HANDBOOK

UK Civil Aviation Authority

Operational Authorisation
UAS13529

Version 1.7 - December 2025

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Revision History

Version	Date	Changes
V1.1	05/21	• Added CAA logo and authorisation number on the first page. • Added '(numbered UAS13529)' to the first paragraph of page 11. • Added '£5m' to make it say '£5m PUBLIC/ PRODUCTS LIABILITY INSURANCE FOR UNMANNED AIRCRAFT' on page 38.
V1.2	09/21	• Added info about second daily upload for CAA registration at 1.45pm page 6. • Updated insurance section to reflect new insurance terms page 39. • Inserted corrected open category reporting flow diagram from CAP722 page 41. • Replaced references to defunct NATS Drone Assist and DroneSafe.uk page 14. • Updated propeller guidance to recommend manufacturer propellers page 30. • Corrected typos, made mentions of URLs into links, etc throughout.
v1.3	12/22	• Updated competency to require CAA Flyer ID for A16 OA. • Corrected CofC Drone Law pass mark from 70% to 75% (30 correct of 40 questions). • Updated Open Category infographic to show transition period extended to 01/01/26. • Updated text to show C mark/legacy transition period extended to 01/01/26. • Corrected typos, updated URLs to CAA documents, etc
v1.4	12/23	• Removed references to C marked drones throughout (this mostly existed in the Open Category section)
v1.5	05/24	• Updated FPV UK pricing tiers, etc • Changed ‘Unmanned Aircraft’ to ‘Uncrewed Aircraft’ where appropriate.
v1.6	04/25	• Added link to FPV UK occurrence reporting system occurrences.fpv.uk • Fixed links to CAP722
V1.7	12/25	• C-marking, new text and infographics to reflect C-marking related changes • Remote ID - new section explaining remote ID

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 multi-rotor ‘drones’) using First Person View (FPV) technology.

From the beginning, all types of recreational model aircraft and multi-rotor 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, DroneHub.co.uk community hub, Facebook page, Instagram 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.

Annual Membership subscription

Membership starts from £24.99 per annum and is facilitated entirely online through the FPVUK.org website.

FPV UK membership is an annually recurring subscription which runs for twelve 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 cancelled at any time, 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 the day before renewal. A confirmation email is also sent at 10 am the day after the successful renewal.

Organisation Summary

FPV UK was founded in 2009 to encourage, represent and connect drone flyers.

FPV UK works with the regulators for UK aviation – the Civil Aviation Authority (CAA), NATS (formerly the National Air Traffic Service), the Department for Transport (DfT), National Police Chiefs Council (NPCC), Department for Business, Energy & Industrial Strategy (BEIS), the House of Lords, the House of Commons, and other bodies, on matters pertaining to 'drones', FPV and recreational model flying.

Membership benefits include:

- **£5m Public Liability** Insurance
- **Drone Hub** community (our lively forum)
- **Article 16 OA** (FPV UK member-specific set of rules)
- **Operator ID and Flyer ID** issue and renewal through our direct digital link to the CAA
- National network of **mentors and examiners**
- **Member Map** shows flight restriction zones, recommended spots to fly, mentors and examiners
- **Flight Checker** shows locations suitable for each of their drones based on the qualifications held
- **Weather checker** checks the weather is suitable in the chosen location
- **Find my drone** reunites lost drones with their owners using a QR code
- **FPV UK store** - Operator ID labels, CAA ID cards, membership cards, lanyards, hats, hi-viz armbands are available
- **My Log Book** and **My Hangar** lets members manage their drones, and log their flights

Under 18 Annual Membership subscription

Under 18 Annual Membership is basically the same as Annual Membership, except that it is for people who are under eighteen years of age. The price is £12.50 per annum.

Members who are under eighteen will be guided to purchase this membership option rather than Annual Membership, once they enter their date of birth.

There are two main ways for an under eighteen account to be created. By the member themselves, or by their parent or guardian. In the former case the member will be required to enter their parent or guardian's details.

In both cases, in addition to the new under eighteen member's account, the process also creates an account for the parent/guardian with no membership subscription. The

parent/guardian has the opportunity to add an adult Annual Membership subscription (and Plastic Membership Card, CAA Registration/Renewal, etc) to their account if they wish to.

Where the parent/guardian is already an FPV UK member, they may add an under eighteen person as a member under their account by pressing the ‘Add New Member’ button, in the top right hand corner of their FPV UK account.

Where an under eighteen member’s account has been created under their parent/guardian’s account, they have a separate membership subscription which is accessible using the drop down in the top right of their parent/guardian’s user account. The under eighteen member cannot log into their account directly.

However, once they reach eighteen years old the account can be split out into their own separate account, with their own payment details. To do this the parent/guardian would press the ‘Separate account’ button in the top right hand corner. This creates a new user for the formerly under eighteen member, and emails them a link to set a password. The first time they log in they are required to enter their payment details.

When an under eighteen member reaches eighteen years old they will be automatically switched to an adult Annual Membership and charged accordingly.

Plastic membership card subscription

A plastic membership card is available for an extra £10 per annum. This includes 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 - and chose to have an immediate card (rather than just one at their next renewal) - 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 £10 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. (The plastic card will not be produced if there is no active membership subscription).

Just like the main membership subscription, auto-renew on this £10 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 the day before it renews. A confirmation email is sent at 10 am the day following the successful renewal.

Cancellation of the main Annual Membership subscription will also cancel this subscription.

CAA Registration/Renewal subscription

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

If the member has not previously registered with the CAA and they add this subscription to their account, FPV UK will submit their details to the CAA shortly after 1pm on that day or 1am the following day - whichever comes first. The member will receive an email from the CAA confirming their new Operator ID and expiry date shortly after 1.45. The member is then registered to fly for 12 months.

The member's FPV UK account will show their new Operator ID shortly after 2 o'clock and FPV UK will send an email confirming the new Operator ID at this time as well.

The system will automatically renew their CAA registration 28 days before it is due to expire. 12 months will be added to their expiry date at that time.

If the member has previously registered with the CAA directly, or elsewhere, and adds a CAA Registration/Renewal subscription to their FPV UK account, they will be asked to enter their Operator ID and CAA registration expiry date. If the expiry date is in the past or within 28 days of the current date, the system will renew the CAA registration at 1pm that day or 1am the following day, whichever comes first. The new expiry date will be twelve months from the current date for lapsed registrations and twelve months from the registration expiry

date for active registrations.

The member will receive an email from the CAA shortly after 1.45 with their new expiry date. The new expiry date will show in their FPV UK account shortly after 2 o'clock and an email from FPV UK to confirm this will also be sent at that time.

Otherwise the member's CAA registration will be renewed twenty eight days before the supplied expiry date. Twelve months will be added to the end of the expiry date at that time and the member will receive an email from the CAA and one from FPV UK with the details.

This FPV UK service is free of charge. FPV UK will charge the CAA's renewal fee to the member's account and then remit it to the CAA on behalf of the member.

The subscription can be cancelled at any time within the member's FPV UK account. Cancellation of the FPV UK membership subscription will also cancel this subscription.

CAA registration will not take place if the member does not have an active membership subscription at the time of renewal.

As with the other FPV UK subscriptions, two email reminders will be sent to the member. The first one will be sent three days before renewal, and the second the day before renewal.

CAA Operator ID Renewals

The member's CAA renewal payment will be scheduled for 31 days before the expiry date that they provide / are issued with. So long as this payment is received successfully, and they have an active FPV UK membership, their details will be sent to the CAA 28 days before the expiry date.

Why is the payment and renewal done 31 and 28 days ahead of the renewal date respectively?

1) The CAA Registration / Renewal subscription renews 31 days before the expiry date, so that any payment issues (expired cards, insufficient funds in the account, etc can be resolved before renewal 28 days before renewal).

2) We renew operator IDs 28 days before expiry, firstly to give time to solve any issues (people often make mistakes with their operator ID - such as mixing up 2 and Z, 5 and S, etc., provide the wrong email address, get their DOB wrong, etc.). It is good to have a buffer time to solve these before your operator ID expires. And secondly, because if we didn't, our members would receive a number of reminder emails from the CAA, which direct the member to go to the CAA website and renew directly. That is confusing for everyone, and causes more problems whereby members request us to renew their operator ID, and then also renew directly on the CAA website, then causing our renewal attempt to fail.

Nb. 365 days will be added to the end of the member's CAA expiry date. No time is lost due to the early processing of the renewal.

UK UAS Flying Rules and Regulations

CAA Registration - Operator ID

The person responsible for managing the uncrewed aircraft is the operator and must be registered with the CAA. This means they are responsible for maintenance and they must make sure that anyone who flies it is competent. IE that they have a CAA Flyer ID. (Obtained for free by passing the FPV UK CofC Drone Law or the CAA's DMARES test).

