



# HANDBOOK

# Contents

<b>About FPV UK</b>	<b>3</b>
Dissemination of important information	3
Membership subscription	3
Plastic membership card subscription	4
Flight Test Cover subscription	4
CAA registration subscription	5
<b>Insurance</b>	<b>6</b>
Terms and Conditions	6
Making an insurance claim	8
Occurrence reporting procedure	9
<b>Reporting to other organisations (CAA/ AAIB)</b>	<b>9</b>
<b>FPV UK Certificate of competency</b>	<b>13</b>
Mentors	13
Examiners	14
Training Organisations	14
<b>FPV Competition Event Guidance</b>	<b>15</b>
Selecting a suitable racing location	15
Assessing and addressing risk	15
Organising your event	15
Frequency management	16
On the day	16
Pilot's briefing	17
Spotter and marshals briefing	17
<b>FPV Beginner Recommendations</b>	<b>18</b>
Safe Airframes	18
Safe Location	18
Suitable Conditions	18
Quality Equipment	18
Pre-Flight Checks	18
Battery Charge Status	19
Visual Contact / Competent Observer	19
Training	19
Positional Awareness	20
Interference	20
BEC Capacity	20

<b>Operating procedures for flying FPV aircraft with competent observer</b>	<b>21</b>
1. Introduction	21
2. Aircraft	21
3. Competent Observer	21
4. Procedures for flying with a competent observer	21
5. Conditions	22
<b>CAA Operational Authorisation</b>	<b>23</b>
Association Membership	23
Member Compliance	23
Types of Unmanned Aircraft	23
Minimum Age	23
Safety Accountability	24
Registration of the Operator	24
Remote Pilot Competence	25
Location(s) of Operation	25
Type of Operations	25
Operating heights/ altitudes/ levels	25
Separation Distances for model aircraft	26
Dropping of Articles	27
Physically Constrained Unmanned Aircraft	27
Free Flight Model Aircraft	27
Model Aircraft Display Events	28
Operation of Model Aircraft by non-UK persons	28
Operations of Model Aircraft by non-members under instruction	29
<b>Risk Assessments</b>	<b>30</b>



## About FPV UK

In 2009 FPV UK was founded to provide public liability insurance and representation for recreational flyers of unmanned aircraft (model aircraft, including multirotor 'drones') using First Person View (FPV) technology.

From the beginning, all types of recreational model aircraft and multirotor drone flying (not just by FPV) has been encouraged and covered under the association's public liability insurance policy.

It is probably accurate to say that latterly the association membership is predominantly made up of members who fly aircraft without the use of FPV goggles most of the time. FPV UK recognises this and works to represent the interests of all recreational unmanned aircraft flyers - FPV or not.

## Dissemination of important information

FPV UK disseminates important information through the FPVUK.org website, Facebook page and Twitter account.

All members of FPV UK have verified email addresses and information can therefore be emailed directly when necessary. (Mass emails are kept to a minimum).

FPV UK's national network of mentors and examiners receive updated guidance when applicable.

## Membership subscription

Membership costs £19.99 per annum and is facilitated entirely online through the FPVUK.org website.

FPV UK membership is an annually recurring subscription which runs for 12 months from the date the member joins.

By default each member's membership subscription will automatically renew on the anniversary. However, automatic renewal can be disabled at any time before the membership renewal takes place in the member's account on the FPVUK.org website.

Two reminders are sent before membership renewal. The first is sent three days before renewal, and the second reminder is sent one day before renewal.

## Plastic membership card subscription

A plastic membership card is available for an extra £8.99 per annum including postage. When added to the member's account, the renewal date of this annual subscription will be set to coincide with the renewal date of the member's FPV UK membership.

For example; if a member were to join the association in February and then add a plastic card subscription to their account in April they would receive a plastic membership card a few days after they added it in April, with the expiry date of their membership - in February the following year - printed on the card.

The £8.99 plastic card subscription would then renew on the same day as the annual membership the following February so that the member receives a new card shortly after their membership has renewed.

Just like the main membership subscription, auto-renew on this £8.99 subscription can be stopped at any time within the member's account on the FPVUK.org website. And separate reminders are sent to the member three days before, and one day before it renews.

Cancellation of main membership subscription will also cancel this subscription.

## Flight Test Cover subscription

Standard FPV UK membership allows the member to fly their aircraft for recreational purposes and be covered under the FPV UK public liability insurance policy. In some cases members may wish to fly their model aircraft for activities which are not strictly recreational, but are not commercial either. A flight test or a demonstration flight for example.

FPV UK flight test cover is available for £12 per annum to cover this scenario.

Like the FPV UK membership subscription, and the plastic membership card subscription above, Flight Test Cover can be added to the member's account at any time using the member's account on the FPVUK.org website.

The subscription will run for twelve months from the date it is added to the member's account. This subscription must be accompanied by an active FPV UK membership subscription to be valid. Cancellation of the FPV UK membership subscription will also cancel this subscription.

As with the other FPV UK subscriptions, the flight test cover £12 subscription will automatically renew after twelve months. Auto-renew can be removed at any time from the member's account on the FPVUK.org website.

Two email reminders will be sent to the member. The first three days before renewal, and the second one day before renewal.

## CAA registration subscription

With the CAA registration subscription, the association registers the member's details with the CAA on their behalf automatically.

This service costs £9 per annum and can be added to the member's account from their account page on the FPVUK.org website.

The subscription will run for twelve months from the date it is added to the member's account. This subscription must be accompanied by an active FPV UK membership subscription to be valid. Cancellation of the FPV UK membership subscription will also cancel this subscription.

