UAS Regulation

UK Regulation (EU) 2019/947

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UAS Regulation

Consolidated Regulation, Acceptable Means of Compliance and Guidance Material to UK Regulation (EU) 2019/947 (as amended)

List of Revisions

Published	Reason for publication
February 2025	First issue amendment 2, incorporating CAA ORS9 Decision No. 46 adopting AMC and GM to Articles 8 and 11, with consequential amendments to GM1 to Article 16 and AMC and GM contained within Part B, UAS Operations in the ‘Specific’ category.
December 2022	First issue, incorporating CAA ORS9 Decision No. 16 adopting AMC and GM to UK Regulation (EU) 2019/947
December 2022	Update following Statutory Instrument 2022 No. 1235 coming into force

Disclaimer

This version is published by the Civil Aviation Authority in order to provide a consolidated and sequential presentation of current regulations with the related acceptable means of compliance (AMC) and guidance material (GM), as well as certification specifications (CS) as appropriate.

It has been prepared by combining the UK Government published regulations with the adopted AMC, GM and CS, made and issued by CAA under Official Records Series 9 decisions in accordance with Article 76 of the UK Basic Regulation.

There may be a period of time between the regulations and AMC, GM and CS being updated and the amendment to this consolidated version. Users must bear in mind that this is an unofficial version of the legislation, AMC, GM and CS. The authoritative versions (which Courts of Law will refer to) are:

(i) the King's Printer's Edition of Statutory Instruments available at www.legislation.gov.uk; and

(ii) Official Record Series 9 decisions published by the CAA available at https://www.caa.co.uk/our-work/publications/publication-series/ors-9-article-76-decisions/.

Note from the Editor

The content of this document is arranged as follows: the cover regulation (recitals and articles) of the implementing rule (IR) appear first, then the IR annex points, followed by the related acceptable means of compliance (AMC) and guidance material (GM) paragraph(s).

In case of certification specifications (CS), a CS paragraph is followed by the related AMC paragraph.

Under the Retained EU Law (Revocation and Reform) Act 2023 ("REUL Act"), previous references to retained EU law are replaced by the term "assimilated law" and are written as either UK Reg (EU) No. ####/year or UK Reg (EU) year/####.

All elements (i.e. cover regulation, IRs, CS, AMC and GM) are colour-coded and can be identified according to the illustration below.

Cover Regulation

Implementing Rule

Certification Specification

Acceptable Means of Compliance

Guidance Material

An ellipsis in square brackets [...] indicates that text has been intentionally left out, such as the result of an earlier amendment to the regulation, AMC, GM or CS.

Note that the Regulations text may refer to the 'old', repealed, Basic Regulation legislation reference (Regulation (EC) No. 216/2008) rather than 2018/1139. General UK legal principles mean that the UK Reg (EU) 2018/1139 should be referred to in these cases and amendments to the legal text will follow in due course.

You can copy and use this text but please ensure you always use the most up to date version and use it in context so as not to be misleading, and credit the CAA.

List of Abbreviations

This list of abbreviations is included to explain terms referred to throughout this AMC and GM. A comprehensive list of abbreviations, and definitions, can be found in CAP 722D, which draws together a consolidated list of definitions from various regulatory sources, including this list.

List of abbreviations used in this document

Abbreviation	Meaning
AGL	Above Ground Level
AIP	Aeronautical Information Publication
AMC	Acceptable Means of Compliance
ANO 2016	Air Navigation Order 2016
ANSP	Air Navigation Service Provider
AO	Airspace Observer
ATC	Air Traffic Control
ATS	Air Traffic Service
BRLOS	Beyond Radio Line of Sight
BVLOS	Beyond Visual Line of Sight
C2	Command and Control
CU	Command Unit
DAA	Detect and Avoid
ECCAIRS	European Coordination Centre for Accident and Incident Reporting Systems
GM	Guidance Material
GNSS	Global Navigation Satellite System
HMI	Human-Machine Interface
LUC	Light Unmanned Aircraft System Operator Certificate
MOR	Mandatory Occurrence Report
MTOM	Maximum Take-Off Mass
OA	Operational Authorisation
OC	Operating Certificate
OM	Operations Manual
OSC	Operating Safety Case
PDRA	Predefined Risk Assessment
RAE	Recognised Assessment Entity
RF	Radio Frequency
RLOS	Radio Line of Sight
RP	Remote Pilot
RT	Radiotelephony
TAF	Terminal Area Forecast
UA	Unmanned Aircraft
UAS	Unmanned Aircraft System
VLOS	Visual Line of Sight

Operation of unmanned aircraft

UK Regulation (EU) 2019/947

Preamble

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 216/2008 and (EC) No 552/2004 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91, and in particular Article 57 thereof,

Whereas:

(1) Unmanned aircraft, irrespective of their mass, can operate within the same Single European Sky airspace, alongside manned aircraft, whether airplanes or helicopters.

(2) As for manned aviation, a uniform implementation of and compliance with rules and procedures should apply to operators, including remote pilots, of unmanned aircraft and unmanned aircraft system (‘UAS’), as well as for the operations of such unmanned aircraft and unmanned aircraft system.

(3) Considering the specific characteristics of UAS operations, they should be as safe as those in manned aviation.

(4) Technologies for unmanned aircraft allow a wide range of possible operations. Requirements related to the airworthiness, the organisations, the persons involved in the operation of UAS and unmanned aircraft operations should be set out in order to ensure safety for people on the ground and other airspace users during the operations of unmanned aircraft.

(5) The rules and procedures applicable to UAS operations should be proportionate to the nature and risk of the operation or activity and adapted to the operational characteristics of the unmanned aircraft concerned and the characteristics of the area of operations, such as the population density, surface characteristics, and the presence of buildings.

(6) The risk level criteria as well as other criteria should be used to establish three categories of operations: the ‘open’, ‘specific’ and ‘certified’ categories.

(7) Proportionate risks mitigation requirements should be applicable to UAS operations according to the level of risk involved, the operational characteristics of the unmanned aircraft concerned and the characteristics of the area of operation.

(8) Operations in the ‘open’ category, which should cover operations that present the lowest risks, should not require UAS that are subject to standard aeronautical compliance procedures, but should be conducted using the UAS classes that are defined in Commission Delegated Regulation (EU) 2019/945.

(9) Operations in the ‘specific’ category should cover other types of operations presenting a higher risk and for which a thorough risk assessment should be conducted to indicate which requirements are necessary to keep the operation safe.

(10) A system of declaration by an operator should facilitate the enforcement of this Regulation in case of low risk operations conducted in the ‘specific’ category for which a standard scenario has been defined with detailed mitigation measures.

(11) Operations in the ‘certified’ category should, as a principle, be subject to rules on certification of the operator, and the licensing of remote pilots, in addition to the certification of the aircraft pursuant to Delegated Regulation (EU) 2019/945.

(12) Whilst mandatory for the ‘certified category’, for the ‘specific’ category a certificate delivered by the competent authorities for the operation of an unmanned aircraft, as well as for the personnel, including remote pilots and organisations involved in those activities, or for the aircraft pursuant to Delegated Regulation (EU) 2019/945 could also be required.

(13) Rules and procedures should be established for the marking and identification of unmanned aircraft and for the registration of operators of unmanned aircraft or certified unmanned aircraft.

(14) Operators of unmanned aircraft should be registered where they operate an unmanned aircraft which, in case of impact, can transfer, to a human, a kinetic energy above 80 Joules or the operation of which presents risks to privacy, protection of personal data, security or the environment.

(15) Studies have demonstrated that unmanned aircraft with a take-off mass of 250 g or more would present risks to security and therefore UAS operators of such unmanned aircraft should be required to register themselves when operating such aircraft in the ‘open’ category.

(16) Considering the risks to privacy and protection of personal data, operators of unmanned aircraft should be registered if they operate an unmanned aircraft which is equipped with a sensor able to capture personal data. However, this should not be the case when the unmanned aircraft is considered to be a toy within the meaning of Directive 2009/48/EC of the European Parliament and of the Council on the safety of toys.

(17) The information about registration of certified unmanned aircraft and of operators of unmanned aircraft that are subject to a registration requirement should be stored in digital, harmonised, interoperable national registration systems, allowing competent authorities to access and exchange that information. The mechanisms to ensure the interoperability of the national registers in this Regulation should be without prejudice to the rules applicable to the future repository referred to in Article 74 of Regulation (EU) 2018/1139.

(18) In accordance with paragraph 8 of Article 56 of Regulation (EU) 2018/1139, this Regulation is without prejudice to the possibility for Member States to lay down national rules to make subject to certain conditions the operations of unmanned aircraft for reasons falling outside the scope of Regulation (EU) 2018/1139, including public security or protection of privacy and personal data in accordance with the Union law.

(19) National registration systems should comply with the applicable Union and national law on privacy and processing of personal data and the information stored in those registrations systems should be easily accessible.

(20) UAS operators and remote pilots should ensure that they are adequately informed about applicable Union and national rules relating to the intended operations, in particular with regard to safety, privacy, data protection, liability, insurance, security and environmental protection.

(21) Some areas, such as hospitals, gatherings of people, installations and facilities like penal institutions or industrial plants, top-level and higher-level government authorities, nature conservation areas or certain items of transport infrastructure, can be particularly sensitive to some or all types of UAS operations. This should be without prejudice to the possibility for Member States to lay down national rules to make subject to certain conditions the operations of unmanned aircraft for reasons falling outside the scope of this Regulation, including environmental protection, public security or protection of privacy and personal data in accordance with the Union law.

(22) Unmanned aircraft noise and emissions should be minimised as far as possible taking into account the operating conditions and various specific characteristics of individual Member States, such as the population density, where noise and emissions are of concern. In order to facilitate the societal acceptance of UAS operations, Delegated Regulation (EU) 2019/945 includes maximum level of noise for unmanned aircraft operated close to people in the 'open' category. In the 'specific' category there is a requirement for the operator to develop guidelines for its remote pilots so that all operations are flown in a manner that minimises nuisances to people and animals.

(23) Current national certificates should be adapted to certificates complying with the requirements of this Regulation.

(24) In order to ensure the proper implementation of this Regulation, appropriate transitional measures should be established. In particular, Member States and stakeholders should have sufficient time to adapt their procedures to the new regulatory framework before this Regulation applies.

(25) The new regulatory framework for UAS operations should be without prejudice to the applicable environmental and nature protection obligations otherwise stemming from national or Union law.

(26) While the 'U-space' system including the infrastructure, services and procedures to guarantee safe UAS operations and supporting their integration into the aviation system is in development, this Regulation should already include requirements for the implementation of three foundations of the U-space system, namely registration, geo-awareness and remote identification, which will need to be further completed.

(27) Since model aircraft are considered as UAS and given the good safety level demonstrated by model aircraft operations in clubs and associations, there should be a seamless transition from the different national systems to the new Union regulatory framework, so that model aircraft clubs and associations can continue to operate as they do today, as well as taking into account existing best practices in the Member States.

(28) In addition, considering the good level of safety achieved by aircraft of class C4 as provided in Annex to this Regulation, low risk operations of such aircraft should be allowed to be conducted in the 'open' category. Such aircraft, often used by model aircraft operators, are comparatively simpler than other classes of unmanned aircraft and should therefore not be subject to disproportionate technical requirements.

(29) The measures provided for in this Regulation are in accordance with the opinion of the committee established in accordance with Article 127 of Regulation (EU) 2018/1139,

HAS ADOPTED THIS REGULATION:

Article 1 Subject matter

This Regulation lays down detailed provisions for the operation of unmanned aircraft systems as well as for personnel, including remote pilots and organisations involved in those operations.

Article 2 Definitions

For the purposes of this Regulation, the definitions in Regulation (EU) 2018/1139 apply.

The following definitions also apply:

(1) 'unmanned aircraft system' ('UAS') means an unmanned aircraft and the equipment to control it remotely;

(2) 'unmanned aircraft system operator' ('UAS operator') means any legal or natural person operating or intending to operate one or more UAS;

(3) 'assemblies of people' means gatherings where persons are unable to move away due to the density of the people present;

(4) 'UAS geographical zone' means a portion of airspace established by the Secretary of State that facilitates, restricts or excludes UAS operations in order to address risks pertaining to safety, privacy, protection of personal data, security or the environment, arising from UAS operations;

(5) 'robustness' means the property of mitigation measures resulting from combining the safety gain provided by the mitigation measures and the level of assurance and integrity that the safety gain has been achieved;

[...]

(7) 'visual line of sight operation' ('VLOS') means 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 in relation to other aircraft, people and obstacles for the purpose of avoiding collisions;

(8) 'beyond visual line of sight operation' ('BVLOS') means a type of UAS operation which is not conducted in VLOS;

(9) 'light UAS operator certificate' ('LUC') means a certificate issued to a UAS operator by the CAA as set out in part C of the Annex;

(10) 'model aircraft club or association' means an organisation legally established in the United Kingdom for the purpose of conducting leisure flights, air displays, sporting activities or competition activities using UAS;

(11) ‘dangerous goods’ means articles or substances, which are capable of posing a hazard to health, safety, property or the environment in the case of an incident or accident, that the unmanned aircraft is carrying as its payload, including in particular:

(a) explosives (mass explosion hazard, blast projection hazard, minor blast hazard, major fire hazard, blasting agents, extremely insensitive explosives);

(b) gases (flammable gas, non-flammable gas, poisonous gas, oxygen, inhalation hazard);

(c) flammable liquids (flammable liquids; combustible, fuel oil, gasoline);

(d) flammable solids (flammable solids, spontaneously combustible solids, dangerous when wet);

(e) oxidising agents and organic peroxides;

(f) toxic and infectious substances (poison, biohazard);

(g) radioactive substances;

(h) corrosive substances;

(12) ‘payload’ means instrument, mechanism, equipment, part, apparatus, appurtenance, or accessory, including communications equipment, that is installed in or attached to the aircraft and is not used or intended to be used in operating or controlling an aircraft in flight, and is not part of an airframe, engine, or propeller;

(13) ‘direct remote identification’ means a system that ensures the local broadcast of information about a unmanned aircraft in operation, including the marking of the unmanned aircraft, so that this information can be obtained without physical access to the unmanned aircraft;

(14) ‘follow-me mode’ means a mode of operation of a UAS where the unmanned aircraft constantly follows the remote pilot within a predetermined radius;

(15) ‘geo-awareness’ means a function that, based on the data provided by the CAA , detects a potential breach of airspace limitations and alerts the remote pilots so that they can take immediate and effective action to prevent that breach;

(16) ‘privately built UAS’ means a UAS assembled or manufactured for the builder’s own use, not including UAS assembled from sets of parts placed on the market as a single ready-to-assemble kit;

(17) ‘autonomous operation’ means an operation during which an unmanned aircraft operates without the remote pilot being able to intervene;

(18) ‘uninvolved persons’ means persons who are not participating in the UAS operation or who are not aware of the instructions and safety precautions given by the UAS operator;

(19) ‘making available on the market’ means any supply of a product for distribution, consumption or use on the [...] market in the course of a commercial activity, whether in exchange of payment or free of charge;

[...]

(21) ‘controlled ground area’ means the ground area where the UAS is operated and within which the UAS operator can ensure that only involved persons are present;

(22) ‘maximum take-off mass’ (‘MTOM’) means the maximum Unmanned Aircraft mass, including payload and fuel, as defined by the manufacturer or the builder, at which the Unmanned Aircraft can be operated;

(23) ‘unmanned sailplane’ means an unmanned aircraft that is supported in flight by the dynamic reaction of the air against its fixed lifting surfaces, the free flight of which does not depend on an engine. It may be equipped with an engine to be used in case of emergency;

(24) ‘unmanned aircraft observer’ means 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;

(25) ‘airspace observer’ means a person who assists the remote pilot by performing unaided visual scanning of the airspace in which the unmanned aircraft is operating for any potential hazard in the air;

(26) ‘command unit’ (‘CU’) means 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;

(27) ‘C2 link service’ means a communication service supplied by a third party, providing command and control between the unmanned aircraft and the CU;

[...]

(34) ‘night’ means the hours between the end of evening civil twilight and the beginning of morning civil twilight as defined in Implementing Regulation (EU) No 923/2012;

(35) ’CAA’ means the Civil Aviation Authority.

GM1 Article 2 Definitions

CAA ORS9 Decision No. 16

This Article defines a number of terms that are used within UK Regulation (EU) 2019/947.

The definitions appear in the order that they appear in the regulation, rather than being listed alphabetically.

Definitions that are published in:

- Regulation (EU) 2018/1139 as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018 (Basic Regulation), hereafter referred to as UK Regulation (EU) 2018/1139; or

- Regulation (EU) 2019/945 as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018 (UAS Delegated Regulation), hereafter referred to as UK Regulation (EU) 2019/945

are not replicated in this Article.

GM1 Article 2(3) Definitions

CAA ORS9 Decision No. 16

DEFINITION OF 'ASSEMBLIES OF PEOPLE'

Assemblies of people have been defined by the ability of people to move around freely, and therefore move out of the way of an out-of-control UA.

There are no strict numbers defined above which a group of people would turn into an assembly of people as different situations would result in different conclusions. An assembly must be evaluated qualitatively, based on the ability of people within that group to move away from any risk posed by the UAS operation.

Qualitative examples of assemblies of people are:

a) sport, cultural, religious or political events;

b) music festivals and concerts;

c) marches and rallies;

d) parties, carnivals and fêtes.

GM1 Article 2(4) Definitions

CAA ORS9 Decision No. 16

DEFINITION OF 'UAS GEOGRAPHICAL ZONE'

The term UAS Geographical Zone does not include UAS airspace restrictions established under other regulations, such as the Air Navigation Order (ANO). A UAS Geographical Zone is an airspace restriction, established under Article 15.

AMC1 Article 2(7) Definitions

CAA ORS9 Decision No. 16

DEFINITION OF 'VISUAL LINE OF SIGHT OPERATION'- 'UNAIDED VISUAL CONTACT'

'Unaided', in this context means without the use of any other equipment, such as binoculars, telescopes, cameras or any other such equipment.

This does not include corrective lenses, which may be worn.

Note:

> Provision is made in Article 4(1)(d), and UAS.OPEN.060(4), for an UA to be flown in the Open category, beyond the visual line of sight of the Remote Pilot (RP) (due to the RP using 'follow-me' mode, or when making use of an UA Observer and FPV equipment).
>
> Further guidance material on the use of FPV equipment can be found in GM1 UAS.OPEN.060(4).

DEFINITION OF 'VISUAL LINE OF SIGHT OPERATION'- 'CONTROL THE VISUAL FLIGHT PATH'

In order to control the visual flight path of the UA, it must be kept within a suitable distance of the RP such that they can monitor the aircraft's position, orientation and the surrounding airspace at all times.

GM1 Article 2(7) Definitions

CAA ORS9 Decision No. 16

DEFINITION OF 'VISUAL LINE OF SIGHT OPERATION'- 'CONTROL THE VISUAL FLIGHT PATH'

Being able to control the visual flight path of the UA means keeping it within a suitable distance of the RP, such that the RP can maintain control of the flight path of the UA, to avoid a collision with other aircraft, people, obstacles or the ground. This distance depends on a number of factors, including:

- The eyesight of the RP;
- The size of the UA;
- The visual conspicuity of the UA (colour, and contrast of the UA against the backdrop from the viewpoint of the RP);
- Any navigation lighting on board the UA;
- The weather conditions (fog, sun-glare etc);
- Terrain and any other obstacles that may obscure the view of the UA from the RP;
- Whether the operation is during the hours of daylight, or night. Although there are not specific limitations on operating at night, the visual conspicuity of the UA and ambient lighting, may affect the distance to which the UA may be flown from the RP.

This distance will likely vary on each flight depending on these factors, and the RP should be able to identify at what point VLOS can no longer be maintained.

Just because the UA is still visible (for example, a dot in the sky), this does not mean that it meets the definition of VLOS. A RP must be able to visually determine the aircraft's orientation at all times. While this may potentially be aided by navigation lights, the sole use of telemetry to indicate UA orientation to the RP is not considered as acceptable.

GM1 Article 2(16) Definitions

CAA ORS9 Decision No. 16

DEFINITION OF 'PRIVATELY BUILT'

Any UA which is designed and built by an individual or organisation for their own use, and which is not class marked in accordance with UK Regulation (EU) 2019/945, is defined as privately built.

GM1 Article 2(17) Definitions

CAA ORS9 Decision No. 16

DEFINITION OF 'AUTONOMOUS OPERATION'

The implementation of a pre-programmed emergency procedure; for example, the automatic RTH function due to the loss of C2, does not constitute an autonomous operation.

An autonomous operation should not be confused with an automatic or automated operation, which refers to an operation following pre-programmed instructions that the UAS executes whilst the RP is still able to intervene in the flight.

GM1 Article 2(18) Definitions

CAA ORS9 Decision No. 16

DEFINITION OF 'UNINVOLVED PERSONS'

The primary focus for UAS operations is the protection of people that are not a part of the operation (i.e., third parties). Within the UAS regulations, they are referred to as 'uninvolved persons'.

The regulation sets out that 'uninvolved persons' means an individual, or group of individuals, who either:

- are not, in any way, participating in the UAS Operation; or
- have not received clear instructions and safety precautions from the RP, the UAS Operator or a person nominated by the UAS Operator, to follow throughout the operation and in the event the UAS exhibits any unplanned behaviour.

A person is considered to be 'participating' in the operation, if they are the UAS Operator, or acting on behalf of the UAS Operator, for example, the RP, or another member of the flight or supporting ground crew.

GM1 Article 2(22) Definitions

CAA ORS9 Decision No. 16

DEFINITION OF 'MAXIMUM TAKE-OFF MASS (MTOM)'

The MTOM includes all the elements on board the UA, including the motors, propellers, electronic equipment and antennas, batteries /fuel, oil and all other fluids and the payload, including sensors and their ancillary equipment.

Privately built UA, and some off the shelf UA do not have a MTOM defined. In this case, the mass of the aircraft at the time of take-off should be used instead, when interpreting the term 'MTOM' within the regulation.

Although the UAS Regulations refer to 'maximum take-off mass' (MTOM) throughout, this term creates some confusion when referring to home-built or other non-class marked UA where an MTOM has not been defined by the manufacturer.

Take-off Mass (Article 22)

The term 'take-off mass' is also used when referring to non-class marked aircraft, but only within one article (Article 22 – transitional arrangements) and the term is not specifically defined.

For these aircraft, any reference to 'take-off mass should be taken to mean the mass of the UA at the point of take-off for that particular flight.

Article 3 Categories of UAS operations

UAS operations shall be performed in the 'open', 'specific' or 'certified' category defined respectively in Articles 4, 5 and 6, subject to the following conditions:

(a) UAS operations in the 'open' category shall not be subject to any prior operational authorisation [...] before the operation takes place;

(b) UAS operations in the 'specific' category shall require an operational authorisation issued by the CAA pursuant to Article 12 or an authorisation received in accordance with Article 16 [...] ;

(c) UAS operations in the 'certified' category shall require the certification of the UAS pursuant to Delegated Regulation (EU) 2019/945 and the certification of the operator and, where applicable, the licensing of the remote pilot.

GM1 Article 3 Categories of UAS Operations

CAA ORS9 Decision No. 16

BOUNDARIES BETWEEN THE CATEGORIES OF UAS OPERATIONS

a) Boundary between Open and Specific

A UAS operation is not in the Open category when at least one of the general criteria listed in Article 4 of the UAS Regulation is not met (e.g., when operating beyond visual line of sight (BVLOS)) or when the detailed criteria for a subcategory are not met (e.g. operating a 10 kg UA close to people when subcategory A2 is limited to 4 kg UA).

During the course of a Specific category flight, the UA may be flown in such a manner that it enters the Open category. The RP may not actively decide which category they are flying in, this is purely a function of the operational, and technical characteristics of the operation.

The UAS Operator and RP must comply with the relevant responsibilities throughout the flight at all times. The RP and UAS Operator should comply with the Specific Category requirements, as detailed within the Operational Authorisation, for their operation, throughout the operation.

For example, the requirement to maintain a flying log-book is a requirement of an OA when operating within the Specific category. If a portion of the flight takes place within the Open category, the Remote Pilot is not expected to only log the portion of the flight in the Specific category, they should log the entire flight.

b) Boundary between Specific and Certified

Article 6 of the UK Regulation (EU) 2019/947 and Article 40 of UK Regulation (EU) 2019/945 define the boundary between the Specific and the Certified category. The first article defines the boundary from an operational perspective, while the second one defines the technical characteristics of the UA; they should be read together.

UAS operations must be carried out within the Certified category when they:

- are conducted over assemblies of people with a UA that has characteristic dimensions of 3m or more; or
- involve the transport of people; or
- involve the carriage of dangerous goods that may result in a high risk for third parties in the event of an accident.

In addition, a UAS operation is deemed within the Certified category when, based on the safety risk assessment as detailed in Article 11, the competent authority considers that the safety risk cannot be mitigated adequately without it being operated within the Certified category.

Article 4 ‘Open’ category of UAS operations

1. Operations shall be classified as UAS operations in the ‘open’ category only where the following requirements are met:

(a) the UAS belongs to one of the classes set out in Delegated Regulation (EU) 2019/945 or is privately built or meets the conditions defined in Article 20;

(b) the unmanned aircraft has a maximum take-off mass of less than 25 kg;

(c) the remote pilot ensures that the unmanned aircraft is kept at a safe distance from people and that it is not flown over assemblies of people;

(d) the remote pilot keeps the unmanned aircraft in VLOS at all times except when flying in follow-me mode or when using an unmanned aircraft observer as specified in Part A of the Annex;

(e) during flight, the unmanned aircraft is maintained within 120 metres from the closest point of the surface of the earth, except when overflying an obstacle, as specified in Part A of the Annex

(f) during flight, the unmanned aircraft does not carry dangerous goods and does not drop any material;

2. UAS operations in the 'open' category shall be divided in three sub-categories in accordance with the requirements set out in Part A of the Annex.

GM1 Article 4(1)(d) Open Category UAS Operations

CAA ORS9 Decision No. 16

VLOS

In general, the UA must be kept within VLOS of the RP at all times, however provision is made in Article 4, which permits the UA to not be within VLOS of the RP when making use of a UA Observer.

A UA Observer may be used within the Open category, to assist the RP with keeping the UA in VLOS. Further information on the UA Observer may be found in section GM1 UAS.OPEN.060(4).

GM1 Article 4(1)(e) Open Category UAS Operations

CAA ORS9 Decision No. 16

MAXIMUM HEIGHT

Where maximum vertical height is described within the regulation as 120m this may also be approximated to 400ft, for the purpose of this document.

Height, in the context of this document, for most UAS operations refers to the geometric height of the UA above the ground.

In some more complex cases, barometric altitude measurement may be used. In this case, it is vital to understand the differences between geometric and barometric measurements.

AMC1 Article 4(1)(f) Open Category Operations

CAA ORS9 Decision No. 16

DROPPING OF MATERIAL

For the purpose of this article, the term 'dropping of material' shall be taken to also include 'projecting' and 'lowering' of articles, whilst in flight.

Article 5 'Specific' category of UAS operations

1. Where one of the requirements laid down in Article 4 or in Part A of the Annex is not met, a UAS operator shall be required to obtain an operational authorisation pursuant to Article 12 from the CAA .

2. When applying to the CAA for an operational authorisation pursuant Article 12, the operator shall perform a risk assessment in accordance with Article 11 and submit it together with the application, including adequate mitigating measures.

3. In accordance with point UAS.SPEC.040 laid down in Part B of the Annex, the CAA shall issue an operational authorisation, if it considers that the operational risks are adequately mitigated in accordance with Article 12.

4. The CAA shall specify whether the operational authorisation concerns:

(a) the approval of a single operation or a number of operations specified in time or location (s) or both. The operational authorisation shall include the associated precise list of mitigating measures;

(b) the approval of an LUC, in accordance with part C of the Annex.

5. Where the UAS operator submits a declaration to the competent authority of the Member State of registration in accordance with point UAS.SPEC.020 laid down in Part B of the Annex for an operation complying with a standard scenario set out in Appendix 1 to that Annex, the UAS operator shall not be required to obtain an operational authorisation in accordance with paragraphs 1 to 4 of this Article and the procedure laid down in paragraph 5 of Article 12 shall apply. The UAS operator shall use the declaration referred to in Appendix 2 to that Annex.

6. An operational authorisation [...] shall not be required for:

(a) UAS operators holding an LUC with appropriate privileges in accordance with point UAS.LUC.060 of the Annex;

(b) operations conducted in the framework of model aircraft clubs and associations that have received an authorisation in accordance with Article 16.

Article 6 ‘Certified’ category of UAS operations

1. Operations shall be classified as UAS operations in the ‘certified’ category only where the following requirements are met:

(a) the UAS is certified pursuant to points (a), (b) and (c) of paragraph 1 of Article 40 of Delegated Regulation (EU) 2019/945; and

(b) the operation is conducted in any of the following conditions:

i. over assemblies of people;

ii. involves the transport of people;

iii. involves the carriage of dangerous goods, that may result in high risk for third parties in case of accident.

2. In addition, UAS operations shall be classified as UAS operations in the ‘certified’ category where the CAA , based on the risk assessment provided for in Article 11, considers that the risk of the operation cannot be adequately mitigated without the certification of the UAS and of the UAS operator and, where applicable, without the licensing of the remote pilot.

GM1 Article 6 Certified Category of UAS Operations

CAA ORS9 Decision No. 16

UAS OPERATIONS IN THE CERTIFIED CATEGORY

Article 6 should be read alongside UK Regulation (EU) 2019/945 Article 40.

Article 6 addresses UAS operations and UK Regulation (EU) 2019/945 Article 40 addresses the UAS itself. This separation was necessary to comply with UK Regulation (EU) 2018/1138 (the Basic Regulation), which sets out that the requirements for UAS operations and registration are in UK Regulation (EU) 2019/947, and that the technical requirements for UAS are in UK Regulation (EU) 2019/945. The reading of the two articles results in the following:

a) the transport of people is always in the Certified category. The UAS must be certified in accordance with Article 40 and the transport of people is one of the UAS operations identified in Article 6 as being in the Certified category;

b) flying over assemblies of people with a UA that has a characteristic dimension of less than 3m may be carried out in the Specific category unless one of the conditions outlined within 'GM1 Article 3 Categories of UAS operations (b)' is met; and

c) the transport of dangerous goods is in the Certified category if, following an accident, it would pose a high risk to third parties.

In addition, a UAS operation is deemed within the Certified category when, based on the safety risk assessment as detailed in Article 11, the competent authority considers that the safety risk cannot be mitigated adequately without it being operated within the Certified category.

AMC1 Article 6(1)(b)(iii) Certified Category of Operations

CAA ORS9 Decision No. 16

CARRIAGE OF DANGEROUS GOODS

The carriage of dangerous goods must be carried out within the Certified category if there is a high safety risk to third parties following an accident.

Note:

> The operation may be carried out within the Specific category if this safety risk is mitigated sufficiently. This may be achieved with the use of a crash protected container or by adjusting the scope/location/nature of the operation, or by a combination of both.

Article 7 Rules and procedures for the operation of UAS

1. UAS operations in the 'open' category shall comply with the operational limitations set out in Part A of the Annex.

2. UAS operations in the 'specific' category shall comply with the operational limitations set out in the operational authorisation as referred to in Article 12 or the authorisation as referred to in Article 16. This paragraph shall not apply where the UAS operator holds an

LUC with appropriate privileges. UAS operations in the 'specific' category shall be subject to the applicable operational requirements laid down in Commission Implementing Regulation (EU) No 923/2012.

3. UAS operations in the 'certified' category shall be subject to the applicable operational requirements laid down in Implementing Regulation (EU) No 923/2012 and Commission Regulations (EU) No 965/2012 and (EU) No 1332/2011.

AMC1 Article 7(2) Rules and Procedures for the Operation of UAS

CAA ORS9 Decision No. 16

STANDARDISED EUROPEAN RULES OF THE AIR

Article 7(2), states that "UAS operations in the 'Specific' category shall be subject to the applicable operational requirements laid down in UK Regulation (EU) No 923/2012".

This text refers to the Standardised European Rules of the Air (SERA).

Not all requirements within SERA are relevant to UAS in the Specific category. UAS Operators should consider the requirements listed below and their relevance to the intended operation, and incorporate the requirements of those within their Operations Manual (OM), as procedures, as necessary. The inclusion of such procedures within the OM, as with any other procedures, will make them mandatory for the UAS Operator to follow.

The CAA may apply any additional applicable requirements of UK Regulation (EU) No 923/2012 to operations via Operational Authorisations (OA) as conditions and limitations, depending on the operation and the result of the risk assessment process.

The table below sets out some applicable operational requirements from SERA and their applicability to UAS Operations in the Specific category.

Item	Description	Applicability
SERA.2020 - Psychoactive Substances	Requirement not to undertake a function critical to safety of aviation when under the influence of any psychoactive substance, which impairs human performance, and not to engage in any problematic use of such substances.	All Specific category UAS Operations
SERA.3101 - Negligence	Requirement to not operate an aircraft in a negligent or reckless manner, so as to endanger life or property.	All Specific category UAS Operations.
SERA.3145 – Prohibited and Restricted Areas	Requirement not to fly within a Prohibited or Restricted area, unless in accordance with the conditions of the area.	All Specific category UAS Operations.
SERA.3205 - Proximity	Requirement to not operate an aircraft in such proximity to other aircraft as to create a collision hazard.	All Specific category UAS Operations.
SERA.3135 -	Certain requirements to follow when flying within a formation, and to	As required- for

Item	Description	Applicability
Formation Flights	not fly in a formation unless pre- arranged with each pilot.	example, certain BVLOS operations with multiple aircraft.
SERA.3201 - Collision Avoidance	Explanation that nothing within SERA relieves the pilot from the responsibility to take collision avoidance action.	As required- for example, certain BVLOS operations.
SERA.3210 - Right of way	Requirements on the right of way between certain types of aircraft, and manoeuvres that must be taken to avoid collisions.	As required- for example, certain BVLOS operations.
SERA.3215 - Lighting	Certain requirements for aircraft lighting.	As required- for example, certain BVLOS operations.
SERA.3401 - Time	Certain requirements on the use of coordinated universal time (UTC).	As required- for example, certain BVLOS operations.
SERA Section 4- Flight Plans	Certain requirements on the use of flight plans.	As required- for example, certain BVLOS operations.
SERA.6005 (b) – Operations within a TMZ	Requirement to carry and operate a transponder when operating within a Transponder Mandatory Zone.	As required- for example, certain BVLOS operations.

Article 8 Rules and procedures for the competency of remote pilots

1. Remote pilots operating UAS in the 'open' category shall comply with the competency requirements set in Part A of the Annex.

2. Remote pilots operating UAS in the 'specific' category shall comply with the competency requirements set out in the operational authorisation by the CAA[...] as defined by the LUC and shall have at least the following competencies:

(a) ability to apply operational procedures (normal, contingency and emergency procedures, flight planning, pre-flight and post-flight inspections);

(b) ability to manage aeronautical communication;

(c) manage the unmanned aircraft flight path and automation;

(d) leadership, teamwork and self-management;

(e) problem solving and decision-making;

(f) situational awareness;

(g) workload management;

(h) coordination or handover, as applicable.

3. Remote pilots operating in the framework of model aircraft clubs or associations shall comply with the minimum competency requirements defined in the authorisation granted in accordance with Article 16.

GM1 Article 8 Remote Pilot Competence

CAA ORS9 Decision No. 46

AMC and GM for Article 8 can be found in Annex A to Article 8.

Article 9 Minimum age for remote pilots

Repealed

Article 9A Regulations

Repealed

Article 10 Rules and procedures for the airworthiness of UAS

Unless privately-built, or used for operations referred to in Article 16, or meeting the conditions defined in Article 20, UAS used in operations set out in this Regulation shall comply with the technical requirements and rules and procedures for the airworthiness defined in the delegated acts adopted pursuant to Article 58 of Regulation (EU) 2018/1139.

Article 11 Rules for conducting an operational risk assessment

1. An operational risk assessment shall:

(a) describe the characteristics of the UAS operation;

(b) propose adequate operational safety objectives;

(c) identify the risks of the operation on the ground and in the air considering all of the below:

i. the extent to which third parties or property on the ground could be endangered by the activity;

ii. the complexity, performance and operational characteristics of the unmanned aircraft involved;

iii. the purpose of the flight, the type of UAS, the probability of collision with other aircraft and class of airspace used;

iv. the type, scale, and complexity of the UAS operation or activity, including, where relevant, the size and type of the traffic handled by the responsible organisation or person;

v. the extent to which the persons affected by the risks involved in the UAS operation are able to assess and exercise control over those risks.

(d) identify a range of possible risk mitigating measures;

(e) determine the necessary level of robustness of the selected mitigating measures in such a way that the operation can be conducted safely.

2. The description of the UAS operation shall include at least the following:

(a) the nature of the activities performed;

(b) the operational environment and geographical area for the intended operation, in particular overflown population, orography, types of airspace, airspace volume where the operation will take place and which airspace volume is kept as necessary risk buffers, including the operational requirements for geographical zones;

(c) the complexity of the operation, in particular which planning and execution, personnel competencies, experience and composition, required technical means are planned to conduct the operation;

(d) the technical features of the UAS, including its performance in view of the conditions of the planned operation and, where applicable, its registration number;

(e) the competence of the personnel for conducting the operation including their composition, role, responsibilities, training and recent experience.

3. The assessment shall propose a target level of safety, which shall be equivalent to the safety level in manned aviation, in view of the specific characteristics of UAS operation.

4. The identification of the risks shall include the determination of all of the below:

(a) the unmitigated ground risk of the operation taking into account the type of operation and the conditions under which the operation takes place, including at least the following criteria:

i. VLOS or BVLOS;

ii. population density of the overflown areas;

iii. flying over an assembly of people;

iv. the dimension characteristics of the unmanned aircraft;

(b) the unmitigated air risk of the operation taking into account all of the below:

i. the exact airspace volume where the operation will take place, extended by a volume of airspace necessary for contingency procedures;

ii. the class of the airspace;

iii. the impact on other air traffic and air traffic management (ATM) and in particular:

— the altitude of the operation;

— controlled versus uncontrolled airspace;

— aerodrome versus non-aerodrome environment;

— airspace over urban versus rural environment;

— separation from other traffic.

5. The identification of the possible mitigation measures necessary to meet the proposed target level of safety shall consider the following possibilities:

(a) containment measures for people on the ground;

(b) strategic operational limitations to the UAS operation, in particular:

i. restricting the geographical volumes where the operation takes place;

ii. restricting the duration or schedule of the time slot in which the operation takes place;

(c) strategic mitigation by flight rules or airspace structure and services;

(d) capability to cope with possible adverse operating conditions;

(e) organisation factors such as operational and maintenance procedures elaborated by the UAS operator and maintenance procedures compliant with the manufacturer’s user manual;

(f) the level of competency and expertise of the personnel involved in the safety of the flight;

(g) the risk of human error in the application of the operational procedures;

(h) the design features and performance of the UAS in particular:

i. the availability of means to mitigate risks of collision;

ii. the availability of systems limiting the energy at impact or the frangibility of the unmanned aircraft;

iii. the design of the UAS to recognised standards and the fail-safe design.

6. The robustness of the proposed mitigating measures shall be assessed in order to determine whether they are commensurate with the safety objectives and risks of the intended operation, particularly to make sure that every stage of the operation is safe.

AMC1 to Article 11 Conducting a UK Specific Operation Risk Assessment (UK SORA)

CAA ORS9 Decision No. 46

UK UAS regulatory requirements

1. Introduction

1.1 The UK SORA methodology has been adapted from the Joint Authorities for Rulemaking on Unmanned Systems (JARUS) SORA version 2.5 to enable UAS operators to comply with the requirements for conducting an operational risk assessment, as set out in Article 11 of Assimilated UK Regulation (EU) 2019/947. A full list of JARUS publications can be found here.

The UK SORA methodology is one acceptable means of compliance with Article 11 of UK Regulation (EU) 2019/947. This may include describing the technical features of the UAS by relying on a UAS configuration that has been granted a SAIL Mark certificate by the CAA, or by reference to the UK SORA requirements in so far as they apply to a specific UAS.

An Operational Authorisation is granted by the CAA on the basis of its evaluation of the OA Applicant's risk assessment.

Operations out of scope for UK SORA

1.2 UK SORA may not be used for the following types of operation:

(a) Operations outside the regulatory limitations of the Specific Category, such as;

(1) conducted over assemblies of people with a UA that has a characteristic dimension of 3m or more;

(2) carrying people;

(3) carrying dangerous goods that may result in high risk for third parties in the event of an accident

(b) Operations outside the policy limits of the UK SORA, such as;

(1) operating unmanned aircraft with a dimension larger than 40 meters

(2) operating unmanned aircraft with a maximum cruise speed above 200 meters per second

(3) operations above Flight Level 660.

(4) using unmanned aircraft with a maximum dimension of more than 3 metres or maximum speed over 35 metres per second, where the population density is greater than 50,000 people per km2

(c) Some operations require additional applications, outside the SORA, or may require the use of policy that has not yet been released. Please contact the CAA via uksora@caa.co.uk before starting an application, if this applies to your operation. This includes;

(1) Multiple Simultaneous Operations

(2) Operations that require an airspace change

(3) Operations involving the carriage of Dangerous Goods (where this can be achieved in the Specific Category)

1.3 Before starting the UK SORA process the applicant should consider if any of the above criteria apply to the proposed operation. If the answer is yes, then the UK SORA process may not be used for the application.

1.4 If UK SORA may not be used, the applicant should contact the CAA regarding alternative options via uksora@caa.co.uk.

Multiple location applications

1.5 For operations conducted under Visual Line of Sight (VLOS), UK SORA may be used to conduct a risk assessment for operations conducted at multiple locations. The applicant **must** demonstrate that the UK SORA requirements will be met for all flights performed under the operational authorisation. If an applicant can demonstrate they have sufficient procedures in place to correctly identify operational volumes, buffers, adjacent areas, and characterise airspace, a generic location authorisation may be issued by the CAA.

1.6 For operations conducted under Beyond Visual Line of Sight (BVLOS), UK SORA may be used to conduct a risk assessment for operations conducted at multiple locations. The applicant **must** demonstrate that the UK SORA requirements will be met for all flights performed under the operational authorisation. The operational authorisation will detail the specific operational volumes and buffers authorised, which **must** be included in the operation details during the application. The operator **must not** define their own operational volumes, buffers, adjacent areas, or characterise airspace without approval from the CAA.

1.7 The CAA may limit the number of locations or specific locations when assessing an application for the purpose of effective safety management, impact on air traffic, or excessive application time or cost.

The UK SORA process

Managing risk using SORA

1.8 The categories of harm considered in UK SORA are the potential for:

(i) fatal injuries to third parties on the ground;

(ii) fatal injuries to first parties in the air.

1.9 As the UK SORA only addresses safety risk, it is acknowledged that the CAA, when appropriate, may also consider additional categories of harm (e.g. privacy, disruption of a community, environmental damage, financial loss, etc.). Other regulations account for the additional categories.

Target level of safety (TLOS)

1.10 The UK SORA uses a holistic safety risk management process to evaluate the risks related to a given operation and then provide proportionate requirements that an operation should meet to ensure a Target Level of Safety (TLOS) is met.

1.11 This TLOS is defined for people and aircraft uninvolved in the operation and is commensurate with existing manned aviation levels of safety to these same stakeholders. These values were chosen by JARUS to ensure that UAS operations would not pose more risk to third parties than manned aviation which are seen as socially acceptable rates (see Section 5(f) in the Scoping Paper to AMC RPAS 1309 Issue 2 and Section 1.2.1 in JARUS SORA Annex F version 2.5). The specific TLOS figures are also summarised in the JARUS SORA Main Body 2.5.

1.12 The UK CAA is working with JARUS to provide updated accident data and to validate the underlying assumptions contained within Scoping Paper to AMC RPAS 1309 Issue 2. In addition, the CAA is conducting a broader analysis of quantitative methods for risk assessments including the future publication of TLOS figures for UAS operations.

1.13 At the time of publication, an application using the UK SORA methodology shall be assumed to meet the JARUS SORA 2.5 TLOS and therefore compliant with UK Regulation (EU) 2019/947 on rules and procedures for the operation of unmanned aircraft article 11 Rules for conducting an operational risk assessment (3). The assessment shall propose a target level of safety, which shall be equivalent to the safety level in manned aviation, in view of the specific characteristics of UAS operation.

Semantic model in the context of UK SORA

1.14 UK SORA uses a semantic model with standardised terminology for phases of operation, procedures, and operational volumes.

Figure 1 – UK SORA Semantic Model

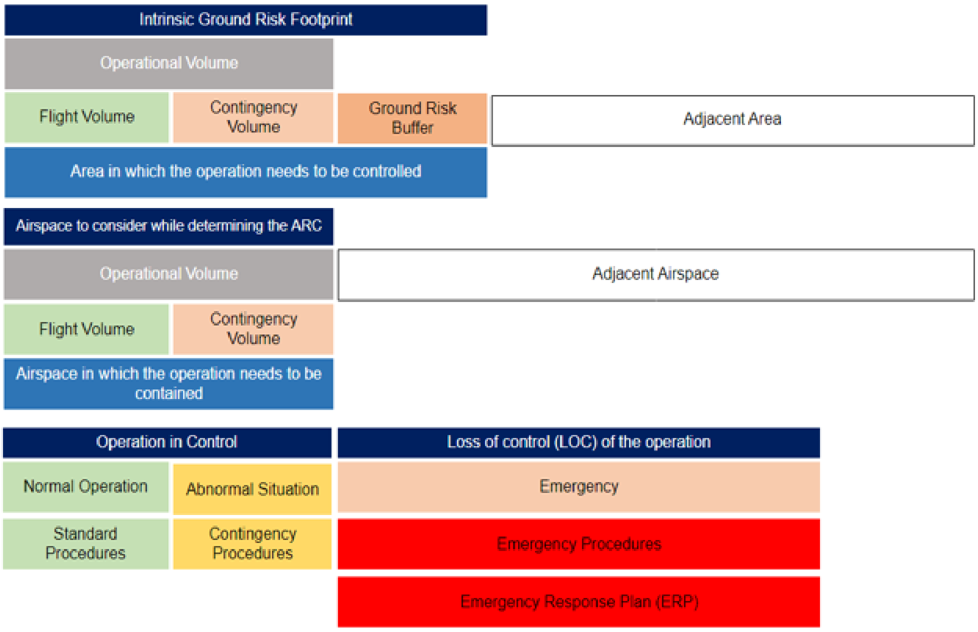
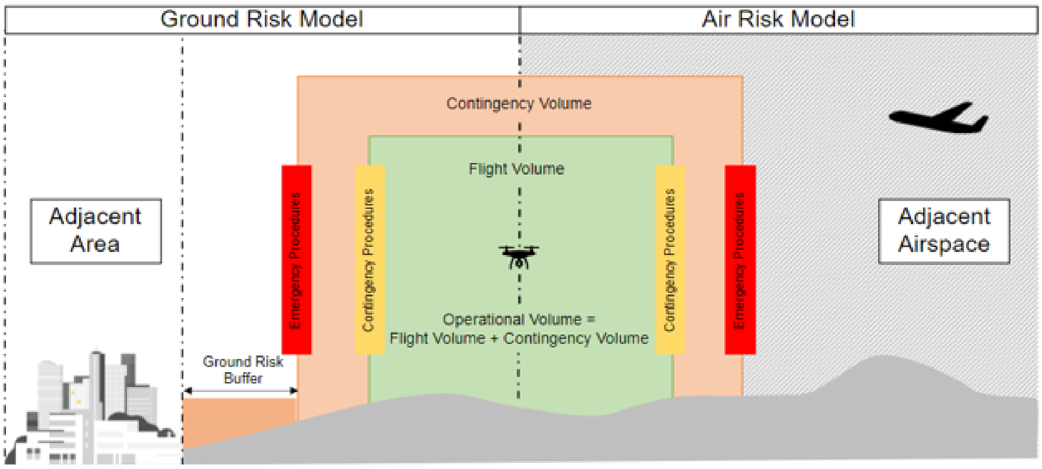


Figure 2 - The Operational Volume



Operation Control States

1.15 The UK SORA considers an operation to be in either a state of control, or a state of loss of control.

The operational volume

1.16 The operational volume is made up of the flight volume and the contingency volume and should be provided in latitude and longitude as either a centre point with radius, or multi point polygon. Vertical extent should be given in height above ground or altitude above sea level.

The flight volume

1.17 For normal operations, the UA **must** only operate inside the flight volume using standard operating procedures.

1.18 Depending on the type of operation, the flight volume may be defined as a flight corridor for each planned trajectory, a larger volume to allow for a multitude of similar flights with changing flight paths, or a set of different flight volumes fulfilling specific conditions.

1.19 The flight volume should be sufficiently large for the planned operation. Whenever a particular flight requires the UA to traverse or loiter/hold at a specific point of interest, this point **must** be included inside the flight volume.

The contingency volume

1.20 The contingency volume surrounds the flight volume. The outer limit of the contingency volume is equivalent to the outer limit of the operational volume.

1.21 Entry into the contingency volume is always considered an abnormal situation and requires the execution of appropriate contingency procedures to return the UA to the flight volume.

1.22 An abnormal situation may also occur inside the flight volume.

The ground risk buffer

1.23 The ground risk buffer is an area on the ground that surrounds the footprint of the contingency volume.

1.24 If the UA exits the contingency volume during a loss of control of the operation, it should end its flight within the ground risk buffer.

1.25 The size of the ground risk buffer is based on the individual risk of an operation and is driven by the flight characteristics of the UA and the containment requirements. Refer to JARUS SORA 2.5 Annex A for further guidance.

The adjacent area

1.26 The adjacent area represents the ground area where it is reasonably expected a UA may crash after a loss of control situation.

1.27 The adjacent area is calculated starting from the outer limit of the operational volume.

1.28 The size of the adjacent area depends on the UA performance.

The adjacent airspace

1.29 The adjacent airspace is the airspace where it is reasonably expected that an unmanned aircraft may fly after a loss of control.

States of operation

Operation in control

1.30 An operation is considered in control when the remote crew can continue the management of the current flight situation, such that no persons on the ground or in the air are endangered. This remains true for both normal and abnormal situations. However, the safety margins in the abnormal situation are reduced.

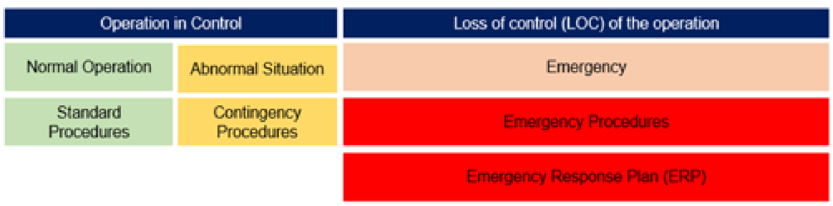
1.31 There are two states of operation in control:

(i) **Normal operation** utilise standard operating procedures (SOP), which are a set of operating instructions covering policies, procedures, and responsibilities set out by the applicant.

(ii) **Abnormal situation** is an undesired state where it is no longer possible to continue the flight using SOPs. However, third parties on the ground or in the air are not in immediate danger. In this case contingency procedures **must** be applied to prevent a loss of control or excursion from the operational volume.

1.32 In an abnormal situation, the remote crew **must** attempt to return the operation back into the controlled state by executing contingency procedures as soon as practicable.

Figure 3 - States of operation



Abnormal Situation

Contingency procedures

1.33 Contingency procedures are designed to prevent a loss of control that has an increased likelihood of occurring due to the current abnormal situation. These procedures should return the operation to a controlled state and the use of SOP's or allow the safe termination of the flight.

1.34 Contingency procedures **must** be activated as soon as the UA deviates from its intended flight path, or behaves abnormally, to prevent it leaving the operational volume.

1.35 If contingency procedures cannot rectify the abnormal situation, or the UA approaches the outer edge of the contingency volume, emergency procedures **must** be applied to safely terminate the flight.

Loss of control (LOC) of the operation

1.36 A Loss of Control (LOC) typically has the following characteristics:

(i) It could not be handled by a contingency procedure; or

(ii) Any occurrence where the safety of the aircraft, operator, other airspace users or members of the public is compromised or reduced to a level whereby potential for harm or damage is likely to occur (or only prevented through luck).

1.37 This includes situations where a UA has exited the operational volume and is potentially operating over or in an area of ground or air risk for which the UAS operator is not authorised.

1.38 The LOC state is also entered if a UA does not follow the authorised route and the remote pilot is unable to control it, an automatic failsafe is initiated, or the Flight Termination System (FTS) is activated, even if this happens inside the operational volume.

Emergency procedures

1.39 Emergency procedures **must** be executed whenever a LOC state is entered, even if it is within the operating volume. They **must** be executed by the remote crew and may be supported by automated features of the UAS (or vice versa) and are intended to mitigate the effect of failures that cause or could lead to an unsafe outcome.

1.40 Regardless of other actions and responses by the flight crew, the emergency procedures **must** always be executed before crossing the outer edge of the contingency volume, which would otherwise result in an operational volume excursion.

Emergency Response Plan (ERP)

1.41 The ERP is used for coordinating all activities needed to respond to incidents and accidents. It is different from emergency procedures, as it does not deal with LOC but actions to be taken afterwards.

Containment

1.42 Containment consists of technical and operational mitigations that are intended to contain the flight of the UA within the defined operational volume and ground risk buffer to reduce the likelihood of a LOC resulting in an operational volume excursion.

Robustness

1.43 Robustness is the term used to describe the combination of two key characteristics of a risk mitigation or operational safety objective:

(i) the level of integrity (LOI) i.e., how good the mitigation/objective is at reducing risk.

(ii) the level of assurance (LOA) i.e., the degree of certainty with which the level of integrity is ensured.

1.44 The compliance evidence used to substantiate the level of integrity and assurance of an application are detailed in the Annexes B, C, D, and E. These annexes contain AMC, GM, or reference to industry standards and practices, where accepted by the CAA.

1.45 Table 1 provides guidance to determine the level of robustness based on the level of integrity and the level of assurance.

Table 1 - Robustness Levels

Integrity	Low Assurance	Medium Assurance	High Assurance
Low integrity	Low robustness	Low robustness	Low robustness
Medium integrity	Low robustness	Medium robustness	Medium robustness
High integrity	Low robustness	Medium robustness	High robustness

1.46 The applicant **must** provide a compliance approach and compliance evidence for mitigations and OSOs based on the SAIL level.

1.47 The CAA will assess the approach and evidence. For some requirements, the CAA may decide that a declaration of compliance is acceptable.

1.48 Applicants should refer to Annex A for a description of the difference between compliance approach and compliance evidence.

Roles, responsibilities, and definitions

General definitions relating to the UK SORA can be found in CAP 722D. Some specific definitions are included below.

The use of the word ‘must’ in the context of AMC/GM to Article 11, indicates a condition that an applicant or operator is required to comply with in order carry out an Article 11 risk assessment using the UK SORA methodology.

‘Should’ indicates a strong recommendation: while the applicant or operator is not required to comply with the recommendation to rely on UK SORA, the CAA would expect it to have regard to the recommendation and provide clear and rational justification for not following it.

‘May’ indicates discretion.

‘Must not’ indicates prohibition

Applicant

1.49 The applicant is the individual or organisation applying for an operational authorisation. The applicant **must** substantiate the safety of the operation by completing the UK SORA. Compliance evidence for the assessment may be provided by third parties (e.g., the designer of the UAS or equipment, UTM service providers, etc.).

Operator

1.50 The operator is an applicant that has obtained an operational authorisation from the CAA. The authorisation allows the operator to perform a series of flights, if they are performed in accordance with the scope and limitations of the operational authorisation, based on the UK SORA compliance demonstration. The responsibilities of the operator are described in UK Reg (EU) 947/2019 UAS.SPEC.050 - Responsibilities of the UAS operator.

Designer

1.51 The legal person or design and production organisation responsible for the development and manufacture of a UAS.

Air navigation service provider (ANSP)

1.52 The ANSP is the designated provider of air traffic service in a specific area of operation (airspace). The ANSP assesses and/or should be consulted whether the proposed operation may be safely conducted in the particular airspace that they cover. Whether an ANSP approval would be required may depend on whether the particular operation may be considered as being compliant with the rules of the air or should be managed as a contained hazard.