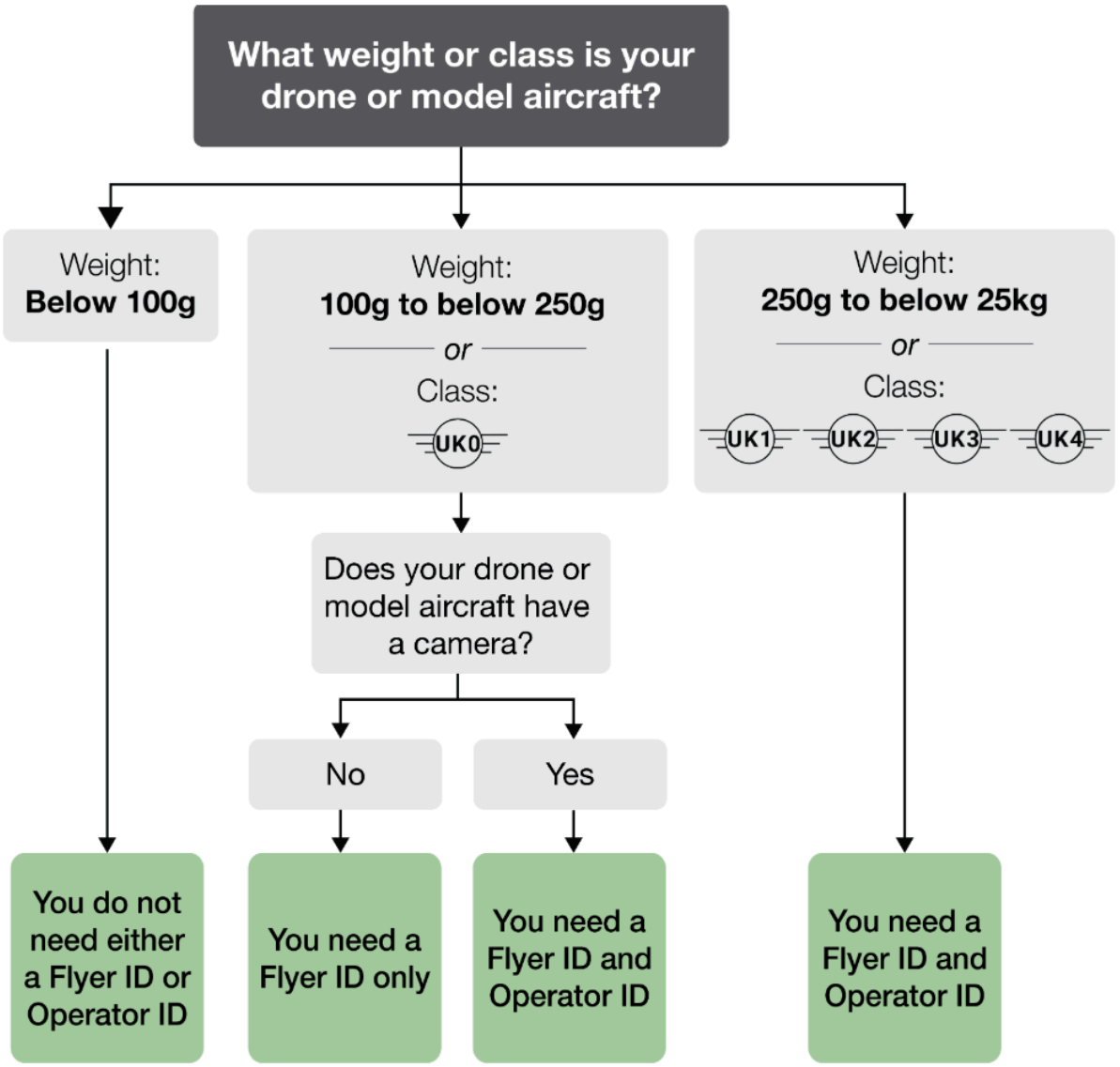
The operator is usually the owner and remote pilot, but if the remote pilot is under 18 it could be a parent or guardian or other responsible adult. The operator is ultimately legally responsible for the aircraft.

The CAA operator registration must be renewed annually. FPV UK can handle this CAA registration/renewal automatically on behalf of the member (as detailed in the CAA Registration/ Renewal subscription section of this document).

The Operator ID must be displayed on all of the aircraft the operator is responsible for and must be:

- Visible from the outside, or within a compartment that can easily be accessed without using a tool.
- Clear and in block capitals taller than 3mm.
- Secure and safe from damage.
- On the main body of the aircraft. (Not on an arm, which could become detached in a crash).

Suitable personalised labels are available from the FPV UK Store - members.fpvuk.org/store



Registration Exceptions

There is no requirement to register an uncrewed aircraft with a mass less than 250 g, unless it has a sensor able to capture personal data (such as a recording camera). In other words: a sub-250 g UA with a live camera used exclusively for piloting the aircraft does not require registration. (GM1 Article 14 (5)(a)(ii) says: *In relation to the registration of UAS Operators under this article, the capture of images or other data solely for the use of controlling or monitoring the aircraft is not considered to be applicable to the meaning of 'a sensor able to capture personal data.*

For example, a camera used solely for the purpose of first-person view flying (when accompanied by a UA Observer), that is not recording, is not considered a sensor able to capture personal data.)

The requirement to register does not apply to the operator of uncrewed aircraft indoors.

Additionally, the requirement to register as an operator of a control line or round-the-pole model aircraft has been exempted, within section 8 of the article 16 operational authorisation, subject to the conditions in that authorisation.

Remote ID

Remote ID is a way for drones and model aircraft to transmit their identity and location when flying. It works by transmitting a Remote ID number from your aircraft using a WiFi or Bluetooth signal.

Legal requirements for Remote ID

Remote ID must be enabled on drones or model aircraft by either 1 January 2026 or 1 January 2028, depending on the class of drone or model aircraft and the category in which it is operated. Remote ID must be switched on whenever flights are conducted from the applicable date onwards.

From 1 January 2028, Remote ID must be used for all drone and model aircraft operations (unless an exemption has been issued by the CAA). The transitional period until 1 January 2028 has been provided to allow legacy drones, privately built aircraft and model aircraft sufficient time for Remote ID functionality to be added.

The activation of Remote ID prior to the mandatory date is recommended, even where its use is not required until 1 January 2028.

Dates when use of Remote ID becomes mandatory

Class or type of aircraft	Open category	Specific category with Operational Authorisation issued before 1 January 2026	Specific category with Operational Authorisation issued from 1 January 2026 onwards

UK0 weighing 100g or more with a camera	1 January 2028	1 January 2028	1 January 2028
UK1, UK2 and UK3	1 January 2026	1 January 2026	1 January 2026
UK4 (e.g. model aircraft)	1 January 2028	1 January 2028	1 January 2028
UK5 and UK6	not applicable	1 January 2026	1 January 2026
Legacy UAS (i.e. not UK class-marked) weighing 100g or more with a camera	1 January 2028	1 January 2028	1 January 2028
Privately built weighing 100g or more with a camera	1 January 2028	1 January 2028	1 January 2028

Where the Remote ID can be found

A Remote ID number is provided by the CAA to all registered operators. The Remote ID number can be viewed in the *My registration* area of the CAA website.

The same Remote ID number may be used for all drones and model aircraft operated by the registrant.

Knowing the Remote ID number

The Remote ID number is similar to, but not identical to, the Operator ID. It is case sensitive.

Example of Remote ID number

Country identifier:	Public part:	Check sum:	Private key:
three upper case characters	12 characters; Mix of lower case letters and numbers	1 number	3 characters; Mix of lower case letters and numbers
GBR	gc284pmztcrt	7	2ot

Always keep the private key secure

Keeping the private key secure

The final three characters of the Remote ID constitute the private key.
The private key must be kept secure so that it cannot be used by anyone else.
The private key must never be written on the drone or model aircraft.
The private key must not be shared and should be avoided being written down.

Open Category Rules/ Article 16 Operational Authorisation

On 31/12/2020 the current (EASA-based) UAS (uncrewed aircraft systems) rules came into force. FPV UK members have two distinct paths to choose from when flying their UAS.

1) The open category.
2) The article 16 operational authorisation (in the specific category).

The open category is available to anyone and is based on a class-marking or mass / distance-from matrix for off-the-shelf unmanned aircraft. Three sub-categories; A1 to A3 define where aircraft may be flown. These are ‘Over people’ (A1)’, ‘Close to people’ (A2), ‘Far from people’ (A3).

The buyer of a new off-the-shelf UA can see the rules that apply to their particular aircraft (e.g. the locations they may fly it / the distances they must maintain from uninvolved people, etc) by looking at the class-mark (UK0-UK6) or mass, and the relevant sub-category (Over People (A1) / Close to people (A2) / Far from people (A3)).

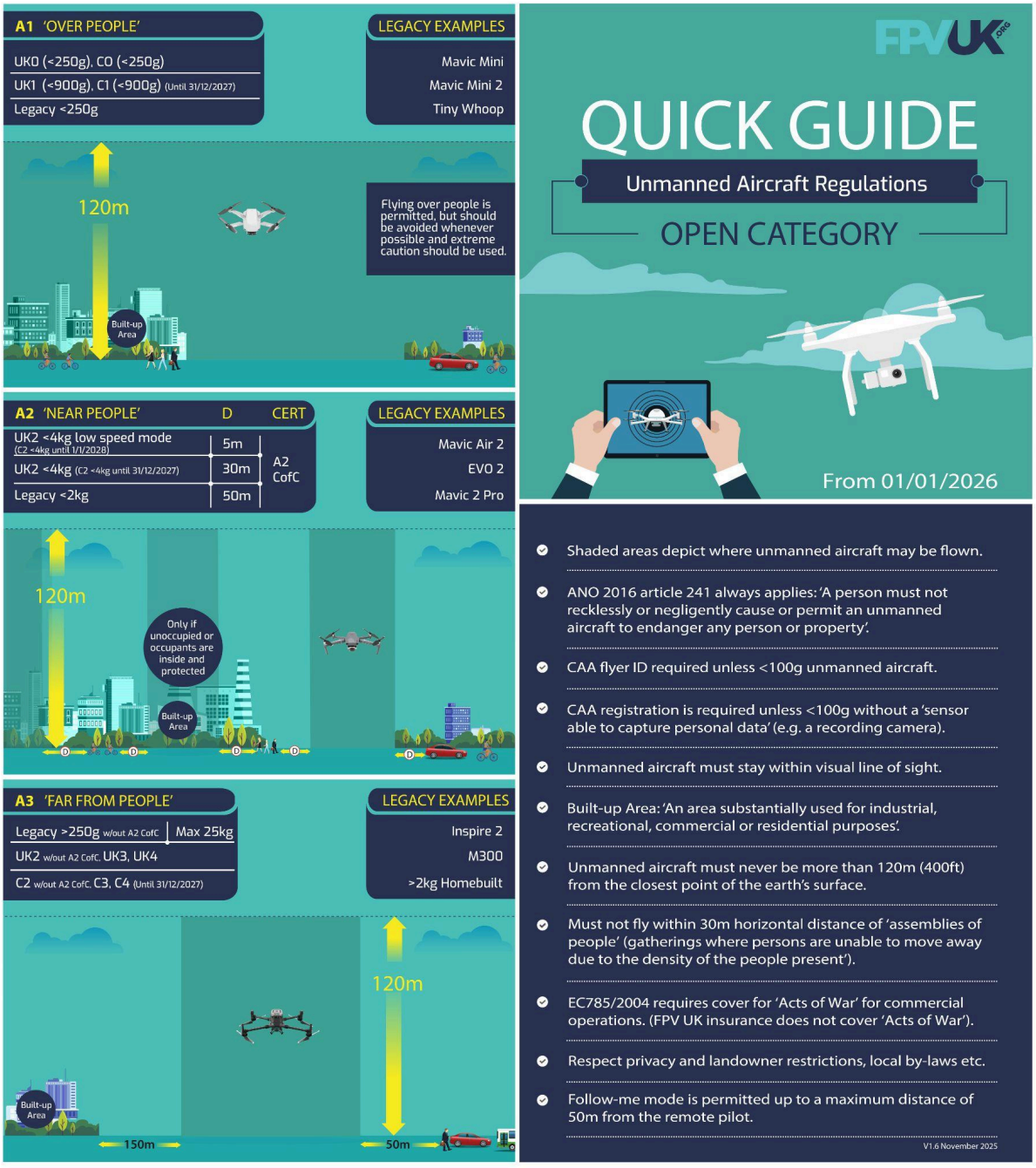
During the transition period from 01/01/2026 to 31/12/2027, EASA class-marked drones may also be flown in the UK in the same way as their UK equivalents. I.e. an EASA C0 marked drone may be flown in the same way as a UK0 drone, an EASA C1 marked drone may be flown in the same way as a UK1 drone, etc.

