

where there is insufficient time left to promulgate a TDA via the normal SUP method, full details of the TDA will be issued via a detailed Notice to Airman (NOTAM). In addition, a document containing text and a diagram in a similar format to the SUP will be placed within the 'News' section on the Home page of the NATS AIS website.

General Principles for Remotely Piloted Aircraft Operations inside Segregated Airspace

- 1.27 For flights within segregated airspace, whilst some of the restrictions detailed at paragraph 1.18 may still apply, a remotely piloted aircraft will generally be given freedom of operation within the bounds of the allocated airspace, subject to any agreed procedures and safety requirements. An approval to operate will take into account the risks associated with any unintended excursion from the allocated airspace and it will also consider the possibility of airspace infringements. In addition, measures that may be put in place to enhance the safety of UAS activities will also be considered in the approval process.
- 1.28 While segregated airspace, by its nature, provides exclusive use of that airspace to the UAS activity, boundaries are not impervious to aircraft infringements. In order to enhance the safety of RPAS operations the following constraints may be imposed:
- Where available, the operator is to make use of an ATS provider to monitor UAS flights and to provide a service to them and to other aircraft operating in the vicinity of the segregated airspace;
 - Communications are to be maintained between the ATS provider and the Remote Pilot;
 - Procedures are to be put in place for, amongst others, emergency recovery, loss of control link and the avoidance of infringing aircraft.

SUA Operating in Controlled Airspace and Aerodrome Traffic Zones

- 1.29 London Heathrow and London City airports, for example, exert a major influence over the characteristics of London airspace and often require that any aircraft operating low-level Visual Flight Rules (VFR) flights adhere to notified routes and procedures to avoid traffic conflict. This is particularly true of VFR helicopter flights in and around London, which are often under active control and confined to a route-structure with changing altitude limitations. Information on this low-level VFR helicopter route structure is provided in the [London Heathrow \(EGLL\)](#) entry in the AD section of the Integrated Aeronautical Information Publication (IAIP) and portrayed on Helicopter Routes in the London Control Zone chart (Scale 1: 50,000, Series GSGS 5542). Operators are strongly advised to have a current copy of this chart available when on-site.

- 1.30 Due to their small size and ability to operate out of small sites in towns and cities, SUA are particularly difficult to see against an urban backdrop versus the relatively much larger size of a manned aircraft. The majority of SUA do not have an anti-collision beacon (although they may have other lights of lesser illumination - typically LEDs) and they are not currently required to be fitted with a transponder. The small size and the open-framework, symmetrical structure of a multi-rotor SUA means that it may not be clearly visible until at a much closer distance than would be the case between two manned aircraft, particularly when the SUA is hovering or moving slowly. Sighting of a SUA from another aircraft is likely to be a 'late sighting' with reduced time to alter course.
- 1.31 Therefore, in addition to maintaining direct VLOS and, where required, keeping to a height of no more than 400 feet above the surface, operators of SUA of any weight must avoid and give way to manned aircraft at all times. SUA must not fly higher than 300 feet when operating directly below the London Helicopter routes, whether on land or over the River Thames. Any flight directly below the helicopter routes must obtain a Non-Standard Flight (NSF) approval prior to flight.
- 1.32 In addition to the helicopter route structure and information on London Heathrow and London City, the AD section of the IAIP also includes data and charts for [London Heliport \(EGLW\)](#). The London Heliport Aerodrome Traffic Zone (ATZ) comprises a 2 NM circle from the surface to 2,000 feet and has an associated Local Flying Area (LFA) to the south from the surface up to 1,000 feet. The airspace dedicated to London Heliport may well cover areas where SUA wish to fly including the River Thames and riverside developments.
- 1.33 London has several unlicensed helicopter landing sites including hospital helipads, the Vanguard helipad at the Isle of Dogs, as well as numerous Police helicopter and air ambulance flights, aircraft of which may loiter at low-level or land and take off from any of the Capital's streets or parks. All of these types of helicopter operations may therefore be affected by SUA operations particularly when approaching to land or departing from a site; SUA operators must take active precautionary measures to avoid creating a collision risk.
- 1.34 Whether operating within London Controlled Airspace, or in other UK areas of Controlled Airspace (including any ATZ), pilots of SUA in the mass range between above 7 kg and 20 kg must obtain a prior NSF approval from the appropriate Air Traffic Services (ATS) unit. For SUA of any mass, a further Enhanced NSF (ENSF) approval is required for flight in certain restricted areas in Central London. Details of both the NSF and ENSF process can be found at UK AIP ENR 1.1 Section 4. For NSF applications, operators must apply via the National Air Traffic Services (NATS) NSF website at www.nats.co.uk/nsf no less than 21 days in advance of the planned task. The NSF approval process is a mandatory preparatory action and, even when approval has been given, SUA

