



#### 4. Procedures for flying with a competent observer

Before any flight is made ensure that your competent observer is fully briefed and rehearsed on what is expected of him/her and your plan for the flight based on the prevailing conditions.

Make sure that the competent observer understands that he/she must stay directly adjacent to you (the person in charge) and maintain direct unaided visual contact with your aircraft at all times, visually and aurally monitoring the airspace for other aircraft and the take-off and landing area for any persons. In the event of another aircraft being spotted they should identify if it poses a risk of collision. If it does they should use the call "Aircraft - Descend, Descend, Descend", or in the very unlikely event that the spotted aircraft is lower than the model "Aircraft - Climb, Climb, Climb".

If your aircraft is proceeding beyond the point at which the observer is able to monitor its flight path sufficiently to identify risks of collision, he/she must tell you to manoeuvre your aircraft so that adequate visual reference is regained.

#### 5. Conditions

The conditions, if any, contained in the General Exemption must be complied with.

The aircraft must not be flown:

- Over or within 150 metres of any congested area;
- Over or within 150 metres of an organised open-air assembly of more than 1,000 persons;
- Within 50 metres of any vessel, vehicle or structure which is not under the control of the person in charge of the aircraft; or
  - except when taking off or landing, within 50 metres of any person.
  - during take-off or landing, within 30 metres of any person.

(The distances from persons do not apply to the person in charge of the aircraft or a person under the control of the person in charge of the aircraft)



## FPV UK Rules

1. All members are responsible for familiarizing themselves with Civil Aviation Laws applicable to model flying. See the Air Navigation Order 2009 and particularly articles 136, 166 and 167. [www.caa.co.uk/cas303](http://www.caa.co.uk/cas303)
2. FPV UK activities are confined to the flying of model aircraft for sporting and recreational purposes.
3. Members involved in any type of incident that could lead to an insurance claim must not admit fault or liability.
4. When flying from club sites pilots must familiarise themselves, and comply with the club site rules.
5. Members must not act in a manner which brings or may bring FPV UK or the FPV activity in general into disrepute.
6. When Members are using a competent observer they must comply with the FPV UK special operating procedures detailed below.

## FPV UK Recommendations

### 1) Safe Airframes

Where appropriate, pilots should use lightweight, low-speed models which will minimise impact forces if things go wrong.

Faster, heavier aircraft should only be used when the FPV pilot is expert and is flying in a suitable and safe location (ie far away from people and property).

### 2) Safe Location

Pilots should make a considered judgement when choosing their FPV flying field and only fly from a safe location away from populated areas and busy roads. The key here is to consider whether, in the event of something going wrong during a flight, the location is safe.

### 3) Suitable Conditions

Pilots should only fly when weather conditions are suitable for their aircraft and their level of ability. Nil wind is usually ideal (with the exception of slope soaring) and anything below 8mph or so is suitable for beginners with most aircraft. Pilots should leave more challenging conditions until they have considerable FPV flight experience. Beginners should choose a bright day with a clear horizon so that they have a good attitude reference.

### 4) Quality Equipment

As with all R/C flying it is important to use good quality components. In addition to a good quality radio transmitter, receiver, servos, etc. a good quality camera should be used that has adequate resolution to easily see the plane's altitude, location, and proximity to other objects. Pilots should also ensure that a high quality video downlink and viewing system (eg video goggles) are used. Pilots should select high quality tried and tested components available from the dedicated FPV sources.

### 5) Pre-Flight Checks

Pilots should:

- double check the centre of gravity location of their aircraft before flight.
- check R/C Tx/Rx range – as specified in the transmitter manual.
- repeat the R/C Tx/Rx range check with the video Tx switched on.
- check the video system range. On new set-ups this is best done by flying a LOS circuit whilst recording the FPV feed and then checking the quality before attempting to fly FPV. Alternatively this can be checked by someone else flying a LOS circuit with the newly configured aircraft whilst the pilot monitors the live video. Nb. Ground

range tests of video will usually show 1/4 to 1/3 of air to ground range (due to the Fresnel Zone effect and multipath interference).