To fly in the Open Category the person flying the aircraft (usually also the owner and operator) must hold a CAA Flyer ID - unless the drone is C0 marked, or has a mass of less than 100g. This Flyer ID must be renewed every five years. The aircraft must also show the Operator's ID as covered in the previous section.

The A2 Certificate of Competence (A2 CofC) is required to fly an aircraft with a flying weight of less than 2kg in the A2 category. The A2 CofC is also required to fly a sub-500g aircraft in the A1 category.

Commercial operations are permitted in the open category.

The following 'Quick Guide' gives an overview of the open category regulations:



This infographic is also available in a larger format here.

The article 16 operational authorisation falls under the specific category and therefore the A1-A3 sub-categories don't apply. This authorisation (numbered UAS13529) has been issued to FPV UK to allow association members to fly their aircraft (whether off-the-shelf, legacy or home-built) with the permissions previously embodied in previous exemptions to the air navigation order.

The FPV UK article 16 operational authorisation is only available to current FPV UK members.

It applies to any aircraft with a Maximum Take Off Mass (MTOM) of less than 25 kg. This includes: any model aircraft, any control line model aircraft, any round-the-pole model aircraft. The CAA defines a Model Aircraft as follows: '*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.'*

In other words: a multi-rotor 'drone', or more traditional model aircraft, can be flown under the FPV UK Article 16 Operational Authorisation so long as it is being flown for the recreational sport of model aircraft / drone flying (i.e. commercial use is not permitted). And it is being controlled by direct inputs from the remote pilot.

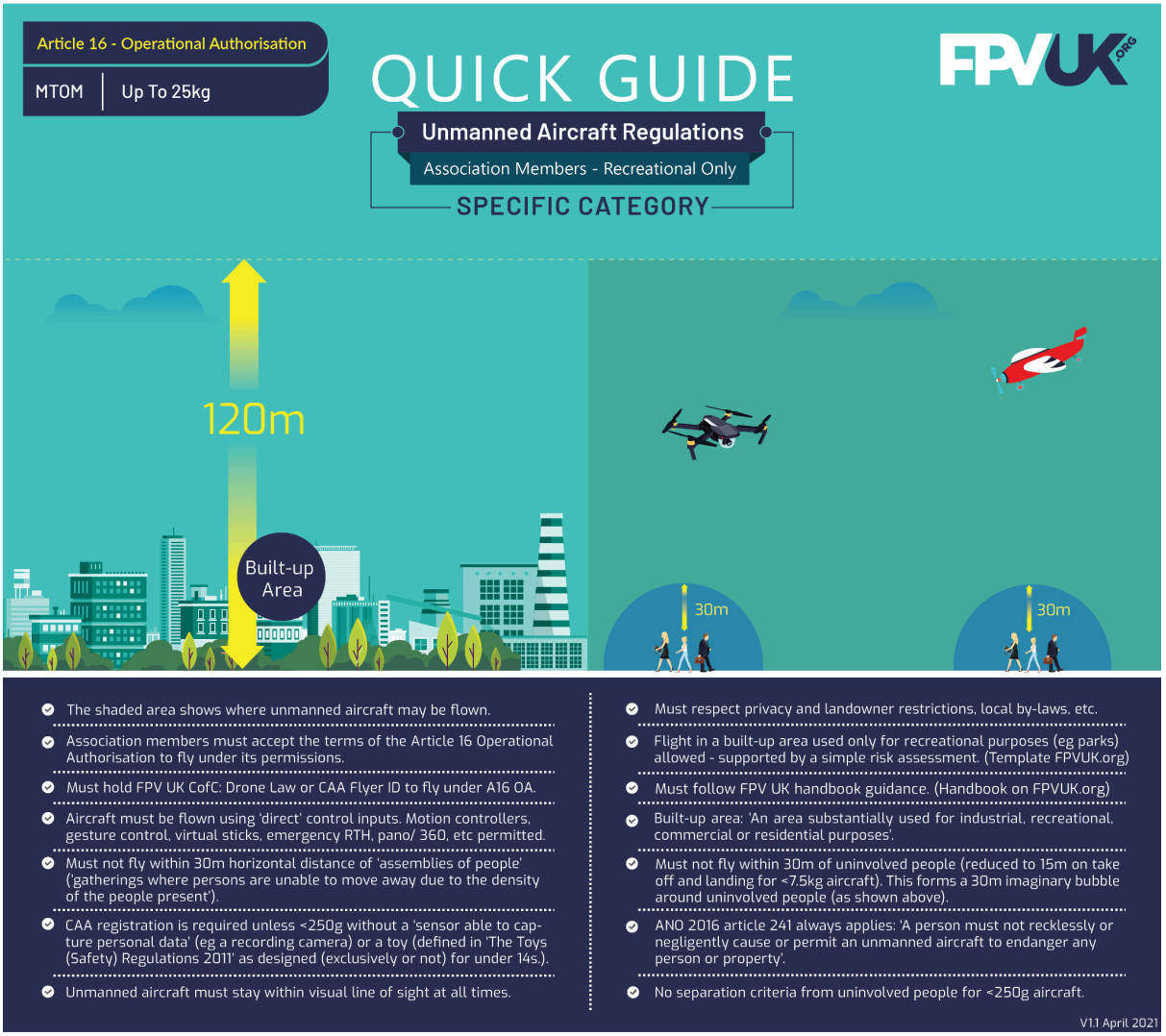
Nb. Using automation modes such as RTH is permitted in an emergency situation - e.g. in the event of a radio link failure. Also, automated modes which don't move the aircraft in physical space, such as position-hold making the aircraft stay in position against the wind or Panorama mode which yaws the aircraft to take a series of photos whilst staying in a fixed location are permitted. Modes such as Tripod mode (which makes the aircraft fly more slowly), beginner mode, cinematic mode, etc are also permitted.

'Direct control inputs' does not necessarily require physical control sticks. Motion controllers, virtual control sticks on a touch screen, gesture control, palm landing, face recognition, palm launch, etc modes where the aircraft moves only in response to a direct control input from the remote pilot are also permitted under the CAA's definition.

The Operator must be registered with the CAA, and the aircraft must show a valid Operator ID - as detailed in CAA Registration - Operator ID earlier in this document.

To fly under the Article 16 Operational Authorisation the member must have a CAA Flyer ID. This can be gained by either passing the *FPV UK Certificate of Competency: Drone Law*, or by passing the CAA's DMARES test.

The following 'quick guide' gives an overview of the article 16 operational authorisation rules:



[This infographic is also available in a larger format here]

There are some specific CAA requirements that members must meet to fly under the article 16 operational authorisation. There are also extra [reporting requirements] when flying (non-multirotors) above 400ft, or flying any aircraft closer than 50m to uninvolved people. The following pages detail the specific terms and conditions of the operational authorisation.

Member Compliance

Any member making use of the operational authorisation must comply with the procedures and rules set out in the FPV UK handbook.

Minimum Age

The minimum age for a UAS operator is eighteen years old. There is no minimum age for a remote pilot. There is no minimum age requirement for the FPV UK insurance policy.

Nb. Operators and remote pilots (e.g parent and child) should both be FPV UK members to ensure they are both covered by the insurance.

Safety Accountability

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

Remote Pilot Competence

Any remote pilot operating under the article 16 operational authorisation must demonstrate a suitable level of competence by holding a CAA Flyer ID. A Flyer ID can be gained free of charge, by taking the *FPV UK Certificate of Competency: Drone Law* online test or by passing the CAA DMARES test.

The *FPV UK Certificate of Competency: Drone Law* is an online multiple-choice question quiz which is available in each member's FPV UK account. This test is free of charge and can be done in only a few minutes. Results show instantly.