UTM service provider

1.53 UTM service providers are entities that provide services to support safe and efficient use of airspace.

Airspace managers

1.54 The Special Use Airspace (SUA) Authority is responsible for ensuring that appropriate processes and procedures exist to ensure the safe and efficient management and operation of the SUA it is responsible for. Where SUA affects IFR flight planning it should be managed by an Airspace Management Cell (AMC) and referred to as an AMC Managed Area (AMA).

Remote pilot in command and flight crew

1.55 The responsibilities of a remote pilot and crew are defined in UK Regulation (EU) 2019/947, UAS.SPEC.060 Responsibilities of the remote pilot. The definition of Remote Pilot can be found in UK Regulation (EU) 2018/1139 (The Basic Regulation) Article 3(31).

Maintenance staff

1.56 Ground personnel in charge of maintaining the UAS before and after flight in accordance with UAS maintenance instructions.

UK SORA application phases

1.57 The UK SORA application process is divided into two broad phases: the final SAIL assessment phase 1, and the compliance evidence assessment phase 2. The table below describes the individual steps per phase of the application process.

Table 2 - UK SORA Application Phases

Phase Number	Step Number	Step Description
1	1	Login to the UK SORA application service
1	2	Determine the intrinsic Ground Risk Class (iGRC)
1	3	Apply strategic ground risk mitigations (Optional)
1	4	Determine the initial air risk class (ARC)
1	5	Apply strategic air risk mitigations (Optional)
1	6	Initial SAIL determination
1	7	Complete the operation details and provide compliance approach and evidence for mitigations
1	8	Phase 1 payment and CAA assessment
1	9	Final SAIL decision
2	10	Provide OSO compliance evidence
2	11	Provide containment compliance evidence
2	12	Provide Tactical mitigation performance requirement (TMPR) compliance evidence
2	13	Phase 2 payment and CAA assessment
2	14	Operational authorisation decision

Step 1 Login to the UK SORA application service

1.58 In Step 1, applicants **must** login to the UK SORA application service using their operator ID.

Step 2 Determination of the intrinsic Ground Risk Class (iGRC)

1.59 The applicant **must** determine the intrinsic ground risk class (iGRC). The applicant **must** consider the following when determining the information to be entered into the application:

(i) Determine the maximum characteristic dimension and the maximum possible speed of the UA in accordance with the manufacturer data.

(ii) Identify the iGRC footprint by completing the following 3 tasks:

(1) Identify the flight volume.

(2) Calculate the contingency volume.

(3) Calculate the initial ground risk buffer.

(iii) Identify the maximum population density within the iGRC footprint.

(iv) Identify the iGRC of the footprint using Table 3 for the UA.

1.60 The final ground risk buffer calculation will be completed as part of the Containment step.

Determining the UA characteristics

1.61 To establish the characteristics of the UA, the applicant **must** consider the following:

(i) **Dimension**: Define the maximum size of the UA by its wingspan for fixed-wing aircraft, or maximum distance between blade tips for rotorcraft.

(ii) **Maximum Speed**: This is defined as the maximum possible airspeed the UA may achieve, as specified by its Designer. It is important to note that this refers to the potential maximum speed, not the maximum speed of the proposed operation. Mitigations that reduce speed during an impact are detailed separately in Annex B.

Determination of the iGRC

1.62 Table 3 shows how the iGRC is determined.

Table 3 - iGRC Determination

Maximum population density	Maximum UA characteristic dimension or maximum speed				
	1 meter or 25m/s	3 meters or 35m/s	8 meters or 75m/s	20 meters or 120m/s	40 meters or 200m/s
Controlled Ground Area	iGRC 1	iGRC 1	iGRC 2	iGRC 3	iGRC 3
5 people/km^2	iGRC 2	iGRC 3	iGRC 4	iGRC 5	iGRC 6
50 people/km^2	iGRC 3	iGRC 4	iGRC 5	iGRC 6	iGRC 7
500 people/km^2	iGRC 4	iGRC 5	iGRC 6	iGRC 7	iGRC 8
5,000 people/km^2	iGRC 5	iGRC 6	iGRC 7	iGRC 8	iGRC 9
50,000 people/km^2	iGRC 6	iGRC 7	iGRC 8	iGRC 9	iGRC 10
>50,000 people/km^2	iGRC 7	iGRC 8	n/a	n/a	n/a

1.63 A UA weighing less than or equal to 250g and having a maximum speed less than or equal to 25 m/s is considered to have an iGRC of 1 regardless of population density.

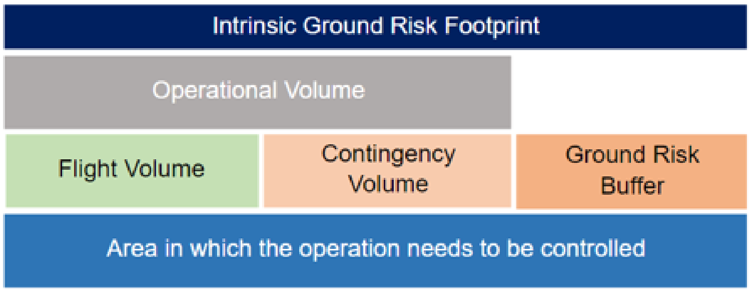
1.64 A UA expected to not penetrate a standard dwelling will get a -1 GRC reduction in Step 3 from the M1(A) sheltering mitigation when not overflying large open-air assemblies of people. See Annex B for additional details.

1.65 Operations that do not have a corresponding iGRC (i.e., grey coloured cells in table 3) are outside the scope of the UK SORA methodology. If UK SORA may not be used, the applicant should contact the CAA regarding the options available.

iGRC footprint

1.66 The applicant **must** define the ground area at risk for the specific operation, termed the iGRC footprint. The calculation should account for the UA's ability to maintain its position in four dimensions (latitude, longitude, height, and time). Factors such as navigation precision, flight technical errors, mapping inaccuracies, and system latencies **must** be considered.

Figure 4 - iGRC Footprint



1.67 The maximum population density within the iGRC **must** be used by the applicant.

Qualitative Ground Risk Determination

1.68 If population density values are not available, not accurate, or an applicant would rather use qualitative descriptors for the iGRC table, the following approximations may be used as guidance:

Qualitative ground risk

Controlled areas and/or extremely remote places

1.69 Maximum Population Value (people/km^2) = 0

1.70 Descriptor: Areas where unauthorised people are not allowed to enter and/or hard to reach areas, where it is reasonably expected that no one will be present:

- Areas of land without public access
- Large bodies of water away from commercial, industrial or recreational users

Areas where a few people may be present

1.71 Maximum Population Value (people/km^2) = 5

1.72 Descriptor: Unpopulated areas with public right of way access by road, cycle path, footpath, bridleway, canal, etc., and/or habited rural areas smaller than a hamlet, and/or bodies of water away from commercial, industrial, or recreational users:

- Forests
- Moorland and heathland

- Large areas of farmland
- Solitary dwellings
- Remote recreational areas

Sparsely populated areas

1.73 Maximum Population Value (people/km^2) = 50

1.74 Descriptor: Sparsely populated residential, commercial, industrial and recreational areas with large areas of land, and/or bodies of water close to residential, commercial, industrial or recreational areas:

- Hamlets
- Clusters of small farms
- Residential areas with very large plots of land
- Small industrial and commercial areas
- Small recreational areas
- Small marinas and boat moorings

Lightly populated areas

1.75 Maximum Population Value (people/km^2) = 500

1.76 Descriptor: Lightly populated residential, commercial and industrial areas with large areas of land, and/or bodies of water within lightly used commercial, industrial and/or recreational areas:

- Villages
- Medium sized industrial and commercial areas
- Medium sized recreational areas
- Small campsites
- Small tourist attractions
- Large marinas

Moderately populated areas

1.77 Maximum Population Value (people/km^2) = 5000

1.78 Descriptor: Moderately populated residential, commercial and industrial areas with moderate areas of land, and/or bodies of water within moderately used commercial, industrial and/or recreational areas. May contain multistorey buildings, but generally most should be low rise:

- Towns
- Residential homes on small plots
- Small blocks of flats and/or apartment complexes
- Large industrial and commercial areas
- Large recreational areas
- Large campsites
- Large/popular tourist attractions
- Harbours and ports

Heavily populated areas

1.79 Maximum Population Value (people/km^2) = 50,000

1.80 Descriptor: Heavily populated residential, commercial and industrial areas with small areas of land, or bodies of water within heavily used commercial, industrial or recreational areas. Urban areas mainly consist of large multistorey buildings. Organised assemblies of people:

- Cities
- Large blocks of flats and/or apartment complexes
- Large office blocks
- Small and medium sized festivals
- Small and medium sized shows and exhibitions
- Small and medium sized sporting events
- Ports with cruise ship docking areas.

Heavily populated areas

1.81 Maximum Population Value (people/km^2) more than 50,000

1.82 Descriptor: Densest populated residential, commercial and industrial areas consisting mainly of tall multi storey buildings or popular events with large assemblies of people:

- City Centres
- Areas of dense high-rise buildings
- Large/popular festivals
- Large/popular shows and exhibitions
- Large/popular sporting events

Ground risk buffer

1.83 The applicant **must** define a ground risk buffer that includes an initial calculation and outcome. Refer to JARUS SORA 2.5 Annex A for further guidance. An appropriate initial ground risk buffer could be defined:

(i) With a 1-to-1 principle, (UA height AGL ≤ distance away from uninvolved people); or

(ii) A different ground risk buffer value may be proposed using the principles outlined in Annex E, Containment.

1.84 The initial ground risk buffer will normally be the same as the final ground risk buffer. However, if appropriately robust strategic mitigations are employed, there are cases where the final ground risk buffer may be different than the initial one. These could include:

(i) Using a medium or high level of containment.

(ii) Use of ground risk mitigations, such as a parachute.

Controlled ground areas

1.85 A controlled ground area is defined as an area that **must** only contain involved persons.

1.86 Controlled ground areas may be used to strategically mitigate the ground risk. The area that **must** be controlled is the iGRC footprint. Assurance that there will be no uninvolved persons in the iGRC footprint is the responsibility of the operator.

Non-typical cases

1.87 There are certain cases, for example aircraft whose maximum characteristic dimension and maximum speed differ significantly from the selected column, which may have a large effect on the iGRC. This may not be well represented in the iGRC table and lead to an increase or decrease in iGRC. See JARUS SORA Annex F Section 1.8 for further guidance.

1.88 The applicant may consider that the iGRC is too conservative for their UA. Therefore, an applicant may decide to calculate the iGRC by applying the mathematical model defined in JARUS SORA 2.5 Annex F Section 1.8. The operator should choose the column that matches their risk as identified in JARUS SORA 2.5 Annex F Table 33.

Population density information

1.89 Determining the population density to calculate the iGRC in Step 2 should be done using maps with appropriate grid size based on the operation. See Population density data sources for further guidance.

1.90 If there are no acceptable population density maps available, or if designated by the CAA, the qualitative population density descriptors (see Table 3) may be used to estimate the population density band in the operational volume and ground risk buffer. Alternatively, the authority may require or permit applicants to provide appropriate population density maps. Table 4 below presents the suggested optimal grid size for different maximum operating heights.

Table 4 - Suggested grid size for authoritative maps

Max. Height (AGL) in Feet	Max. Height (AGL) in Metres	Suggested Optimal Grid Size (metre x metre)
500	152	> 200 x 200
1,000	305	> 400 x 400
2,500	762	> 1,000 x 1,000
5,000	1,524	> 2,000 x 2,000
10,000	3,048	> 4,000 x 4,000
20,000	6,096	> 5,000 x 5,000
60,000	18,288	> 10,000 x 10,000

Population density data sources

1.92 The following population density data sources may be used when determining the iGRC:

(i) ONS Census Data https://www.ons.gov.uk/census/maps/

(ii) ESA Copernicus Data https://www.esa.int/Applications/Observing_the_Earth/Copernicus

(iii) Survey data collected by the applicant.

(iv) Other resources may be used, subject to the applicant verifying the accuracy of the data and evidencing their data verification process.

Step 3 Final Ground Risk Class (GRC) determination

1.91 This step is only required if the applicant is planning to reduce their iGRC with strategic mitigations.

1.92 Acceptable mitigations may reduce the intrinsic risk of an uninvolved person being struck by a UA during a LOC. An applicant that wishes to reduce their iGRC **must** identify and apply suitable ground risk mitigations. Annex B contains further guidance on how to complete this step.

Ground Risk Mitigations

1.93 The applicant should identify the applicable mitigations listed in Table 5 that could lower the iGRC of the iGRC footprint. All mitigations **must** be applied in numerical sequence.

Table 5 - Strategic Ground Risk Mitigations

Ref	Mitigation	Low Robustness	Medium Robustness	High Robustness
M1A	Strategic mitigation - Sheltering	-1	-2	N/A
M1B	Strategic mitigations - Operational restrictions	N/A	-1	-2
M1C	Tactical mitigations - Ground observation	-1	N/A	N/A
M2	Effects of UA impact dynamics are reduced	N/A	-1	-2

1.94 In case a mitigation that affects the UA aerodynamics is used, assess if the size of the ground risk buffer is still valid.

Application of Ground Risk Mitigations

1.95 The mitigations used to modify the iGRC have a direct effect on the safety objectives associated with an operation, and therefore it is important to ensure their robustness. This is particularly relevant for technical mitigations (e.g., parachute), where limitations to the robustness and effectiveness of mitigations **must** be considered.

1.96 The Final GRC determination is based on the availability and correct application of the mitigations. Table 5 provides a list of potential mitigations and the associated relative correction factor. All mitigations **must** be applied in numeric sequence to perform the assessment i.e. M1(A), M1(B), M1(C), M2. Annex B provides additional details on the robustness requirements for each mitigation.

1.97 When applying all the M1 mitigations, the final GRC may not be reduced to a value lower than the lowest value in the applicable column in Table 5. This is because it is not possible to reduce the number of people at risk below that of a controlled ground area.

1.98 In case the mitigation influences the aerodynamics of the UA, for example by using a parachute, the ground risk buffer size should be redefined using correct assumptions including the effects of the mitigation means.

1.99 If the final GRC is higher than 7, the operation is considered to have more risk than the UK SORA is designed to support. The applicant should contact the CAA regarding the options available, such as using the Certified category as defined in Article 6 of UK Regulation (EU) 2019/947.

Step 4 Determination of the initial Air Risk Class (ARC)

1.100 In this step, the applicant **must** assess the initial Air Risk Class (ARC) of the operational volume. The initial ARC is a qualitative classification that describes the general collision risk associated with UAS operations before any strategic mitigations are applied.

1.101 The UK SORA Air Risk Model currently only considers encounters between UA and crewed aircraft. A Mid Air Collision (MAC) event between an UA and a crewed aircraft is always assumed to be catastrophic. Additionally, the ability of a crewed aircraft to remain well clear or to avoid collisions with the UA is not directly considered at present.

1.102 The Air Risk model applies to all categories of UAS and all classes of airspace. While the UK SORA methodology is intended to be used to assess UAS operations within the 'specific' category, the risk assessment process also allows identification of operations that belong within the 'certified' category, and / or where certified components may be required within the 'specific' category.

General - Aviation conflict management and BVLOS scalability

1.103 Conflict management within the existing global aviation system is premised on cockpit-based pilot see-and-avoid supporting elements of both layer two and three of the following three-layer system:

(i) Layer 1: Strategic conflict management – Airspace design, demand & capacity balancing, traffic synchronisation. 'Strategic' is used here to mean 'in advance of tactical'. The objective of this layer is to minimise the need to apply the second layer.

(ii) Layer 2: Separation provision – This is a tactical (in-flight) process where the pilot **must** ensure that the aircraft is not operated in such proximity to other aircraft as to create a collision hazard. Typically, this is achieved via cockpit-based see-and-avoid but may be supplemented through the application of separation minima or provision of collision hazard information by an ATM service, dependent upon the airspace classification and flight rules followed.

(iii) Layer 3: Collision avoidance – Required when the separation mode has been compromised, this layer is predominately based on cockpit view pilot 'see & avoid', although for some categories of aircraft, and in some categories of airspace, this may be augmented by systems such as Traffic Collision Avoidance System (TCAS).

1.104 For UAS operations BVLOS of the remote pilot and outside of segregated airspace, a Detect and Avoid (DAA) capability is therefore required to replace the pilot see-and-avoid responsibilities. DAA is defined within the ICAO RPAS Manual Doc 10019 as providing "the capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action". The DAA system therefore enables the Remote Pilot (RP) to exercise their responsibilities with regard to other aircraft, as required within the standardised rules of the air.

1.105 Within their RPAS Concept of Operations (CONOP) for International IFR, ICAO also define the following:

(i) Accommodation – Where UAS may operate along with some level of adaptation or support that compensates for its inability to comply within existing operational constructs.

(ii) Integration – Where UAS enter airspace system routinely without requiring special provisions.

1.106 DAA, as defined above, is therefore a critical enabler for BVLOS UAS operations and the safe integration of UAS into the wider airspace environment. Where the DAA capability is not able to fully replicate the pilot cockpit see-and-avoid capability then accommodation is still possible, with the required ruleset and procedures dependent on the capability of the DAA system.

1.107 The scalability of the BVLOS solution may then be defined by the restrictions imposed on other air users for the accommodation of UAS operations. Such restrictions may include:

(i) Loss of airspace access, e.g., segregation of UA from all other air users.

(ii) Mandatory equipment carriage, e.g., Electronic Conspicuity (EC).

(iii) Air traffic management procedures, e.g., a separation or deconfliction service to structure traffic within the airspace.

(iv) Air traffic density restrictions, e.g., to enable large separation distances.

(v) Air traffic speed / size restrictions, e.g., low speed light aircraft only.

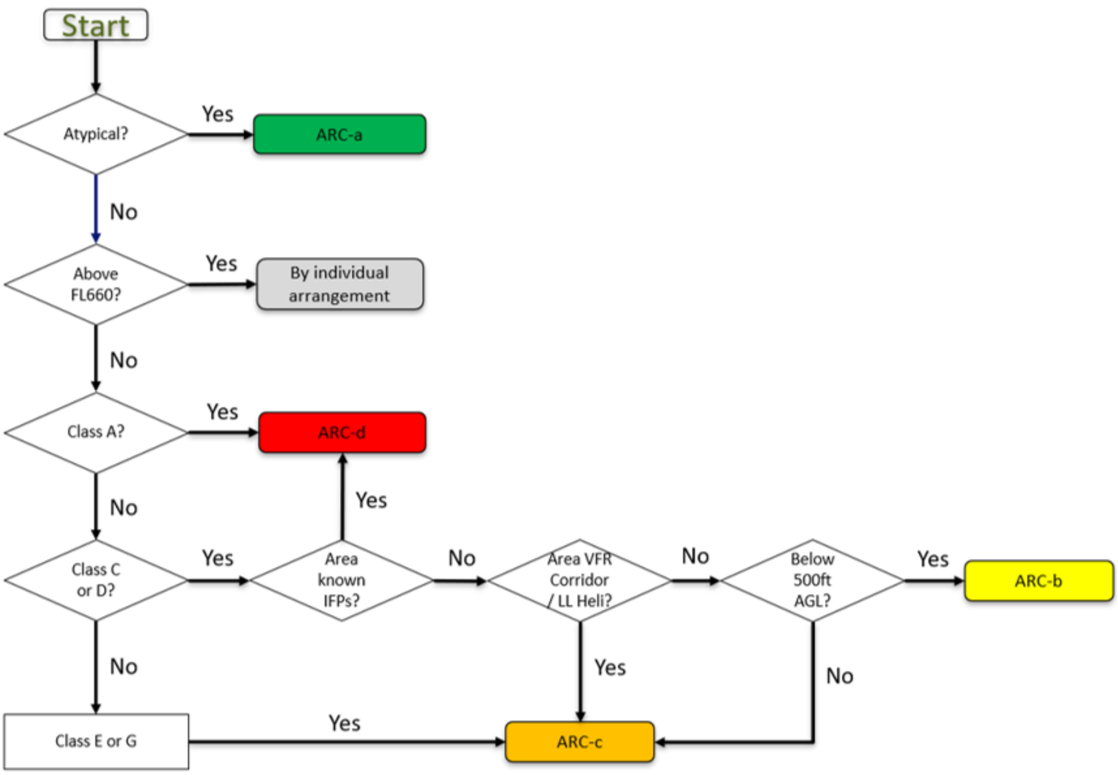
1.108 The requirement for such restrictions, and hence the scalability of the BVLOS solution, is determined largely by the assured performance capability of the UAS DAA system.

Quantitative air risk flow chart

1.109 Figure 5 is the underlying air risk characterisation flow chart describing the UK SORA air risk model characterisation process.

1.110 The UK SORA application service guides applicants through the characterisation process.

Figure 5 - Quantitative Air Risk Flowchart



Encounter Types

1.111 Encounters with two distinct types of flight operations are considered:

(i) Type-1: Operations primarily conducted under self-separation and see-and-avoid (primarily in uncontrolled airspace).

(ii) Type-2: Operations that occur with separation provided by an Air Navigation Service Provider (ANSP) (primarily in controlled airspace).

1.112 Encounters between UA and both Type-1 and Type-2 flight operations are considered, where an encounter is defined as an event associated with the presence of an intruder aircraft. An encounter is simply a measure of when the proximity of two aircraft becomes such that the operation of the UA may be impacted, and the UA may be required to take action to reduce the risk of a MAC, or where a simulation or timeline may start.

1.113 When considering an encounter, its definition must be large enough to include anything which may influence the tactical mitigations of the UA, but not so large that it considers the impact of factors which clearly have no material impact on the operation, such as flights several hundred miles away.

Air Risk Classifications (ARC)

1.114 There are four levels of ARC:

(i) ARC-a (minimal risk);

(ii) ARC-b (Low risk);

(iii) ARC-c (Medium risk); and

(iv) ARC-d (High risk).

1.115 The UK-specific flowchart focusses primarily on encounter types, the airspace ruleset and whether the air environment is either recognised or contains known traffic. The initial ARC assignment has a limited emphasis on encounter rates, which are difficult to predict in a generalised model and are considered primarily via strategic mitigations. Key elements within the flowchart and initial ARC assignment are below:

1.116 **Atypical** – An Atypical Air Environment (AAE) is not a separate classification of airspace, and it may exist within any classification of airspace. Broadly, it may be considered to be a volume of airspace in which it may be reasonably anticipated that there is likely to be an 'improbable encounter rate' with crewed air traffic due to the proximity of certain ground infrastructure, rendering it hazardous for most traditional forms of aviation.

The following examples of what may be considered an AAE should be used as a guide:

(i) Within 100ft / 30.5m of any building or structure.

(ii) Within 50ft of a permanent, above ground level, linear structure. For example, a railway, road, or powerline.

(iii) Within the confines of private property at a height not exceeding 50ft. For example, an industrial site where security personnel use a UA for perimeter inspection.

1.117 CAP 3040 contains further guidance on characterising Atypical Air Environments.

1.118 Above FL660 – Within the UK this region may contain several different types of aircraft, including crewed military, experimental crewed, High Altitude Long Endurance (HALE) UAS, space launch, civil faster than sound, high-altitude balloons, etc. Therefore, this region may not be treated as segregated without further consideration and potentially mitigation. Note that special consideration will also be required for ingress to / egress from the operating volume, as well as contingency management due to potential risk to aircraft within airspace below the potential operating area.

1.119 **Class A** – This class of airspace provides the highest level of control and is only available to Instrument Flight Rules (IFR) traffic. Air Traffic Control (ATC) clearance and continuous air-ground voice communication is required, and all traffic is under an Air Navigation Service Provider (ANSP) provided separation service. Encountered traffic is expected to be predominately (but not exclusively) large commercial transport, and within the initial ARC flowchart exclusively meets the Type-2 encounter definition. The highest severity consequences lead to the highest safety standard; therefore, an initial ARC-d assignment is appropriate.

1.120 **Class C or D** – These classes are grouped together as they both allow IFR and Visual Flight Rules (VFR) traffic and follow a similar standard ruleset, where flights are subject to ATC clearance and all traffic is provided with an air traffic control service. In ‘Area of known IFPs’ (See definition below) the aircraft will be predominantly (but not exclusively) large commercial air transport, flying under IFR with a separation service and therefore encounter Type-2 will be appropriate, which dictates initial ARC-d. Outside of this known area, the general risk is from smaller GA aircraft flying under VFR with self-separation through see-and-avoid and therefore encounter Type-1 will be appropriate, which dictates initial ARC-c. The exception is in Class D below 500ft where the traffic is known, cooperative and flies below 500ft by exception (and with ATC knowledge), where the ability to predict a lower encounter rate in this environment allows a lower initial ARC-b characterisation. For example, a crewed aircraft is conspicuous, identified and provided with specific traffic information for a VFR transit within Class D airspace. A clearance to transit ‘not above 1500ft’ is given due to IFR traffic above and ATC request that the crewed aircraft report if descending below 500ft for any reason (landing, forced down by weather etc). Both the UAS and crewed aircraft are in receipt of specific traffic information and will be aware of the others relative position (where necessary) and as the crewed aircraft will report if descending below 500ft, it is a known and cooperative situation where the encounter rate may be controlled and predicted.

1.121 **Area of known IFPs** – Means Instrument Flight Procedures (IFPs) including airways, Standard Instrument Departures (SIDs), Standard Arrival Routes (STARs), Instrument Approach Procedures (IAPs), IFP Protected Areas (Aerodrome Safeguarding) and radar manoeuvring areas. The presence of structures such as Flight Restriction Zones (FRZ) and Control Zones, may indicate the presence of an IFP.This area may be expected to contain predominantly large commercial transport aircraft, hence is assumed to meet the Type-2 encounter definition and justify an ARC-d assignment.

1.122 **Area VFR corridor / Low Level (LL) Helicopter** – Means corridors through controlled airspace with defined boundaries where aircraft may fly VFR, which have specific rules for altitudes, frequencies, and directions, but maintain the background classification and ruleset of the airspace in which they are contained.

1.123 **Class E or G** – These classes are grouped together as they both allow IFR and VFR traffic and follow a similar standard ruleset (for participating non-IFR traffic), particularly where the VFR traffic is potentially unknown and uncooperative due to the lack of EC and VHF communication requirements. The decision of which encounter type to use for operations in Class E airspace should be made on a case-by-case basis, as the proximity and type of IFR traffic could dictate Type-1 or Type-2 encounters depending on local operations. Class E Airspace is established to ensure separation between IFR and IFR traffic, but not between IFR and VFR traffic despite the likelihood of an 'area of known IFPs'. Therefore, to be proportionate to the requirements for crewed aircraft as participating non IFR traffic, the UAS requirement equivalent to see and avoid would dictate initial ARC-c. The VFR aircraft should be predominantly small General Aviation or light commercial, self-separated using see and avoid and therefore encounter Type-1 will be appropriate which also dictates initial ARC-c. There is no differentiation below 500ft in these classes of airspace as the traffic is potentially unknown, uncooperative and may fly below 500ft without warning. The ability to predict a lower encounter rate in this environment is therefore greatly reduced and does not allow a lower ARC characterisation ahead of strategic mitigation. All operations above and below 500ft in this environment are therefore initial ARC-c.

General

1.124 In order to navigate the generalised flowchart applicants are referred to the Aeronautical Information Publication (AIP) [NATS, electronic Aeronautical Information Service, NATS UK, NATS UK | Home (ead-it.com)] which defines UK airspace classifications, airspace structures and formal VFR routes such as London Helicopter and Manchester low level routes. Local area specifics on traffic types, informal patterns, mean traffic density and encounter rates (as confirmed via airspace characterisation) may be considered via strategic mitigations.

1.125 It should also be noted that although the initial ARC is intended to be conservative, there may be situations where that conservative assessment may be insufficient. In those situations, the CAA may disagree with the applicant's initial ARC.

1.126 Irrespective of the Air Risk Class (ARC), an applicant **must** initially consider the expected ruleset of the airspace, Section 6 Airspace Classification, proposing changes only if necessary, and with agreement of the ANSP and authority where required. Further information on these rules, for VLOS operations, can be found in AMC1 and GM1 to UAS.SPEC.040(1)(b).

1.127 Use the highest ARC score if the operating area spans multiple ARCs.

Step 5 Application of strategic mitigations to determine residual ARC (optional)

1.128 This step is only required if the applicant is planning to reduce their initial ARC with strategic mitigations.

1.129 Strategic mitigation involves procedures and operational restrictions designed to manage the types of crewed aircraft, encounter rates, or exposure times before take-off. If an applicant believes the initial Air Risk Class (ARC) is too high for the conditions in the local operational volume, they should consult Annex C for guidance on reducing the ARC. If the initial ARC is deemed appropriate for the local conditions, it is then considered the Residual ARC.

1.130 Guidance for the application of strategic mitigations is provided in Annex C.

1.131 To illustrate the value of different strategic mitigations a description of the residual ARCs is provided in Annex C Paragraphs C15-C19.

1.132 For VLOS operations the initial air risk class may be reduced by one class. This may only be reduced to a minimum of ARC-b. This may include the use of an observer in order to meet the VLOS requirement. This could be an Airspace Observer (such as, for BVLOS VM operations), or a UA Observer (such as for First person View operations). The use of an Airspace, or UA, observer must be justified, in claiming this reduction, including demonstrating that instantaneous and effective communication between the Remote Pilot and observer is achieved, thereby enabling immediate and effective collision avoidance action to be taken by the Remote Pilot at all times.

The initial air risk class may be reduced to ARC-a if the operational volume meets the requirements of an Atypical airspace environment, or is later reduced by strategic mitigation(s). In certain environments an additional agreement with ATC or the airspace manager may be required. Further information on VLOS UAS operations above 400ft, within controlled airspace, may be found in AMC1 UAS.SPEC.040(1)(b).

Step 6 – Specific Assurance and Integrity Levels (SAIL) determination

1.133 The SAIL consolidates the final ground and air risk scores. It determines the required compliance evidence the applicant **must** submit for assessment.

1.134 **Below** is the underlying SAIL calculation table for applicant's reference.

Table 6 - SAIL Determination

Final GRC	Residual ARC a	Residual ARC b	Residual ARC c	Residual ARC d
Final GRC ≤2	SAIL 1	SAIL 2	SAIL 4	SAIL 6
Final GRC 3	SAIL 2	SAIL 2	SAIL 4	SAIL 6
Final GRC 4	SAIL 3	SAIL 3	SAIL 4	SAIL 6
Final GRC 5	SAIL 4	SAIL 4	SAIL 4	SAIL 6
Final GRC 6	SAIL 5	SAIL 5	SAIL 5	SAIL 6
Final GRC 7	SAIL 6	SAIL 6	SAIL 6	SAIL 6
Final GRC >7	Certified category	Certified category	Certified category	Certified category

Step 7 – Operation Details

1.135 The operation details are used to describe the proposed operation and demonstrate how the SAIL calculation has been determined.

1.136 The applicant **must** complete the operation details pages, providing the following information:

(i) A brief overview of the operation.

(ii) The make and model of the UA they plan to operate under their authorisation (plus details of any modifications).

(iii) The industry or sector they will operate in, for example agriculture.

(iv) Where they want to operate.

(v) Details of their operational volume and ground risk buffer.

(vi) Details of how they worked out the population densities for the operational area and adjacent area (if applicable).

(vii) Details of any dangerous goods they intend to carry.

(viii) Details of any articles they plan to drop from their UA.

Step 8 - Phase 1 Assessment

1.137 The purpose of this step is for the applicant to submit their SAIL calculation, operational details, and compliance evidence.

1.138 Complete all required steps in the UK SORA application service.

1.139 Make the required Phase 1 payment when prompted.

1.140 The status of the assessment can be found in the relevant section of the UK SORA application service summary page.

1.141 Assessment feedback is provided as it becomes available to allow applicants to action findings as soon as possible.

Step 9 - Final SAIL Decision

1.142 The purpose of this step is for the applicant to receive a decision and feedback on their SAIL calculation.

1.143 If the SAIL is approved the applicant may move to Phase 2.

1.144 If the SAIL is not approved, the applicant will receive feedback in the form of findings. The applicant **must** address the findings to move to Phase 2.

1.145 If the applicant disagrees with a finding or multiple findings, they have the right to appeal. More information about the appeals process can be found here.

Step 10 Determination of containment requirements

1.146 The containment requirements are derived from the difference between the final ground risk level in the operational volume, plus ground risk buffer, and the final ground risk level in the adjacent area.

1.147 The applicant **must** apply at least the level of containment required to ensure that the safety of the operation is maintained in the event of a LOC resulting in the aircraft leaving the operational volume.

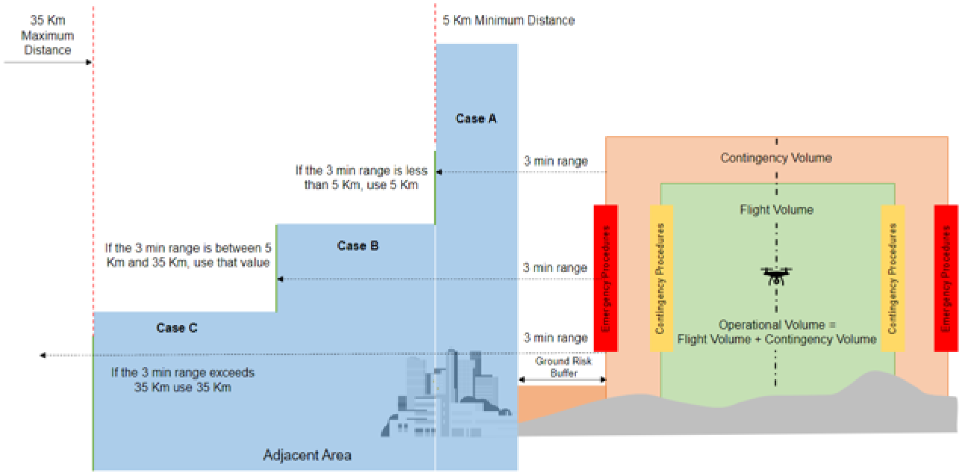
1.148 There are three possible levels of robustness for containment: Low, Medium, and High; each with a set of safety requirements described in Annex E.

1.149 If the ground risk buffer is larger than the adjacent area, containment requirements do not apply.

1.150 If the UA is less than 250g, the applicant **must** apply Low containment, or higher. In this case there is no requirement to account for the population in the adjacent area.

1.151 If the UA is more than 250g, the applicant **must** determine the size and population characteristics of the adjacent area. The section below explains how to do this.

Figure 6 - Adjacent area calculation



1.152 Calculate the size of the adjacent area for the operation. The lateral outer limit of the adjacent area is calculated from the operational volume as the distance flown in 3 minutes at the maximum capable speed of the UA:

(i) If the distance is less than 5 km, use 5 km.

(ii) If the distance is between 5 km and 35 km, use the distance calculated.

(iii) If the distance is more than 35 km, use 35 km.

1.153 Determine the average population density between the outer limit of the ground risk buffer and the outer limit of the adjacent area.

1.154 Determine the presence of assemblies of people within 1 km of the outer limit of the operational volume.

1.155 Determine a set of operational limits (average population density allowed and assemblies allowed within 1km of the operational volume) appropriate for intended operation using the Tables 5-12.

1.156 The applicant **must**:

(i) Determine the operational limits for the acceptable average population density in the adjacent area.

(ii) Determine the operational limits for the acceptable size of assemblies of people within 1km surrounding the operational volume.

1.157 Use Tables 7-12 to determine the required containment robustness level for the chosen operational limits, the characteristic dimension of the UA, and the SAIL of the operation.

Table 7 - Containment requirements 1m UA (<25 m/s)

Average population density allowed	No Upper Limit	No Upper Limit	< 50,000 ppl/km^2
Assemblies allowed within 1km of the operational volume	**> 400k**	**Assemblies of 40k to 400k**	**Assemblies < 40k**
SAIL1 & 2	High	Medium	Low
SAIL 3	Medium	Low	Low
SAIL 4	Low	Low	Low
SAIL 5-6	Low	Low	Low

Table 8 - Containment requirements 3m UA (< 35 m/s) applicant claims sheltering as a mitigation

Average population density allowed	No Upper Limit	No Upper Limit	< 50,000 ppl/km^2	< 5,000 ppl/km^2
Assemblies allowed within 1km of the operational volume	**> 400k**	**Assemblies of 40k to 400k**	**Assemblies < 40k**	**Assemblies < 40k**
SAIL1 & 2	Out of scope	High	Medium	Low
SAIL 3	Out of scope	Medium	Low	Low
SAIL 4	Medium	Low	Low	Low
SAIL 5-6	Low	Low	Low	Low

Table 9 - Containment requirements 3m UA (< 35 m/s) applicant does not claim sheltering as a mitigation

Average population density allowed	No Upper Limit	No Upper Limit	< 5,000 ppl/km^2	< 500 ppl/km^2
Assemblies allowed within 1km of the operational volume	**> 400k**	**Assemblies of 40k to 400k**	**Assemblies < 40k**	**Assemblies < 40k**
SAIL1 & 2	Out of scope	High	Medium	Low
SAIL 3	Out of scope	Medium	Low	Low
SAIL 4	Medium	Low	Low	Low
SAIL 5-6	Low	Low	Low	Low

Table 10 - Containment requirements 8m UA (< 75 m/s) applicant does not claim sheltering as a mitigation

Average population density allowed	No Upper Limit	< 50,000 ppl/km^2	< 5,000 ppl/km^2	< 500 ppl/km^2	< 50 ppl/km^2
Assemblies allowed within 1km of the operational volume	**> 400k**	**Assemblies of 40k to 400k**	**Assemblies < 40k**	**Assemblies < 40k**	**Assemblies < 40k**
SAIL1 & 2	Out of scope	Out of scope	High	Medium	Low
SAIL 3	Out of scope	Out of scope	Medium	Low	Low
SAIL 4	Out of scope	Medium	Low	Low	Low
SAIL 5	Medium	Low	Low	Low	Low
SAIL 6	Low	Low	Low	Low	Low

Table 11 - Containment requirements 20m UA (< 125 m/s) applicant does not claim sheltering as a mitigation

Average population density allowed	No Upper Limit	< 50,000 ppl/km^2	< 5,000 ppl/km^2	< 500 ppl/km^2	< 50 ppl/km^2
Assemblies allowed within 1km of the operational volume	**> 400k**	**Assemblies of 40k to 400k**	**Assemblies < 40k**	**Assemblies < 40k**	**Assemblies < 40k**
SAIL1 & 2	Out of scope	Out of scope	Out of scope	High	Medium
SAIL 3	Out of scope	Out of scope	Out of scope	Medium	Low
SAIL 4	Out of scope	Out of scope	Medium	Low	Low
SAIL 5	Out of scope	Medium	Low	Low	Low
SAIL 6	Medium	Low	Low	Low	Low

Table 12 - Containment requirements 40m UA (< 200 m/s) applicant does not claim sheltering as a mitigation

Average population density allowed	No Upper Limit	< 50,000 ppl/km^2	< 5,000 ppl/km^2	< 500 ppl/km^2	< 50 ppl/km^2
Assemblies allowed within 1km of the operational volume	**> 400k**	**Assemblies of 40k to 400k**	**Assemblies < 40k**	**Assemblies < 40k**	**Assemblies < 40k**
SAIL1 & 2	Out of scope	Out of scope	Out of scope	Out of scope	High
SAIL 3	Out of scope	Out of scope	Out of scope	Out of scope	Medium
SAIL 4	Out of	Out of scope	Out of scope	Medium	Low

Average population density allowed	No Upper Limit	< 50,000 ppl/km^2	< 5,000 ppl/km^2	< 500 ppl/km^2	< 50 ppl/km^2
Assemblies allowed within 1km of the operational volume	**> 400k**	**Assemblies of 40k to 400k**	**Assemblies < 40k**	**Assemblies < 40k**	**Assemblies < 40k**
	scope				
SAIL 5	Out of scope	Out of scope	Medium	Low	Low
SAIL 6	Out of scope	Medium	Low	Low	Low

Adjacent area

1.158 The ground area adjacent to the ground risk buffer is defined as the adjacent area. This is the area where it is reasonably expected a UA may crash after a LOC.

1.159 The operator **must not** plan flights in this area, and it will only be overflown unintentionally in the event of a LOC.

1.160 The applicant may use a realistic estimate of the average population density for the adjacent area.

Adjacent area containment requirements

1.161 The UK SORA application service will guide the applicant to determine the containment requirements.

Adjacent area operational limitations

1.162 The operator **must** have a procedure to identify and consider whether there is an assembly of people that exceeds the operational limitations within 1 km of the operational volume.

1.163 The operator **must** have a procedure to determine a realistic estimate of the size of any assembly of people within 1 km of the operational volume.

1.164 If the ground risk buffer size exceeds 1km, the adjacent area consideration for all assemblies of people is not applicable.

Containment effects upon ground risk buffer and operational volume definitions

1.165 The applicant may need to try different SAIL calculations, with variations of their operational volume, ground risk buffer and adjacent area before settling on an appropriate combination.

1.166 If the applicant determines they require medium or high robustness containment for their operational objective, there might be a recursive effect, as these containment requirements have higher requirements on the fidelity of the ground risk buffer size calculation. It is possible, that this results in a bigger ground risk buffer size compared to the one originally defined by the operator.

Containment requirements for adjacent airspace

1.167 By containing flight to the Operational Volume and assuring the immediate cessation of the flight in case of a breach of the operational volume, low robustness containment is generally considered sufficient to allow operations adjacent to all airspaces.

Step 11 Operational Safety Objectives (OSO)

1.168 The purpose of this step is for the applicant to provide their compliance evidence for the relevant OSOs.

1.169 The applicant is responsible for providing compliance evidence. Compliance evidence may be provided by third parties (e.g., the designer of the UAS or equipment, UTM service providers, etc.).

1.170 Table 11 indicates the corresponding OSOs per SAIL. In this table:

(i) NR means not required;

(ii) L means low robustness;

(iii) M means medium robustness;

(iv) H means high robustness.

1.171 The applicant should consider using low robustness even if the OSO is not required at the applicable SAIL.

Table 13 - Operational Safety Objectives (OSO)

OSO ID	OSO Description	SAIL 1	SAIL 2	SAIL 3	SAIL 4	SAIL 5	SAIL 6
OSO01	Ensure the operator is competent and/or proven	NR	L	M	H	H	H
OSO02	UAS manufactured by competent and/or proven entity	NR	NR	L	M	H	H
OSO03	UAS maintained by competent and/or proven entity	L	L	M	M	H	H
OSO04	UAS components essential to safe operations are designed to an Airworthiness Design Standard (ADS)	NR	NR	NR	L	M	H
OSO05	UAS is designed considering system safety and reliability	NR	NR	L	M	H	H
OSO06	C3 link performance is appropriate for the operation	NR	L	L	M	H	H
OSO07	Conformity check of the UAS configuration	L	L	M	M	H	H
OSO08	Operational procedures are defined, validated and adhered to address normal, abnormal and emergency situations potentially resulting from technical issues with the UAS or external systems supporting UAS operation, human errors or critical environmental conditions	L	M	H	H	H	H
OSO09	Remote crew trained and current and able to control the normal, abnormal and emergency situations potentially resulting from technical issues with the UAS or external systems supporting UAS operation, human errors or critical environmental conditions situation	L	L	M	M	H	H
OSO13	External services supporting UAS operations are adequate to the operation	L	L	M	H	H	H
OSO16	Multi crew coordination	L	L	M	M	H	H
OSO17	Remote crew is fit to operate	L	L	M	M	H	H
OSO18	Automatic protection of the flight envelope from Human Error	NR	NR	L	M	H	H
OSO19	Safe recovery from Human Error	NR	NR	L	M	M	H
OSO20	A Human Factors evaluation has been performed and the HMI found appropriate for the mission	NR	L	L	M	M	H
OSO23	Environmental conditions for safe operations defined, measurable and adhered to	L	L	M	M	H	H
OSO24	UAS designed and qualified for adverse environmental conditions	NR	NR	M	H	H	H

Step 12 Tactical mitigation performance requirement (TMPR) and robustness levels

1.172 Tactical Mitigations are applied to mitigate any residual risk of a mid-air collision (as defined by the assigned residual ARC) needed to achieve the applicable airspace safety objective. Tactical Mitigations are usually applied after take-off using a "mitigating feedback loop" to reduce the rate of collisions by modifying the geometry and dynamics of aircraft in conflict, based on real time aircraft conflict information.

1.173 Detailed guidance for the application of strategic mitigations is provided in Annex D.

VLOS Operations

1.174 The applicant **must** develop and document a VLOS deconfliction scheme, in which it is explained which methods will be used for detection.

1.175 The applicant **must** define the associated criteria applied for the decision to avoid other traffic. In case the remote pilot relies on detection by observers, the communication between the remote pilot and observer, including any specific phraseology, **must** be described as well.

BVLOS Operations

1.176 Identify the applicable Detect and Avoid (DAA) requirements for the residual ARC.

Step 13 - Phase 2 Assessment

1.177 The purpose of this step is for the applicant to submit their compliance evidence for OSOs, TMPR, and Containment. The CAA will then evaluate the proposed risk assessment and robustness of the mitigating measures, that the applicant proposes to keep the operation safe.

1.178 The applicant should then:

- Complete all required steps in the UK SORA application service.
- Make the required Phase 2 payment when prompted.

1.179 The CAA will assess the compliance evidence and other information provided by the applicant to determine whether the proposed mitigation measures are adequate and sufficiently robust to keep the operation safe in view of the identified ground and air risks, in order to decide whether to grant the operational authorisation.

1.180 The applicant may obtain information about the progress of an ongoing assessment by checking the relevant section of the UK SORA application service summary page. Status updates are provided for each element of the risk assessment.

1.181 Assessment feedback is provided as it becomes available to allow applicants to action findings as soon as possible.

Step 14 - Compliance Evidence Decision

1.182 The purpose of this step is for the applicant to receive a decision and feedback about their application.

1.183 If the application is approved, the CAA will grant an operational authorisation to the applicant.

1.184 If the application is not approved, the CAA will not grant an Operational Authorisation and will provide feedback in the form of findings. The applicant **must** address the findings before an operational authorisation may be granted.

1.185 If the applicant disagrees with one or more findings, they have the right to appeal. More information about the appeals process can be found here.

GM1 to Article 11 Rules for Conducting an Operational Risk Assessment

CAA ORS9 Decision No. 46

Predefined Risk Assessment

When a UAS Operator applies for an OA, they must submit a risk assessment as required by Article 11 of the IR. This may be conducted using the methodology as described in "AMC1 to Article 11 Conducting a UK Specific Operation Risk Assessment (UK SORA)" on page 38.

Alternatively, a UAS Operator may submit a request for an OA based on the mitigations and provisions described within a Predefined Risk Assessment (PDRA), as published by the CAA. In the case of a PDRA, the CAA has conducted a risk assessment that is compliant with Article 11.

A PDRA significantly reduces the administrative burden on both the operator and the CAA for simple, repeatable type operations. A UAS Operator provides a ‘shortened’ application to the CAA based on a series of requirements covering topics such as RP competency, OM contents, etc. Accompanying any PDRA based authorisation will be a set of prescriptive conditions an operator must comply with. These conditions form part of the risk mitigation measures identified by the CAA during the creation of a given PDRA.

The CAA will publish PDRAs separately to this AMC/ GM. Operators wishing to make use of PDRAs should use the relevant PDRA to complete the necessary parts of the OM. Completion of the risk assessment part of the OM (Volume 3) is not required, as this has already been carried out. Full instructions on how to make use of a PDRA, and what to submit to the CAA, can be found within CAP 722H.

Note: A PDRA only addresses safety risk; consequently, additional limitations and provisions might exist within an operation such as security, privacy, environmental protection, the use of the radio frequency (RF) spectrum, etc. It is for the operator to identify and mitigate against non-safety risks.

GM1 Article 11(6) Use of Recognised Assessment Entities for Flightworthiness – RAE(F)

CAA ORS9 Decision No. 46

An RAE(F) approved by the CAA in accordance with the RAE(F) policy (CAP 722J) may carry out the detailed assessment of a UAS against UK SORA requirements for the purpose of advising the CAA as to whether to issue a SAIL Mark certificate or whether the technical features of a specific UAS are consistent with the UK SORA requirements that apply in relation to a given planned operation. The process and criteria for becoming an RAE(F) are set out in the RAE(F) policy (CAP 722J).

An RAE(F) approved by the CAA in accordance with the RAE(F) policy (CAP 722J) may assess a UAS configuration against the criteria in the SAIL Mark policy (CAP 722K) for the purpose of assisting the CAA to decide whether to issue a SAIL Mark certificate in accordance with the SAIL Mark policy (CAP 722K).

Article 12 Authorising operations in the ‘specific’ category

1. The CAA shall evaluate the risk assessment and the robustness of the mitigating measures that the UAS operator proposes to keep the UAS operation safe in all phases of flight.

2. The CAA shall grant an operational authorisation when the evaluation concludes that:

(a) the operational safety objectives take account of the risks of the operation;

(b) the combination of mitigation measures concerning the operational conditions to perform the operations, the competence of the personnel involved and the technical features of the unmanned aircraft, are adequate and sufficiently robust to keep the operation safe in view of the identified ground and air risks;

(c) the UAS operator has provided a statement confirming that the intended operation complies with any applicable [...] rules relating to it, in particular, with regard to privacy, data protection, liability, insurance, security and environmental protection.

3. When the operation is not deemed sufficiently safe, the CAA shall inform the applicant accordingly, giving reasons for its refusal to issue the operational authorisation.

4. The operational authorisation granted by the CAA shall detail:

(a) the scope of the authorisation;

(b) the ‘specific’ conditions that shall apply:

i. to the UAS operation and the operational limitations;

ii. to the required competency of the UAS operator and, where applicable, of the remote pilots;

iii. to the technical features of the UAS, including the certification of the UAS, if applicable;

(c) the following information:

i. the registration number of the UAS operator and the technical features of the UAS;

ii. a reference to the operational risk assessment developed by the UAS operator;

iii. the operational limitations and conditions of the operation;

iv. the mitigation measures that the UAS operator has to apply;

v. the location(s) where the operation is authorised to take place [...] ;

vi. all documents and records relevant for the type of operation and the type of events that should be reported in addition to those defined in Regulation (EU) No 376/2014 of the European Parliament and of the Council.

[...]

Article 13 Cross-border operations or operations outside the state of registration

Repealed

Article 14 Registration of UAS operators and certified UAS

1. The CAA shall establish and maintain accurate registration systems for UAS whose design is subject to certification and for UAS operators whose operation may present a risk to safety, security, privacy, and protection of personal data or environment.

2. The registration systems for UAS operators shall provide the fields for introducing and exchanging the following information:

(a) the full name and the date of birth for natural persons and the name and their identification number for legal persons;

(b) the address of UAS operators;

(c) their email address and telephone number;

(d) an insurance policy number for UAS if required by an enactment ;

(e) the confirmation by legal persons of the following statement: 'All personnel directly involved in the operations are competent to perform their tasks, and the UAS will be operated only by remote pilots with the appropriate level of competency';

(f) operational authorisations and LUCs held [...] .

3. The registration systems for unmanned aircraft whose design is subject to certification shall provide the fields for introducing and exchanging the following information:

(a) manufacturer's name;

(b) manufacturer's designation of the unmanned aircraft;

(c) unmanned aircraft's serial number;

(d) full name, address, email address and telephone number of the natural or legal person under whose name the unmanned aircraft is registered.

[...]

5. Subject to paragraph 5A, UAS operators shall register themselves:

(a) when operating within the 'open' category any of the following unmanned aircraft:

i. with a MTOM of 250 g or more, or, which in the case of an impact can transfer to a human kinetic energy above 80 Joules;

ii. that is equipped with a sensor able to capture personal data, unless it complies with the Toys (Safety) Regulations 2011 .

(b) when operating within the 'specific' category an unmanned aircraft of any mass.

5A. Paragraph 5 does not apply to UAS operations performed with a small control line model aircraft:

(a) in the 'open' category;

(b) in the 'specific' category in accordance with an authorisation received under Article 16.

6. UAS operators shall register themselves with the CAA and ensure that their registration information is accurate. [...] The CAA shall issue a unique digital registration number for UAS operators and for the UAS that require registration, allowing their individual identification. [...]

7. The owner of an unmanned aircraft whose design is subject to certification shall register the unmanned aircraft. The nationality and registration mark of an unmanned aircraft shall be established in line with ICAO Annex 7. [...]

8. The UAS operators shall display their registration number on every unmanned aircraft meeting the conditions described in paragraph 5.

9. In addition to the data defined in point (2) the CAA may collect additional identity information from the UAS operators.

10. In this Article, "small control line model aircraft" means a fixed-wing unmanned aircraft having a MTOM of not more than 7.5 kg and which is flown within limits imposed by a restraining device of not more than 25 metres in length which attaches the aircraft to the surface or to a person on the surface.

GM1 to Article 14(1) Registration of UAS Operators and Certified UAS

CAA ORS9 Decision No. 16

ACCURACY OF THE REGISTRATION SYSTEMS

UAS Operators, when registering themselves or their certified UAS, are required to provide accurate information and update the registration data when it changes.

The CAA will keep this registration data accurate within the Registration database.

An example of data that may change over time includes the UAS Operator address, email address, telephone number, and name by proof of deed poll.

UAS Operators, especially those conducting UAS operations for leisure, may decide to fly their UAS only for a short period; therefore, it is possible that even if the database of the registration system contains many registered UAS Operators, only some of them are active.

The CAA defines a duration period for the validity of 1 year, for the registration of all UAS Operators. If the UAS Operator does not renew their registration, it will expire. The CAA may also decide to suspend or revoke the registration number if the UAS Operator's conduct justifies such a measure.

UAS Operators have the ability to request to deactivate their registration if they no longer wish to have it active, this feature allows the CAA to improve level of accuracy of active operators in the database.

GM1 Article 14 (5)(a)(ii) Registration of UAS Operators and Certified UAS

CAA ORS9 Decision No. 16

ARTICLE 14(5)(a)(ii) SENSOR ABLE TO CAPTURE PERSONAL DATA

In relation to the registration of UAS Operators under this article, the capture of images or other data solely for the use of controlling or monitoring the aircraft is not considered to be applicable to the meaning of ‘a sensor able to capture personal data.

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

GM1 Article 14(5A) Registration of Small Control Line Model Aircraft

CAA ORS9 Decision No. 16

Small control line model aircraft are attached via a restraining device to the ground, or to a person, via a cable, or series of cables. As such, the need to identify the RP and operator via an Operator ID is not required, as the RP will either be attached to the aircraft by these cables or will be in the immediate vicinity of the aircraft, if it is fixed to the ground.

Control of the aircraft is maintained by manoeuvring the control cables, which manipulate the control surfaces in order to maintain control of the aircraft.

AMC1 Article 14(6) Registration of UAS Operators and Certified UAS

CAA ORS9 Decision No. 16

UAS OPERATOR REGISTRATION NUMBER

The unique UAS Operator digital registration number that is issued by the CAA consists of seventeen (17) alphanumeric in total split into 3 sections, arranged as follows:

(1) the first three alphanumeric (upper-case only) shall be 'GBR' corresponding to the ISO 3166 Alpha-3 code;

(2) The characters 'OP', which is a fixed field, meaning 'Operator'; and

(3) Twelve randomly generated characters that consist of alphanumeric (upper-case) characters, with the exception of the following characters: A, E, I, O, U, 1 and 0.

AMC1 Article 14(8) Registration of UAS Operators and Certified UAS

CAA ORS9 Decision No. 16

DISPLAY OF REGISTRATION INFORMATION

UAS Operators must display their registration number (known as an 'Operator ID') on every UA that they operate within the Open and Specific categories.

a) The Operator ID must be displayed in a manner that ensures it is readable when the UA is on the ground, without the need to use any special devices other than corrective spectacles or lenses.

b) The Operator ID must be:

i. clear and in block capitals taller than 3mm

ii. secure and safe from damage

iii. on the main body of the aircraft

c) If the size of the UA does not allow the Operator ID to be clearly displayed externally, or the UA is a model aircraft that represents a real manned aircraft where an external marking would spoil the realism of the representation, a marking inside the UA, in a compartment that can be accessed easily and without the need for any tools is acceptable.

In addition to the compulsory printed Operator ID, a further QR code (quick response code) may also be used. This may link to the CAA registration check service, on the CAA website.

