



LONDON FIRE BRIGADE

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Freedom of Information request reference number: 6806.1

Date of response: 20/09/2022

Request:

I would like a copy of your UAV teams, CAA approved Operational Authorisation or PFCO,

*Any operational safety cases and risk assessments (enhanced permissions),
Section 1: UAS OSC Volume 1 - Operations Manual,
Section 2: UAS OSC Volume 2 – UAS System(s),
Section 3: UAS OSC Volume 3- Safety Risk Assessment.*

Response:

I have attached a copy of the current LFB Drone team's Unmanned Aircraft Systems Operating Safety Case Operations Manual which contains the information you have requested.

Please note, some information has been redacted from the document as follows:

1. Personal data has been removed from the attached document under [section 40 of the FOIA – Personal Information](#).
2. Details of the types of incident the LFB drone team attend and instructions on how to update any drone software have been removed under the FOIA via [Section 24 – National Security](#). Although we believe this exemption applies, the Brigade is required, under the Freedom of Information Act (FOIA), to consider the public interest. This requires us to consider whether the public interest in withholding the information outweighs the public interest in disclosing it. Whilst we acknowledge there is a public interest in knowing that the London Fire Brigade has adequate procedures in place to deal with any emergency incident involving public safety, the disclosure of these details would, or would be likely to, provide anyone wanting to carry out acts of terrorism with a detailed plan of our pre-planned emergency response and in turn damage the Brigade's ability to respond efficiently and effectively, and placing public safety at risk. It is for this reason we conclude that the public interest in withholding the information, outweighs the public interest in disclosure.
3. Copies of any LFB forms have been removed under the FOIA via [Section 31 – Law Enforcement](#). We do not typically provide copies of LFB forms under the FOI act as, if they are made public, there could be a risk of them being used in some element of criminal activity. Therefore, this information is exempt from disclosure under the FOI act under section 31(1)(a) - Law enforcement. Section 31 is a qualified exemption and I must consider the public interests for and against disclosure. By disclosing this information there is a risk that it could make the LFB more vulnerable to crime. For example, it may be possible to print and use the LFB branded forms to impersonate a Firefighter which could, in turn, put other people at risk. I am therefore of the view that it is in the public interest not to disclose this particular section of the manual you have requested.

You will see on page 33 of the document that the copy of Operational Authorisation is not included in the current version of this manual. Our Drone team have confirmed that they do hold a copy of the CAA authorization document. This document is withheld under via [Section 31 – Law Enforcement](#). As with LFB forms, there could be a risk of the certificate being used in some element of criminal activity. Therefore, this information is exempt from disclosure under the FOI act under section 31(1)(a) - Law enforcement. Section 31

is a qualified exemption and I must consider the public interests for and against disclosure. By disclosing this information there is a risk that it could make the LFB more vulnerable to crime. For example, it may be possible to print and use the Operational Authorisation to impersonate an LFB drone operator which could, in turn, put other people at risk. I am therefore of the view that it is in the public interest not to disclose this particular section of the manual you have requested.

You will see from page 56 that the copy of insurance certificate is not included in the current version of this manual. Our Drone team have confirmed that they do hold a copy of the insurance certificate. This document is withheld under via [Section 43 – Commercial Interests](#). Section 43 requires that we consider whether there is a public interest in disclosing the withheld materials, but we are of the view that the public interest is best served by the Authority being able to secure the best terms and prices for its contracts, which means keeping the financial details of such agreements confidential.

We have dealt with your request under the Freedom of Information Act 2000. For more information about this process please see the guidance we publish about making a request [on our website](#).

London Fire Commissioner

Unmanned Aircraft Systems
Operating Safety Case
Volume 1 - Operations Manual

CAA Operator ID: [REDACTED]

Version 4.3

Dated 30.09.21

London Fire Commissioner UAS Operations Manual

Safety Statement

This Operations Manual describes London Fire Commissioner's (London Fire Brigade) Unmanned Aircraft Systems, personnel, flight operations and procedures by which London Fire Brigade carries out its UAS Operations.

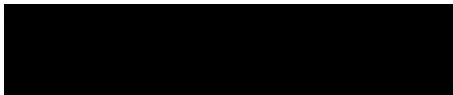
The operation of any UAS by London Fire Commissioner's (London Fire Brigade) is carried out in accordance with, and abide by the requirements of ANO2016 - 2020 Amendment and UAS Implementing Regulation 2019/947 (as retained in UK Law), the conditions of this Operations Manual, the relevant PDRA, insurance policy, and the Operational Authorisation issued by the Civil Aviation Authority (CAA).

This Operations Manual and any associated referenced documents define the organisation and procedures upon which the Civil Aviation Authority Operational Authorisation approval is based.

These procedures are approved by the undersigned and must be complied with, as applicable, under the terms of the Operational Authorisation approval. It is accepted that these procedures do not override the necessity of complying with any new or amended regulation published by the Civil Aviation Authority where these new or amended regulations are in conflict with these procedures. Changes or additions to regulations shall be monitored and implemented through regular monitoring of the Civil Aviation Authority website, CAP 722 revisions and involvement with associations and Emergency Services Working Groups.

It is understood that the Civil Aviation Authority will approve this organisation whilst the Civil Aviation Authority is satisfied that the procedures are being followed and work standards maintained. It is further understood that the Civil Aviation Authority reserves the right to suspend, limit or revoke the Operational Authorisation status of the organisation if the Civil Aviation Authority has evidence that procedures are not followed or standards not upheld.

Signed



Deputy Assistant Commissioner

Accountable Manager

For and on behalf of the London Fire Commissioner (London Fire Brigade)

London Fire Commissioner UAS Operations Manual

Amendment Record

Document history				
Version	Date	Author	Status	Changes
1.0	17.08.18	[REDACTED]	Final	
1.1	16.09.18	[REDACTED]	Final	ANO 2018 update: Referenced Documents. Changed Remote Pilot to Pilot-in-Command. 3.3 – Areas of Operation. 3.5 – Supervision of SUA Operations . 4.2 – Operating limitations and conditions. 4.13 – Night Operations. Updated company name to London Fire Commissioner
1.2	05.11.18	[REDACTED]	Final	Added a 3 rd platform – DJI Inspire 1. Amendments made throughout manual. FRC added in Appendix 10.
1.3	12.11.18	[REDACTED]	Final	Added 2 new pilots to Appendix 8. New Pilot Flight Log in Appendix 4. New Techlog in Appendix 5.
1.4	18.07.19	[REDACTED]	Final	Removed DJI Matrice 210 (Appendix 6), DJI Phantom 4 (Appendix 7) and DJI Inspire 1 (Appendix 10). Replaced with DJI Matrice 210 V2 (Appendix 6) and DJI Mavic 2 Dual (Appendix 7).
2.0	20.08.19	[REDACTED]	Draft	Updated Referenced Documents. 4.2 Operating limitations and conditions completely re-written to reflect the amendments detailed in CAP 1763
2.1	12.09.19	[REDACTED]	Final	Amendments following submission. P-i-C changed to RP. Legacy information updated
2.2	10.02.20	[REDACTED]	Final	Added new permission to Appendix 1. Removal of 2 pilots and addition of 2 pilots to Appendix 8.
2.3	17.08.20	[REDACTED]	Final	Added Operator CAA Operator ID and CAA Flyer ID's throughout and Appendix 8.
3.0	15.09.20	[REDACTED]	Final	Removed DJI Matrice 210 FRC in Appendix 6 and replaced with DJI M300 RTK FRC. Added new safety statement

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3.1	11.03.21	██████████ ██████████	Final	Updates made throughout document including updated referenced documents, Acronyms and abbreviations. Legacy Articles removed. Amended articles added
4.1	16.09.21	██████████ ██████████	Final	Added 2 new RP, updated references to critical documents throughout document. Added new type of platform and removed old one. Added new RA.
4.2	28.09.21	██████████ ██████████	Final	Updated referenced docs, PFCO term removed
4.3	30.09.21	██████████ ██████████	Final	Article 94/95 references removed. PFCO removed

Acronyms and Abbreviations

Acronym	Definition
AIP	Aeronautical Information Publication. A publication issued by or with the authority of a state and containing aeronautical information of a lasting character essential to air navigation. It is designed to be a manual containing thorough details of regulations, procedures and other information pertinent to flying aircraft in the particular country to which it relates.
AIS	Aeronautical Information Service. Run by NATS, includes the IAIP, NOTAMs and VFR Charts.
AML	Aircraft Maintenance Log. Record of all maintenance activities for the Aircraft.
ANO	Air Navigation Order (2016) – Amended 2020 . Contains the orders and regulations (practical instructions for the Civil Aviation Act (2006)) for UK aviation.
ASR	Air Safety Report. A form that is completed to record any safety-related incidents. If applicable, the Operator will forward it to the CAA under the MOR Scheme.
ATC	Air Traffic Control
ATTI	ATTitude – flight mode
ATZ	Aerodrome Traffic Zone. The airspace around an aerodrome that has controlled airspace extending from surface to 2000 feet and within a circle of radius 2 nautical miles or 2.5 nautical miles depending on the length of the runway.
BVLOS	Beyond Visual Line Of Sight
CAA	The Civil Aviation Authority. A UK government statutory authority that oversees the approval and regulation of civil aviation.
Unmanned Aircraft Observer	A person, positioned alongside the remote pilot, who, by unaided visual observation of the unmanned aircraft, assists the remote pilot in keeping the unmanned aircraft in VLOS and safely conducting the flight.
CAP	Civil Aviation Publication
Daylight Hours	The hours between the end of morning civil twilight and the beginning of