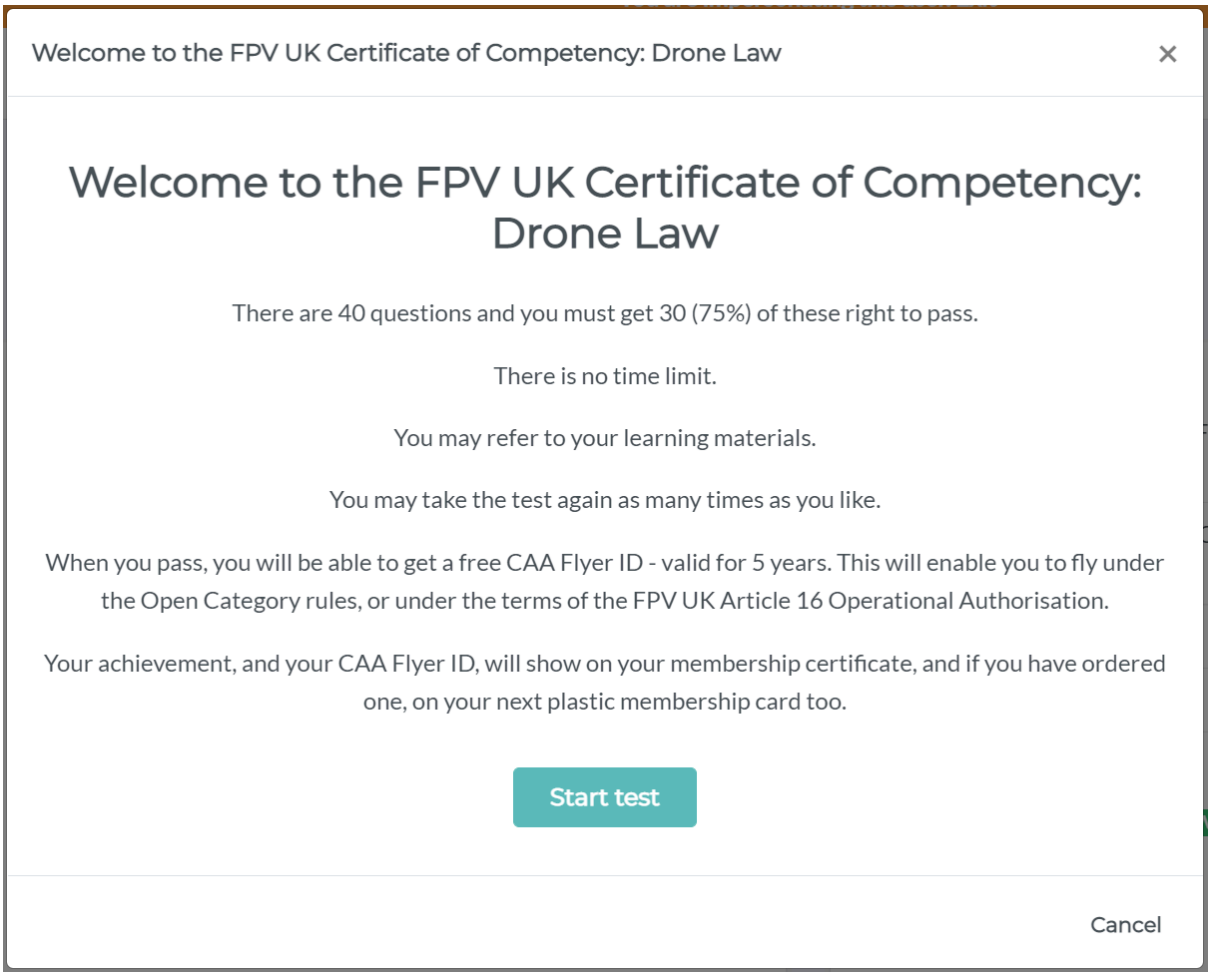
The test includes forty questions on the following seven topics:

1. Air Safety
2. Airspace Restrictions
3. Operational Procedures
4. UAS General Knowledge
5. Privacy and Security
6. Insurance
7. Aviation Regulation

The questions are presented in a different order each time.

The pass mark is seventy five percent - the member must get thirty of forty correct to pass.

The test has no time limit and can be taken multiple times.



The first screen of the FPV UK CofC: Drone Law.

Location(s) of Operation

The Article 16 Operational Authorisation specifies that the authorisation may be used throughout the United Kingdom, at:

1. Any established model flying club site;
   a) Any established model flying club located in a 'built-up area', must conduct a risk assessment, with suitable mitigations. This must be made available to members flying at that site, who must be familiar with it; or
2. Any other suitable area, which is not a built-up area, other than in the circumstances defined in 2(a) below;
   a) 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.

Flying at an established club

If flying at an established club site the member should be sure to follow that club's specific rules and regulations to ensure safety is maintained in that specific location. The club will doubtless have a handbook of its own and someone will brief you, and very likely test you, before you can fly in the club and/or fly unsupervised.

The procedures of that club are there for safety (and potentially noise abatement/ to keep the landowner on-side) and so should be carefully followed.

If the club is located in a 'built-up area' the club will have a risk assessment which they must make available to each of their members (this is stipulated under the terms of the Article 16 Operational Authorisation). Members should take the time to understand the risks identified and the measures in place to mitigate those risks, and follow the club's rules to implement those mitigation measures.

To comply with the requirement to have a risk assessment, the management of a club located in a built-up area can see the risk assessment section of this handbook for guidance on doing a risk assessment. This includes links to a template and an example risk assessment. Risk assessments are simple and straightforward - don't be put off!

Flying in a suitable area

When choosing a place to fly other than in an established club, the member should be careful to make sure it is suitable for uncrewed aircraft flying.

A suitable location has sufficient open space to allow flying the UA without coming too close to uninvolved people or putting anyone at risk. And the activity shouldn't unduly inconvenience, annoy or otherwise upset anyone else, or conflict with any other activities - such as hang gliding and/or paragliding on hill/coastal sites.

It is also crucial that you consider low flying manned aircraft - such as HEMS (Helicopter Emergency Medical Service) and NPAS (National Police Air Service) activities. A large open field next to a hospital may seem like a good flying site, but if there are frequent helicopter movements it may not be suitable at all. Common sense should prevail here.

Whilst it is not a legal requirement (unless the proposed flying area is within a built-up area), a risk assessment is an excellent way to consider the suitability of a flying location in a structured way. A risk assessment is perfectly simple and straightforward - members shouldn't be put off by the prospect of completing one.

Flight Restriction Zones

An FRZ is an area where drones may not be flown without specific permission from NATS if it's a NATS operated airport, the air traffic control (ATC) unit of that airport, or if there isn't one, the aerodrome operator.

NATS are perfectly open to allowing uncrewed aircraft to fly in the FRZs around their airports

and will not unreasonably withhold their permission. Applying for permission is done by submitting a non-standard flight (NSF) application to NATS at https://nsf.nats.aero/drones-and-model-aircraft/ You must wait for permission to be granted before flying in an FRZ.

For non-NATS airports you should be able to find the contact details for the particular airport on their website. Alternatively they are all listed in the UK AIP (UK Aeronautical Information Publication) and the UK Mil AIP (UK Military Aeronautical Information Publication). Again, you must wait for permission before flying an FRZ.

FRZs are shown on the FPV UK map.

It should also be noted that there are many small GA (General Aviation) aerodromes which do not have FRZs. These aerodromes are not 'protected aerodromes' and don't have restricted airspace of any kind - however, some of them are busier than licenced aerodromes with large FRZs! Common sense should prevail here. Flying close to an unlicensed/ unprotected aerodrome would clearly not be a good idea (unless you have spoken with them and come to a separation arrangement). Many (but not all) unlicensed aerodromes are listed with NATs as such, and show on the FPV UK map. The same is true of unlicensed helicopter landing sites, microlight sites and hang gliding / paragliding sites, parachute drop zones and other hazards such as gas venting stations, high intensity radio transmitters, etc.

Flying in a built-up area used *only* for recreational purposes
A built-up area used only for recreational purposes describes an area like a public park. This is usually a wide open space which is captured by the word *recreational* in the CAA's definition of a built-up area. (*Built-up area: An area substantially used for industrial, **recreational**, commercial or residential purposes).*

It is permissible to fly here under the Article 16 Operational Authorisation if it can be shown to be safe to do so. This is shown by completing a risk assessment.

It's important to remember that an area may be safe and suitable at one time, and unsuitable at another time. For example; a park may be suitable on a Tuesday morning, and unsuitable on a Sunday morning because footballers/park runners/cyclists/sunbathers/picnickers use the space. For this reason you should consider the risks each time you fly.

Risk Assessment
Guidance on how to conduct a risk assessment, including a template and example, is here.

Type of Operations - FPV

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 either the 'Flying FPV with a competent observer' rules or the Flying FPV in a sterile area rules - as set out in 4.3 of the article 16 operational authorisation.

Operating heights/altitudes/levels - (Flight above 120m/400ft)

(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.

Multi-rotor aircraft, and automated aircraft, are therefore limited to 120m (400ft) maximum height in all cases. Other aircraft may be flown above this height only if they have a mass of less than 7.5kg. Except gliders up to 14kg - which are limited to 120m above the remote pilot. Aircraft must always be kept within visual line of sight of the remote pilot.

Especially extra care should be taken to keep a good lookout and listen out for approaching manned aircraft when operating above 120m (400ft).

Occurrences which occur when flying your uncrewed aircraft above 400ft must be reported to the CAA. Please see occurrence reporting for more details.

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.

Aircraft must not be flown within 30m of any uninvolved person. This can be reduced to 15m for take-off and landing (supported by a risk assessment) only for uncrewed aircraft with a mass of less than 7.5kg.

The separation criteria effectively creates an imaginary bubble around an uninvolved person in which the uncrewed aircraft must not be flown. The Article 16 Operational Authorisation infographic depicts this *30m from uninvolved person* separation criteria in graphical form (as 30m bubbles around uninvolved people).

Occurrences which occur when flying closer than 50m to uninvolved people must be reported to the CAA (see Reporting to other organisations (CAA/ AAIB) for more details on what needs to be reported and how.)

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.

Clearly the text *The unmanned aircraft is not capable of vertical take-off/landing or hovering, such as helicopters or multicopters.* means that the exemption described does not apply to tethered multi-rotor aircraft. This section is only applicable to control line and round-the-pole type aircraft.

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.

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, or the CAA DMARES test (both of which give them a Flyer ID) 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 of the authorisation.

(2) The registration requirements and registration display requirements still apply.

This means that the aircraft must carry a valid Operator ID and the person in charge (the instructor / person supervising the non-member) must be competent (IE they must have a CAA Flyer ID) and they must be an FPV UK member.