As with the other FPV UK subscriptions, the CAA registration subscription will automatically renew after twelve months. Auto-renew can be removed at any time from the member's account on the FPVUK.org website.

Two email reminders will be sent to the member. The first three days before renewal, and the second one day before renewal.

# Insurance

## Terms and Conditions

### **PUBLIC/ PRODUCTS LIABILITY INSURANCE FOR UNMANNED AIRCRAFT**

**What is Insured:** Public and Products liability is liability to third parties. It is liability that arises following damage to third party property or injury to third party persons (injury means bodily injury, mental injury, death, disease, illness, wrongful arrest or false imprisonment). This insurance provides cover for the association and also for all members 365 days per year whilst they are undertaking modelling or model engineering activities of all and every kind including when they are 'on their own'. The Public Liability cover extends to include the liability of one member to another member and cover applies to members of all ages - there is no upper or lower age limit.

**Geographical Limits:** Permanent residents of the UK, Channel Islands or the Isle of Man will be covered anywhere in the UK or EU member states (plus Switzerland and Norway). Non UK, Channel Islands or Isle of Man permanent residents will be covered anywhere in the UK, the Channel Islands or the Isle of Man.

Wives, girlfriends, partners and friends are often "roped in to help" on occasions when more hands are needed and it should be mentioned that, as they may not be members, the public liability cover may not extend to include them although this will depend on the circumstances surrounding the incident giving rise to the claim. In order to ensure their inclusion consideration should be given to including such helpers as members.

The limit of indemnity for Public Liability cover applies to any one event whereas the limit of indemnity for Products Liability cover applies to any one event and in any one period of insurance. Legal defence costs are included with an indemnity limit of £250,000 representing the total amount payable in respect of all costs and expenses arising out of claims during any period of insurance. The following restrictions/conditions should be noted: -

1. Insurance cover as required by the Road Traffic Act is not provided.
2. Cover extends to include unmanned aircraft less than 20kg in weight including those powered by rubber motors, internal combustion engines or propelled electrically excluding any kind of rocket or pulse jet unit, gas turbine or turbojet other than 'Jetex' power units.
3. Pollution and contamination is excluded unless the pollution and contamination emanated from an identifiable single source and occurred at an identifiable time.

4. Indemnity will not apply to legal liability arising out of advice design or specification provided for a fee.
5. Unmanned aircraft must be operated with reasonable care for and attention to the safety of other persons and property and to comply with any statutory enactment or instrument, bye law or other regulation.
6. Cover extends to include unmanned aircraft flying from M.O.D. property.
7. Cover extends to include instructors providing unmanned aircraft flying training for financial gain.
8. Cover extends to include any public authority whose facilities are being used by the insured. Indemnity to principals is automatically provided (e.g. private landowners, host modelling clubs or societies) and the interest of the Secretary of State for Defence is noted.

**Guidance Note - Operators with Medical Conditions:** - Persons are acceptable as operators unless they have a medical condition which would normally preclude them from holding a driving licence. This does not mean that they have to have had a driving licence but just that the medical condition they have would preclude them from holding a driving licence were they to apply for one.

Health and Safety Executive - Cover for legal expenses incurred defending Health & Safety Executive prosecutions is included in the policy cover. There is, however, no cover for any fines imposed.

**Abuse:** Insurers shall not be liable for claims arising from abuse. Abuse shall mean:

- A. acts of hurting or injuring mentally or physically by maltreatment or ill-use
- B. acts of forcing sexual activity rape or molestation, or
- C. repeated or continuing contemptuous coarse or insulting words or behaviours

**Asbestos:** Fear of asbestos and removal Costs Exclusion: Asbestos shall mean crocidolite amosite chrysotile fibrous actinolite fibrous anthophyllite or fibrous tremolite or any mixture containing any of those materials. Asbestos Dust shall mean fibres or particles of asbestos. Asbestos Containing Materials shall mean any material containing Asbestos or Asbestos Dust Indemnity will not apply to legal liability for bodily injury or mental injury to or death disease or illness of any person employed arising out of and in the course of employment by the insured in the business. Indemnity will not apply to legal liability for the costs of remedying:

- A. any defect or alleged defect
- B. the presence of Asbestos, Asbestos Dust, or Asbestos containing Materials in premises disposed of by the insured Indemnity will not apply to legal liability for mental injury or fear of suffering bodily injury death disease or illness arising out of actual or suspected exposure to Asbestos, Asbestos Dust or Asbestos Containing Materials Indemnity will not apply to legal

liability for the costs of management (including those of any persons under statutory duty to manage) removal repair alterations recall replacement or reinstatement of any property or part thereof arising out of the presence of Asbestos, Asbestos Dust or Asbestos Containing Materials.

**Terrorism Exclusion:** The Company shall not be liable for injury or loss of or damage to Property in respect of legal liability arising directly or indirectly out of terrorism. Terrorism shall mean an act of any person acting on behalf of or in connection with any individual or organisation which carries out activities directed towards the overthrowing or influencing by force or violence of Her Majesty's government in the United Kingdom or any government de jure or de facto.

**Excess:** There is a £50 excess in respect of damage to third party property.

**Recreational Use Only:** Except where the member has paid for the "*Flight Test (Non-Recreational/ Non-Commercial Add On)*", only flying for the purpose of recreation (i.e. for fun/ pleasure/ as a hobby) is permitted.