operators must establish contact with the appropriate ATS unit on the actual day of operation. At such time, the SUA operator will normally be given a tactical clearance to operate within the limits of their pre-existing NSF approval and advice and information may be provided on the local air situation. This does not absolve the operator from the responsibility for avoiding all other aircraft.

- 1.35 NOTAM action at each site is generally not required due to the typically small scale, duration and operating limitations of SUA operations. Such a requirement must, however, form part of the operator's risk assessment process, particularly outside of controlled airspace and when several SUA will be operating together ('swarming').
- 1.36 Under ANO 2009 Article 166, operators of SUA with a mass of 7 kg or less are not required to gain an NSF approval from Air Traffic Control (ATC) to operate within Class A, C, D or E airspace or within an active ATZ. However ANO Article 166 states that a person in charge of a SUA 'may only fly the aircraft if reasonably satisfied that the flight can safely be made' and that they 'must maintain direct, unaided visual contact with the aircraft ... for the purpose of avoiding collisions'. In practical terms, SUA of any mass could present a particular hazard when operating near an aerodrome or other landing site due to the presence of manned aircraft taking off and landing. Therefore, it is strongly recommended that contact with the relevant ATS unit is made prior to conducting such a flight. As in paragraph 1.34, advice and information may be provided on the local air situation that will help the operator satisfy themselves that the flight can safely be made. Such information provided by the ATS unit does not constitute or infer an approval to operate in the airspace and does not absolve the operator from the responsibility for avoiding all other aircraft. Contact details for aerodromes and ATS units can be found in the [AD section of the UK AIP](#).
- 1.37 Operators of any SUA of mass 7 kg or less, are strongly advised for collision avoidance purposes, to remain clear of charted aerodromes by at least a distance of 5 km, whether or not the aerodrome is in controlled airspace or has an associated ATZ.

London Restricted Areas EG R157, R158 and R159

- 1.38 The Air Navigation (Restriction of Flying) (Hyde Park) Regulations 2004, Air Navigation (Restriction of Flying) (City of London) Regulations 2004 and Air Navigation (Restriction of Flying) (Isle of Dogs) Regulations 2004 within [CAP 393](#) lay down restrictions on aircraft operations (which include SUA) within three defined airspace areas: EG R157 (vicinity of Hyde Park), EG R158 (vicinity of the City of London) and EG R159 (vicinity of the Isle of Dogs). These Restricted Areas are described in the IAIP at [ENR 5.1](#) and are marked on current VFR charts. The restrictions require, with certain exceptions, that no aircraft fly below 1,400 feet Above Means Sea Level (AMSL) within these areas unless in accordance with an ENSF clearance issued by the appropriate ATC unit.

- 1.39 The procedure for gaining an ENSF clearance for these Restricted Areas is described at IAIP ENR 1.1, paragraph 4.1.6 and the clearance is initially granted by NATS. Operators can utilise the web-based application process at the [NATS website](#) as above and will then need to comply with any conditions imposed by the clearance. Operators must note that the ENSF process also involves security considerations that would apply to any flight by a SUA whether or not engaged in aerial work or equipped for surveillance or data acquisition. The ENSF process may take up to 28 days before the grant of an approval.

Source Documents

- CAP 393 Air Navigation: The Order and the Regulations²².
- UK AIP Aeronautical Information Publication.
- Regulation (EU) 923/2012 (Standardised European Rules of the Air).
- EASA Decision 2013/013/R of 17 July 2013 (Acceptable Means of Compliance (AMC) and Guidance Material (GM) for Implementing Regulation (EU) 923/2012 of 26 September 2012)

²² CAP393 sets out the provisions of the Air Navigation Order as amended together with Regulations made under the Order. These Regulations are The Rules of the Air Regulations, The Air Navigation (General) Regulations, the Air Navigation (Cosmic Radiation) (Keeping of Records) Regulations, the Air Navigation (Dangerous Goods) Regulations and a number of permanent Air Navigation (Restriction of Flying) Regulations. It also contains the provisions of the Civil Aviation Authority Regulations.