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	evening civil twilight.
DJI	Da-Jiang Innovations
ECCAIRS	European Co-ordination Centre for Air and Incident Reporting Systems
ESE	Emergency Services Exemption (General Exemption E4506)
Failsafe	A safety system that returns the aircraft to its take off location and automatically lands in the event that radio control is lost. Also known as Return to Home (RTH)
FOD	Foreign Objects and Debris
GPS	Global Positioning System
HEMS	Helicopter Emergency Medical Service
HTOL	Hand Take Off and Landing
IAIP	Integrated Aeronautical Information Package
ICO	Information Commissioner's Office
LZ	Landing Zone. Nominated site for aircraft landing. It will be the landing site in the event of failsafe being activated.
METAR	Meteorological Aerodrome Report
MOR	Mandatory Occurrence Report. Safety related reporting scheme which defines which events must be reported to the CAA.
NATS	NATS Holdings, formerly National Air Traffic Services and commonly referred to as NATS, is the main air navigation service provider in the United Kingdom.
NOTAM	Notice to Airmen of hazards or flight safety issues that are a change from the published information.
NPAS	National Police Air Support
RAE	Recognised Assessment Entity An organisation approved by the CAA to submit reports and/or issue certificates on the CAA's behalf in relation to remote pilot competency.
Observer	Suitably briefed individual whose role it is to maintain a visual survey of the operation in addition to any other tasks specified by the RP. This person may be the camera operator.
Operations Manager	Individual within each emergency service who is responsible for ensuring the safe and efficient operation of aircraft. In addition, they are responsible for the training of pilots and technical support.
PIA	Privacy Impact Assessment
OA	Operational Authorisation. A document issued by the CAA that authorises the operation of an unmanned aircraft system, subject to the conditions outlined within the authorisation, having taken into account the operational risks involved.
Pilot logbook	Record of flying undertaken by the pilot.
RED	Risk assessment Exemptions and Deconfliction
CU	Command Unit. The equipment or system of equipment to control unmanned aircraft remotely as defined in point 32 of article 3 of Regulation (EU) 2018/1139 which supports the control or the monitoring of the unmanned aircraft during any phase of flight, with the exception of any infrastructure supporting the command and control (C2) link service.
Remote Pilot	A natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change the course at any time.
RTH	Return to Home. This is a failsafe feature of the SUA, where the device will automatically return to the location set as "home" by the RP. This can be

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	triggered by the RP, or will occur automatically if the signal between the device and RP is lost for any reason, or battery power becomes low.
SERD	Safety Event Reporting Database - A bespoke London Fire Commissioner database
SOP	Standard Operating Procedure
UAS Operator	Any legal or natural person operating or intending to operate one or more UAS
VFR	Visual Flight Rules
VLOS	Visual Line of Sight. A type of UAS operation in which the remote pilot is able to maintain continuous unaided visual contact with the unmanned aircraft, allowing the remote pilot to control the flight path of the unmanned aircraft, people and obstacles for the purpose of avoiding collisions.

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1. Introduction

The guidance contained within this document has been developed to meet the requirements of the Civil Aviation Authority (CAA) permissions for the safe operating of Unmanned Aircraft Systems (UAS). This standard operating procedure (SOP) must be adhered to during all flight operations whether at operational incidents or training events.

This is a working document and will be updated as necessary to ensure that safe operation protocols are maintained and CAA regulations adhered to.

This document will be subject to regular governance and updated in conjunction with any updated reference material published. As a minimum, this document is to be reviewed annually by the Accountable Manager and published for the attention of all personnel. Any changes to this document are to be reflected in the record of amendments accordingly.

The operating procedures contained within this document must be followed and wilful violation will constitute a breach of this document, rendering the individual liable for disciplinary proceedings and/ or cessation of employment.

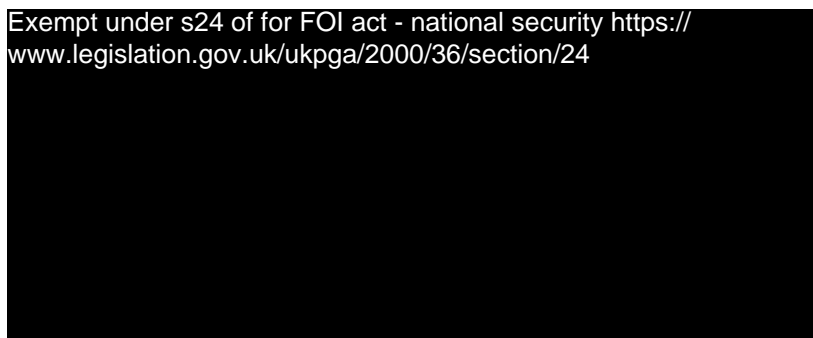
All operations using UAS will be conducted in accordance with the conditions and limitations stated within the Operational Authorisation (OA).

All operating personnel must comply with established policies and procedures unless there is an urgent and compelling reason to depart from them.

A degree of flexibility is essential in emergency service UAS operations, however, personnel have discretion to use non-standard practices to meet unexpected or unusual circumstances in the interests of safety.

The UAS will be utilised to deliver a range of services to support the emergency services at a large variety of incidents. This may include but is not limited to:

Exempt under s24 of for FOI act - national security <https://www.legislation.gov.uk/ukpga/2000/36/section/24>



The use of the UAS capability will greatly improve the situational awareness and decision making of operational and tactical commanders, as well as reducing risks to the public and other responders.

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2. Safety Policy

Health and safety is an integral component in delivering a quality service to the public. We will ensure that risk is managed in order to protect the health, safety and welfare at work of all our employees and any other persons who may be affected by our operations.

This document applies to the emergency services operation of Unmanned Aircraft Systems (UAS).

The instructions, procedures and information contained in this manual have been devised to ensure safety and standardisation in the conduct of operations. They are to be observed by all operating personnel. Personnel are also reminded of their obligation to comply with the CAA regulations. Each pilot must read this Operations Manual and sign against their relevant name in Appendix 8 to show that they have understood and acknowledged its contents. The document is version controlled and a brief summary of amendments can be found on page 3.

Nothing in this manual takes precedence over CAA regulations or permits unsafe operation.

Referenced Documents

Document	Full Title	Version & Date of Issue
ORS4 No.1449	Unmanned Aircraft – Amendments to UAS Operator 'standard permissions' issued prior to 31 December 2020	V1 – 4/2/2021
CAP 2038A00	The Air Navigation Order 2016	V5 – 06/09/2021
SI No. 2020/1555	The Air Navigation (Amendment) Order 2020	V1 – 17/12/2020
CAP1789A	The EU UAS Implementing Regulation: Consolidated text	V4.0 – 17/8/2021
UKPDRA01	Operations within 150 metres of any Residential, commercial, Industrial or Recreational areas for UAS with a Maximum Take-Off Mass of less than 25kg	V1.0 – 5/11/2020
CAP 722	Unmanned Aircraft System Operations in UK Airspace - Guidance	V8 – 5/11/2020
CAP 722C	UAS Airspace Restrictions Guidance and Policy	V1.0 – 10/12/2020
ORS4 No.1233	Small Unmanned Aircraft - Emergency Services Operations	V1 – 31/07/2017
CAP 382	Mandatory Occurrence Reporting Scheme	07/2021
EC785/2004	Regulation (EC) No. 785/2004 of the European Parliament and of the Council of 21 April 2004 on insurance requirements for air carriers and aircraft	V1 – 30/4/2004

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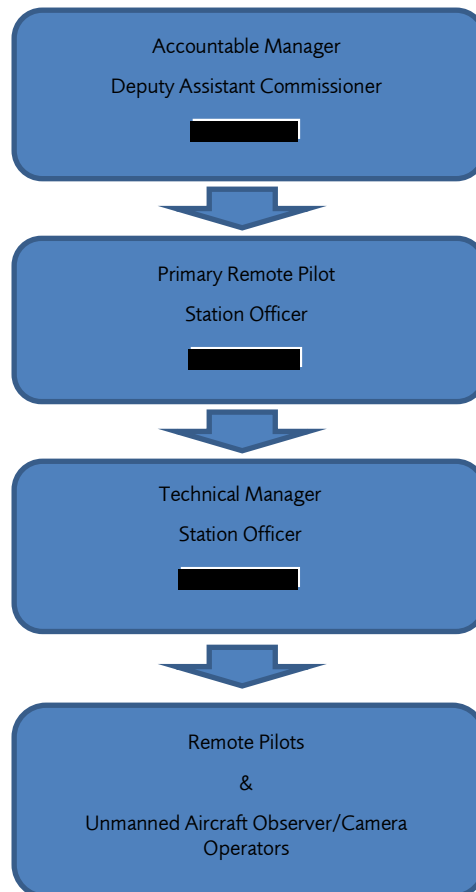
	operators	
RTSA 2003	Railway and transport safety act 2003 – Chapter 20 Part 5 – Aviation; Alcohol and Drugs	V1 - 10/7/2003

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3. Organisation

The London Fire Commissioner is the statutory fire and rescue service for London. The below diagram depicts the hierarchical structure of London Fire Commissioner's (London Fire Brigade) detailing specific roles associated with UAS operations. The roles and responsibilities of personnel employed during operations are also included which defines the requirement of these roles. Not every deployment will require the complete spectrum of personnel and a single individual may assume a number of different roles dependent on circumstance.

3.1 Nominated personnel and management lines for UAS operations



3.2 Responsibility and duties of the persons in charge of the UA

Accountable Manager

The accountable manager has the overall responsibility for London Fire Commissioner's UAS capability. They will provide the necessary resources so that all operations and maintenance can be conducted towards meeting London Fire Commissioner's obligations, goals and objectives.

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Primary Remote Pilot

The Primary Remote Pilot is responsible for all Remote Pilot training and operational matters affecting the safety of the OA holder's operation. The role and responsibilities of the Primary Remote Pilot are:

- a) Ensuring that London Fire Commissioner's air operations are conducted in compliance with the operations manual and CAA's regulations.
- b) Maintaining a record of qualifications held by each Remote Pilot (RP).
- c) Monitoring operational standards, supervising and training RP employed by London Fire Commissioner.
- d) Maintaining a complete and up-to-date reference library of operational documents as required by CAA for the class of operations conducted.
- e) Being the point of contact between the emergency service and CAA.
- f) Ensure that specialist equipment items are serviceable;
- g) Investigate all defects with the UAS.

Remote Pilot

Authorised Remote Pilots are detailed with Appendix 8 and must:

- a) Operate in strict compliance with the procedures contained within this document, the Operational Authorisation and direction of any ATC/ FIS;
- b) Obey the limitations contained UKPDRA01 unless operating under OR4 No.1233;
- c) Follow the guidance contained with CAP 722 unless operating under OR4 No.1233;
- d) Ensure the UA is in an airworthy condition to operate;
- e) Conduct operational planning and risk management in accordance with the procedures contained within this document;
- f) Ensure that they are fit to operate.

Technical Manager

The technical manager is responsible for the prompt and effective maintenance of all UAS and for ensuring that all maintenance is correctly certified. They shall also be responsible for ensuring that records of maintenance carried out are retained safely and securely. The technical manager is responsible for the implementation of a fault reporting system.

Camera Operator

Any individual who meets the qualification and training requirements may be a Cam-Op. The Cam-Op may operate any sensor installed or attached to the UA and assist the RP in maintaining control of the operating site; maintaining situational awareness for persons, vehicles, vessels and structures not under the control of the RP.

The Cam-Op is responsible for the following:

- a) Operate the sensor equipment;
- b) Liaise with the RP to allow the photo or video to be captured safely;

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- c) Providing additional visual contact with UA to ensure safe proximities are maintained from other aircraft and uninvolved persons.
- d) Inform the RP of any hazard approaching the area of operations;
- e) Adhere to the control measures contained within the operational planning and risk assessment

Unmanned Aircraft Observer

Any individual who meets the qualification and training requirements may be a UA observer. The UA observer takes the responsibility to maintain direct, unaided VLOS with the aircraft, sufficient to avoid collisions so the RP can focus on the iOSD to frame shots. The responsibility to ensure the safety of the flight remains with the RP at all times.