**Flight Test (Non-Recreational/ Non-Commercial Add On):** Where the member has paid for this add-on their membership certificate/ membership card will be marked as such under the endorsements section. Operations which are not recreational in nature, but are also not commercial (IE no 'valuable consideration' is received for the flight) will be covered. For example PfCO flight training and flight tests.

**Commercial operations (i.e. where a 'valuable consideration' is received) are specifically and completely excluded from cover.** EU directive 785/2004 requires that commercial operations include cover for terrorism (eg hijack). This insurance does not include such cover.

***Policy Underwritten by Travelers Insurance Ltd.***

## Making an insurance claim

**Under no circumstances should the member admit fault or agree to pay for damage caused. This could prejudice a claim and invalidate cover.**

In the event of an accident or incident involving a third party, the chief executive must be notified immediately by emailing [claims@fpvuk.org](mailto:claims@fpvuk.org).

Details of exactly what happened and where and when it happened are important. Videos, photographs, and flight logs can be very useful as well. Contact details for any witnesses should be supplied as well. Members should submit as much detail as possible.

## Occurrence reporting procedure

Occurrence reporting systems are established to learn from occurrences, improve aviation safety and prevent recurrence. **They are not to attribute blame or liability.**

In the first instance an occurrence should be reported to FPV UK by emailing [occurrences@fpvuk.org](mailto:occurrences@fpvuk.org). FPV UK can then log and store, exchange, analyse and disseminate occurrence information - promoting a good air safety culture.

FPV UK can also then guide members on any further reporting requirements applicable to the particular occurrence - such as reporting to the CAA and/ or the AAIB.

### Reporting to other organisations (CAA/ AAIB)

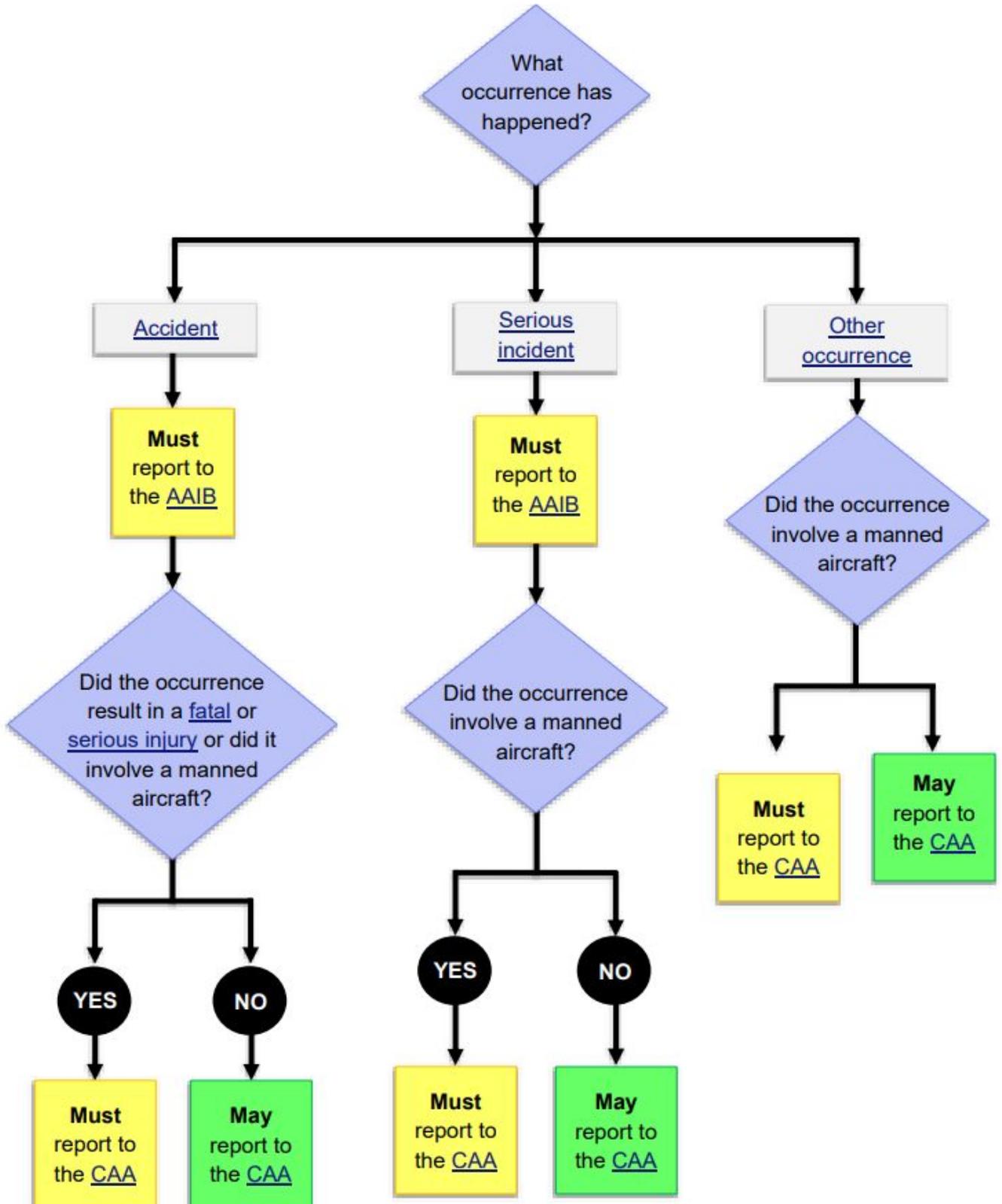
The Air Accidents Investigation Branch (AAIB) and the Civil Aviation Authority (CAA) have separate reporting requirements. It may be necessary to report to one or both.