Chapter 2

Cross Border Operations

Scope

- 2.1 For the purposes of this guidance, international boundaries are considered to be coincident with lateral FIR/UIR boundaries.

Policy

- 2.2 UAS operators planning to operate beyond an international FIR/UIR boundary must comply with the regulatory and ATM requirements applicable to the territories over which the UAS is flown; these may differ from UK requirements. Whilst the CAA will provide guidance on cross border ATC procedures, including detailing the arrangements for those areas of airspace where ATS provision is delegated either to or by the UK, guidance on foreign national procedures is to be sought from the appropriate State National Aviation Authority (NAA). This requirement stems from Article 8 of the Convention on International Civil Aviation ('Chicago Convention'), which states that:
- "No aircraft capable of being flown without a pilot shall be flown over the territory of a contracting State without special authorisation by that State and in accordance with the terms of such an authorisation. Each contracting State undertakes to insure [sic²³] that the flight of such an aircraft without a pilot in regions open to civil aircraft shall be so controlled as to obviate danger to civil aircraft".
- 2.3 For the purposes of the Convention the territory of a State shall be deemed to be the land areas and territorial waters adjacent thereto under the sovereignty, suzerainty, protection or mandate of such state (Chicago Convention Article 2).
- 2.4 ICAO requirements concerning the authorisation of UAS flight across the territory of another State are published at Appendix 4 to ICAO Annex 2, Rules of the Air.

23 .ICAO use of "insure" should read "ensure"

Chapter 3

ATM Procedures

Scope

- 3.1 Air Traffic Services (ATS) in the UK are provided by personnel who are suitably trained and qualified to provide services at one or more of the three levels of provision: Air Traffic Control, UK Flight Information Services and Air/Ground Communication Service. It is not possible to anticipate all of the issues and queries relating to ATS integration that will inevitably arise during the future development of UAS and their operational procedures. Any enquiries for further guidance or to establish the UK policy on a particular issue must be made to the CAA.
- 3.2 This Chapter provides guidance on the policy associated with the provision of Air Traffic Services within UK airspace.

Policy

- 3.3 Individual ATS units may provide services within clearly defined geographic boundaries (such as a specific portion of airspace) or may provide services within a general area (for example, in the vicinity of an aerodrome).
- 3.4 The rules pertaining to aircraft flight and to the ATS provided will be determined by a number of factors (including airspace categorisation, weather conditions, aircraft flight rules and type of ATSU).
- 3.5 Not all aircraft within the same geographic area will necessarily be in communication with the same ATSU or operating under the same rules.
- 3.6 It is important that those managing UAS operations are familiar with the relevant rules and procedures applicable within any airspace through which the aircraft will be flown.
- 3.7 UAS operation is expected to be transparent to ATS providers. The pilot will be required to respond to ATS guidance or requests for information, and comply with any ATC instruction, in the same way and within the same timeframe that the pilot of a manned aircraft would. These instructions may take a variety of forms, for example, to follow another aircraft or to confirm that another aircraft is in sight.
- 3.8 International regulations and standards require that any new system, procedure or operation that has an impact on the safety of aerodrome operations or ATS shall be subject to a risk assessment and mitigation process to support its safe introduction and operation. Where an agency intends to operate a UAS in UK

airspace it will be required to provide with a safety assessment demonstrating that associated hazards to other airspace users have been identified, that the risks have been assessed and either eliminated or reduced to a level which is at least tolerable and is as low as reasonably practicable through ATS and/or other measures.

- 3.9 Where it is intended to operate a UAS in segregated airspace such a safety assessment must reflect measures intended to reduce the risk of mid-air collision between UAS and between UAS and manned aircraft. The safety assessment (which may also be presented in the form of a safety case or ATS sub-section of a broader UAS OSC) would be expected to include safety arguments concerning ATS and/or other measures to reduce the risk of accidents resulting from unplanned incursions into the segregated airspace by manned aircraft and unplanned excursions from the segregated airspace by the UAS.