The UA Observer is responsible for the following:

- a) Maintain direct unaided visual contact with the aircraft sufficient to monitor the flight path in relation to other aircraft and uninvolved persons to avoid collisions;
- b) Stand directly adjacent to the RP while performing their duties;
- c) Alert the RP to the position of the aircraft in relation to any other aircraft and uninvolved persons.
- d) Alert the RP in the event of an emergency;
- e) Ensure that they are fit to participate in operations.

3.3 Areas of operation

In line with the regulations and the CAA OA, the UAS will be used to deliver a range of services to support the London Fire Commissioner at a large variety of incidents.

The operations may take place anywhere in the UK in the following environments:

- Over land
- Over water
- Rural
- Semi-rural
- Urban

The operations may take place in some challenging scenarios. The majority of these operations will be taking place within a controlled cordon managed by London Fire Commissioner or other emergency services.

Operations may take place during either daylight hours or at night. Section 4.13 describes the additional control measure put in place for night flights.

If the flight is within Controlled Airspace (A, C, D or E), the controlling ATCU must be identified during operational planning. If the flight is within a Flight Restriction Zone of a protected aerodrome, permission must be obtained from ATC or FIS in advance.

All UAS operations conducted in UK airspace will be assessed in advance using comprehensive site risk assessment forms and procedures, see Appendix 3.

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3.4 Types of operation

All UAS operations will be conducted in accordance with the conditions and limitations placed on the OA - Appendix 1 and the Emergency Services Exemption ORS4 No.1233 (General Exemption E4506) - Appendix 2.

All personnel must comply with established policies and procedures unless they have urgent and compelling reasons to depart from them. A degree of flexibility is essential in UAS operations, however, personnel have discretion to use non-standard practices to meet unexpected or unusual circumstances in the interests of safety.

The UAS will be used to deliver a range of services to support the emergency services at a large variety of incidents. This may include, but is not limited to:

Exempt under s24 of for FOI act - national security
<https://www.legislation.gov.uk/ukpga/2000/36/section/24>



The UAS capability will greatly improve the situational awareness and decision making of operational and tactical commanders, as well as reducing risks to the public and other responders.

3.5 Supervision of UAS operations

London Fire Commissioner recognises the importance of effective safety management to ensure that customers, staff, and all others affected by London Fire Commissioner's activities are not exposed to unacceptable risks. The London Fire Commissioner's aim is to minimise risks in all its activities to a level that is as low as reasonably practicable.

Safety is a core value integrated into every activity carried out by the London Fire Commissioner and we are committed to continually develop and improve it's safety processes. We have an effective health and safety reporting system. As long as individuals have not deliberately violated procedures, acted recklessly or out of keeping with their responsibilities, reporting of events will not result in discipline procedures. The sole objective is to learn from the event to enhance safety.

Incidents, which do not involve people or property, will be reported to the operations manager for investigation. For all other safety events they will be reported via the London Fire Commissioner's own Safety Event Recording Database (SERD).

London Fire Commissioner's health and safety department, in liaison with the operations manager, will be responsible for collating reports, reviewing them to see if any further action is required to enhance safety (changes of procedures, additional training etc.) and deciding whether it should be forwarded to the CAA under the MOR scheme (see CAP 382). An occurrence means any safety-related event which endangers, or which if not corrected or addressed, could endanger an aircraft, its occupants or any other person. The incident

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reporting scheme (ECCAIRS2) can be found on the following link:

<https://e2.aviationreporting.eu/reporting>

We will also submit an AIRPROX report if the criteria for reporting are met via the UK AIRPROX Board website: <https://www.airproxboard.org.uk/home/> and notify the local ATC (if applicable).

The AAIB must be informed of any accident or serious incident via their 24h reporting hotline, Tel: 01252512299.

It must be remembered that the Remote Pilot is responsible for the safe operation of the UAS whilst in flight.

3.6 Accident prevention and flight safety programme

A pre flight check and risk assessment (known as the "RED") must be performed and completed, by the qualified pilot or camera operator, prior to conducting any task (a single task may consist of a number of flights).

The risk assessment would normally be performed during the feasibility planning phase to determine if the flight is viable and validated prior to the first flight. This is when assumptions made during the initial risk assessment (such as weather/wind forecast, location of persons etc.) are validated.

As a minimum the flight risk assessment must consider the following:

- Having access to the necessary maps (either hard copy or electronic) for the area
- Determining the weather is suitable for the aircraft and the operation
- NOTAM
- Possibility of person moving into the area of operation or landing area during flight
- Suitable take-off and landing areas (including alternate landing area)
- Ability to maintain 30 m separation from the uninvolved persons during take-off and landing
- Ability to maintain 50 m separation from the uninvolved persons whilst in-flight
- Obstructions (buildings trees etc.)
- Possible radio interference (power lines, antenna etc.)
- Ability to maintain visual line of sight
- RP s ability matches location/task
- Permission from land owner
- Privacy
- Local restrictions, byelaws
- Need for signage

If hazards are identified a risk matrix (severity and frequency/probability) will then define the hazard as either acceptable, need to review or unacceptable.

The risk assessment form will record hazards that require further mitigation and what those mitigations are. Actions that are required on site will be recorded.

These should be included in the pre-flight preparations. Appendix 3 shows an example of the pre flight check and risk assessment form.

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Note: Although a recorded risk assessment would be ideal at all deployments, it must be born in mind the urgency of the required task. The risk assessment will always be undertaken, but may need to be recorded contemporaneously.

3.7 Flight team composition

For normal operations the flight team will always compose of a minimum of two qualified RP. One will operate as the RP; the other will act as the camera operator or UA observer. The system has two Command Units, master and slave. The slave is designated as the camera CU and the master as the flight controller.

This will be adhered to at all times unless when operational urgency deems that the UAS is required before the arrival of the second RP. In this instance a member of LFB staff will be obtained to act as Unmanned Aircraft Observer, this person will need to be fully briefed before commencing.

In case of incapacitation of the RP, the camera operator/ UA observer should have the ability to invoke the failsafe return to home system on the Command Unit or take over as the RP and safely land the aircraft.

The RP has ultimate authority and responsibility.

For hand launch/recovery (HTOL) of the system a minimum of two qualified RP (qualification must have included demonstration of competence in hand launch/recovery).

3.8 Operation of multiple types of UA

Currently, within London Fire Commissioner, there are two types of UA (see Appendix 6 & 7). If other models of UA are procured then RP may operate all UAS for which they are appropriately qualified. A single RP may not operate more than one UA at the same time.

3.9 Qualification requirements

In order to operate as a Remote Pilot, the individual must have the following:

- a) An NQE Approved Certificate of Competence in Remote Pilot Theoretical Knowledge/ General Airmanship Syllabus and an NQE Approved Certificate of Practical Flight Assessment for the weight class and type of aircraft or;
- b) An RAE Approved General Visual Line of Sight Certificate;
- c) Remote Pilot Logbook with evidence of a minimum flight time of two hours within the last three months. A RP logbook sample is provided as an appendix to this document however, other methods of recording are also accepted;
- d) Be approved to operate under the OA by the Accountable Manager and appear in Appendix 8.
- e) Completed in-house training, assessment and refresher training. See 4.1 Role training and currency.

3.10 Crew health

Within London Fire Commissioner, regular health checks and medicals are undertaken.

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It is the responsibility of the individual to determine if they are in a physically and mentally fit condition to operate as part of the flight crew on the day. They shall not undertake flight operations when unfit due to injury, fatigue, medication, sickness or other similar causes.

The London Fire Commissioner has a strict alcohol and drugs policy.

All flight crew members taking prescription drugs should seek professional guidance with regards to any contraindications. Any flight crew members who feel unable to continue with their assigned responsibilities should immediately advise the Accountable Manager or Primary Remote Pilot.

Remote Pilots are limited to a maximum of 6 hours of flight time in any twenty-four hour period. Notwithstanding this, the Remote Pilot must have self-awareness and ensure that any operations can be completed whilst physically and mentally fit to do so.

3.11 Logs and records

The Accountable Manager is responsible for maintaining records of each flight made under the Operational Authorisation and ensures that operational documentation and training records are securely filed in accordance with data management legislation and LFB data retention policy for a minimum of 3 years.

The following documents must be available to the Civil Aviation Authority upon request for audit purposes:

- a) TechLog/Equipment fault record – Appendix 5
- b) All flight data is stored on an internal storage device on the aircraft – accessed via the DJI Pilot app.
- c) Online pilot logbook – Appendix 4 (individual RP's are responsible for their own logbook).

3.12 Insurance

A copy of the insurance certificate can be found in Appendix 9.

3.13 Details of the operator training programme

All RP will hold a suitable qualification, acceptable to the CAA. A list of all qualified pilots can be found in Appendix 8.

In the London Fire Commissioner, regular medicals are undertaken (including eyesight), so there will be no specific requirement of a medical.

All RP must average a minimum of 20 minutes flying time per week during any three month period. This is to be logged within their pilot flight log. The Primary Remote Pilot is responsible for inducting and recording training of all UAS. They should ensure that each RP is familiar with this Operations Manual before they operate any UAS.

An annual assessment, which should be recorded in the pilot flight log, should be made of all RP to include:

Functionality and start-up of systems

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- Description of all common components
- Handling of system
- Handling of rechargeable batteries
- Description and inspection of machine and all of its related parts
- Construction and deconstruction of the system
- Use of software to include all aspects of updating
- Flight controls and associated flight theory
- Maintenance and inspection training
- Problem solving, fault analysis
- Pre and post flight related matters
- Safety and risk management

Flight exercises

- Theory of flight
- Aircraft physical influences
- Downwash and ground effect
- Take-off and landing
- Practical flight exercises
- Pre and post flight
- Safety and risk management
- Land

If there is a major change to: equipment, procedures or policy; a training event should be arranged to ensure that all pilots are aware of the changes.

It is a requirement that all RP provide an up to date logbook, to the Primary Remote Pilot, on request.

3.14 Accident/incident and investigation policy

Any accident or near miss will be reported to the Accountable Manager who will consider reporting the event to the Civil Aviation Authority and the Air Accident Investigation Branch, if deemed appropriate and necessary.