The flowcharts below (reproduced from [CAA document CAP722](#)) will explain the following:

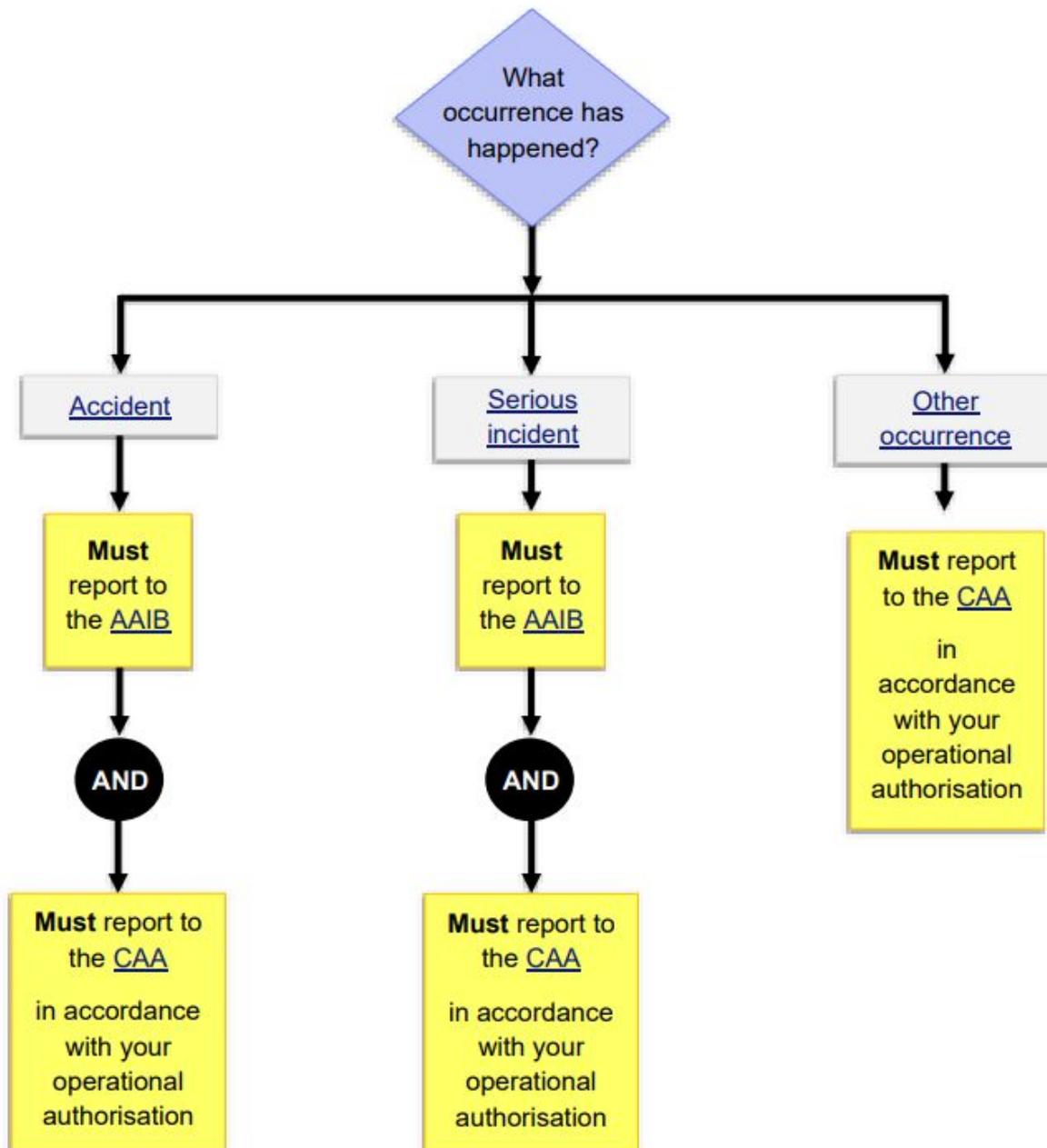
- What occurrences must be reported
- Who must be reported to
- How to report

Yellow boxes mean mandatory reporting is required and green boxes mean reporting is voluntary. Voluntary reporting is useful to provide opportunity for safety lessons to be learned more widely from an occurrence.

Open category occurrence reporting diagram (from CAA document [CAP722](#))



Specific category occurrence reporting diagram (from CAA document [CAP722](#))



The following must be reported to the AAIB (Air Accidents Investigation Branch) in accordance with Regulation (EU)996/2010 (as retained in UK domestic law):

- Accidents
- Serious Incidents

To report an accident or serious incident to the AAIB:  
<https://www.gov.uk/guidance/report-an-aircraft-accident-or-serious-incident>

The following must be reported to the CAA, in accordance with Regulation (EU)

376/2014 (the reporting regulation):

Occurrences which involve any of the following:

- Fatality
- Serious Injury
- Manned aircraft

If operating under the terms of the UAS implementing regulation article 16 operational authorisation the following additional reporting requirements apply.

The following must be reported to the CAA:

- Serious Incidents or Other Occurrences which involve any of the following:
  - Manned aircraft
  - Operating above 400ft
  - Operating less than 50m from uninvolved people
- Other occurrences which occur at any of the following:
  - Operating above 400ft
  - Operating less than 50m from uninvolved people

To report a UAS occurrence to the CAA. Reports are submitted using the European Co-ordination Centre for Accident and Incident Reporting Systems (ECCAIRS) reporting portal.  
<https://www.aviationreporting.eu/AviationReporting/> Guidance in [CAP1496](#).

