
Spectrum for Unmanned Aircraft Systems (UAS) licence

Licensing guidance document for licensed equipment
on drones

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1. Overview

- 1.1 This Guidance document provides information on how Ofcom licences Unmanned Aircraft Systems (UAS), commonly called drones, under our Unmanned Aircraft Systems (UAS) Operator Radio Licence. The document describes which devices are covered by the Unmanned Aircraft Systems (UAS) Operator Radio Licence, how you go about obtaining a licence and what terms and conditions you must adhere to.
- 1.2 Most drones use spectrum designated for Wi-Fi or model aircraft. Drones that only use this equipment do not need to obtain a licence as they are already exempt from the need to obtain a licence under our regulations. Therefore, there is no change for drones already in use today.
- 1.3 With a UAS Operator Radio Licence, you will have the spectrum authorisation to use a variety of radio equipment on a drone. The licence covers equipment for command and control, including mobile and satellite terminals, as well as other safety systems. This will allow UAS operators to have access to a range of technologies that could enable them to operate a wider range of services and over longer distances.

Below is a summary of the main features of the UAS Operator Radio Licence:

- Covers all drones a company or individual operates in the UK and territorial waters, but does not extend to international flights.
- Has an indefinite duration, subject to the payment of an annual licence fee of £75.
- Authorises a range of specific radio equipment that may be needed for future drone operations, including beacons and safety equipment that may be mandated by the CAA. The list of equipment will be kept under review and, subject to consultation, will be updated to reflect changes in technology or the overarching air safety framework.
- Permits the use of satellite and mobile technologies while requiring the specific agreement of the network operator(s). No transmission will be permitted in the 2.6 GHz mobile band.

What is a UAS or drone

- 1.4 Unmanned Aircraft Systems (UAS), also referred to as Remotely Piloted Aerial Systems (RPAS) but more commonly known as 'drones', are aerial vehicles that do not carry a human operator, but instead are remotely piloted. This technology could bring significant innovations to several industries, ultimately delivering benefits to consumers and citizens. As technology progresses, these devices are becoming increasingly automated and may one day become fully autonomous without the need for a remote pilot.

Rules on flying a UAS or drone

- 1.5 The Civil Aviation Authority (CAA) regulates the safety of aviation, including aircraft, associated equipment and airspace in the UK. The CAA also sets the rules governing how and where drones can be flown safely.
- 1.6 It should be noted that our Unmanned Aircraft Systems (UAS) Operator Radio licence only authorises the use of radio equipment in regard to the authorisation under the Wireless Telegraphy Act 2006. It does not provide any broader authorisation related to drone operations or supersede any aviation safety rules or requirements. Many of these are set by the [CAA](#) and could include requiring the operator to hold a Flight Radio Telephony Operators Licence (FRTOL), or being granted special permission to use certain equipment. There may also be specific CAA approvals required or restrictions placed on the use of some of the equipment listed in the licence. Therefore, operators should ensure they have secured all relevant permissions prior to drone use.

Does my drone need a licence?

- 1.7 Almost all drones use spectrum designated for Wi-Fi or model aircraft which is already allowed under our licence exemption regulations. These regulations provide the technical and operational requirements that equipment must meet in order to be used without a licence. Most technical parameters that equipment must meet are set out in our Radio Interface Requirement [IR 2030](#). This includes specific frequencies for model control, Wi-Fi/RLAN and short-range devices. The most commonly used are:
- 35 MHz that is designated for model aircraft use only; and
 - 2.400 to 2.4835 GHz ('2.4 GHz') and 5.725 to 5.875 GHz ('5.8 GHz'), which are used for a wide range of devices including Wi-Fi, Bluetooth and other data networks.
- 1.8 Drones also use a number of receive-only devices such as GPS receivers. As these are incapable of transmitting, they are exempted from the need to be licensed under the Wireless Telegraphy Act 2006. Therefore, any receive-only equipment does not need to be licensed by Ofcom.
- 1.9 The radio equipment that most drones use today are not suitable for them to fly over these longer distances, due to power limitations of the licence exempt devices which means that they cannot provide the necessary range. The UAS Operator Radio Licence offers a spectrum access licence to operate drones using alternative technologies that allow higher powers which enable a wider range.