UA whose design is subject to certification are required to be registered in accordance with Annex IX of UK Regulation (EU) 2018/1139 (and Articles 24 to 32 of ANO 2016 unless they are flying under an exemption). Once the CAA has processed the application, the aircraft will be issued with a registration ID consisting of five characters starting 'G-' (e.g., G-ABCD) and the details will be entered into the Aircraft Register. The registration must be displayed permanently on the aircraft in accordance with Article 32 of the ANO.

GM1 Article 14(8) Registration of UAS Operators and Certified UAS

CAA ORS9 Decision No. 16

DISPLAY OF REGISTRATION INFORMATION

The purpose of displaying the registration ID (‘Operator ID’) on the UA, is to enable the operator to be linked to the individual UA, either in order to re-unite them should the UA become lost, or for enforcement purposes.

For this reason, it is not appropriate to expect a third party to be able to access the Operator ID within a compartment in the UA using specialist tools, or to have access to a QR code scanner. As such, the Operator ID must be displayed fully, on the outside, or within an easy to access internal compartment.

AMC1 Article 14 (10)- Small Control Line Model Aircraft Definition

CAA ORS9 Decision No. 16

The restraining device must be of a sufficient strength to secure the aircraft safely to a point on the ground, either fixed, or to the RP, taking into account the force exerted on the restraining device, from the mass of the aircraft and the acceleration experienced during flight.

Article 15 Operational conditions for UAS geographical zones

1. The Secretary of State may make regulations for the purpose of designating UAS geographical zones for safety, security, privacy or environmental reasons. The regulations may:

(a) prohibit certain or all UAS operations, request particular conditions for certain or all UAS operations or require a prior flight authorisation for certain or all UAS operations;

(b) subject UAS operations to specified environmental standards;

(c) allow access to certain UAS classes only;

(d) allow access only to UAS equipped with certain technical features, in particular remote identification systems or geo awareness systems.

2. The Secretary of State may by regulations designate certain geographical zones in which UAS operations are exempt from one or more of the ‘open’ category requirements.

3. When pursuant to paragraphs 1 or 2 Member States define UAS geographical zones, for geo awareness purposes they shall ensure that the information on the UAS geographical zones, including their period of validity, is made publicly available in a common unique digital format.

4. Regulations made under this Article are to be made by statutory instrument.

GM1 Article 15 Operational Conditions for UAS Geographical Zones

CAA ORS9 Decision No. 16

Availability of UAS Geographical Zone data

Information on permanent airspace restrictions which affect the operation of UAS are notified within the AIP (Section ENR 5.1), and all permanent restrictions which impact UAS can be accessed via a downloadable file contained within the AIS website.

Article 16 UAS operations in the framework of model aircraft clubs and associations

1. Upon request by a model aircraft club or association, the CAA may issue an authorisation for UAS operations in the framework of model aircraft clubs and associations.

2. The authorisation referred to in paragraph 1 shall be issued in accordance with any of the following:

[...]

(b) established procedures, organisational structure and management system of the model aircraft club or association, ensuring that:

i. remote pilots operating in the framework of model aircraft clubs or associations are informed of the conditions and limitations defined in the authorisation issued by the CAA ;

ii. remote pilots operating in the framework of model aircraft clubs or associations are assisted in achieving the minimum competency required to operate the UAS safely and in accordance with the conditions and limitations defined in the authorisation;

iii. the model aircraft club or association takes appropriate action when informed that a remote pilot operating in the framework of model aircraft clubs or associations does not comply with the conditions and limitations defined in the authorisation, and, if necessary, inform the CAA ;

iv. the model aircraft club or association provides, upon request from the CAA , documentation required for oversight and monitoring purposes.

3. The authorisation referred to in paragraph 1 shall specify the conditions under which operations in the framework of the model aircraft clubs or associations may be conducted [...].

4. The CAA may, after consultation with the Secretary of State, enable model aircraft clubs and associations to register their members into the registration systems established in accordance with Article 14 on their behalf. If this is not the case, the members of model aircraft clubs and associations shall register themselves in accordance with "Article 14 Registration of UAS operators and certified UAS" on page 77.

GM1 Article 16 UAS Operations in the Framework of Model Aircraft Clubs and Associations

CAA ORS9 Decision No. 46

AMC and GM for Article 16 can be found in Annex A to Article 16.

Article 17 Designation of the competent authority

Repealed

Article 18 Responsibilities of the CAA

The CAA shall be responsible for:

(a) enforcing this Regulation;

(b) issuing, suspending or revoking certificates of UAS operators and licenses of remote pilots operating within the 'certified' category of UAS operations;

(c) issuing remote pilots with a proof of completion of an online theoretical knowledge examination according to points UAS.OPEN.020 and UAS.OPEN.040 of the Annex and issuing, amending, suspending, limiting or revoking certificates of competency of remote pilots according to point UAS.OPEN.030 of the Annex;

(d) issuing, amending, suspending, limiting or revoking operational authorisations and LUCs, which are required to carry out UAS operations in the 'specific' category of UAS operations;

(e) keeping documents, records and reports concerning UAS operational authorisations, certificates of competency of the remote pilots and LUCs;

[...]

(h) developing a risk-based oversight system for:

i. UAS operators that hold an operational authorisation or an LUC;

ii. model clubs and associations that hold an authorisation referred to in Article 16;

(i) for operations other than those in the 'open' category, establishing audit planning based on the risk profile, compliance level and the safety performance of UAS operators who hold a certificate issued by the CAA ;

(j) for operations other than those in the ‘open’ category, carrying out inspections with regard to UAS operators who hold a certificate issued by the CAA inspecting UAS and ensuring that UAS operators and remote pilots comply with this Regulation;

(k) implementing a system to detect and examine incidents of non-compliance by UAS operators operating in the ‘open’ or ‘specific’ categories and reported in accordance with paragraph 2 of Article 19;

(l) providing UAS operators with information and guidance that promotes the safety of UAS operations;

(m) establishing and maintaining registration systems for UAS whose design is subject to certification and for UAS operators whose operation may present a risk to safety, security, privacy, and protection of personal data or the environment.

Article 19 Safety information

1. The CAA and market surveillance and control authorities referred to in Article 36 of Delegated Regulation (EU) 2019/945 shall cooperate on safety matters and establish procedures for the efficient exchange of safety information.

2. Each UAS operator shall report to the CAA on any safety-related occurrence and exchange information regarding its UAS in compliance with Regulation (EU) No 376/2014.

3. The CAA shall collect, analyse and publish safety information concerning UAS operations [...] .

4. Upon receiving any of the information referred to in paragraphs 1 or 2, the CAA shall take the necessary measures to address any safety issues on the best available evidence and analysis, taking into account interdependencies between the different domains of aviation safety, and between aviation safety, cyber security and other technical domains of aviation regulation.

5. Where the CAA takes measures in accordance with paragraph 4, it shall immediately notify all relevant interested parties and organisations that need to comply with those measures in accordance with Regulation (EU) 2018/1139 and its implementing acts.

AMC1 Article 19(2) Safety Information

CAA ORS9 Decision No. 16

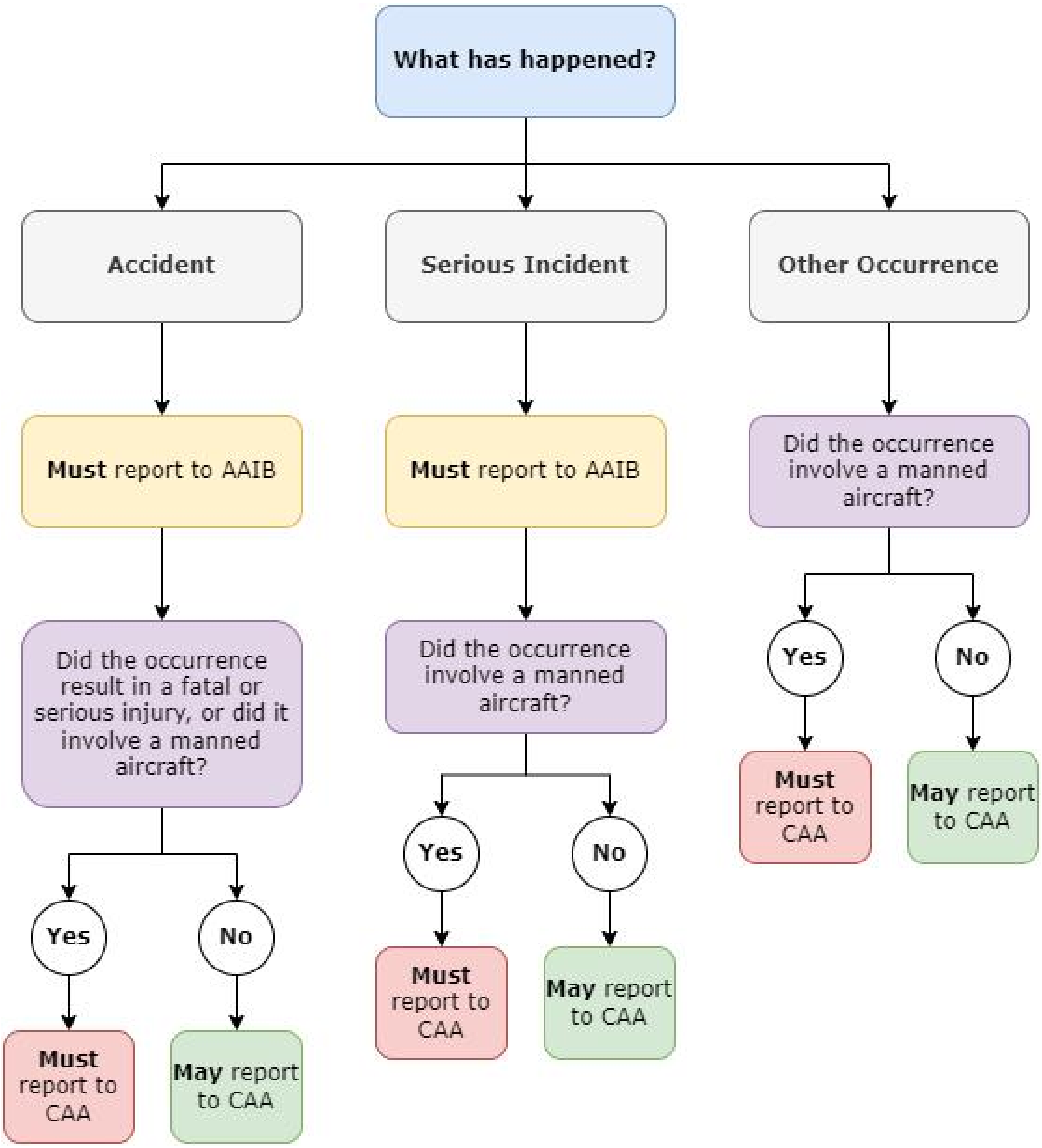
OCCURENCE REPORTING - CAA

Occurrence reports must be submitted through the Mandatory Occurrence Reporting (MOR) process, using the ECCAIRS portal, which can be found here (https://aviationreporting.eu). When making a report, UAS Operators should also include their registration number (Operator ID), and state whether an OA is held. Further guidance can be found in CAP1496.

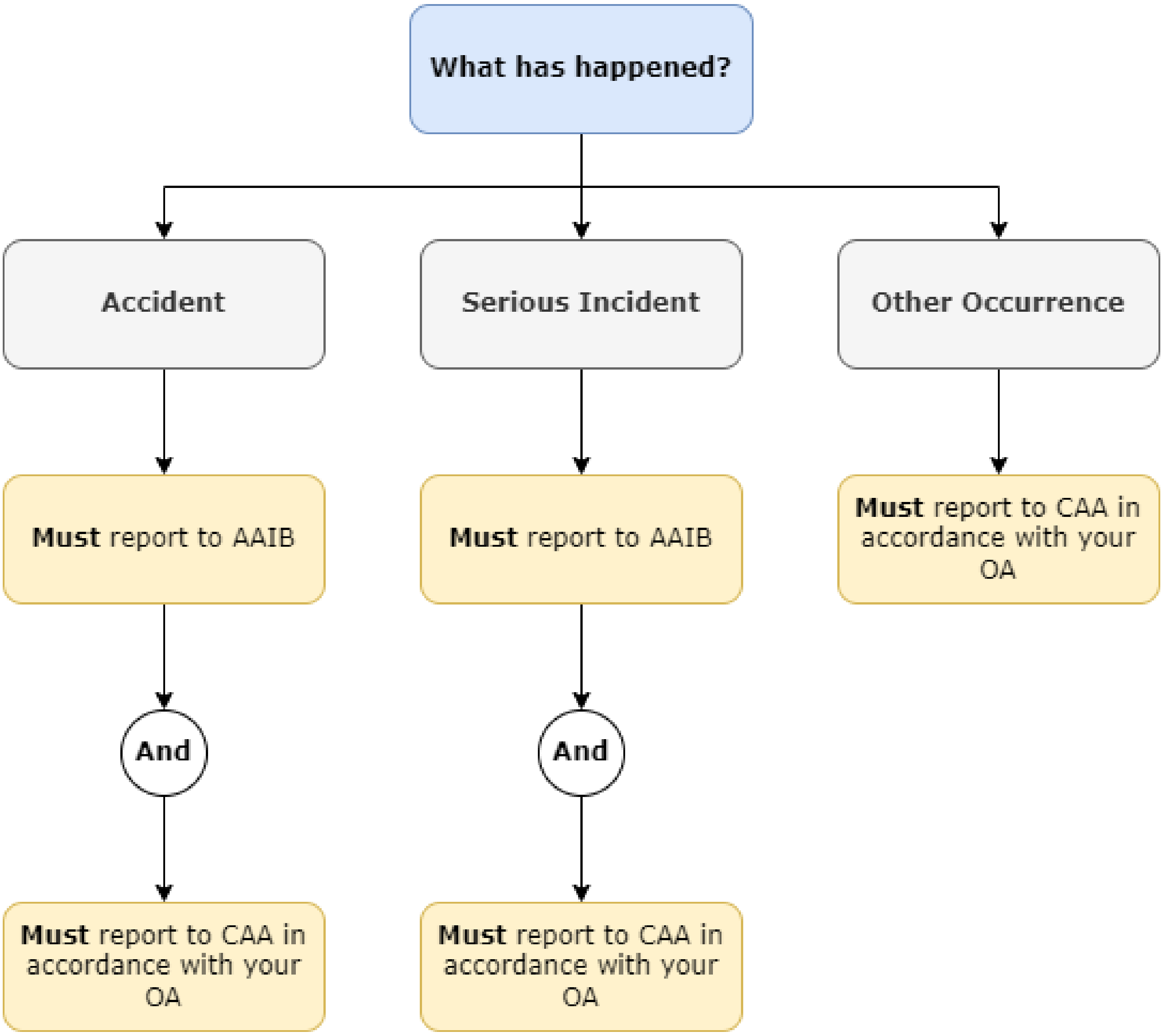
Consideration should also be given to supplementary safety reporting channels, for example:

- Confidential Human Factors Incident Reporting Programme (https://chirp.co.uk/aviation/).

OPEN CATEGORY REPORTING REQUIREMENTS



SPECIFIC CATEGORY REPORTING REQUIREMENTS



GM1 Article 19(2) Safety Information

CAA ORS9 Decision No. 16

USE OF THE ECCAIRS PORTAL

Reporting to the CAA should take place via the ECCAIRS portal (AMC1 Article 19(2), above).

It should be noted that when selecting the UK, within this system, it explains that the user is reporting as an ICAO state, and not under Regulation (EU) 376/2014. This is because the UK has left the EU, and so reports are made under Regulation (EU) 376/2014 as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018, hereafter referred to as UK Regulation (EU) 376/2014, rather than the European version of that regulation.

OCCURRENCE REPORTING - CAA

According to UK Regulation (EU) 376/2014, occurrences shall be reported when they refer to a condition which endangers, or which if not corrected or addressed would endanger an aircraft, its occupants, any other person, equipment or installation affecting aircraft operations.

Obligations to report apply in accordance with UK Regulation (EU) 376/2014, Article 3(2). This limits the mandatory reporting of UA occurrences to those that involve a fatal or serious injury or involve a manned aircraft. Other occurrences may be reported voluntarily.

Occurrence reporting systems are not established to attribute blame or liability.

Occurrence reporting systems are established to learn from occurrences, improve aviation safety and prevent recurrence.

The purpose of occurrence reporting is to improve aviation safety by ensuring that relevant safety information is reported, collected, stored, protected, exchanged, disseminated and analysed. Organisations and individuals with a good air safety culture will report effectively and consistently. Every occurrence report is an opportunity to identify root causes and prevent them contributing to accidents where people are harmed.

The safe operation of UAS is as important as that of manned aircraft. Injuries to third parties, or damage to property, can be just as severe. Proper investigation of each accident, serious incident or other occurrence is necessary to identify causal factors and to prevent repetition. Similarly, the sharing of safety related information via good reporting is critical in reducing the number of future occurrences.

REPORTING TO THE AAIB

Reporting requirements to the AAIB are set out under a different regulation. Further guidance on how to report to the AAIB can be found on their website.

Article 20 Particular provisions concerning the use of certain UAS in the ‘open’ category

SI 2022 No. 1235

UAS [...] which do not comply with Delegated Regulation (EU) 2019/945 and which are not privately-built are allowed to continue to be operated under the following conditions, when they have been placed on the market before 1 January 2026:

(a) in subcategory A1 as defined in Part A of the Annex, provided that the unmanned aircraft has a maximum take-off mass of less than 250 g, including its payload;

(b) in subcategory A3 as defined in Part A of the Annex, provided that the unmanned aircraft has a maximum take-off mass of less than 25 kg, including its fuel and payload.

Article 21 Adaptation of authorisations and certificates

SI 2022 No. 1235

Repealed.

Article 22 Transitional Provisions

SI 2022 No. 1235

Without prejudice to Article 20 before 1 January 2026, the use of UAS in the 'open' category which do not comply with the requirements of Parts 1 to 5 of the Annex to Commission Delegated Regulation (EU) 2019/945 shall be allowed subject to the following conditions:

(a) unmanned aircraft with a take-off mass of less than 500 g are operated within the operational requirements set out in points UAS.OPEN.020(1) of Part A of the Annex by a remote pilot having competency level [at least equivalent to the level in point UAS.OPEN.030(2) of Part A of the Annex] ;

(b) unmanned aircraft with a take-off mass of less than 2 kg is operated by keeping a minimum horizontal distance of 50 meters from people and the remote pilots have a competency level at least equivalent to the one set out in point UAS.OPEN.030 (2) of Part A of the Annex;

(c) unmanned aircraft with a take-off mass of less than 25 kg is operated within the operational requirements set out in point UAS.OPEN.040 (1) and (2) and the remote pilots have a competency level at least equivalent to the one set out in point UAS.OPEN.020(4)(b) of Part A of the Annex.

GM1 Article 22 Take-Off Mass

CAA ORS9 Decision No. 16

TAKE-OFF MASS

Further information on the term 'take-off mass' can be found in "GM1 Article 2(22) Definitions" on page 26.

Article 23 Entry into force and application

1. This Regulation shall enter into force on the twentieth day following that of its publication in the Official Journal of the European Union. It shall apply from 31 December 2020.

2. Paragraph 5 of Article 5 and point (1)(l) of point UAS.SPEC.050 shall apply from 2 December 2021;

3. Point (2)(g) of point UAS.OPEN.060 shall apply from 1 July 2022.

[...]

5. Paragraph 3 of Article 15 shall apply from 1 January 2022.

Signatures

[...]

Done at Brussels, 24 May 2019.

For the Commission

The President

Jean-Claude Juncker

Annex to UK Regulation (EU) 2019/947

UAS OPERATIONS IN THE 'OPEN' AND 'SPECIFIC' CATEGORIES

Part A UAS OPERATIONS IN THE 'OPEN' CATEGORY

UAS.OPEN.010 General provisions

(1) The category of UAS 'open' operations is divided into three subcategories A1, A2 and A3, on the basis of operational limitations, requirements for the remote pilot and technical requirements for UAS.

(2) Where the UAS operation involves the flight of the unmanned aircraft starting from a natural elevation in the terrain or over terrain with natural elevations, the unmanned aircraft shall be maintained within 120 metres from the closest point of the surface of the earth. The measurement of distances shall be adapted accordingly to the geographical characteristics of the terrain, such as plains, hills, mountains.

(3) When flying an unmanned aircraft within a horizontal distance of 50 metres from an artificial obstacle taller than 105 metres, the maximum height of the UAS operation may be increased up to 15 metres above the height of the obstacle at the request of the entity responsible for the obstacle.

(4) By way of derogation from point (2), unmanned sailplanes with a MTOM, including payload, of less than 10 kg, may be flown at a distance in excess of 120 metres from the closest point of the surface of the earth, provided that the unmanned sailplane is not flown at a height greater than 120 metres above the remote pilot at any time.

GM1 UAS.OPEN.010(4) General Provisions

CAA ORS9 Decision No. 16

OPERATIONS WITH UNMANNED SAILPLANES

This provision was included to allow model gliders to continue to operate along slopes. Strictly applying the 120 metres distance from the closest point of the surface of the earth would have had disproportionate consequences. These operations have been conducted successfully for decades. Two measures have been put in place to reduce the risk:

a) A MTOM limited to 10 kg to reduce the consequences of an impact. 10 kg covers the vast majority of gliders in operation.

b) The maximum height above the RP is limited to 120 m, which reduces the air risk.

GM1 UAS.OPEN.010 General Provisions

CAA ORS9 Decision No. 16

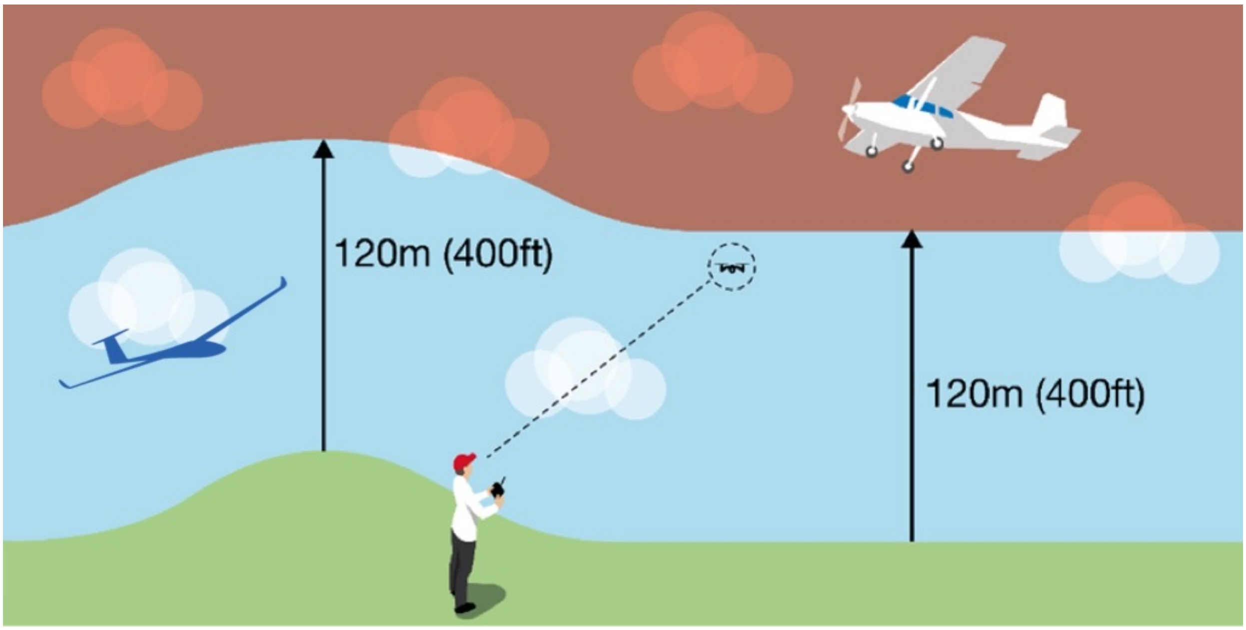
MAXIMUM HEIGHT

The RP must ensure that the UA is kept at a distance less than 120m (approximated to 400 ft for the purpose of this document) from the terrain. This is not a 'vertical height', but a geometric distance between the UA and the closest point of the surface of the Earth.

In most cases, this distance will be measured as a GPS height, rather than barometric height. Where a barometric measured height is used, the effects of atmospheric pressure and temperature on the measurement of height, should be understood.

This height limit applies from the surface of the Earth, and not from an elevated point on a structure or building.

The picture below shows how the maximum height that the UA may reach changes according to the topography of the terrain. In addition, if the flight is being conducted within a geographical zone with a lower maximum height or altitude (as defined in the associated restrictions of the geographical zone), the RP must ensure that the UA always complies with those limitations.



The entity responsible for an artificial obstacle, referred to in point UAS.OPEN.010(3), must explicitly grant the UAS Operator permission to conduct an operation close to the obstacle, e.g., a building, or antenna.

UAS.OPEN.020 UAS operations in subcategory A1

UAS operations in subcategory A1 shall comply with all of the following conditions:

(1) for unmanned aircraft referred to in point (5)(d), be conducted in such a way that a remote pilot of the unmanned aircraft does not overfly assemblies of people and reasonably expects that no uninvolved person will be overflown. In the event of unexpected overflight of uninvolved persons, the remote pilot shall reduce as much as possible the time during which the unmanned aircraft overflies those persons;

(2) in the case of an unmanned aircraft referred to in points (5)(a), (5)(b) and (5)(c), be conducted in such a way that the remote pilot of the unmanned aircraft may overfly uninvolved persons, but shall never overfly assemblies of people;

(3) by way of derogation from point (d) of paragraph 1 of Article 4, be conducted, when the follow-me mode is active, up to a distance of 50 metres from the remote pilot;

(4) be performed by a remote pilot who:

(a) is familiar with manufacturer's instructions provided by the manufacturer of the UAS;

(b) in the case of an unmanned aircraft class C1, as defined in Part 2 of the Annex to Delegated Regulation (EU) 2019/945, has completed an online training course followed by completing successfully an online theoretical knowledge examination provided by the CAA achieving at least 75% of the overall marks. The examination shall comprise 40 multiple-choice questions distributed appropriately across the following subjects:

(i) air safety;

(ii) airspace restrictions;

(iii) aviation regulation;

(iv) human performance limitations;

(v) operational procedures;

(vi) UAS general knowledge;

(vii) privacy and data protection;

(viii) insurance;

(ix) security.

(5) be performed with an unmanned aircraft that:

(a) has an MTOM, including payload, of less than 250 g and a maximum operating speed of less than 19 m/s, in the case of a privately built UAS; or

(b) meets the requirements defined in point (a) of Article 20;

(c) is marked as class C0 and complies with the requirements of that class, as defined in Part 1 of the Annex to Delegated Regulation (EU) 2019/945; or

(d) is marked as class C1 and complies with the requirements of that class, as defined in Part 2 of the Annex to Delegated Regulation (EU) 2019/945 and is operated with active and updated direct remote identification system and geo-awareness function.

AMC1 UAS.OPEN.020(1) and (2) UAS Operations in Subcategory A1

CAA ORS9 Decision No. 16

OPERATIONAL LIMITATIONS IN SUBCATEGORY A1

As a principle, the rules prohibit overflying assemblies of people. There is a distinction between class C1/C0 UAS and privately built UAS with MTOM of less than 250 g.

a) For UAS flying under the ‘A1 Transitional’ provisions of Article 22(a): Before starting the UAS operation, the RP must assess the area and must reasonably expect that no uninvolved person will be overflown. This evaluation must be made taking into account the configuration of the site of operation (e.g., the existence of roads, streets, pedestrian or bicycle paths), the ability to secure the site, and the time of the day. In case of an unexpected overflight, the RP must reduce as much as possible the duration of the overflight, for example, by flying the UAS in such a way that the distance between the UA and the uninvolved people increases, or by positioning the UAS over a place where there are no uninvolved people.

b) Non-class marked UAS with MTOM less than 250g, or privately built UAS with MTOM less than 250 g: These UAS may fly over uninvolved people (but not over assemblies of people) however, flight over uninvolved people should be avoided whenever possible, and extreme caution should still be used.

Uninvolved people should only be overflown when absolutely necessary, to achieve the aim of the flight and should be minimised as much as possible.

When flying in an area with uninvolved people, the RP should allow for a ground safety buffer to prevent accidental overflight in the event of loss of propulsion, by using the 1:1 rule. The RP must be aware of their responsibilities as set out in UAS.OPEN.060(2)(d), and in GM1 UAS.OPEN.060(2)(d), with regard to maintaining control of the UA.

The operational limitations above, in relation to the overflying of uninvolved people, do not apply to uninvolved people inside buildings. The RP is ultimately responsible for maintaining safe horizontal distances including from uninvolved people entering and exiting buildings. This includes consideration for open areas such balconies and roofs.

AMC1 UAS.OPEN.020(4)(b) and UAS.OPEN.030(2)(a) and UAS.OPEN.040(3) UAS Operations in Subcategories A1, A2 and A3

CAA ORS9 Decision No. 16

COMPLETION OF OPEN CATEGORY ONLINE TRAINING

The ‘Flyer ID’ online training course and test must be completed by RPs of UA with a mass of 250g or more, i.e.

- A2 subcategory- all UA (note- in the A2 subcategory, an additional qualification must also be held- see AMC1 UAS.OPEN.030(2)(c).

- A3 subcategory- all UA.

The RP must complete the training course and test provided by the CAA Drone and Model Aircraft Registration System (DMARES) (https://register-drones.caa.co.uk/).

In certain circumstances, where provision is included within a model aircraft association Article 16 Authorisation, RPs may complete a model aircraft association training course and test instead of the CAA DMARES test. Following completion of this test, the CAA will issue the RP with a ‘Flyer ID’ number, which is equivalent to the completion of the CAA DMARES Flyer ID test. In this instance the RP does not need to undertake the CAA DMARES Flyer ID test, a RP may only hold one Flyer ID.

AMC2 UAS.OPEN.020(4)(b) and UAS.OPEN.030(2)(a) and UAS.OPEN.040(3) UAS Operations in Subcategories A1, A2 and A3

CAA ORS9 Decision No. 16

PROOF OF COMPLETION OF OPEN CATEGORY ONLINE TRAINING

Upon receipt of proof of a RP passing the online theoretical examination, the CAA will provide the following proof of completion to the RP. The proof may be provided in electronic form

The certificate will contain the following two elements:

(1) The identifier provided by the CAA (the ‘Flyer ID’). The identifier has the following format:

NNN-RP-XXXXXXXXXXXX

Where:

i. NNN is the ISO 3166 Alpha-3 code of the country issuing the certificate (GBR);

ii. RP is a fixed field, meaning RP; and

iii. XXXXXXXXXXXX are 12 alphanumeric characters (upper-case only)) with the exception of the following characters: A, E, I, O, U, 1 and 0 defined by the CAA.

As an example: (GBR-RP-9WM5CGTWGC37); and

(2) QR code providing a link to the UK Flying drones and model aircraft web page where the information related to the RP is stored. Through the ‘RP identifier’ (‘Flyer ID Number’) information related to the Open category competence of the RP can be retrieved by the RP.

AMC1 UAS.OPEN.020(5)(c) and (d), UAS.OPEN.030(3) and UAS.OPEN.040(4)(c), (d) and (e) UAS Operations in Subcategories A1, A2 and A3

CAA ORS9 Decision No. 16

MODIFICATION OF A UAS WITH A CLASS MARK

See GM1 Article 2(16).

UAS.OPEN.030 UAS operations in subcategory A2

UAS operations in subcategory A2 shall comply with all of the following conditions:

(1) be conducted in such a way that the unmanned aircraft does not overfly uninvolved persons and the UAS operations take place at a safe horizontal distance of at least 30 metres from them; the remote pilot may reduce the horizontal safety distance down to a minimum of 5 metres from an uninvolved person when operating an unmanned aircraft with an active low speed mode function and after evaluation of the situation regarding:

(a) weather conditions,

(b) performance of the unmanned aircraft,

(c) segregation of the overflown area.

(2) be performed by a remote pilot who is familiar with manufacturer's instructions provided by the manufacturer of the UAS and holds a certificate of remote pilot competency issued by the CAA or an entity designated by the CAA . This certificate shall be obtained after complying with all of the following conditions and in the order indicated:

(a) completing an online training course and passed the online theoretical knowledge examination as referred to in point (4)(b) of point UAS.OPEN.020;

(b) completing a self- practical training in the operating conditions of the subcategory A3 set out in points (1) and (2) of point UAS.OPEN.040;

(c) declaring the completion of the self-practical training defined in point (b) and passing an additional theoretical knowledge examination provided by the CAA or an entity designated by the CAA achieving at least 75% of the overall marks. The examination shall comprise at least 30 multiple- choice questions aimed at assessing the remote pilot's knowledge of the technical and operational mitigations for ground risk, distributed appropriately across the following subjects:

(i) meteorology;

(ii) UAS flight performance;

(iii) technical and operational mitigations for ground risk.

(3) be performed with an unmanned aircraft which is marked as class C2 and complies with the requirements of that class, as defined in Part 3 of the Annex to Delegated Regulation (EU) 2019/945, and is operated with active and updated direct remote identification system and geo-awareness function.

AMC1 UAS.OPEN.030(1) UAS Operations in Subcategory A2

CAA ORS9 Decision No. 16

SAFE HORIZONTAL DISTANCE FROM UNINVOLVED PERSONS

(a) The horizontal distance of the UA from uninvolved persons is defined as the distance between the points where the UA would hit the ground in the event of a vertical fall and the position of the uninvolved persons.

(b) The safe horizontal distance of the UA from uninvolved persons is variable and is dependent on the performance and characteristics of the UAS involved, the weather conditions and the segregation of the overflown area. The RP is ultimately responsible for the determination of this distance however, the distance from uninvolved persons must always be greater than 30m.:

(c) The horizontal distances described above do not apply to uninvolved people inside buildings. The RP is ultimately responsible for maintaining safe horizontal distances including from uninvolved people entering and exiting buildings. This includes consideration for open areas such balconies and roofs.

Article 22 gives provision for some non-class marked UA to be operated within the A2 subcategory but limits the minimum horizontal distance from uninvolved people to 50m.

AMC1 UAS.OPEN.030(2)(b) and (c) UAS Operations in Subcategory A2

CAA ORS9 Decision No. 16

REMOTE PILOT CERTIFICATE OF COMPETENCY

After verification that the applicant:

- Has Passed the online theoretical knowledge examination; and
- Has completed and declared the self-practical training; and
- Has passed the additional theoretical knowledge examination provided by the competent authority or by an entity recognised by the competent authority,

The CAA, or an entity designated by the CAA, will provide a certificate of competency to the RP.

The certificate has the following elements:

(1) The identifier provided by the CAA (Flyer ID) has the following format:

GBR-RP-XXXXXXXXXXXX

Where:

1. GBR is the ISO 3166 Alpha-3 code of the Great Britain;
2. RP is a fixed field meaning Remote Pilot; and
3. XXXXXXXXXXXX are 12 alphanumeric characters that form the unique identifier.

AMC2 UAS.OPEN.030(2)(b) UAS Operations in Subcategory A2

CAA ORS9 Decision No. 16

PRACTICAL SELF-TRAINING

(a) The aim of the practical self-training is to ensure that the RP can demonstrate at all times the ability to:

(1) operate the UAS within its limitations;

(2) complete all manoeuvres with smoothness and accuracy;

(3) exercise good judgment and airmanship;

(4) apply their theoretical knowledge; and

(5) maintain control of the UA at all times in such a manner that the successful outcome of a procedure or manoeuvre is assured.

(b) The RP must complete the practical self-training with a UAS that features the same flight characteristics (e.g. fixed wing, rotorcraft), control scheme (manual or automated, human machine interface) and a similar weight as the UAS intended for use in the UAS operation. This implies the use of a UA with an MTOM of less than 4 kg and bearing the Class 2 marking after the transition period defined in Article 22 has ended.

(c) If a UAS with both manual and automated control functions is used, the practical self-training must be performed with both control functions. If this UAS has multiple automated features, the RP must demonstrate proficiency with each automated feature.

(d) The practical self-training must contain at least flying exercises covering take-off or launch and landing or recovery, precision flight manoeuvres remaining in a given airspace volume, hovering in all orientations, or loitering around positions when applicable. In addition, the RP must exercise procedures for abnormal situations (e.g., a return-to-home function, if available), as stipulated in the user’s manual provided by the manufacturer.

(e) This must be completed prior to taking the test described in AMC1 UAS.OPEN.030(2)(c). This practical training must be completed within the confines of the A1 or A3 subcategory, and may be completed at either a RAE, or by the individual.

PRACTICAL COMPETENCIES FOR PRACTICAL SELF-TRAINING

When executing the practical self-training, RPs should perform as many flights as they deem necessary to gain a reasonable level of knowledge and the skills to operate the UAS safely.

The following list of practical competencies must be considered:

(a) Preparation of the UAS operation:

(1) make sure that the:

(i) chosen payload is compatible with the UAS used for the flight;

(ii) operating area is suitable for the intended operation; and

(iii) UAS meets the technical requirements of any geographical zone that is being flown within;

(2) define the area of operation in which the intended operation takes place in accordance with UAS.OPEN.040;

(3) define the area of operation considering the characteristics of the UAS;

(4) identify the limitations published for any relevant geographical zone (e.g., FRZs around aerodromes, Prohibited, Restricted or Danger areas, etc), and if needed, seek authorisation by the entity responsible for such zones;

(5) identify any obstacles and the potential presence of uninvolved persons in the area of operation that could hinder the intended UAS operation; and

(6) check the current meteorological conditions and the forecast for the time planned for the operation.

(b) Preparation for the flight:

(1) assess the general condition of the UAS and ensure that the configuration of the UAS complies with the instructions provided by the manufacturer in the user's manual;

(2) ensure that all removable components of the UA are properly secured;

(3) make sure that the software installed on the UAS and in the command unit is the latest version published by the UAS manufacturer;

(4) calibrate the instruments on board the UA, if required;

(5) identify possible conditions that may jeopardise the safety of the intended UAS operation;

(6) check the status of the battery and make sure it is sufficient for the intended UAS operation;

(7) update the geo-awareness system; and

(8) set the height limitation system, if required.

(c) Flight under normal conditions:

(1) using the procedures provided by the manufacturer in the user’s manual, familiarise with how to:

i. take off (or launch)

ii. carry out a stable flight:

iii. hover in case of multirotor UA;

iv. perform coordinated large turns;

v. perform coordinated tight turns;

vi. perform straight flight at a constant altitude;

vii. change direction, height and speed;

viii. follow a path;

ix. return of the UA towards the RP after the UA has been placed at a distance that no longer allows its orientation to be distinguished, in case of multirotor UA;

x. perform horizontal flight at different speed (critical high speed or critical low speed), in case of fixed wing UA;

xi. keep the UA outside any relevant airspace restrictions, unless holding an authorisation to enter;

xii. use some external references to assess the distance and height of the UA;

xiii. perform return to home procedure — automatic or manual;

xiv. land (or recovery); and

xv. perform landing procedure and missed approach in case of fixed wing UA; and

(2) maintain a sufficient separation from obstacles;

(d) Flight under abnormal conditions, where an abnormal condition is one which involves the use of additional procedures to continue the flight safely:

(1) manage the UAS flight path in abnormal situations;

(2) manage a situation where the UAS positioning equipment is impaired;

(3) manage a situation of incursion of a person into the area of operation, and take appropriate measures to maintain safety;

(4) manage the exit from the operating area as defined during the flight preparation;

(5) manage the incursion of a manned aircraft into/ near to the area of operation;

(6) manage the incursion of another UAS into the area of operation;

(7) deal with a situation of a loss of attitude or position control generated by external phenomena such as Electromagnetic Interference (EMI);

(8) resume manual control if fitted on the UAS, when automatic systems render the situation dangerous; and

(9) carry out the loss of C2 link procedure.

(e) Briefing, debriefing and feedback:

(1) conduct a review of the UAS operation; and

(2) identify situations when an occurrence report is necessary and complete the occurrence report.

AMC1 UAS.OPEN.030(2)(c) Additional A2 Online Test

CAA ORS9 Decision No. 16

DECLARATION OF COMPLETION OF SELF-PRACTICAL TRAINING

The applicant shall declare that they have completed the self-practical training, described in "AMC1 UAS.OPEN.030(2)(b) and (c) UAS Operations in Subcategory A2" on page 99 and "AMC2 UAS.OPEN.030(2)(b) UAS Operations in Subcategory A2" on page 100. This declaration shall be made in writing to the RAE that the applicant has chosen to attend, for completion of the training course described below.

The applicant shall provide evidence as part of their declaration to the RAE confirming that the self-practical training has been completed, by means of a flight log, to demonstrate that flight time has been recorded, during the self-practical training.

AMC2 UAS.OPEN.030(2)(c) Additional A2 Online Test

CAA ORS9 Decision No. 16

PASS AN ADDITIONAL THEORY TEST

The additional theory test shall be completed at an RAE.

The examination may be electronic, or paper based, but must be 'closed book' – i.e. without reference to other material, other than that specifically referred to within a question (i.e. charts/maps).

The examination shall comprise a minimum of 30 multiple choice questions and is to be 75 minutes in duration. The pass mark shall be at least 75%.

A candidate with a recognised disability or additional needs will be granted an additional 15 minutes to complete the examination upon request.

If, following a failure of a previous attempt, an examination is being repeated, the student must sit a different set of questions to that used previously.

A Flyer ID must be held prior to commencing the additional theory test (see AMC1 UAS.OPEN.020(4)(b) and UAS.OPEN.030(2)(a) and UAS.OPEN.040(3)).

Following completion of the self-practical training, declaration to the RAE and completion of the additional theory test, the RAE shall issue the applicant with a certificate- the 'A2 Certificate of Competence'.

Note:

The CAA will issue RAEs with copies of templates to be used.

QUESTIONS TO BE DISTRIBUTED ACROSS THE FOLLOWING SUBJECTS

The questions shall be comprised from the following topics:

Subject	Areas to be Covered
Meteorology	- Introduction to obtaining and interpreting weather information - Weather reporting resources - Reports, forecasts and meteorological conventions appropriate for typical UAS flight operations - Local weather assessments - Effects of weather on the UA - Wind – urban effects, gradients, masking, turbulence - Temperature – precipitation, icing, turbulence

Subject	Areas to be Covered
	- Visibility factors - Clouds – Cumulonimbus (CB) hazards (including lightning) - IP43 (International Protection) IEC/EN 60529 standards with regard to water ingress
UAS Flight Performance	Typical operational envelope of a rotorcraft, fixed wing and hybrid configurations - Basic principles of flight Operating guides - Flight procedures/basic drills - Emergencies[1] Maintenance of system - Scheduled and repairs - Manufacturer's recommendations - Assessment 'safe to be flown?' Mass and balance and centre of gravity (CG) - Consideration of the overall balance when attaching gimbals, payloads - Understand meaning of MTOM - Security of the payload - Payload characteristics – how differences can affect the stability of a flight - CG – differences between different types of UA Batteries - Understand the terminology used for batteries (e.g. memory effect, capacity, c-rate) - Differences in battery types - Understand how a battery functions (e.g. charging, usage, danger, storage) - Battery safety - how to help prevent potential unsafe conditions
UAS Operating Principles	UAS operations - Visual Line of Sight (VLOS) - Avoiding collisions – 'See and Avoid' - Decision process - Stress/pressure from 'customers' - Occurrence reporting and investigation Congested area operations - Planning and preparation - Hazard identification

[1] See GM1 UAS.OPEN.060(2)(b) Responsibilities of the Remote Pilot.

Subject	Areas to be Covered
	- Overflight of people - Public/third parties – crowds and gatherings Medical fitness - Crew health precautions - Alcohol, drugs, medication, medical restrictions - Fatigue o Flight duration/flight workload o Outdoors and lone working Technical and operational mitigations for ground risk Low speed mode function Evaluating distance from people 1:1 rule

GM1 UAS.OPEN.030(1) UAS Operations in Subcategory A2

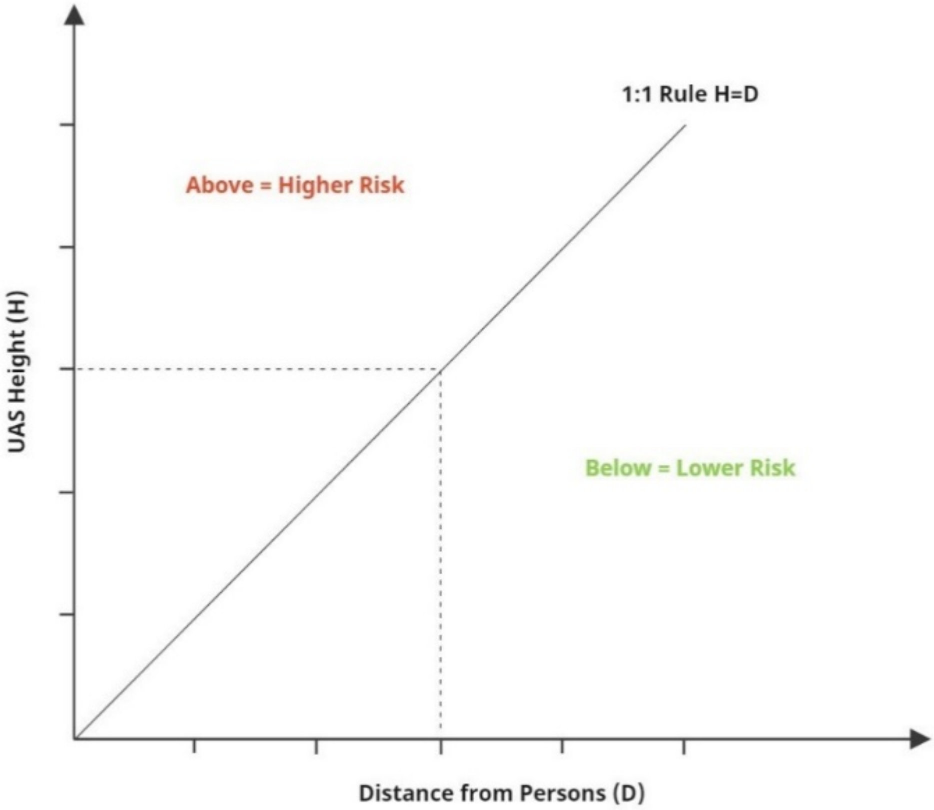
CAA ORS9 Decision No. 16

OPERATIONS IN SUBCATGORY A2

Subcategory A2 addresses operations during which flying close to people is intended for a significant portion of the flight. The minimum horizontal distance from uninvolved people is 30m. The RP is also required to have successfully passed an additional examination (known as the A2 CofC) in order to fly in sub-category A2.

The 1:1 'rule'

The '1:1 rule' is a principle which can be used to identify when the minimum separation distance from uninvolved people may need to be increased, and by how much. It is based on the relationship between the UA's height and its distance from the uninvolved person (the 1:1 line).



The horizontal separation between the UA and uninvolved people should not be less than the height of the aircraft. The higher the aircraft, the further it will travel should it suffer a catastrophic failure, and therefore the higher the likelihood of it colliding with uninvolved people, and so the separation distance must be increased (or the height reduced). This is so that, in the event of a propulsion failure, the UA is not likely to fall in an area with uninvolved people present.

RPs should aim to maintain a horizontal separation distance that is greater than, or equal to, the aircraft's height, using the same units of measurement.

Operations where the aircraft's height is greater than the separation distance (i.e. above the 1:1 line) should be avoided or kept to the absolute minimum time necessary, due to the increased risk.

GM1 UAS.OPEN.030(2)(a) UAS Operations in Subcategory A2

CAA ORS9 Decision No. 16

COMPLETION OF A1/A3 REMOTE PILOT COMPETENCE

See AMC1 UAS.OPEN.020(4)(b) and UAS.OPEN.030(2)(a) and UAS.OPEN.040(3) UAS operations in subcategories A1, A2 and A3.

GM1 UAS.OPEN.030(2)(c) Additional A2 Online Test

CAA ORS9 Decision No. 16

DECLARATION OF COMPLETION OF SELF-PRACTICAL TRAINING

No specific minimum flight time is set out in regulation, in order to demonstrate completion of the self-practical training. When the applicant declares that they have completed the training, they must demonstrate that they have undertaken the flight time, that they declare they have undertaken during this self-practical training.

GM1 UAS.OPEN.030(3) UAS Operations in Subcategory A2

CAA ORS9 Decision No. 16

MODIFICATION OF A UAS WITH A CLASS MARK

See "GM1 Article 2(16) Definitions" on page 25.

UAS.OPEN.040 UAS operations in subcategory A3

UAS operations in subcategory A3 shall comply with all of the following conditions:

(1) be conducted in an area where the remote pilot reasonably expects that no uninvolved person will be endangered within the range where the unmanned aircraft is flown during the entire time of the UAS operation;

(2) be conducted at a safe horizontal distance of at least 150 metres from residential, commercial, industrial or recreational areas;

(3) be performed by a remote pilot who is familiar with manufacturer's instructions provided by the manufacturer of the UAS and who has completed an online training course and passed an online theoretical knowledge examination as defined in point (4)(b) of point UAS.OPEN.020;

(4) be performed with an unmanned aircraft that:

(a) has an MTOM, including payload, of less than 25 kg, in the case of a privately built UAS, or

(b) meets the requirements defined in point (b) of Article 20;

(c) is marked as class C2 and complies with the requirements of that class, as defined in Part 3 of the Annex to Delegated Regulation (EU) 2019/945 and is operated with active and updated direct remote identification system and geo-awareness function or;

(d) is marked as class C3 and complies with the requirements of that class, as defined in Part 4 of the Annex to Delegated Regulation (EU) 2019/945 and is operated with active and updated direct remote identification system and geo-awareness function; or

(e) is marked as class C4 and complies with the requirements of that class, as defined in Part 5 of the Annex to Delegated Regulation (EU) 2019/945.

AMC1 UAS.OPEN.040(1) Operations in Subcategory A3

CAA ORS9 Decision No. 16

ENDANGERMENT OF UNINVOLVED PEOPLE

If an uninvolved person enters the area of the UAS operation, the RP must, where necessary, adjust the operation to ensure the safety of the uninvolved person and discontinue the operation if the safety of the UAS operation cannot be ensured.

GM1 UAS.OPEN.040(1) Operations in Subcategory A3

CAA ORS9 Decision No. 16

SAFE DISTANCE FROM UNINVOLVED PEOPLE

The safe distance of the UA from uninvolved persons is variable and is heavily dependent on the performance and characteristics of the UAS involved, the weather conditions and the segregation of the overflown area. The RP is ultimately responsible for the determination of this distance.

It is advised that, as a general rule, a 50m horizontal separation distance from uninvolved people is used as a method to comply with the requirement to ensure the safety of uninvolved people. This minimum distance may need to be increased based on other factors, such as kinetic energy, controllability, height and other such factors.

Uninvolved people should only be overflown when absolutely necessary, to achieve the aim of the flight and must be minimised as much as possible.

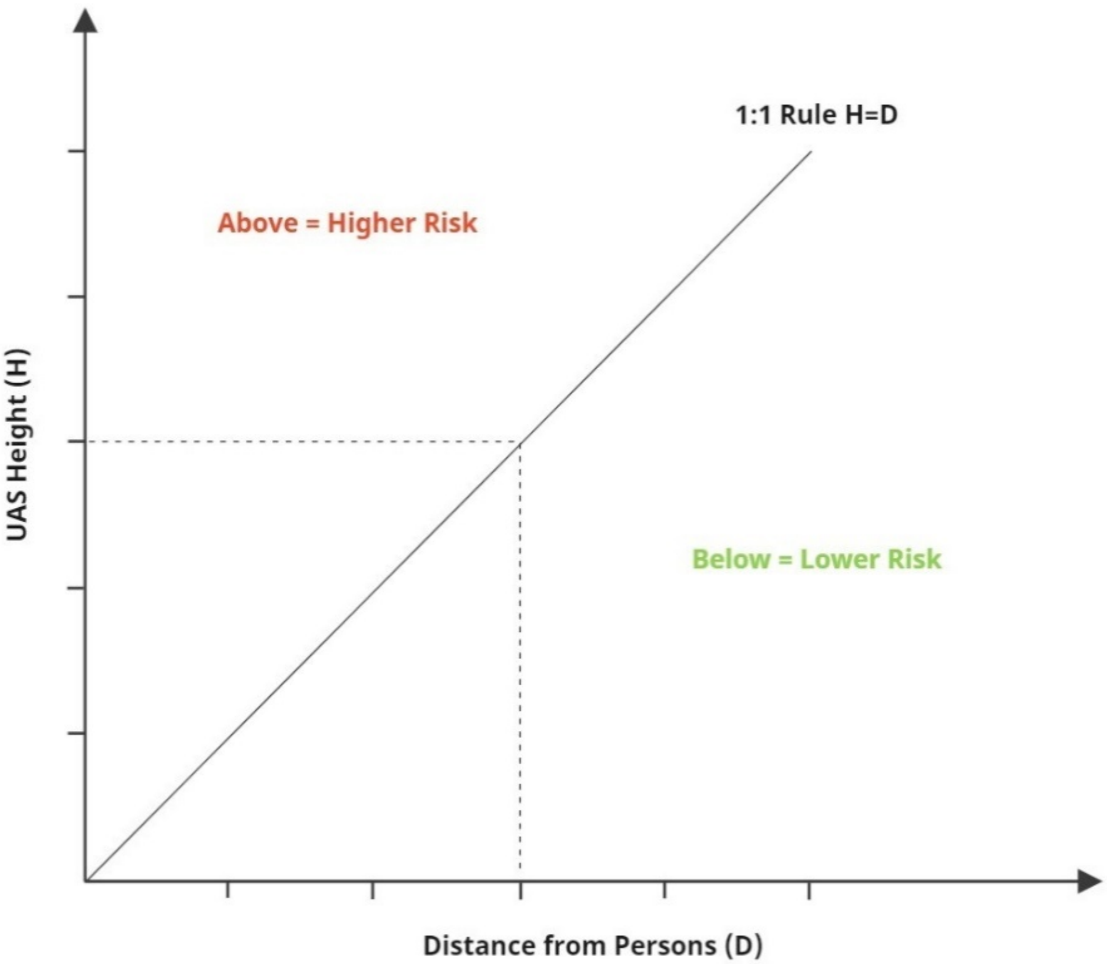
When flying above uninvolved people, some horizontal separation should be maintained. The necessary horizontal separation depends on factors, such as wind direction, trajectory of the UA and height of the UA.

The RP must be aware of their responsibilities as set out in "UAS.OPEN.060 Responsibilities of the remote pilot" on page 114 (2)(d), and in "GM1 UAS.OPEN.060(2)(d) Responsibilities of the Remote Pilot" on page 121, with regard to maintaining control of the UA.

<u>The 1:1 rule:</u>

The ‘1:1 rule’ is a principle which can be used to identify when the minimum separation distance from uninvolved people may need to be increased, and by how much. It is based on the relationship between the UA’s height and its distance from the uninvolved person (the 1:1 line).

The horizontal separation between the UA and uninvolved people should not be less than the height of the aircraft. The higher the aircraft, the further it will travel should it suffer a catastrophic failure, and therefore the higher the likelihood of it colliding with uninvolved people, and so the separation distance must be increased (or the height reduced). This is so that, in the event of a propulsion failure, the UA is not likely to fall in an area with uninvolved people present.



GM1 UAS.OPEN.040(2) UAS Operations in Subcategory A3

CAA ORS9 Decision No. 16

RESIDENTIAL, COMMERCIAL, INDUSTRIAL AND RECREATIONAL AREAS

The definition of residential, commercial, and recreational areas incudes individual buildings in remote locations.

GM1 UAS.OPEN.040(3) UAS Operations in Subcategory A3

CAA ORS9 Decision No. 16

COMPLETION OF A1/A3 REMOTE PILOT COMPETENCE

See "AMC1 UAS.OPEN.020(4)(b) and UAS.OPEN.030(2)(a) and UAS.OPEN.040(3) UAS Operations in Subcategories A1, A2 and A3" on page 95 and "UAS.OPEN.030 UAS operations in subcategory A2" on page 97 (2)(a) and "UAS.OPEN.040 UAS operations in subcategory A3" on page 108 (3) UAS operations in subcategories A1, A2 and A3.