Further information on occurrence reporting, including the relevant regulations which bring the reporting requirements into force, and the official definitions of accident, serious incident, fatal injury, serious injury, etc and more information on how to report to the AAIB and CAA is included in CAP 722 here: [https://publicapps.caa.co.uk/docs/33/CAP722%20Edition8\(p\).pdf](https://publicapps.caa.co.uk/docs/33/CAP722%20Edition8(p).pdf)

## FPV UK Certificate of competency

FPV UK has a two part achievement scheme with a web based online knowledge test (the FPV UK Certificate of Competency: Drone Law), and a practical skills test (the FPV UK Certificate of Competency: Practical) invigilated by a national network of examiners.

Each candidate must have passed the FPV UK CofC: Drone Law before they may attempt the FPV UK CofC: Practical test.

The training notes can be viewed here:

<https://www.fpvuk.org/files/FPVUK-Certificate-of-Competency-Practical-Member-Notes.pdf>

The examiner's check sheet is available here:

<https://www.fpvuk.org/files/FPVUK-Certificate-of-Competency-Practical-Examiner-Check-Sheet.pdf>

Each member's achievement is shown on their certificate of membership, their electronic membership card, and their physical plastic membership card.

The data can also be validated using the FPV UK membership check website: <https://members.fpvuk.org/membership-check>

An API is also available for third party electronic systems to automatically check that a pilot is a current member, is insured, and has passed the tests (e.g. a race series organiser requires all participants to be a member and to have passed the test – their website automatically validates this to be the case before the member can sign up for a race on their website, without any human intervention). Contact [info@fpvuk.org](mailto:info@fpvuk.org) for access to the API.

## Mentors

A network of mentors around the UK provide help to members who wish to improve their knowledge and flying technique and train for the FPV UK achievement scheme.

The list of local mentors is available on the FPVUK.org website here: <https://www.fpvuk.org/certificate-of-competency-practical/>

A member can apply to become a mentor by emailing [info@fpvuk.org](mailto:info@fpvuk.org)

## Examiners

Once a member is ready to undertake the FPV UK Certificate of Competency test they can arrange to meet with an examiner to be assessed.

The list of local examiners is available on the FPVUK.org website here: <https://www.fpvuk.org/certificate-of-competency-practical/>

A member can apply to become an examiner by emailing [info@fpvuk.org](mailto:info@fpvuk.org)

## Training Organisations

In addition to the network of mentors mentioned above, a number of training organisations around the UK offer training for the FPV UK Certificate of Competency. These can be viewed on the FPVUK.org website here: <https://www.fpvuk.org/certificate-of-competency-practical/>

Training organisations wishing to offer training to the FPV UK Certificate of Competency can email [info@fpvuk.org](mailto:info@fpvuk.org) for more information.

# FPV Competition Event Guidance

## Selecting a suitable racing location

The UAS implementing regulation article 16 operational authorisation allows for FPV flying *'within a sterile area - meaning a cordoned off, closed area that uninvolved persons are excluded from'*. You should select a location which allows for this requirement to be met.

Drone insurance claims are almost exclusively for damage to motor vehicles. Make sure vehicles are parked a safe distance away.

Indoor flying is not governed by the CAA so the rules above do not apply, however it is a good idea to cordon your flying area off from the public and keep the aircraft a safe distance away from spectators nonetheless. Netting can be very useful for managing risk at indoor flying events.

## Managing risk

Guidance on how to conduct a [risk assessment is here](#).

## Organising your event

It is a good idea to assign an Event Director who will have overall charge on the day. This person should brief the pilots and marshals and control the day (see 'on the day' section below).

If required marshals should be assigned to ensure the safe running of the day. For example a marshal may be required to prevent members of the public walking into the cordoned off area.

To ensure that you are prepared for the number of people who will attend an event it may be useful to assign tickets (either free or chargeable). There are online services which do this - EventBrite is one example. You will then be able to prepare accordingly for the number of people who are intending to come (minus a percentage for no-shows).

This list of items may be useful for your event:

- Obstacles (flags, air gates, inflatables, etc)
- Arrows (to guide competitors around the course)
- Tent pegs (for arrows/ banners/ air gates, etc)
- Clothes pegs (for FPV frequency control)
- Air horns (for director/ marshals)

- High visibility jackets
- Cordon tape
- Two way radios

## Frequency management

Radio frequency interference is a crucial consideration in a race environment and must be managed properly for a safe and enjoyable event. 2.4 GHz radio control systems are frequency hopping and spread spectrum and allow multiple aircraft to fly simultaneously, but analogue (and some digital) FPV systems are not.

It is a good idea to ask each competitor to submit their control frequency and their video frequency before the day - perhaps as part of the aforementioned ticketing process. This will allow the organisers to create racing slots for compatible aircraft/ pilots - with no RF interference issues.

Each pilot should also be aware of how to change the frequency of their equipment on the day in case they make it to the quarter/ semi/ finals and have to fly against someone who was using clashing frequencies in previous heats.

Race frequency management systems do now exist; such as the ImmersionRC Tramp HV system which uses an NFC wand to assign frequencies and power levels to each competitor at race time (and the rest of the time their transmitters are set to a ultra low power output).

## On the day

It is best to set out your cordon using fencing or cordon tape and then set up your flying area a safe distance (eg 50m) from this cordon.

The event director should hold a pilot's briefing before any flying. All pilots should attend this briefing.