If your drone only uses radio equipment that is exempted from the need to hold a Wireless Telegraphy Act licence then you do not need to apply for an Unmanned Aircraft Systems (UAS) Operator Radio Licence.

How to apply for a licence

- 1.10 To apply for an UAS Operator Radio Licence, you'll need to fill in an application form. You'll be able to access the form on the Ofcom website.
- 1.11 The licence will permit you to operate any number of drones using a variety of technologies, anywhere in the UK.
- 1.12 Once you've filled in the licence application form, email it to the Licensing Team at UAS@ofcom.org.uk.
- 1.13 Once you submit your completed application form, we'll send an invoice and request payment. You have 30 days to pay for the invoice. Once you pay your licence fees, we'll then issue you with your licence. You may then start using your radio equipment.

2. Licence terms and conditions

- 2.1 The licence has a number of technical and non-technical conditions that the licensee must adhere to. These are explained further in this section.

High level licence summary

- 2.2 This licence authorises spectrum use in accordance with the licence terms and conditions. UAS/drone operators will continue to need to adhere to any air safety requirements and other regulations regarding the operation of their drone set by the CAA, the UK's aviation regulator.
- 2.3 Like most other licences that Ofcom issues, the licence consists of two separate parts:
- a) The **licence document**: this includes information specific to a licensee, and covers:
 - i) Licence Details and Validity: information such as the licensee's address details, licence number and the date their licence was issued.
 - ii) Radio Equipment: the radio equipment authorised under the licence.
 - iii) Use of Radio Equipment: sets out those specific terms and conditions relating to the use of the equipment on a UAS which do not apply to other licence types that Ofcom issues.
 - b) **Wireless Telegraphy (WT) Licence Conditions Booklet**: This includes the standard terms and conditions applicable to the installation and use of many licences that Ofcom issues. These standard terms and conditions are available on our website in the [Wireless Telegraphy Licence Conditions Booklet OfW 597](#). It covers amongst other things:
 - i) The process for varying or revoking a licence;
 - ii) How any changes to the licence need to be notified to Ofcom;
 - iii) The requirements for licence fee payment;
 - iv) General provisions regarding the use of radio equipment;
 - v) Ofcom's powers to access and inspect the equipment;
 - vi) If required, Ofcom's powers to require licensees to modify, restrict or stop using the radio equipment; and
 - vii) Requirements on licensees to ensure that the public is protected from Electromagnetic Fields (EMF).
- 2.4 These two documents together form the licence. Licensees are required to comply with all the terms and conditions in both the licence document and the separate WT Licence Conditions Booklet. Licensees are issued with their own licence document and are able to access the WT Licence Conditions Booklet online.

Licence fee and non-technical licence conditions

Licence Fee

- 2.5 We've decided to set a cost-based fee for the licence; this means the amount we charge has been calculated to make sure Ofcom only recovers the cost of administering the licence.
- 2.6 The fee for this licence is £75 payable every year.
- 2.7 The licence covers unlimited UAS/drones, devices and locations in the UK (see paragraphs 2.8-2.9), so no extra fee is required if you want to operate additional devices once you have your licence.

Where can it be used

- 2.8 The licence authorises use of the designated spectrum across the UK, including UK territorial seas. This covers the area out to twelve nautical miles as well as other areas covered by UK law such as UK controlled areas of the North Sea.
- 2.9 The licence does not authorise use in the Channel Islands and Isle of Man.

Licence duration and revocation

- 2.10 The licence has an indefinite duration; as long as you pay your licence fees each year, and do not break any of the licence terms and conditions, you can keep it for as long as you like.
- 2.11 The licence permits Ofcom to give five year's notice to revoke the licence for spectrum management reasons. We normally only do this if we intend to change the way the band is used.
- 2.12 We may also revoke the licence at any time for other reasons set out in the licence, including if the conditions of the licence are breached or a licensed device is causing interference to other authorised spectrum users.