GM1 UAS.OPEN.040(4)(c), (d) and (e) UAS Operations in Subcategory A3

CAA ORS9 Decision No. 16

MODIFICATION OF A UAS WITH A CLASS MARK

See "GM1 Article 2(16) Definitions" on page 25.

UAS.OPEN.050 Responsibilities of the UAS operator

The UAS operator shall comply with all of the following:

(1) develop operational procedures adapted to the type of operation and the risk involved;

(2) ensure that all operations effectively use and support the efficient use of radio spectrum in order to avoid harmful interference;

(3) designate a remote pilot for each flight;

(4) ensure that remote pilots and all other personnel performing a task in support of the operations are familiar with manufacturer's instructions provided by the manufacturer of the UAS, and:

(a) have appropriate competency in the subcategory of the intended UAS operations in accordance with points UAS.OPEN.020, UAS.OPEN.030 or UAS.OPEN.040 to perform their tasks or, for personnel other than the remote pilot, have completed an on-the-job-training course developed by the operator;

(b) are fully familiar with the UAS operator's procedures;

(c) are provided with the information relevant to the intended UAS operation concerning any geographical zones designated by the Secretary of State in accordance with Article 15;

(5) update the information into the geo-awareness system when applicable according to the intended location of operation;

(6) in the case of an operation with an unmanned aircraft of one of the classes defined in Parts 1 to 5 of the Annex of Delegated Regulation (EU) 2019/945, ensure that the UAS is:

(a) accompanied by the corresponding [...] declaration of conformity, including the reference to the appropriate class; and

(b) the related class identification label is affixed to the unmanned aircraft.

(7) Ensure in the case of an UAS operation in subcategory A2 or A3, that all involved persons present in the area of the operation have been informed of the risks and have explicitly agreed to participate.

AMC1 UAS.OPEN.050(1) Operations in Subcategory A3

CAA ORS9 Decision No. 16

OPERATIONAL PROCEDURES

The UAS Operator is responsible for developing procedures that are adapted to the type of operations and to the risks involved, and for ensuring that those procedures are complied with. The extent of the detail that needs to be provided within those procedures will vary depending on the relative complexity of the operation and/or the organisation involved.

Written procedures may not always be necessary, especially if the UAS Operator is also the only RP. The limitations of the Open category and the operating instructions provided by the UAS manufacturer may be considered sufficient.

If the UAS Operator employs more than one RP, the UAS Operator must:

(a) develop procedures for UAS operations in order to coordinate the activities between its employees; and

(b) establish and maintain a list of their personnel and their assigned duties.

For UAS Operators who wish to develop procedures, guidance can be found in the AMC and GM to Article 11.

GM1 UAS.OPEN.050(2) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

EFFICIENT USE OF RADIO SPECTRUM TO AVOID HARMFUL INTERFERENCE-VHF RADIO COMMUNICATIONS

The incorrect and illegal use of VHF Radiotelephony (RT) can cause significant impact to airspace users who require its use for communication with an ATS provider, especially in critical phases of flight or during an emergency. VHF radio communication should not be required in the Open category.

It should be noted that the use of VHF RT is strictly controlled, and requires the pilot to hold an appropriate licence, and to use an appropriately licenced radio for air-air, air-ground or ground-ground use.

It is the responsibility of the UAS Operator to ensure that the radio spectrum used for the C2 Link and for any payload communications complies with the relevant Ofcom requirements and that any licenses required for its operation have been obtained.

Frequency bands are allocated by Ofcom, details can be found on the Ofcom website and include IR 2030 – UK Interface Requirements 2030 which covers licence exempt short range devices. Applications for the assignment of frequencies within the bands must be addressed to Ofcom.

Licencing of frequency allocations is the responsibility of Ofcom and hence, where required, all applications for a frequency assignment should be directed in the first instance to Ofcom. In frequency bands where the CAA is the assigning authority, then the application will be passed to the CAA by Ofcom so that the CAA can conduct the technical work, but Ofcom still remains the licencing authority.

There are no specific frequencies allocated for use by UAS in the UK. However, the most used frequencies are 35 MHz, 2.4 GHz and 5.8 GHz.

35 MHz is a frequency designated for model aircraft use only, with the assumption that clubs and individuals will be operating in a known environment to strict channel allocation rules. It is therefore not considered to be a suitable frequency for more general UAS operations (i.e. outside a club environment) where the whereabouts of other users is usually difficult to assess.

2.4 GHz is a licence free band used for car wireless keys, household internet and a wide range of other applications. Although this is considered to be far more robust to interference than 35 MHz, operators must act with appropriate caution in areas where it is expected that there will be a high degree of 2.4 GHz activity.

5.8 GHz is a licenced band which requires a minimum payment and registration with Ofcom. This band is in use with other services including amateur-satellite, weather and military radars. Details can be found on the Ofcom website.

For further UAS specific guidance on whether a licence is required for your UAS, more information can be found on the Ofcom website.

Operations close to any facility that could cause interference (such as a radar station) could potentially disrupt communications with the UAS, whatever the frequency in use. GNSS jamming activities may also disrupt communications as well as C2 signals. Information on scheduled GNSS jamming exercises can be found on the Ofcom website, and should be promulgated via NOTAM.

AMC1 UAS.OPEN.050(4)(c) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

OBTAIN UPDATED INFORMATION ABOUT GEOGRAPHICAL ZONES

The UAS Operator must download the latest version of the geographical zone data and make this available to the RP such that they can upload it into the geo-awareness system, if such a system is available on the UA used for the operation. This information must be both an accurate, and complete, representation of the applicable airspace restrictions to the UAS Operation.

UAS.OPEN.060 Responsibilities of the remote pilot

(1) Before starting an UAS operation, the remote pilot shall:

(a) have the appropriate competency in the subcategory of the intended UAS operations in accordance with points UAS.OPEN.020, UAS.OPEN.030 or UAS.OPEN.040 to perform its task and carry a proof of competency while operating the UAS, except when operating an unmanned aircraft referred to in points (5)(a), (5)(b) or (5)(c) of point UAS.OPEN.020;

(b) obtain updated information relevant to the intended UAS operation about any geographical zone designated by the Secretary of State in accordance with Article 15;

(c) observe the operating environment, check the presence of obstacles and, unless operating in subcategory A1 with an unmanned aircraft referred to in points (5)(a), (5)(b) or (5)(c) of point UAS.OPEN.020, check the presence of any uninvolved person;

(d) ensure that the UAS is in a condition to safely complete the intended flight, and if applicable, check if the direct remote identification is active and up-to-date;

(e) if the UAS is fitted with an additional payload, verify that its mass does not exceed neither the MTOM defined by the manufacturer or the MTOM limit of its class.

(2) During the flight, the remote pilot shall:

(a) not perform duties under the influence of psychoactive substances or alcohol or when it is unfit to perform its tasks due to injury, fatigue, medication, sickness or other causes;

(b) keep the unmanned aircraft in VLOS and maintain a thorough visual scan of the airspace surrounding the unmanned aircraft in order to avoid any risk of collision with any manned aircraft. The remote pilot shall discontinue the flight if the operation poses a risk to other aircraft, people, animals, environment or property;

(c) comply with the operational limitations in geographical zones designated in accordance with Article 15;

(d) have the ability to maintain control of the unmanned aircraft, except in the case of a lost link or when operating a free-flight unmanned aircraft;

(e) operate the UAS in accordance with manufacturer's instructions provided by the manufacturer, including any applicable limitations;

(f) comply with the operator's procedures when available;

(g) when operating at night, ensure that a green flashing light on the unmanned aircraft is activated.

(3) During the flight, remote pilots and UAS operators shall not fly close to or inside areas where an emergency response effort is ongoing unless they have permission to do so from the responsible emergency response services.

(4) For the purposes of point (2)(b), remote pilots may be assisted by an unmanned aircraft observer. In such case, clear and effective communication shall be established between the remote pilot and the unmanned aircraft observer.

AMC1 UAS.OPEN.060(1)(c) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

OPERATING ENVIRONMENT

(a) The RP should observe the operating environment and check any conditions that might affect the UAS operation such as; the locations of people, property, vehicles, public roads, obstacles, aerodromes, critical infrastructure, and any other elements that may pose a risk to the safety of the UAS operation.

(b) Familiarisation with the environment and obstacles should be conducted, when possible, by walking around the area where the operation is intended to be performed.

(c) It must be verified that the weather conditions at the time when the operation starts and those that are expected for the entire period of the operation are within limits defined as suitable for the UAS, which must not exceed any specified in the manufacturer's manual. Note that this may need to include an understanding of the effects of wind flow / air flow patterns and potential turbulence caused by obstacles and buildings in the location of operation at all operating heights.

(d) The RP must be familiar with the operating environment and the light conditions and make a reasonable effort to identify potential sources of electromagnetic energy, which may cause undesirable effects, such as electromagnetic interference (EMI) or physical damage to the operational equipment of the UAS.

AMC1 UAS.OPEN.060(1)(d) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

UAS IN A SAFE CONDITION TO COMPLETE THE INTENDED FLIGHT

The RP must:

- Update the UAS with data for the geo-awareness function if it is available on the UA, including relevant airspace restrictions;

- Ensure that the UAS is safe to be flown and complies with the instructions and limitations provided by the manufacturer, or the best practice in the case of a privately built UAS;

- Ensure that any payload carried is properly secured and installed and that it complies with the limits of the mass and Centre of Gravity (CG) of the UA;

- Ensure that the charge of the battery of the UA (and quantify of fuel, if applicable) is enough for the intended operation based on:

  o the planned operation; and

  o the need for extra energy in case of unpredictable events; and

  o For UAS equipped with a loss-of-data-link recovery function, ensure that the recovery function allows a safe recovery of the UAS for the envisaged operation; for programmable loss-of-data- link recovery functions, the RP may have to set up the parameters of this function to adapt it to the envisaged operation prior to flight.

- Ensure any lighting or remote identification systems (if applicable) are functioning correctly.

AMC1 UAS.OPEN.060(2)(b) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

VLOS RANGE

The maximum distance of the UA from the RP will depend on the size of the UA and on the environmental characteristics of the area (such as the visibility, presence of tall obstacles, etc.).

RPs must keep the UA at a distance such that they are always able to clearly see it and evaluate the distance of the UA from other obstacles.

If the operation takes place in an area where there are no obstacles and the RP has unobstructed visibility up to the horizon, the UA can be flown up to a distance such that the UA remains clearly visible, in order that it can be controlled, this includes being able to determine its orientation.

If there are obstacles in the operating area, then the distance should be reduced such that the RP is able to evaluate the relative distance of the UA from those obstacles.

The RP should also consider other factors that may affect the maximum range of the UA from the RP, including the C2 link range.

Ensure VLOS, as defined within GM1 Article 2(7), is maintained at all times during flight.

AMC1 UAS.OPEN.060(2)(d) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

ABILITY TO MAINTAIN CONTROL OF THE UA

In order to maintain control of the UA, the RP should:

(1) be focused on the operation of the UA, as appropriate; and

(2) not operate a UA while also operating a moving vehicle;

(3) Operate only one UA at a time

If, as a passenger, the RP operates a UA from a moving ground vehicle or boat, the speed of the vehicle must be slow enough for the RP to maintain a VLOS of the UA, maintain control of the UA at all times and maintain situational awareness and orientation.

Autonomous operations are not allowed in the Open category, and the RP must be able to take control of the UA at any time, except in the event of a free-flight UA. This includes when required to land the UA at any point during the flight, by maintaining VLOS.

In the event of a lost C2 Link the RP will no longer be able to take control of the UA, therefore the RP must take all reasonable steps to ensure that the UA is not flown into a situation where the C2 Link might be lost (e.g. due to excessive range from the command unit, or in an area where the potential for RF interference is increased).

In addition, RPs must always fly their UA in a manner that, should a lost C2 Link situation occur, the UA will not subsequently endanger persons or property (e.g. while flying its ‘return to home’ procedure).

GM1 UAS.OPEN.060(1)(b)

CAA ORS9 Decision No. 16

UPDATED INFORMATION ON GEOGRAPHICAL ZONES

Although "UAS.OPEN.060 Responsibilities of the remote pilot" on page 114 (1)(b) specifically refers to geographical zones established under "Article 15 Operational conditions for UAS geographical zones" on page 82, the primary means for restricting flight of aircraft (including UA) in the UK, is under the ANO article 239. The RP must be familiar with these restrictions, and obtain any necessary permissions required to fly within them. This information can be found within the AIP.

GM1 UAS.OPEN.060(2)(a) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

PSYCHOACTIVE SUBSTANCES OR ALCOHOL

It is the responsibility of the RP to ensure that they are fit to fly and are not under the influence of any psychoactive substance or alcohol. While the general message is ‘don’t drink and fly’, additional information is provided below for reference and guidance.

While no actual limits are specified, the alcohol and drug consumption limitations that are prescribed for driving a car may be considered as an appropriate limit when flying in the Open category (i.e., if you are fit to drive a car, then you should be considered fit to fly in the Open category).

INJURY, FATIGUE, MEDICATION OR SICKNESS

While there are no specific requirements or medical standards set out for operations in the Open category, RPs should apply the same considerations that they would before driving a motor vehicle or riding a pedal cycle on the road.

OTHER CAUSES

'Other causes' means any physical or mental disorder or any functional limitation of a sensory organ that would prevent the RP from performing the operation safely.

GM1 UAS.OPEN.060(2)(b) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

DISCONTINUATION OF THE FLIGHT IF THE OPERATION POSES A RISK TO OTHER AIRCRAFT

There is an obligation on the RP to maintain a thorough visual scan of the surrounding airspace to avoid any risk of a collision with manned aircraft. It is likely that the RP will identify other airspace users before they identify the UA, and therefore the RP will usually be the first to manoeuvre away from any conflicting aircraft.

RPs should be aware that their UA are generally difficult, if not impossible, to see from another aircraft until they are extremely close.

As soon as the RP sees another aircraft, parachute, or any other airspace user, they must immediately keep the UA at a safe distance from it and land if the RP is not confident the flight can continue without posing a risk to the other airspace user.

If the RP cannot ensure suitable separation from the other aircraft, the UA must be landed immediately.

Although many aerodromes are protected by FRZs, many unlicensed aerodrome sites also exist, including hospital helipads. Such aircraft may loiter at low-level or land and take off unexpectedly. All of these types of helicopter operations may therefore be affected by VLOS operations particularly when approaching to land or departing from a site; UAS Operators and RPs must take active precautionary measures to avoid affecting the safety of other airspace users, either by requiring them to take avoiding action, disrupting a mission or distraction (for example, aborting an air ambulance landing due to a UA sighting).

DISCONTINUE THE FLIGHT IF THE OPERATION POSES A RISK TO ANIMALS AND THE ENVIRONMENT

In order to help assess whether the flight may pose a risk to animals, or the environment, the RP should check whether or not the flight is to take place within a Site of Special Scientific Interest (SSSI). When a flight may take place in such an area, the RP should contact the appropriate public body (e.g., Natural England, Natural Wales, Nature Scotland, National Trust, Historic Scotland, etc.) for further advice.

DISCONTINUE THE FLIGHT IF THE OPERATION POSES A RISK TO PEOPLE OR PROPERTY

This requirement also includes people inside vehicles. A collision, or even a distraction, caused by a UA to a motor vehicle, or any other passenger carrying vehicle, is likely to lead to a risk to the occupants of the vehicle.

EMERGENCY LANDING

Planning is a crucial stage to a mission's success and RPs must consider all 'in-flight' emergency scenarios, particularly when operating at a range where a systems failure or external influence may remove the RTH option and potentially result in an unplanned landing outside of the VLOS criteria. RPs should continually identify and update suitable Emergency Landing Sites (ELSs) as part of their desk top analysis, when conducting on-site reconnaissance and throughout the flight phase.

If an UA Observer is not employed and an aircraft experiences a critical system failure, or is subject to unexpected external influences, precluding the aircraft from safely returning to the home point it may be necessary to conduct an unassisted emergency landing away from the RP. RPs are required to maintain good situational awareness throughout all flights and must therefore adequately divide their attention between scanning the airspace for conflicting aircraft and achieving the mission. This should also involve exploiting the aircrafts sensor to scan the ground below for uninvolved persons infringing the safety minima and to identify suitable ELSs should an emergency landing be required. RPs should proactively scan and plan for new ELSs as the aircraft tracks away from the previous one. Whilst it is accepted that in such circumstances an RP may have little or no control over the aircrafts safe decent, they must make every effort to mitigate the risk to uninvolved persons.

GM1 UAS.OPEN.060(2)(c)

CAA ORS9 Decision No. 16

GEOGRAPHICAL ZONES

Although this requirement relates specifically to geographical zones established under Article 15, RPs should be aware of other airspace restrictions established under the ANO. These airspace restrictions must also be complied with. Details of these can be found within the AIP.

GM1 UAS.OPEN.060(2)(d) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

ABILITY TO MAINTAIN CONTROL OF THE UA

In order to help maintain control of the UA, the RP should fly cautiously, with the expectation that control of the UA may be lost without notice. The RP should avoid flying at excessive speeds when not necessary, especially near people.

The RP and UAS Operator should consider any environmental factors that may increase the potential for loss of control of the aircraft, or loss of propulsion. These factors may include terrain, other nearby sources of RF interference or weather conditions that may degrade the performance of the C2 link, and systems on the UA including batteries.

Precipitation may lead to water ingress into various systems on the UA, low temperatures may affect battery performance, and high wind speeds will result in a faster battery drain than in nil-wind conditions.

It should be noted that a partial loss of control may also be experienced, for example, a loss of some automated functions of the UA. The RP should be familiar with how these failures may affect other systems on the UA, and what backup systems are available- if any. The RP should also be familiar with flying the UA without the use of automated flight functions, in manual modes.

GM2 UAS.OPEN.060(2)(d) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

FREE-FLIGHT UA

‘Free flight’ means performing flights with no external control, taking advantage of the ascending currents, dynamic winds and the performance of the model. Outdoor free flights are carried out with gliders or with models equipped with means of propulsion (e.g. rubber-bands or thermal engines) that raise them in altitude, before they freely glide and follow the air masses.

For the purpose of free-flight UA, the person who launches the UA is the RP, and must comply with the responsibilities of the RP.

GM1 UAS.OPEN.060(3) and GM1 UAS.SPEC.060(3)(e) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

EMERGENCY RESPONSE DEFINITION

The term 'emergency response effort' covers any activities by police, fire, ambulance, coastguard, Search and Rescue or other similar services where action is ongoing in order to preserve life, protect the public or respond to a crime in progress. This includes activities such as road traffic collisions, fires, flooding events, rescue operations and firearms incidents, although this list is not exhaustive.

'Emergency response' is an action taken in response to an unexpected and dangerous event in an attempt to mitigate its impact on people, property or the environment.

EMERGENCY RESPONSE EFFORT

When there is an emergency response effort taking place within the operational area of a UAS, the UAS operation must be safely and immediately discontinued unless it was explicitly authorised by the responsible emergency response services.

When an emergency response effort is taking place close to the operational area, a safe distance must be maintained between the UA and the emergency response site so that the UA does not interfere with, or endanger, the activities of the emergency response services. The UAS Operator should take particular care not to hinder any possible aerial support to the emergency services, and to protect the privacy rights of persons involved in the emergency event.

GM1 UAS.OPEN.060(4) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

ROLE OF THE UA OBSERVER AND FIRST-PERSON VIEW

RPs may be assisted by UA Observers in helping them to keep the UA away from other aircraft and obstacles. The UA Observer must be situated alongside the RP and observers may not use any form of aided vision (e.g. binoculars) other than corrective spectacles or contact lenses.

UA Observers may also be used when the RP conducts UAS operations in first-person view (FPV), which is the method of controlling the UA primarily by referencing the UA's video downlink, either via watching the UA controller's screen or via goggles. The UA Observer must be situated alongside the RP and may not use aided vision other than corrective spectacles or contact lenses.

In all cases, the RP is still fully responsible for the safety of the flight.

The UA Observer's purpose is not to extend the range of the UA beyond the VLOS distance from the RP. However, in emergency situations, such as the need to perform an emergency landing away from the RP's position, binoculars may be used to assist the RP in safely performing the landing.

The UA Observer needs to be briefed by the RP or UAS Operator, in regard to keeping the UA within VLOS, and the definition of VLOS set out in GM1 Article 2(7). Whilst no minimum age, or competence level, is set out in law for a UA Observer, in order to meet the regulatory requirements that do exist, it is recommended that the UA Observer completes the Flyer ID test and learning, as set out in section "AMC1 UAS.OPEN.020(4)(b) and UAS.OPEN.030(2)(a) and UAS.OPEN.040(3) UAS Operations in Subcategories A1, A2 and A3" on page 95 and "UAS.OPEN.030 UAS operations in subcategory A2" on page 97 (2)(a) and "UAS.OPEN.040 UAS operations in subcategory A3" on page 108 (3).

UAS.OPEN.070 Duration and validity of the remote pilot online theoretical competency and certificates of remote pilot competency

(1) The remote pilot online theoretical competency, required by points (4)(b) of point UAS.OPEN.020 and point (3) of point UAS.OPEN.040, and the certificate of remote pilot competency, required by point (2) of point UAS.OPEN.030, shall be valid for five years.

(2) The revalidation of the remote pilot online theoretical competency and of the certificate of remote pilot competency is, within its validity period, subject to:

(a) a demonstration of competencies respectively in accordance with point (4)(b) of point UAS.OPEN.020 or point (2) of point UAS.OPEN.030; or

(b) the completion of a refresher training addressing respectively the theoretical knowledge subjects as defined in point (4)(b) of point UAS.OPEN.020 or point (2) of point UAS.OPEN.030 provided by the CAA or an entity designated by the CAA .

(3) In order to revalidate the remote pilot online theoretical competency or the certificate of remote pilot competency upon its expiration, the remote pilot shall comply with point (2)(a).

GM1 UAS.OPEN.070 Duration and Validity of Remote Pilot Competency

CAA ORS9 Decision No. 16

DURATION OF FLYER-ID VALIDITY

A Flyer ID that was obtained under national regulations, or before this regulation became applicable, holds a validity period of 3 years. On renewal, these Flyer IDs will hold a validity of 5 years.

Part B UAS OPERATIONS IN THE 'SPECIFIC' CATEGORY

UAS.SPEC.010 General provisions

The UAS operator shall provide the CAA with an operational risk assessment for the intended operation in accordance with Article 11 [...] unless the operator holds a light UAS operator certificate (LUC) with the appropriate privileges, in accordance with Part C of this Annex. The UAS operator shall regularly evaluate the adequacy of the mitigation measures taken and update them where necessary.

[...]

UAS.SPEC.030 Application for an operational authorisation

(1) Before starting an UAS operation in the ‘specific’ category the UAS operator shall obtain an operational authorisation from the CAA except where the UAS operator holds an LUC with the appropriate privileges, in accordance with Part C of this Annex.

(2) The UAS operator shall submit an application for an updated operational authorisation if there are any significant changes to the operation or to the mitigation measures listed in the operational authorisation.

(3) The application for an operational authorisation shall be based on the risk assessment referred to in Article 11 and shall include in addition the following information:

(a) the registration number of the UAS operator;

(b) the name of the accountable manager or the name of the UAS operator in the case of a natural person;

(c) the operational risk assessment;

(d) the list of mitigation measures proposed by the UAS operator, with sufficient information for the CAA to assess the adequacy of the mitigation means to address the risks;

(e) an operations manual when required by the risk and complexity of the operation;

(f) a confirmation that an appropriate insurance cover will be in place at the start of the UAS operations, if required by an enactment.

AMC1 UAS.SPEC.030(2) Application for an Operational Authorisation

CAA ORS9 Decision No. 46

SIGNIFICANT CHANGES TO THE OPERATIONAL AUTHORISATION

Guidance on how to determine whether a change to an operation is significant, can be found in;

- CAP722G, for guidance on significant changes to an OA obtained based on the CAP 722A methodology.
- CAP722L for guidance on significant changes to an OA obtained based on the UK SORA methodology, described in the AMC to Article 11.

UAS.SPEC.040 Issuing of an operational authorisation

(1) When receiving an application in accordance with point UAS.SPEC.030, the CAA shall issue, without undue delay, an operational authorisation in accordance with Article 12 when it concludes that the operation meets the following conditions:

(a) all information in accordance with point (3) of point UAS.SPEC.030 is provided;

(b) a procedure is in place for coordination with the relevant service provider for the airspace if the entire operation, or part of it, is to be conducted in controlled airspace.

(2) The CAA shall specify in the operational authorisation the exact scope of the authorisation in accordance with Article 12.

AMC1 UAS.SPEC.040(1)(b) Operational Authorisation

CAA ORS9 Decision No. 46

PROCEDURE FOR COORDINATION WITH SERVICE PROVIDER FOR OPERATION IN CONTROLLED AIRSPACE

Any application for operation in the Specific category must consider the need for involvement of the relevant Air Navigation Service Provider (ANSP), when operating within controlled airspace. This must be set out within suitable procedures. Guidance can be found the AMC to Article 11 (Annex E. OSO8). These procedures must take into account the risk of the operation and provide any necessary coordination with the ATS unit.

For VLOS operations within controlled airspace, below 400ft AGL, no permission or notification to the ANSP is required, unless operating within an FRZ.

For VLOS operations within controlled airspace, above 400ft AGL, this must be coordinated via a notification process when required for that portion of airspace, as set out within the AIP. This is in addition to the FRZ permission process, if operating within an FRZ. The AIP may set out additional requirements for the notification, such as a notice period for notification, within the AIP.

Note:

ANSPs will be required to update the AIP with such requirements, as necessary, by means of an ACP, which is likely to be a 'Level 0 ACP'. Further information can be found in CAP 1616.

Any operation that has the potential to impact the operation of another airspace user within controlled airspace, must consider how coordination with the ANSP will be achieved.

ANSPs may choose to be notified about all, or some, or no UAS operations within controlled airspace above 400ft AGL.

For BVLOS operations, at any height, within controlled airspace, the ANSP responsible for the management of the controlled airspace must be notified.

Although there is not a requirement to notify the ANSP when flying within controlled airspace below 400ft AGL, outside the FRZ, and within visual line of sight, this may still be identified as a risk mitigation within the risk assessment (see Article 11). In such cases, if this is adopted as a procedure within the OM, then this must also be carried out.

When notifying an ANSP of a potential flight within controlled airspace, the ATS unit may advise that the flight should not take place for safety, or other operational reasons. Although the ANSP may not specifically issue, or reject, a permission for entry to such airspace (unless an FRZ/Restricted area), this advice should be followed by the UAS Operator. Failure to follow this advice is likely to lead to a breach of a number of other regulatory requirements, such as ANO article 240, which sets out that a person must not recklessly or negligently act in a manner likely to endanger an aircraft. The ANSP may choose to provide advice to the UAS Operator, on notification, of an alternative course of action that may mitigate the safety risk associated with the planned operation notified to the ANSP.

GM1 UAS.SPEC.040(1)(b) Operational Authorisation

CAA ORS9 Decision No. 16

PROCEDURE FOR COORDINATION WITH SERVICE PROVIDER FOR OPERATION IN CONTROLLED AIRSPACE

The Specific category covers a wide range of operations, many of which pose only a low air risk to other airspace users. In such instances (subject to proper procedures and risk assessment), it is not proportionate to require permission from, or notification to, an ANSP to operate within controlled airspace, much of which extends down to the surface.

The requirements of controlled airspace do not automatically apply to operations in the Open and Specific categories.

These instructions may be found within AIP Part 3, section AD 2.17, of the respective aerodrome (for controlled airspace established around an aerodrome) or within Part 2, section ENR 2.1 for other controlled airspace. If there are no instructions set out for the controlled airspace the flight is planned within, then it may be assumed that notification is not required.

The UAS Operator of any BVLOS operation will be expected to liaise with the ANSP when within controlled airspace, at any altitude.

A NOTAM is not sufficient for the purpose of this requirement (although may also be required, to promulgate details of the operation to other airspace users).

The notification of a flight to the ANSP as part of a coordination activity, as set out in "UAS.SPEC.040 Issuing of an operational authorisation" on page 126 (1)(b), does not imply the provision of any service, or separation, to the UA. If such a service is required by the OA then it must be explicitly agreed with the ANSP in advance of the flight.

UAS.SPEC.050 Responsibilities of the UAS operator

(1) The UAS operator shall comply with all of the following:

(a) establish procedures and limitations adapted to the type of the intended operation and the risk involved, including:

(i) operational procedures to ensure the safety of the operations;

(ii) procedures to ensure that security requirements applicable to the area of operations are complied with in the intended operation;

(iii) measures to protect against unlawful interference and unauthorised access;

(iv) procedures to ensure that all operations are in respect of Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data. In particular it shall carry out a data protection impact assessment, when required by the Information Commissioner's Office in application of Article 35 of Regulation (EU) 2016/679;

(v) guidelines for its remote pilots to plan UAS operations in a manner that minimises nuisances, including noise and other emissions-related nuisances, to people and animals.

(b) designate a remote pilot for each flight or, in the case of autonomous operations, ensure that during all phases of the flight, responsibilities and tasks especially those defined in points (2) and (3) of point UAS.SPEC.060 are properly allocated in accordance with the procedures established pursuant to point (a);

(c) ensure that all operations effectively use and support the efficient use of radio spectrum in order to avoid harmful interference;

(d) ensure that before conducting operations, remote pilots comply with all of the following conditions:

(i) have the competency to perform their tasks in line with the applicable training identified by the operational authorisation or, if point UAS.SPEC.020 applies, by the conditions and limitations defined in the appropriate standard scenario listed in Appendix 1 or as defined by the LUC;

(ii) follow remote pilot training which shall be competency based and include the competencies set out in paragraph 2 of Article 8:

(iii) follow remote pilot training, as defined in the operational authorisation, for operations requiring such authorisation, it shall be conducted in cooperation with an entity designated by the CAA ;

[...]

(v) have been informed about the UAS operator's operations manual, if required by the risk assessment and procedures established in accordance with point (a);

(vi) obtain updated information relevant to the intended operation about any geographical zones designated in accordance with Article 15;

(e) ensure that personnel in charge of duties essential to the UAS operation, other than the remote pilot itself, comply with all of the following conditions:

(i) have completed the on-the-job-training developed by the operator;

(ii) have been informed about the UAS operator’s operations manual, if required by the risk assessment, and about the procedures established in accordance with point (a);

(iii) have obtained updated information relevant to the intended operation about any geographical zones designated in accordance with Article 15;

(f) carry out each operation within the limitations, conditions, and mitigation measures [...] specified in the operational authorisation;

(g) keep and maintain an up-to-date record of:

(i) all the relevant qualifications and training courses completed by the remote pilot and the other personnel in charge of duties essential to the UAS operation and by the maintenance staff, for at least 3 years after those persons have ceased employment with the organisation or have changed their position in the organisation;

(ii) the maintenance activities conducted on the UAS for a minimum of 3 years;

(iii) the information on UAS operations, including any unusual technical or operational occurrences and other data as required [...] by the operational authorisation for a minimum of 3 years;

(h) use UAS which, as a minimum, are designed in such a manner that a possible failure will not lead the UAS to fly outside the operation volume or to cause a fatality. In addition, Man Machine interfaces shall be such to minimise the risk of pilot error and shall not cause unreasonable fatigue;

(i) maintain the UAS in a suitable condition for safe operation by:

(i) as a minimum, defining maintenance instructions and employing an adequately trained and qualified maintenance staff; and

(ii) complying with point UAS.SPEC.100, if required;

(iii) using an unmanned aircraft which is designed to minimise noise and other emissions, taking into account the type of the intended operations and geographical areas where the aircraft noise and other emissions are of concern.

(j) establish and keep an up-to-date list of the designated remote pilots for each flight;

(k) establish and keep an up-to-date list of the maintenance staff employed by the operator to carry out maintenance activities; and

(l) ensure that each individual unmanned aircraft is installed with:

(i) at least one green flashing light for the purpose of visibility of the unmanned aircraft at night, and

(ii) an active and up-to-date remote identification system.

AMC1 UAS.SPEC.050(1)(a) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 46

OPERATIONAL PROCEDURES

The UAS Operator is responsible for developing procedures as required by the OA and for ensuring that those procedures are complied with.

The UAS Operator must:

(1) develop procedures for its UAS operations within an OM, detailing the scope of the organisation and the procedures to be followed as a minimum. This manual should be expanded as necessary to cover any increased complexity in the types of UAS being flown (based on the manufacturer's recommendations, if available), or of the types of operation being conducted; and

(2) compile and maintain a list of their personnel and their assigned duties.

The UAS Operator must allocate functions and responsibilities in accordance with the level of autonomy of the UAS during the operation.

These operational procedures must be set out as part of the OA application process. Guidance can be found in the AMC to Article 11 (Annex E. OSO8).

GM1 UAS.SPEC.050(1)(a)(i) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 46

OPERATIONAL PROCEDURES TO ENSURE THE SAFETY OF THE OPERATION- HIGH VOLTAGE STORAGE DEVICES

The safe handling of such devices is important, and must be considered within the risk assessment process, described in the AMC/GM to Article 11 (Annex E. OSO8). Consideration should be given to any time that any person may come into contact with such devices, including:

- Payload handlers/loaders
- Ground staff
- The RP
- Any person discovering the UA following an accident

Procedures should be established to cover all such eventualities and should include the display of relevant warnings.

The use of such devices on a UA should be identified and listed within the risk assessment process, and the display of a suitable warning label should be used as part of a mitigation of injury to third parties following an accident.

GM1 UAS.SPEC.050(1)(a)(iv) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

PROCEDURES TO ENSURE THAT ALL OPERATIONS ARE IN COMPLIANCE WITH REGULATION (EU) 2016/679 AS RETAINED (AND AMENDED IN UK DOMESTIC LAW) UNDER THE EUROPEAN UNION (WITHDRAWAL) ACT 2018, HEREAFTER REFERRED TO AS UK REGULATION (EU) 2016/679 ON THE PROTECTION OF NATURAL PERSONS WITH REGARD TO THE PROCESSING OF PERSONAL DATA AND ON THE FREE MOVEMENT OF SUCH DATA

The UAS Operator is responsible for complying with UK law and regulations in particular, with regard to privacy, data protection, liability, insurance, security and environmental protection.

This GM helps the UAS Operator to identify and describe the procedures to ensure that the UAS operations are in compliance with UK Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data.

For further information on data-protection responsibilities, see the ICO (Information Commissioner's Office) Website, here. The following table is included as an example of how an operator may ensure their data-protection responsibilities are complied with.

Considerations for operators to discharge data-protection responsibilities
1. Identify the privacy risks that the intended operation may create
2. Define your role with respect to personal data collection and processing
☐ I am the (joint) data controller ☐ I am the (joint) data processor
3. Data protection impact assessment (DPIA)
Have you assessed the need to perform a DPIA: Yes ☐ No ☐ If yes, do you have to perform a DPIA? Yes☐ No☐ - If yes, did you perform a DPIA? Yes☐ No ☐
4. Describe the measures you are taking to ensure data subjects are aware that their data may be collected

Considerations for operators to discharge data-protection responsibilities
5. Describe the measures you are taking to minimise the personal data you are collecting or to avoid collecting personal data
6. Describe the procedure established to store the personal data and limit access to it
7. Describe the measures taken to ensure that data subjects can exercise their right to access, correction, objection and erasure
8. Additional information

GM1 UAS.SPEC.050(1)(b) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

LEVEL OF AUTONOMY AND GUIDELINES FOR HUMAN-AUTONOMY INTERACTION

Autonomous UAS are not the same as 'highly automated' UAS. There are many highly automated UAS currently in use today, but an autonomous UAS is one which requires no input or control in order to commence, and carry out its flight, and that no intervention from a RP is possible. It will be able to follow the planned route, communicate with other airspace users, detect, diagnose and recover from faults and operate at least as safely as a system with continuous human involvement.

Nevertheless, the risk assessment of autonomous operations should ensure, as for any other operations, that the risks identified are mitigated to an acceptable level.

GM2 UAS.SPEC.050(1)(b) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

DESIGNATE A REMOTE PILOT FOR EACH FLIGHT

In the case of UAS Operators that are organisations, the RP does not have to necessarily be an employee or part of the organisation, in order to be designated a RP for a specific flight by the UAS Operator. The UAS Operator, however, remains responsible for the safety of the operation and the RP must follow the procedures of the UAS Operator. The UAS Operator remains responsible for ensuring the competence of the RP and that the obligations of the RP are met, in the same way as it would be if the RP was an employee of the UAS Operator's organisation.

The RP remains responsible for adhering to the regulatory responsibilities of the RP, and the UAS Operator remains responsible for adhering to the regulatory Responsibilities of the Operator.

GM1 UAS.SPEC.050(1)(c) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

EFFICIENT USE OF RADIO SPECTRUM

It is the responsibility of the UAS Operator to ensure that the radio spectrum used for the C2 Link and for any payload communications complies with the relevant Ofcom requirements and that any licences required for its operation have been obtained.

It is also the responsibility of the operator to ensure that the appropriate aircraft radio licence has been obtained for any transmitting radio equipment that is installed or carried on the aircraft, or that is used in connection with the conduct of the flight and that operates in an aeronautical band.

Licensing of frequency allocations is the responsibility of Ofcom and hence, where required, all applications for a frequency assignment should be directed in the first instance to Ofcom. In frequency bands where the CAA is the assigning authority, the application will be passed to the CAA by Ofcom so that the CAA can conduct the technical work however, Ofcom remains the licensing authority.

Where a frequency licence is required (e.g., in protected frequency bands or where powers exceed the current regulatory limits) the CAA will not be able to issue a permission or exemption.

There are no specific frequencies allocated for use by UAS in the UK. However, the most used frequencies are 35 MHz, 2.4 GHz and 5.8 GHz.

35 MHz is a frequency designated for model aircraft use only, with the assumption that clubs and individuals will be operating in a known environment to strict channel allocation rules. It is therefore not considered to be a suitable frequency for more general UAS operations (i.e., not in a club environment) where the whereabouts of other users is usually difficult to assess.

2.4 GHz is a licence free band used for car wireless keys, household internet and a wide range of other applications. Although this is considered to be far more robust to interference than 35 MHz, operators must act with appropriate caution in areas where it is expected that there will be a high degree of 2.4 GHz activity.

5.8 GHz is a licenced band which requires a minimum payment and registration with Ofcom. This band is in use with other services including amateur-satellite, weather and military radars. Details can be found on the Ofcom website.

For further UAS specific guidance on whether a licence is required for your UAS, more information can be found on the Ofcom website.

Operations close to any facility that could cause interference (such as a radar station) could potentially disrupt communications with the UAS, whatever the frequency in use. GNSS jamming activities may also disrupt communications as well as C2 signals. Information on scheduled GNSS jamming exercises can be found on the Ofcom website.

The risk assessment process described in the AMC and GM to "Article 11 Rules for conducting an operational risk assessment" on page 35 is likely to involve a radio frequency survey, in order to meet "UAS.SPEC.050 Responsibilities of the UAS operator" on page 128 (1)(c), which should also include a physical range check.

UAS Operators are advised to carry out such a survey, when assessing the suitability of a site for a proposed UAS Operation. In doing so, the operator should:

· Explain how C2 instructions, as well as telemetry data, are relayed between the command unit and the UA.

· Describe in detail Operational C2 link management, including frequency switchovers and C2 link contingency situations.

· Provide the Link Budget Calculation, wherever possible[1]

The following table may assist in this survey:

Survey element considerations when assessing the suitability of a site for a proposed UAS Operation		
C2 Link	Radio Line Of Sight (RLOS) C2 link	
	Beyond Radio Line Of Sight (BRLOS) C2 link (if applicable)	
Transceivers / Modems	Power Levels	
	Transmission Schemes	
Operating Frequencies Used		
Third Party Link Service Provider		
Minimum and average assured data Rates		
Minimum and average assured latencies		
Means of protection against harmful interference		
Any other relevant information		
Operating Frequencies Used		

Providing a detailed control system architecture diagram that includes informational or data flows and subsystem performance may assist in explaining the requirements above.

[1] A link budget calculation is the theoretical calculation of the end-to-end performance of a communications link

C2 link could include, direct (RLOS) or relayed (BRLOS). BRLOS includes all satellite systems or relaying C2 link through UA in the air to extend the signal range.

The following examples of technical solutions may help make the C2 link secure: pairing, encryption or back up link. It is recommended to use licensed spectrum for BVLOS operations to minimise the chances of external interference and to improve latency.

The UAS Operator should identify what alerts, such as warning, caution and advisory alerts, does the system provide to the operator and RP, to advise them of C2 link disruption.

The UAS Operator should consider what design characteristics or procedures are in place to maintain the availability, continuity, and integrity of the datalink. Factors to consider:

- RF or other interference
- Flight beyond communications range
- Antenna masking (during turns and/or at high attitude angles)
- Loss of command unit functionality
- Loss of UA functionality
- Atmospheric attenuation including precipitation
- RF wireless site survey to ensure reliable connectivity, it may include:
    - o Survey for frequency coverage throughout the potential operating area.
    - o Survey for frequency capacity to ensure sufficient bandwidth to support all predicted operations.

AMC1 UAS.SPEC.050(1)(d)(i), (ii) and (iii) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

REMOTE PILOT COMPETENCE- CURRENCY

The UAS Operator should identify the appropriate amount of recent flying experience in order to be considered 'current'.

Currency requirements should include:

- Regular practise of manoeuvres relevant to the scope of the OA.
- Regular practise of abnormal conditions and in-flight failures, such as:
    - o the ability to identify a deteriorating situation and react accordingly;

o taking manual control after a failure of any automated system;

o practice flight in 'manual' modes;

o identification of the potential for GNSS and compass loss or degradation.

As a minimum, RPs are expected to have logged at least 2 hours of total flight time in the last 3 calendar months on the type of UA applicable to the OA. For VLOS operations, this should be 'live' flight time, and not carried out on a simulator.

For new and novel types of UA, which are being test flown by a RP, currency must be demonstrated using a similar aircraft type. It is expected that this will be detailed within the specific flight test plan, and set out within the OM.

The UAS Operator, however, will need to identify the suitable level of currency for their operation, which is likely to be greater than the 2 hour minimum described above, for more complex operations.

RPs are expected to maintain a log book of flying activity, which may be used to demonstrate currency. This should contain:

- Date
- Aircraft type
- Aircraft identification (registration, if applicable, or serial number)
- Take off and landing location
- Duration (including whether in daylight, or at night)
- Remote pilot name
- Description of the flight/remarks

This should be stored electronically, in order that it can be easily submitted to the CAA for oversight purposes.

This is separate to the UA technical logbook requirement set out in "AMC1 UAS.SPEC.050(1)(g) Responsibilities of the UAS Operator" on the next page.

GM1 UAS.SPEC.050(1)(d)(i), (ii) and (iii) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

THEORETICAL KNOWLEDGE SUBJECTS FOR REMOTE PILOT TRAINING FOR THE 'SPECIFIC' CATEGORY

Within the Specific category there exists a wide range of potential UAS operations, each with unique risk. It is the responsibility of the UAS Operator to identify the competency requirements of the RP (requirements in addition to the GVC), and all personnel involved in the UAS operation, that is commensurate with the risk assessment for the given operation.

See AMC1 Article 8 Remote Pilot Competence for further information on these requirements.

AMC1 UAS.SPEC.050(1)(d)(vi) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

OBTAIN UPDATED INFORMATION ABOUT GEOGRAPHICAL ZONES

The UAS Operator must download the latest version of the geographical zone data and make this available to the RP such that they can upload it into the geo-awareness system, if such a system is available on the UA used for the operation. This information must be both an accurate, and complete, representation of the applicable airspace restrictions to the UAS Operation.

AMC2 UAS.SPEC.050(1)(d)(vi) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

UPDATED INFORMATION ON GEOGRAPHICAL ZONES

Although UAS.SPEC.050(1)(d)(vi) specifically refers to geographical zones established under Article 15, the primary means for restricting flight of aircraft (including UA) in the UK, is under the ANO article 239. The RP must be familiar with these restrictions, and obtain any necessary permissions required to fly within them. This information can be found within the AIP.

AMC1 UAS.SPEC.050(1)(e)(ii) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

INFORMATION ABOUT THE UAS OPERATOR’S MANUAL

The UAS Operator must ensure that the personnel in charge of duties essential to the UAS operation, apply the procedures contained in the operator’s OM.

AMC1 UAS.SPEC.050(1)(g) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

LOGGING OF FLIGHT ACTIVITIES AND RECORD-KEEPING

Operations must be logged, using a technical logbook for each aircraft, which must be held on an electronic record. This is to assist with regulatory oversight.

NOTE:

> This is separate to the RP log- book requirements, set out in "AMC1 UAS.SPEC.050 (1) (d) (i), (ii) and (iii) Responsibilities of the UAS Operator" on page 136.

The information to be recorded must include the following:

a. the identification of the UAS (manufacturer, model/variant (e.g. serial number));

  i. If the UAS itself is not subject to registration (i.e. not certified), the identification of the UAS may be achieved using the serial number of the UAS.

b. the date, time, and location of the take-off and landing;

c. the duration of each flight;

d. the total number of flight hours/cycles (take off and landings);

e. The name of the RP responsible for the flight;

f. the activity performed (including the OA number, and whether the flight was VLOS or BVLOS);

g. any significant incident or accident that occurred during the operation;

h. a completed pre-flight inspection

i. any site risk assessments and radio frequency surveys carried out;

j. any defects and rectifications;

k. any repairs and changes to the UAS configuration; and

l. the information required to comply with "UAS.SPEC.100 Use of certified equipment and certified unmanned aircraft" on page 152.

Records must be stored for 3 years in a manner that ensures their protection from unauthorised access, damage, alteration, and theft.

The logbook can be generated in either electronic or paper format. If the paper format is used, it must contain, in a single volume, all the pages needed to log the holder’s flight time. When one volume is completed, a new one will be started based on the cumulative data from the previous one.

GM1 UAS.SPEC.050(1)(g)(iii) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

UP TO DATE RECORD OF INFORMATION ON UAS OPERATIONS- FLIGHT DATA RECORDING

Although there is no legal requirement to make use of a flight data recording system (device, or service), it is recommended that UAS Operators make use of such systems to assist with the regulatory requirement set out in UAS.SPEC.050(1)(g)(iii). This would also assist with demonstration of regulatory compliance during the CAA audit process, to demonstrate that UAS Operations have been conducted within the conditions and limits of the OA, for example- providing a summary of the maximum height of all operations.

Such flight data recording systems are invaluable when investigating occurrences, insofar as providing a recording of the flight parameters, system status and control input.

This should also include the monitoring of high-voltage stored energy devices during the flight, for:

- The remaining charge left, i.e. the ‘fuel’ available for the remainder of the flight; and
- The health of the batteries (i.e. the temperature/ rate of discharge etc).

It should also be noted that equipment manufacturers are responsible for specifying the minimum requirements for the monitoring of UAS high-voltage stored energy devices. It is the responsibility of the UAS Operator to define procedures for satisfying these minimum requirements as part of their risk assessment process, as described in the AMC and GM to Article 11.

GM1 UAS.SPEC.050(1)(h) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

A POSSIBLE FAILURE WILL NOT LEAD THE UAS TO FLY OUTSIDE THE OPERATIONAL VOLUME

In order to identify whether a possible failure may lead the UA to fly outside the operational volume, a detailed description of the volume is necessary for each flight.

· Applications for OAs covering only specific locations should include the following information within the application.

· Applications for OAs which are not limited to a specific location should include suitable procedures to identify and record the following information, within the application. The operational volume should be described in the following way:

Emergency Buffer

Contingency Volume

Flight Volume

Operational Volume

The Flight Volume should encompass the entire operation, with sufficient buffer for any operational movement around the flight path, due to navigational errors, expected weather conditions and any other reason for deviating from the flight path.

The Contingency Volume provides a buffer around the Flight Volume. If the UA leaves the Flight Volume and enters the Contingency Volume, then the contingency procedures, documented in the OM, must be activated. The exact procedures will depend on the nature of the operation but should result in the UA re-entering the Flight Volume. Excursions from the Flight Volume may result from unexpected weather conditions, avoidance manoeuvres from weather, other airspace users or other such reasons. The Contingency Volume should be sufficiently large to accommodate any excursion due to weather, with enough room to manoeuvre the UA back into the Flight Volume. The Flight Volume and the Contingency Volume make up the Operational Volume.

Should the contingency mitigations fail, the UA might leave the Operational Volume and enter the Emergency Buffer. Upon such an excursion, the Emergency Response Plan, detailed within the OM, should be executed. This may include terminating the operation safely, with the flight termination device and alerting ATC, the Police and reporting the accident to the CAA.

The UAS Operator should describe the proposed area(s) of operation, using relevant, up to date and suitable maps and diagrams, with photographs if necessary. This should also include details of any relevant airspace.

The accuracy of any maps used must be verified, and preferably from an authoritative cartographic source, such as Ordnance Survey.

Where appropriate, aeronautical charts must be sourced and used.

This may be a brief description and should include information such as:

(a) Type of area – congested (urban), building sites, open countryside (rural), road, marine environment (offshore), airport etc.;

(b) Geographic location;

(c) Population density;

(d) Features considered important to the operation(s) – roads, railways, tall obstacles and surrounding terrain;

(e) Any operation at an aerodrome can be supported with relevant aeronautical information and charts, sourced from the AIP;

(f) Any relevant airspace restrictions may be described using information from the AIP;

Simplistic descriptions such as, 'all of the UK' or 'as clients request', are not suitable operating area definitions, if not supported by suitable other conditions and limitations and information as described in points (a) to (f) above.

Individual sites do not necessarily need to be listed, if the description of the information above is adequate, and supporting procedures within the OM are provided.

The UAS Operator should, as part of the risk assessment process, identify how the operational and technical factors may lead to a delay between the RP commanding a control response, and the UA responding accordingly. This includes the following steps, that the UAS Operator should consider.

These steps are affected by multiple factors, such as HMI considerations, decision taking time, time taken to action a response, latency, and time taken to execute the command.

This time should be used to estimate the overall time taken between identifying the need to manoeuvre the aircraft, and the aircraft manoeuvring. This should be used when considering the operational volume, and the likelihood of the UA leaving it.

SAFETY SYSTEMS

Several modern commercially available UAS are fitted with safety systems as standard such as, GNSS position monitoring systems, which can aid navigation but also enable electronic safety measures. These include geo-fencing or geo-caging, automated return to home, controlled descents, hovering and automatic landing. Other safety systems are available including propeller guards, flight termination functions, tethering systems, airbags and an automatic parachute recovery system which, on detecting a problem prevent the propellors from turning (by either switching the power off or blocking them) and deploys a recovery parachute.

The UAS Operator should consider the use of any safety systems on a UA that could substantially reduce the risk to other aircraft and the public. Whilst the incorporation of such safety systems is not mandated their inclusion may be a significant factor in assuring appropriate levels of safety in the event of an UAS malfunction.

A number of different safety systems may be used to help meet this requirement.

The UAS Operator should explain, within the OM, any systems fitted to the UA or command unit that contribute to safe handling or recovery of the UA in the event of loss of control or situational awareness.

If independent ‘kill switches’ are relied on as safety risk mitigations, these must be fully described.

Use of schematic diagrams may help describe the system layout and how this is constructed.

The UAS Operator should include any manufacturer supplied data relating to equipment or components included in the system i.e. data sheets, specification sheets, performance data etc.

GM1 UAS.SPEC.050(1)(L) Responsibilities of the UAS Operator

CAA ORS9 Decision No. 16

GREEN FLASHING LIGHT

Although this text remains in the regulation; the requirement to install, and use, a green flashing light on UAS within the Specific category has not been retained within the UK version of this regulation, because the applicability date of this requirement (set out in Article 23) was after the UK EU exit date, and as such was not retained.

REMOTE ID

Although this text remains in the regulation; the requirement to install an active remote identification system within the Specific category has not been retained within the UK version of this regulation, because the applicability date of this requirement (set out in article 23) was after the UK EU exit date, and as such was not retained.

UAS.SPEC.060 Responsibilities of the remote pilot

(1) The remote pilot shall:

(a) not perform duties under the influence of psychoactive substances or alcohol or when it is unfit to perform its tasks due to injury, fatigue, medication, sickness or other causes;

(b) have the appropriate remote pilot competency as defined in the operational authorisation [...] or as defined by the LUC and carry a proof of competency while operating the UAS.

(c) be familiar with manufacturer's instructions provided by the manufacturer of the UAS.

(2) Before starting an UAS operation, the remote pilot shall comply with all of the following:

(a) obtain updated information relevant to the intended operation about any geographical zones designated in accordance with Article 15;

(b) ensure that the operating environment is compatible with the authorised [...] limitations and conditions;

(c) ensure that the UAS is in a safe condition to complete the intended flight safely, and if applicable, check if the direct remote identification is active and up-to-date;

(d) ensure that the information about the operation has been made available to the relevant air traffic service (ATS) unit, other airspace users and relevant stakeholders, as required by the operational authorisation or by the conditions designated by the Secretary of State for the geographical zone of operation in accordance with Article 15.

(3) During the flight, the remote pilot shall:

(a) comply with the authorised [...] limitations and conditions;

(b) avoid any risk of collision with any manned aircraft and discontinue a flight when continuing it may pose a risk to other aircraft, people, animals, environment or property;

(c) comply with the operational limitations in geographical zones designated in accordance with Article 15;

(d) comply with the operator's procedures;

(e) not fly close to or inside areas where an emergency response effort is ongoing unless they have permission to do so from the responsible emergency response services.

GM1 UAS.SPEC.060(1)(a) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

THE REMOTE PILOT SHALL NOT PERFORM DUTIES UNDER THE INFLUENCE OF PSYCHOACTIVE SUBSTANCES OR ALCOHOL

UAS Operators should propose procedures, including alcohol limits, within their OM. Although no limits currently exist in law, it is advised that UAS Operators make use of the current Railways and Transport Safety Act 2003 Section 93 limits, which are:

Level of alcohol	All UK nations
Micrograms per 100 millilitres of breath	9 µg
Micrograms per 100 millilitres of blood	20 µg
Micrograms per 100 millilitres of urine	27 µg

THE REMOTE PILOT SHALL NOT PERFORM DUTIES WHEN THEY ARE UNFIT TO PERFORM TASKS DUE TO INJURY, FATIGUE, MEDICATION, SICKNESS OR OTHER CAUSES

The medical requirements for operations within the Specific category will be set out in the OA. Normally, this will be achieved by reference to the medical requirements that have been set out by the UAS Operator in its OM, although in some cases, additional requirements may be expressed more precisely.

UAS Operators will be expected to propose details of their required medical standards through the risk assessment associated with the particular operation.

GM1 UAS.SPEC.060(2)(a) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

UPDATED INFORMATION ON GEOGRAPHICAL ZONES

Although "UAS.SPEC.060 Responsibilities of the remote pilot" on page 143 (2)(a) specifically refers to geographical zones established under "Article 15 Operational conditions for UAS geographical zones" on page 82, the primary means for restricting flight of aircraft (including UA) in the UK, is under the ANO Article 239. The RP must be familiar with these restrictions, and obtain any necessary permissions required to fly within them. This information can be found within the AIP.

AMC1 UAS.SPEC.060(2)(b) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

OPERATING ENVIRONMENT

The RP, UAS Operator, must check any conditions that might affect the UAS operation, such as the locations of people, property, vehicles, public roads, obstacles, aerodromes, critical infrastructure, and any other elements that may pose a risk to the safety of the UAS operation.

Familiarisation with the environment and obstacles should be conducted through a survey of the area where the operation is intended to be performed.

It must be verified that the weather conditions at the time when the operation starts and those that are expected for the entire period of the operation are within limits defined in the manufacturer's manual, as well as with the OA or declaration, as applicable.

The RP must be familiar with the light conditions and make a reasonable effort to identify potential sources of electromagnetic energy, which may cause undesirable effects, such as EMI or physical damage to the operational equipment of the UAS.