Source Documents

- 3.10 Further information about the various levels of ATS and the services available from
- ATS units can be found in the following documents:
 - CAP 493 Manual of Air Traffic Services Part 1.
 - CAP 797 Flight Information Service Officer Manual.
 - CAP 452 Aeronautical Radio Station Operator's Guide.
 - CAP 774 UK Flight Information Services.
- 3.11 Further information about the classification of airspace and flight rules can be found in CAP 32 UK Aeronautical Information Publication.
- 3.12 Further information about radiotelephony procedures can be found in CAP 413 Radiotelephony Manual.
- 3.13 Further guidance on the conduct of safety assessments relating to ATS aspects of UAS operations can be found in CAP 760 Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases: For Aerodrome Operators and Air Traffic Service Providers.

Chapter 4

Emergency ATM Procedures

Scope

- 4.1 The guidance below outlines the requirements for an operator of a UAS in UK airspace to include robust provision for ATM aspects of the efficient handling of relevant UAS emergencies.
- 4.2 Pre-planned arrangements for emergency manoeuvring of UAS, including manoeuvre into emergency orbit areas, emergency landing areas, 'cut-down' points and ditching areas, must be developed in consultation with CAA Airspace Regulation, who will coordinate with associated ANSPs and other elements within the CAA Safety and Airspace Regulation Group (SARG).

Policy

- 4.3 In accordance with the overarching principle that UAS operation is expected to be transparent to ATS providers, the ATM handling of emergencies involving UAS will be expected to follow the same process as that for manned aircraft with the air traffic controller/Flight Information Service Officer / Air-Ground radio operator providing assistance to the Remote Pilot in order to recover and/or land the UAS without injury to life and, where possible, without damage to property. However, the absolutely overriding objective in any emergency situation is the safety of human life. ATM procedures for dealing with UAS emergencies must, therefore, focus on assisting the Remote Pilot to resolve the situation without endangering other airspace users or people on the ground. Although the ATS provider can offer assistance, ultimate responsibility for concluding a UAS emergency safely must rest with the Remote Pilot.
- 4.4 UAS operators must, as a minimum, develop procedures which provide for the emergency notification of the relevant ATM agencies in the event that guidance of a UAS is lost or significantly restricted. Such notification must include the last known position, altitude and speed of the aircraft and sufficient additional information, such as endurance, which would enable other airspace users and aerodrome operators to be alerted to the hazard. Such notification arrangements must be reflected in the UAS operator's safety assessment.

Source Documents

- 4.5 Further information about ATS arrangements for dealing with aircraft emergencies can be found in the following documents:
- CAP 493 Manual of Air Traffic Services Part 1.

- CAP 797 Flight Information Service Officer Manual.
- CAP 452 Aeronautical Radio Station Operator's Guide.
- CAP 774 UK Flight Information Services.

4.6 Further guidance on the conduct of safety assessments relating to ATS aspects of UAS operations can be found in CAP 760 Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases: For Aerodrome Operators and Air Traffic Service Providers.

Chapter 5

Breaches of ATC Regulations

Scope

- 5.1 Guidance relating to breaches of civil ATC regulations must be sought from CAA – Safety and Airspace Regulation Group (SARG), Airspace, ATM and Aerodromes (AAA).

Point of Contact

- 5.2 Breaches of Aviation Regulation legislation must be reported directly to:

Investigation and Enforcement Team
Civil Aviation Authority
Room 505
CAA House
45-59 Kingsway
London
WC2B 6TE

E-mail: jetmailbox@caa.co.uk

Chapter 6

Aerodrome Operating Procedures

Scope

- 6.1 The ANO does not require UAS operations to take place from aerodromes licensed by the CAA. This Chapter applies to those UAS operations that take place at licensed aerodromes.
- 6.2 It is not possible to anticipate all of the issues and queries relating to aerodrome operations that will inevitably arise during the future development and operation of UAS. Any enquiries for further guidance or to establish the UK policy on a particular issue must be made to the CAA.

Policy

- 6.3 The aerodrome licence holder is required to demonstrate how the safety of those aircraft requiring the use of a licensed aerodrome will be assured when UAS operations are permitted at the aerodrome.
- 6.4 The operation of UAS at a licensed aerodrome must be conducted in accordance with safety management requirements set out in the Aerodrome Manual of the aerodrome. This Manual, which forms a core element of the aerodrome's Safety Management System (SMS), contains the safety policies, accountabilities, responsibilities and procedures to facilitate the safe operation of the aerodrome.
- 6.5 It is essential that those managing UAS operations are familiar with the relevant rules and procedures applicable at the aerodrome from which they operate. The aerodrome licence holder must provide an operating manual or other documents pertaining to the operation of UAS at that aerodrome, to ensure that risks from all aspects of the intended UAS operation are assessed and mitigated.
- 6.6 Aerodrome and UAS operating procedures may be subject to audit by the CAA.