However, the RP of the system at the time of the incident also has a responsibility to report certain occurrences under the CAA's Mandatory Occurrence Reporting Scheme. LFB personnel must report any occurrences related to UA operations which are considered to have endangered or might have endangered, any aircraft (including the subject unmanned aircraft) or any person or property via the ECCAIRS2 portal: e2.aviationreporting.eu

These could be:

- Loss of control/data link — where that loss resulted in an event that was potentially prejudicial to the safety of other airspace users or third parties.
- Navigation failures.
- Pilot station configuration changes/errors (e.g. display failures).
- Structural damage/heavy landings.
- Flight programming errors.
- Any incident that injures a third party.

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For more information on incident/accident reporting procedures see:

- CAP 722 - Unmanned Aircraft System Operations in UK Airspace — Guidance, Section 3, Chapter 9
- CAP 382 - The Mandatory Occurrence Reporting Scheme

LFB personnel must file an AIRPROX report if the criteria for reporting are met via the UK AIRPROX Board website: <http://www.airproxboard.org.uk> and notify the local ATC (if applicable).

The AAIB must be informed of any accident or serious incident via their 24h reporting hotline, Tel: 01252512299.

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4. Operations

4.1 Role training and currency

All RP will hold a suitable qualification, acceptable to the CAA. A list of all qualified pilots can be found in Appendix 8.

Within the London Fire Commissioner, regular medicals are undertaken (including eyesight), so there will be no specific requirement of a medical.

All RP must average a minimum of 20 minutes flying time per week during any three month period. This is to be logged within their pilot flight log.

The Primary Remote Pilot is responsible for inducting and recording training of all RP. They should ensure that each RP is familiar with this operations manual before they operate.

An annual assessment, which should be recorded in the pilot flight log, should be made of all RP to include:

Functionality and start-up of systems

- Description of all common components
- Handling of system
- Handling of rechargeable batteries
- Description and inspection of machine and all of its related parts
- Construction and deconstruction of the system
- Use of software to include all aspects of updating
- Flight controls and associated flight theory
- Maintenance and inspection training
- Problem solving, fault analysis
- Pre and post flight related matters
- Safety and risk management

Flight Exercises

- Theory flight
- Aircraft physical influences
- Downwash and ground effect
- Take-off and landing
- Practical flight exercises
- Pre and post flight
- Safety
- Land

If there is a major change to: equipment, procedures or policy; a training event should be arranged to ensure that all pilots are aware of the changes.

It is a requirement that all RP provide an up to date logbook, to the Accountable Manager/ Primary Remote Pilot, on request.

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4.2 Operating limitations and conditions

All operations by London Fire Commissioner must be conducted in accordance with the procedures contained within this document, the OA and UKPDRA01. CAP 722 also contains relevant guidance which the Remote Pilot must adhere to. A copy of the OA, whether in physical or digital form must accompany the Remote Pilot on every operation.

All Flights must be:

- a) Completed during the Day, unless following the requirements in Section 3.10 Night Operations;
- b) Within VLOS of the RP or UA observer;
- c) To a height of no more than 400ft (120m) from the surface (unless operating with 50m horizontal distance from and no higher than 15m above an obstacle which exceeds 105m in height and with permissions from the organisation responsible for the obstacle).
- d) Within 500m of the RP;
- e) Within the operational envelope of the aircraft.

The aircraft must not be flown within the separation distances in the following table (these mandatory separations are specified in UKPDRA01 and OA issued to London Fire Commissioner)

Assemblies of People	Within 50m horizontally
Any uninvolved person during take-off and landing	Within 30m
Any uninvolved person while in flight	Within 50m

The aircraft must not be flown in the airspace defined as the Flight Restriction Zone of a protected aerodrome unless permission has been obtained from the ATC or FIS.

Notwithstanding the above, the RP is at all times responsible for ensuring that any flight may be safely completed. If the RP believes that the conditions/circumstances are not conducive to a safe flight then their decision not to fly will be relayed to the operation/ tactical commander for the incident.

Application of the Emergency Services Exemption

The Emergency Services exemption was introduced by the CAA as a means for the emergency services to operate UAS in a manner which would usually be restricted under standard operating limitations. Such exemption only applies to short term reactive situations aimed at preventing the immediate risk to human life, or during a major incident, where the observance of the restrictions referred to in UKPDRA01 would be likely to hinder this objective.

The exemption is not intended to be used for pre-planned or routine UAS operations, therefore should there be the requirement to utilise such exemption during these operations.

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As outlined within the exemption document, authorisation is required from the On-Scene Commander to operate the UA at a distance beyond 1000 metres of the Command Unit or from the Tactical Commander to operate at a distance beyond 2000 metres of the CU. However, for all operations by London Fire Commissioner using such exemption, the Duty Inspector will be considered as the Tactical Commander who has Command and Control (C2) over all assets and is therefore best placed to provide authorisation. The On-Scene Commander may still provide authorisation for use of such exemption, however this should only be to a maximum distance of 1000 metres beyond the CU. The Tactical Commander has the authority to override the decision of the On-Scene Commander and withdraw the authorisation to use such exemption should they deem it necessary.

When considering the use of such exemption, the Tactical Commander and On-Scene Commander should consider the following:

- a) Weather conditions. (Wind speed (constant and gusting), temperature, precipitation and visibility)
- b) Airspace and/or proximity to aerodromes.
- c) The potential for other manned aircraft to be operating in the same area.
- d) Proximity to areas that would be particularly vulnerable if the UA were to be lost (major/busy roads, railways, large gatherings of people etc).
- e) Endurance of the aircraft (ie. how long it is able to keep flying).
- f) The quality of the control link.
- g) Operations beyond a distance of 3000 metres from the remote pilot should only be considered in extreme circumstances.

The authorisation to operate the UA under the provision of the Emergency Services exemption should be recorded in the incident log and on any subsequent operational documentation held by the RP. This may be requested for production to the CAA on request.

Once authorisation has been obtained, the RP must as a minimum obtain the following information prior to operating the aircraft. In most cases, this information will be gathered by Fire Control and disseminated to the RP and other relevant members of the flight crew via the Personal Data Device (PDD) whilst they transit to the incident, however it is the responsibility of the RP to interpret this information accordingly.

The RP must consider:

- a) Weather conditions must be within the Operational Envelope of the Aircraft
- b) NOTAM must be checked using an approved platform such as NATS AIS
- c) Airspace restrictions
- d) Liaison with the Local ATC when operating in controlled airspace and the issuing of a NOTAM

Once authorisation for use of the Emergency Service Exemption has been obtained, the RP must abide by the limitations described below and must apply sound judgement to the necessity to operate at reduced and extended operating distances.

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The RP must consider public perception and alarm/ distress caused by the reduction in operating distances there should be used only for as long as deemed necessary for the specific operation.

The RP remains responsible for the safe operation of the aircraft throughout such operations and must apply sound judgement to the necessity to operate the aircraft such distances. The same logic is applied to that of use of pursuit authorisation in that whilst authorisation may be issued, the responsibility for applying judgement on the given situation rests with the RP.

4.3 Methods to determine the intended tasks and feasibility

When a request for the capability comes from an on-scene commander or from another agency (via Fire Control), information relating to request should be obtained to allow task definition to commence and an initial assessment of feasibility to be made. Some of the details that should be captured include:

- Address of incident,
- RVP,
- Incident type,
- Work expectations,
- Commanders name and contact point/details,
- Location of flight (if different to incident address),
- Type of environment,
- Any other air users,
- Day/night flight,
- Any other relevant information.

From the information provided, the operator can carry out an initial assessment of the feasibility of the planned operation. All operational information will be kept for a minimum of three years.

4.4 Operating site planning and assessment.

The RP and camera operator should carry out a site location and assessment pre-flight check and risk assessment (the 'RED') – Appendix 3. Potential hazards/restrictions to identify might include:

- Type of airspace –controlled/ATZ?
- Other aircraft operations
- Hazards associated with industrial sites or such activities as live firing, gas venting, high intensity radio transmissions etc.
- Local byelaws
- Obstructions (wires, masts, buildings etc.)
- Extraordinary restrictions such as segregated airspace around prisons, nuclear establishments etc. (suitable permission may be needed)
- Residential and recreational activities
- Public access
- Landowner permission
- Likely operating site and alternate sites

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- Weather conditions required for the planned event

Sources of information may include:

- Drone Assist app
- www.notaminfo.com - mapped NOTAMs, flying sites etc.
- Google Earth and Google Maps
- Met Office or other weather apps (UAV forecast app).

4.5 Communications

Multiple communication methods will be available to the crew at operations. This includes handheld digital/UHF back to back radios, mobile phones (qualified pilots mobile phone numbers can be found in Appendix 8) and Airwave radio.

Airwave radio can be used for single agency/multiagency communications, but can also be used to contact each organisations control rooms. Appendix 3 will show a list of useful numbers needed in day to day operations. An agreed communications plan will be formed for each incident and will be included in a pre-deployment brief.

When flying Beyond Visual Line of Sight (BVLOS) within the emergency services exemption, it must be done with a member of the flight crew acting as a spotter, this spotter should be within VLOS of the UA and remain in radio communication with the pilot.

See Appendix 8 for full contacts sheet.

4.6 Pre-notification

If the flight is within Controlled Airspace (A, C, D or E), the controlling ATCU must be identified during operational planning. If the flight is within a Flight Restriction Zone of a protected aerodrome or protected space site, permission must be obtained from ATC, FIS or the operator of the protected space site, in advance. In some circumstances, a 28 working day lead time is in effect and therefore, an application should be considered as early as practicable. Close liaison with the ATC will take place for the duration of the incident, ensuring that all ATC requirements and restrictions are applied to any operation.

As part of the "RED", National Police Air Service (NPAS) and Helicopter Emergency Medical Service (HEMS) will need to be informed of all UA activity and logged. They will also be informed of when operations will cease.

4.7 Site permissions

As the vast majority of flights will be taking place within an emergency services controlled cordon, the need to seek site permissions is negated. However, prior to any training flights on private land, permissions will be sought from the appropriate landowner/responsible person. Permissions should be in writing (physical or electronic) and stored.

4.8 Weather

The key weather limitations for each UA can be found in the relevant flight reference card.

Weather information can be sought in a number of different means. Many internet sites and apps are available (BBC weather, met office forecasts and surface pressure charts,

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raintoday.co.uk, meteoradar app, AeroWeather app). Each emergency service control room will also be able to supply weather information (via FireMet, ChemMet etc..).

Note: METeorological Aerodrome Reports (METAR) weather checks should be used when operating near an aerodrome as these provide a more accurate weather report.

4.9 On site procedures

All on site procedures are detailed in the flight reference cards – See Appendix 6, 7 & 10

4.10 Surveillance & privacy provisions

The Information Commissioner's Office (ICO) has produced a code of practice in relation to the legal framework and best working practice for surveillance cameras, including UAS.