AMC1 UAS.SPEC.060(2)(c) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

THE UAS IS IN A SAFE CONDITION TO COMPLETE THE INTENDED FLIGHT

The RP, or the UAS Operator in the case of an autonomous operation, must:

(a) update the UAS with data for the geo-awareness function if one is available on the UA;

(b) ensure that the UAS is safe to be flown and complies with the instructions and limitations provided by the manufacturer;

(c) ensure that any payload carried is properly secured and installed, respecting the limits for the mass and CG of the UA;

(d) ensure that the UA has enough available propulsion energy for the intended operation based on:

i. the planned operation; and

ii. the need for extra energy in case of unpredictable events;

(e) for a UAS equipped with a loss-of-data-link recovery function, ensure that the recovery function allows a safe recovery of the UAS for the envisaged operation; for programmable loss-of-data- link recovery functions, the RP may have to set up the parameters of this function to adapt it to the envisaged operation.

(f) Ensure that any lighting or remote ID systems (if applicable) are functioning correctly.

GM1 UAS.SPEC.060(2)(d) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

INFORMATION RELEVANT TO THE OPERATION MADE AVAILABLE TO THE ATS UNIT

For AMC on this requirement, in relation to controlled airspace, see AMC1 UAS.SPEC.040(1)(b).

INFORMATION PROVIDED TO OTHER AIRSPACE USERS WHEN INSIDE AN FRZ

The AIP (Section ENR 1.1 – 4.1.8) sets out when a NOTAM should be used to promulgate UAS operations, when operating within an FRZ, including inside/outside hours of operation of the aerodrome.

VHF RADIO COMMUNICATIONS TO PROVIDE INFORMATION TO THE ATS UNIT

The use of VHF RT to help meet this requirement should only be used when absolutely necessary. Such circumstances may include:

- Operations within the close vicinity of an aerodrome, where permission for entry into an FRZ/ATZ has been arranged and the use of VHF RT has been requested by the ATS Unit.

- BVLOS operations outside segregated airspace.

- Operations in close vicinity to other airspace users, such as air shows and flying displays.

It is not possible to give an exhaustive list of such circumstances when the use of VHF RT is appropriate, and it is the responsibility of the operator to apply such a mitigation appropriately. Acceptance of such a mitigation within the OM does not authorise its use. A number of requirements must also be met in order to legally make use of VHF RT, which are detailed below.

If the operation is approved with such a mitigation, then the following requirements must be met and detailed within the OM, and may also be set out within the conditions of the OA:

- Suitable VHF radio must be installed on the UA, and a relay to the ground station provided to enable RP communication. The equipment and installation must be approved by the CAA. A ground-based VHF radio must not be used. This is due to regulatory requirements set out by Ofcom. Any queries on this requirement should be directed to Ofcom.

- Appropriate licence held by the RP; this will normally be a Flight Radio Telephony Operator's Licence (FRTOL), which must be issued by the CAA following recommendation from an examiner.

- Appropriate radio licence: the radio must either be licenced, or have an exemption from the wireless telegraphy act, to operate. Ofcom issue these licences.

Further information on radio requirements can be found in AIP GEN 1.5 section 5.

The use of RT on aeronautical band radios within the Specific category for contact with ATC should be limited to exceptional circumstances and be carried out as directed by the ATS unit with which the RP needs to communicate. In the majority of circumstances VHF RT is not required, and other methods of communication and/or procedural mitigations are sufficient.

AMC1 UAS.SPEC.060(3)(b) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 46

AVOID RISK OF COLLISION WITH ANY MANNED AIRCRAFT - WHEN BEYOND VISUAL LINE OF SIGHT

When operating BVLOS, the risk of collision with a manned aircraft must be mitigated sufficiently. Guidance can be found in AMC to Article 11 (UK SORA) and its appendices.

AVOID RISK OF COLLISION WITH ANY MANNED AIRCRAFT - WHEN OPERATING IN CLOSE PROXIMITY TO HELICOPTER LANDING SITES

When preparing a risk assessment for an operation, UAS Operators should consider the risk of interaction with un-notified aerial activity such as Air Ambulance arrivals and departures.

RPs and UAS Operators are reminded of the difficulty in visually observing UA, and the impact this is likely to have on the ability of other airspace users to avoid a collision with a UA.

Therefore, when operating in the vicinity of a Helicopter Landing Site, the UAS Operator should submit a NOTAM request to the Airspace Regulation Unit using the online application form, in order to increase helicopter crew awareness of planned UAS activity.

It should be noted, that a NOTAM may not be issued, following such a request. This does not indicate that the UAS Operation should not take place, but that it does not require a NOTAM.

Similarly, if a NOTAM is generated, this does not constitute ‘permission’ for the operation, or mean that the UAS Operator may disregard other restrictions, requirements or regulations that may otherwise apply.

GM1 UAS.SPEC.060(3)(b) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

AVOID RISK OF COLLISION WITH ANY MANNED AIRCRAFT- WHEN BEYOND VISUAL LINE OF SIGHT

An operational mitigation to reduce the likelihood of encountering other aircraft, may include airspace segregation.

AVOID RISK OF COLLISION WITH ANY MANNED AIRCRAFT- WHEN OPERATING IN CLOSE PROXIMITY TO HELICOPTER LANDING SITES

The issuing of a NOTAM when operating in close proximity to a HLS is one way of alerting the air crew to the UAS operation, so that they are aware of it. It is the responsibility of the operator to determine:

- Whether there is a HLS nearby;

    o The UAS Operator should determine whether there is an HLS in close proximity to their operation, although it should be expected that helicopters may take off and land anywhere. Although there is no authoritative source of all HLSs in the UK, the following list includes common examples of HLS;

- Hospitals, air ambulance and police helicopter bases, HLS on office blocks and temporary HLS at large events such as horse racing events (these are normally subject to NOTAM).

    o The following list contains examples of ways of checking whether an operation is likely to be in proximity to an HLS:

        - Military AIP, VFR charts, online GA mapping software, and satellite-based imagery analysis.

        - Whether the UAS operation is likely to affect the helicopter operation.

o Factors to consider include the planned height of the operation, the distance from the HLS and the planned flight path of the UA.

GM2 UAS.SPEC.060(3)(b) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

AVOID RISK OF COLLISION WITH ANY MANNED AIRCRAFT

There is an obligation on the RP to maintain a thorough visual scan of the surrounding airspace to avoid any risk of a collision with manned aircraft. It is likely that the RP will identify other airspace users before they identify the UA, and therefore the RP will usually be the first to manoeuvre away from any conflicting aircraft.

RPs are reminded of the applicable requirements of SERA, as set out in AMC1 Article 7 (2).

RPs should be aware that their UA are generally difficult, if not impossible, to see from another aircraft until they are extremely close.

As soon as the RP sees another aircraft, or parachute, or any other airspace user, they must immediately keep the UA at a safe distance from it and land if the UA is on a trajectory towards the other object.

If the RP cannot ensure suitable separation from the other aircraft such that there is no risk of a collision, then the UA must be landed immediately (see AMC1 Article 7(2)).

Although many aerodromes are protected by FRZs, many unlicensed helicopter landing sites also exist, including hospital helipads. Such aircraft may loiter at low-level or land and take off unexpectedly. All of these types of helicopter operations may therefore be affected by UAS operations particularly when approaching to land or departing from a site; UAS Operators and RPs must take active precautionary measures to avoid affecting the safety of other airspace users, either by requiring them to take avoiding action, disrupting a mission or distraction (for example, aborting an air ambulance landing due to a UAS sighting.

GM1 UAS.SPEC.060(3)(c) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

GEOGRAPHICAL ZONES

Although this requirement relates specifically to geographical zones established under Article 15, RPs should be aware of other airspace restrictions established under the ANO. These airspace restrictions must also be complied with. Details of these can be found within the AIP.

GM1 UAS.SPEC.060(3)(e) Responsibilities of the Remote Pilot

CAA ORS9 Decision No. 16

EMERGENCY RESPONSE EFFORT

See section: GM1 UAS.OPEN.060(3) for further information.

UAS.SPEC.070 Transferability of an operational authorisation

An operational authorisation is not transferable.

UAS.SPEC.080 Duration and validity of an operational authorisation

(1) The CAA shall specify the duration of the operational authorisation in the authorisation itself.

(2) Notwithstanding point (1), the operational authorisation remains valid as long as the UAS operator remains compliant with the relevant requirements of this Regulation and with the conditions defined in the operational authorisation.

(3) Upon revocation or surrender of the operational authorisation the UAS operator shall provide an acknowledgment in digital format that must be returned to the CAA without delay.

[...]

UAS.SPEC.090 Access

For the purpose of demonstrating compliance with this Regulation, an UAS operator shall grant to any person, that is duly authorised by the CAA , an access to any facility, UAS, document, records, data, procedures or to any other material relevant to its activity, which is subject to operational authorisation [...] , regardless of whether or not its activity is contracted or subcontracted to another organisation.

UAS.SPEC.100 Use of certified equipment and certified unmanned aircraft

(1) If the UAS operation is using an unmanned aircraft for which a certificate of airworthiness or a restricted certificate of airworthiness have been issued, or using certified equipment, the UAS operator shall record the operation or service time in accordance either with the instructions and procedures applicable to the certified equipment, or with the organisational approval or authorisation.

(2) The UAS operator shall follow the instructions referred to in the unmanned aircraft certificate or equipment certificate, and also comply with any airworthiness or operational directives issued by the CAA.

GM1 UAS.SPEC.100 The Use of Certified Equipment and Certified Unmanned Aircraft

CAA ORS9 Decision No. 16

GENERAL

For the purposes of "UAS.SPEC.100 Use of certified equipment and certified unmanned aircraft" above, ‘certified equipment’ is considered to be any equipment for which the relevant design organisation has demonstrated compliance with the applicable certification specifications and received a form of recognition from the CAA that attests such compliance (e.g., a TSO approval).

The use of certified equipment or certified UA in the Specific category does not imply an automatic transfer of the flight activities into the Certified category. However, the use of certified equipment or certified UA in the Specific category should be considered as a risk reduction and/or mitigation measure in the risk assessment. If the certification of those products is relied upon within the risk assessment, then all aspects/conditions related to that certification (such as performance limitations, routine maintenance, scheduled servicing and the qualifications/ approvals of the organisations and personnel carrying out those duties) must also be complied with.

An ETSO/ TSO approval approves the equipment, and not the installation of it on an aircraft. Therefore, the applicant needs to demonstrate via their risk assessment how this equipment does not impact on other aircraft systems or airspace users, an example is the electrical power requirements, i.e. this should not draw more power than the electrical distribution system can provide. This equipment should also not induce any electromagnetic interference on other equipment installed on the platform.

Part C LIGHT UAS OPERATOR CERTIFICATE (LUC)

UAS.LUC.010 General requirements for an LUC

(1) A legal person is eligible to apply for an LUC under this Part.

(2) An application for an LUC or for an amendment to an existing LUC shall be submitted to the CAA and shall contain all of the following information:

(a) a description of the UAS operator's management system, including its organisational structure and safety management system;

(b) the name(s) of the responsible UAS operator's personnel, including the person responsible for authorising operations with UASs;

(c) a statement that all the documentation submitted to the CAA has been verified by the applicant and found to comply with the applicable requirements.

(3) If the requirements of this Part are met, an LUC holder may be granted the privileges, in accordance with point UAS.LUC.060.

UAS.LUC.020 Responsibilities of the LUC holder

The LUC holder shall:

(1) comply with the requirements of points UAS.SPEC.050 and UAS.SPEC.060;

(2) comply with the scope and privileges defined in the terms of approval;

(3) establish and maintain a system for exercising operational control over any operation conducted under the terms of its LUC;

(4) carry out an operational risk assessment of the intended operation in accordance with Article 11 [...] ,

(5) keep records of the following items in a manner that ensures protection from damage, alteration and theft for a period at least 3 years for operations conducted using the privileges specified under point UAS.LUC.060:

(a) the operational risk assessment [...] and its supporting documentation;

(b) mitigation measures taken; and

(c) the qualifications and experience of personnel involved in the UAS operation, compliance monitoring and safety management;

(6) keep personnel records referred to in point (5)(c) as long as the person works for the organisation and shall be retained until 3 years after the person has left the organisation.

UAS.LUC.030 Safety management system

(1) An UAS operator who applies for an LUC shall establish, implement and maintain a safety management system corresponding to the size of the organisation, to the nature and complexity of its activities, taking into account the hazards and associated risks inherent in these activities.

(2) The UAS operator shall comply with all of the following:

(a) nominate an accountable manager with authority for ensuring that within the organisation all activities are performed in accordance with the applicable standards and that the organisation is continuously in compliance with the requirements of the management system and the procedures identified in the LUC manual referred to in point UAS.LUC.040;

(b) define clear lines of responsibility and accountability throughout the organisation;

(c) establish and maintain a safety policy and related corresponding safety objectives;

(d) appoint key safety personnel to execute the safety policy;

(e) establish and maintain a safety risk management process including the identification of safety hazards associated with the activities of the UAS operator, as well as their evaluation and the management of associated risks, including taking action to mitigate those risks and verify the effectiveness of the action;

(f) promote safety in the organisation through:

(i) training and education;

(ii) communication;

(g) document all safety management system key processes for making personnel aware of their responsibilities and of the procedure for amending this documentation; key processes include:

(i) safety reporting and internal investigations;

(ii) operational control;

(iii) communication on safety;

(iv) training and safety promotion;

(v) compliance monitoring;

(vi) safety risk management;

(vii) management of change;

(viii) interface between organisations;

(ix) use of sub-contractors and partners;

(h) include an independent function to monitor the compliance and adequacy of the fulfilment of the relevant requirements of this Regulation, including a system to provide feedback of findings to the accountable manager to ensure effective implementation of corrective measures as necessary;

(i) include a function to ensure that safety risks inherent to a service or product delivered through subcontractors are assessed and mitigated under the operator's safety management system.

(3) If the organisation holds other organisation certificates within the scope of Regulation (EU) 2018/1139, the safety management system of the UAS operator may be integrated with the safety management system that is required by any of those additional certificate (s).

UAS.LUC.040 LUC manual

(1) An LUC holder shall provide the CAA with an LUC manual describing directly or by cross reference its organisation, the relevant procedures and the activities carried out.

(2) The manual shall contain a statement signed by the accountable manager that confirms that the organisation will at all times work in accordance with this Regulation and with the approved LUC manual. When the accountable Manager is not the Chief Executive Officer of the organisation, the chief executive officer shall countersign the statement.

(3) If any activity is carried out by partner organisations or subcontractors, the UAS operator shall include in the LUC manual procedures on how the LUC holder shall manage the relationship with those partner organisations or subcontractors.

(4) The LUC manual shall be amended as necessary to retain an up-to-date description of the LUC holder's organisation, and copies of amendments shall be provided to the CAA .

(5) The UAS operator shall distribute the relevant parts of the LUC manual to all its personnel in accordance with their functions and duties.

UAS.LUC.050 Terms of approval of the LUC holder

(1) The CAA shall issue an LUC after it is satisfied that the UAS operator complies with points UAS.LUC.020, UAS.LUC.030 and UAS.LUC.040.

(2) The LUC shall include:

(a) the UAS operator identification;

(b) the UAS operator's privileges;

(c) authorised type(s) of operation;

(d) the authorised area, zone or class of airspace for operations, if applicable;

(e) any special limitations or conditions, if applicable;

UAS.LUC.060 Privileges of the LUC holder

When satisfied with the documentation provided, the CAA :

(1) shall specify the terms and conditions of the privilege granted to the UAS operator in the LUC; and

(2) may, within the terms of approval, grant to an LUC holder the privilege to authorise its own operations without applying for an operational authorisation.

UAS.LUC.070 Changes in the LUC management system

After an LUC is issued, the following changes require prior approval by the CAA :

(1) any change in the terms of approval of the UAS operator;

(2) any significant change to the elements of the LUC holder's safety management system as required by point UAS.LUC.030.

UAS.LUC.075 Transferability of an LUC

Except for the change to the ownership of the organisation, approved by the CAA in accordance with point UAS.LUC.070, an LUC is not transferable.

UAS.LUC.080 Duration and validity of an LUC

(1) An LUC shall be issued for an unlimited duration. It shall remain valid subject to:

(a) the LUC holder's continuous compliance with the relevant requirements of this Regulation and other relevant enactments ; and

(b) it not being surrendered or revoked.

(2) Upon revocation or surrender of an LUC, the LUC holder shall provide an acknowledgment in digital format that must be returned to the CAA without delay.

UAS.LUC.090 Access

For the purpose of demonstrating compliance with this Regulation, the LUC holder shall grant any person, that is duly authorised by the CAA , an access to any facility, UAS, document, records, data, procedures or to any other material relevant to its activity, which is subject to certification or operational authorisation [...] , regardless of whether or not its activity is contracted or subcontracted to another organisation.

Appendices

Annex A to Article 8

Remote Pilot Competence

Due to the size of the AMC and GM for Article 16, it has been included as an Appendix to this document.

AMC1 Article 8(2) Remote Pilot Competence

CAA ORS9 Decision No. 46

INTRODUCTION

The following AMC and GM have been developed to support remote pilot training and progression for increasingly complex UAS operations.

This AMC, in so far as it relates to an RAE(PC), forms part of the RAE(PC) scheme, which also includes the CAA policy for approving an RAE(PC) to carry out the training and assessment of remote pilots, as set out in Unmanned Aircraft System Operations in UK Airspace – Recognised Assessment Entity for Remote Pilot Competence RAE(PC), Fifth Edition (CAP 722B).

The training has been designed to deliver the relevant remote pilot competencies based on the required task performance, knowledge, skills, and attitudes for future remote pilots.

The training is not designed to cover all operational scenarios on all types of UAS as this would create significant complexity.

UAS operators continue to be responsible for UA specific training and remote pilot standardisation, proportional to the complexity of their individual organisation. Operators should carefully consider what UA or operation specific training is required for remote pilots prior to making an application for an Operational Authorisation.

DEFINITIONS

For the purposes of this AMC, the following definitions apply:

- “**Trainee**” means a remote pilot undergoing training at an RAE(PC)
- “**OA Applicant**” means applicant for an Operational Authorisation.
- "**Assessment of competence**" means the demonstration of skills, knowledge, and attitudes for the initial issue, revalidation, or renewal of a remote pilot certificate.
- "**Competency**" means a combination of skills, knowledge and attitudes required to perform a task to the prescribed standard.
- “**UA Category**” or “**Category of UA**” means a categorisation of unmanned aircraft according to its basic characteristics. For this AMC that could mean an unmanned aeroplane or unmanned rotorcraft.
- “**Type**” or “**UA Type**” means a categorisation of unmanned aircraft according to the specific manufacturer and model.
- “**Credit**” means the recognition of prior experience or qualifications.
- “**Flight instruction**” means imparting of aeronautical knowledge through a combination of ground schooling, simulated, and practical flight instruction.
- “**Live flight hours**” means practical flight undertaken in real world conditions and cannot be simulated.
- “**Simulated flight hours**” means flight undertaken in a CAA approved simulator.
- “**Practical Flight Instructor**” (PFI) means an individual who is authorised by an RAE(PC) to conduct flight instruction of remote pilots.
- “**Theoretical Knowledge Instructor**” (TKI) means an individual who is authorised by an RAE(PC) to conduct theoretical training of remote pilots.
- “**Practical Flight Assessor**” (PFA) means an individual who is authorised by an RAE(PC) to conduct flight assessments and evaluations of remote pilots.
- “**Air Risk Class**” (ARC) is a classification of the risk of the air environment as defined in UK SORA.
- “**Certificate Currency**” means the minimum currency to maintain the privileges of the remote pilot competence certificate for the relevant UA category. Certificate currency must be live flight hours only.
- “**Operator Currency**” means the minimum currency determined by the operator for the relevant UA type.
- “**RAE(PC)**” means Recognised Assessment Entity (Pilot Competence).
- “**RPC**” means Remote Pilot Certificate.
- "**Must**" indicates:

(a) a condition a trainee is required to comply with to be assessed as competent to the relevant standard or

(b) a condition an RAE(PC) is required to comply with to maintain approval under the RAE(PC) scheme.

REMOTE PILOT FLIGHT LOGGING

Remote pilots must keep accurate flight logs in accordance with mandatory operator's procedures and UAS.SPEC.050(1)(g). To be accepted for the purpose of training course entry requirements, crediting, revalidation, and renewal, remote pilot flight logs, including flight logs for routine flight operations, **must**:

- (a) Be accurate and recorded in accordance with UAS.SPEC.050(1)(g).
- (b) Be auditable by an RAE(PC) and/or the CAA including by being:
  - (1) Verifiable by means of a corresponding aircraft technical log entry held by the operator.
  - (2) Supported by all other relevant operational documentation relating to that flight.

It is **not** an operator's responsibility to provide the remote pilot with digital or paper flight records, although this is common practice. Remote pilots should keep their own remote pilot logbook as necessary.

The CAA takes falsification of RP logs extremely seriously. Falsifying RP logs is a serious offence and could result in the suspension or revocation of the RP's certificate of competence and criminal prosecution.

The CAA is also under an obligation to be satisfied, on a continuing basis, of the fitness of character of individuals we licence or approve in accordance with applicable legislation. We must be satisfied that all such individuals can be relied on as honest and truthful and that they are demonstrably consistent in applying the rules, in spirit and letter. When considering these behaviours, we will take into account the overriding need to protect the general public, maintain public confidence in the individual privileges we licence, and maintain public confidence in our decision-making processes. Providing false information or other dishonest behaviour may call into question an individual's fitness of character. This fitness of character policy sits alongside any competence or skills requirements a remote pilot must demonstrate in order to obtain and maintain an RPC. For more information on our fitness of character policy, see Fitness of character policy framework | Civil Aviation Authority (caa.co.uk).

REMOTE PILOT COMPETENCE STRUCTURE

To demonstrate RP competence a RP may hold one of the following certificates of competence in each UA category:

General VLOS Certificate (GVC) Multirotor and/or Fixed Wing

Level 1 Remote Pilot Certificate (RPC-L1) Rotorcraft (R) and/or Aeroplane (A)

Level 2 Remote Pilot Certificate (RPC-L2) Rotorcraft (R) and/or Aeroplane (A)

Level 3 Remote Pilot Certificate (RPC-L3) Rotorcraft (R) and/or Aeroplane (A)

Level 4 Remote Pilot Certificate (RPC-L4) Rotorcraft (R) and/or Aeroplane (A)

General VLOS Certificate (GVC)

COMMON REQUIREMENTS

Below are the common requirements for the issue of a General VLOS Certificate (GVC).

MINIMUM AGE

None

CONDITIONS

A GVC trainee **must** have passed the theoretical assessment and practical flight assessment at a CAA approved RAE(PC).

TRAINING COURSE

(a) A GVC trainee **must** complete a training course at a CAA approved RAE(PC).

(b) The course **must** include theoretical knowledge, operator knowledge, and practical flight assessment appropriate to the privileges of GVC applied for.

ENTRY TO TRAINING

The remote pilot **must** have completed the following initial training prior to being accepted for further training:

(a) Open category online training material UAS.OPEN.020(4)(b) & UAS.OPEN.040(3) & UAS.OPEN.030(2)(a)

(b) Open category online assessment and have obtained a Flyer ID by completing the training course and test provided by the CAA Drone and Model Aircraft Registration System (DMARES) (https://register-drones.caa.co.uk/).

GVC Fixed Wing & Multirotor

THEORETICAL KNOWLEDGE TOPICS

In the tables of Appendix B, the applicable learning objectives (LOs) for each certificate are marked with an ‘X’.

An RAE(PC) should use the LOs when developing the theoretical knowledge elements of the appropriate course. The LOs do not provide a ready-made ground training syllabus for individual RAE(PC)s and an RAE(PC) should not rely on the LOs as a substitute for thorough course design.

THEORETICAL KNOWLEDGE ASSESSMENT

A GVC trainee **must** demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

(a) Air law.

(b) Aircraft general knowledge.

(c) Human performance.

(d) Meteorology.

(e) Operational procedures.

PRACTICAL FLIGHT ASSESSMENT GENERAL

(a) The RAE(PC) **must** define the pass/fail criteria for the practical flight assessment ('the practical flight assessment'). As a guide, the criteria should consist of a combination of:

(1) 'Minor' errors – cumulative up to a maximum of 7, at which point the practical flight assessment is failed;

(2) 'Major' errors – cumulative up to a maximum of 3, at which point the practical flight assessment is failed;

(3) 'Safety' errors – any single safety error will result in an automatic failure.

(b) An RAE(PC) may require the remote pilot to undertake further training following any failed practical flight assessment. There is no limit to the number of practical flight assessments that a remote pilot may attempt.

GVC PRACTICAL FLIGHT ASSESSMENT

GVC PRACTICAL FLIGHT ASSESSMENT	
Section 1 - Pre-Flight	
1.1	Mission planning to include; meteorological checks, airspace considerations, and site risk-assessment
1.2	Aircraft pre-flight inspection and set-up
Section 2 - In Flight Procedures	
2.1	Take-off procedures
2.2	Flight under abnormal conditions
Section 3 - Post Flight Actions	
3.1	Shut down and secure/make safe the UAS
3.2	Post-flight inspection and recording of any relevant data relating to the general condition of the UAS

GVC PRIVILEGES AND CONDITIONS

(a) **Privileges.** The privileges of the holder of a GVC are to act as remote pilot in command or flight crew of a UA where all of the following apply:

(1) the flight is being undertaken in the Specific category.

(2) the flight is being conducted VLOS.

(3) the operational authorisation under which the flight is being conducted states the GVC is the minimum remote pilot competence.

(b) **Conditions.** BVLOS flight is prohibited.

GVC EXPERIENCE REQUIREMENTS AND CREDITING

None

GVC VALIDITY, REVALIDATION, AND RENEWAL

(a) A GVC is valid for 5 years beginning with the date of issue notified on the GVC.

THE GENERAL VLOS CERTIFICATE

To qualify for the issue of a GVC, a RP must:

(a) Have completed the Open category online training material (AMC1 UAS.OPEN.20(4)(b) & UAS OPEN.040(3) & UAS.OPEN.030(a).

(b) Complete the Open category online assessment and have obtained a Flyer ID by completing the training course and test provided by the CAA Drone and Model Aircraft Registration System (DMARES), (https://register-drones.caa.co.uk/).

(c) Complete the necessary theoretical knowledge training.

(d) Complete the necessary practical training to pass the practical flight assessment.

(e) Have an operations manual that can be provided for the practical flight assessment.

(f) Complete the theoretical knowledge assessment.

(g) Complete the practical flight assessment.

Level 1 Remote Pilot Certificate (RPC-L1)

COMMON REQUIREMENTS

Below are the common requirements for the issue of an RPC-L1.

MINIMUM AGE

None

CONDITIONS

An RPC-L1 trainee **must** have passed the theoretical assessment and practical flight assessment at a CAA approved RAE(PC).

TRAINING COURSE

(a) An RPC-L1 trainee **must** complete a training course at a CAA approved RAE (PC).

(b) The course **must** include theoretical knowledge and flight instruction appropriate to the privileges of the RPC-L1.

(c) A trainee may complete their theoretical knowledge instruction and practical flight instruction at an RAE(PC) different from the one where they commenced their training course. This applies at any point in the training course. Where a trainee relies on this flexibility, the new RAE(PC) should assess the trainee’s levels of theoretical and practical competence to determine how much further training the trainee requires.

ENTRY TO TRAINING

The RP **must** have completed the following initial training prior to being accepted for further training:

(a) Open category online training material (AMC1 UAS.OPEN.20(4)(b) & UAS.OPEN.040(3) & UAS.OPEN.030(a)

(b) Open category online assessment and have obtained a Flyer ID by completing the training course and test provided by the CAA Drone and Model Aircraft Registration System (DMARES) (https://register-drones.caa.co.uk/).

RPC-L1(A) Aeroplane

GROUND INSTRUCTION

Ground instruction considering take-off and landing area selection, aircraft preparation, ground hazard analysis, route planning, avoidance of uninvolved people, and airspace.

FLIGHT INSTRUCTION

The RPC-L1(A) flight instruction syllabus considers the principles of safe UA operations including:

(a) Ability to apply operational procedures (normal, contingency, and emergency procedures, flight planning, pre-flight and post-flight inspections).

(b) Ability to manage aeronautical communication.
(c) Manage the unmanned aircraft flight path and automation.
(d) Leadership, teamwork, and self-management.
(e) Problem solving and decision-making.
(f) Situational awareness.
(g) Workload management.
(h) Coordination or handover, as applicable.

THEORETICAL KNOWLEDGE TOPICS

In the tables of Appendix B, the applicable learning objectives (LOs) for each certificate are marked with an 'X'.

An RAE(PC) should use the LOs when developing the theoretical knowledge elements of the appropriate course. But the LOs do not provide a ready-made ground training syllabus for individual RAE(PC)s and an RAE(PC) should not rely on the LOs as a substitute for thorough course design.

THEORETICAL KNOWLEDGE ASSESSMENT

An RPC-L1(A) trainee **must** demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

(a) Air law.
(b) Aircraft general knowledge.
(c) Human performance.
(d) Meteorology.
(e) Operational procedures.

PRACTICAL FLIGHT ASSESSMENT GENERAL

(a) A trainee for a practical flight assessment for the RPC-L1(A) **must** have received instruction on the same category and type of UAS to be used in the assessment.
(b) An applicant **must** pass all the relevant sections of the practical flight assessment, in accordance with the following:
    (1) If a trainee fails any item in a section, they have failed that section.
    (2) If a trainee fails only one section, they must retake only that section.
    (3) If a trainee more than one section, they must retake the entire practical flight assessment.

(4) If a trainee fails any section of the retaken practical flight assessment, including any section that was passed on a previous attempt, they must retake the entire practical flight assessment.

(c) All relevant sections of the practical flight assessment **must** be completed within 6 months of the date on which the trainee attempted the first section of the practical flight assessment.

(d) If a trainee fails any individual section of the practical flight assessment, the RAE(PC) may require them to undertake further training. If a trainee fails to achieve a pass in all sections of the practical flight assessment in two attempts, they **must** undertake further training.

(e) There is no limit to the number of practical flight assessments that a trainee may attempt.

CONDUCT OF THE ASSESSMENT

(a) Should the trainee choose to terminate a practical flight assessment for reasons considered inadequate by the Practical Flight Assessor (PFA), the trainee **must** retake the entire practical flight assessment. If the assessment is terminated for reasons considered adequate by the PFA, only those sections not completed **must** be tested in a further flight. Adequate reasons include, but are not limited to, illness, poor weather conditions, equipment failure, and other risks to persons or property.

(b) At the discretion of the PFA, any manoeuvre or procedure of the assessment may be repeated once by the trainee. The PFA may stop the assessment at any stage if they consider that the trainee's demonstration of flying skills requires a complete retest.

(c) A trainee **must** indicate to the PFA the checks and duties carried out. Checks **must** be completed in accordance with the checklist for the UA on which the assessment is being taken. During pre-flight preparation for the assessment, the trainee **must** configure the command unit (CU).

(d) The PFA **must** take no part in the operation of the UA except where intervention is necessary in the interest of safety.

CONTENT OF THE PRACTICAL FLIGHT ASSESSMENT FOR THE ISSUE OF AN RPC-L1(A)

(a) The UAS used for the practical flight assessment **must** meet the requirements for training UAS as set out in the relevant CAA publication.

(b) The practical flight assessment **must** comprise of a general handling assessment in a range of flight modes including non-positioning mode lasting a minimum of 30 minutes.

(c) Every section of the practical flight assessment must assess the use of checklists, situational awareness, control of the UA either manually or by use of the CU, and principles of risk management.

RPC-L1(A) PRACTICAL FLIGHT ASSESSMENT

RPC-L1(A) PRACTICAL FLIGHT ASSESSMENT	
Section 1 - Pre-Flight	
1.1	Conducts a pre-flight including flight planning, documentation, mass and balance consideration, flight briefing, NOTAMS
1.2	UA inspection and technical logbook
1.3	Take-off
1.4	Performance considerations
Section 2 - General Handling	
2.1	Control of the aeroplane by use of the transmitter/CU in both positioning and non-positioning flight modes including: 1) level flight, control of heading, altitude, and airspeed 2) climbing and descending turns 3) recoveries from unusual attitudes
Section 3 - Approach and Landing	
3.1	Approach procedures
3.2	Go-around landing area blocked
3.3	Normal Landing
3.4	Post flight actions
Section 4 - Abnormal and Emergency Procedures	
4.1	Simulated engine/motor failure
4.2	Equipment malfunctions
4.3	Forced landing
4.4	Oral questions

RPC-L1(A) PRIVILEGES AND CONDITIONS

(a) **Privileges.** The privileges of the holder of an RPC-L1(A) are to act as remote pilot in command or flight crew of a UA where all the following apply:

(1) The flight is being undertaken in the Specific category.

(2) The primary means of lift of the UA is fixed wing(s).

(3) The flight is being conducted VLOS

(4) The operational authorisation under which the flight is being conducted states the RPC-L1(A) is the minimum remote pilot competence.

(b) **Conditions.**

(1) The remote pilot maintains a minimum certificate currency of 2 hours of live flight within the last 90 days.

(2) The remote pilot holds a valid flyer ID.

(3) BVLOS prohibited

RPC-L1(A) EXPERIENCE REQUIREMENTS AND CREDITING

(a) An RPC-L1(A) trainee **must** have completed at least 2 hours of flight instruction at a CAA approved RAE(PC).

(b) An RPC-L1(A) trainee that holds a valid GVC are exempt from the theoretical assessment.

RPC-L1(A) VALIDITY, REVALIDATION, AND RENEWAL

(a) Validity. An RPC-L1(A) is valid for 5 years from the date notified on the certificate.

(b) **Revalidation.** An RPC-L1(A) may be revalidated within the 3 months immediately preceding its expiry date if the remote pilot undertakes a revalidation proficiency check at an RAE(PC).

(c) The RAE(PC) **must** determine on a case-by-case basis what steps the revalidation proficiency check requires, having regard to the remote pilot's certificate currency, experience, flight logs, last use of RPC privileges and any other relevant factors RAE(PC).

(d) An RAE(PC) should exempt a remote pilot from a live revalidation check where:

(1) the remote pilot has maintained at least minimum certificate currency for the complete duration of the certificate validity period; and

(2) the remote pilot demonstrates that certificate currency has been maintained through a personal flight log.

(e) An RAE(PC) may exempt a remote pilot from a live revalidation check where certificate currency has not been maintained in accordance with (d) if the RAE (PC) is satisfied that an exemption is appropriate, having regard in particular to:

(1) the remote pilot's experience; and

(2) the amount of time elapsed since the date on which the remote pilot last used privileges of the RPC-L1(A).

(f) The remote pilot **must** undertake a revalidation proficiency check consisting of at least 1 hour of supervised flying covering general handling and emergency procedures where the RAE(PC) considers this to be necessary.

(g) If a remote pilot chooses to fulfil the revalidation requirements earlier than prescribed in point (b), the new 5-year validity period will be set by reference to the date of the successful revalidation proficiency check.

(h) A remote pilot who fails to revalidate their RPC-L1(A) before it expires **must not** exercise any RPC-L1(A) privileges unless they renew their RPC-L1(A) in accordance with the provisions below.

(i) **Renewal**. If an RPC-L1(A) has expired, a remote pilot may renew their privileges, by complying with all the following requirements:

  (1) The remote pilot **must** complete a refresher training at an RAE(PC), if the RAE(PC) considers that refresher training is necessary for the remote pilot to reach the level of proficiency needed to pass an RPC-L1 (A) proficiency check.

  (2) The remote pilot **must** pass an RPC-L1(A) proficiency check at an RAE (PC), including any theoretical knowledge or practical skills checks the RAE(PC) considers necessary.

RPC-L1(A) PROOF OF COMPETENCE

Upon satisfactory completion of the training, the RAE(PC) will advise the CAA as to the competencies demonstrated by remote pilots which must include as a minimum, the trainee’s name, CAA flyer ID, the RAE(PC) approval number, the competence level and category satisfactorily demonstrated.

The RAE(PC) must issue a proof of competence to the RP in a form and manner determined by the CAA.

RPC-L1(R) Rotorcraft

GROUND INSTRUCTION

Ground instruction considering take-off and landing area selection, UA preparation, ground hazard analysis, route planning, avoidance of uninvolved people, and airspace.

FLIGHT INSTRUCTION

The RPC-L1(R) flight instruction syllabus considers the principles of safe UA operations including:

(a) Ability to apply operational procedures (normal, contingency, and emergency procedures, flight planning, pre-flight and post-flight inspections).

(b) Ability to manage aeronautical communication.

(c) Manage the unmanned aircraft flight path and automation.

(d) Leadership, teamwork, and self-management.

(e) Problem solving and decision-making.
(f) Situational awareness.
(g) Workload management.
(h) Coordination or handover, as applicable.

THEORETICAL KNOWLEDGE TOPICS

In the tables of Appendix B, the applicable learning objectives (LOs) for each certificate are marked with an 'X'.

An RAE(PC) should use the LOs when developing the theoretical knowledge elements of the appropriate course. But the LOs do not provide a ready-made ground training syllabus for individual RAE(PC)s and an RAE(PC) should not rely on the LOs as a substitute for thorough course design.

THEORETICAL KNOWLEDGE ASSESSMENT

An RPC-L1(R) trainee **must** demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

(a) Air law.
(b) Aircraft general knowledge.
(c) Human performance.
(d) Meteorology.
(e) Operational procedures.

PRACTICAL FLIGHT ASSESSMENT GENERAL

(a) A trainee for a practical flight assessment for the RPC-L1(R) **must** have received instruction on the same category and type of UAS to be used in the assessment.
(b) A trainee **must** pass all the relevant sections of the practical flight assessment, in accordance with the following:
  (1) If a trainee fails any item in a section, they have failed that section.
  (2) If a trainee fails only one section, they must retake only that section.
  (3) If a trainee fails more than one section, they must retake the entire practical flight assessment.
  (4) If a trainee fails any section of the retaken practical flight assessment, including any section that was passed on a previous attempt, they must retake the entire practical flight assessment.
(c) All relevant sections of the practical flight assessment **must** be completed within 6 months of the date on which the trainee attempted the first section of the practical flight assessment.

(d) If a trainee fails any individual section of the practical flight assessment, the RAE(PC) may require them to undertake further training. If a trainee fails to achieve a pass in all sections of the practical flight assessment in two attempts, they **must** undertake further training.

(e) There is no limit to the number of practical flight assessments that a trainee may attempt.

CONDUCT OF THE ASSESSMENT

(a) Should the trainee choose to terminate a practical flight assessment for reasons considered inadequate by the PFA, the trainee **must** retake the entire practical flight assessment. If the assessment is terminated for reasons considered adequate by the PFA, only those sections not completed **must** be tested in a further flight. Adequate reasons include, but are not limited to, illness, poor weather conditions, equipment failure, and other risks to persons or property.

(b) At the discretion of the PFA, any manoeuvre or procedure of the assessment may be repeated once by the trainee. The PFA may stop the assessment at any stage if they consider that the trainee's demonstration of flying skills requires a complete retest.

(c) A trainee **must** indicate to the PFA the checks and duties carried out. Checks **must** be completed in accordance with the checklist for the UA on which the assessment is being taken. During pre-flight preparation for the assessment, the trainee **must** configure the command unit (CU).

(d) The PFA **must** take no part in the operation of the UA except where intervention is necessary in the interest of safety.

CONTENT OF THE PRACTICAL FLIGHT ASSESSMENT FOR THE ISSUE OF AN RPC-L1(R)

(a) The UAS used for the practical flight assessment **must** meet the requirements for training UAS as set out in the relevant CAA publication.

(b) The practical flight assessment **must** comprise of a general handling assessment in a range of flight modes including non-positioning mode lasting a minimum of 30 minutes.

(c) Every section of the practical flight assessment must assess the use of checklists, situational awareness, control of the UA either manually or by use of the CU, and principles of risk management.

RPC-L1(R) PRACTICAL FLIGHT ASSESSMENT

RPC-L1(R) PRACTICAL FLIGHT ASSESSMENT	
Section 1 - Pre-Flight	
1.1	Conducts a pre-flight including flight planning, documentation, mass and balance

RPC-L1(R) PRACTICAL FLIGHT ASSESSMENT	
	consideration, flight briefing, NOTAMS
1.2	Rotorcraft inspection and technical logbook
1.3	Take-off
1.4	Performance considerations
Section 2 - General Handling	
2.1	Control of the aeroplane by use of the transmitter/CU in both positioning and non-positioning flight modes including: 1) level flight, control of heading, altitude, and airspeed 2) climbing and descending turns 3) recoveries from unusual attitudes
2.5	Hover manoeuvres
2.6	Autorotation (if equipped)
Section 3 - Approach and Landing	
3.1	Approach procedures
3.2	Go-around TOLA blocked
3.3	Normal Landing
3.4	Post flight actions
Section 4 - Abnormal and Emergency Procedures	
4.1	Simulated engine/motor failure
4.2	Equipment malfunctions
4.3	Forced landing
4.4	Oral questions

RPC-L1(R) PRIVILEGES AND CONDITIONS

(a) **Privileges.** The privileges of the holder of an RPC-L1(R) are to act as remote pilot in command or flight crew of a UA where all the following apply:

(1) The flight is being undertaken in the Specific Category.

(2) The primary means of lift of the UA is rotating wing(s).

(3) The flight is being conducted VLOS

(4) The operational authorisation under which the flight is being conducted states the RPC-L1(R) is the minimum remote pilot competence.

(b) **Conditions.**

(1) The remote pilot maintains a minimum certificate currency of 2 hours of live flight within the last 90 days.

(2) The remote pilot holds a valid flyer ID.

(3) BVLOS flight is prohibited.

RPC-L1(R) EXPERIENCE REQUIREMENTS AND CREDITING

(a) An RPC-L1(R) trainee **must** have completed a minimum of 2 hours of instruction at a CAA approved RAE(PC).

(b) An RPC-L1(R) trainee that holds a valid GVC **must** be exempt from the theoretical assessment.

RPC-L1(R) VALIDITY, REVALIDATION, AND RENEWAL

(a) **Validity.** An RPC-L1(R) is valid for 5 years from the date notified on the certificate.

(b) **Revalidation.** An RPC-L1(R) may be revalidated within the 3 months immediately preceding its expiry date if the remote pilot undertakes a revalidation proficiency check at an RAE(PC).

(c) The RAE(PC) **must** determine on a case-by-case basis what steps the revalidation proficiency check requires, having regard to the remote pilot's certificate currency, experience, flight logs, last use of RPC privileges and any other relevant factors RAE(PC).

(d) An RAE(PC) should exempt a remote pilot from a live revalidation check where:

  (1) the remote pilot has maintained at least minimum certificate currency for the complete duration of the certificate validity period; and

  (2) the remote pilot demonstrates that certificate currency has been maintained through a personal flight log.

(e) An RAE(PC) may exempt a remote pilot from a live revalidation check where certificate currency has not been maintained in accordance with (d) if the RAE (PC) is satisfied that an exemption is appropriate, having regard in particular to:

  (1) the remote pilot's experience; and

  (2) the amount of time elapsed since the date on which the remote pilot last used privileges of the RPC-L1(R).

(f) The remote pilot **must** undertake a revalidation proficiency check consisting of at least 1 hour of supervised flying covering general handling and emergency procedures where the RAE(PC) considers this to be necessary.

(g) If a remote pilot chooses to fulfil the revalidation requirements earlier than prescribed in point (b), the new 5-year validity period will be set by reference to the date of the successful revalidation proficiency check.

(h) A remote pilot who fails to revalidate their RPC-L1(R) before it expires **must not** exercise any RPC-L1(R) privileges unless they renew their RPC-L1(R) in accordance with the provisions below.

(i) **Renewal**. If an RPC-L1(R) has expired, a remote pilot may renew their privileges, by complying with all the following requirements:

(1) The remote pilot **must** complete a refresher training at an RAE(PC), if the RAE(PC) considers that refresher training is necessary for the remote pilot to reach the level of proficiency needed to pass an RPC-L1 (R) proficiency check.

(2) The remote pilot **must** pass an RPC-L1(R) proficiency check at an RAE (PC), including any theoretical knowledge or practical skills checks the RAE(PC) considers necessary.

(j) The RAE(PC) **must** determine on a case-by-case basis what amount of refresher training and what theoretical and practical skills checks are necessary to assess a remote pilot's RPC-L1(R) proficiency, having regard in particular to:

(1) the experience of the remote pilot; and

(2) the amount of time elapsed since the remote pilot last used the privileges of the RPC-L1(R); and

(3) the complexity of the remote pilot's experience.

RPC-L1(R) PROOF OF COMPETENCE

Upon satisfactory completion of the training, the RAE(PC) will advise the CAA as to the competencies demonstrated by remote pilots which must include as a minimum, the trainee's name, CAA flyer ID, the RAE(PC) approval number, the competence level and category satisfactorily demonstrated.

The RAE(PC) must issue a proof of competence to the RP in a form and manner determined by the CAA.

Level 2 Remote Pilot Certificate (RPC-L2)

COMMON REQUIREMENTS

Below are the common requirements for the issue of an RPC-L2.

MINIMUM AGE

The minimum age for trainees for the RPC-L2 is 18.

CONDITIONS

An RPC-L2 trainee **must** have passed the theoretical assessment and practical flight assessment at a CAA approved RAE(PC).

TRAINING COURSE

(a) An RPC-L2 trainee **must** complete a training course at a CAA approved RAE (PC).

(b) The course **must** include theoretical knowledge and flight instruction appropriate to the privileges of the RPC-L2.

(c) A trainee may complete their theoretical knowledge instruction and practical flight instruction at an RAE(PC) different from the one where they commenced their training course. This applies at any point in the training course. Where a trainee relies on this flexibility, the new RAE(PC) should assess the trainee's levels of theoretical and practical competence to determine how much further training the trainee requires.

ENTRY TO TRAINING

The RP **must** have completed the following initial training prior to being accepted for further training:

(a) Hold a valid RPC-L1 certificate for the same UA category.

(b) Have at least 50 logged flight hours on a UA of the same category conducted in the Specific category.

RPC-L2(A) Aeroplane

GROUND INSTRUCTION

Ground instruction considering take-off and landing area selection, aircraft preparation, ground hazard analysis, route planning, avoidance of uninvolved people, and airspace.

FLIGHT INSTRUCTION

The RPC-L2(A) flight instruction syllabus considers the principle of safe UA operations including:

(a) Ability to apply operational procedures (normal, contingency, and emergency procedures, flight planning, pre-flight and post-flight inspections).

(b) Ability to manage aeronautical communication.

(c) Manage the unmanned aircraft flight path and automation.

(d) Leadership, teamwork, and self-management.

(e) Problem solving and decision-making.

(f) Situational awareness.

(g) Workload management.

(h) Coordination or handover, as applicable.

SYLLABUS OF FLIGHT INSTRUCTION

Details of the flight instruction syllabus can be found in Appendix A. The syllabus details are intended to be used by an RAE(PC) when developing the RPC-L2(A) flight training elements of the appropriate course. It should be noted, however, that they do not provide a ready-made flight training syllabus for individual RAE(PC)s and should not be seen by organisations as a substitute for thorough course design.

The RPC-L2(A) flight instruction syllabus should consider the principles of threat and error management and **must** be competency-based training throughout.

THEORETICAL KNOWLEDGE TOPICS

In the tables of Appendix B, the applicable learning objectives (LOs) for each certificate are marked with an ‘X’.

An RAE(PC) should use the LOs when developing the theoretical knowledge elements of the appropriate course. But the LOs do not provide a ready-made ground training syllabus for individual RAE(PC)s and an RAE(PC) should not rely on the LOs as a substitute for thorough course design.

THEORETICAL KNOWLEDGE ASSESSMENT

An RPC-L2(A) trainee **must** demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

(a) BVLOS operational procedures.

Practical flight assessment general

(a) A trainee for a practical flight assessment for the RPC-L2(A) **must** have received instruction on the same category and type of UAS to be used in the assessment.

(b) A trainee **must** pass all the relevant sections of the practical flight assessment, in accordance with the following:

   (1) If a trainee fails any item in a section, they have failed that section.

   (2) If a trainee fails only one section, they must retake only that section.

   (3) If a trainee fails more than one section, they must retake the entire practical flight assessment.

   (4) If a trainee fails any section of the retaken practical flight assessment, including any section that was passed on a previous attempt, they must retake the entire practical flight assessment.

(c) All relevant sections of the practical flight assessment **must** be completed within 6 months of the date on which the trainee attempted the first section of the practical flight assessment.

(d) If a trainee fails any individual section of the practical flight assessment, the RAE(PC) may require them to undertake further training. If a trainee fails to achieve a pass in all sections of the practical flight assessment in two attempts, they **must** undertake further training.

(e) There is no limit to the number of practical flight assessments that a trainee may attempt.

CONDUCT OF THE ASSESSMENT

(a) Should the trainee choose to terminate a practical flight assessment for reasons considered inadequate by the PFA, the trainee **must** retake the entire practical flight assessment. If the assessment is terminated for reasons considered adequate by the PFA, only those sections not completed **must** be tested in a further flight. Adequate reasons include, but are not limited to, illness, poor weather conditions, equipment failure, and other risks to persons or property.

(b) At the discretion of the PFA, any manoeuvre or procedure of the assessment may be repeated once by the trainee. The PFA may stop the assessment at any stage if they consider that the trainee's demonstration of flying skills requires a complete retest.

(c) A trainee **must** indicate to the PFA the checks and duties carried out. Checks **must** be completed in accordance with the checklist for the UA on which the assessment is being taken. During pre-flight preparation for the assessment, the trainee **must** configure the command unit (CU).

(d) The PFA **must** take no part in the operation of the UA except where intervention is necessary in the interest of safety.

CONTENT OF THE PRACTICAL FLIGHT ASSESSMENT FOR THE ISSUE OF AN RPC-L2(A)

(a) The UAS used for the practical flight assessment **must** meet the requirements for training UAS as set out in the relevant CAA publication.

(b) The practical flight assessment **must** comprise of at least two BVLOS flights conducted under ARC-a conditions lasting at least 30mins flight time in total.

(c) Every section of the practical flight assessment must assess the use of checklists, situational awareness, control of the UA either manually or by use of the CU, and principles of risk management.

RPC-L2(A) Practical Flight Assessment	
Section 1 - Pre-Flight	
1.1	Conducts a pre-flight, including flight planning, documentation, mass and balance consideration, flight brief, NOTAMS

RPC-L2(A) Practical Flight Assessment	
1.2	CU configuration
1.3	UA inspection and technical logbook
1.4	Take-off
1.5	Performance considerations
Section 2 - General Handling	
2.1	Control of the UA by the CU, flight path management, and range/endurance considerations
2.2	Monitoring of flight progress, fuel/energy usage, airspace, and ground risks
2.3	Altitude, speed, heading control
2.4	Monitoring navigation and communication system performance
2.5	CU management
Section 3 - Approach and Landing	
3.1	Approach procedures
3.3	Go-around TOLA blocked
3.4	Normal Landing
3.5	Post flight actions
Section 4 - Abnormal and Emergency Procedures	
4.1	Engine/motor failure
4.2	Equipment malfunctions
4.3	Tactical deconfliction procedures
4.4	Forced landing
4.5	Oral questions

RPC-L2(A) PRIVILEGES AND CONDITIONS

(a) **Privileges.** The privileges of the holder of an RPC-L2(A) are to act as remote pilot in command or flight crew of a UA where all the following apply:

(1) The flight is being undertaken in the Specific category.

(2) The primary means of lift of the UA is fixed wing(s).

(3) The maximum air risk class (ARC) of the flight is ARC-a.

(4) The operational authorisation under which the flight is being conducted states the RPC-L2(A) is the minimum remote pilot competence.

(b) **Conditions**.

(1) The remote pilot maintains a minimum certificate currency of 2 hours of live flight within the last 90 days.

(2) The remote pilot holds a valid flyer ID.

(3) No intentional traffic deconfliction permitted.

RPC-L2(A) EXPERIENCE REQUIREMENTS AND CREDITING

(a) An RPC-L2(A) trainee **must** have completed at least 5 hours of flight instruction of which up to 2 hours may be completed using a CAA approved flight simulator device to facilitate emergency procedures training.

(b) An RPC-L2(A) trainee that holds a valid RPC-L2 in another category may be credited towards the requirements in (a).

(c) The amount of credit **must** be decided by the RAE(PC) where the pilot undergoes the training course but **must** in any case not exceed 50% (2.5 hours) of the hours required in (a).

RPC-L2(A) VALIDITY, REVALIDATION AND RENEWAL

(a) Validity. An RPC-L2(A) is valid for 3 years from the date notified on the certificate.

(b) **Revalidation.** An RPC-L2(A) may be revalidated within the 3 months immediately preceding its expiry date if the remote pilot undertakes a revalidation proficiency check at an RAE(PC).

(c) The RAE(PC) **must** determine on a case-by-case basis what steps the revalidation proficiency check requires, having regard to the remote pilot’s certificate currency, experience, flight logs, last use of RPC privileges and any other relevant factors.

(d) An RAE(PC) should exempt a remote pilot from a live revalidation check where:

  (1) the remote pilot has maintained at least minimum certificate currency for the complete duration of the certificate validity period; and

  (2) the remote pilot demonstrates that certificate currency has been maintained through a personal flight log.

(e) An RAE(PC) may exempt a remote pilot from a live revalidation check where certificate currency has not been maintained in accordance with (d) if the RAE (PC) is satisfied that an exemption is appropriate, having regard to:

  (1) the remote pilot’s experience; and

  (2) the amount of time elapsed since the date on which the remote pilot last used privileges of the RPC-L2(A).

(f) The remote pilot **must** undertake a revalidation proficiency check consisting of at least 1 hour of supervised flying covering general handling and emergency procedures where the RAE(PC) considers this to be necessary.

(g) If a remote pilot chooses to fulfil the revalidation requirements earlier than prescribed in point (b), the new 3-year validity period will be set by reference to the date of the successful revalidation proficiency check.

(h) A remote pilot who fails to revalidate their RPC-L2(A) before it expires **must not** exercise any RPC-L2(A) privileges unless they renew their RPC-L2(A) in accordance with the provisions below.

(i) **Renewal**. If an RPC-L2(A) has expired, a remote pilot may renew their privileges, by complying with all the following requirements:

(1) The remote pilot **must** complete a refresher training at an RAE(PC), if the RAE(PC) considers that refresher training is necessary for the remote pilot to reach the level of proficiency needed to pass an RPC-L2 (A) proficiency check.

(2) The remote pilot **must** pass an RPC-L2(A) proficiency check at an RAE (PC), including any theoretical knowledge or practical skills checks the RAE(PC) considers necessary.

(j) The RAE(PC) must determine on a case-by-case basis what amount of refresher training and what theoretical and practical skills checks are necessary to assess a remote pilot's RPC-L2(A) proficiency, having regard in particular to:

(1) the experience of the remote pilot;

(2) the amount of time elapsed since the remote pilot last used the privileges of the RPC-L2(A); and

(3) the complexity of the remote pilot's experience.

RPC-L2(A) PROOF OF COMPETENCE

Upon satisfactory completion of the training, the RAE(PC) will advise the CAA as to the competencies demonstrated by remote pilots which must include as a minimum, the trainee's name, CAA flyer ID, the RAE(PC) approval number, the competence level, and category satisfactorily demonstrated.

The RAE(PC) must issue a proof of competence to the RP in a form and manner determined by the CAA.

RPC-L2(R) Rotorcraft

GROUND INSTRUCTION

Ground instruction considering take-off and landing area selection, aircraft preparation, ground hazard analysis, route planning, avoidance of uninvolved people, and airspace.

FLIGHT INSTRUCTION

The RPC-L2(R) flight instruction syllabus considers the principle of safe UA operations including:

(a) Ability to apply operational procedures (normal, contingency, and emergency procedures, flight planning, pre-flight and post-flight inspections),

(b) Ability to manage aeronautical communication,

(c) Manage the unmanned aircraft flight path and automation,

(d) Leadership, teamwork, and self-management,

(e) Problem solving and decision-making,

(f) Situational awareness,

(g) Workload management,

(h) Coordination or handover, as applicable.

SYLLABUS OF FLIGHT INSTRUCTION

Details of the flight instruction syllabus can be found in Appendix A. The syllabus details are intended to be used by an RAE(PC) when developing the RPC-L2(R) flight training elements of the appropriate course. It should be noted, however, that they do not provide a ready-made flight training syllabus for individual RAE(PC)s and should not be seen by organisations as a substitute for thorough course design.

THEORETICAL KNOWLEDGE TOPICS

In the tables of Appendix B, the applicable learning objectives (LOs) for each certificate are marked with an 'X'.