### 6) Battery Charge Status

Flying FPV can involve several more batteries than normal R/C flight. All batteries should be checked for full charge before each flight. If possible the pilot should power all ground equipment from a single, voltage/ capacity remaining monitored audio-alarmed high-capacity source (eg a large capacity gel cell). Ideally the airborne equipment should similarly be powered from a single voltage/ capacity remaining monitored battery, or several if they can all be monitored through an OSD/ low battery display. The batteries may include:

- Video Receiver Battery
- Video Transmitter/ Camera Battery
- Aircraft (Motor) Battery
- Video Goggles Battery
- R/C Transmitter Battery

### 7) Visual Contact / Competent Observer

Article 166(3) of the Air Navigation Order (which forms UK law) stipulates that the person in charge of a small unmanned aircraft must maintain direct unaided visual contact at all times for the purposes of collision avoidance. In practice this means that two people must participate and the pilot in charge must be the person with his eyes on the model. The FPV pilot may have control for the entire flight, if it is safe to do so, however the person in charge must be able to take over instantly if required.

Exceptions: Models under 1.8kg AUMW (including fuel, if relevant) may be exempt from article 166(3) where the model meets certain criteria and specific FPV UK flying procedures are followed - including a Competent Observer. Please see the specific FPV UK guidance on flying with a Competent Observer.

### 8) Training

First Person View flying means that the pilot controls the aircraft by reference to the horizon - just as with full-sized aviation. It is recommended that novice FPV pilots practice on a radio control simulator with FPV mode and become proficient before attempting FPV flight for real.

Before attempting a first flight it is a good idea for a novice FPV pilot to wear the goggles and view the video feed as a "passenger" whilst another pilot flies the aircraft. This will give the new pilot a feel for FPV flying and allow him to become familiar with the flying field and locality before taking control.

Until the pilot is proficient at flying FPV, it is advisable that flights are carried out with an experienced person in charge who will carry out the take offs and landings by traditional line of sight flying.

### 9) Positional Awareness

FPV flying is different to line-of-sight flying. The pilot sees a completely different perspective, and during his first flights, it is easy to lose track of where the aircraft is relative to the flying field - especially when directly above it.

Pilots should get to know the flying field and locality from the air by flying as a "passenger" and also by using tools such as OS maps, or Google Maps/ Google Earth to become familiar with the terrain, trees, buildings, roads, landmarks, etc.



Equipment such as OSDs (on screen displays) which can overlay GPS data on to the pilot's screen and provide an arrow and distance back to the field ensure that positional awareness is never lost.

A Competent Observer should always be able to tell the pilot which way to fly to head for home.

#### 10) Interference

Interference from WiFi installations can create horizontal lines on the pilot's video image if using analogue 2.4GHz video equipment. This is another good reason that pilots should ensure that their flying field is away from residential areas.

There are known issues with using 2.4GHz R/C equipment alongside analogue 2.4GHz video equipment. When designing an FPV system it is best to choose R/C and video frequencies that are significantly separated. For example 35MHz R/C control and 2.4GHz video, or 459MHz R/C control and 5.8GHz video, 2.4GHz R/C control and 5.8GHz video, etc, etc.

Digital 2.4GHz FPV systems are interoperable with 2.4GHz R/C systems.

#### 11) BEC Capacity

If the aircraft uses servos for a pan/tilt mount, the pilot should ensure that the BEC on the ESC can drive the total number of servos in the system – or they should use a UBEC. Most BECs, especially when running off 3s LiPos, can only drive 3 or 4 servos. (Regulating the voltage down to 5v creates heat - and supplying amps to servos creates heat: too many volts or too many servos can result in thermal overload - which shuts down the BEC and the power to the Receiver).

If 3 or 4 servos are already in use to fly the plane, adding 2 more for the pan/tilt mount could result in disaster. Pilots need to take care not to overload their BEC.

### FPV UK Operating Procedures for flying 1.8kg or less aircraft with a competent observer.

#### 1. Introduction

Article 166(3) of the Air Navigation Order 2009 stipulates that the person in charge of a small unmanned aircraft must maintain direct unaided visual contact with the aircraft at all times, for the purposes of collision avoidance. Under the terms of an exemption issued by the CAA, FPV UK members may be exempt from this rule when flying aircraft which meet the criteria described in the exemption, this document and when flown in adherence with the procedures in this document.

#### 2. Aircraft

This document applies exclusively to aircraft which have a maximum take-off mass of 1.8kg, or less, including fuel and/ or batteries (if relevant).

#### 3. Competent Observer

A 'competent observer' is defined as a trained and competent person designated by the person in charge of the aircraft who, by direct unaided visual observation of the aircraft, assists the person in charge with the safe conduct of the flight.