## Pilot's briefing

In the pilot's briefing the event director should explain the rules of the day - including:

- When you can and when you can't power up equipment (to avoid frequency clashes - perhaps allocating clothes pegs - one per band).
- Where you can and where you can't fly (basic principle; do not fly over people, do not turn towards people, allow at least 50 metres between the spectator cordon and flying aircraft).
- How to identify Safety Marshals (eg Green High Visibility jackets).
- What each fog horn sound means (a sound of the horn will usually mean; 'Terminate race and land the aircraft immediately').
- The maximum altitude for the day (maximum allowed under the article 16 operational authorisation is 50 metres (160ft) above the surface).
- Where you can and where you can't stand (including when you can make "the walk of shame" to collect your aircraft).
- Insurance: the event director should check that each pilot has valid 3rd party liability insurance. (<https://members.fpvuk.org/membership-check>)
- Who will be spotter ('competent observer') and/ or marshal for which hours of the day/ for which races.

Remember: safety is the primary concern - if any pilot feels that safety has been compromised they should stop racing and land the aircraft safely.

It is a good idea to take all of the pilots and walk around the track together to get a feel for the course.

Most racing rules include one practice lap for each competitor.

## Spotter and marshals briefing

Spotters (competent observers) and marshals must be properly briefed about their responsibilities for the event.

For example marshals may be tasked with ensuring that members of the public do not enter the cordoned area, and also keeping an eye out for low flying manned aircraft. In the event of either kind of incursion they can call a race to a close by sounding an air horn - which signifies 'terminate race and land immediately'.

Safety is the primary concern. A race can always be restarted.

# FPV Beginner 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/ or is flying in a suitable and safe location (e.g. 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. Guidance on how to conduct a [risk assessment is here](#).

## 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 in their goggles.

## 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 attitude, 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 outlets.

## 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  $\frac{1}{4}$  to  $\frac{1}{3}$  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 94(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:

- 1) Models under 3.5kg AUW (including fuel, if relevant) may be exempt from article 94(3) where the model meets certain criteria and specific flying procedures are followed - including a Competent Observer. See the specific guidance on flying with a Competent Observer elsewhere in this document.
- 2) FPV in a sterile area under the terms of the UAS implementing regulation article 16 authorisation detailed elsewhere in this document.

#### 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 or her 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 onto the pilot's screen and provide an arrow and distance back to the field can be very helpful.

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.

#### 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.

## Operating procedures for flying FPV aircraft with a competent observer

### 1. Introduction

Article 94(3) of the Air Navigation Order 2016 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 the UAS implementing regulation article 16 operational authorisation issued by the CAA, FPV UK members may be exempt from this rule when flying aircraft which meet the criteria described in the authorisation when flown in adherence with the procedures in this document.

### 2. Aircraft

Permission applies exclusively to aircraft which have a maximum take-off mass of 3.5kg, or less, including fuel and/ or batteries (if relevant).

### 3. Competent Observer

A 'competent observer' is a briefed and competent person designated by the person in charge of the aircraft who, by direct unaided visual observation of the unmanned aircraft, assists the person in charge with the safe conduct of the flight by monitoring its flight path in relation to other aircraft, persons, vehicles, vessels and structures.

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

Before any flight is made ensure that your competent observer is fully briefed 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 competent 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 contained in the operational authorisation must be complied with.

The aircraft must not be flown:

- Within an aerodrome FRZ, unless appropriate permission has been obtained;
- At a height of more than 1000ft above the surface, unless it is a rotorcraft with more than 1 lift generating rotor or propeller in which case the height shall not exceed 400ft above the surface;
- In a built-up area (*An area substantially used for industrial, recreational, commercial or residential purposes.*), other than a built up area which is *only* used substantially for recreational purposes. Operations within such an area must be supported by a [risk assessment](#).
- Over or within 150m of any assemblies of people (*Gatherings where persons are unable to move away due to the density of the people present*);
- Within 50 metres of any vessel, vehicle or structure which is not under the control of the remote pilot; or
  - Within a horizontal distance of 30m of assemblies of people;
  - Within 30m of any uninvolved person. This distance may be reduced to 15m for take-off and landing if required for practical operations and there are locally applied mitigations to protect uninvolved persons, following a local [risk assessment](#).

(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).

## CAA Operational Authorisation

The following pages detail the terms of the operational authorisation issued to FPV UK by the CAA under UAS IR article 16.

### Association Membership

The operational authorisation is available only to current association members.

### Member Compliance

Any member making use of the operational authorisation must comply with the procedures and rules set out in this document.

### Types of Unmanned Aircraft

The operational authorisation only applies to model aircraft with a MTOM less than 25Kg.

This includes:

- Any model aircraft
- Any control line model aircraft
- Any round-the-pole model aircraft

Definition of a model aircraft:

*'Any unmanned aircraft being flown purely for the recreational sport of model aircraft flying. This includes shop bought or home built aircraft, which are flown 'manually' using traditional control inputs rather than with any automation other than for flight stabilisation purposes. This includes multi rotor aircraft which are being flown with 'direct' control inputs, and without any automation, other than for flight stabilisation purposes.'*

#### *Note 1*

*Control Line and Round-the-pole model aircraft with a mass of not more than 1Kg are outside the scope of the UAS IR (as defined in section 7) as set out in the Basic Regulation (Regulation (EU) 2018/1139) and are instead regulated within the Air Navigation Order, article 265D.*

### Minimum Age

- 1) In accordance with UAS IR article 9(5), the minimum age for a remote pilot, operating within the limits of the authorisation, is ten years.