A Privacy Impact Assessment (PIA) has been carried out as part of this capability, the main parts of the PIA is set out below:

The project aims to deliver a UAS, flown by trained pilots, to an incident ground and give the command team live aerial footage of the incident. The types of incidents the UAS may attend include incidents of 6 pumps or more, water rescue, Line rescue, building collapse or any incident deemed appropriate by the OIC.

The footage from the UA may be 'live' or recorded for further scrutiny.

The advantages of having the UA include giving the OIC a full 360 degree aerial overview of the incident and may allow a close up view of the incident negating the need to commit firefighters into the risk area therefore increasing firefighter safety. Recorded footage may be used after the incident as part of the debrief process to identify areas of development or best practice.

UAS technology is new and innovative and has been developed by numerous fire rescue services.

Any footage taken by the UAS can be viewed by 'live' feed and can be recorded by either the tablet device or memory card. These recording devices should only be available to either the pilot or support officer. If footage is no longer required then it can be removed / deleted from the devices by the flying staff.

If footage is required for future use or by another organisation e.g. police, then this would be requested as per London Fire Commissioner information policy. The memory card would have to be sent to the brigade library and they would record the required information and forward to the requesting person, if the request was accepted.

4.11 Deconfliction

In scenarios where there may be multiple aircraft (including manned and unmanned) at an incident, potentially sharing the same airspace, a deconfliction plan needs to be considered. Initially this will include:

- Making contact with NPAS and HEMS prior to any flight (contact details found on pre-flight check and risk assessment). The pilot should provide the following information:

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- Postcode of incident location
 - Height you will be operating up to
 - Timings
 - Contact number for RP or camera operator
-
- A Reference number will be provided and should be recorded on the risk assessment.
 - After finishing all flights, NPAS and HEMS should be informed so that they can close the log.
 - Contacting other agencies as appropriate.

4.12 Preparation and serviceability of UAS

A daily check should be made to ensure that all batteries are charged and ready for use. Including:

- DJI intelligent flight batteries (refer to user manual and safety guide)
- Transmitters
- Tablet devices

Check TechLog (Appendix 5) to confirm the UAS is in serviceable condition. A visual inspection should be undertaken. This should include:

- Inspect the airframe for any damage, unusual marks and tightness of fixings.
- Inspect the motor mountings for correct tension.
- Inspect propellers for condition, unusual marks, chips and cracks.
- Inspect electrical wiring for condition, unusual marks or discolouration.
- Inspect electrical terminal fittings and plugs for secure attachment and general condition.
- Inspect attachment of all fittings such as flight controller, Global Positioning System (GPS) antennae etc. for secure attachment
- Inspect camera attachment point for condition and security of payload.
- Inspect condition and function of all ancillary equipment such as transmitter, ground station etc.
- Test all system battery packs for charge status and general condition.
- Check memory cards.

All equipment should be securely packed away in its case, an inventory of equipment is found on the inventory sheet within the case

4.13 Night operations

Daylight hours are defined as "The hours between the end of morning civil twilight and the beginning of evening civil twilight." The London Fire Commissioner's Operational Authorisation allows for its pilots to operate within the hours of darkness, this however relies on the RP having been assessed as competent to carry out night flights.

In hours of darkness, it is preference for flight to be made vertically (rather than horizontal movement of the system). The pilot needs to justify any horizontal movement and the appropriate risk assessment is to be captured on the London Fire Commissioner risk

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assessment 'RED' (Appendix 3). During night time flying the UA will only be flown in direct unaided line of sight.

The RP must satisfy themselves prior to night flights that the take off/ landing site is suitably illuminated for the take off/ landing to be carried out safely. This will be achieved by using Dragon Lamps to illuminate the landing area. Night flights should only be carried out following a site safety assessment to identify any obstacles or flight paths, this will be achieved by using Dragon Lamps to carry out a full survey of the site.

Both Aircraft are equipped with LED air navigation lights. Additional LED lighting can be fitted to the aircraft if required. In the event of navigation lights failing in flight the RP will engage the RTH function.

Wherever possible a day light survey should be taken of the area where night operations are required. Any obstacles that may not be obvious in low light should be documented with grid reference and height. These obstacles can then be accounted for in pre-flight planning prior to the operation of the system.

4.14 Emergency procedures

Both aircraft have a Return to Home function (RTH). The RTH function brings the aircraft back to the last recorded home point (the location from which the aircraft takes off or a dynamic home point – current position). There are three cases that trigger RTH procedure: Smart RTH, Low Battery RTH and Failsafe RTH.

Smart RTH – Using the RTH button, on the remote controller or within the DJI Pilot App, when GPS is available to enable smart RTH. The UA will return to the latest recorded home point, you may control the aircraft's orientation to avoid collision during the smart RTH. This functionality could be used to safely land the aircraft if the RP becomes incapacitated during operations or there is a loss of visual reference.

Low Battery RTH – The low battery level failsafe is triggered when the battery is depleted to a point that may affect the safe return of the UA. Pilots should have planned prior to this happening. Pilots are informed of the battery condition throughout the flight by the camera operator and are advised when to return home safely.

Failsafe RTH – This is activated automatically if remote controller signal (including video relay signal) is lost for more than 3 seconds (providing that a home point has been successfully recorded and the compass is working normally).

NOTE – All RTH methods use a pre-set RTH altitude. If RTH is triggered the UA will ascend to this altitude before returning to the home point (unless within 20 m of the RTH point). It is important that users set an appropriate RTH altitude before each flight (as per pre-flight checks).

GPS failure – The aircraft will warn users if GPS fails. All RP 's are trained to fly the aircraft without GPS assistance Attitude (ATTI) mode.

Malfunctions – At any sign of malfunction, or an unexpected loss of aircraft parts, land as soon as it is safe to do so.

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Designate landing area not clear – Never assume the landing area is clear. Always look and be prepared to land in a safe place away from the planned landing area if necessary. In all cases the safety of third parties is paramount.

Aircraft Incursion – Actions in the event of converging aircraft. The responsibility to avoid aerial collisions rests with the RP. The camera operator should be acting as look out for the RP. Therefore, if another aircraft is seen to be on a converging heading the RP must take action to avoid the collision and, if there is any doubt, land the aircraft.

As most of our operations are going to be carried out within London, we will adopt the HEMS model to offer full redundancy and operate with 2 qualified pilots, one as RP and one as camera operator.

Remote Pilot Incapacitation			
Sign/ Symptom	RP Action	Flight Crew Action	Reporting
RP feels unwell, losing consciousness or is unconscious	Warn flight crew Clear TOLS Activate RTH Monitor UA Shutdown UAS	Clear TOLS Activate RTH Monitor UA Shutdown UAS Administer first-aid	Request ambulance AAIB ECCAIRS Report
Mitigations			
<ol style="list-style-type: none"> 1. Remote Pilot/ Flight Crew Fitness declaration 2. RTH Familiarisation/ Demonstration 			

Loss of Command & Control Link			
Sign/ Symptom	RP Action	Flight Crew Action	Reporting
Loss of video link	Check antenna position	Monitor UA	ATC
Loss of UA Control	Move closer to UA	Clear TOLS	AAIB
Loss of CU lights/ power	Restart CU Power CU from alternative power source Follow FLYAWAY procedure if the aircraft does not RTH		ECCAIRS Report

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Mitigations
<ol style="list-style-type: none"> 1. Operational planning/ risk assessment 2. Site survey 3. UA Assembly 4. UA Functional checks

Public Encroachment/ Uninvolved Person(s)			
Sign/ Symptom	RP Action	Flight Crew Action	Reporting
Uninvolved person(s) observed entering operating site	Increase separation distance Select TOLS Follow landing procedure	Inform RP Intercept encroaching person(s) Request they hold position until the UA has landed	Nil
Mitigations			
<ol style="list-style-type: none"> 1. Operational planning/ risk assessment 2. Site survey 3. Cordon erection 4. Flight Crew personnel 5. Situation awareness 			

Aircraft Encroachment			
Sign/ Symptom	RP Action	Flight Crew Action	Reporting
(Un)Manned Aircraft observed entering operating site	Manoeuvre UA away from aircraft If head-on collision imminent, turn RIGHT Follow landing procedure	Inform RP Clear TOLS	ATC UK Airprox Board
Mitigations			
<ol style="list-style-type: none"> 1. Operational planning/ risk assessment 2. Site survey 3. Flight Crew personnel 4. Situation awareness 			

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Loss of Control			
Sign/ Symptom	RP Action	Flight Crew Action	Reporting
UA behaving erratically or visually unstable Uncommanded movement	Toggle flight mode Activate RTH If no control: Restart CU If no control: Motor stop If no control: Follow FLYWAY procedure	Clear operating site Monitor UA	ATC AAIB ECCAIRS Report
Mitigations			
<ol style="list-style-type: none"> Operational planning/ risk assessment Site survey UA Assembly UA Functional checks 			

Loss of GNSS			
Sign/ Symptom	RP Action	Flight Crew Action	Reporting
UA lights iOSD warning UA drift	Inform flight crew Orientate UA Control UA Toggle flight mode Select TOLS Follow landing procedure	Clear operating site Monitor UA	Nil
Mitigations			
<ol style="list-style-type: none"> Operational planning/ risk assessment Site survey UA Assembly UA Functional checks 			

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UA Fire			
Sign/ Symptom	RP Action	Flight Crew Action	Reporting
Smoke/ flames visible from UA	Inform flight crew	Inform RP	Fire Service
	Identify suitable LS	Clear operating site	AAIB
	Descent	Monitor UA	ECCAIRS Report
	Follow landing procedure	Prepare safety equipment	
	Contain/ extinguish (if safe to do so)	Contain/ extinguish (if safe to do so)	
Mitigations			
<ol style="list-style-type: none"> 1. Operational planning/ risk assessment 2. Site survey 3. Flight Crew Briefing 4. Battery Maintenance 5. UA Assembly 6. UA Functional checks 			

CU Fire			
Sign/ Symptom	RP Action	Flight Crew Action	Reporting
Smoke/ flames visible from CU CU become hot to touch	Inform flight crew	Clear operating site	Fire Service
	Activate RTH	Monitor UA	AAIB
	Power off CU	Prepare safety equipment	ECCAIRS Report
	Place on ground away from TOLS and equipment	Contain/ extinguish (if safe to do so)	
	Monitor UA		
	Contain/ extinguish (if safe to do so)		
Mitigations			
<ol style="list-style-type: none"> 1. Operational planning/ risk assessment 2. Site survey 3. Flight Crew Briefing 4. CU Maintenance 5. UA Assembly 6. UA Functional checks 			