Special conditions on the use of certain radio equipment

- 2.13 Certain equipment can only be used by a person who holds (or is under the direct supervision of a person who holds) a valid Flight Radio Telephony Operator's Licence (FRTOL) issued by the CAA (or equivalent licence issued by a national aviation authority), unless such a requirement has been exempted under the [Air Navigation Order 2016](#).
- 2.14 The use of mobile and satellite equipment is subject to further conditions. These are set out in more detail in Section 3 of this document.

Accessing, modifying and shutting down your equipment if something goes wrong

- 2.15 The licence includes terms that allow Ofcom to instruct you to provide access to, modify or shut down your equipment – but we will only do this if there is a problem of some sort that we consider requires such action.
- 2.16 For example, we could need to do this if your equipment was causing interference to another user. We might request that you modify your equipment parameters and change the way it transmits so that the users can operate without interference.

Compliance with EMF

- 2.17 All uses of radio spectrum generate electromagnetic fields (EMF). There are internationally agreed guidelines published by the International Commission for Non-Ionising Radiation Protection ([ICNIRP](#)) to help ensure services operate in a way that will not adversely affect health. These guidelines include limits on EMF exposure for the protection of the general public. We refer to these limits as the “ICNIRP general public limits”.
- 2.18 In our “Statement on Measures to require compliance with international guidelines for limiting exposure to electromagnetic fields (EMF)” (the “[EMF Statement](#)”), we explained that some spectrum users are not fully aware of the limits in the ICNIRP Guidelines or are not taking full account of EMF exposure when installing or modifying radio equipment. In order to address these risks, we decided to include a specific condition in licences requiring licensees to comply with limits in the ICNIRP general public limits. This condition applies to all licence classes which authorise equipment to transmit at powers higher than 10 Watts e.i.r.p. (including, for example, the licences of mobile phone companies, TV and radio broadcasters and most point-to-point microwave links).
- 2.19 Therefore, a requirement of the licence is that the licensee carry out an assessment of the equipment in order to ensure that the ICNIRP general public limits are being complied with. In summary, the EMF condition:
- includes a set of definitions relating to the EMF condition;
 - imposes a requirement to comply with the ICNIRP general public limits for (i) sites not shared with other licensees; and (ii) where applicable, sites shared with other licensees (advice on how to comply is set out in our [Guidance on EMF Compliance and Enforcement](#));
 - sets out an exemption where licensees are not required to comply with the ICNIRP general public limits in emergency situations;
 - imposes a requirement to keep records demonstrating compliance with the ICNIRP general public limits; and
 - imposes a requirement to take into account Ofcom’s Guidance on EMF Compliance and Enforcement.
- 2.20 Further information on the EMF condition can be found on the [Ofcom website](#).

3. Equipment covered by the licence

- 3.1 The UAS Operator Radio licence provides the spectrum authorisation for a range of radio equipment, including those that are used for:
- UAS 'command and control' functions, which enables the remote pilot to control the device and send navigation commands, and controls the launching, flying, and recovery of the device.
 - Relaying of payload data (which allows the UAS to send video and data back to the remote pilot).
 - 'Electronic Conspicuity' (which allows other users to 'see' your UAS' location and flight path). Please note that the use of some of these technologies are also subject to prior approval or recommendation by the CAA.
 - 'Detect and Avoid' functions which give the drone the ability to take evasive action and avoid objects (such as other UAS) which pose a danger.
 - Communications, navigation, and surveillance which will allow Air Traffic Controllers to maintain oversight and control of the flight, if required by CAA.
- 3.2 Table 1 below (Table 1 in Schedule 2 in the licence) sets out the specific technical requirements which equipment must comply with in order to be used.
- 3.3 Most of the equipment covered under the UAS Operator Radio licence is already authorised for airborne use under through Aircraft Radio licence. This licence now enables the use of this equipment on a drone.