- 2) No minimum age for a remote pilot operating within the limits of the authorisation applies to:
  - 1) Any remote pilot of a physically constrained model aircraft.
  - 2) Any remote pilot who is under the direct supervision of another remote pilot who has reached the age of fourteen years, and both have passed the *FPV UK Certificate of Competency: Drone Law*.

### **Definition of physically constrained model aircraft:**

*A model aircraft that:*

- a. is flying within a closed building or other physical construction forming a safely enclosed area; or*
- b. is a control-line model aircraft; or*
- c. is a round-the-pole aircraft.*

## Safety Accountability

As with all model flying, the remote pilot is responsible for the safety of the operation and may only fly the model aircraft if reasonably satisfied that the flight can be safely made.

## Registration of the Operator

The operator must ensure that they are registered with the CAA and their aircraft carries their CAA Operator ID.

Control line and round-the-pole model aircraft are exempt from the operator's requirement to register.

### **Note 1:**

*The requirement to register does not apply to the operator of UAS indoors. Additionally, the requirement to register as an operator of a control line or round-the-pole model aircraft has been exempted from, within section 8, subject to the conditions within.*

### **Note 2:**

*The requirement to register only applies to:*

- *the operator of a UAS with a mass greater than 250g; or*
- *the operator of a UAS below 250g which is equipped with a sensor able to capture personal data and which is not a toy as defined in The Toys (Safety) Regulations 2011.*

### **Note 3:**

*The definition of a 'toy' includes: 'products designed or intended, whether or not exclusively, for use in play by children under 14 years in age'.*

*Products equipped with combustion engines are specifically excluded from this definition of a toy.*

## Remote Pilot Competence

Any remote pilot operating under the authorisation must demonstrate a suitable level of pilot competence by passing the *FPV UK certificate of competency: Drone Law* online test.

This test is available in each member's FPV UK account and can be done online in a few minutes. Results show instantly.

## Location(s) of Operation

1. Any suitable area, which is not a built-up area, as defined below, other than in the circumstances defined in 2 below;
2. A built-up area which is *only* used substantially for recreational purposes may be considered a 'suitable area'. Operation within such an area must be supported by a risk assessment.

### **Built-Up Area**

*An area substantially used for industrial, recreational, commercial or residential purposes.*

### **Risk Assessment**

Guidance on how to conduct a [risk assessment is here](#).

## Type of Operations

The remote pilot of a model aircraft must maintain direct, unaided visual contact with the aircraft sufficient to monitor its flight path in relation to other aircraft, persons, vehicles, vessels and structures for the purpose of avoiding collisions, unless the aircraft is being flown in accordance with [the 'First Person View' conditions](#).

## Operating heights/ altitudes/ levels

- (1) The operation of model aircraft within the authorisation is limited to 120m (400ft), unless the conditions below are met.
- (2) A model aircraft is permitted to fly at a height in excess of 120m (400ft) above the surface, in accordance with the limitations of the authorisation, if all the conditions in sub paragraphs a) to e) below are met.
  - a) The model aircraft is not a rotorcraft with more than one lift generating rotor or propeller;

- b) The model aircraft is not an automated model aircraft as defined below;
- c) The model aircraft is not being flown within the Flight Restriction Zone of an aerodrome, unless operating with the appropriate permission from the aerodrome as set out in ANO article 94.
- d) The model aircraft remains within the visual line of sight of the remote pilot;
- e) The mass of the model aircraft (MTOM- see section 3.6) shall not exceed 7.5Kg, with the exception of the circumstances in (e(i)) below;
  - i. The model aircraft is a glider, the mass (MTOM) of which does not exceed 14Kg. In this case, it may not be flown at a height greater than 120m above the remote pilot but may be flown at a height exceeding 120m above the surface directly beneath the glider.

#### **Automated model aircraft:**

*A model aircraft with autonomous or automatic flight capability. This does not include systems which are fitted for flight stabilisation purposes or flight termination purposes, such as free-flight termination devices.*

When operating above 400ft it is especially important to keep a proper lookout and listen out for approaching manned aircraft.

## Separation Distances for model aircraft

1. A model aircraft with a MTOM above 250g and not more than 7.5Kg shall not be flown:
  - a) Within a horizontal distance of 30m of assemblies of people;
  - b) Within 30m of any uninvolved person. This distance may be reduced to 15m for take-off and landing if required for practical operations and there are locally applied mitigations to protect uninvolved persons, following a local risk assessment.
2. A model aircraft with a MTOM greater than 7.5Kg, and less than 25kg shall not be flown:
  - a) Within a horizontal distance of 50m of assemblies of people. This distance may be reduced to 30m for take-off and landing if required for practical operations and there are locally applied mitigations to protect uninvolved persons, following a local risk assessment.
  - b) Within 30m of any uninvolved person.

#### **Assemblies of People**

*Gatherings where persons are unable to move away due to the density of the people present.*

#### **Uninvolved Persons**

*Persons who are not participating in the UAS operation or who are not aware of the instructions and safety precautions given by the UAS operator.*

## Dropping of Articles

The remote pilot must not cause or permit any article or animal to be dropped from an unmanned aircraft so as to endanger persons or property.

## Physically Constrained Unmanned Aircraft

Permission is not required to operate a control line or round-the-pole model aircraft within an Aerodrome Flight Restriction Zone, providing all the following conditions are met:

- a) The tether line does not exceed 25m;
- b) The flight does not take place within the Runway Protection Zone (RPZ) part of the FRZ;
- c) The MTOM does not exceed 7.5Kg;
- d) The flight does not take place over, or within the boundary of the protected aerodrome unless permission for the flight has been obtained, as described in ANO article 94A.