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Flyaway			
Sign/ Symptom	RP Action	Flight Crew Action	Reporting
UA not responding to input and departing operating site	Inform flight crew Record <ul style="list-style-type: none"> • Speed • Direction • Height • Battery % Contact Police	Monitor UA Record <ul style="list-style-type: none"> • Speed • Direction • Height • Battery % 	ATC Police (Via 999) AAIB ECCAIRS Report
Mitigations			
<ol style="list-style-type: none"> 1. Operational planning/ risk assessment 2. Site survey 3. Flight Crew Briefing 4. UA Maintenance 5. UA Assembly 6. UA Functional checks 			

Loss of Lights (Night Operation)			
Sign/ Symptom	RP Action	Flight Crew Action	Reporting
Loss of Lights and VLOS	Inform flight crew Activate RTH Clear TOLS Monitor iOSD Following procedure landing	Clear TOLS Illuminate sky Monitor airspace	ECCAIRS Report
Mitigations			
<ol style="list-style-type: none"> 1. Operational planning/ risk assessment 2. Site survey 3. Flight Crew Briefing 4. UA Maintenance 5. UA Assembly 6. UA Functional checks 			

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Appendix 1 – Copy of Operational Authorisation

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Appendix 2 – Emergency Services Exemption

Official Record Series 4

United Kingdom
Civil Aviation Authority



Miscellaneous

No: 1233

Air Navigation Order 2016

Publication date: 31 July 2017

General Exemption E 4506

Small Unmanned Aircraft - Emergency Services Operations

- 1) The Civil Aviation Authority, in exercise of its powers under article 266 of the Air Navigation Order 2016 ('the Order'), exempts any member of the United Kingdom Emergency Services acting as the person in charge of a small unmanned aircraft¹ in support of a United Kingdom Police Force, from the requirements at articles 94(3), and 95 of the Order (see Note 1), subject to the conditions in paragraphs 2 to 4 below.
- 2) This exemption only applies to short term reactive situations aimed at preventing the immediate risk to human life, or during a major incident (see Note 2), where the observance of the restrictions in articles 94(3) and 95 of the Order would be likely to hinder this objective (see Note 3).
- 3) When employing this exemption the small unmanned aircraft must not be flown:
 - (a) other than by a remote pilot flying in accordance with a valid operational authorisation (permission or exemption) issued to a United Kingdom Police, Fire or Ambulance Service, as amended by this exemption;
 - (b) unless the decision to proceed has been made with reference to the Joint Decision Model (JDM) as prescribed under the Joint Emergency Services Interoperability Principles;
 - (c) at a height exceeding 400 feet above the surface, or 100 feet above the highest obstacle in the vicinity of the small unmanned aircraft if this is higher;
 - (d) at a distance from the remote pilot station which exceeds the maximum control range of the aircraft, as stated in the operating manual of the emergency service under whose authority the person in charge is operating the aircraft;
 - (e) beyond a distance of 1000 metres from the remote pilot station without the explicit approval of the On-Scene Incident Commander (see Note 4);
 - (f) beyond a distance of 2000 metres from the remote pilot without the explicit approval of the Tactical Commander assigned to the incident (see Note 4).
- 4) Details on the execution of this exemption, and the individual procedures and training requirements, including the risk management process that will enable a reduction of separation distances, must be incorporated into the relevant operator's operations manual. This exemption may also be applied during training scenarios, provided that they cover the situations listed in paragraph 2 and they are being conducted within a controlled training environment.

¹ "Small unmanned aircraft" means any unmanned aircraft, other than a balloon or a kite, having a mass of not more than 20kg without its fuel but including any articles or equipment installed in or attached to the aircraft at the commencement of its flight (ANO 2016)

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UK Civil Aviation Authority

Official Record Series 4, No. 1233

- 5) Details of all occasions where this exemption has been employed must specifically be logged by the operator. These details must be provided to the Civil Aviation Authority on request, or whenever the operational authorisation is renewed.
- 6) This exemption has effect from the date it is signed until varied, suspended or revoked.

P Kelleher

for the Civil Aviation Authority

31 July 2017

Notes:

- 1) Article 94(3) requires the person in charge of a small unmanned aircraft to ensure that direct unaided visual contact is maintained 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.

Article 95 prevents the flight of a small unmanned surveillance aircraft under certain circumstances (minimum distances from congested areas, organised open-air assemblies and persons, vessels, vehicles or structures) except in accordance with a permission issued by the CAA.
- 2) Within the Joint Emergency Services Interoperability Principles, a major incident is one which is beyond the scope of business-as-usual operations, and is likely to involve serious harm, damage, disruption or risk to human life or welfare, essential services, the environment or national security.
- 3) The intended purpose of this exemption is to allow a more flexible, but controlled, use of a small unmanned aircraft during an emergency operation where an increased risk to life becomes apparent at short notice (e.g. missing persons scenarios where it is clearly evident that swift action is required). It should be viewed in a similar fashion to that where Police, Fire or Ambulance vehicles are permitted to proceed through red traffic light signals, disregard 'keep left' signs, exceed speed limits etc. It is not intended to be used for longer term planned, or routine operations, where a more detailed permission or exemption would be required.
- 4) These requirements are made to introduce a series of 'check points' at which a positive decision is required before the flight is continued further. At each point, a full consideration of the aircraft's location, with respect to the potential risks in continuing further, is to be made and assessed against the overall benefits that may be achieved. Points to be considered may include, but are not limited to:
 - Weather conditions.
 - Airspace and/or proximity to aerodromes.
 - The potential for other manned aircraft to be operating in the same area.
 - Proximity to areas that would be particularly vulnerable if the small unmanned aircraft were to be lost (major/busy roads, railways, large gatherings of people etc).
 - Endurance of the aircraft (i.e. how long it is able to keep flying).
 - The quality of the control link.
 - Operations beyond a distance of 3000 metres from the remote pilot should only be considered in extreme circumstances.

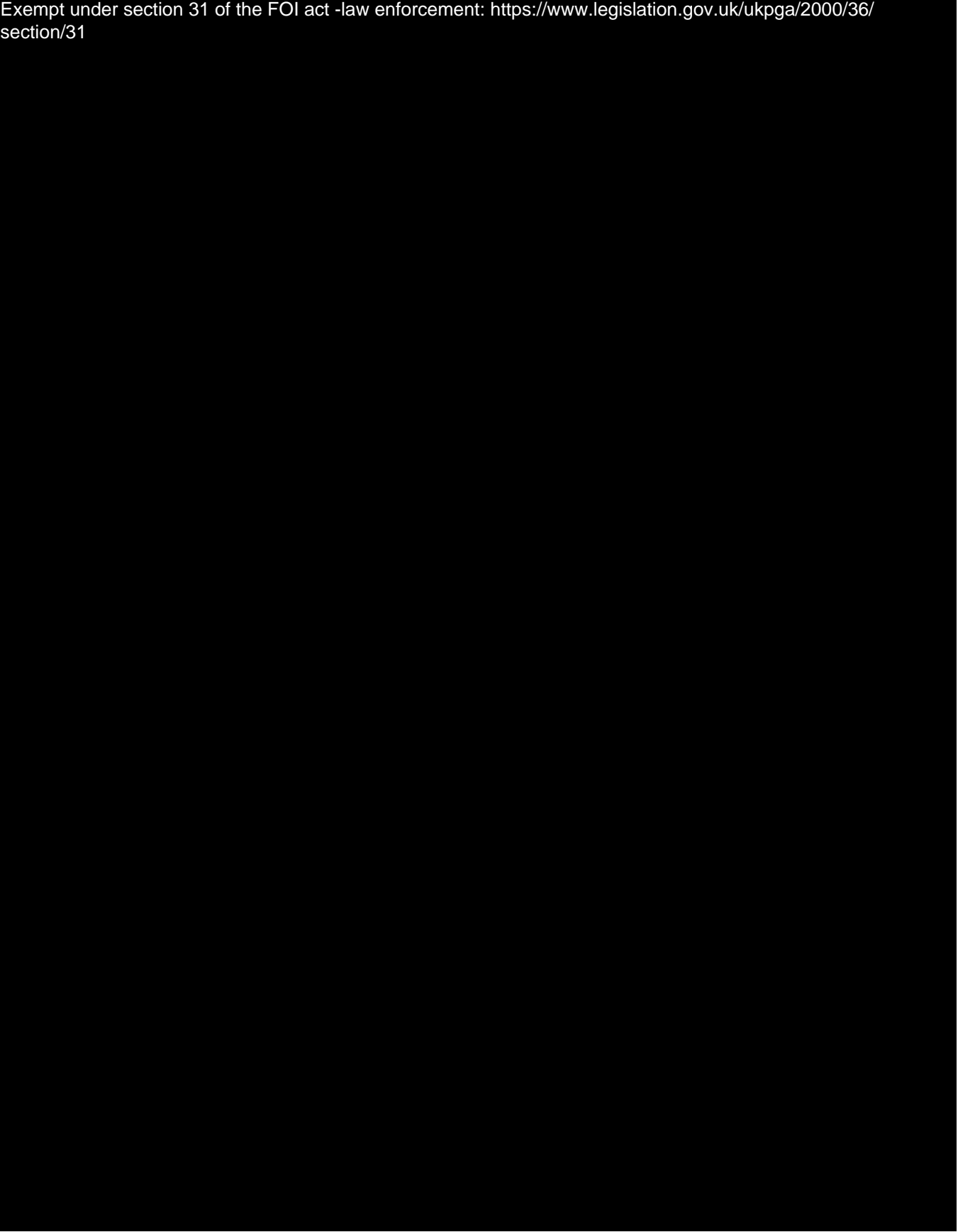
31 July 2017

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Appendix 3 – London Fire Commissioner UAS Risk Assessment (RED)

Exempt under section 31 of the FOI act -law enforcement: <https://www.legislation.gov.uk/ukpga/2000/36/section/31>



Critical Risks	16 – 25	HIGH	SEVERITY				
Significant Risks	8 – 15	MEDIUM	5	4	3	2	1
Minor Risks	1 – 6	LOW	Single or multiple fatalities	Major disabling injury	Injury resulting in 3 or more days off	Minor Injury	Accident or near miss with no harm arising
LIKELIHOOD	5 Very likely to occur	25	20	15	10	5	
	4 Probable	20	16	12	8	4	
	3 Possible	15	12	9	6	3	
	2 Remote	10	8	6	4	2	
	1 Improbable	5	4	3	2	1	

Primary Contacts			Secondary contacts	
Name	Contact	NOTES	Name	ATC
HEMS			Heathrow	
NPAS			Biggin Hill	
MPS Drone			City	
BTP		London Heliport		
Swanwick (NATS)		Elstree		
PaDP		Northolt		
RAF safety centre		Denham		
DPG Ranger	<div style="background-color: black; width: 100px; height: 15px;"></div>	<div style="background-color: black; width: 100px; height: 15px;"></div>	Catwick	
			Stansted	

VO	VLOS pilot or observer. < 500 m range. < 150 m and not overflying gatherings > 1000 persons. > 50 m from structures, vehicles, persons not under control (reduced to 30 m during take off & landing). Altitude < 400 ft. Range < 500 m.
ESE	Short term reactive situation and either, Major Incident declared or immediate threat to life.

