restriction on the type of aircraft to which Return to Home can be applied.

11.3 The requirements of Section 10 apply in addition to the normal MAAA guidelines for the class of model being flown including remaining within Visual Control Range.

11.4 The Return to Home function capable of being selected by the Pilot in Command shall be capable of de-selection by the Pilot in Command at any stage of the flight.

11.5 In the event that the Pilot in Command realises that there is any malfunction in the Return to Home operation, he shall immediately disable the function and endeavour to recover the aircraft manually.

11.6 The programmed 'home' shall be the take-off area that the flight commenced from and should be away from the pits and spectators.

11.7 Before an aircraft is first authorised to fly under this Section 11 the successful operation of Return to Home shall be verified under the safety distance conditions of Visual Control Range. This verification is to be carried out by the pilot for the type of aircraft being flown and preferably from the club where the flight is to take place, except if the aircraft is required to have a valid Permit to Fly. In this case then the successful demonstration of the Return to Home capability must be added to the Permit to Fly and authorised by a MAAA Inspector authorised to certify the appropriate class of aircraft.

11.8A successful radio equipment ground range check with the Return to Home equipment turned both on and off shall be completed before the first flight of the day. This is to verify that the range of the model control system is not significantly degraded by the operation of the Return to Home equipment.

11.9 Clubs can impose additional safety and other rules on Return to Home operations above those mandated by the MAAA.

11.10 In the event that the definition of SGMA in this Policy is not adequate to determine whether an aircraft is considered to be only Return to Home equipped, the MAAA Secretary should be contacted to make a ruling.

12. GUIDANCE

12.1There is the potential for interference between the technology used in FPV and SGMA systems and the basic radio system controlling the model, particularly if this uses 2.4 GHz. Precautions to be considered are included within MOP058 2.4 GHz Policy.