An RAE(PC) should use the LOs when developing the theoretical knowledge elements of the appropriate course. But the LOs do not provide a ready-made ground training syllabus for individual RAE(PC)s and an RAE(PC) should not rely on the LOs as a substitute for thorough course design.

THEORETICAL KNOWLEDGE ASSESSMENT

An RPC-L2(R) trainee **must** demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

(a) BVLOS operational procedures

PRACTICAL FLIGHT ASSESSMENT GENERAL

(a) A trainee for a practical flight assessment for the RPC-L2(R) **must** have received instruction on the same category and type of UAS to be used in the assessment.

(b) A trainee **must** pass all the relevant sections of the practical flight assessment, in accordance with the following:

  (1) If a trainee fails any item in a section, they have failed that section.

  (2) If a trainee fails only one section, they must retake only that section.

(3) If a trainee fails more than one section, they must retake the entire practical flight assessment.

(4) If a trainee fails any section of the retaken practical flight assessment, including any section that was passed on a previous attempt, they must retake the entire practical flight assessment.

(c) All relevant sections of the practical flight assessment **must** be completed within 6 months of the date on which the trainee attempted the first section of the practical flight assessment.

(d) If a trainee fails any individual section of the practical flight assessment, the RAE(PC) may require them to undertake further training. If a trainee fails to achieve a pass in all sections of the practical flight assessment in two attempts, they **must** undertake further training.

(e) There is no limit to the number of practical flight assessments that a trainee may attempt.

CONDUCT OF THE ASSESSMENT

(a) Should the trainee choose to terminate a practical flight assessment for reasons considered inadequate by the PFA, the trainee **must** retake the entire practical flight assessment. If the assessment is terminated for reasons considered adequate by the PFA, only those sections not completed **must** be tested in a further flight. Adequate reasons include, but are not limited to, illness, poor weather conditions, equipment failure, and other risks to persons or property.

(b) At the discretion of the PFA, any manoeuvre or procedure of the assessment may be repeated once by the trainee. The PFA may stop the assessment at any stage if they consider that the trainee’s demonstration of flying skills requires a complete retest.

(c) A trainee **must** indicate to the PFA the checks and duties carried out. Checks **must** be completed in accordance with the checklist for the UA on which the assessment is being taken. During pre-flight preparation for the assessment, the trainee **must** configure the command unit (CU).

(d) The PFA **must** take no part in the operation of the UA except where intervention is necessary in the interest of safety.

CONTENT OF THE PRACTICAL FLIGHT ASSESSMENT FOR THE ISSUE OF AN RPC-L2(R)

(a) The UAS used for the practical flight assessment **must** meet the requirements for training UAS as set out in the relevant CAA publication.

(b) The practical flight assessment **must** comprise of at least two BVLOS flights conducted under ARC-a conditions lasting at least 30mins flight time in total.

(c) Every section of the practical flight assessment must assess the use of checklists, situational awareness, control of the UA either manually or by use of the CU, and principles of risk management.

RPC-L2(R) Practical Flight Assessment	
Section 1 - Pre-Flight	
1.1	Conducts a pre-flight, including flight planning, documentation, mass and balance consideration, flight brief, NOTAMS
1.2	CU Configuration
1.3	UA inspection and technical logbook
1.4	Take-off
1.5	Performance considerations
Section 2 - General Handling	
2.1	Control of the UA by the CU, flight path management, and range/endurance considerations
2.2	Monitoring of flight progress, fuel/energy usage, airspace, and ground risks
2.3	Altitude, speed, heading control
2.4	Monitoring navigation and communication system performance
2.5	CU management
Section 3 - Approach and Landing	
3.1	Approach procedures
3.3	Go-around TOLA blocked
3.4	Normal Landing
3.5	Post flight actions
Section 4 - Abnormal and Emergency Procedures	
4.1	Engine/motor failure
4.2	Equipment malfunctions
4.3	Tactical deconfliction procedures
4.4	Forced landing
4.5	Oral questions

RPC-L2(R) PRIVILEGES AND CONDITIONS

(a) **Privileges.** The privileges of the holder of an RPC-L2(R) are to act as remote pilot in command or flight crew of a UA where all of the following apply:

(1) the flight is being undertaken in the Specific Category.

(2) the primary means of lift of the UA is rotating wing(s).

(3) the maximum air risk class (ARC) of the flight is ARC-a.

(4) the operational authorisation under which the flight is being conducted states the RPC-L2(R) is the minimum remote pilot competence.

(b) **Conditions.**

(1) The remote pilot maintains a minimum certificate currency of 2 hours of live flight within the last 90 days.

(2) The remote pilot holds a valid flyer ID.

(3) No intentional traffic deconfliction.

RPC-L2(R) EXPERIENCE REQUIREMENTS AND CREDITING

(a) An RPC-L2(R) trainee **must** have completed at least 5 hours of flight instruction of which up to 2 hours may be completed using a CAA approved flight simulator device to facilitate emergency procedures training.

(b) An RPC-L2(R) trainee that holds a valid RPC-L2 in another category may be credited towards the requirements in (a).

(c) The amount of credit **must** be decided by the RAE(PC) where the pilot undergoes the training course, but **must** in any case not exceed 50% (2.5 hours) of the hours required in (a).

RPC-L2(R) VALIDITY, REVALIDATION AND RENEWAL

(a) **Validity.** An RPC-L2(R) is valid for 3 years from the date notified on the certificate.

(b) **Revalidation.** An RPC-L2(R) may be revalidated within the 3 months immediately preceding its expiry date if the remote pilot undertakes a revalidation proficiency check at an RAE(PC).

(c) The RAE(PC) **must** determine on a case-by-case basis what steps the revalidation proficiency check requires, having regard to the remote pilot's certificate currency, experience, flight logs, last use of RPC privileges and any other relevant factors.

(d) An RAE(PC) should exempt a remote pilot from a live revalidation check where:

(1) the remote pilot has maintained at least minimum certificate currency for the complete duration of the certificate validity period; and

(2) the remote pilot demonstrates that certificate currency has been maintained through a personal flight log.

(e) An RAE(PC) may exempt a remote pilot from a live revalidation check where certificate currency has not been maintained in accordance with (d) if the RAE (PC) is satisfied that an exemption is appropriate, having regard in particular to:

(1) the remote pilot's experience; and

(2) the amount of time elapsed since the date on which the remote pilot last used privileges of the RPC-L2(R).

(f) The remote pilot **must** undertake a revalidation proficiency check consisting of at least 1 hour of supervised flying covering general handling and emergency procedures where the RAE(PC) considers this to be necessary.

(g) If a remote pilot chooses to fulfil the revalidation requirements earlier than prescribed in point (b), the new 3-year validity period will be set by reference to the date of the successful revalidation proficiency check.

(h) A remote pilot who fails to revalidate their RPC-L2(R) before it expires **must not** exercise any RPC-L2(R) privileges unless they renew their RPC-L2(R) in accordance with the provisions below.

(i) **Renewal**. If an RPC-L2(R) has expired, a remote pilot may renew their privileges, by complying with all the following requirements:

(1) The remote pilot **must** complete a refresher training at an RAE(PC), if the RAE(PC) considers that refresher training is necessary for the remote pilot to reach the level of proficiency needed to pass an RPC-L2 (R) proficiency check.

(2) The remote pilot **must** pass an RPC-L2(R) proficiency check at an RAE (PC), including any theoretical knowledge or practical skills checks the RAE(PC) considers necessary.

RPC-L2(R) PROOF OF COMPETENCE

Upon satisfactory completion of the training, the RAE(PC) will advise the CAA as to the competencies demonstrated by remote pilots which must include as a minimum the trainee's name, CAA flyer ID, the RAE(PC) approval number, the competence level, and category satisfactorily demonstrated.

The RAE(PC) must issue a proof of competence to the RP in a form and manner determined by the CAA.

Level 3 Remote Pilot Certificate (RPC-L3)

COMMON REQUIREMENTS

Below are the common requirements for the issue of an RPC-L3.

MINIMUM AGE

The minimum age for trainees for the RPC-L3 is 18.

CONDITIONS

An RPC-L3 trainee **must** have fulfilled the requirements of the relevant training course at a CAA approved RAE(PC).

TRAINING COURSE

(a) An RPC-L3 trainee **must** complete a training course at a CAA approved RAE (PC).

(b) The course **must** include theoretical knowledge and flight instruction appropriate to the privileges of the RPC-L3.

(c) A trainee may complete their theoretical knowledge instruction and practical flight instruction at an RAE(PC) different from the one where they commenced their training course. This applies at any point in the training course. Where a trainee relies on this flexibility, the new RAE(PC) should assess the trainee's levels of theoretical and practical competence to determine how much further training the trainee requires.

ENTRY TO TRAINING

An RPC-L3 trainee **must** have completed the following initial training prior to being accepted for further training:

(a) Hold a valid RPC-L2 certificate.

(b) Have logged at least 50 hours of BVLOS flight as RP in command in the Specific category on the same UA category.

(c) Hold at least a valid LAPL medical certificate.

RPC-L3(A) Aeroplane

GROUND INSTRUCTION

Ground instruction considering take-off and landing area selection, aircraft preparation, ground hazard analysis, route planning, avoidance of uninvolved people, and airspace.

FLIGHT INSTRUCTION

The RPC-L3(A) flight instruction syllabus considers the principles of safe UA operations including:

(a) Ability to apply operational procedures (normal, contingency, and emergency procedures, flight planning, pre-flight and post-flight inspections).

(b) Ability to manage aeronautical communication.

(c) Manage the unmanned aircraft flight path and automation.

(d) Leadership, teamwork, and self-management.

(e) Problem solving and decision-making.

(f) Situational awareness.
(g) Workload management.
(h) Coordination or handover, as applicable.

SYLLABUS OF FLIGHT INSTRUCTION

Details of the flight instruction syllabus can be found in Appendix A. The syllabus details are intended to be used by an RAE(PC) when developing the RPC-L3(A) flight training elements of the appropriate course. It should be noted, however, that they do not provide a ready-made flight training syllabus for individual RAE(PC)s and should not be seen by organisations as a substitute for thorough course design.

The RPC-L3(A) flight instruction syllabus should consider the principles of threat and error management and **must** be competency-based training throughout.

THEORETICAL KNOWLEDGE TOPICS

In the tables of Appendix B, the applicable learning objectives (LOs) for each certificate are marked with an 'X'. The LOs define the subject knowledge and applied knowledge, skills, and attitudes that a student remote pilot should have assimilated during the theoretical knowledge course.

An RAE(PC) should use the LOs when developing the theoretical knowledge elements of the appropriate course. But the LOs do not provide a ready-made ground training syllabus for individual RAE(PC)s and an RAE(PC) should not rely on the LOs as a substitute for thorough course design.

THEORETICAL KNOWLEDGE ASSESSMENT

An RPC-L3(A) trainee **must** demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

(a) Air law.
(b) Aircraft general knowledge.
(c) Human performance and limitations.
(d) Meteorology.
(e) Operational procedures.

PRACTICAL FLIGHT ASSESSMENT GENERAL

(a) A trainee for a practical flight assessment for the RPC-L3(A) **must** have received instruction on the same category and type of UAS to be used in the assessment.
(b) A trainee **must** pass all the relevant sections of the practical flight assessment, in accordance with the following:

(1) If a trainee fails any item in a section, they have failed that section.

(2) If a trainee fails only one section, they must retake only that section.

(3) If a trainee fails more than one section, they must retake the entire practical flight assessment.

(4) If a trainee fails any section of the retaken practical flight assessment, including any section that was passed on a previous attempt, they must retake the entire practical flight assessment.

(c) All relevant sections of the practical flight assessment **must** be completed within 6 months of the date on which the trainee attempted the first section of the practical flight assessment.

(d) If a trainee fails any individual section of the practical flight assessment, the RAE(PC) may require them to undertake further training. If a trainee fails to achieve a pass in all sections of the practical flight assessment in two attempts, they **must** undertake further training.

(e) There is no limit to the number of practical flight assessments that a trainee may attempt.

CONDUCT OF THE ASSESSMENT

(a) Should the trainee choose to terminate a practical flight assessment for reasons considered inadequate by the PFA, the trainee **must** retake the entire practical flight assessment. If the assessment is terminated for reasons considered adequate by the PFA, only those sections not completed **must** be tested in a further flight. Adequate reasons include, but are not limited to, illness, poor weather conditions, equipment failure, and other risks to persons or property.

(b) At the discretion of the PFA, any manoeuvre or procedure of the assessment may be repeated once by the trainee. The PFA may stop the assessment at any stage if they consider that the trainee’s demonstration of flying skills requires a complete retest.

(c) A trainee **must** indicate to the PFA the checks and duties carried out. Checks **must** be completed in accordance with the checklist for the UA on which the assessment is being taken. During pre-flight preparation for the assessment, the trainee **must** configure the command unit (CU).

(d) The PFA **must** take no part in the operation of the UA except where intervention is necessary in the interest of safety.

CONTENT OF THE PRACTICAL FLIGHT ASSESSMENT FOR THE ISSUE OF AN RPC-L3(A)

(a) The UAS used for the practical flight assessment **must** meet the requirements for training UAS as set out in the relevant CAA publication.

(b) The practical flight assessment **must** comprise of 3 elements to be completed at the end of each phase of training:

(1) General handling BVLOS flight conducted in at least ARC-b lasting at least 45 minutes returning to the departure location.

(2) Cross country flight conducted in at least ARC-b including landing at a location different to the departure location where:

(ii) The outbound leg is at least 10 nautical miles.

(iii) The return leg is at least 10 nautical miles.

(iv) The remote pilot will be responsible for all aspects of the operation including the remote recovery and repositioning of the aircraft at the destination location.

(3) Emergency procedures assessment lasting at least 45 minutes conducted in a simulator.

(c) Every section of the practical flight assessment must assess the use of checklists, situational awareness, control of the UA either manually or by use of the CU, and principles of risk management.

RPC-L3(A) PRIVILEGES AND CONDITIONS

(a) **Privileges.** The privileges of the holder of an RPC-L3(A) are to act as remote pilot in command or flight crew of a UA where all of the following apply:

(1) The flight is being undertaken in the Specific category.

(2) The primary means of lift of the UA is fixed wing(s).

(3) The maximum air risk class (ARC) of the flight is ARC-c.

(4) The operational authorisation under which the flight is being conducted states the RPC-L3(A) is the minimum remote pilot competence.

(b) **Conditions.**

(1) The remote pilot maintains a minimum certificate currency of 2 hours of live flight within the last 90 days.

(2) The remote pilot holds a valid flyer ID.

(3) Airspace classified as ARC-d prohibited.

RPC-L3(A) EXPERIENCE REQUIREMENTS AND CREDITING

Experience Requirements. An RPC-L3(A) trainee, **must** be able to demonstrate that they meet both flight experience requirements below prior to the issue of an RPC-L3(A) certificate:

- (a) at least 55 hours of instruction completed, which **must** include:
  - (1) 35 hours of beyond visual line of sight (BVLOS) dual flight simulator instruction, and
  - (2) 15 hours of BVLOS dual practical flight instruction, and
  - (3) 5 hours of supervised practical flight as RP in command; and
- (b) at least 75 hours of logged live BVLOS flight in total as RP in command, which may include live practical flight instruction undertaken during this training course, or a previous RPC training course.

Crediting. An RPC-L3(A) trainee with equivalent prior experience as a remote pilot, or experience as a manned aeroplane pilot may be credited towards the requirements in (1)(a). The amount of credit **must** be decided by the RAE(PC) where the pilot undergoes the training course, based on a pre-entry flight assessment, but **must** in any case:

- (a) Not exceed 20% of the hours required in (1)(a).
- (b) Not include the requirements in (1)(b), (1)(c), or (2).

Crediting. An RPC-L3(A) trainee that holds a valid RPC-L3 in another category may be credited towards the requirements in (a) subject to completion of a suitable bridging course at a CAA approved RAE(PC).

Crediting. An RPC-L3(A) trainee who holds a valid ATPL or CPL theory certificate in the appropriate category may be credited towards the requirements in Appendix A subject to completion of a suitable theoretical bridging course and assessment at a CAA approved RAE(PC).

RPC-L3(A) VALIDITY, REVALIDATION AND RENEWAL

- **(a) Validity. An RPC-L3(A) is valid for 3 years from the date notified on the certificate.**
- (b) **Revalidation.** An RPC-L3(A) may be revalidated within the 3 months immediately preceding its expiry date if the remote pilot undertakes a revalidation proficiency check at an RAE(PC).
- (c) The RAE(PC) **must** determine on a case-by-case basis what steps the revalidation proficiency check requires, having regard to the remote pilot’s certificate currency, experience, flight logs, last use of RPC privileges and any other relevant factors.
- (d) An RAE(PC) should exempt a remote pilot from a live revalidation check where:

(1) the remote pilot has maintained at least minimum certificate currency for the complete duration of the certificate validity period; and

(2) the remote pilot demonstrates that certificate currency has been maintained through a personal flight log.

(e) An RAE(PC) may exempt a remote pilot from a live revalidation check where certificate currency has not been maintained in accordance with (d) if the RAE (PC) is satisfied that an exemption is appropriate, having regard in particular to:

(1) the remote pilot’s experience; and

(2) the amount of time elapsed since the date on which the remote pilot last used privileges of the RPC-L3(A).

(f) The remote pilot **must** undertake a revalidation proficiency check consisting of at least 1 hour of supervised flying covering general handling and emergency procedures where the RAE(PC) considers this to be necessary.

(g) If a remote pilot chooses to fulfil the revalidation requirements earlier than prescribed in point (b), the new 3-year validity period will be set by reference to the date of the successful revalidation proficiency check.

(h) A remote pilot who fails to revalidate their RPC-L3(A) before it expires **must not** exercise any RPC-L3(A) privileges unless they renew their RPC-L3(A) in accordance with the provisions below.

(i) **Renewal**. If an RPC-L3(A) has expired, a remote pilot may renew their privileges, by complying with all the following requirements:

(1) The remote pilot **must** complete a refresher training at an RAE(PC), if the RAE(PC) considers that refresher training is necessary for the remote pilot to reach the level of proficiency needed to pass an RPC-L3 (A)proficiency check.

(2) The remote pilot **must** pass an RPC-L3(A) proficiency check at an RAE (PC), including any theoretical knowledge or practical skills checks the RAE(PC) considers necessary.

(j) The RAE(PC) must determine on a case-by-case basis what amount of refresher training and what theoretical and practical skills checks are necessary to assess a remote pilot’s RPC-L3(A) proficiency, having regard in particular to:

(1) the experience of the remote pilot; and

(2) the amount of time elapsed since the remote pilot last used the privileges of the RPC-L3(A); and

(3) the complexity of the remote pilot’s experience.

RPC-L3(A) PROOF OF COMPETENCE

Upon satisfactory completion of the training the RAE(PC) will advise the CAA as to the competencies demonstrated by remote pilots which must include as a minimum the trainee's name, CAA flyer ID, the RAE(PC) approval number, the competence level, and category satisfactorily demonstrated.

The RAE(PC) must issue a proof of competence to the RP in a form and manner determined by the CAA.

RPC-L3(R) Rotorcraft

GROUND INSTRUCTION

Ground instruction considering take-off and landing area selection, aircraft preparation, ground hazard analysis, route planning, avoidance of uninvolved people, and airspace.

FLIGHT INSTRUCTION

The RPC-L3(R) flight instruction syllabus considers the principles of safe UA operations including:

(a) Ability to apply operational procedures (normal, contingency, and emergency procedures, flight planning, pre-flight and post-flight inspections).

(b) Ability to manage aeronautical communication.

(c) Manage the unmanned aircraft flight path and automation.

(d) Leadership, teamwork, and self-management.

(e) Problem solving and decision-making.

(f) Situational awareness.

(g) Workload management.

(h) Coordination or handover, as applicable.

SYLLABUS OF FLIGHT INSTRUCTION

Details of the flight instruction syllabus can be found in Appendix A. The syllabus details are intended to be used by an RAE(PC) when developing the RPC-L3(R) flight training elements of the appropriate course. It should be noted, however, that they do not provide a ready-made flight training syllabus for individual RAE(PC)s and should not be seen by organisations as a substitute for thorough course design.

The RPC-L3(R) flight instruction syllabus should consider the principles of threat and error management and **must** be competency-based training throughout.

THEORETICAL KNOWLEDGE TOPICS

In the tables of Appendix B, the applicable learning objectives (LOs) for each certificate are marked with an ‘X’.

An RAE(PC) should use the LOs when developing the theoretical knowledge elements of the appropriate course. But the LOs do not provide a ready-made ground training syllabus for individual RAE(PC)s and an RAE(PC) should not rely on the LOs as a substitute for thorough course design.

THEORETICAL KNOWLEDGE ASSESSMENT

An RPC-L3(R) trainee(s) **must** demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

(a) Air law.

(b) Aircraft general knowledge.

(c) Human performance and limitations.

(d) Meteorology.

(e) Operational procedures.

PRACTICAL FLIGHT ASSESSMENT GENERAL

(a) A trainee for a practical flight assessment for the RPC-L3(R) **must** have received instruction on the same category and type of UAS to be used in the assessment.

(b) A trainee **must** pass all the relevant sections of the practical flight assessment, in accordance with the following:

  (1) If trainee fails any item in a section, they have failed that section.

  (2) If a trainee fails only one section, they must retake only that section.

  (3) If a trainee fails more than one section, they must retake the entire practical flight assessment.

  (4) If a trainee fails any section of the retaken practical flight assessment, including any section that was passed on a previous attempt, they must retake the entire practical flight assessment.

(c) All relevant sections of the practical flight assessment **must** be completed within 6 months of the date on which the trainee attempted the first section of the practical flight assessment.

(d) If a trainee fails any individual section of the practical flight assessment, the RAE(PC) may require them to undertake further training. If a trainee fails to achieve a pass in all sections of the practical flight assessment in two attempts, they **must** undertake further training.

(e) There is no limit to the number of practical flight assessments that a trainee may attempt.

CONDUCT OF THE ASSESSMENT

(a) Should the trainee choose to terminate a practical flight assessment for reasons considered inadequate by the PFA, the trainee **must** retake the entire practical flight assessment. If the assessment is terminated for reasons considered adequate by the PFA, only those sections not completed **must** be tested in a further flight. Adequate reasons include, but are not limited to, illness, poor weather conditions, equipment failure, and other risks to persons or property.

(b) At the discretion of the PFA, any manoeuvre or procedure of the assessment may be repeated once by the trainee. The PFA may stop the assessment at any stage if they consider that the trainee's demonstration of flying skills requires a complete retest.

(c) A trainee **must** indicate to the PFA the checks and duties carried out. Checks **must** be completed in accordance with the checklist for the UA on which the assessment is being taken. During pre-flight preparation for the assessment, the trainee **must** configure the command unit (CU).

(d) The PFA **must** take no part in the operation of the UA except where intervention is necessary in the interest of safety.

CONTENT OF THE PRACTICAL FLIGHT ASSESSMENT FOR THE ISSUE OF AN RPC-L3(R)

(a) The UAS used for the practical flight assessment **must** meet the requirements for training UAS as set out in the relevant CAA publication.

(b) The practical flight assessment **must** comprise of 3 elements to be completed at the end of each phase of training:

(1) General handling BVLOS flight conducted in at least ARC-b lasting at least 45 minutes returning to the departure location.

(2) Cross country flight conducted in at least ARC-b including landing at a location different to the departure location where:

(ii) The outbound leg is at least 10 nautical miles.

(iii) The return leg is at least 10 nautical miles.

(iv) The remote pilot will be responsible for all aspects of the operation including the remote recovery and repositioning of the aircraft at the destination location.

(3) Emergency procedures assessment lasting at least 45 minutes conducted in a simulator.

(c) Every section of the practical flight assessment must assess the use of checklists, situational awareness, control of the UA either manually or by use of the CU, and principles of risk management.

RPC-L3(R) PRIVILEGES AND CONDITIONS

(a) **Privileges.** The privileges of the holder of an RPC-L3(R) are to act as remote pilot in command or flight crew of a UA where all of the following apply:

(1) The flight is being undertaken in the Specific Category.

(2) The primary means of lift of the UA is rotating wings(s).

(3) The maximum air risk class (ARC) of the flight is ARC-c.

(4) The operational authorisation under which the flight is being conducted states the RPC-L3(R) is the minimum remote pilot competence.

(b) **Conditions**.

(1) The remote pilot maintains a minimum certificate currency of 2 hours of live flight within the last 90 days.

(2) The remote pilot holds a valid Flyer ID.

(3) Airspace classified as ARC-d prohibited.

RPC-L3(R) EXPERIENCE REQUIREMENTS AND CREDITING

Experience Requirements. An RPC-L3(R) trainee **must** be able to demonstrate that they meet both flight experience requirements below:

(a) at least 55 hours of instruction completed, which **must** include:

(1) 35 hours of beyond visual line of sight (BVLOS) dual flight simulator instruction, and

(2) 15 hours of BVLOS dual practical flight instruction, and

(3) 5 hours of supervised practical flight as RP in command; and

(b) at least 75 hours of logged live BVLOS flight in total as RP in command, which may include live practical flight instruction undertaken during this training course, or a previous RPC training course.

Crediting. An RPC-L3(R) trainee with equivalent prior experience as a remote pilot, or experience as a manned aeroplane pilot may be credited towards the requirements in (1)(a). The amount of credit **must** be decided by the RAE(PC) where the pilot undergoes the training course, based on a pre-entry flight assessment, but **must** in any case:

(a) Not exceed 20% of the hours required in (1)(a).

(b) Not include the requirements in (1)(b), (1)(c), or (2).

Crediting. An RPC-L3(R) trainee that holds a valid RPC-L3 in another category may be credited towards the requirements in (a) subject to completion of a suitable bridging course at a CAA approved RAE(PC).

Crediting. An RPC-L3(R) trainee who hold a valid ATPL or CPL theory certificate in the appropriate category may be credited towards the requirements in Appendix A subject to completion of a suitable bridging course and assessment at a CAA approved RAE(PC).

RPC-L3(R) VALIDITY, REVALIDATION AND RENEWAL

(a) **Validity.** An RPC-L3(R) is valid for 3 years from the date notified on the certificate.

(b) **Revalidation.** An RPC-L3(R) may be revalidated within the 3 months immediately preceding its expiry date if the remote pilot undertakes a revalidation proficiency check at an RAE(PC).

(c) The RAE(PC) **must** determine on a case-by-case basis what steps the revalidation proficiency check requires, having regard to the remote pilot's certificate currency, experience, flight logs, last use of RPC privileges and any other relevant factors.

(d) An RAE(PC) should exempt a remote pilot from a live revalidation check where:

(1) the remote pilot has maintained at least minimum certificate currency for the complete duration of the certificate validity period; and

(2) the remote pilot demonstrate certificate currency has been maintained through a personal flight log.

(e) An RAE(PC) may exempt a remote pilot from a live revalidation check where certificate currency has not been maintained in accordance with (d) if the RAE (PC) is satisfied that an exemption is appropriate, having regard in particular to:

(1) the remote pilot's experience; and

(2) the amount of time elapsed since the date on which the remote pilot last used privileges of the RPC-L3(R).

(f) The remote pilot **must** undertake a revalidation proficiency check consisting of at least 1 hour of supervised flying covering general handling and emergency procedures where the RAE(PC) considers this to be necessary.

(g) If a remote pilot chooses to fulfil the revalidation requirements earlier than prescribed in point (b), the new 3-year validity period will be set by reference to the date of the successful revalidation proficiency check.

(h) A remote pilot who fails to revalidate their RPC-L3(R) before it expires **must not** exercise any RPC-L3(R) privileges unless they renew their RPC-L3(R) in accordance with the provisions below.

(i) **Renewal**. If an RPC-L3(R) has expired, a remote pilot may renew their privileges, by complying with all the following requirements:

(1) The remote pilot **must** complete a refresher training at an RAE(PC), if the RAE(PC) considers that refresher training is necessary for the remote pilot to reach the level of proficiency needed to pass an RPC-L3 (A) proficiency check.

(2) The remote pilot **must** pass an RPC-L3(R) proficiency check at an RAE (PC), including any theoretical knowledge or practical skills checks the RAE(PC) considers necessary.

(j) The RAE(PC) **must** determine on a case-by-case basis what amount of refresher training and what theoretical and practical skills checks are necessary to assess a remote pilot's RPC-L3(R) proficiency, having regard in particular to:

(1) the experience of the remote pilot; and

(2) the amount of time elapsed since the remote pilot last used the privileges of the RPC-L3(R); and

(3) the complexity of the remote pilot's experience.

RPC-L3(R) PROOF OF COMPETENCE

Upon satisfactory completion of the training the RAE(PC) will advise the CAA as to the competencies demonstrated by remote pilots which must include as a minimum the trainee's name, CAA flyer ID, the RAE(PC) approval number, the competence level, and category satisfactorily demonstrated.

The RAE(PC) must issue a proof of competence to the RP in a form and manner determined by the CAA.

Level 4 Remote Pilot Certificate (RPC-L4)

The level 4 RPC considers the **future possibility** of full integration between UAS and manned aircraft in the Specific category. The UAS technical assurance, operator procedures, and flight crew training requirements to perform these types of operations could be very high. Several other national and international policies need to be adopted prior to the commencement of these types of operations. Therefore, the following should be considered a **framework for further development**.

COMMON REQUIREMENTS

Below are the common requirements for the issue of an RPC-L4.

MINIMUM AGE

The minimum age for trainees for the RPC-L4 is 18.

CONDITIONS

An RPC-L4 trainee **must** have fulfilled the requirements of the relevant training course at a CAA approved RAE(PC).

TRAINING COURSE

(a) An RPC-L4 trainee **must** complete a training course at a CAA approved RAE (PC).

(b) The course **must** include theoretical knowledge and flight instruction appropriate to the privileges of the RPC-4 applied for.

(c) A trainee may complete their theoretical knowledge instruction and practical flight instruction at an RAE(PC) different from the one where they commenced their training course. This applies at any point in the training course. Where a trainee relies on this flexibility, the new RAE(PC) should assess the trainee's levels of theoretical and practical competence to determine how much further training the trainee requires.

ENTRY TO TRAINING

An RPC-L4 trainee **must** have completed the following initial training prior to being accepted for further training:

(a) Hold a valid RPC-L3 certificate.

(b) Have logged at least 75 hours of BVLOS flight as RP in command in the Specific category on the application UA category.

(c) Hold at least a valid LAPL medical certificate.

RPC-L4(A) Aeroplane

GROUND INSTRUCTION

Ground instruction considering take-off and landing area selection, aircraft preparation, ground hazard analysis, route planning, avoidance of uninvolved people, and airspace.

FLIGHT INSTRUCTION

The RPC-L4(A) flight instruction syllabus considers the principles of safe UA operations including:

(a) Ability to apply operational procedures (normal, contingency, and emergency procedures, flight planning, pre-flight and post-flight inspections).

(b) Ability to manage aeronautical communication.

(c) Manage the unmanned aircraft flight path and automation.

(d) Leadership, teamwork, and self-management.

(e) Problem solving and decision-making.

(f) Situational awareness.

(g) Workload management.

(h) Coordination or handover, as applicable.

SYLLABUS OF FLIGHT INSTRUCTION

Details of the flight instruction syllabus can be found in Appendix A. The syllabus details are intended to be used by an RAE(PC) when developing the RPC-L4 flight training elements of the appropriate course. It should be noted, however, that they do not provide a ready-made flight training syllabus for individual RAE(PC)s and should not be seen by organisations as a substitute for thorough course design.

The RPC-L4(A) flight instruction syllabus should consider the principles of threat and error management and **must** be competency-based training throughout.

THEORETICAL KNOWLEDGE TOPICS

In the tables of Appendix B, the applicable learning objectives (LOs) for each certificate are marked with an ‘X’.

An RAE(PC) should use the LOs when developing the theoretical knowledge elements of the appropriate course. But the LOs do not provide a ready-made ground training syllabus for individual RAE(PC)s and an RAE(PC) should not rely on the LOs as a substitute for thorough course design.

THEORETICAL KNOWLEDGE ASSESSMENT

An RPC-L4(A) trainee **must** demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

(a) International Air Law.

(b) IFR Navigation.

(c) IFR Operational procedures.

Practical flight assessment general

(a) A trainee for a practical flight assessment for the RPC-L4(A) **must** have received instruction on the same category and type of UAS to be used in the assessment.

(b) An RPC-L4(A) trainee **must** pass all the relevant sections of the practical flight assessment, in accordance with the following:

  (1) If a trainee fails any item in a section, they have failed that section.

  (2) If a trainee fails only one section, they must retake only that section.

  (3) If a trainee fails more than one section, they must retake the entire practical flight assessment.

  (4) If a trainee fails any section of the retaken practical flight assessment, including any section that was passed on a previous attempt, they must retake the entire practical flight assessment.

(c) All relevant sections of the practical flight assessment **must** be completed within 6 months of the date on which the trainee attempted the first section of the practical flight assessment.

(d) If a trainee fails any individual section of the practical flight assessment, the RAE(PC) may require them to undertake further training. If a trainee fails to achieve a pass in all sections of the practical flight assessment in two attempts, they **must** undertake further training.

(e) There is no limit to the number of practical flight assessments that a trainee may attempt.

CONDUCT OF THE ASSESSMENT

(a) Should the trainee choose to terminate a practical flight assessment for reasons considered inadequate by the PFA, the trainee **must** retake the entire practical flight assessment. If the assessment is terminated for reasons considered adequate by the PFA, only those sections not completed **must** be tested in a further flight. Adequate reasons include, but are not limited to, illness, poor weather conditions, equipment failure, and other risks to persons or property.

(b) At the discretion of the PFA, any manoeuvre or procedure of the assessment may be repeated once by the trainee. The PFA may stop the assessment at any stage if they consider that the trainee’s demonstration of flying skills requires a complete retest.

(c) A trainee **must** indicate to the PFA the checks and duties carried out. Checks **must** be completed in accordance with the checklist for the UA on which the assessment is being taken. During pre-flight preparation for the assessment, the trainee **must** configure the command unit (CU).

(d) The PFA **must** take no part in the operation of the UA except where intervention is necessary in the interest of safety.

CONTENT OF THE PRACTICAL FLIGHT ASSESSMENT FOR THE ISSUE OF AN RPC-L4(A)

(a) The UAS used for the practical flight assessment **must** meet the requirements for training UAS as set out in the relevant CAA publication.

(b) The practical flight assessment **must** comprise of a practical flight assessment conducted in ARC-d airspace.

(c) Every section of the practical flight assessment must assess the use of checklists, situational awareness, control of the UA either manually or by use of the CU, and principles of risk management.

RPC-L4(A) PRIVILEGES AND CONDITIONS

(a) **Privileges.** The privileges of the holders of an RPC-L4(A) are to act as remote pilot in command or flight crew of a UA where all of the following apply:

  (1) The flight is being undertaken in the Specific category.

  (2) The primary means of lift of the UA is fixed wing(s).

  (3) The maximum air risk class (ARC) of the flight is ARC-d.

  (4) The operational authorisation under which the flight is being conducted states the RPC-L4(A) is the minimum remote pilot competence.

(b) Conditions.

  (1) The remote pilot maintains a minimum certificate currency of 2 hours of live flight within the last 90 days.

  (2) The remote pilot holds a valid flyer ID.

RPC-L4(A) EXPERIENCE REQUIREMENTS AND CREDITING

Experience Requirements. An RPC-L4(A) trainee **must** be able to demonstrate that they meet both flight experience requirements below:

(a) at least 28 hours of instruction completed, which **must** include:

  (1) 14 hours of beyond visual line of sight dual flight simulator instruction, and

  (2) 14 hours of beyond visual line of sight dual practical flight instruction; and

(b) at least 100 hours of logged live BVLOS flight in total as RP in command, which may include live practical flight instruction undertaken during this training course, or a previous RPC training course.

Crediting. Trainees for the RPC-L4(A) that hold valid RPC-L4 in another category may be credited towards the requirements in (1)(a) subject to completion of a suitable bridging course at a CAA approved RAE(PC).

RPC-L4(A) VALIDITY, REVALIDATION AND RENEWAL

(a) **Validity.** An RPC-L4(A) is valid for 1 year from the date notified on the certificate.

(b) **Revalidation.** An RPC-L4(A) may be revalidated within the 3 months immediately preceding its expiry date if the remote pilot undertakes a revalidation proficiency check at an RAE(PC).

(c) The RAE(PC) **must** determine on a case-by-case basis what steps the revalidation proficiency check requires, having regard to the remote pilot's certificate currency, experience, flight logs, last use of RPC privileges and any other relevant factors.

(d) An RAE(PC) should exempt a remote pilot from a live revalidation check where:

(1) the remote pilot has maintained at least minimum certificate currency for the complete duration of the certificate validity period; and

(2) the remote pilot demonstrate certificate currency has been maintained through a personal flight log.

(e) An RAE(PC) may exempt a remote pilot from a live revalidation check where certificate currency has not been maintained in accordance with (d) if the RAE (PC) is satisfied that an exemption is appropriate, having regard in particular to:

(1) the remote pilot's experience; and

(2) the amount of time elapsed since the date on which the remote pilot last used privileges of the RPC-L4(A).

(f) The remote pilot **must** undertake a revalidation proficiency check consisting of at least 1 hour of supervised flying covering general handling and emergency procedures where the RAE(PC) considers this to be necessary.

(g) If a remote pilot chooses to fulfil the revalidation requirements earlier than prescribed in point (b), the new 1-year validity period will be set by reference to the date of the successful revalidation proficiency check.

(h) A remote pilot who fails to revalidate their RPC-L4(A) before it expires **must not** exercise any RPC-L4(A) privileges unless they renew their RPC-L4(A)in accordance with the provisions below.

(i) **Renewal**. If an RPC-L4(A) has expired, a remote pilot may renew their privileges, by complying with all the following requirements:

(1) The remote pilot **must** complete a refresher training at an RAE(PC), if the RAE(PC) considers that refresher training is necessary for the remote pilot to reach the level of proficiency needed to pass an RPC-L4 (A) proficiency check.

(2) The remote pilot **must** pass an RPC-L4(A) proficiency check at an RAE (PC), including any theoretical knowledge or practical skills checks the RAE(PC) considers necessary.

(j) The RAE(PC) must determine on a case-by-case basis what amount of refresher training and what theoretical and practical skills checks are necessary to assess a remote pilot's RPC-L4(A) proficiency, having regard in particular to:

(1) the experience of the remote pilot; and

(2) the amount of time elapsed since the remote pilot last used the privileges of the RPC-L4(A); and

(3) the complexity of the remote pilot's experience.

RPC-L4(A) PROOF OF COMPETENCE

Upon satisfactory completion of the training the RAE(PC) will advise the CAA as to the competencies demonstrated by remote pilots which must include as a minimum the trainee's name, CAA flyer ID, the RAE(PC) approval number, the competence level, and category satisfactorily demonstrated.

The RAE(PC) must issue a proof of competence to the RP in a form and manner determined by the CAA.

RPC-L4(R) Rotorcraft

GROUND INSTRUCTION

Ground instruction considering take-off and landing area selection, aircraft preparation, ground hazard analysis, route planning, avoidance of uninvolved people, and airspace.

FLIGHT INSTRUCTION

The RPC-L4(R) flight instruction syllabus considers the principles safe UA operations including:

(a) Ability to apply operational procedures (normal, contingency, and emergency procedures, flight planning, pre-flight and post-flight inspections).

(b) Ability to manage aeronautical communication.

(c) Manage the unmanned aircraft flight path and automation.

(d) Leadership, teamwork, and self-management.

(e) Problem solving and decision-making.
(f) Situational awareness.
(g) Workload management.
(h) Coordination or handover, as applicable.

SYLLABUS OF FLIGHT INSTRUCTION

Details of the flight instruction syllabus can be found in Appendix A. The syllabus details are intended to be used by an RAE(PC) when developing the RPC-L4 flight training elements of the appropriate course. It should be noted, however, that they do not provide a ready-made flight training syllabus for individual RAE(PC)s and should not be seen by organisations as a substitute for thorough course design.

The RPC-L4(R) flight instruction syllabus should consider the principles of threat and error management and **must** be competency-based training throughout.

THEORETICAL KNOWLEDGE TOPICS

In the tables of Appendix B, the applicable learning objectives (LOs) for each certificate are marked with an ‘X’.

An RAE(PC) should use the LOs when developing the theoretical knowledge elements of the appropriate course. But the LOs do not provide a ready-made ground training syllabus for individual RAE(PC)s and an RAE(PC) should not rely on the LOs as a substitute for thorough course design.

THEORETICAL KNOWLEDGE ASSESSMENT

An RPC-L4(R) trainee **must** demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

(a) International Air Law.
(b) IFR Navigation.
(c) IFR Operational procedures.

PRACTICAL FLIGHT ASSESSMENT GENERAL

(a) A trainee for a practical flight assessment for the RPC-L4(R) **must** have received instruction on the same category and type of UAS to be used in the assessment.
(b) A trainee **must** pass all the relevant sections of the practical flight assessment, in accordance with the following:
    (1) If a trainee fails any item in a section, they have failed that section.
    (2) If a trainee fails only one section, they must retake only that section.

(3) If a trainee fails more than one section, they must retake the entire practical flight assessment.

(4) If a trainee fails any section of the retaken practical flight assessment, including any section that was passed on a previous attempt, they must retake the entire practical flight assessment.

(c) All relevant sections of the practical flight assessment **must** be completed within 6 months of the date on which the trainee attempted the first section of the practical flight assessment.

(d) If a trainee fails any individual section of the practical flight assessment, the RAE(PC) may require them to undertake further training. If a trainee fails to achieve a pass in all sections of the practical flight assessment in two attempts, they **must** undertake further training.

(e) There is no limit to the number of practical flight assessments that a trainee may attempt.

CONDUCT OF THE ASSESSMENT

(a) Should the trainee choose to terminate a practical flight assessment for reasons considered inadequate by the PFA, the trainee **must** retake the entire practical flight assessment. If the assessment is terminated for reasons considered adequate by the PFA, only those sections not completed **must** be tested in a further flight. Adequate reasons include, but are not limited to, illness, poor weather conditions, equipment failure, and other risks to persons or property.

(b) At the discretion of the PFA, any manoeuvre or procedure of the assessment may be repeated once by the trainee. The PFA may stop the assessment at any stage if they consider that the trainee's demonstration of flying skills requires a complete retest.

(c) A trainee **must** indicate to the PFA the checks and duties carried out. Checks **must** be completed in accordance with the checklist for the UA on which the assessment is being taken. During pre-flight preparation for the assessment, the trainee **must** configure the command unit (CU).

(d) The PFA **must** take no part in the operation of the UA except where intervention is necessary in the interest of safety.

CONTENT OF THE PRACTICAL FLIGHT ASSESSMENT FOR THE ISSUE OF AN RPC-L4(R)

(a) The UAS used for the practical flight assessment **must** meet the requirements for training UAS as set out in the relevant CAA publication.

(b) The practical flight assessment **must** comprise of a practical flight assessment lasting at least 1 hour conducted in ARC-d conditions departing from and returning to a licenced aerodrome.

(c) Every section of the practical flight assessment must assess the use of checklists, situational awareness, control of the UA either manually or by use of the CU, and principles of risk management.

RPC-L4(R) PRIVILEGES AND CONDITIONS

(a) **Privileges.** The privileges of the holders of an RPC-L4(R) are to act as remote pilot in command or flight crew of a UA where all of the following apply:

(1) The flight is being undertaken in the Specific Category.

(2) The primary means of lift of the UA is rotating wing(s).

(3) The maximum air risk class (ARC) of the flight is ARC-d.

(4) The operational authorisation under which the flight is being conducted states the RPC-L4(R) is the minimum remote pilot competence.

(b) **Conditions.**

(1) The remote pilot maintains a minimum certificate currency of 2 hours of live flight within the last 90 days.

(2) The remote pilot holds a valid flyer ID.

RPC-L4(R) EXPERIENCE REQUIREMENTS AND CREDITING

Experience Requirements. An RPC-L4(R) trainee **must** be able to demonstrate that they meet both flight experience requirements below:

(a) at least 28 hours of instruction completed, which **must** include:

(1) 14 hours of beyond visual line of sight dual flight simulator instruction, and

(2) 14 hours of beyond visual line of sight dual practical flight instruction; and

(b) at least 100 hours of logged live BVLOS flight in total as RP in command, which may include live practical flight instruction undertaken during this training course, or a previous RPC training course.

Crediting. An RPC-L4(R) trainee that holds a valid RPC-L4 in another category may be credited towards the requirements in (1)(a) subject to completion of a suitable bridging course at a CAA approved RAE(PC).

RPC-L4(R) VALIDITY, REVALIDATION AND RENEWAL

(a) **Validity.** An RPC-L4(R) is valid for 1 year from the date notified on the certificate.

(b) **Revalidation.** An RPC-L4(R) may be revalidated within the 3 months immediately preceding its expiry date if the remote pilot undertakes a revalidation proficiency check at an RAE(PC).

(c) The RAE(PC) **must** determine on a case-by-case basis what steps the revalidation proficiency check requires, having regard to the remote pilot's certificate currency, experience, flight logs, last use of RPC privileges and any other relevant factors.

(d) An RAE(PC) should exempt a remote pilot from a live revalidation check where:

  (1) the remote pilot has maintained at least minimum certificate currency for the complete duration of the certificate validity period; and

  (2) the remote pilot demonstrate certificate currency has been maintained through a personal flight log.

(e) An RAE(PC) may exempt a remote pilot from a live revalidation check where certificate currency has not been maintained in accordance with (d) if the RAE (PC) is satisfied that an exemption is appropriate, having regard in particular to:

  (1) the remote pilot's experience; and

  (2) the amount of time elapsed since the date on which the remote pilot last used privileges of the RPC-L4(R).

(f) The remote pilot **must** undertake a revalidation proficiency check consisting of at least 1 hour of supervised flying covering general handling and emergency procedures where the RAE(PC) considers this to be necessary.

(g) If a remote pilot chooses to fulfil the revalidation requirements earlier than prescribed in point (b), the new 1-year validity period will be set by reference to the date of the successful revalidation proficiency check.

(h) A remote pilot who fails to revalidate their RPC-L4(R) before it expires **must not** exercise any RPC-L4(R)privileges unless they renew their RPC-L4(R) in accordance with the provisions below.

(i) **Renewal**. If an RPC-L4(R) has expired, a remote pilot may renew their privileges, by complying with all the following requirements:

  (1) The remote pilot **must** complete a refresher training at an RAE(PC), if the RAE(PC) considers that refresher training is necessary for the remote pilot to reach the level of proficiency needed to pass an RPC-L4 (R) proficiency check.

  (2) The remote pilot **must** pass an RPC-L4(R) proficiency check at an RAE (PC), including any theoretical knowledge or practical skills checks the RAE(PC) considers necessary.

(j) The RAE(PC) must determine on a case-by-case basis what amount of refresher training and what theoretical and practical skills checks are necessary to assess a remote pilot's RPC-L4(R) proficiency, having regard in particular to:

(1) the experience of the remote pilot; and

(2) the amount of time elapsed since the remote pilot last used the privileges of the RPC-L4(R); and

(3) the complexity of the remote pilot's experience.

RPC-L4(R) PROOF OF COMPETENCE

Upon satisfactory completion of the training the RAE(PC) will advise the CAA as to the competencies demonstrated by remote pilots which must include as a minimum the trainee's name, CAA flyer ID, the RAE(PC) approval number, the competence level, and category satisfactorily demonstrated.

The RAE(PC) must issue a proof of competence to the RP in a form and manner determined by the CAA.

APPENDIX A – FLIGHT INSTRUCTION

The LOs in this appendix are intended to be used by an RAE(PC) when developing the simulated and practical training events of the appropriate course. It should be noted, however, that the LOs do not provide a ready-made flight training syllabus for individual RAE(PC)s and should not be seen by organisations as a substitute for thorough course design.

FLIGHT INSTRUCTION – RPC-L1

To be defined by the RAE(PC) through course design.