Image Processing	
Images uploaded to Onedrive	
Once uploaded - Email link to [REDACTED] @london-fire.gov.uk	

London Fire Commissioner UAS Operations Manual

Appendix 4 – Pilot Flight Log

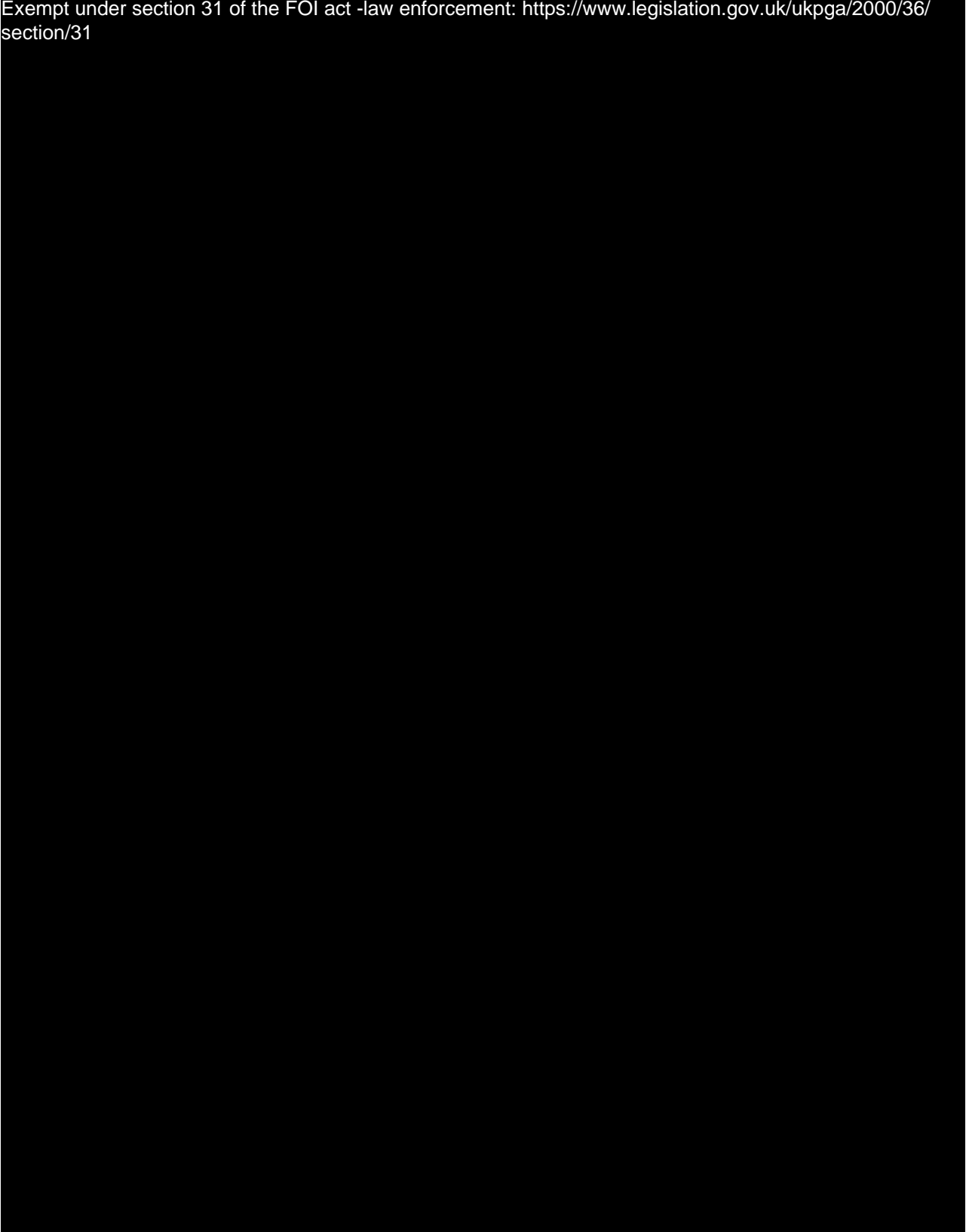
Pilot running totals. Rolling 3 month average. Current month and preceding two.		September 2018	October 2018	November 2018	December 2018	January 2019	F
		01:47	00:34	01:04	02:48	00:16	
		01:00	03:25	00:50	00:20	00:00	
		00:50	01:35	01:12	00:30	00:38	
		00:40	01:00	00:40	00:20	02:37	
		01:55	00:52	00:50	00:00	00:00	
		00:40	03:45	02:05	00:40	01:40	
				04:20	01:57	01:18	
				05:00	00:15	00:20	

Pilot Name	Co-pilot name	DATE	Location	Flight purpose	Drone	Altitude (ft)	Distance (m)	Flight duration (min)	Flight modes	Weather	Ground wind speed (m/s)
		15-06-2018		Training	DJI Inspire 1			20	GPS	Clear (night)	1
		15-06-2018		Training	DJI Inspire 1			20	GPS	Clear (night)	1
		02/08/2018		Training	DJI Matrice 210			30	GPS	Clear (night)	1
		13/08/2018		Training	DJI Matrice 210			30	GPS	Cloudy	2
		13/08/2018		Training	DJI Phantom 4			30	GPS	Cloudy	2
		29/08/2018		Training	DJI Matrice 210			30		Sunny (day)	2
		04/09/2018		Training	DJI Phantom 4			20		Sunny (day)	1
		04/09/2018		Training	DJI Matrice 210			20		Sunny (day)	1
		01/10/2018		Training	DJI Matrice 210			20		Sunny (day)	6
		02/10/2018		Training	DJI Matrice 210			30	GPS	Sunny (day)	15
		03/10/2018		Training	DJI Matrice 210			20		ATTI Inside Building	0
		03/10/2018		Training	DJI Matrice 210			30	GPS	Sunny (day)	5
		04/10/2018		Training	DJI Phantom 4			20		ATTI Sunny (day)	4
		04/10/2018		Training	DJI Phantom 4			20	GPS	Sunny (day)	4
		06/10/2018		Operational	DJI Matrice 210	200	150	20	GPS	Mist	2
		06/10/2018		Operational	DJI Matrice 210	200	150	25	GPS	Clear (night)	2
		30/10/2018		Operational	DJI Phantom 4	250	50	20	GPS	Clear (night)	4
		31/10/2018		Training	DJI Phantom 4	200	250	20	GPS	Sunny (day)	8
		23/11/2018		Training	DJI Inspire 1	100	400	20	GPS	Clear (night)	4
		23/11/2018		Training	DJI Inspire 1	100	400	20	GPS	Clear (night)	4
		14/11/2018		Training	DJI Phantom 4	100	200	25		Sunny (day)	10
		26/11/2018		Training	DJI Phantom 4	150	500	20	GPS	Sunny (day)	5
		26/11/2018		Training	DJI Inspire 1	150	200	20		ATTI Sunny (day)	5
		27/11/2018		Operational	DJI Inspire 1	200	100	20	GPS	Mist	0
		31/12/2018		Incident	DJI Matrice 210	200	2000	20	GPS	Clear (night)	
		31/12/2018		Incident	DJI Matrice 210	200	2000	20		Clear (night)	
		01/01/2019		Incident	DJI Matrice 210	200	2000	20	GPS	Clear (night)	
		01/01/2019		Incident	DJI Matrice 210	200	2000	20	GPS	Clear (night)	
		01/01/2019		Incident	DJI Matrice 210	200	2000	20	GPS	Sunny Intervals (day)	
		03/01/2019		Incident	DJI Matrice 210	200	1500	20	GPS	Clear (night)	
		03/01/2019		Incident	DJI Matrice 210	200	1500	20	GPS	Clear (night)	

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Appendix 5 – Aircraft Maintenance Log 'TechLog'

Exempt under section 31 of the FOI act -law enforcement: <https://www.legislation.gov.uk/ukpga/2000/36/section/31>





DJI MATRICE 300 RTK



FLIGHT REFERENCE CARD

London Fire Commissioner UAS Operations Manual

Environmental Factors

Action	Remarks
Maximum Speed	23 m/s (51 mph)
Max Wind Resistance	15 m/s (33 mph)
Operating Temperature	-20° to 50° C
Waterproof Level	IP45

Site

Action	Remarks
Make contact with OIC	Agree Plan & Objectives
Carry out Site Survey & Risk Assessment (the "RED")	As per Ops Manual Documentation and training with NQE
Primary & Secondary Landing Area	Confirm location Check area for suitability

Pre Flight Checks

Action	Remarks
Check UA for damage	UA body for cracks and cleanliness
Check Motors and Props	Rotate freely and without resistance No damage to props Props fitted and locked down
Check & Install Batteries	Inspect for swelling, leaks and heat Check charge level Check number of charges
Insert SD Card	Insert SD card for recording

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Orientate and place UA	Check area for FOD Clear from public
Check Controller	Inspect aerals and fit battery Check for physical damage Turn on controller Flight mode in GPS – P Mode
Carry out APP system check	Check battery cells RTH APP System check
Compass Calibration	Perform compass calibration if indicated by APP or if operating at a new location
Check Video Output	If live feeding, ensure live feed is live Select video and press record If connecting to external monitor, connect relevant cables
"Clear Ground"	Camera Op clears ground
"Clear Air"	Camera Op clears air
"Starting props"	Pilot starts props
"Taking off"	Pilot/UA takes off
Confidence Checks	Camera Op guides to 10m Pilot checks functionality Once satisfied – Commence flight

London Fire Commissioner UAS Operations Manual

Pre Landing Checks

Action	Remarks
Return UA above landing site	Camera Op guides to 10m
"Clear Ground"	Camera Op clears ground
"Clear FOD"	Camera Op checks for FOD and people
Lower to land	Camera operator counts down flight level Keep lookout for ground incursions
Land	Hold down left stick until rotors stop
"System Safe"	Camera Op powers down UA

Post Flight Checks

Action	Remarks
Remove Flight Battery	Check for: Damage Swelling Excessive Heat Loose connectors Allow battery to cool for at least 20 minutes before charging
Inspect UAS for damage	Check body Check props Check camera
Mission Complete	Shut down flight controllers

London Fire Commissioner UAS Operations Manual

	Pack away Complete Pilot Flight Log, Tech Log and Red
Mission Not Complete	Insert new batteries and carry out pre flight