Remote Pilot Responsibilities

UAS.SPEC.060 responsibilities of the remote pilot:

1. The remote pilot shall:
    a. not perform duties under the influence of psychoactive substances or alcohol or when it is unfit to perform its tasks due to injury, fatigue, medication, sickness or other causes;
    b. have the appropriate remote pilot competency as defined in the operational authorisation, in the standard scenario defined in Appendix 1 or as defined by the LUC and carry a proof of competency while operating the UAS.
    c. be familiar with manufacturer's instructions provided by the manufacturer of the UAS.

2. Before starting an UAS operation, the remote pilot shall comply with all of the following:
    a. obtain updated information relevant to the intended operation about any geographical zones defined in accordance with Article 15;
    b. ensure that the operating environment is compatible with the authorised or declared limitations and conditions;
    c. ensure that the UAS is in a safe condition to complete the intended flight safely, and if applicable, check if the direct remote identification is active and up-to-date;
    d. ensure that the information about the operation has been made available to the relevant air traffic service (ATS) unit, other airspace users and relevant stakeholders, as required by the operational authorisation or by the conditions published by the Member State for the geographical zone of operation in accordance with Article 15.

3. During the flight, the remote pilot shall:
    a. comply with the authorised or declared limitations and conditions;
    b. avoid any risk of collision with any manned aircraft and discontinue a flight when continuing it may pose a risk to other aircraft, people, animals, environment or property;
    c. comply with the operational limitations in geographical zones defined in accordance with Article 15;
    d. comply with the operator's procedures;
    e. not fly close to or inside areas where an emergency response effort is ongoing unless they have permission to do so from the responsible emergency response services.

FPV Competition Event Guidance ('Sterile Area')

1. Section 4.3 of the article 16 operational authorisation includes the following:

    A model aircraft may be flown by a remote pilot using first person view (FPV) equipment subject to the limitations of this authorisation, and following conditions (a) or (b), either:

    a. *The aircraft is flown in accordance with all of the following conditions:*
        i. *Within a sterile area- meaning a cordoned off, closed area that uninvolved persons are excluded from; and*
        ii. *The aircraft is not flown at a height in excess of 160 feet (50 metres) from the surface; and*
        iii. *In accordance with procedures specifically set out for the purpose of the event, and in accordance with instruction from the race director or other nominated person, including any 'terminate race and land immediately' instruction; and*

iv. *Any observers are suitably briefed and aware of their responsibilities, including the monitoring of people or aircraft entering the cordoned off area;*

The following is guidance on how to comply with those requirements for a safe and lawful FPV event.

Selecting a suitable 'sterile area' racing location

Section 4.3)a)i) allows for FPV flying '*within a sterile area - meaning a cordoned off, closed area that uninvolved persons are excluded from*'. This could mean selecting a private location where access can be controlled naturally (eg a gated/walled off location with no access to the public). Or it may be a public location with a temporary cordoned off area to control access (this may be temporary fencing or cordon tape - with marshals controlling entry points).

The guidance in Flying in a suitable area is relevant for selecting a suitable site in the first instance - and beyond that a suitable cordon must be established to prevent uninvolved people from accessing the flying area.

Nb. Indoor flying is not governed by the CAA so the rules above do not apply to events held indoors. Health and Safety regulations do apply though and you must take appropriate measures to protect people. Netting can be very useful for managing risk at indoor flying events, whilst still allowing spectators to watch the flying.

Identifying and managing risk

Guidance on how to conduct a risk assessment is here. A risk assessment is a structured way to identify and mitigate risk and can be very useful in setting up a drone race. A risk assessment is a simple process - members shouldn't be put off by the idea of doing one.

Event Map

For events in public spaces an event map should be produced along with the risk assessment. This map should show the flight area, spectator area, pilot station, identified hazards and other relevant information. This map should be distributed to all competitors and made available to spectators if relevant. It should be discussed in the event briefing so that everyone involved is aware of the layout of the site, where activities can and cannot take place and any hazards.

Height Limit - 50m (160ft)

The sterile area FPV rules require that uncrewed aircraft do not exceed 50 metres from the surface. Remote pilots should be briefed on this point. If it is technically possible, each remote pilot should set this maximum altitude in their aircraft's systems.

The FPV racing course should be designed not to encourage flight above 50m. (EG big power loops which might exceed 50m should not be part of the course).

Organising your event

Race Director

To fly under the Article 16 Operational Authorisation a Race Director should be assigned. The Race Director has ultimate responsibility for the organisation and running of the race event - and the legal responsibility rests with this person.

A good race director is a well organised individual who works well under pressure. They must have good people skills and the ability to communicate effectively and garner the respect of those involved in the event (the competitors and their marshalling colleagues, etc).

The race director should brief the remote pilots and marshals and control the day (see 'on the day' section below).

It is a good idea for the race director to wear something that makes them easy to identify - perhaps a vest which says 'Race Director' on it, or a hat, or distinctive top.

Marshals

If the location requires it, 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.

High visibility clothing (e.g. high-vis vests) are a good idea for marshals.

Attendee Numbers

To ensure that you are prepared for the number of people who will attend an event it is a good idea to assign tickets (either free of charge, 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).

Competitors/ Remote Pilots should also be registered before the event - along with their competence and frequencies. You can check attendees have valid FPV UK membership (and therefore insurance) at check.fpv.uk

Frequency management

Radio frequency interference is a crucial consideration in a race environment and must be managed properly for a safe and enjoyable event. 2.4GHz 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 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 an ultra low power output).

Checking competitors are competent and insured

FPV UK provides a membership check function at check.fpv.uk) to confirm that a membership number is genuine and active and which achievements/competencies the member has done. This allows an event organiser to confirm that a competitor is a member (and therefore is insured) and which achievements they have completed. This functionality is also available through an API so that an event organiser's website/system can automatically carry out these checks when a member signs up.

CAA Operator IDs and Flyer IDs can be checked on the CAA website: https://register-drones.caa.co.uk/check-a-registration (Nb. people often also enter their middle name in the 'First name' field on the CAA's system - so you may find that you need to put in their middle name to get a match).

Useful Equipment

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 arrow/banners/air gates, etc)
- Clothes pegs (for FPV frequency control)
- Air horns (for director/marshals)
- High visibility jackets
- Cordon tape/temporary fencing
- Two way radios

On the day

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

Pilot’s briefing

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

- When remote pilots can and can't power up equipment (to avoid frequency clashes - perhaps allocating clothes pegs - one per band).
- Where remote pilots can and can't fly (basic principle; do not fly over people, do not turn towards people, allow at least thirty metres between the spectator cordon and flying aircraft).
- How to identify Safety Marshals (e.g. Green High Visibility jackets).
- What each fog horn sound means (a long sound of the horn may mean; ‘Terminate race and land the aircraft immediately’ for example).
- The maximum altitude for the day (maximum allowed under the article 16 operational authorisation is fifty metres (160ft) above the surface).
- Where people can and where people can't stand (including when remote pilots can make ‘the walk of shame’ to collect their aircraft).
- Insurance: everyone should have insurance cover. The event organiser should check that each pilot has valid 3rd party liability insurance. (check.fpv.uk)
- Who will be marshal for which hours of the day / for which races (if turns are being taken).

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

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.

Flying FPV with a competent observer

Section 4.3)1) of the article 16 operational authorisation includes the following:

b. *The aircraft is flown in accordance with all of the following conditions:*
   i. *The remote pilot is accompanied by a competent observer who maintains direct unaided visual contact with the unmanned aircraft sufficient to monitor its flight path in relation to other aircraft, persons, vehicles, vessels and structures for the purpose of avoiding collisions and advises the remote pilot accordingly;*
   ii. *The MTOM of the aircraft does not exceed 3.5Kg;*
   iii. *The aircraft is not flown:*
      A. *Within an aerodrome FRZ, unless appropriate permission has been obtained;*
      B. *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;*
      C. *Unless within an area as set out in section 3.7.;*
      D. *Over or within 50m of any assemblies of people;*
      E. *Within 30m of any vessel, vehicle or structure which is not under the control of the remote pilot.*
      F. *Within 30m of any 'uninvolved person'.*

3.7: *This authorisation may be used throughout the United Kingdom, at:*

1. Any established model flying club site;

a) Any established model flying club located in a 'built-up area' as defined in section 7.1, must conduct a risk assessment, with suitable mitigations. This must be made available to members flying at that site, who must be familiar with it; or
2. Any other suitable area, which is not a built-up area, as defined in section 7.1, other than in the circumstances defined in 2(a) below;

a) 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.

3.11: *1. A model aircraft that is not a free flight model aircraft, and 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, as defined in section 7.1;
b) Within 30m of any uninvolved person, as defined in section 7.1. 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.

Aircraft

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

Competent Observer

A ‘competent observer’ is a briefed and competent person designated by the remote pilot, who maintains direct unaided visual contact with the unmanned aircraft sufficient to monitor its flight path in relation to other aircraft, persons, vehicles, vessels and structures for the purpose of avoiding collisions and advises the remote pilot accordingly.

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 remote pilot) 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 incursions by people, vehicles, vessels, or animals.

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 your uncrewed aircraft "Aircraft - Climb, Climb, Climb".

In the event of a person, vehicle, vessel or animal appearing in your landing area they should use the call “Landing Zone Unavailable”. And, “Landing Area Clear” when it becomes clear again.

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 back so that adequate visual reference is regained using the call “Losing visual - Return towards home”.

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 1000 ft above the surface, unless it is a rotorcraft with more than one lift generating rotor or propeller, in which case the height shall not exceed 400 ft 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 50m of any assemblies of people (‘*Gatherings where persons are unable to move away due to the density of the people present’)*.
- Within 30 metres of any vessel, vehicle or structure which is not under the control of the remote pilot; or
- Within 30m of any uninvolved person.