Control line and round-the-pole model aircraft are exempt from all the requirements of the UAS implementing regulation, providing all the following conditions are met:

- a) The tether line does not exceed 25m;
- b) The MTOM does not exceed 1Kg.
- c) The unmanned aircraft is not capable of vertical take-off/landing or hovering, such as helicopters or multicopters.

### **Note:**

*The Basic Regulation excludes powered tethered unmanned aircraft with a mass of not more than 1kg from the requirements of the UAS IR. ANO Article 265D re-applies certain requirements of the UAS IR to tethered unmanned aircraft with a mass of not more than 1Kg. This exemption sets out that control line model aircraft and round the pole model aircraft are exempt from the requirements of article 265D.*

## Free Flight Model Aircraft

- (1) Before launching a free flight model aircraft the remote pilot, taking into account the expected performance of the aircraft, the weather conditions, and any flight termination device fitted to the aircraft, shall be reasonably satisfied that the expected flight path will not infringe a Flight Restriction Zone, or any other airspace restriction (unless prior permission for flight within the airspace has been obtained).
- (2) The operation of free flight model aircraft must only be carried out within the limits and conditions of this authorisation, or within the Open category of operations.
- (3) A free flight model aircraft shall not be:

- a. Launched, unless from an area which the remote pilot is able to satisfy themselves is free from uninvolved people.
  - b. Launched, until the remote pilot has identified the area within which he or she believes the aircraft will remain (the 'flight volume') based on the considerations in (1).
  - c. Flown, unless the remote pilot is satisfied that the aircraft will remain within the flight volume.
  - d. Flown, unless the remote pilot is satisfied at the point of launch, that no uninvolved persons will enter flight volume and may be endangered by the flight of the free flight model aircraft.
- (4) A free flight model aircraft shall not be flown beyond the visual line of sight of the remote pilot, unless otherwise in accordance with a suitable authorisation.

#### **Free flight model aircraft:**

*A free-flight model aircraft cannot be remotely piloted and does not have software or systems for autonomous control of the flight path. A flight termination device may be fitted. The aircraft trim is adjusted prior to flight. The aircraft is trimmed (and fuelled if applicable) with the intent that it will follow a substantially circular path relative to the air and ultimately glide to a low velocity landing. A free-flight unmanned aircraft will drift relative to the user depending upon the speed and direction of the wind. The person in charge of the free-flight unmanned aircraft is deemed to be the remote pilot for the purposes of this authorisation.*

## Model Aircraft Display Events

- (1) Any operator and remote pilot who wishes to operate a model aircraft as part of a flying display event may do so within the limits of the authorisation, in accordance with CAP 403 and CAP 658 – or any subsequently updated or replacement document.
- (2) Any such display which takes place above 400ft, must be notified to other airspace users through the use of a NOTAM.
- (3) Should the operator wish to operate as part of a flying display **outside** any of the conditions within the authorisation, they must obtain a separate authorisation for the operation, and an additional model aircraft display authorisation using form SRG 1308 and in accordance with the CAA Scheme of Charges.

## Operation of Model Aircraft by non-UK persons

Non-UK residents may operate model aircraft in accordance with all operating conditions of the authorisation, provided that they hold FPV UK membership and comply with the rules and practices of FPV UK.

Any non-UK remote pilot must take the *FPV UK certificate of competency: drone law* test and must fly an aircraft displaying a valid Operator ID.

## Operations of Model Aircraft by non-members under instruction

- (1) For the purposes of conducting 'trial flights' by non-members, the non-member may operate the controls of the model aircraft whilst under the direct instruction and supervision of a member. In such an instance, the remote pilot receiving instruction does not need to comply with the competence requirements set out above.
- (2) The registration requirements and registration display requirements still apply.

## Risk Assessments

A risk assessment is a way to manage risk. It needn't be complicated.

It is simply a case of identifying the things that could happen (the hazards), and then thinking about how likely they are to happen (the likelihood), how severe the outcome would be if they were to happen (the severity) - and multiplying them by one another to give a risk value. Then coming up with suitable measures to reduce those risks to an acceptable level (the mitigations).

### Severity of Hazard

What would the outcome be should the hazard become a reality?

Trivial	Minor Injury	Serious Injury	Single Fatality	Multiple Fatality
1	2	3	4	5

### Likelihood of Occurrence

What is the likelihood of the hazard becoming a reality?

	<b>Extremely improbable</b>	<b>Improbable</b>	<b>Remote</b>	<b>Occasional</b>	<b>Frequent</b>
Meaning	Almost inconceivable that the event will occur.	Very unlikely to occur.	Unlikely, but may possibly occur.	Likely to occur sometimes.	Likely to occur many times.
Statistical	<10 <sup>-9</sup> per hour	10 <sup>-7</sup> to 10 <sup>-9</sup> per hour	10 <sup>-5</sup> to 10 <sup>-7</sup> per hour	10 <sup>-3</sup> to 10 <sup>-5</sup> per hour	1 to 10 <sup>-3</sup> per hour
Annual/daily equivalent	Never	Once in 1000 years to once in 100,000 years	Once in 10 years to once in 1000 years	Once per 40 days to once in 10 years	Once per hour to once in 40 days
Value	1	2	3	4	5

Example:

Hazard	Severity	Likelihood	Rating	Mitigation	M/Factor	Final Rating
Spectator hit by racing drone	2	3	6	Cordon off the flying area to keep spectators 30m back	Likelihood reduced to 2	4

### Risk Rating

< 6 indicates a low risk

Between 6 and 15 indicates a medium risk

>15 a high risk.