Aircraft specifications

Dimensions	Unfolded – 810 x 670 x 430mm Folded – 430 x 420 x 430 mm
Max takeoff weight	9 kg
Max payload	2.7 kg
Max ascent speed	6 m/s (13 mph)
Max descent speed	7 m/s (15 mph)
Max speed	23 m/s (51 mph)
Max service ceiling above sea level	5000 m
Max wind resistance	15 m/s (33 mph)
Max flight time	45 mins
Waterproof level	IP45
Operating temperature	-4° to 113° F (-20° to 45° C)

Remote controller specifications

Operating frequency	2.400 - 2.483 ghz (5.725 – 5.850 ghz)
Max transmitting distance	8 km
Video output ports	HDMI
Power supply	Extended intelligent battery (model: WB37 - 4920 mah – 7.6V)

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Charging	DJI charger or DJI battery station
Dual user capability	Host and slave connection
Operating temperature	-4° to 104° F (-20° to 40° C)
USB supply power	5V/1.5A


Batteries

Model	TB60
Capacity	5935 mAh
Voltage	52.8V
Battery type	LiPo 12S
Energy	274 Wh
Net weight	1.35Kg
Operating temperature	-4° to 122° F (-20° to 50° C)
Charging temperature	41° to 104°F (5° to 40° C)
Max Charging power	470 W

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Updating the firmware

Exempt under s24 of for FOI act - national security <https://www.legislation.gov.uk/ukpga/2000/36/section/24>



Appendix 7 – Flight Reference Card – DJI Mavic 2 Enterprise Advanced



DJI MAVIC 2 ENTERPRISE ADVANCED



FLIGHT REFERENCE CARD

Environmental Factors

Action	Remarks
Maximum Speed	44 mph (20 m/s)
Max Wind Resistance	10 m/s (25 mph)
Operating Temperature	-10° C to 40° C
Waterproof Level	None

Site

Action	Remarks
Make contact with OIC	Agree Plan & Objectives
Carry out Site Survey & Risk Assessment (the "RED")	As per Ops Manual Documentation and training with NQE
Primary & Secondary Landing Area	Confirm location Check area for suitability

Pre Flight Checks

London Fire Commissioner UAS Operations Manual

Action	Remarks
Check RPAS for damage	RPAS body for cracks and cleanliness
Check Motors and Props	Rotate freely and without resistance No damage to props Props fitted and locked down
Check & Install Battery	Inspect for swelling, leaks and heat Check charge level Check number of charges
Insert SD Card	Insert SD card for recording
Choose relevant Accessory	Fit as required
Orientate and place RPAS	Check area for FOD Clear from public – 30 Metres
Check Controller	Inspect aerials Check for physical damage Turn on controller Flight mode in GPS
Carry out APP system check	Check battery cells RTH APP System check
Compass Calibration	Perform compass calibration if indicated by APP or if operating at a new location
Check Video Output	If live feeding, ensure live feed is live

London Fire Commissioner UAS Operations Manual

	Select video and press record If connecting to external monitor, connect relevant cables
"Clear Ground"	Camera Op clears ground
"Clear Air"	Camera Op clears air
"Starting props"	Pilot starts props
"Taking off"	Pilot/RPAS takes off
Confidence Checks	Camera Op guides to 10m Pilot checks functionality Once satisfied – Commence flight

Pre Landing Checks

Action	Remarks
Return RPAS above landing site	Camera Op guides to 10m
"Clear Ground"	Camera Op clears ground
"Clear FOD"	Camera Op checks for FOD and people
Lower to land	Camera operator counts down flight level Keep lookout for ground incursions
Land	Hold down left stick until rotors stop
"System Safe"	Camera Op powers down RPAS

London Fire Commissioner UAS Operations Manual

Post Flight Checks

Action	Remarks
Remove Flight Battery	Check for: Damage Swelling Excessive Heat Loose connectors Allow battery to cool for at least 20 minutes before charging
Inspect RPAS for damage	Check body Check props Check camera
Mission Complete	Shut down flight controller Pack away Complete Pilot Flight Log, Tech Log and Red
Mission Not Complete	Insert new batteries and carry out pre flight

Aircraft specifications

Weight (Battery & Propellers Included)	909g (Without Accessories)
Max Ascent Speed	6 m/s (S-mode) 5 m/s (P-mode)

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Max Descent Speed	5 m/s (S-mode) 4 m/s (P-mode)
Max service ceiling above sea level	19685 feet (6000 m)
Max flight time	Approx. 31 minutes
Obstacle sensory range	Forward: 0.5m – 20m Backward: 0.5 m – 16m Upward: 0.1m – 8m Downward: 0.5m – 11m Sides: 0.5m – 10m
Operating Temperature	-10° to 40° C

Remote controller specifications

Operating Temperature	0° to 40° C
Operating Frequency	2.400 GHz to 2.483 GHz 5.725 GHz to 5.850 GHz
Max Transmission distance	3.1 miles (5 km)
Battery	6000 mAh LiPo 2S
Operating Voltage	1800mA @ 3.83 V

Batteries





Capacity	3850 mAh
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Voltage	15.4 V Max Charge Voltage: 17.6 V
Battery type	Lipo 4S
Energy	59.29 Wh
Net weight	297g
Operating temperature	-4° to 104° F (-20° to 40° C)
Charging temperature	23° to 104° F (-5° to 40° C)
Max charging power	80 W

Aircraft status indicator description

Battery Level LEDs During Charging

	LED 1	LED 2	LED 3	LED 4
Battery Level LEDs During Charging				
Battery Level	0%~25%	25%~50%	50%~75%	Fully Charged


Battery Protection

Battery Protection Mechanisms					
LED 1	LED 2	LED 3	LED 4	Blinking Pattern	Battery Protection Item
				LED 2 blinks twice per second	Overcurrent detected
				LED 2 blinks three times per second	Short circuit detected
				LED 3 blinks twice per second	Overcharge detected
				LED 3 blinks three times per second	Over-voltage charger detected
				LED 4 blinks twice per second	Charging temperature is too low
				LED 4 blinks three times per second	Charging temperature is too high

Updating the firmware

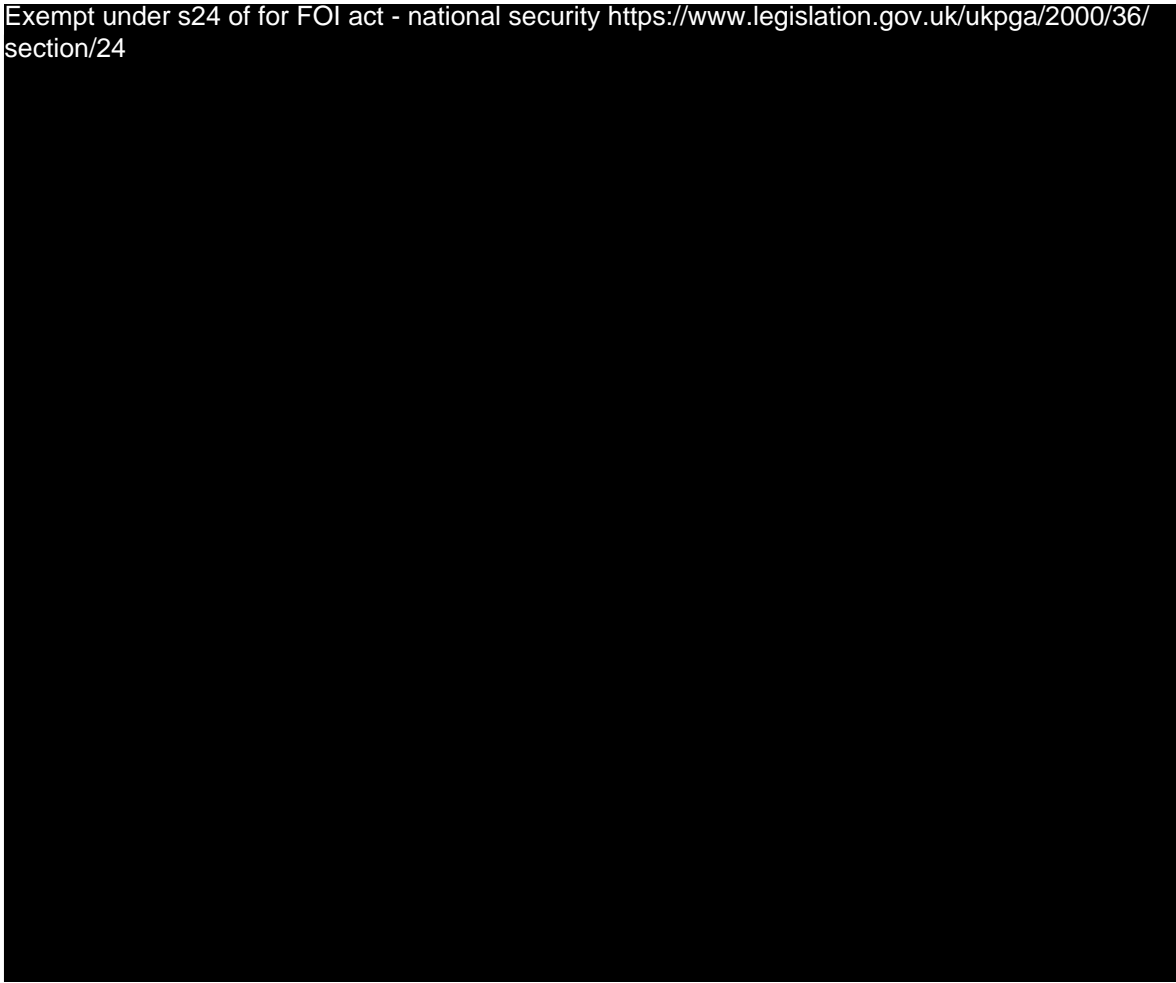
Whenever an update is completed, fill in the Techlog

Exempt under s24 of for FOI act - national security <https://www.legislation.gov.uk/ukpga/2000/36/section/24>



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Exempt under s24 of for FOI act - national security <https://www.legislation.gov.uk/ukpga/2000/36/section/24>



Appendix 8 – London Fire Commissioner Qualified Pilots

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CAA Operator ID: [REDACTED]

Printed Name	Mobile Telephone Number	Signature	CAA Flyer ID
[REDACTED]	[REDACTED]		[REDACTED]
[REDACTED]	[REDACTED]		[REDACTED]
[REDACTED]	[REDACTED]		[REDACTED]
[REDACTED]	[REDACTED]		[REDACTED]
[REDACTED]	[REDACTED]		[REDACTED]
[REDACTED]	[REDACTED]		[REDACTED]
[REDACTED]	[REDACTED]		[REDACTED]
[REDACTED]	[REDACTED]		[REDACTED] [REDACTED]
[REDACTED]	[REDACTED]		[REDACTED] [REDACTED]

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REMOVED AWAITING NEW INSURANCE CERTIFICATE