Multi-rotor ‘Drone’ Flying - Guidance

DRONE FLYING CHECKLIST

AT HOME

- ☐ FIRMWARE / APP - NO UPDATES REQUIRED
- ☐ MEMORY CARD - SAVED & FORMATTED
- ☐ BATTERIES (DRONE / CONTROLLER / ETC) - FULLY CHARGED
- ☐ WEATHER - SUITABLY LIGHT WINDS & NO RAIN FORECAST IMMINENTLY
- ☐ DRONE ASSIST APP - SUITABLE LOCATION (NO NOTAMS / FRZs / CREWED AIRCRAFT / HAZARDS)
- ☐ DAMAGE - CHECK DRONE IS FULLY INTACT - IF IN DOUBT, SWAP IT OUT

IN THE FIELD

- ☐ DAMAGE - CHECK DRONE IS FULLY INTACT - IF IN DOUBT, SWAP IT OUT
- ☐ PROPELLERS - FREE OF DAMAGE AND INSTALLED CORRECTLY
- ☐ BATTERY - INSTALLED PROPERLY AND NOT TOO COLD
- ☐ CONTROL LINK - WORKING & OPERATING CORRECT FUNCTIONS / MOTORS
- ☐ GPS - SOLID FIX & HOME POINT SET
- ☐ FAIL SAFE - RETURN TO HOME SET CORRECTLY FOR CONTROL LINK FAILURE
- ☐ GIMBAL CLAMP & LENS CAP - REMOVED
- ☐ SD CARD - INSTALLED & FORMATTED
- ☐ COMPASS - CALIBRATED & NO INTERFERENCE
- ☐ WEATHER / WIND - SUITABLE FOR YOUR DRONE
- ☐ DRONE ASSIST APP - FINAL CHECK (NO NOTAMS / FRZs / CREWED AIRCRAFT / HAZARDS) & NOTIFY FLIGHT
- ☐ LOCATION - ASSESS & MITIGATE RISK - OBSTACLES, STRUCTURES, PEOPLE, ANIMALS, VEHICLES, MANNED AIRCRAFT, BACKUP LANDING SPOT
- ☐ PEOPLE - HELPERS BRIEFED AND UNINVOLVED PEOPLE AT A SAFE DISTANCE

ARTICLE 16 OPERATIONAL AUTHORISATION QUICK GUIDE

- A16 OA IS FOR SPORT AND RECREATION ONLY - NO COMMERCIAL USE
- KEEP YOUR DRONE WITHIN VISUAL LINE OF SIGHT
- DO NOT FLY WITHIN 30 M OF UNINVOLVED PEOPLE (EXCEPT <250 G)
- KEEP YOUR DRONE BELOW 120 M (400 FT)
- DO NOT FLY WITHIN A FLIGHT RESTRICTION ZONE (FRZ) WITHOUT PERMISSION
- DO NOT FLY WITHIN A BUILT-UP AREA (EXCEPT A BUILT-UP AREA USED ONLY FOR RECREATIONAL PURPOSES WITH A RISK ASSESSMENT)

YOU ARE LEGALLY RESPONSIBLE. YOU COULD FACE LIFE IMPRISONMENT

A higher resolution version of this checklist can be downloaded from FPV UK here.

Checks at home

Firmware/ Apps - No updates required
There's nothing worse than attempting to make your drone take-off in the field when it reports 'firmware update required'. It is therefore worth checking your firmware is up to date before you leave the house.

Using the latest firmware is almost always a good idea. However, there is an argument that sticking with a stable firmware version which is proven to be good, at least until a new version has been in the wild for a while, may also have merit. (Clearly this is only possible if your particular drone will allow take-off with an outdated firmware version).

Likewise with the app which connects to your drone. Big version upgrades are a pain in the field and so checking for updates at home is a good idea.

SD Card - Saved and formatted
It is a good idea to backup your SD card and format it ready for your next flight. It's annoying (and distracting) if your drone reports 'Memory Card Full' during flight.

It's worth using a good quality memory card of the recommended class.

Batteries - Drone, Controller, etc. - Fully charged
Be sure to charge your controller and flight batteries before heading to the field.

Battery charging carries some level of risk - particularly if you're using a system with LiPo batteries and balance chargers (such as a home built drone). Don't leave batteries charging unattended, and charge them outside if possible.

Do not attempt to charge batteries if they show any signs of damage. It's not worth burning your house down for the price of a LiPo!

Weather - Suitably light winds and no rain forecast
Xcweather.co.uk and Windy.com are good sources for current local weather and forecasts. The lighter the wind the better. Nil wind is perfect. Less than 10mph is great. Less than 15mph is good.

Rain makes flying a drone much less enjoyable and, in almost all cases, drones are not waterproof and are likely to malfunction and crash after a few minutes of flying in rain. The MetOffice rainfall radar service is quite useful for monitoring rain moving across the country in real time and reversing through the timed images can show the trend: https://www.metoffice.gov.uk/public/weather/observation/rainfall-radar

Drone Maps
The FPV UK Map offers detailed maps showing important data - such as FRZs and NOTAMS and a lot more besides. It is important to check this information before you fly.

Damage - Check your drone is fully intact
It is really important to check for damage before you fly. Very often people don't realise that a previous hard landing (or big crash into a tree!) has done damage to their drone. It could also have sustained damage between flights - reversing a car seat into a drone is not uncommon!

Be sure to carefully check for damage to arms, legs, motors, propellers, propeller nuts, camera mountings, radio gear, etc. And if you find any damage be sure to repair the damage before you fly it again.

It is worth checking for damage before you leave home so that you have access to all of your tools and equipment, and can avoid a wasted trip if necessary.

At the field

Damage - Check your drone is fully intact - If in doubt, swap it out
It's worth checking your drone again at the field to make sure that no damage is present.

Propellers - Free of damage and installed correctly
Cracked carbon fibre propellers tend to disintegrate in mid-air, sending bits of high speed carbon flying everywhere and causing your drone to drop from a height. This is extremely undesirable and so it is worth thoroughly checking your propellers before flying.

If there is any sign of damage, put new propellers on. They're relatively cheap components and so much better than the alternative. **If in doubt, swap them out!**

Also, if you manage to install the wrong propellers on the wrong motors the quad will flip when you try to take off. Some drones have keyed propellers to prevent this from happening - but certainly not all. So be very careful to fit the correct propellers on the correct motors, and the correct way around.

If the manufacturer of your drone also manufactures/supplies propellers, it is a good idea to continue to use that type/brand of propeller. The manufacturer will have done extensive testing with these propellers to ensure they work properly with your drone. Weird issues can occur when using third party propellers.

Battery - Installed properly and not too cold

It makes sense to have a fully charged battery before commencing your drone flying. It's also important to ensure that the battery is correctly fitted. If it were to come loose in flight the results would not be good.

Batteries don't perform well in very cold weather. Some drones have built in battery heaters, some have separate battery heaters and insulation jackets available for purchase. Third party battery heaters are also available. Putting a battery in your pocket, or under your arm, is a good low tech solution!

Consult the manufacturer's manual before you fly in cold weather and make sure that you are flying within the published specifications. Also, monitor the battery state very closely - you're likely to have significantly reduced longevity in cold weather.

Control Link - Working and Operating Correct functions/ motors
A properly working control link is imperative. Test that you have a good link, no or minimal interference, good range, and that the correct motors/functions operate when you use the controls.

The most common mode is mode-2 in the UK - this puts throttle and rudder/yaw on the left stick. If your drone is in another mode - eg mode-1 (which is popular in the USA) - then flying it could have unexpected results! Make sure everything operates correctly before take-off.

It's a good idea to get the aircraft 'light on the skids' (where it's just about to lift-off the ground, but not quite) and check that the controls do what you expect. Or alternatively have a brave helper carefully hold the aircraft above their heads whilst you check the controls work as expected.

GPS - Solid Fix and Home Point Set
Most drones heavily rely on GPS to hold their position and to fly home in the event of a radio link failure (as well as for log files, to show you where they are on the moving map display on your phone or tablet, to keep out of FRZs and other no-fly-zones, etc). It is therefore very important that the drone has a good solid GPS fix before you take-off.

Modern drones take only a few seconds to get a good fix. Older drones might need a minute or two with a good view of the sky in order for them to get their location and set their home point.

Failsafe - Return to Home set correctly for control link failure
It is a good idea to set your drone to return-to-home in the event of a control link failure. This means that if the aircraft stops receiving commands from you it will, if it's lower than a predefined height; ascend to that height, and then return to your location and slowly descend and land. (The ascent is so as to avoid any obstacles, e.g. trees, on the route back to you). You should be familiar with your particular drone's behaviour on failsafe and configure the settings appropriately.

It is permissible to use RTH on failsafe under the Article 16 Operational Authorisation.

Gimbal Clamp/Lens Cap - Removed
The gimbal can be damaged if you power up the drone with the clamp still attached to it. Make sure you remove it before powering up the drone.

Removing the lens cap is fairly self explanatory. You won't get very good video with the lens cap on!

After flying, it's a good idea to install both of these items back on the drone. The gimbal clamp does a good job of protecting the gimbal - which is the most expensive and fragile part of the system. And the lens cap protects your lens.

SD Card - Installed and formatted
Avoid the dreaded 'No SD Card' warning when you're ready to take a great photo! Make sure you put an SD card in.

It's best to format the card so that you have the maximum capacity available to you. Always use a good quality card to the correct speed rating for your drone. Cheaper cards are often a false economy.

Compass - calibrated and no interference
Make sure the compass is calibrated before you fly your drone, particularly in a new location.

Sometimes a 'Compass interference' warning will show when the drone is situated on reinforced concrete. The metalwork within the concrete is the culprit. In that instance adding something (perhaps a 'landing pad' or piece of cardboard) between the concrete and the drone can resolve the issue. Or relocate to a grassy area instead.

Don't take-off if you have compass interference.

Weather/ Wind - Suitable for your drone
Light winds are best. Nil wind is perfect. If the wind is higher than the maximum speed of the drone then you simply cannot fly it.

Consult the manufacturer's handbook for the maximum wind strength that your drone can safely operate. And if you're inexperienced aim for nil wind, or as close to it as possible.

Drone App
A final check of the FPV UK Map to check for NOTAMS, FRZs and other hazards is worthwhile.