All equipment covered under the licence

Table 1: List of authorised equipment under the UAS Operator Radio licence

System	Frequency	Requirements
High Frequency (HF) Communications	2.85 to 22 MHz	Flight Radio Telephony Operator's Licence (FRTOL) required
VHF Communications	117.975 to 137 MHz	<p>Analogue voice communications terminals with 8.33 kHz and 25 kHz channelization, VHF Data Link Mode 2 & 4 with 25 kHz channelization.</p> <p>When operating on the emergency frequency (121.5 MHz), the auxiliary frequency for search and rescue operations (123.1 MHz) or the airport fire service frequency (121.6 MHz), the equipment may operate 25 kHz channel spacing on these frequencies.</p> <p>FRTOL required</p> <p>This licence does not cover Aeronautical Ground Radio Stations that are subject to separate WT Act</p>

		licensing and also approval under the Air Navigation Order 2016.
Mobile Network User Equipment (UE)	703 to 733 MHz (700 MHz band)	Technical parameters set out in UK Interface Requirement IR 2107, published by Ofcom.
	832 to 862 MHz (800 MHz band)	Technical parameters set out in UK Interface Requirement IR 2090, published by Ofcom.
	880 to 915 MHz (900 MHz band)	Technical parameters set out in UK Interface Requirement IR 2109, published by Ofcom.
	1710 to 1781.7 MHz (1800 MHz band)	Technical parameters set out in UK Interface Requirement in IR 2109, published by Ofcom.
	1920 to 1980 MHz (2100 MHz band)	Technical parameters set out in UK Interface Requirement IR 2092, published by Ofcom.
	2350 to 2390 MHz (2.3 GHz band)	Technical parameters set out in UK Interface Requirement IR 2098, published by Ofcom.
	3410 to 3800 MHz (3.4-3.8 GHz band)	<p>Technical parameters set out in UK Interface Requirement IR 2097, published by Ofcom.</p> <p>The Licensee must have written permission for airborne use of its User Equipment (UE) from the mobile network(s) to which that UE connects.</p> <p>All airborne UE transmissions in the 2500 to 2690 MHz (2.6 GHz band) are prohibited. The Licensee must ensure that under no circumstance should the UE be able to connect to services operating in this band.</p>
Air Traffic Control (ATC) Transponder	1030/1090 MHz	No FRTOL needed if the operator has no control over the operation of the Transponder, other than to switch it on and off.
Traffic Alert and Collision Avoidance System (TCAS)/	1030/1090 MHz	

Airborne Collision Avoidance System (ACAS)		
Automatic Dependent Surveillance–Broadcast (ADS-B)	1090 MHz	Must be operated in accordance with the latest version of CAP 1391, published by the CAA.
Distance Measurement Equipment (DME)	960 to 1215 MHz	FRTOL required.
Satellite Earth Station Communication	14 to 14.47 GHz	<p>Satellite Earth Station may be used only if authorised to do so under a “Satellite (Earth Station Network)” Licence issued to the operator of the earth station network;</p> <p>The Satellite Earth Station may transmit with an e.i.r.p. no greater than 55 dBW;</p> <p>If operating to a geostationary satellite, the Satellite Earth Station must employ a stabilised platform and must maintain a pointing accuracy ± 0.2 degrees towards the relevant geostationary satellite throughout transmissions;</p> <p>At angles greater than or equal to 2.5 degrees from the antenna main beam axis, the e.i.r.p. of the Satellite Earth Station, if operating to a geostationary satellite, shall not exceed 20 dBW/40 kHz;</p> <p>All transmissions from the Satellite Earth Station must be clearly identifiable;</p> <p>The Satellite Earth Station must at all times operate such that it conforms to Interface Requirement IR 2077, published by Ofcom;</p> <p>The Satellite Earth Station shall meet the conditions given in footnotes 5.504B, 5.504C, 5.508A and 5.509A of the Radio Regulations so as not to cause harmful interference to terrestrial fixed and radio astronomy stations.</p>
	1525 to 1660.5 MHz	