Source Documents

- 6.7 Information about the licensing and operation of aerodromes can be found in the following documents:
- CAP 168 Licensing of Aerodromes.
 - CAP 738 Safeguarding of Aerodromes.

Chapter 7

Incident and Accident Procedures

Scope

- 7.1 The safe operation of UAS is as important as that of manned aircraft, and third-party injury and damage to property can be just as severe when caused by either type of aircraft. Proper investigation of each accident, serious incident or other occurrence is absolutely necessary in order to identify causal factors and to prevent repetition. Similarly, the sharing of safety related information is critical in reducing the number of occurrences. The limited operational experience with UAS in civil applications makes such investigation particularly relevant.
- 7.2 This Chapter outlines the principles that must be employed with regard to the reporting and further investigation of occurrences involving the operation of all civilian unmanned aircraft within UK airspace; it also covers occurrences involving UK-registered unmanned aircraft that take place within the airspace of other nations.

Definitions

- 7.3 The current UK definitions of 'Accident' and 'Serious Incident' originate from Regulation (EU) No. 996/2010, which in turn are directly linked to the ICAO Annex 13 definitions.
- 7.4 An **Accident** is defined as: 'An occurrence associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked or, in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time it comes to rest at the end of the flight and the primary propulsion system is shut down, in which:
- a) a person is fatally or seriously injured as a result of:
 - being in the aircraft, or,
 - direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or,
 - direct exposure to jet blast, except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the

passengers and crew; or

- b) the aircraft sustains damage or structural failure which adversely affects the structural strength, performance or flight characteristics of the aircraft, and would normally require major repair or replacement of the affected component, except for engine failure or damage, when the damage is limited to a single engine (including its cowlings or accessories), to propellers, wing tips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aircraft skin (such as small dents or puncture holes) or minor damages to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike (including holes in the radome); or
- c) the aircraft is missing or is completely inaccessible.'

7.5 A **Serious Incident** is defined as: 'An incident involving circumstances indicating that there was a high probability of an accident and associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked or, in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time it comes to rest at the end of the flight and the primary propulsion system is shut down.'

NOTE: The difference between an accident and a serious incident lies only in the result.

7.6 A **Reportable Occurrence** is defined as: 'Any incident which endangers or which, if not corrected, would endanger an aircraft, its occupants or any other person.'

Policy

7.7 Any person involved (as defined under Regulation (EU) No. 996/2010) who has knowledge of the occurrence of an accident or serious incident in UK airspace must report it to the AAIB. Such persons include (but are not limited to) the owner, operator and pilot of a UAS.

7.8 All other occurrences must be reported under the CAA Mandatory Occurrence Reporting Scheme (MOR Scheme – details are contained in CAP 382).

7.9 The following aircraft categories are specifically covered by the MOR Scheme (i.e. all occurrences must be reported):

- any aircraft operated under an Air Operator's Certificate granted by the CAA;
- any turbine-powered aircraft which has a Certificate of Airworthiness issued by the CAA.

- 7.10 Although these categories would appear to exclude the vast majority of UAS applications, all occurrences related to UAS operations which are considered to have endangered, or might have endangered, any aircraft (including the subject unmanned aircraft) or any person or property, must still be reported to the CAA via the MOR Scheme. This applies equally to all UAS categories, regardless of the aircraft's mass or certification state. It also includes UK registered UAS operating outside UK airspace.
- 7.11 Appendix B to CAP 382 lists the types of occurrence that are likely to fall into the definition of a 'reportable occurrence'. Whilst some of the listed occurrences would clearly only apply to manned aviation, many will apply equally to UAS, in particular those associated with the operation of the aircraft; there are also failure modes that are UAS specific. In addition to those listed in CAP 382, other, more UAS-specific, reportable occurrences include events such as:
- Loss of control/datalink – 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:
 - between Pilot Stations;
 - transfer to/from launch control / mission control stations;
 - display failures.
 - Crew Resource Management (CRM) failures/confusion;
 - Structural damage/heavy landings;
 - Flight programming errors (e.g. incorrect speed programmed);
 - Any incident that injures a third party.

Source Documents

The Civil Aviation (Investigation of Air Accidents and Incidents) Regulations 1996.