FLIGHT INSTRUCTION – RPC-L2

Ref	ARC	Learning Objectives (LO)	Sim	Live
FAM-1	**All**	**CU Familiarisation**		
		Introduce the UAS Command Unit		X
		Introduce flight planning		X
GH-S1	**All**	**Start Up Procedures**		
		Practice CU set-up		X
		Consolidate performance planning		X
		Introduce automation handling		X
		Introduce flight briefing		X
		Introduce pre-start / start procedures		X
		Introduce shutdown		X
GH-1	**All**	**Aircraft Preparation**		
		Introduce walk around		X

Ref	ARC	Learning Objectives (LO)	Sim	Live
		Introduce refuelling		X
GH-S2	**All**	**Flight Preparation Procedures**		
		Consolidate Flight Planning		X
		Consolidate Flight Briefing		X
		Consolidate CU setup procedures		X
		Consolidate Startup procedures		X
		Consolidate emergency procedures		X
		Introduce pre-take off procedures		X
GH-S3	**A**	**Introduce Take-off**		
		Introduce take-off procedures		X
		Introduce basic automation management		X
GH-L2	**A**	**Consolidate Start-up, Taxi, Take-off**		
		Consolidate GH-S1, GH-S2, and GH-S3		X
		Observe landing and shutdown		X
		Introduce C2 link emergencies		X
GH-S4	**A**	**Introduce Landing**		
		TOAL site approaches		X
		Landing procedures		X
AM-1	**A**	**Automation Management**		
		Basic automation handling		X
		Introduce high/low speed flight awareness		X
		Introduce climbs and descents		X
EP-S1	**A**	**Emergency Procedures**		
		Introduce basic EP management	X	
		Introduce startup emergencies	X	
		Introduce engine emergency procedures	X	
		Introduce C2 link emergencies	X	
		Automation and sensor Failures	X	
		Introduce automation / FCA / Pitot Static failures	X	
		Introduce low visibility operations	X	

FLIGHT INSTRUCTION – RPC-L3

Ref	ARC	Learning Objectives (LO)	Sim	Live
FAM-1	**All**	**CU Familiarisation**		
		Introduce the UAS Command Unit (CU)	X	
		Introduce flight planning	X	
		Introduce performance planning	X	
GH-S1	**All**	**Start-up Procedures**		
		Practice CU set-up	X	
		Consolidate performance planning	X	
		Introduce automation handling	X	
		Introduce flight briefing	X	
		Introduce pre-start & start procedures	X	
		Introduce shutdown procedures	X	
EP-1	**All**	**Emergency Procedures**		
		Introduce basic EP management	X	

Ref	ARC	Learning Objectives (LO)	Sim	Live
		Introduce startup emergencies	X	
GH-L1	**All**	**Aircraft Preparation**		
		Introduce walk around		X
		Introduce refuelling		X
GH-S2	**All**	**Taxi and Positioning Procedures**		
		Consolidate Flight Planning	X	
		Consolidate Flight Briefing	X	
		Consolidate CU setup procedures	X	
		Consolidate startup procedures	X	
		Consolidate emergency procedures	X	
		Introduce pre-take off procedures	X	
GH-S3	**C**	**Introduce Take-off and Departure**		
		Consolidate taxi and positioning	X	
		Introduce take-off procedures	X	
		Introduce departure procedures	X	
		Introduce basic automation management	X	
EP-2	**C**	**Consolidate Emergency Procedures**		
		Consolidate EP-1	X	
		Introduce engine emergency procedures	X	
GH-L2	**C**	**Consolidate Start-up, Taxi, Take-off**		
		Consolidate GH-S1, GH-S2, and GH-S3		X
		Observe landing and shutdown		X
EP-S3	**C**	**Consolidate Emergency Procedures**		
		Consolidate EP-1 and EP-2	X	
		Introduce C2 link emergencies	X	
GH-S4	**C**	**Introduce Landing**		
		Introduce circuits to land	X	
		Straight-in approaches	X	
		Circuits with visual traffic	X	
GH-S5	**C**	**Consolidate Circuits to Land**		
		Introduce airfield recovery	X	
		Consolidate circuits to land	X	
GH-L3	**C**	**Consolidate Circuits**		
		Consolidate Circuits - dual		X
GH-L4	**C**	**Consolidate Circuits**		
		Solo circuits		X
GH-S6	**C**	**Consolidate Automation Management**		
		Basic automation handling	X	
		Introduce high/low speed flight awareness	X	
		Consolidate engine failure	X	
		Introduce climbs and descents	X	
GH-L5	**C**	**Introduce General Handling**		
		General handling exercises		X
GH-L6	**C**	**General Handling**		
		Consolidate handling		X
EP-S4	**C**	**Consolidate Emergency Procedures**		
		Automation and sensor Failures	X	
		Introduce automation / FCA / Pitot Static failures	X	

Ref	ARC	Learning Objectives (LO)	Sim	Live
		Introduce low visibility operations	X	
GH-S7	**C**	**Introduce Threat Management**		
		Consolidate automation management	X	
		Introduce threat management - weather	X	
		Introduce IMC flight	X	
		Consolidate recovery	X	
GH-S8	**C**	**Introduce Traffic Avoidance**		
		Introduction to DAA systems	X	
		Introduction to airspace transits	X	
EP-S5	**C**	**Consolidate Emergency Procedures**		
		Consolidate EP-S3 and EP-S4	X	
		Introduce electrical system failures	X	
GH-S9	**C**	**Consolidate Traffic Avoidance**		
		Consolidate traffic avoidance	X	
		Consolidate departure	X	
ST-L1	**C**	**Phase 1 GH Practical Flight Assessment**		
		Practical flight assessment evaluation		X
GH-L7	**C**	**Consolidate Departure and Transit**		
		Solo departure, transit, and GH		X
GH-L8	**C**	**Introduce Remote Departure Procedures**		
		Consolidate departure and transit		X
		Introduce departure remote aerodrome		X
GH-L9	**C**	**Consolidate Remote Departure Procedures**		
		Departure, transit, and land at remote aerodrome		X
		Departure remote aerodrome and return to base		X
ST-L2	**C**	**Phase 2 Cross Country Practical Flight Assessment**		
		Cross Country Practical flight assessment		X
ST-EP	**C**	**Phase 4 Emergency Procedures Assessment**		
		Emergency Procedures Assessment	X	

FLIGHT INSTRUCTION – RPC-L4

Ref	ARC	Learning Objectives (LO)	Sim	Live
IFR-S1	**D**	**Introduce IFR Departure and Transit**		
		Introduce IFR workflow	X	
		Introduce ANSP coordination	X	
IFR-S2	**D**	**Standard Instrument Departures and Arrivals**		
		Consolidate IFR workflow	X	
		Introduce SIDs and STARs	X	
IFR-S3	**D**	**Enroute IFR Procedures**		
		Introduce en-route holding	X	
		Consolidate SIDs and STARs	X	
IFR-S4	**D**	**Holding Procedures**		
		Introduce terminal aera holds	X	
IFR-S5	**D**	**Instrument Approaches to Specified Minima**		
		Consolidate IFR-S2, IFR-S3, and IFR-S4	X	
IFR-S6	**D**	**Missed Approach Procedures**		

Ref	ARC	Learning Objectives (LO)	Sim	Live
		Go around procedures		
IFR-L1	**D**	**IFR Departure**		
		IFR Departure – Dual		X
		IFR Exercises		X
IFR-L2	**D**	**IFR Instrument Departure**		
		SID exercises		X
IFR-L3	**D**	**IFR Holds**		
		Holds and IFR exercises		X
IFR-L4	**D**	**IFR Exercises**		
		Holds into approaches		X
IFR-L5	**D**	**IFR Exercises Dual**		
		Dual departure, hold and recovery		X
IFR-L6	**D**	**IFR Exercises Solo**		
		Solo departure, hold, and recovery		X
IFR-ST	**D**	**IFR Practical Flight Assessment**		

APPENDIX B – THEORICAL KNOWLEDGE TOPICS

Air Law

Syllabus Reference	Syllabus Details and Associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
LAW.SPEC.00.00	**Air Law**									
LAW.SPEC.01.00	**UK UAS Regulations**									
LAW.SPEC.01.01	Demonstrate an understanding of the UK Regulation (EU) 2019/947.	X	X	X						
LAW.SPEC.01.02	Demonstrate an understanding of the Acceptable Means of Compliance to UK Regulation (EU) 2019/947.	X	X	X						
LAW.SPEC.01.03	Demonstrate an understanding of other relevant CAA supporting documents and polices.	X	X	X						
LAW.SPEC.01.04	Describe the requirements of article 8 in relation to remote pilot competence. **Source: UK Regulation (EU) 2019/947 Art 8.**						X	X		
LAW.SPEC.01.05	State the privileges of each of the remote pilot competence certificates in the Specific category. **Source: UK Regulation (EU) 2019/947 Art 8.**						X	X		
LAW.SPEC.01.06	Describe the responsibilities of a remote pilot in accordance with UAS.SPEC.050. **Source: UAS.SPEC.050**						X	X		
LAW.SPEC.01.07	Describe the responsibilities of a UAS operator in accordance with UAS.SPEC.060. **Source: UAS.SPEC.060**						X	X		
LAW.SPEC.01.08	Explain key differences between these responsibilities.						X	X		
LAW.SPEC.02.00	**UK National UAS Regulations - The Air Navigation Order**									
LAW.SPEC.02.01	Demonstrate awareness of the UK Air Navigation Order including residual articles relevant to UAS operations.	X	X	X						
LAW.SPEC.02.02	Describe the relationship between the ANO and UK Regulation (EU) 2019/947.						X	X		
LAW.SPEC.02.03	Describe how article 23 of the ANO limits the scope of the order in relation to UAS operations.						X	X		
LAW.SPEC.02.04	Describe the residual articles of the ANO that remain in scope of the order.						X	X		

Syllabus Reference	Syllabus Details and Associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
LAW.SPEC.03.00	**The issue of an Operational Authorisation**									
LAW.SPEC.03.01	Demonstrate an understanding of an Operational Authorisation (OA) and how it describes the privileges and conditions it sets out.	X	X	X						
LAW.SPEC.04.00	**The Convention on International Civil Aviation (Chicago) — ICAO Doc 7300/9**									
LAW.SPEC.04.01	Explain the circumstances that led to the establishment of the Convention on International Civil Aviation, Chicago, 7 December 1944. **Source: ICAO Doc 7300/9 Preamble**						X	X		
LAW.SPEC.05.00	**The Standard European Rules of the Air (SERA)**									
LAW.SPEC.05.01	Reserved - Rights of Way.								X	X
LAW.SPEC.06.00	**Flightworthiness of UAS**									
LAW.SPEC.06.01	For use after the implementation of the UK SAIL mark for flightworthiness.						X	X		

Operational Procedures

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
OPS.SPEC.00.00	**Operational Procedures**									
OPS.SPEC.01.00	**Visual Line of Sight Procedures**									
OPS.SPEC.01.01	Describe specific airspace classifications and types.	X	X	X						
OPS.SPEC.01.02	Describe the UK airspace reservations such as: (a) Danger Areas (b) Restricted Areas (c) Prohibited areas	X	X	X						
OPS.SPEC.01.03	Demonstrate an understanding of official sources of information that support UAS operations.	X	X	X						
OPS.SPEC.01.04	Extract information from relevant aeronautical information sources.	X	X	X						
OPS.SPEC.01.05	Interpret information from aeronautical information sources for their applicability to	X	X	X						

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	UAS operations.									
OPS.SPEC.02.00	**Beyond Visual Line of Sight Procedures**									
OPS.SPEC.02.01	Demonstrate an understanding of coordination procedures with air traffic control (ATC) for BVLOS flights.				X	X				
OPS.SPEC.03.00	**BVLOS Flight Planning**									
OPS.SPEC.03.01	Describe the regulatory boundaries of BVLOS flight operations in terms of UK SORA (GRC, ARC, and Total SAIL).				X	X				
OPS.SPEC.04.00	**BVLOS Route Selection**									
OPS.SPEC.04.01	Describe the process of route optimisation considering factors such as terrain, obstacles, and populated areas.				X	X				
OPS.SPEC.05.00	**Waypoint Planning**									
OPS.SPEC.05.01	Describe the process to determine the position of waypoints along the chosen route.				X	X				
OPS.SPEC.05.02	Explain the need for precision navigation, obstacle avoidance, and compliance with airspace restrictions.				X	X				

UA general knowledge

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1 R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.00.00	**UA General Knowledge**									
AGK.SPEC.01.00	**SAIL Certification**									
AGK.SPEC.01.01	Reserved for future.									
AGK.SPEC.02.00	**Stress, Strain and Loads**									
AGK.SPEC.02.01	Explain how stress and strain are always present in a UA structure both when parked and during manoeuvring.						X	X		
AGK.SPEC.02.02	Describe the following types of loads that an unmanned aircraft may be subjected to, when they occur, and how a remote pilot may affect their						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
	magnitude: (a) static loads (b) dynamic loads (c) cyclic loads									
AGK.SPEC.02.03	Describe the areas typically prone to stress that should be given particular attention during a pre-flight inspection and highlight the limited visual cues of any deformation that may be evident.						X	X		
AGK.SPEC.03.00	**Fatigue and Corrosion**									
AGK.SPEC.03.01	Describe the effects of corrosion and how it can be visually identified by a remote pilot during the pre-flight inspection.						X	X		
AGK.SPEC.03.02	Describe the operating environments where the risk of corrosion is increased and how to minimise the effects of the environmental factors.						X	X		
AGK.SPEC.03.03	Explain fatigue, how it affects the useful life of an unmanned aircraft, and the effect of the following factors on the development of fatigue: (a) corrosion (b) number of cycles (c) type of flight manoeuvres (d) stress level						X	X		
AGK.SPEC.04.00	**UA Maintenance**									
AGK.SPEC.04.01	Reserved for future.									
AGK.SPEC.05.00	**Airframe**									
AGK.SPEC.05.01	Describe the following attachment methods used for unmanned aircraft parts and components: (a) riveting (b) welding (c) bolting (d) pinning (e) adhesives (bonding						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
	(f) screwing									
AGK.SPEC.05.02	Explain how the development of a faulty attachment between unmanned aircraft parts or components can be detected by a remote pilot during the pre-flight inspection.						X	X		
AGK.SPEC.06.00	**Composite and Other Materials**									
AGK.SPEC.06.01	Explain the principle of a composite material, and give examples of typical non-metallic materials used on unmanned aircraft: (a) carbon (b) glass fibre (c) Kevlar aramid						X	X		
AGK.SPEC.06.02	State the advantages and disadvantages of composite materials compared with metal alloys by considering the following: (a) strength-to-weight ratio (b) capability to tailor the strength to the direction of the load (c) stiffness (d) electrical conductivity (lightning) (e) resistance to fatigue and corrosion (f) resistance to cost (g) discovering damage during a pre-flight inspection.						X	X		
AGK.SPEC.06.03	State that several types of materials are used on unmanned aircraft and that they are chosen based on type of structure or component and the required/desired material properties.						X	X		
AGK.SPEC.07.00	**Aeroplane: Wings, Tail Surfaces, and Control Surfaces**									
AGK.SPEC.07.01	Describe the different types of UA design and explain their advantages and disadvantages.						X	X		
AGK.SPEC.08.00	**Structural Components**									
AGK.SPEC.08.01	Describe the function of a wing spar and other critical structural components.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.09.00	**Loads, Stresses and Aeroelastic Vibrations (flutter)**									
AGK.SPEC.09.01	Describe the vertical and horizontal loads on the ground and during normal flight.						X	X		
AGK.SPEC.10.00	**Rotorcraft Structural Aspects of Fight Controls**									
AGK.SPEC.10.01	List the functions of flight controls.						X	X		
AGK.SPEC.10.02	Explain why vertical and horizontal stabilisers may have different shapes and alignments.						X	X		
AGK.SPEC.11.00	**Structural Components, and Materials**									
AGK.SPEC.11.01	Describe the fatigue life and methods of checking for serviceability of the components and materials of flight and control surfaces.						X	X		
AGK.SPEC.12.00	**Loads, Stresses, and Aeroelastic Vibrations**									
AGK.SPEC.12.01	Describe the dangers and stresses regarding safety and serviceability in flight when the manufacturer's design envelope is exceeded.						X	X		
AGK.SPEC.12.02	Explain that blade tracking is important both to minimise vibration and to help ensure uniformity of flow through the disc.						X	X		
AGK.SPEC.12.03	Describe the early indications and vibrations which are likely to be experienced when the main-rotor blades and tail rotor are out of balance or tracking, including the possible early indications due to possible fatigue and overload.						X	X		
AGK.SPEC.12.04	Explain how a vibration harmonic can be set up in other components which can lead to their early failure.						X	X		
AGK.SPEC.12.05	State the three planes of vibration measurement, i.e. vertical, lateral, fore and aft.						X	X		
AGK.SPEC.13.00	**Brakes**									
AGK.SPEC.13.01	Describe the basic operating principle of a disc brake.						X	X		
AGK.SPEC.13.02	Explain the limitation of brake energy and describe the operational. consequences.						X	X		
AGK.SPEC.13.03	Explain how brakes are actuated: hydraulically, electrically, or mechanically						X	X		
AGK.SPEC.13.04	Describe the function of a parking brake.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1 R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.14.00	**Flight Controls**									
AGK.SPEC.14.01	Define a ‘primary flight control’ in the context of a UA.	X	X	X						
AGK.SPEC.14.02	List the following primary flight control surfaces elevator, aileron, roll spoilers, flaperon and rudder.	X	X	X						
AGK.SPEC.14.03	List the various means of control surface actuation.	X	X	X						
AGK.SPEC.15.00	**Rotorcraft Flight Controls**									
AGK.SPEC.15.01	Describe the following four axes of control operation, their operating principle, and their associated cockpit controls: (a) collective control (b) cyclic fore and aft (pitch axis) (c) cyclic lateral (roll axis) (d) yaw	X	X	X						
AGK.SPEC.15.02	Describe the swash plate or azimuth star control system including the following: swash plate inputs the function of the non-rotating swash plate the function of the rotating swash plate how swash plate tilt is achieved swash plate pitch axis swash plate roll axis balancing of pitch/roll/collective inputs to the swash plate to equalise torsional loads on the blades						X	X		
AGK.SPEC.15.03	Describe how flight control is achieved in multirotor UA.	X	X	X						
AGK.SPEC.15.04	Describe how transition between vertical and horizontal flight is achieved in VTOL UA.	X	X	X						

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1 R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.16.00	**Piston Engines**									
AGK.SPEC.16.01	State the types of fuel used by a piston engine and their associated limitations: (a) diesel (b) JET-A1 (for high-compression engines) (c) AVGAS						X	X		
AGK.SPEC.16.02	State the main characteristics of these fuels and give typical values regarding their flash points, freezing points and density.						X	X		
AGK.SPEC.17.00	**Design, Operation, System Components, Indications**									
AGK.SPEC.17.01	State the tasks of the fuel system.						X	X		
AGK.SPEC.17.02	Name the following main components of a fuel system, and state their location and their function: (a) lines (b) pumps (c) pressure valves (d) filter/strainer (e) tanks (f) vent system (g) fuel-quantity sensor; fuel-temperature sensor						X	X		
AGK.SPEC.17.03	Describe a gravity fuel feed system and a pressure feed fuel system.						X	X		
AGK.SPEC.17.04	Describe the construction of the different types of fuel tanks and state their advantages and disadvantages: (a) drum tank (b) bladder tank (c) integral tank						X	X		
AGK.SPEC.17.05	Define the term ‘unusable fuel’.						X	X		
AGK.SPEC.17.06	List the following parameters that maybe monitored for the fuel system:						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
	(a) fuel quantity (low-level warning) (b) fuel temperature									
AGK.SPEC.18.00	**Turbine Engines**									
AGK.SPEC.18.01	State the types of fuel used by a gas turbine engine: (a) JET-A (b) JET-A1 (c) JET-B						X	X		
AGK.SPEC.18.02	State the main characteristics of these fuels and give typical values regarding their flash points, freezing points and density.						X	X		
AGK.SPEC.18.03	State the existence of additives for freezing.						X	X		
AGK.SPEC.19.00	**Design, operation, system components, indications**									
AGK.SPEC.19.01	Explain the function of the fuel system: (a) lines (b) pumps (c) pressure valves (d) filter/strainer (e) tanks (f) vent system (g) fuel-quantity sensor; fuel-temperature sensor						X	X		
AGK.SPEC.20.00	**Electrics**									
AGK.SPEC.20.01	Explain static electricity and describe the flying conditions where unmanned aircraft are most susceptible to build-up of static electricity.						X	X		
AGK.SPEC.20.02	Describe a static discharger and explain the following: (a) its purpose (b) typical locations (c) remote pilot’s role of observing it during pre-flight inspection						X	X		
AGK.SPEC.20.03	Explain why an unmanned aircraft must first be grounded before refuelling/defueling.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1 R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.20.04	Explain the reason for electrical bonding.						X	X		
AGK.SPEC.21.00	**Direct Current (DC)**									
AGK.SPEC.21.01	Explain the term direct current (DC), and state that current can only flow in a closed circuit.	X	X	X						
AGK.SPEC.21.02	Explain the basic principles of conductivity and give examples of conductors, semiconductors, and insulators.	X	X	X						
AGK.SPEC.21.03	Describe the difference in use of the following mechanical switches and explain the difference in observing their state (e.g. ON/OFF), and why some switches are guarded: (a) toggle switch (b) rocker switch (c) pushbutton switch (d) rotary switch						X	X		
AGK.SPEC.21.04	Define voltage and current and state their unit of measurement.	X	X	X						
AGK.SPEC.21.05	Explain Ohm's law in qualitative terms.	X	X	X						
AGK.SPEC.21.06	Explain the effect on total resistance when resistors are connected in series or in parallel.						X	X		
AGK.SPEC.21.07	State that resistances can have a positive or a negative temperature coefficient (PTC/NTC) and state their use.						X	X		
AGK.SPEC.21.08	Define electrical power and state the unit of measurement.	X	X	X						
AGK.SPEC.22.00	**Alternating Current (AC)**									
AGK.SPEC.22.01	Explain the term 'alternating current' (AC) and compare its use to DC regarding complexity.						X	X		
AGK.SPEC.22.02	Define the term 'phase', and explain the basic principle of single- phase and three-phase AC.						X	X		
AGK.SPEC.22.03	State that unmanned aircraft can use single-phase or three-phase AC.						X	X		
AGK.SPEC.22.04	Define frequency and state the unit of measurement.						X	X		
AGK.SPEC.22.05	Define 'phase shift' in qualitative terms.						X	X		
AGK.SPEC.23.00	**Electromagnetism**									

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.23.01	State that an electrical current produces a magnetic field.						X	X		
AGK.SPEC.23.02	Describe how the strength of the magnetic field changes with the magnitude of the current.						X	X		
AGK.SPEC.23.03	Explain the purpose and the working principle of a solenoid.						X	X		
AGK.SPEC.23.04	Explain the purpose and the working principle of a relay.						X	X		
AGK.SPEC.23.05	Explain the principle of electromagnetic induction and how two electrical components or systems may affect each other through this principle.						X	X		
AGK.SPEC.24.00	**Circuit Protection**									
AGK.SPEC.24.01	Explain the working principle of a fuse and a circuit breaker.	X	X	X						
AGK.SPEC.24.02	Explain how a fuse is rated.	X	X	X			X	X		
AGK.SPEC.24.03	Describe how circuit breakers may be used to reset unmanned aircraft systems/computers in the event of system failure.						X	X		
AGK.SPEC.24.04	Explain a short circuit in practical terms using Ohm's Law, power and energy expressions highlighting the risk of fire due to power transfer and extreme energy dissipation.						X	X		
AGK.SPEC.24.05	Explain the risk of fire resulting from excessive heat in a circuit subjected to overcurrent.	X	X	X						
AGK.SPEC.24.06	Explain that overcurrent situations may be transient.									
AGK.SPEC.24.07	Explain the hazards of the use of incorrect fuse rating when replacing blown fuses.	X	X	X						
AGK.SPEC.25.00	**Semiconductors and Logic Circuits (Reserved)**									
AGK.SPEC.26.00	**Batteries**									
AGK.SPEC.26.01	State the functions of an unmanned aircraft battery.	X	X	X						
AGK.SPEC.26.02	Name the types of rechargeable batteries used in unmanned aircraft: (a) lithium-ion (b) lithium-polymer	X	X	X						
AGK.SPEC.26.03	Compare the different battery types with respect to: (a) load behaviour (b) charging characteristics	X	X	X						

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
	(c) risk of thermal runaway									
AGK.SPEC.26.04	Explain the term ‘cell voltage’ and describe how a battery may consist of several cells that combined provide the desirable voltage and capacity.	X	X	X						
AGK.SPEC.26.05	Explain the difference between battery voltage and charging voltage.	X	X	X						
AGK.SPEC.26.06	Define the term ‘capacity of batteries’ and state the unit of measurement used.	X	X	X						
AGK.SPEC.26.07	State the effect of temperature on battery capacity and performance.	X	X	X						
AGK.SPEC.26.08	State that in the case of loss of all generated power (battery power only) the remaining electrical power is time limited.	X	X	X						
AGK.SPEC.26.09	Describe how to contain a battery thermal runaway highlighting how one cell can affect the neighbouring cells.	X	X	X						
AGK.SPEC.27.00	**DC Generation**									
AGK.SPEC.27.01	Describe the basic working principle of a simple DC generator or DC alternator.						X	X		
AGK.SPEC.27.02	Explain the principle of voltage control and why it is required.						X	X		
AGK.SPEC.27.03	Describe the basic operating principle of a starter generator and state its purpose.						X	X		
AGK.SPEC.28.00	**DC Distribution**									
AGK.SPEC.28.01	Describe a simple DC electrical system of an unmanned aircraft.	X	X	X						
AGK.SPEC.28.02	Give examples of DC consumers.	X	X	X						
AGK.SPEC.29.00	**Electrical Motors**									
AGK.SPEC.29.01	State that the purpose of an electrical motor is to convert electrical energy into mechanical energy.	X	X	X						
AGK.SPEC.29.02	Describe how electrical motors are rated for use in unmanned aircraft.	X	X	X						
AGK.SPEC.29.03	State that because of the similarity in design, a generator and an electrical motor may be combined into a starter generator.						X	X		
AGK.SPEC.30.00	**Operating Principle**									
AGK.SPEC.30.01	Describe how the torque of an electrical motor is determined by the supplied voltage and current, and the resulting magnetic fields within the motor.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.31.00	**Components**									
AGK.SPEC.31.01	Name the following components of an electrical motor: rotor (rotating part of an electrical motor); stator (stationary part of an electrical motor).	X	X	X						
AGK.SPEC.32.00	Piston Engines									
AGK.SPEC.32.01	Define the following terms and expressions: (a) rpm (b) torque (c) manifold absolute pressure (MAP) (d) power output (e) specific fuel consumption (f) compression ratio, clearance volume, swept (displaced) volume, total volume						X	X		
AGK.SPEC.33.00	**Piston Engine: Design, Operation, Components**									
AGK.SPEC.33.01	Describe the basic operating principle of a piston engine: (a) crankcase (b) crankshaft (c) connecting rod (d) piston (e) piston pin (f) piston rings (g) cylinder (h) cylinder head (i) valves (j) valve springs (k) push rod (l) camshaft (m) rocker arm (n) camshaft gear						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
	(o) bearings									
AGK.SPEC.33.02	Name and identify the various types of engine design with regard to cylinder arrangement and their advantages/disadvantages’						X	X		
AGK.SPEC.33.03	Describe the differences between petrol and diesel engines with respect to: (a) means of ignition (b) maximum compression ratio (c) regulating air or mixture supply to the cylinder (d) pollution from the exhaust						X	X		
AGK.SPEC.34.00	**Fuel**									
AGK.SPEC.34.01	Name the type of fuel used for petrol engines including its colour (AVGAS); (a) 100 (green) (b) 100LL (blue)						X	X		
AGK.SPEC.34.02	Name the type of fuel normally used for aviation diesel engines (JET-A1).						X	X		
AGK.SPEC.34.03	Define the term ‘octane rating’.						X	X		
AGK.SPEC.34.04	Define the term ‘detonation’ and describe the causes and effects of detonation for both petrol and diesel engines.						X	X		
AGK.SPEC.34.05	Define the term ‘pre-ignition’ and describe the causes and effects of pre-ignition for both petrol and diesel engines.						X	X		
AGK.SPEC.34.06	Identify the conditions and power settings that promote detonation for petrol engines.						X	X		
AGK.SPEC.34.07	Describe how detonation in petrol engines is recognised.						X	X		
AGK.SPEC.34.08	Describe the method and occasions for checking the fuel for water content.						X	X		
AGK.SPEC.34.09	State the typical value of fuel density for aviation gasoline and diesel fuel.						X	X		
AGK.SPEC.34.10	Explain volatility, viscosity and vapour locking in petrol and diesel fuels.						X	X		
AGK.SPEC.35.00	**Engine Fuel Pumps**									

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.35.01	Describe common fuel pumps used in unmanned aircraft.						X	X		
AGK.SPEC.36.00	**Carburettor/Injection System**									
AGK.SPEC.36.01	State the purpose of a carburettor.						X	X		
AGK.SPEC.36.02	Explain the advantages and difference in operation of an injection system compared with a carburettor system.						X	X		
AGK.SPEC.37.00	**Icing**									
AGK.SPEC.37.01	Describe the causes and effects of carburettor icing.						X	X		
AGK.SPEC.37.02	Name the meteorological conditions under which carburettor icing may occur.						X	X		
AGK.SPEC.37.03	Describe the indications of the presence of carburettor icing for a rotorcraft.						X	X		
AGK.SPEC.37.04	Describe the indications that will occur upon selection of carburettor heat depending on whether ice is present or not.						X	X		
AGK.SPEC.37.05	Explain the reason for the use of alternate air on fuel injection systems and describe its operating principle.						X	X		
AGK.SPEC.37.06	State the meteorological conditions under which induction system icing may occur.						X	X		
AGK.SPEC.38.00	**Cooling Systems**									
AGK.SPEC.38.01	Specify the reasons for cooling a piston engine.						X	X		
AGK.SPEC.38.02	Describe the design features to enhance cylinder air cooling for aeroplanes.						X	X		
AGK.SPEC.38.03	Describe the design features to enhance cylinder air cooling for rotorcraft.						X	X		
AGK.SPEC.38.04	Compare the differences between liquid- and air-cooling systems.						X	X		
AGK.SPEC.39.00	**Lubrication Systems**									
AGK.SPEC.39.01	Describe the term ‘viscosity’ including the effect of temperature.						X	X		
AGK.SPEC.39.02	Describe the viscosity grade numbering system used in aviation.						X	X		
AGK.SPEC.39.03	Design, operation, indications, and warnings.						X	X		
AGK.SPEC.39.04	State the functions of a piston-engine lubrication system.						X	X		
AGK.SPEC.39.05	Describe the working principle of a dry-sump lubrication system and						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
	describe the functions of the following components: (a) oil tank (b) check valve (non-return valve). (c) pressure pump and pressure-relief valve. (d) scavenge pump (e) filters (f) oil cooler (g) oil cooler bypass valve (h) pressure and temperature sensors (i) lines									
AGK.SPEC.39.06	Describe a wet-sump lubrication system.						X	X		
AGK.SPEC.39.07	State the differences between a wet- and a dry-sump lubrication system and their advantages and disadvantages.						X	X		
AGK.SPEC.39.08	List the following factors that influence oil consumption: (a) oil grade (b) cylinder and piston wear; condition of piston rings						X	X		
AGK.SPEC.39.09	Describe the interaction between oil pressure, oil temperature and oil quantity.						X	X		
AGK.SPEC.40.00	**Ignition Circuits**									
AGK.SPEC.40.01	Describe the working principle of a magneto-ignition system and the functions of the following components: (a) magneto (b) contact-breaker points (c) capacitor (condenser) (d) coils or windings (e) ignition switches (f) distributor (g) spark plug						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1 R	L2A	L2R	L3A	L3R	L4A	L4R
	(h) high-tension (HT) cable									
AGK.SPEC.40.02	State why piston engines maybe equipped with two electrically independent ignition systems.						X	X		
AGK.SPEC.40.03	Explain how combustion is initiated in diesel engines.						X	X		
AGK.SPEC.41.00	**Fuel and Air Mixture**									
AGK.SPEC.41.01	Define the term mixture.						X	X		
AGK.SPEC.41.02	State the typical fuel-to-air ratio values or range of values for the above mixtures.						X	X		
AGK.SPEC.41.03	Describe the advantages and disadvantages of weak and rich mixtures.						X	X		
AGK.SPEC.41.04	Describe the relation between engine-specific fuel consumption and mixture ratio.						X	X		
AGK.SPEC.42.00	**Aeroplane: Propellers**									
AGK.SPEC.42.01	Describe the operating principle of a fixed pitch propeller system	X	X							
AGK.SPEC.43.00	**Performance and Engine Handling**									
AGK.SPEC.43.01	Describe the effect on power output of a petrol and diesel engine taking into consideration the following parameters: (a) ambient pressure, exhaust back pressure (b) temperature (c) density altitude (d) humidity						X	X		
AGK.SPEC.44.00	**Engine Handling**									
AGK.SPEC.44.01	Define the following terms: (a) take-off power (b) maximum continuous power						X	X		
AGK.SPEC.44.02	Describe the start problems associated with extreme cold weather.						X	X		
AGK.SPEC.45.00	**Turbine Engines**									
AGK.SPEC.45.01	Describe how thrust is produced by a basic gas turbine engine.						X	X		
AGK.SPEC.45.02	Describe how thrust is produced by a basic electric ducted fan (EDF)						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
	engine.									
AGK.SPEC.45.03	Describe the simple form of the thrust formula for a basic, straight jet engine and perform simple calculations (including pressure thrust).						X	X		
AGK.SPEC.46.00	**Design, Types and Components of Turbine Engines**									
AGK.SPEC.46.01	List the main components of a basic gas turbine engine: (a) inlet (b) compressor (c) combustion chamber (d) turbine (e) outlet						X	X		
AGK.SPEC.46.02	List the different types of gas turbine engines: (a) straight jet (b) turboprop						X	X		
AGK.SPEC.46.03	State that a gas turbine engine can have one or more spools.						X	X		
AGK.SPEC.46.04	Describe how thrust is produced by turbojet engines.						X	X		
AGK.SPEC.46.05	Describe how power is produced by turboprop engines.						X	X		
AGK.SPEC.47.00	**Aeroplane: Air Intake**									
AGK.SPEC.47.01	State the functions of the engine air inlet/air intake.						X	X		
AGK.SPEC.47.02	Describe the reasons for, and the dangers of, the following operational problems concerning the engine air inlet: (a) airflow separation (b) inlet icing (c) inlet damage (d) foreign object damage (FOD) (e) heavy in-flight turbulence						X	X		
AGK.SPEC.48.00	**Compressor and Diffuser**									
AGK.SPEC.48.01	State the purpose of the compressor.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1 R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.48.02	Describe the working principle of a centrifugal and an axial flow compressor.						X	X		
AGK.SPEC.48.03	Name the following main components of a single stage and describe their function for a centrifugal compressor: impeller diffuser						X	X		
AGK.SPEC.48.04	Name the following main components of a single stage and describe their function for an axial compressor: rotor vanes stator vanes						X	X		
AGK.SPEC.48.05	Describe the gas-parameter changes in a compressor stage.						X	X		
AGK.SPEC.48.06	Define the term ‘pressure ratio’ and state a typical value for one stage of a centrifugal and an axial flow compressor and for the complete compressor.						X	X		
AGK.SPEC.48.07	State the advantages and disadvantages of increasing the number of stages in a centrifugal compressor.						X	X		
AGK.SPEC.48.08	Explain the difference in sensitivity for FOD of a centrifugal compressor compared with an axial flow type.						X	X		
AGK.SPEC.48.09	Explain the convergent air annulus through an axial flow compressor.						X	X		
AGK.SPEC.48.10	Describe the reason for twisting the compressor blades.						X	X		
AGK.SPEC.48.11	State the tasks of inlet guide vanes (IGVs).						X	X		
AGK.SPEC.48.12	State the advantages of increasing the number of spools.						X	X		
AGK.SPEC.48.13	Explain the implications of tip losses and describe the design features to minimise the problem.						X	X		
AGK.SPEC.48.14	Explain the problems of blade bending and flapping and describe the design features to minimise the problem.						X	X		
AGK.SPEC.48.15	Explain the following terms:						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1 R	L2A	L2R	L3A	L3R	L4A	L4R
	compressor stall engine surge									
AGK.SPEC.48.16	State the conditions that are possible causes of stall and surge.						X	X		
AGK.SPEC.48.17	Describe the indications of stall and surge.						X	X		
AGK.SPEC.48.18	Describe the design features used to minimise the occurrence of stall and surge.						X	X		
AGK.SPEC.48.19	Describe a compressor map (surge envelope) with rpm lines, stall limit, steady state line and acceleration line.						X	X		
AGK.SPEC.48.20	Describe the function of the diffuser.						X	X		
AGK.SPEC.49.00	**Combustion Chamber**									
AGK.SPEC.49.01	Define the purpose of the combustion chamber.						X	X		
AGK.SPEC.49.02	List the requirements for combustion.						X	X		
AGK.SPEC.49.03	Describe the working principle of a combustion chamber.						X	X		
AGK.SPEC.49.04	Explain the reason for reducing the airflow axial velocity at the combustion chamber inlet (snout).						X	X		
AGK.SPEC.49.05	State the function of the swirl vanes (swirler).						X	X		
AGK.SPEC.49.06	State the function of the drain valves.						X	X		
AGK.SPEC.49.07	Define the terms ‘primary airflow’ and ‘secondary airflow’ and explain their purpose.						X	X		
AGK.SPEC.49.08	Explain the following two mixture ratios: (a) primary airflow to fuel (b) total airflow (within the combustion chamber) to fuel						X	X		
AGK.SPEC.49.09	Describe the gas-parameter changes in the combustion chamber.						X	X		
AGK.SPEC.49.10	State a typical maximum value of the outlet temperature of the combustion chamber.						X	X		
AGK.SPEC.49.11	Describe the following types of combustion chambers and state the differences between them: (a) can type						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1 R	L2A	L2R	L3A	L3R	L4A	L4R
	(b) can-annular, cannular or turbo-annular (c) annular (d) reverse-flow annular									
AGK.SPEC.50.00	**Turbine**									
AGK.SPEC.50.01	Explain the purpose of a turbine in different types of gas turbine engines.						X	X		
AGK.SPEC.50.02	Describe the principles of operation of impulse, reaction, and impulse-reaction axial flow turbines.						X	X		
AGK.SPEC.50.03	Name the main components of a turbine stage and their function.						X	X		
AGK.SPEC.50.04	Describe the working principle of a turbine.						X	X		
AGK.SPEC.50.05	Describe the gas-parameter changes in a turbine stage.						X	X		
AGK.SPEC.50.06	Describe the function and the working principle of active clearance control.						X	X		
AGK.SPEC.50.07	Describe the implications of tip losses and the means to minimise them.						X	X		
AGK.SPEC.50.08	Explain why the available engine thrust is limited by the turbine inlet temperature.						X	X		
AGK.SPEC.50.09	Explain the divergent gas-flow annulus through an axial-flow turbine.						X	X		
AGK.SPEC.50.10	Explain the high mechanical thermal stress in the turbine blades and wheels/discs.						X	X		
AGK.SPEC.51.00	**Aeroplane: Exhaust**									
AGK.SPEC.51.01	Name the following main components of the exhaust unit and their function: (a) jet pipe (b) propelling nozzle (c) exhaust cone						X	X		
AGK.SPEC.51.02	Describe the working principle of the exhaust unit.						X	X		
AGK.SPEC.51.03	Describe the gas-parameter changes in the exhaust unit.						X	X		
AGK.SPEC.51.04	Define the term ‘choked exhaust nozzle’ (not applicable to turboprops).						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.51.05	Explain how jet exhaust noise can be reduced.						X	X		
AGK.SPEC.52.00	**Rotorcraft: Air Intake**									
AGK.SPEC.52.01	Name and explain the main task of the engine air intake.						X	X		
AGK.SPEC.52.02	Describe the use of a convergent air-intake ducting on rotorcrafts.						X	X		
AGK.SPEC.52.03	Describe the reasons for and the dangers of the following operational problems concerning engine air intake: airflow separations intake icing intake damage FOD						X	X		
AGK.SPEC.52.04	Describe the conditions and circumstances during ground operations when FOD is most likely to occur.						X	X		
AGK.SPEC.52.05	Describe and explain the principles of air intake filter systems that can be fitted to some rotorcrafts for operations in icing and sand conditions.						X	X		
AGK.SPEC.52.06	Describe the function of the heated pads on some rotorcraft air intakes.						X	X		
AGK.SPEC.53.00	**Rotorcraft: Exhaust**									
AGK.SPEC.53.01	Describe the working principle of the exhaust unit.						X	X		
AGK.SPEC.53.02	Describe the gas-parameter changes in the exhaust unit.						X	X		
AGK.SPEC.54.00	**Additional Components and Systems**									
AGK.SPEC.54.01	Name the main components of the engine fuel system and state their function: (a) filters (b) pump (c) fuel manifold (d) fuel nozzles (e) fuel control system						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.54.02	State the tasks of the fuel control unit.						X	X		
AGK.SPEC.54.03	List the possible input parameters to a fuel control unit to achieve a given thrust/power setting.						X	X		
AGK.SPEC.55.00	**Engine control system**									
AGK.SPEC.55.01	State the tasks of the engine control system.						X	X		
AGK.SPEC.56.00	**Engine lubrication**									
AGK.SPEC.56.01	State the tasks of an engine lubrication system.						X	X		
AGK.SPEC.56.02	Name the following main components of a lubrication system and state their function: (a) oil tank (b) oil pump (c) oil filters (d) oil sumps (e) chip detectors (f) coolers						X	X		
AGK.SPEC.57.00	**Engine Ignition**									
AGK.SPEC.57.01	State the task of the ignition system.						X	X		
AGK.SPEC.57.02	Name the following main components of the ignition system and state their function.						X	X		
AGK.SPEC.58.00	**Engine Starter**									
AGK.SPEC.58.01	Name the main components of the starting system and state their function.						X	X		
AGK.SPEC.58.02	Explain the principle of a turbine engine start.						X	X		
AGK.SPEC.58.03	Define ‘self-sustaining rpm’.						X	X		
AGK.SPEC.59.00	**Rotorcraft specifics on design, operation and components for additional components and systems such as lubrication system, ignition circuit, starter, accessory gearbox**									
AGK.SPEC.59.01	State the task of the lubrication system.						X	X		
AGK.SPEC.59.02	List and describe the common rotorcraft lubrication systems.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1 R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.59.03	Name the following main components of a rotorcraft lubrication system.						X	X		
AGK.SPEC.60.00	**Engine Operation and Monitoring**									
AGK.SPEC.60.01	Explain spool-up time.						X	X		
AGK.SPEC.60.02	State the parameters that can be used for setting and monitoring the thrust/power.						X	X		
AGK.SPEC.60.03	Explain how the exhaust gas temperature is used to monitor turbine stress.						X	X		
AGK.SPEC.60.04	Describe the possible effects on engine components when EGT limits are exceeded.						X	X		
AGK.SPEC.60.05	Explain why engine-limit exceedances must be reported.						X	X		
AGK.SPEC.60.06	Explain the term ‘engine seizure’.						X	X		
AGK.SPEC.60.07	State the possible causes of engine seizure and explain their preventative measures.						X	X		
AGK.SPEC.60.08	Explain oil-filter clogging (blockage) and the implications for the lubrication system.						X	X		
AGK.SPEC.60.09	Give examples of monitoring instruments of an engine.						X	X		
AGK.SPEC.60.10	Describe how to identify and assess engine damage based on instrument indications.						X	X		
AGK.SPEC.61.00	**Relight Envelope**									
AGK.SPEC.61.01	Explain the relight envelope.						X	X		
AGK.SPEC.62.00	**Rotorcraft: Rotor-Heads**									
AGK.SPEC.62.01	Describe the following rotor-head system.						X	X		
AGK.SPEC.62.02	Describe in basic terms the following configuration of rotor systems and their advantages and disadvantages.						X	X		
AGK.SPEC.62.03	Explain how flapping, dragging and feathering is achieved in each rotor-head system.						X	X		
AGK.SPEC.63.00	**Structural Components and Materials, Stresses, Structural Limitations**									

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1 R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.63.01	Identify from a diagram the main structural components of the main types of rotor-head systems.						X	X		
AGK.SPEC.64.00	**Design and Construction**									
AGK.SPEC.64.01	Describe the material technology used in rotor-head design, including construction, using the following materials or mixture of materials: (a) composites (b) fibreglass (c) alloys (d) elastomer						X	X		
AGK.SPEC.65.00	**Adjustment**									
AGK.SPEC.65.01	Describe and explain the methods of adjustment which are possible on various rotorcraft rotor-head assemblies.						X	X		
AGK.SPEC.66.00	**Tail Rotor Types**									
AGK.SPEC.66.01	Describe common tail-rotor systems used on UA.						X	X		
AGK.SPEC.66.02	Identify from a diagram the main structural components of common tail-rotor systems used on UA.						X	X		
AGK.SPEC.66.03	Explain pitch-input mechanisms.									
AGK.SPEC.66.04	Explain the relationship between tail-rotor thrust and engine power.						X	X		
AGK.SPEC.66.05	Describe how the vertical fin on some types reduces the power demand of the tail rotor.						X	X		
AGK.SPEC.67.00	**Design and Construction**									
AGK.SPEC.67.01	List and describe the various tail-rotor designs and construction methods used on rotorcrafts currently in service.						X	X		
AGK.SPEC.68.00	**Rotorcraft: Transmission**									
AGK.SPEC.68.01	Describe the following main principles of rotorcraft transmission systems used in UA.						X	X		
AGK.SPEC.69.00	**Rotor Brake**									
AGK.SPEC.69.01	Describe the main function of the disc type of rotor brake.						X	X		
AGK.SPEC.69.02	Describe the different options for the location of the rotor brake.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1 R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.70.00	**Driveshaft and Associated Installation**									
AGK.SPEC.70.01	Describe how power is transmitted from the engine to the main- rotor gearbox.						X	X		
AGK.SPEC.70.02	Describe the material and construction of the driveshaft.						X	X		
AGK.SPEC.70.03	Explain the need for alignment between the engine and the main- rotor gearbox.						X	X		
AGK.SPEC.70.04	Identify how temporary misalignment occurs between driving and driven components.						X	X		
AGK.SPEC.70.05	Explain the relationship between driveshaft speed and torque.						X	X		
AGK.SPEC.70.06	Describe the methods with which power is delivered to the tail rotor.						X	X		
AGK.SPEC.71.00	**Intermediate and Tail Gearbox**									
AGK.SPEC.71.01	Explain and describe the various arrangements when the drive changes direction and the need for an intermediate or tail gearbox.						X	X		
AGK.SPEC.72.00	**Clutches**									
AGK.SPEC.72.01	Explain the purpose of a clutch.						X	X		
AGK.SPEC.72.02	Describe and explain the operation of a: (a) centrifugal clutch (b) actuated clutch						X	X		
AGK.SPEC.72.03	List the typical components of the various clutches.						X	X		
AGK.SPEC.73.00	**Rotorcraft: Blades**									
AGK.SPEC.73.01	Describe the different types of blade construction and the need for torsional stiffness.						X	X		
AGK.SPEC.73.02	Describe the fully articulated rotor with hinges and feathering hinges.						X	X		
AGK.SPEC.74.00	**Structural Components and Materials**									
AGK.SPEC.74.01	List the materials used in the construction of main-rotor blades.						X	X		
AGK.SPEC.74.02	List the main structural components of a main-rotor blade and their function.						X	X		
AGK.SPEC.74.03	Describe the drag hinge of the fully articulated rotor and the lag flexure in the hinge-less rotor.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1A	L1R	L2A	L2R	L3A	L3R	L4A	L4R
AGK.SPEC.75.00	**Forces and Stresses**									
AGK.SPEC.75.01	Describe main-rotor blade-loading on the ground and in flight.						X	X		
AGK.SPEC.75.02	Describe where the most common stress areas are on rotor blades.						X	X		
AGK.SPEC.76.00	**Structural Limitations**									
AGK.SPEC.76.01	Explain the structural limitations in terms of bending and rotor rpm.						X	X		
AGK.SPEC.77.00	**Adjustment**									
AGK.SPEC.77.01	Explain the use of trim tabs.						X	X		
AGK.SPEC.78.00	**Tip Shape**									
AGK.SPEC.78.01	Describe the various blade-tip shapes used by different manufacturers and compare their advantages and disadvantages.						X	X		
AGK.SPEC.79.00	**Lateral Vibrations**									
AGK.SPEC.79.01	Explain blade imbalances, causes, and effects.						X	X		
AGK.SPEC.80.00	**Tail-Rotor Design and Blade Design**									
AGK.SPEC.80.01	Describe the most common design of tail-rotor blade construction.						X	X		
AGK.SPEC.80.02	Describe the dangers to ground personnel and to the rotor blades, and how to minimise these dangers.						X	X		
AGK.SPEC.81.00	**Stresses, Vibrations and Balancing**									
AGK.SPEC.81.01	Describe the tail-rotor blade-loading on the ground and in flight.						X	X		
AGK.SPEC.81.02	Explain the sources of vibration of the tail rotor and the resulting high frequencies.						X	X		
AGK.SPEC.81.03	Explain balancing and tracking of the tail rotor.						X	X		
AGK.SPEC.82.00	**Structural Limitations**									
AGK.SPEC.82.01	Describe the structural limitations of the tail-rotor blades.						X	X		
AGK.SPEC.82.02	Describe the method of checking the strike indicators placed on the tip of some tail-rotor blades.						X	X		
AGK.SPEC.83.00	**Adjustment**									
AGK.SPEC.83.01	Describe the adjustment of yaw pedals in the cockpit to obtain full-control authority of the tail rotor.						X	X		

Human Performance and Limitations

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
HPL.SPEC.00.00	**Human Performance and Limitations**									
HPL.SPEC.01.00	**Human Factors: Basic Concepts**									
HPL.SPEC.01.01	State that competence is based on knowledge, skills and attitudes of the individual remote pilot.	X	X	X						
HPL.SPEC.02.00	**Flight Safety Concepts**									
HPL.SPEC.02.01	Explain the three components of the TEM model.						X	X		
HPL.SPEC.02.02	Explain and give examples of latent threats.						X	X		
HPL.SPEC.02.03	Explain and give examples of environmental threats.						X	X		
HPL.SPEC.02.04	Explain and give examples of organisational threats.						X	X		
HPL.SPEC.02.05	Explain and give a definition of 'error' according to the TEM model of ICAO Doc 9683 (Part II, Chapter 2).						X	X		
HPL.SPEC.02.06	Give examples of different countermeasures which may be used to manage threats, errors, and undesired unmanned aircraft states.						X	X		
HPL.SPEC.02.07	Explain and give examples of procedural error, communication errors, and unmanned aircraft handling errors.						X	X		
HPL.SPEC.02.08	Explain and give examples of 'undesired unmanned aircraft states'.						X	X		
HPL.SPEC.02.09	State the components of the SHELL model.						X	X		
HPL.SPEC.02.10	State the relevance of the SHELL model to the work in the flightdeck						X	X		
HPL.SPEC.03.00	**Safety Culture and Safety Management**									
HPL.SPEC.03.01	Distinguish between 'open cultures' and 'closed cultures'.						X	X		
HPL.SPEC.03.02	Illustrate how safety culture is reflected in national culture.						X	X		
HPL.SPEC.03.03	Discuss the established expression 'safety first' in a commercial entity.						X	X		
HPL.SPEC.03.04	Explain James Reason's 'Swiss Cheese Model'.						X	X		
HPL.SPEC.03.05	State the important factors that promote a good safety culture.						X	X		
HPL.SPEC.03.06	Distinguish between 'just culture' and 'non-punitive culture'.						X	X		
HPL.SPEC.03.07	Name the five components which form safety culture (according to James Reason: informed culture, reporting culture, learning culture, just culture, flexible culture).						X	X		
HPL.SPEC.03.08	Name the basic concepts of safety management system (SMS) (including hazard						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	identification and risk management) and its relationship with safety culture.									
HPL.SPEC.04.00	**The Sensory System**									
HPL.SPEC.04.01	List the different senses	X	X	X						
HPL.SPEC.05.00	**Central, Peripheral and Autonomic Nervous System**									
HPL.SPEC.05.01	Define the term 'sensory threshold'.						X	X		
HPL.SPEC.05.02	Define the term 'sensitivity', especially in the context of vision.						X	X		
HPL.SPEC.05.03	Give examples of sensory adaptation.						X	X		
HPL.SPEC.05.04	Define the term 'habituation' and state its implication for flight safety.						X	X		
HPL.SPEC.06.00	**Vision - Function**									
HPL.SPEC.06.01	Name the most important parts of the eye and the pathway to the visual cortex.						X	X		
HPL.SPEC.06.02	State the basic functions of the parts of the eye.	X	X	X						
HPL.SPEC.06.03	Define 'accommodation'.						X	X		
HPL.SPEC.06.04	Distinguish between the functions of the rod and cone cells.						X	X		
HPL.SPEC.06.05	Describe the distribution of rod and cone cells in the retina and explain their relevance to vision.						X	X		
HPL.SPEC.06.06	Explain the terms 'visual acuity', 'visual field', 'central vision', 'peripheral vision' and 'the fovea', and explain their function in the process of vision.						X	X		
HPL.SPEC.06.07	List the factors that may degrade visual acuity and the importance of 'lookout'.						X	X		
HPL.SPEC.06.08	State the limitations of night vision and the different scanning techniques at both night and day	X	X	X						
HPL.SPEC.06.09	State the time necessary for the eye to adapt both to bright light and the dark.						X	X		
HPL.SPEC.06.10	Reserved.									
HPL.SPEC.06.11	Explain the nature of colour blindness.						X	X		
HPL.SPEC.06.12	Distinguish between monocular and binocular vision.	X	X	X						
HPL.SPEC.06.13	Explain the basis of depth perception.	X	X	X						
HPL.SPEC.06.14	List the possible monocular cues for depth perception.						X	X		
HPL.SPEC.06.15	Explain long-sightedness, short-sightedness, and astigmatism.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
HPL.SPEC.06.16	List the causes of and the precautions that may be taken to reduce the probability of vision loss due to: (a) presbyopia (b) cataract (c) glaucoma						X	X		
HPL.SPEC.06.17	State the possible problems associated with contact lenses.						X	X		
HPL.SPEC.06.18	Explain the significance of the 'blind spot' on the retina in detecting other traffic in flight.	X	X	X						
HPL.SPEC.07.00	**Hearing**									
HPL.SPEC.07.01	Descriptive and functional anatomy.	X	X	X						
HPL.SPEC.07.02	State the basic parts and functions of the outer, the middle and the inner ear.	X	X	X						
HPL.SPEC.07.03	Differentiate between the functions of the vestibular apparatus and the cochlea in the inner ear.						X	X		
HPL.SPEC.07.04	Define the main causes of the following hearing defects/loss: — conductive deafness — noise-induced hearing loss — presbycusis						X	X		
HPL.SPEC.07.05	Summarise the effects of environmental noise on hearing.						X	X		
HPL.SPEC.07.06	State the decibel level of received noise that will cause NIHL.						X	X		
HPL.SPEC.07.07	Identify the potential occupational risks that may cause hearing loss.						X	X		
HPL.SPEC.07.08	List the main sources of hearing loss in the unmanned flying environment.						X	X		
HPL.SPEC.07.09	List the precautions that may be taken to reduce the probability of onset of hearing loss.						X	X		
HPL.SPEC.08.00	**Integration of Sensory Inputs**									
HPL.SPEC.08.01	Define the term 'illusion'.	X	X	X						
HPL.SPEC.08.02	Give examples of visual illusions based on shape constancy, size constancy, aerial perspective, atmospheric perspective, the absence of focal or ambient cues, autokinesis, vectional false horizons, field myopia, and surface planes.	X	X	X						
HPL.SPEC.09.00	**Body Rhythm and Sleep**									
HPL.SPEC.09.01	Name some internal body rhythms and their relevance to sleep. Explain that the most						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	important of which is body temperature.									
HPL.SPEC.09.02	Explain the term ‘circadian rhythm’.						X	X		
HPL.SPEC.09.03	State the approximate duration of a ‘free-running’ rhythm.						X	X		
HPL.SPEC.09.04	Explain the significance of the ‘internal clock’ in regulating the normal circadian rhythm.						X	X		
HPL.SPEC.09.05	State the effect of the circadian rhythm of body temperature on an individual’s performance standard and on an individual’s sleep patterns.						X	X		
HPL.SPEC.09.06	List and describe the stages of a sleep cycle.						X	X		
HPL.SPEC.09.07	Differentiate between rapid eye movement (REM) and non-REM sleep.						X	X		
HPL.SPEC.09.08	Explain the function of sleep and describe the effects of insufficient sleep on performance.						X	X		
HPL.SPEC.09.09	Explain the simple calculations for the sleep/wake credit/debit situation.						X	X		
HPL.SPEC.09.10	Explain how sleep debit can become cumulative.						X	X		
HPL.SPEC.09.11	Describe the main effects of lack of sleep on an individual’s performance.	X	X	X			R	R		
HPL.SPEC.10.00	**Intoxication**									
HPL.SPEC.10.01	State the harmful effects of tobacco on: — the respiratory system — the cardiovascular system						X	X		
HPL.SPEC.10.02	Indicate the level of caffeine dosage at which performance is degraded.						X	X		
HPL.SPEC.10.03	Besides coffee, indicate other beverages containing caffeine.						X	X		
HPL.SPEC.10.04	State the maximum acceptable limit of alcohol for flight crew according to the applicable regulations.	X	X	X			R	R		
HPL.SPEC.10.05	State the effects of alcohol consumption on: — the ability to reason — inhibitions and self-control — vision — the sense of balance and sensory illusions — sleep patterns	X	X	X			R	R		
HPL.SPEC.10.06	State the effects alcohol may have if consumed together with other drugs.	X	X	X						

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
HPL.SPEC.10.07	List the signs and symptoms of alcoholism.						X	X		
HPL.SPEC.10.08	List the factors that may be associated with the development of alcoholism.						X	X		
HPL.SPEC.10.09	Define the 'unit' of alcohol and state the approximate elimination rate from the blood.						X	X		
HPL.SPEC.10.10	State the maximum daily and weekly intake of units of alcohol which may be consumed without causing damage to the organs and systems of the human body.						X	X		
HPL.SPEC.10.11	Discuss the actions that might be taken if a crew member is suspected of being an alcoholic.						X	X		
HPL.SPEC.10.12	State the dangers associated with the use of non-prescription drugs.	X	X	X			R	R		
HPL.SPEC.10.13	State the side effects of common non-prescription drugs used to treat colds, flu, hay fever and other allergies, especially medicines containing antihistamine preparations.	X	X	X			R	R		
HPL.SPEC.10.14	Interpret the rules relevant to using (prescription or non-prescription) drugs that the remote pilot has not used before.	X	X	X						
HPL.SPEC.10.15	Interpret the general rule that 'if a remote pilot is so unwell that they require any medication, then they should consider themselves unfit to fly'.	X	X	X						
HPL.SPEC.10.16	List those materials present in an unmanned aircraft which may, when uncontained, cause severe health problems.						X	X		
HPL.SPEC.10.17	List those unmanned aircraft component parts which if burnt may give off toxic fumes.						X	X		
HPL.SPEC.11.00	**Incapacitation**									
HPL.SPEC.11.01	State that incapacitation is most dangerous when its onset is insidious.	X	X	X			R	R		
HPL.SPEC.11.02	List the major causes of remote pilot incapacitation.	X	X	X			R	R		
HPL.SPEC.11.03	State the importance of crew to be able to recognise and promptly react upon incapacitation of other crew members, should it occur in flight.						X	X		
HPL.SPEC.11.04	Explain methods and procedures to cope with incapacitation in flight.	X	X	X			R	R		
HPL.SPEC.12.00	**Human Information Processing (HIP)**									
HPL.SPEC.12.01	Differentiate between 'attention' and 'vigilance'.	X	X	X			R	R		
HPL.SPEC.12.02	Differentiate between 'selective' and 'divided' attention.						X	X		
HPL.SPEC.12.03	Define 'hypovigilance'.						X	X		
HPL.SPEC.12.04	Identify the factors that may affect the state of vigilance.						X	X		
HPL.SPEC.12.05	List the factors that may forestall hypovigilance during flight.						X	X		

Syllabus Reference	**Syllabus details and associated Learning Objectives**	**GVC**	**L1 A**	**L1 R**	**L2 A**	**L2 R**	**L3 A**	**L3 R**	**L4 A**	**L4 R**
HPL.SPEC.12.06	Indicate the signs of reduced vigilance.						X	X		
HPL.SPEC.12.07	List the factors that affect a person's level of attention.	X	X	X						
HPL.SPEC.13.00	**Perception**									
HPL.SPEC.13.01	Name the basis of the perceptual process.	X	X	X						
HPL.SPEC.13.02	Describe the mechanism of perception ('bottom-up'/'top-down' process).						X	X		
HPL.SPEC.13.03	Illustrate why perception is subjective and state the relevant factors that influence interpretation of perceived information						X	X		
HPL.SPEC.13.04	Describe some basic perceptual illusions.						X	X		
HPL.SPEC.13.05	Illustrate some basic perceptual concepts.						X	X		
HPL.SPEC.13.06	Give examples where perception plays a decisive role in flight safety.						X	X		
HPL.SPEC.13.07	Stress how persuasive and believable mistaken perception can manifest itself both for an individual and a group.						X	X		
HPL.SPEC.14.00	**Memory**									
HPL.SPEC.14.01	Explain the link between the types of memory (to include sensory, working/short-term and long-term memory).						X	X		
HPL.SPEC.14.02	Describe the differences between the types of memory in terms of capacity and retention time.						X	X		
HPL.SPEC.14.03	Justify the importance of sensory-store memories in processing information.						X	X		
HPL.SPEC.14.04	State the average maximum number of separate items that may be held in working memory (5 ± 2).						X	X		
HPL.SPEC.14.05	Stress how interruption can affect short-term/working memory.						X	X		
HPL.SPEC.14.06	Give examples of items that are important for pilots to hold in working memory during flight.						X	X		
HPL.SPEC.14.07	Describe how the capacity of the working-memory store may be increased.						X	X		
HPL.SPEC.14.08	State the subdivisions of long-term memory and give examples of their content.						X	X		
HPL.SPEC.14.09	Explain that skills are kept primarily in the long-term memory.						X	X		
HPL.SPEC.14.10	Describe amnesia and how it affects memory.						X	X		
HPL.SPEC.14.11	Name the common problems with both the long- and short-term memories and the best methods to try to counteract them.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
HPL.SPEC.15.00	**Learning Principles and Techniques**									
HPL.SPEC.15.01	Explain and distinguish between the following basic forms of learning: — classic and operant conditioning (behaviouristic approach) learning by insight (cognitive approach) — learning by imitating (modelling)						X	X		
HPL.SPEC.15.02	Recognise pilot-related examples as behaviouristic, cognitive or modelling forms of learning.						X	X		
HPL.SPEC.15.03	State the factors that are necessary for and promote the quality of learning: — intrinsic motivation — good mental health — rehearsals for improvement of memory — consciousness — vigilance — application in practical exercises						X	X		
HPL.SPEC.15.04	Explain ways to facilitate the memorisation of information with the following learning techniques: — mnemonics — mental training						X	X		
HPL.SPEC.15.05	Describe the advantage of planning and anticipation of future actions: — define the term 'skills' — state the three phases of learning a skill (Anderson cognitive, associative and autonomous phase)						X	X		
HPL.SPEC.15.06	Explain the term 'motor programme' or 'mental schema'.						X	X		
HPL.SPEC.15.07	Describe the advantages and disadvantages of mental schemas.						X	X		
HPL.SPEC.15.08	Explain the Rasmussen model which describes the guidance of a pilot's behaviour in different situations.						X	X		
HPL.SPEC.15.09	State the possible problems or risks associated with skill, rule and knowledge-based behaviour.						X	X		
HPL.SPEC.15.10	Define 'motivation'.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
HPL.SPEC.15.11	Explain the relationship between motivation and learning.						X	X		
HPL.SPEC.15.12	Explain the problems of over-motivation, especially in the context of the extreme need to achieve.						X	X		
HPL.SPEC.16.00	**Human Error and Reliability**									
HPL.SPEC.16.01	Name and explain the factors that influence human reliability.	X	X	X						
HPL.SPEC.16.02	Define the term 'situation awareness'.	X	X	X	R	R				
HPL.SPEC.16.03	List the cues that indicate loss of situation awareness and name the steps to regain it.						X	X		
HPL.SPEC.16.04	List the factors that influence one's situation awareness both positively and negatively and stress the importance of situation awareness in the context of flight safety.						X	X		
HPL.SPEC.16.05	Define the term 'mental model' in relation to a surrounding complex situation.						X	X		
HPL.SPEC.16.06	Describe the advantages/disadvantages of mental models.						X	X		
HPL.SPEC.16.07	Explain the relationship between personal 'mental models' and the creation of cognitive illusions.						X	X		
HPL.SPEC.16.08	Explain the concept of the 'error chain'.						X	X		
HPL.SPEC.16.09	Differentiate between an isolated error and an error chain.						X	X		
HPL.SPEC.16.10	Distinguish between the main forms/types of errors (i.e. slips, faults, omissions and violations).						X	X		
HPL.SPEC.16.11	Discuss the above errors and their relevance in flight.						X	X		
HPL.SPEC.16.12	Distinguish between an active and a latent error and give examples.						X	X		
HPL.SPEC.16.13	Distinguish between internal and external factors in error generation.						X	X		
HPL.SPEC.16.14	Identify possible sources of internal error generation.						X	X		
HPL.SPEC.16.15	Define and discuss the two errors associated with motor programmes (action slip and environmental capture).						X	X		
HPL.SPEC.16.16	List the three main sources of external error generation in the flight crew compartment.						X	X		
HPL.SPEC.16.17	Give examples to illustrate the following factors in external error generation in the flight crew compartment: — ergonomics — economics — social environment						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
HPL.SPEC.16.18	Name the major goals in the design of human-centred human– machine interfaces.						X	X		
HPL.SPEC.16.19	Define the term ‘error tolerance’.						X	X		
HPL.SPEC.16.20	List and describe the strategies that are used to reduce human error.						X	X		
HPL.SPEC.16.21	Describe the advantage of planning and the anticipation of future actions.						X	X		
HPL.SPEC.17.00	**Decision Making**									
HPL.SPEC.17.01	Define the terms ‘deciding’ and ‘decision-making’.						X	X		
HPL.SPEC.17.02	Describe the major factors on which decision-making should be based during the course of a flight.						X	X		
HPL.SPEC.17.03	Describe the main human attributes with regard to decision making.						X	X		
HPL.SPEC.17.04	Discuss the nature of bias and its influence on the decision making process.						X	X		
HPL.SPEC.17.05	Describe the main error sources and limits in an individual’s decision-making mechanism.						X	X		
HPL.SPEC.17.06	State the factors upon which an individual’s risk assessment is based.	X								
HPL.SPEC.17.07	Explain the relationship between risk assessment, commitment, and pressure of time in decision-making strategies.	X								
HPL.SPEC.17.08	Explain the risks associated with dispersion or channelised attention during the application of procedures requiring a high workload within a short time frame (e.g. a go-around).						X	X		
HPL.SPEC.17.09	Describe the positive and negative influences exerted by other group members on an individual’s decision-making process (risk shift).	X								
HPL.SPEC.17.10	Explain the general idea behind the creation of a model for decision-making based upon: — definition of the aim — collection of information — risk assessment — development of options — evaluation of options — decision — implementation — consequences — review and feedback						X	X		