	1980 to 2010 MHz	<p>45 dBm / 200 kHz e.i.r.p. is permitted when operating at altitudes of 1000 metres and above; or</p> <p>24 dBm / 200 kHz e.i.r.p. is permitted when operating at an altitude below 1000 metres.</p>
	27.5 to 27.8185 GHz, 28.4545 to 28.8265 GHz and 29.4625 to 30 GHz for transmission (Earth-to-space)	<p>Satellite Earth Station to geostationary orbit (GSO) satellites may be used only if authorised to do so under a “Satellite (Earth Station Network)” Licence issued to the operator of the earth station network.</p> <p>Satellite Earth Stations operating to Non-GSO (NGSO) satellites are not permitted.</p> <p>The operation of the Earth stations in motion (ESIM) Equipment shall comply with the technical and operational criteria contained within the UK Interface Requirement 2093, published by Ofcom.</p> <p>The Licensee must have written permission for airborne use of its User Equipment (UE) from the satellite network(s) to which that UE connects.</p>
2 GHz Complementary Ground Component (CGC)	1980 -2010 MHz	<p>The Licensee is only authorised to operate the 2 GHz CGC Equipment to connect with a satellite or CGCs operated by Inmarsat Ventures Limited or Echostar forming part of a 2GHz Mobile Satellite System.</p> <p>Transmit power when transmitting to one or more CGCs:</p> <ul style="list-style-type: none"> • 40 dBm e.i.r.p is permitted when operating at altitudes of 1000 metres and above; or • 24 dBm e.i.r.p. is permitted when operating at altitudes below 1000 metres.
Radio altimeters	4200 to 4400 MHz	
Weather Radar	9300 to 9500 MHz	

Special provisions on the use of mobile equipment

- 3.4 Unlike terrestrial use which is exempt from the need to hold a licence, the use of mobile terminals (referred to as User Equipment (UE)) airborne requires the user to hold a UAS Operator Radio licence. This is because airborne use can cause problems to Air Traffic Control (ATC) radars operating in the 2.7 GHz band as well as the physical mobile networks the drone would be using. The following paragraphs explain some of the specific conditions regarding the use of mobile UE.

Prohibition on the use of 2.6 GHz band to protect Air Traffic Control radars

- 3.5 The use of airborne UE transmitting in the 2500-2690 MHz (the '2.6 GHz band') can have an impact on the ATC radars in the adjacent frequency band. The use of deployments in the 2.6 GHz band must be coordinated with ATC radar in order to prevent interference to these important systems. However, the distances required to protect the ATC radars vary greatly depending on the performance of the mobile UE equipment and for this reason, we are not allowing access to the 2.6 GHz band at this time.
- 3.6 We have purposely not specified the mechanism that UAS operators can use to comply with this provision. Licensees are able to use a hardware, software or a network solution provided by the MNO. We would expect UAS operators to take appropriate steps to obtain assurance from the equipment supplier, network provider and/or their own testing to confirm that this condition has been met.

The use of the 2.6 GHz band is not permitted to ensure the protection of the Air Traffic Control radars. Licensees are required to ensure that their devices cannot connect to this band.

Written permission from the mobile network operator

- 3.7 Studies have shown that the airborne use of a UE can cause quality of service impacts on the host mobile network. To ensure that this potential problem can be managed by the impacted network, the airborne use of any UE is only permitted with the express written permission of the host MNO(s). **In the case of a drone operator seeking to use connectivity provided by a Mobile Virtual Network Operator (MVNO)¹ written permission must be obtained from the MNO whose physical network is to be used by the device while airborne.**
- 3.8 Using an MNO's network without written permission would constitute a breach of licence. If the permission is rescinded at any time by the MNO, then the UAS operator cannot use that network. If a licensee uses a mobile network without such an agreement, then this will be illegal use.
- 3.9 Network providers have the discretion to refuse to allow their network(s) to be used to provide connectivity to a drone, this is regardless of whether a valid UAS Operator Radio

¹ A Mobile Virtual Network Operator (MVNO) is a mobile provider that does not own the wireless network infrastructure over which it provides mobile services to its customers.

licence is held. The conditions that an MNO may impose before access is granted and any contractual agreements, including fees, on using the MNO's network are a commercial matter between the parties. Ofcom will not become involved in these matters or disputes regarding any refusal to provide permission to use the network(s).