Location - Assess & Mitigate Risk - Obstacles, Structures, People, Animals, Vehicles, Manned Aircraft, Backup Landing Spot
Make sure that your chosen location is suitable for your intended flight. Make sure that obstacles (such as structures, trees, people, vehicles, power lines, etc) are all a safe distance away (or not present at all).

It is also a good idea to have a backup landing spot in mind, in case someone or something appears in your main landing area. (And it is always good to aim to land with a good amount of battery power left, so that you can 'go around' and wait for the landing area to become clear, or divert to your backup landing spot).

Make sure that you are fully content that the flight can be safely made before take-off.

People - Helpers Briefed & Uninvolved People at a safe distance
You may have friends or children with you, and/or you may have attracted interested people over to you whilst setting up your drone.

Before you start the motors and take-off you should brief everyone about what you're about to do. You may need to ask interested people to stand back (or else move yourself and your drone elsewhere and take-off from there).

Double check that you are at least 30m from uninvolved people. (This can be reduced to 15m for take-off and landing if the aircraft weighs less than 7.5kg, but you must complete a risk assessment beforehand).

FPV Beginner Recommendations - Homebuilt

1) Safe Airframes

Where appropriate, you 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 for that airframe (e.g. far away from people and property).

2) Suitable Safe Location

As explained in Flying in a suitable area you should make a considered judgement when choosing your FPV flying field. As a beginner, it is a good idea to choose an especially open and clear location so that, in the event of something going wrong during a flight, the location

is safe.

3) Suitable Conditions

You should only fly when weather conditions are suitable for your aircraft and level of ability. Nil wind is usually ideal (with the exception of slope soaring) and anything below 10mph or so is suitable for beginners with most aircraft. You should leave more challenging conditions until you have more FPV flight experience.

Beginners should choose a bright day with a clear horizon so that you 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.

You should also ensure that a high quality video downlink and viewing system (eg video goggles) are used. High quality tried and tested components available from the dedicated FPV outlets are the best bet.

5) Pre-Flight Checks

- Double check the centre of gravity of the 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 you monitor the live video. Nb. Ground range tests of video will usually show ¼ 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 (e.g. a large capacity gel cell or portable power station / power bank).

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

Flying FPV outside of a race ('sterile area') scenario, requires that you fly with a 'competent observer' who acts as your eyes whilst you fly. Please see Procedures for flying with a competent observer for specific guidance on that.

8) Training

First Person View flying means that you, the remote pilot, controls the aircraft by reference to the horizon - just as with full-sized aviation. It is recommended that novice FPV pilots practise 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 you a feel for FPV flying and allow you 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 visual line-of-sight (VLOS) flying. The remote pilot sees a completely different perspective, and during your first flights, it is easy to lose track of where the aircraft is relative to the flying field - especially when it is directly above it!

You should get to know the flying field and locality from the air by flying as a 'passenger' and also by using tools such as 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 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.

The latest FPV systems - such as the DJI FPV system (and the DJI FPV drone) - have a fully integrated control and FPV system and so interference and frequency issues are not a concern here.

11) BEC Capacity

If the aircraft uses servos for a pan/tilt mount, you should ensure that the BEC on the ESC can drive the total number of servos in the system – or you 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. You should take care not to overload your BEC.

Control Line Aircraft Guidance

Equipment

You should use high quality components which are suitable for the stresses created by your chosen aircraft and the manoeuvres that you intend to fly;

Strong steel lines (stranded ideally) - tested with a pull test ten times the weight of the model.

Suitable linkages and swivels (if present).

It is a good idea to use a wrist strap to secure the handle to your wrist.

Damage

Always check for damage to your aircraft, lines, linkages, swivels (if present), handle, wrist strap, etc. before flying. Components are put under high stress when flying - if damage is spotted, do not fly until you have replaced the component in question. If in doubt, swap it out!

Location

Choose the location for your flying circle carefully. You should be a clear distance from other flyers and spectators.

Avoid flying near any kind of overhead cables - your body and steel lines represent an excellent conductor and electricity can jump several metres! (Also avoid flying when a thunderstorm is likely. You and your lines would make an excellent lightning conductor!).

Mark a centre point in your flying circle and ensure that you stay in this spot when flying.

Flying

Make sure that your flying circle is clear before your model is released.

If a person or animal appears in your flying circle whilst you are flying, you should fly your model high to avoid them, until they have cleared the area.

Do not release the control handle whilst flying under any circumstances.

Freeflight Model Flying Guidance

Equipment

A flight termination device can be used to manage the potential flight volume of the aircraft. The simplest method is a fuse which burns/smoulders for a time (usually one minute) and then releases a flap/boom or elevator. This then causes the aircraft to descend to earth. If this kind of dethermaliser is used then an aluminium ‘snuffer’ tube should be part of the design in order to put out the fuse.

Radio dethermalisers are now also available and allow the remote pilot to control the dethermaliser (and thus the aircraft’s flight volume) remotely. This gives the remote pilot more control over when (and therefore where) the aircraft comes to earth - which is highly desirable.

A radio dethermaliser also allows the remote pilot to bring the aircraft down if it is caught in a thermal and is heading out of sight (the aircraft must remain within visual line of sight).

Damage

Always check your aircraft and equipment for damage before you fly it. Although freeflight aircraft are usually very lightweight - so carry little inertia, descent is not controlled and damage is sometimes sustained on landing.

You should check all of the flying surfaces are properly aligned and check that the dethermaliser mechanism works satisfactorily.

Location

Competition free flight model flyers usually operate on large open areas such as military airfields or military exercise areas. This is a good idea because it allows the remote pilot to judge the area in which the aircraft is likely to fly (the ‘flight volume’) and be confident that no uninvolved person will be within that area. And also that no flight restriction zone (or other airspace restriction) will be entered without permission (‘infringed’).

Freeflight models always land downwind of their launch point and this is an important consideration. You should always launch the aircraft downwind of any people, vessels, vehicles or structures - this will help to ensure that you comply with the stipulations of the article 16 operational authorisation.

Flying

You must ensure that the launch area, and the ‘flight volume’ are clear of uninvolved people. You must also be satisfied that the ‘flight volume’ is where the freeflight model is likely to fly, that no uninvolved person will enter that flight volume, and the aircraft must not fly beyond visual line of sight.

Flying in a Group

FPV UK members sometimes fly in groups, or informal ‘clubs’. Sometimes this is organised through DroneHub.co.uk, FPV UK’s official community hub. Often a group meets and flies at many different locations (depending on the weather, time of year, site access, etc).

In addition to social media; a group can be listed on fpvracingworld.com with a blue pin. This also appears in an iframe on the ‘Local Clubs’ area of the FPV UK website. This can be a good way to attract more interested flyers in the local area. Events (e.g. race events, or one-off flying meet-ups) can be listed on this website (with a red pin) as well. It is also possible to use the fpvracingworld.com map to gauge possible interest in a proposed group/club site by listing it (as a yellow pin - ‘proposed club’) and seeing how much interest it generates.

FPV UK is often contacted by landowners (sometimes farmers, stately home owners, go kart track operators, paintball location operators, etc) who wish to attract drone flyers to come to their location and fly their drones. In these cases FPV UK encourages the landowner to list their location on the fpvracingworld.com map where members can see it and make contact.

If your group/club wishes to fly in the same location often, it may be prudent to create a permanent site and create an ‘Established Flying Club Site’ as mentioned in section 3.7 of the article 16 operational authorisation.

The first step is getting the landowner's permission for your group to fly on their land on a regular basis. A farmer is often glad to have a small number of known people actively using a small section of their land and perhaps keeping vandals away, or birds off their crops. In other cases the landowner may put more value on making a small income off an otherwise underutilised small strip of land; or in the case of multirotors, not even a strip is required - just the air above a piece of their land! Have a chat and come to an arrangement.

Once permission has been obtained it's a case of following a simple process to identify any hazards/risks (by doing a risk assessment). Create a site map if required (e.g. if certain areas must be avoided, if you will have a pit area and a flight line, where cars must be parked, etc), and establish some site guidance to keep things safe. The site guidance, and risk assessment, should be made available to anyone who flies on the site to make sure that they are aware of what they should and shouldn't be doing, and why.

The principle is that your risk assessment should identify any hazards, and mitigations required, and then your site guidance should implement those mitigations in the form of site rules.

All members, whether flying as part of a group or individually, and whether flying on established club sites, or other suitable areas, must ensure that they fly lawfully - under either the Open Category rules, or the terms of the FPV UK Article 16 Operational Authorisation.

Any member who does not follow the terms of the article 16 operational authorisation, and this handbook, is automatically disqualified from flying under the article 16 operational authorisation.

Nb. FPV UK does not affiliate clubs and provides no specific insurance cover for clubs/officers/club equipment/lawn mowers/club houses, etc.

Insurance - Summary of Liability Cover

Broker: Howden Insurance Brokers Limited.

Insurer: Sportscover Europe / Allianz

Entitled to Indemnity: FPV UK Ltd t/a FPV UK affiliated members.

Cover: The insurer will pay damages and legal costs arising from any claim made during the period of insurance and notified to Insurers in respect of legal liability incurred by the Insured in accordance with the terms and conditions of the policy.

Operative time: Whist participating in any authorised/recognised activity of the Association.

Limit of Indemnity: Public & Product Liability: £5,000,000 any one Occurrence, but limited to £5,000,000 in the aggregate in respect of Products Liability. Professional Indemnity - £1,000,000 any one Claim, limited to £1,000,000 in the aggregate

Geographical Limits: Permanent residents of the UK, Channel Islands or the Isle of Man will be covered anywhere in the UK, EU plus Norway and Switzerland.

Please note: if you are a member based outside of the UK, cover will only apply whilst you are participating in an insured activity whilst being in the UK, Channel Islands or Isle of Man.

Excess: £250 in respect of Third Party Property Damage and Third Party Bodily Injury. £250 in respect of Products and Public liability.

MOD Property: The insurance has no exclusion for MOD property.