Air Navigation Order 2009 – Article 226.

CAP 382 (The Mandatory Occurrence Reporting Scheme).

Regulation (EU) No. 996/2010 on the investigation and prevention of accidents and incidents in civil aviation.

ICAO Annex 13 – Aircraft Accident and Incident Investigation.

Points of Contact

Accident / Serious Incident:

Air Accidents Investigation Branch
Farnborough House
Berkshire Copse Road
Aldershot
HANTS
GU11 2HH
24 hour Accident/Incident reporting line: +44 (0) 1252 512299

(Administration/general enquiries)

Tel: +44 (0) 1252 510300

Fax: +44 (0) 1252 376999

E-mail: enquires@aaib.gov.uk

Mandatory Occurrence Reporting:

Safety Data
Civil Aviation Authority
Aviation House
Gatwick Airport South
West Sussex
RH6 0YR
Tel: +44 (0) 1293 573220
Fax: +44 (0) 1293 573972
E-mail: sdd@caa.co.uk

Chapter 8

Leasing

Introduction

- 8.1 CAP 722 does not address the leasing of communication links. This will be addressed separately once the ICAO RPAS Panel reaches a conclusion on this subject. Until an ICAO position on leasing communication links is reached, it will only be possible to take limited certification credit for communication links between the control station(s) and air vehicle(s).

Aim

- 8.2 The aim of this chapter is to clarify the position of the CAA with respect to the leasing, chartering, code sharing, interchanging and franchising of UAS.

Policy

- 8.3 Where an AOC holder wishes to lease, charter, code share, franchise or interchange a UAS it is strongly recommended that they communicate with the CAA in order to obtain the most appropriate and detailed guidance.
- 8.4 Further guidance can be found in the “Aircraft Leasing – Approval Requirements under the EASA Air Operations Regulation” document which can be found on the CAA website.
- 8.5 It is anticipated that at some point in the future there will be a desire for commercial organisations to be able to lease UAS or parts thereof. If UAS are being operated commercially then any leasing arrangements will need to meet the relevant operational rules.

Lead Agency

- 8.6 At this time, with the exception of wet leasing of third country aircraft, in the UK the CAA has responsibility for oversight of aircraft leasing.
- 8.7 The issuance of approvals for wet leasing of third country aircraft is currently the responsibility of the Department of Transport.

Appendices

APPENDIX A**Operational Factors for SUA Flights within Congested Areas**

Operational Factors for SUA Flights within Congested Areas

A1 In order to fly a SUA in a congested area, SUA operators must establish safety and operational control measures that prevent the SUA from endangering the general public. Operators are advised to ensure that their existing risk assessment and operating procedures address the enhanced measures required for congested areas. The procedures must address all relevant aspects of the congested areas they intend to operate within, taking into account any special circumstances or local conditions. Such measures may include but not be limited to:

- Segregation. Segregating the activities from public interference by placing physical barriers and cordons, or using other built/natural features that effectively separate the SUA operation from the general public.
- Crowd control. Marshalling or other active crowd control measures that restrict access to the area within which the SUA is operating.
- Utilisation of other agencies. Liaising with the Police, local authorities and other controlling agencies/organisation to gain official road closures, traffic cessation or site access restrictions.

Note: These measures will ideally be proportionate to the risk posed by the SUA, bearing in mind the limited flight times and size and weight of the aircraft. Temporary restrictions may suffice in some cases. Restrictions that would be suitable for a full-size aircraft such as a helicopter in most cases would not be applicable to a SUA.

- Wind and turbulence. Taking account of changes of wind strength and direction at varying heights above the surface. Windshear, 'rotor' and 'curl-over' effects may be present at any point on the planned flight path caused by interactions between buildings and strong winds or when transitioning from flight over land to over water.

- Radio Frequency (RF) interference. Pilots must take account of the possible reduction in operating range in an urban environment due to the heavy use of communications equipment (mobile telephone, Wi-Fi etc.) and other sources of electromagnetic spectrum/RF interference. Mitigation for the consequences of weak or lost GPS signal due to masking by buildings must be considered along with the general RF saturation level. The use of a spectrum analyser is recommended to assist in assessing the level of local electromagnetic and RF congestion in the 2.4 GHz or 35 MHz frequency range.
- Emergency procedures. SUA emergency procedures planned to be implemented during controller/transmitter/loss of GPS guidance failure modes must be able to be put into effect without breaching the minimum separation distances or flying directly overhead persons/vehicles. An automatic 'Return-to-Base' feature must not cause a hazard to anyone off the nominal flight path; this may limit the SUA to mainly vertical flight paths directly above the launch point.
- Test flights. It is desirable to conduct limited test flights (hover controllability check) and other systems tests at the launch point before committing to the full flight profile. The integration and correct set-up of the camera and gimbal-mounted will also be checked at this time to avoid unnecessary calibration flights.