- 3.10 This provision is only needed if you plan to equip a mobile UE on your drone(s). If you do not initially plan to deploy a mobile UE on your drone(s) but at a future date wish to do so, you must obtain written permission from the relevant MNO before doing so.

Mobile network operators (MNOs) are not obliged to permit any airborne access on their networks. Although the licence lists a number of mobile frequency bands, the use of any particular mobile network or band is subject to the MNO giving permission to do so.

Mobile Network Operator contact details for UAS/drone enquiries

- 3.11 Below are contact details that have been provided by the MNOs for those operators wishing to discuss gaining access to their networks:

- BT/EE – email droneconnect@bt.com
- Vodafone – email ukdronesregulatory@vodafone.com
- Three – to be confirmed, please contact mwb@ofcom.org.uk in the meantime.
- Telefonica (O2) - Not currently hosting operational drone use, pending impact assessment work

A licensee must have written approval from the MNO(s) whose network they wish to use before they fly their drone using a mobile UE.

Special provisions on the use satellite equipment

- 3.12 The licence permits the use of a range of satellite user equipment connecting to a range of different networks. These include:

- Equipment operating in L Band (1616-1626.35 MHz and 1626.5-1660.5MHz);
- Ku satellite band (14-14.47GHz);
- Ka satellite band (27.5-30GHz); and
- 2 GHz Mobile Satellite Service (MSS) and Complementary Ground Component (CGC) networks in (1980-2010MHz).

- 3.13 As part of the licence requirements, written permission is needed from the satellite network that you can use the equipment airborne.

- 3.14 Some satellite networks need to be authorised by Ofcom in order to operate in the UK. Before using a satellite network licensees need to ensure that the satellite provider they wish to use has the necessary permissions to transmit in the UK. The use of the following frequency bands requires the satellite provider to be authorised by Ofcom under the terms of this licence:

- Use of Ku satellite band (14-14.47GHz) and Ka satellite band (27.5-30GHz) requires the operator to hold a Satellite (Earth Station Network) licence;

- The 2 GHz MSS (1980-2010MHz) can only be used to connect to a satellite operated by either Inmarsat Ventures Limited or Echostar;
- Connection to a 2 GHz CGC network (1980-2010 MHz) is only permitted if the network holds either a Network 2 GHz or Satellite (Complementary Ground Components of a Mobile Satellite System) licence.

Additional rules on aeronautical use of equipment

- 3.15 In addition to the rules that are set out in the UAS Operator Radio licence, licensees will also need to adhere to any usage requirements as stipulated by the CAA. This may include requirements on the specific uses that a particular piece of equipment can be put to and any technical aviation safety standards this must meet.

Failure to comply with provisions in the licence or unlicensed use

- 3.16 It is a criminal offence to use or install wireless telegraphy apparatus, unless under and in accordance with the terms, provisions and limitations set out in a licence or licence exemption regulations, section 8 and 35 of the Wireless Telegraphy Act 2006.
- 3.17 The maximum penalty varies depending on the specific offence committed, where in the UK it is committed and whether it is tried by a Magistrates Court or in the Crown Court, but both imprisonment and large fines are possible. See section 35 of the Wireless Telegraphy Act 2006 for more information. More information can be found on the [Ofcom website](#).

4. Contact details

Ofcom, Riverside House, 2a Southwark Bridge Road, London, SE1 9HA

Tel: 020 7981 3000

Website: [Ofcom](#) | [Spectrum](#)

- Technical enquiries to Spectrum Management & Authorisations Team

Email: UAS@ofcom.org.uk

- Licensing enquiries to Spectrum Management & Authorisations Team

Email: UAS@ofcom.org.uk

5. Document history

5.1 This is a live document, and we may change it from time to time to update it with new information. Any changes that have been made on the document history is outlined at the table below.

Version	Date	Changes
1.0	January 2023	First published
1.1	March 2023	Adding a contact email at 3.11; minor typo corrections