Principle conditions: Flying Condition – it is a condition precedent to insurers liability that at all times the rules and regulations of FPV UK Ltd shall be complied with. This policy excludes any liability arising directly or indirectly from any form of flying other than visual line of sight flight, and FPV flying with a competent observer.

Principle exclusions:

- Communicable Disease Exclusion.
- Airside activities – airside defined as an airport terminal beyond passport and customs control.
- Criminal Acts.
- Damage to Own Property.
- Acts of War

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.

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. 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.**

Reporting an occurrence to FPV UK

In the first instance, an occurrence should be reported to FPV UK using the occurrence reporting system at occurrences.fpv.uk FPV UK then logs and stores the occurrence data and can analyse and disseminate occurrence patterns, trends, etc - promoting a good air safety culture.

The FPV UK occurrence reporting process will also guide members on any further reporting requirements applicable to the particular occurrence - such as reporting to the CAA and / or the AAIB. And in the case of the latter, it allows the member to submit their occurrence report directly to the AAIB (and provides the phone number where immediate reporting is appropriate).

Reporting to other organisations (CAA/AAIB)

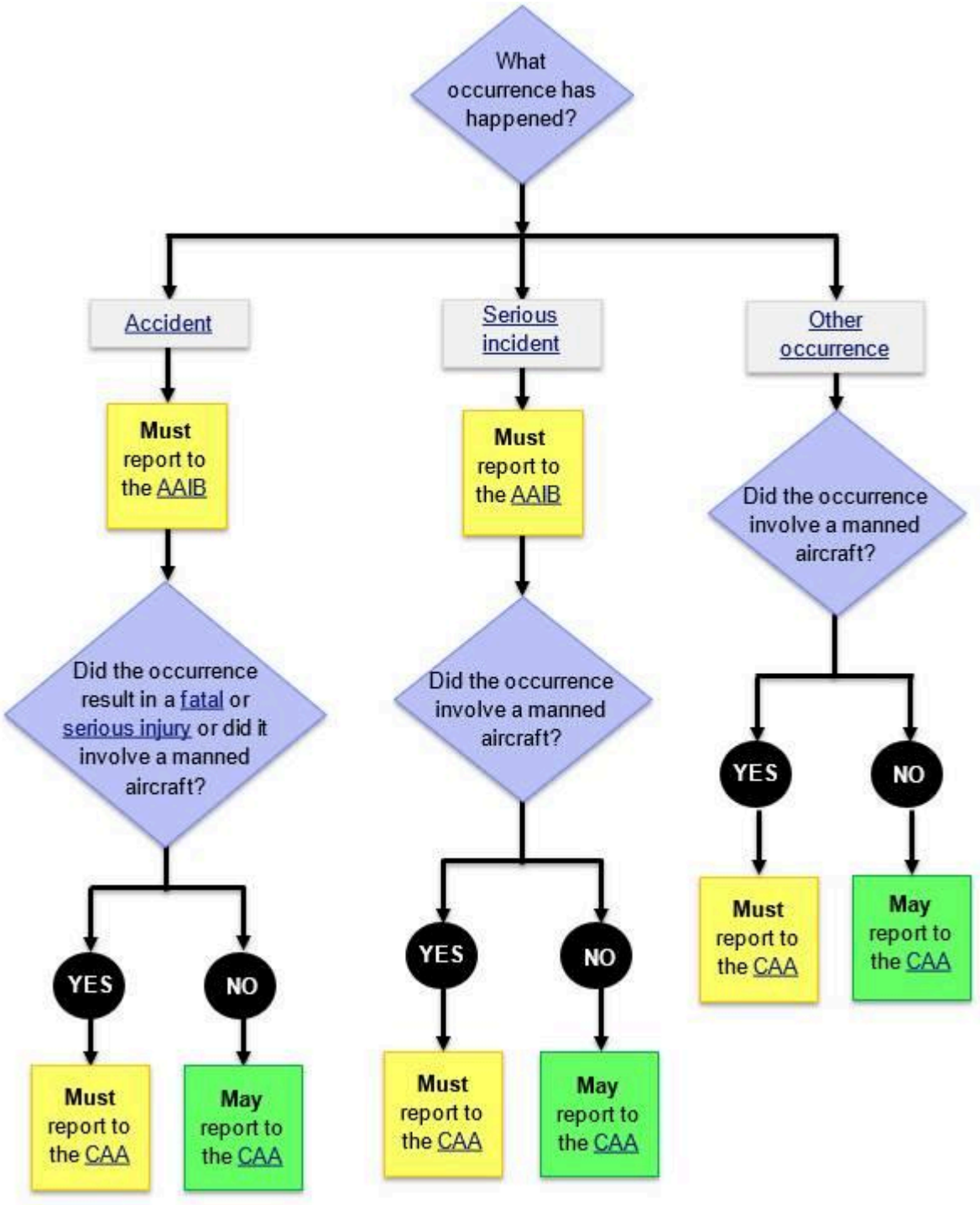
The Air Accidents Investigation Branch (AAIB) and the Civil Aviation Authority (CAA) have separate reporting requirements. It may be necessary to report to one or both.

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

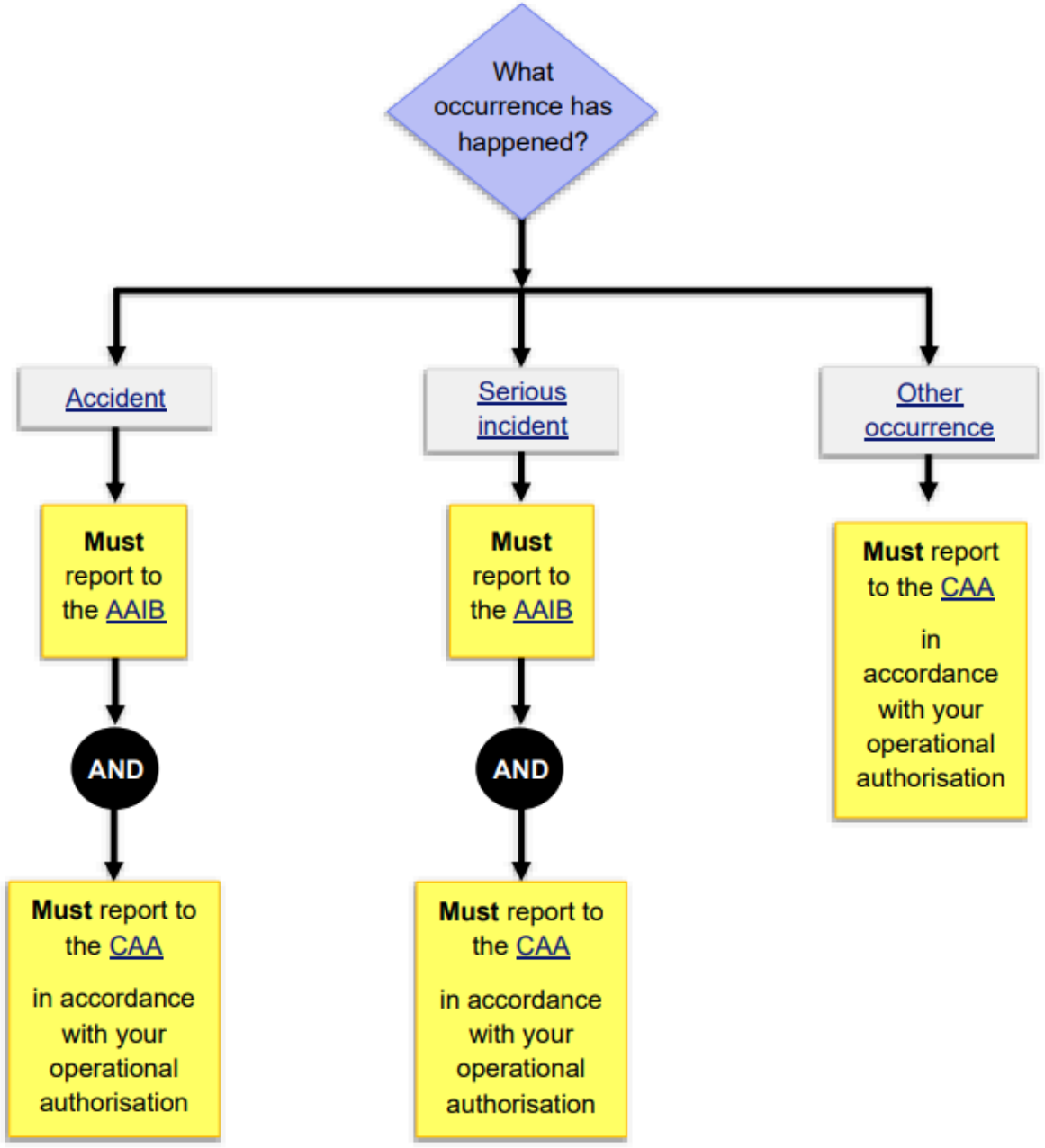
- What occurrences must be reported.
- Who must be reported to.
- How to report.

Yellow boxes mean reporting is mandatory 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). This applies if flying under the Article 16 Operational Authorisation.



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 - this will be done automatically when you report the occurrence through occurrences.fpv.uk

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
- Any instances of flight beyond the visual line of sight of the remote pilot.

To report a UAS occurrence to the CAA. Reports are submitted using the European Co-ordination Centre for Accident and Incident Reporting Systems (ECCAIRS2) reporting portal. https://e2.aviationreporting.eu/reporting 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.

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.

The examiner's check sheet is available here.

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

The data can also be validated using the FPV UK membership check website: check.fpv.uk

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 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 pressing the Mentor/Examiner: Apply Now button in their FPV UK account.

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 pressing the Mentor/Examiner: Apply Now button in their FPV UK account.

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 for more information.

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 if the hazard became 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?

	Extremely improbable	**Improbable**	**Remote**	**Occasional**	**Frequent**
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	$<10^{-9}$ per hour	10^{-7} to 10^{-9} per hour	10^{-5} to 10^{-7} per hour	10^{-3} to 10^{-5} per hour	1 to 10^{-3} 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

Further example risk assessment.

Risk assessment template.