A2 The procedures and limitations on the use of the SUA that will be used to establish these control measures must be stated in the Volume 1 of the UAS OSC.

Site Survey Assessment

A3 The use of non-established sites for flying UA requires an assessment of the suitability of that site to be made prior to commencing operations. Such an assessment must be made using a site visit and available information from at least the aeronautical charts, as well as other sources of information such as the UK Aeronautical Information Service (www.ais.org.uk), digital imagery (Google Earth/ Maps etc.), Ordnance Survey maps etc.

A4 Typical elements of an assessment that could affect the safety of the flight would include:

- the type of airspace and specific provisions (e.g. Controlled Airspace);
- other aircraft operations (local aerodromes or operating sites);
- hazards associated with industrial sites or such activities as live firing, gas venting, high-intensity radio transmissions etc.;
- local by-laws;

- obstructions (wires, masts, buildings etc.);
- extraordinary restrictions such as segregated airspace around prisons, nuclear establishments etc. (suitable permission may be needed); habitation and recreational activities;
- public access;
- permission from landowner;
- likely operating site and alternative sites;
- weather conditions for the planned flight;
- minimum separation distances from persons, vessels, vehicles and structures.

Overflight of People

- A5 In the absence of airworthiness certification, the overflight of persons not under the control of the pilot is restricted and described in the conditions of the Permission issued by the CAA. For UA of 20 kg and below, ANO 2009 Articles 166 and 167 define the separation distances that must be applied. For UA operations over 20 kg, the overflight of persons may be allowed subject to the assessment of the UAS Operating Safety Case and / or airworthiness certification and appropriate operational procedures such as Ballistic Recovery Systems (BRS) (e.g. parachutes).
- A6 The safety case for the overflight of people must include an assessment of the Kinetic Energy Limits and the method of flight termination (e.g. BRS). Two crash scenarios must be considered in determining the impact kinetic energy of the UA, as follows:
- a free-fall from 400 ft for all UA;
 - additionally, for a UA capable of high forward speed, a maximum impact speed (set as 1.4 x maximum achievable steady speed in level flight).
- A7 Assuming negligible aerodynamic drag, an object dropped from 400 ft will hit the surface at 95 kt and the kinetic energy at impact will be 95 kJ if the mass of the object is 80 kg. If the object exhibits significant aerodynamic drag (without reliance upon any on-board parachute deployment system), the impact velocity will be less and a higher mass may be permissible without exceeding a calculated 95 kJ.
- A8 In the second scenario and with a maximum speed of 70 kt, 95 kJ equates to a mass of 75 kg. The mass can be increased up to a maximum of 150 kg, provided the maximum achievable steady level flight speed is sufficiently low that the energy limit is not exceeded (e.g. at 150 kg a maximum speed of 49 kt is permitted).

APPENDIX B**UAS OSC Volume 1 - Operations Manual Template**

UAS OSC - Volume 1 - Operations Manual

{Enter company name}

UAS Operating Safety Case**Volume 1 – Operations Manual**

Version X.x Dated XX Xxx XX

{Conditions:

This document must be an original work representing the applicant Company.

The Company must take responsibility for its own safety case, whether the material originates from this template or otherwise.

Any significant changes to the Company's OSC will require further assessment, by the CAA or approved organisation, prior to further operations being conducted.

All text in {curly brackets} is guidance only and must be deleted from the Company's OSC}

Safety Statement

{The person responsible ²⁴ for the safe conduct of all of the Company's operations must make and sign this statement. The statement must include, as a minimum, a statement that the company is safe to operate in the proposed environment, that the system(s) to be employed can be operated safely and a commitment to operate within the bounds of this UAS OSC, the Operations Manual and any CAA permission granted. Where necessary it must also include a commitment to conduct further mitigation actions detailed within this UAS OSC. A commitment to safety, as a priority, must be detailed.}

²⁴ e.g. Accountable Manager, CEO, Company Director, etc