Syllabus Reference	**Syllabus details and associated Learning Objectives**	**GVC**	**L1 A**	**L1 R**	**L2 A**	**L2 R**	**L3 A**	**L3 R**	**L4 A**	**L4 R**
HPL.SPEC.18.00	Avoiding and Managing Errors: Cockpit Management									
	Safety Awareness									
HPL.SPEC.18.01	Justify the need for being aware of not only one's own performance but that of others before and during a flight and the possible consequences or risks.						X	X		
HPL.SPEC.19.00	**Coordination (Multi-Crew Concepts)**									
HPL.SPEC.19.01	Name the objectives of the multi-crew concept.						X	X		
HPL.SPEC.19.02	State and explain the elements of multi-crew concepts.						X	X		
HPL.SPEC.19.03	Describe the concepts of 'standard operating procedures' (SOPs), checklists and crew briefings.	X	X	X	R	R	R	R		
HPL.SPEC.19.04	Describe the purpose of and procedure for crew briefings.	X	X	X						
HPL.SPEC.19.05	Describe the purpose of and procedure for checklists.	X	X	X						
HPL.SPEC.19.06	Describe the function of communication in a coordinated team.	X	X	X						
HPL.SPEC.19.07	Explain the advantages of SOPs.	X	X	X						
HPL.SPEC.19.08	Explain how SOPs contribute to avoiding, reducing and managing threats and errors.						X	X		
HPL.SPEC.19.09	Explain potential threats of SOPs.						X	X		
HPL.SPEC.20.00	**Cooperation**									
HPL.SPEC.20.01	Distinguish between cooperation and coaction.						X	X		
HPL.SPEC.20.02	Define the term 'group'.						X	X		
HPL.SPEC.20.03	Illustrate the influence of interdependence in a group.						X	X		
HPL.SPEC.20.04	List the advantages and disadvantages of teamwork.						X	X		
HPL.SPEC.20.05	Explain the term 'synergy'.						X	X		
HPL.SPEC.20.06	Define the term 'cohesion'.						X	X		
HPL.SPEC.20.07	Define the term 'groupthink'.						X	X		
HPL.SPEC.20.08	State the essential conditions for good teamwork.						X	X		
HPL.SPEC.20.09	Explain the function of role and norm in a group.						X	X		
HPL.SPEC.20.10	Name the different role patterns which occur in a group situation.						X	X		
HPL.SPEC.20.11	Explain how behaviour can be affected by the following factors: — persuasion						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	— conformity — compliance — obedience									
HPL.SPEC.20.12	Distinguish between status and role.						X	X		
HPL.SPEC.20.13	Stress the inherent dangers of a situation where there is a mix of role and status within the flight crew compartment.						X	X		
HPL.SPEC.20.14	Explain the terms ‘leadership’ and ‘followership’.						X	X		
HPL.SPEC.20.15	Describe the trans-flightdeck authority gradient and its affiliated leadership styles (i.e. autocratic, laissez-faire and synergistic).						X	X		
HPL.SPEC.20.16	Name the most important attributes of a positive leadership style.						X	X		
HPL.SPEC.21.00	**Communication**									
HPL.SPEC.21.01	Define the term ‘communication’.						X	X		
HPL.SPEC.21.02	List the most basic components of interpersonal communication.						X	X		
HPL.SPEC.21.03	Explain the advantages of in-person two-way communication as opposed to one-way communication.						X	X		
HPL.SPEC.21.04	Name the importance of non-verbal communication.						X	X		
HPL.SPEC.21.05	Describe the general aspects of non-verbal communication.						X	X		
HPL.SPEC.21.06	Describe the advantages/disadvantages of implicit and explicit communication.						X	X		
HPL.SPEC.21.07	Describe the advantages and possible problems of using ‘social’ and ‘professional’ language in high- and low-workload situations.						X	X		
HPL.SPEC.21.08	Name and explain the major obstacles to effective communication.						X	X		
HPL.SPEC.21.09	Explain the difference between intrapersonal and interpersonal conflict.						X	X		
HPL.SPEC.21.10	Describe the escalation process in human conflict.						X	X		
HPL.SPEC.21.11	List the typical consequences of conflicts between crew members.						X	X		
HPL.SPEC.21.12	Explain the following terms as part of the communication practice with regard to preventing or resolving conflicts: — inquiry — active listening						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	— advocacy — feedback — metacommunication — negotiation									
HPL.SPEC.21.13	Describe the limitations of communication in situations of high workload in the flight crew compartment in view of listening, verbal, non-verbal and visual effects.						X	X		
HPL.SPEC.22.00	**Human Behaviour**									
HPL.SPEC.22.01	Personality, attitude, and behaviour.									
HPL.SPEC.22.02	Describe the factors that determine an individual's behaviour.						X	X		
HPL.SPEC.22.03	Define and distinguish between personality, attitude, and behaviour.						X	X		
HPL.SPEC.22.04	State the origin of personality and attitude.						X	X		
HPL.SPEC.22.05	State that with behaviour good and bad habits can be formed.						X	X		
HPL.SPEC.22.06	Explain how behaviour is generally a product of personality, attitude and the environment to which one was exposed at significant moments (childhood, schooling and training).						X	X		
HPL.SPEC.22.07	State that personality differences and selfish attitude may have effects on flight crew performance.						X	X		
HPL.SPEC.23.00	**Individual Differences in Personality and Motivation**									
HPL.SPEC.23.01	Describe the individual differences in personality by means of a common trait model (e.g. Eysenck's personality factors).						X	X		
HPL.SPEC.24.00	**Self-Concept**									
HPL.SPEC.24.01	Define the term 'self-concept' and the role it plays in any change of personality.						X	X		
HPL.SPEC.24.02	Explain how a self-concept of under confidence may lead to an outward show of aggression and self- assertiveness.						X	X		
HPL.SPEC.25.00	**Self-Discipline**									
HPL.SPEC.25.01	Define 'self-discipline' and justify its importance for flight safety.						X	X		
HPL.SPEC.26.00	**Identification of Hazardous Attitudes (error proneness)**									
HPL.SPEC.26.01	Explain dangerous attitudes in aviation: — negotiation						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	— Anti-authority — macho — impulsivity — invulnerability — complacency — resignation									
HPL.SPEC.26.02	Describe the personality, attitude, and behaviour patterns of an ideal crew member.						X	X		
HPL.SPEC.26.03	Summarise how a person's attitude influences their work in an unmanned flightdeck						X	X		
HPL.SPEC.27.00	**Human Overload and Underload**									
	Arousal									
HPL.SPEC.27.01	Explain the term 'arousal'.						X	X		
HPL.SPEC.27.02	Describe the relationship between arousal and performance.						X	X		
HPL.SPEC.27.03	Explain the circumstances under which underload may occur and its possible dangers.						X	X		
HPL.SPEC.28.00	**Stress**									
HPL.SPEC.28.01	Explain the term 'stress' and why stress is a natural human reaction.	X	X	X						
HPL.SPEC.28.02	State that the physiological response to stress is generated by the 'fight or flight' response.						X	X		
HPL.SPEC.28.03	Describe the function of the autonomic nervous system (ANS) in stress response.						X	X		
HPL.SPEC.28.04	Explain the relationship between arousal and stress.						X	X		
HPL.SPEC.28.05	State the relationship between stress and performance.						X	X		
HPL.SPEC.28.06	State the basic categories of stressors.	X	X	X						
HPL.SPEC.28.07	List and discuss the major environmental sources of stress in the flight crew compartment.						X	X		
HPL.SPEC.28.08	Discuss the concept of 'break point' with regard to stress, overload and performance.						X	X		
HPL.SPEC.28.09	Name the principal causes of domestic stress.						X	X		
HPL.SPEC.28.10	State that the stress experienced as a result of particular demands varies among individuals.						X	X		
HPL.SPEC.28.11	Explain the factors that lead to differences in the levels of stress experienced by individuals.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
HPL.SPEC.28.12	List the factors that influence the tolerance of stressors.						X	X		
HPL.SPEC.28.13	State that stress is a result of perceived demands and perceived ability.						X	X		
HPL.SPEC.28.14	Explain the relationship between stress and anxiety.						X	X		
HPL.SPEC.28.15	Describe the effects of anxiety on human performance.						X	X		
HPL.SPEC.28.16	State the general effect of acute stress on people.						X	X		
HPL.SPEC.28.17	Describe the relationship between stress, arousal and vigilance.						X	X		
HPL.SPEC.28.18	State the general effect of chronic stress and the biological reaction by means of the three stages of the general adaptation syndrome (Selye): alarm, resistance, and exhaustion.						X	X		
HPL.SPEC.28.19	Explain the differences between psychological, psychosomatic, and somatic stress reactions.						X	X		
HPL.SPEC.28.20	Name the typical common physiological and psychological symptoms of human overload.						X	X		
HPL.SPEC.28.21	Describe the effects of stress on human behaviour.						X	X		
HPL.SPEC.28.22	Explain how stress is cumulative and how stress from one situation can be transferred to a different situation.						X	X		
HPL.SPEC.28.23	Explain how successful completion of a stressful task will reduce the amount of stress experienced when a similar situation arises in the future.						X	X		
HPL.SPEC.28.24	Describe the effect of human underload/overload on effectiveness in the flight crew compartment.						X	X		
HPL.SPEC.28.25	List sources and symptoms of human underload.						X	X		
HPL.SPEC.29.00	**Fatigue and Stress Management**									
HPL.SPEC.29.01	Explain the term ‘fatigue’ and differentiate between the two types of fatigue (short-term and chronic fatigue).	X	X	X			R	R		
HPL.SPEC.29.02	Name the causes of short-term and chronic fatigue.	X	X	X			R	R		
HPL.SPEC.29.03	Identify the symptoms and describe the effects of fatigue.	X	X	X			R	R		
HPL.SPEC.29.04	List the strategies that prevent or delay the onset of fatigue and hypovigilance.						X	X		
HPL.SPEC.29.05	List and describe strategies for coping with stress factors and stress reactions.						X	X		
HPL.SPEC.29.06	Distinguish between short-term and long-term methods of stress management.	X	X	X			R	R		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
HPL.SPEC.29.07	Give examples of short-term methods of stress management.	X	X	X			X	X		
HPL.SPEC.29.08	Give examples of long-term methods of coping with stress.						X	X		
HPL.SPEC.29.09	Describe the fatigue risk management system (FRMS) as follows: a data-driven means of continuously monitoring and managing fatigue-related safety risks, based upon scientific principles and knowledge as well as operational experience that aims to ensure relevant personnel are performing at adequate levels of alertness.						X	X		
HPL.SPEC.30.00	**Automation**									
	Advantages and Disadvantages									
HPL.SPEC.30.01	Explain the fundamental restrictions of automated flight systems to be lack of creativity in unknown situations, and lack of personal motivation with regard to safety.						X	X		
HPL.SPEC.30.02	List the principal strengths and weaknesses of pilot versus automated flight systems to be creativity, decision-making, prioritisation of tasks, safety attitude versus precision, reliability.						X	X		
HPL.SPEC.31.00	**Automation Complacency**									
HPL.SPEC.31.01	State the main weaknesses in the monitoring of automatic systems to be hypovigilance.						X	X		
HPL.SPEC.31.02	Explain some basic flight crew errors and terms that arise with the introduction of automation: passive monitoring blinkered concentration confusion flight mode awareness.						X	X		
HPL.SPEC.31.03	Explain how the method of call-outs counteracts ineffective monitoring of automatic systems.						X	X		
HPL.SPEC.31.04	Define 'complacency'.						X	X		
HPL.SPEC.32.00	**Working Concepts**									
HPL.SPEC.32.01	Explain that the potential disadvantages of automation on crew communication are loss of awareness of input errors, flight modes, failure detection, failure						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	comprehension, status of the unmanned aircraft and unmanned aircraft position.									

Meteorology

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.00.00	**Meteorology**									
MET.SPEC.01.00	**The Atmosphere**									
	Structure of the Atmosphere									
MET.SPEC.01.01	Describe the vertical division of the atmosphere up to flight level (FL) 650, based on the temperature variation with height	X	X	X			R	R		
MET.SPEC.01.02	List the different layers and their main qualitative characteristics up to FL650						X	X		
MET.SPEC.02.00	**Air Temperature**									
MET.SPEC.02.01	Define ‘air temperature’.	X	X	X						
MET.SPEC.02.02	List the units of measurement of air temperature used in aviation meteorology (Celsius, Fahrenheit, Kelvin). *(Refer to Subject 050 10 01 01)*	X	X	X						
MET.SPEC.03.00	**Vertical Distribution of Temperature**									
MET.SPEC.03.01	Describe the mean vertical distribution of temperature up to FL 650.						X	X		
MET.SPEC.03.02	Mention the general causes of the cooling of the air in the troposphere with increasing altitude.						X	X		
MET.SPEC.03.03	Calculate the temperature and temperature deviations (in relation to International Standard Atmosphere (ISA)) at specified levels.						X	X		
MET.SPEC.04.00	**Transfer of Heat**									
MET.SPEC.04.01	Explain how local cooling or warming processes result in transfer of heat.						X	X		
MET.SPEC.04.02	Describe radiation.						X	X		
MET.SPEC.04.03	Describe solar radiation reaching the Earth.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.04.04	Describe the filtering effect of the atmosphere on solar radiation.						X	X		
MET.SPEC.04.05	Describe terrestrial radiation.						X	X		
MET.SPEC.04.06	Explain how terrestrial radiation is absorbed by some components of the atmosphere.						X	X		
MET.SPEC.04.07	Explain the effect of absorption and radiation in connection with clouds.						X	X		
MET.SPEC.04.08	Explain the process of conduction.						X	X		
MET.SPEC.04.09	Explain the role of conduction in the cooling and warming of the atmosphere.						X	X		
MET.SPEC.04.10	Explain the process of convection.						X	X		
MET.SPEC.04.11	Name the situations in which convection occurs.						X	X		
MET.SPEC.04.12	Explain the process of advection.						X	X		
MET.SPEC.04.13	Name the situations in which advection occurs.						X	X		
MET.SPEC.04.14	Describe the transfer of heat by turbulence.						X	X		
MET.SPEC.04.15	Describe the transfer of latent heat.						X	X		
MET.SPEC.05.00	**Temperature near the Earth's Surface, Insolation, Surface Effects, Effect of Clouds, Effect of Wind**									
MET.SPEC.05.01	Explain the cooling/warming of the surface of the Earth by radiation.						X	X		
MET.SPEC.05.02	Explain the cooling/warming of the air by molecular or turbulent heat transfer to/from the earth or sea surfaces.						X	X		
MET.SPEC.05.03	Describe qualitatively the influence of the clouds on the cooling and warming of the surface and the air near the surface.						X	X		
MET.SPEC.05.04	Explain the influence of the wind on the cooling and warming of the air near the surfaces.						X	X		
MET.SPEC.06.00	**Atmospheric Pressure**									
	Barometric Pressure, Isobars									
MET.SPEC.06.01	Define 'atmospheric pressure'.						X	X		
MET.SPEC.06.02	List the units of measurement of the atmospheric pressure used in aviation (hPa, inches of mercury). (Refer to Subject 050 10 01 01)						X	X		
MET.SPEC.06.03	Describe the principle of the barometers (mercury barometer, aneroid barometer).						X	X		
MET.SPEC.06.04	Define isobars and identify them on surface weather charts.						X	X		
MET.SPEC.06.05	Define 'high', 'low', 'trough', 'ridge', 'col'.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.07.00	**Pressure Variation with Height, Contours (Isotypes)**									
MET.SPEC.07.01	Explain the pressure variation with height.						X	X		
MET.SPEC.07.02	Describe quantitatively the variation of the barometric lapse rate. *Remark: An approximation of the average value for the barometric lapse rate near mean sea level (MSL) is 30 ft (9 m) per 1 hPa.*						X	X		
	Reduction of Pressure to QFF (MSL)									
MET.SPEC.07.03	Define ‘QFF’.						X	X		
MET.SPEC.07.04	Explain the reduction of measured pressure (QFE) to QFF (MSL).						X	X		
MET.SPEC.07.05	Mention the use of QFF for surface weather charts.						X	X		
	Relationship between surface pressure centres & pressure centres aloft									
MET.SPEC.07.06	Illustrate with a vertical cross section of isobaric surfaces the relationship between surface pressure systems and upper-air pressure systems.						X	X		
MET.SPEC.08.00	**Air Density**									
	Relationship between pressure, temperature and density									
MET.SPEC.08.01	Describe the relationship between pressure, temperature and density.						X	X		
MET.SPEC.08.0	Describe the vertical variation of the air density in the atmosphere.						X	X		
MET.SPEC.09.00	**International Standard Atmosphere (ISA)**									
MET.SPEC.09.01	Explain the use of standardised values for the atmosphere.						X	X		
MET.SPEC.09.02	List the main values of the ISA MSL pressure, MSL temperature, the vertical temperature lapse rate up to FL 650, height and temperature of the tropopause.						X	X		
MET.SPEC.10.00	**Altimetry**									
	Terminology and Definitions									
MET.SPEC.10.01	Define the following terms and explain how they are related to each other: height, altitude, pressure altitude, FL, pressure level, true altitude, true height, elevation, QNH, QFE, and standard altimeter setting.						X	X	X	X
MET.SPEC.10.02	Describe the terms ‘transition altitude’, ‘transition level’,‘transition layer’, ‘terrain clearance’, ‘lowest usable flight level’.						X	X	X	X
	Altimeter settings									

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.10.03	Name the altimeter settings associated to height, altitude, pressure altitude and FL.						X	X		
MET.SPEC.10.04	Describe the altimeter-setting procedures.						X	X		
	Calculations									
MET.SPEC.10.05	Calculate the different readings on the altimeter when a remote pilot uses different settings (QNH, 1013.25, QFE).						X	X		
MET.SPEC.10.06	Illustrate with a numbered example the changes of altimeter setting and the associated changes in reading when the pilot climbs through the transition altitude or descends through the transition level.						X	X		
MET.SPEC.10.07	Derive the reading of the altimeter of an unmanned aircraft on the ground when the pilot uses the different settings.						X	X		
MET.SPEC.10.08	Explain the influence of the air temperature on the distance between the ground and the level read on the altimeter and between two FLs.						X	X		
MET.SPEC.10.09	Explain the influence of pressure areas on true altitude.						X	X		
MET.SPEC.10.10	Determine the true altitude/height for a given altitude/height and a given ISA temperature deviation.						X	X		
MET.SPEC.10.11	Calculate the terrain clearance and the lowest usable FL for given atmospheric temperature and pressure conditions.						X	X		
MET.SPEC.10.12	State that the 4 %-rule can be used to calculate true altitude from indicated altitude, and also indicated altitude from true altitude (not precise but sufficient due to the approximation of the 4%-rule.) *Remark: The following rules should be considered for altimetry calculations:* (a) All calculations are based on rounded pressure values to the nearest lower hPa. (b) The value for the barometric lapse rate between MSL and 700 hPa to be used is 30 ft/hPa as an acceptable approximation of the barometric lapse rate. (c) To determine the true altitude/height, the following rule of thumb, called the ‘4 %-rule’, **must** be used: the altitude/height changes by 4 % for each 10 °C temperature deviation from ISA.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	(d) If no further information is given, the deviation of the outside-air temperature from ISA is considered to be constantly the same given value in the whole layer. (e) The elevation of the aerodrome has to be taken into account. The temperature correction has to be considered for the layer between the ground and the position of the unmanned aircraft.									
	Effect of Accelerated Airflow Due to Topography									
MET.SPEC.10.13	Describe qualitatively how the effect of accelerated airflow due to topography (the Bernoulli effect) affects altimetry.						X	X		
MET.SPEC.11.00	**Wind**									
	Definition and Measurement of Wind									
	Definition and measurement									
MET.SPEC.11.01	Define ‘wind’ and ‘surface wind’.	X	X	X						
MET.SPEC.11.02	State the units of wind directions	X	X	X						
MET.SPEC.11.03	Describe that the reported wind is an average wind derived from measurements with an anemometer at a height of 10 m over 2 min for local routine and special reports and ATS units, and over 10 min for aerodrome routine meteorological reports (METARs) and aerodrome special meteorological reports (SPECIs).						X	X		
MET.SPEC.12.00	**Primary Cause of Wind, Pressure Gradient, Coriolis Force, Gradient Wind**									
MET.SPEC.12.01	Define the term ‘horizontal pressure gradient’.						X	X		
MET.SPEC.12.02	Reserved for future									
MET.SPEC.13.00	**General Global Circulation**									
	General Circulation Around the Globe									
MET.SPEC.13.01	Describe the general global circulation.						X	X		
MET.SPEC.14.00	**Local Winds**									
MET.SPEC.14.01	Describe and explain anabatic and katabatic winds.	X	X							
MET.SEPC.14.02	Describe mountain and valley winds.	X	X							
MET.SPEC.14.03	Describe the Venturi effect, convergence in valleys and mountain areas.	X	X							

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.14.04	Describe land and sea breezes, and sea-breeze front.	X	X							
MET.SPEC.14.05	Describe that local, low-level jet streams can develop in the evening.						X	X		
MET.SPEC.15.00	**Mountain Waves (standing waves, lee waves)**									
	Origin and Characteristics									
MET.SPEC.15.01	Explain the origin and formation of mountain waves.						X	X		
MET.SPEC.15.02	State the conditions necessary for the formation of mountain waves.						X	X		
MET.SPEC.15.03	Describe the structure and properties of mountain waves.						X	X		
MET.SPEC.15.04	Explain how mountain waves may be identified by their associated meteorological phenomena.						X	X		
MET.SPEC.15.05	Describe that mountain wave effects can exceed the performance or structural capability of unmanned aircraft.						X	X		
MET.SPEC.15.06	Describe that mountain wave effects can propagate from low to high level, e.g. over Greenland and elsewhere.						X	X		
MET.SPEC.16.00	**Turbulence**									
	Description and Types of Turbulence									
MET.SPEC.16.01	Describe turbulence and gustiness.	X	X	X						
MET.SPEC.16.02	List the common types of turbulence (convective, mechanical, orographic, frontal, clear-air turbulence).	X	X	X						
MET.SPEC.17.00	**Formation and Location of Turbulence**									
MET.SPEC.17.01	Explain the formation of convective turbulence, mechanical and orographic turbulence, and frontal turbulence.						X	X		
MET.SPEC.17.02	State where turbulence will normally be found (rough-ground surfaces, relief, inversion layers, cumulonimbus (CB), thunderstorm (TS) zones, unstable layers).						X	X		
MET.SPEC.17.03	Describe and indicate the areas of worst wind shear and CAT.						X	X		
MET.SPEC.18.00	**Clouds and Fog**									
MET.SPEC.18.01	Explain cloud formation by adiabatic cooling, conduction, advection and radiation.						X	X		
MET.SPEC.18.02	Describe cloud formation based on the following lifting processes: unorganised lifting						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	in thin layers and turbulent mixing; forced lifting at fronts or over mountains; free convection.									
MET.SPEC.18.03	List cloud types typical for stable and unstable air conditions.						X	X		
MET.SPEC.18.04	Summarise the conditions for the dissipation of clouds.						X	X		
MET.SPEC.19.00	**Cloud Types and Cloud Classification**									
MET.SPEC.19.01	Describe the different cloud types and their classification.	X	X	X						
MET.SPEC.20.00	**Flying Conditions in each Cloud Type**									
MET.SPEC.20.01	Assess the 10 cloud types for icing and turbulence.						X	X		T
MET.SPEC.21.00	**Fog, Mist, Faze**									
MET.SPEC.21.01	Define ‘fog’, ‘mist’ and ‘haze’ with reference to the WMO standards of visibility range.						X	X		
MET.SPEC.21.02	Explain briefly the formation of fog, mist and haze.						X	X		
MET.SPEC.21.03	Name the factors that generally contribute to the formation of fog and mist.						X	X		
MET.SPEC.21.04	Name the factors that contribute to the formation of haze.						X	X		
MET.SPEC.21.05	Describe freezing fog and ice fog.						X	X		
MET.SPEC.22.00	**Radiation Fog**									
MET.SPEC.22.01	Explain the formation of radiation fog.						X	X		
MET.SPEC.22.02	Describe the significant characteristics of radiation fog, and its vertical extent.						X	X		
MET.SPEC.22.03	Summarise the conditions for the dissipation of radiation fog.						X	X		
MET.SPEC.23.00	**Advection Fog**									
MET.SPEC.23.01	Explain the formation of advection fog.						X	X		
MET.SPEC.23.02	Describe the different possibilities of advection-fog formation (over land, sea and coastal regions).						X	X		
MET.SPEC.23.03	Describe the significant characteristics of advection fog.						X	X		
MET.SPEC.23.04	Summarise the conditions for the dissipation of advection fog.						X	X		
MET.SPEC.24.00	**Sea Smoke**									
MET.SPEC.24.01	Explain the formation of sea smoke.						X	X		
MET.SPEC.24.02	Explain the conditions for the development of sea smoke.						X	X		
MET.SPEC.24.03	Summarise the conditions for the dissipation of sea smoke.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.24.04	Explain the formation of frontal fog.						X	X		
MET.SPEC.24.05	Describe the significant characteristics of frontal fog.						X	X		
MET.SPEC.24.06	Summarise the conditions for the dissipation of frontal fog.						X	X		
MET.SPEC.24.07	Summarise the features of orographic fog.						X	X		
MET.SPEC.24.08	Describe the significant characteristics of orographic fog.						X	X		
MET.SPEC.24.09	Summarise the conditions for the dissipation of orographic fog.						X	X		
MET.SPEC.25.00	**Precipitation**									
	Process of Development of Precipitation									
MET.SPEC.25.01	Describe the two basic processes of forming precipitation (The Wegener–Bergeron–Findeisen process, Coalescence).						X	X		
MET.SPEC.25.02	Summarise the outlines of the ice-crystal process (The Wegener– Bergeron–Findeisen process).						X	X		
MET.SPEC.25.03	Summarise the outlines of the coalescence process.						X	X		
MET.SPEC.25.04	Explain the development of snow, rain, drizzle and hail.						X	X		
MET.SPEC.26.00	**Types of Precipitation**									
MET.SPEC.26.01	List and describe the types of precipitation given in the aerodrome forecast (TAF) and METAR codes (drizzle, rain, snow, snow grains, ice pellets, hail, small hail, snow pellets, ice crystals, freezing drizzle, freezing rain).						X	X		
MET.SPEC.26.02	State the ICAO/WMO approximate diameters for cloud, drizzle and rain drops.						X	X		
MET.SPEC.26.03	State that, because of their size, hail stones can cause significant damage to unmanned aircraft.						X	X		
MET.SPEC.26.04	Explain the mechanism for the formation of freezing precipitation.						X	X		
MET.SPEC.26.05	Describe the weather conditions that give rise to freezing precipitation.						X	X		
MET.SPEC.26.06	Distinguish between the types of precipitation generated in convective and stratiform clouds.						X	X		
MET.SPEC.26.07	Assign typical precipitation types and intensities to different cloud types.						X	X		
MET.SPEC.26.08	Explain the relationship between moisture content and visibility during different types of winter precipitation (e.g. large vs small snowflakes).						X	X		
MET.SPEC.27.00	**Air Masses and Fronts**									

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	Air Masses									
MET.SPEC.27.01	Define the term ‘air mass’.						X	X		
MET.SPEC.27.02	Describe the properties of the source regions.						X	X		
MET.SPEC.27.03	Summarise the classification of air masses by source regions.						X	X		
MET.SPEC.27.04	State the classifications of air masses by temperature and humidity at source.						X	X		
MET.SPEC.27.05	State the characteristic weather in each of the air masses.						X	X		
MET.SPEC.27.06	Name the three main air masses that affect Europe.						X	X		
MET.SPEC.27.07	Classify air masses on a surface weather chart.						X	X		
MET.SPEC.27.08	Remark: Names and abbreviations of air masses used in assessments: — first letter: humidity continental (c) maritime (m) — second letter: type of air mass arctic (A) polar (P) tropical (T) equatorial (E) — third letter: temperature cold (c) warm (w)						X	X		
MET.SPEC.28.00	**Modifications of Air Masses**									
MET.SPEC.28.01	List the environmental factors that affect the final properties of an air mass.						X	X		
MET.SPEC.28.02	Explain how maritime and continental tracks modify air masses.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.28.03	Explain the effect of passage over cold or warm surfaces.						X	X		
MET.SPEC.28.04	Explain how air-mass weather is affected by the season, the air- mass track and by orographic and thermal effects over land.						X	X		
MET.SPEC.28.05	Assess the tendencies of the stability of an air mass and describe the typical resulting air-mass weather including the hazards for aviation.						X	X		
MET.SPEC.29.00	**Fronts**									
MET.SPEC.29.01	Describe the boundaries between air masses (fronts).						X	X		
MET.SPEC.29.02	Define ‘front’ and ‘frontal zone’.						X	X		
MET.SPEC.29.03	Name the global frontal systems (polar front, arctic front).						X	X		
MET.SPEC.29.04	State the approximate seasonal latitudes and geographic positions of the polar front and the arctic front.						X	X		
MET.SPEC.30.00	**Warm Front, Associated Clouds and Weather**									
MET.SPEC.30.01	Define a ‘warm front’.						X	X		
MET.SPEC.30.02	Describe the cloud, weather, ground visibility and aviation hazards at a warm front depending on the stability of the warm air.						X	X		
MET.SPEC.30.03	Explain the seasonal differences in the weather at warm fronts.						X	X		
MET.SPEC.30.04	Describe the structure, slope and dimensions of a warm front.						X	X		
MET.SPEC.30.05	Sketch a cross section of a warm front showing weather, cloud and aviation hazards.						X	X		
MET.SPEC.31.00	**Cold Front, Associated Clouds and Weather**									
MET.SPEC.31.01	Define a ‘cold front’.						X	X		
MET.SPEC.31.02	Describe the cloud, weather, ground visibility and aviation hazards at a cold front depending on the stability of the warm air.						X	X		
MET.SPEC.31.03	Explain the seasonal differences in the weather at cold fronts.						X	X		
MET.SPEC.31.04	Describe the structure, slope and dimensions of a cold front.						X	X		
MET.SPEC.31.05	Sketch a cross section of a cold front showing weather, cloud and aviation hazards.						X	X		
MET.SPEC.32.00	**Warm Sector, Associated Clouds and Weather**									
MET.SPEC.32.01	Describe fronts and air masses associated with the warm sector.						X	X		
MET.SPEC.32.02	Describe the cloud, weather, ground visibility and aviation hazards in a warm sector.						X	X		
MET.SPEC.32.03	Explain the seasonal differences in the weather in the warm sector.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.32.04	Sketch a cross section of a warm sector showing weather, cloud and aviation hazards.						X	X		
MET.SPEC.33.00	**Weather behind the Cold Front**									
MET.SPEC.33.01	Describe the cloud, weather, ground visibility and aviation hazards behind the cold front.						X	X		
MET.SPEC.33.02	Explain the seasonal differences in the weather behind the cold front.						X	X		
MET.SPEC.34.00	**Occlusions, Associated Clouds and Weather**									
MET.SPEC.34.01	Define the term ‘occlusion’ and ‘occluded front’.						X	X		
MET.SPEC.34.02	Describe the cloud, weather, ground visibility and aviation hazards in a cold occlusion.						X	X		
MET.SPEC.34.03	Describe the cloud, weather, ground visibility and aviation hazards in a warm occlusion.						X	X		
MET.SPEC.34.04	Explain the seasonal differences in the weather at occlusions.						X	X		
MET.SPEC.34.05	Sketch a cross section of occlusions showing weather, cloud and aviation hazards.						X	X		
MET.SPEC.34.06	On a sketch illustrate the development of an occlusion and the movement of the occlusion point.						X	X		
MET.SPEC.35.00	**Stationary Front, Associated Clouds and Weather**									
MET.SPEC.35.01	Define a ‘stationary front’.						X	X		
MET.SPEC.35.02	Describe the cloud, weather, ground visibility and aviation hazards in a stationary front.						X	X		
MET.SPEC.36.00	**Movement of Fronts and Pressure Systems, Life Cycle**									
MET.SPEC.36.01	Describe the movements of fronts and pressure systems and the life cycle of a mid-latitude depression.						X	X		
MET.SPEC.36.02	State the rules for predicting the direction and the speed of movement of fronts.						X	X		
MET.SPEC.36.03	State the difference in the speed of movement between cold and warm fronts.						X	X		
MET.SPEC.36.04	State the rules for predicting the direction and the speed of movement of frontal depressions.						X	X		
MET.SPEC.36.05	Describe, with a sketch if required, the genesis, development and life cycle of a frontal depression with associated cloud and rain belts.						X	X		
MET.SPEC.37.00	**Changes of Meteorological Elements at a Frontal Wave**									
MET.SPEC.37.01	Sketch a plan and a cross section of a frontal wave (warm front, warm sector, and cold front) and illustrate the changes of pressure, temperature, surface, wind and wind in						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	the vertical axis.									
MET.SPEC.38.00	**Pressure Systems**									
	Location of the Principal Pressure Areas									
MET.SPEC.38.01	Identify or indicate on a map the principal global high-pressure and low-pressure areas in January and July.						X	X		
MET.SPEC.38.02	Explain how these pressure areas are formed.						X	X		
MET.SPEC.38.03	Explain how the pressure areas move with the seasons.						X	X		
MET.SPEC.39.00	**Flight Hazards**									
	Icing									
MET.SPEC.39.01	Summarise the general conditions under which ice accretion occurs on unmanned aircraft (temperatures of outside air; temperature of the airframe; presence of supercooled water in clouds, fog, rain and drizzle; possibility of sublimation).						X	X		
MET.SPEC.39.02	Explain the general weather conditions under which ice accretion occurs in a venturi carburettor.						X	X		
MET.SPEC.39.03	Explain the general weather conditions under which ice accretion occurs on airframe.						X	X		
MET.SPEC.39.04	Explain the formation of supercooled water in clouds, rain and drizzle.						X	X		
MET.SPEC.39.05	Explain qualitatively the relationship between the air temperature and the amount of supercooled water.						X	X		
MET.SPEC.39.06	Explain qualitatively the relationship between the type of cloud and the size and number of the droplets in cumuliform and stratiform clouds.						X	X		
MET.SPEC.39.07	Indicate in which circumstances ice can form on an unmanned aircraft on the ground: air temperature, humidity, precipitation.						X	X		
MET.SPEC.39.08	Explain in which circumstances ice can form on an unmanned aircraft in flight: inside clouds, in precipitation, and outside clouds and precipitation.						X	X		
MET.SPEC.39.09	Explain the influence of fuel temperature, radiative cooling of the unmanned aircraft surface and temperature of the unmanned aircraft surface (e.g. from previous flight) on ice formation.						X	X		
MET.SPEC.39.10	Describe the different factors that influence the intensity of icing: air temperature, amount of supercooled water in a cloud or in precipitation, amount of ice crystals in the						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	air, speed of the unmanned aircraft, shape (thickness) of the airframe parts (wings, antennas, etc.).									
MET.SPEC.39.11	Explain the effects of topography on icing.						X	X		
MET.SPEC.39.12	Explain the higher concentration of water drops in stratiform orographic clouds.						X	X		
MET.SPEC.40.00	**Types of Ice Accretion**									
MET.SPEC.40.01	Define 'clear ice'.						X	X		
MET.SPEC.40.02	Describe the conditions for the formation of clear ice.						X	X		
MET.SPEC.40.03	Explain the formation of the structure of clear ice with the release of latent heat during the freezing process.						X	X		
MET.SPEC.40.04	Describe the aspects of clear ice: appearance, weight, solidity.						X	X		
MET.SPEC.40.05	Define 'rime ice'.						X	X		
MET.SPEC.40.06	Describe the conditions for the formation of rime ice.						X	X		
MET.SPEC.40.07	Describe the aspects of rime ice: appearance, weight, solidity.						X	X		
MET.SPEC.40.08	Define 'mixed ice'.						X	X		
MET.SPEC.40.09	Describe the conditions for the formation of mixed ice.						X	X		
MET.SPEC.40.10	Describe the aspects of mixed ice: appearance, weight, solidity.						X	X		
MET.SPEC.40.11	Describe the possible process of ice formation in snow conditions.						X	X		
MET.SPEC.40.12	Define 'hoar frost'.						X	X		
MET.SPEC.40.13	Describe the conditions for the formation of hoar frost.						X	X		
MET.SPEC.40.14	Describe the aspects of hoar frost: appearance, solidity.						X	X		
MET.SPEC.41.00	**Hazards of Ice Accretion, Avoidance**									
MET.SPEC.41.01	State the ICAO qualifying terms for the intensity of icing.						X	X		
MET.SPEC.41.02	Describe, in general, the hazards of icing.						X	X		
MET.SPEC.41.03	Assess the dangers of the different types of ice accretion.						X	X		
MET.SPEC.41.04	Describe the position of the dangerous zones of icing in fronts, in stratiform and cumuliform clouds, and in the different precipitation types.						X	X		
MET.SPEC.41.05	Indicate the possibilities of avoiding dangerous zones of icing: in the flight planning: weather briefing, selection of track and altitude;						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	during flight: recognition of the dangerous zones, selection of appropriate track and altitude.									
MET.SPEC.42.00	**Ice Crystal Icing**									
MET.SPEC.42.01	Describe ice crystal icing.						X	X		
MET.SPEC.42.02	Describe the atmospheric processes leading to high ice crystal concentration. Define the variable ice water content (IWC).						X	X		
MET.SPEC.42.03	Identify weather situations and their relevant areas where high concentrations of ice crystals are likely to occur.						X	X		
MET.SPEC.42.04	Name, in general, the flight hazards associated with high concentrations of ice crystals.						X	X		
MET.SPEC.42.05	Explain how a pilot may possibly avoid areas with a high concentration of ice crystals.						X	X		
MET.SPEC.43.00	**Turbulence**									
MET.SPEC.43.01	Describe the effects of turbulence on an unmanned aircraft in flight.						X	X		
MET.SPEC.43.02	Indicate the possibilities of avoiding turbulence: in the flight planning: weather briefing, selection of track and altitude; during flight: selection of appropriate track and altitude.						X	X		
MET.SPEC.43.03	Describe atmospheric turbulence and distinguish between turbulence, gustiness and wind shear.						X	X		
MET.SPEC.43.04	Describe that forecasts of turbulence are not very reliable and state that pilot reports of turbulence are very valuable as they help others to prepare for or avoid turbulence.						X	X		
MET.SPEC.44.00	**Wind Shear**									
MET.SPEC.44.01	Define ‘wind shear’ (vertical and horizontal).						X	X		
MET.SPEC.44.02	Define ‘low-level wind shear’.						X	X		
MET.SPEC.45.00	**Weather Conditions for Wind Shear**									
MET.SPEC.45.01	Describe the conditions, where and how wind shear can form (e.g. thunderstorms, squall lines, fronts, inversions, land and sea breeze, friction layer, relief).						X	X		
MET.SPEC.46.00	**Effects on Flight, Avoidance**									

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.46.01	Describe the effects of wind shear on flight.									
MET.SPEC.46.02	Indicate the possibilities of avoiding wind shear in flight: in the flight planning; during flight.									
MET.SPEC.47.00	**Thunderstorms**									
MET.SPEC.47.01	Conditions for and process of development, forecast, location, type specification.						X	X		
MET.SPEC.47.02	Name the cloud types which indicate the development of thunderstorms.	X	X	X						
MET.SPEC.47.03	Describe the different types of thunderstorms, their location, the conditions for and the process of development, and list their properties (air-mass thunderstorms, frontal thunderstorms, squall lines, supercell storms, orographic thunderstorms).							X		
MET.SPEC.48.00	**Structure of Thunderstorms, Life Cycle**									
MET.SPEC.48.01	Assess the average duration of thunderstorms and their different stages.						X	X		
MET.SPEC.48.02	Describe a supercell storm: initial, supercell, tornado and dissipating stage.						X	X		
MET.SPEC.48.03	Summarise the flight hazards associated with a fully developed thunderstorm.						X	X		
MET.SPEC.48.04	Indicate on a sketch the most dangerous zones in and around a single-cell and a multi-cell thunderstorm.						X	X		
MET.SPEC.49.00	**Electrical Discharges**									
MET.SPEC.49.01	Describe the basic outline of the electric field in the atmosphere.						X	X		
MET.SPEC.49.02	Describe types of lightning, i.e. ground stroke, intra-cloud lightning, cloud-to-cloud lightning, upward lightning.								X	X
MET.SPEC.49.03	Reserved									
MET.SPEC.49.04	Describe the development of lightning discharges.						X	X		
MET.SPEC.49.05	Describe the effect of lightning strike on unmanned aircraft and flight execution.						X	X		
MET.SPEC.50.00	**Development and Effects of Downbursts**									
MET.SPEC.50.01	Define the term ‘downburst’.						X	X		
MET.SPEC.50.02	Distinguish between macroburst and microburst.						X	X		
MET.SPEC.50.03	State the weather situations leading to the formation of downbursts.						X	X		
MET.SPEC.50.04	Describe the process of development of a downburst.						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.50.05	Give the typical duration of a downburst.						X	X		
MET.SPEC.50.06	Describe the effects of downbursts.						X	X		
MET.SPEC.51.00	**Thunderstorm Avoidance**									
MET.SPEC.51.01	Explain how the pilot can anticipate each type of thunderstorm: through pre-flight weather briefing, observation in flight, use of specific meteorological information, use of information given by ground weather radar and by airborne weather radar.						X	X		
MET.SPEC.51.02	Describe practical examples of flight techniques used to avoid the hazards of thunderstorms.						X	X		
MET.SPEC.52.00	**Tornadoes**									
MET.SPEC.52.01	Define 'tornado'.						X	X		
MET.SPEC.52.02	Describe the formation of a tornado.						X	X		
MET.SPEC.52.03	Describe the typical features of a tornado such as appearance, season, time of day, stage of development, speed of movement, and wind speed.						X	X		
MET.SPEC.52.04	Compare the dimensions and properties of tornadoes and dust devils.						X	X		
MET.SPEC.53.00	**Inversions**									
MET.SPEC.53.01	Compare the flight hazards during take-off and approach associated with a strong inversion alone and with a strong inversion combined with marked wind shear.						X	X		
MET.SPEC.54.00	**Hazards in Mountainous Areas**									
MET.SPEC.54.01	Describe the influence of mountainous area on a frontal passage.						X	X		
MET.SPEC.54.02	Describe the vertical movements, wind shear and turbulence that are typical of mountain areas.						X	X		
MET.SPEC.54.03	Indicate on a sketch of a chain of mountains the turbulent zones (mountain waves, rotors).						X	X		
MET.SPEC.54.04	Explain the influence of relief on ice accretion.						X	X		
MET.SPEC.55.00	**Development and Effect of Valley Inversions**									
MET.SPEC.55.01	Describe the formation of a valley inversion due to katabatic winds.						X	X		
MET.SPEC.55.02	Describe the valley inversion formed by warm winds aloft.						X	X		
MET.SPEC.55.03	Describe the effects of a valley inversion for an unmanned aircraft in flight.						X	X		
MET.SPEC.56.00	**Meteorological Information**									
MET.SPEC.56.01	Demonstrate ability to obtain, interpret and apply meteorological reports and forecasts	X	X	X						

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
	for operations.									
MET.SPEC.56.02	Define ‘gusts’ as given in METARs.							X		
MET.SPEC.56.03	Distinguish wind given in METARs and wind given by the control tower for take-off and landing.						X	X		
MET.SPEC.56.04	Define ‘visibility’.						X	X		
MET.SPEC.56.05	Describe the meteorological measurement of visibility.						X	X		
MET.SPEC.56.06	Define ‘prevailing visibility’.						X	X		
MET.SPEC.56.07	Define ‘ground visibility’.						X	X		
MET.SPEC.56.08	List the units used for visibility (m, km, statute mile).						X	X		
MET.SPEC.56.09	Define ‘runway visual range’.						X	X		
MET.SPEC.56.11	Describe the meteorological measurement of runway visual range.						X	X		
MET.SPEC.56.12	Indicate where the transmissometers/forward-scatter meters are placed on the aerodrome.						X	X		
MET.SPEC.56.13	List the units used for runway visual range (m, ft).						X	X		
MET.SPEC.56.14	List the different possibilities to transmit information to pilots about runway visual range.						X	X		
MET.SPEC.56.15	Compare ground visibility, prevailing visibility, and runway visual range.						X	X		
MET.SPEC.56.16	Indicate the means of observation of present weather.						X	X		
MET.SPEC.56.17	Indicate the means of observing clouds for the purpose of recording: type, amount, height of base (ceilometers), and top.						X	X		
MET.SPEC.56.18	State the clouds which are indicated in METAR, TAF and SIGMET.						X	X		
MET.SPEC.56.19	Define ‘oktas’.						X	X		
MET.SPEC.56.20	Define ‘cloud base’.						X	X		
MET.SPEC.56.21	Define ‘ceiling’.						X	X		
MET.SPEC.56.22	Name the unit and the reference level used for information about cloud base (ft).						X	X		
MET.SPEC.56.23	Define ‘vertical visibility’.						X	X		
MET.SPEC.56.24	Explain briefly how and when vertical visibility is measured.						X	X		
MET.SPEC.56.25	Name the units used for vertical visibility (ft, m).						X	X		

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.56.26	Indicate the means of observation of air temperature (thermometer).						X	X		
MET.SPEC.56.27	Name the units of relative humidity (%) and dew-point temperature (Celsius, Fahrenheit).						X	X		
MET.SPEC.57.00	**Satellite Observations**									
MET.SPEC.57.01	Describe the basic outlines of satellite observations.						X	X		
MET.SPEC.57.02	Name the main uses of satellite pictures in aviation meteorology.						X	X		
MET.SPEC.57.03	Describe the different types of satellite imagery.						X	X		
MET.SPEC.57.04	Interpret qualitatively the satellite pictures to get useful information for flights: — location of clouds (distinguish between stratiform and cumuliform clouds).						X	X		
MET.SPEC.57.06	Interpret qualitatively the satellite pictures in order to get useful information for flights: — location of fronts.						X	X		
MET.SPEC.58.00	**Weather Radar Observations**									
MET.SPEC.58.01	Describe the basic principle and the type of information given by a ground weather radar.						X	X		
MET.SPEC.58.01	Interpret ground weather radar images.						X	X		
MET.SPEC.58.01	Describe the basic principle and the type of information given by airborne weather radar.						X	X		
MET.SPEC.58.01	Describe the limits and the errors of airborne weather radar information.						X	X		
MET.SPEC.58.01	Interpret typical airborne weather radar images.						X	X		
MET.SPEC.59.00	**Unmanned Aircraft Observations and Reporting**									
MET.SPEC.59.01	Describe routine air-report and special air-report (ARS).						X	X		
MET.SPEC.59.02	State the obligation of a pilot to prepare air-reports.						X	X		
MET.SPEC.59.03	Name the weather phenomena to be stated in an ARS.						X	X		
MET.SPEC.60.00	**Weather Charts**									
MET.SPEC.60.01	Decode and interpret significant weather charts (low, medium and high level).						X	X		
MET.SPEC.60.02	Describe from a significant weather chart the flight conditions at designated locations or along a defined flight route at a given FL.						X	X		
MET.SPEC.61.00	**Surface Charts**									

Syllabus Reference	Syllabus details and associated Learning Objectives	GVC	L1 A	L1 R	L2 A	L2 R	L3 A	L3 R	L4 A	L4 R
MET.SPEC.61.01	Recognise the following weather systems on a surface weather chart (analysed and forecast): ridges, cols and troughs; fronts; frontal side, warm sector and rear side of mid-latitude frontal lows; high- and low-pressure areas.						X	X		
MET.SPEC.61.02	Determine from surface weather charts the wind direction and speed.						X	X		
MET.SPEC.62.00	**Information for Flight Planning**									
MET.SPEC.62.01	Describe, decode and interpret the following aviation weather messages (given in written or graphical format): METAR, aerodrome special meteorological report (SPECI), trend forecast (TREND), TAF, information concerning en-route weather phenomena which may affect the safety of unmanned aircraft operations (SIGMET), information concerning en-route weather phenomena which may affect the safety of low-level unmanned aircraft operations (AIRMET), area forecast for low-level flights (GAMET), ARS, volcanic ash advisory information.						X	X		
MET.SPEC.62.02	Describe the general meaning of MET REPORT and SPECIAL REPORT.						X	X		

APPENDIX C – REMOTE PILOT COMPETENCE

APPLICATION OF KNOWLEDGE

Application of Knowledge (APK)	
Description: Demonstrates knowledge and understanding of relevant information, operating instruction, unmanned aircraft systems and the operating environment.	
Observable Behaviours	
1	Demonstrates practical and applicable knowledge of limitations and systems and their interactions
2	Demonstrates required knowledge of published operating instructions
3	Demonstrates knowledge of the physical environment, the air traffic environment including routings, weather, airports, and the operational infrastructure
4	Demonstrates appropriate knowledge of applicable legislation
5	Knows where to source required information
6	Demonstrates a positive interest in acquiring knowledge
7	Can apply knowledge effectively

APPLICATION OF PROCEDURES & COMPLIANCE WITH REGULATIONS

Application of Procedures & Compliance with Regulations (PCR)	
Description: Identifies and applies procedures in accordance with published operating instructions and applicable regulations, using the appropriate knowledge.	
Observable Behaviours	
1	Identifies the source of operating instructions
2	Follows standard operating procedures (SOPs) unless a higher degree of safety dictates an appropriate deviation
3	Identifies and follows all operating instructions in a timely manner
4	Correctly operates the UAS and associated equipment
5	Complies with applicable regulations
6	Applies relevant procedural knowledge

SITUATIONAL AWARENESS

Situational Awareness (SIT)	
Description: Perceives and comprehends the operational situation of the moment and all of the relevant information available and anticipates what could happen that may affect the operation.	
Observable Behaviours	
1	Identifies and assesses accurately the state of the UAS
2	Identifies and assesses accurately the UAS vertical and lateral position, and its anticipated flight path
3	Identifies and assesses accurately the general environment as it may affect the flight, including the air traffic neighbouring the UAS operation and the meteorological conditions that could impact the operation
4	Conducts the operation in accordance with the airspace configuration where the UAS operation is taking place

Situational Awareness (SIT)	
5	Keeps track of time and energy
6	Maintains awareness of the people involved in or affected by the operation and their capacity to perform as expected
7	Anticipates accurately what could happen, plans, and stays ahead of the situation
8	Develops effective contingency plans based upon potential threats
9	Recognizes and effectively responds to indications of reduced situational awareness

COMMUNICATION

Communication (COM)	
Description: Demonstrates effective verbal, written and nonverbal communications, in normal and abnormal situations.	
Observable Behaviours	
1	Ensures the recipient is ready and able to receive the information
2	Selects appropriately what, when how and with whom to communicate
3	Conveys messages clearly, accurately, and concisely
4	Confirms that the recipient correctly understands important information
5	Listens actively and demonstrates understanding when receiving information
6	Asks relevant and effective questions – Adheres to standard radiotelephony phraseology and procedures
7	Accurately reads and interprets required documentation for the operation of UAS
8	Accurately reads, interprets, constructs and responds to datalink messages
9	Completes accurate reports as required by operating procedures
10	Correctly interprets non-verbal communication
11	Where applicable, uses eye contact, body movement and gestures that are consistent with and support verbal messages

RPA FLIGHT PATH MANAGEMENT AND AUTOMATION

UA Flight Path Management, Automation (FPM)	
Description: Controls the RPA flight path through automation, including appropriate use of flight management system(s) and guidance.	
Observable Behaviours	
1	Controls the RPA through automation with accuracy and smoothness as appropriate to the situation
2	Contains the RPA within the normal flight envelope
3	Maintains the desired flight path during flight using automation
4	Takes appropriate action in case of deviations from the desired RPA trajectory
5	Selects appropriate level and mode of automation in a timely manner considering phase of flight and workload
6	Effectively monitors automation, including engagement and automatic mode transitions
7	Controls the RPA safely in degraded automation using only the relationship between RPA attitude, speed and thrust if applicable

LEADERSHIP, TEAMWORK, AND SELF-MANAGEMENT

Leadership, Teamwork and Self-Management (LTS)	
Description: Demonstrates effective leadership, team working and self-management.	
Observable Behaviours	
1	Understands and agrees with the crew's roles and objectives
2	Creates an atmosphere of open communication and encourages team participation
3	Uses initiative and gives directions when required
4	Admits mistakes and takes responsibility for own performance, detecting and resolving own errors
5	Anticipates and responds appropriately to other crew members' needs
6	Carries out instructions when directed
7	Communicates relevant concerns and intentions
8	Gives and receives feedback constructively
9	Confidently intervenes when important for safety
10	Demonstrates empathy and shows respect and tolerance for other people
11	Engages others in planning and allocates activities fairly and appropriately according to abilities
12	Addresses and resolves conflicts and disagreements in a constructive manner
13	Demonstrates self-control in all situations
14	Self-evaluates the effectiveness of actions

PROBLEM SOLVING AND DECISION MAKING

Problem Solving and Decision Making (PDM)	
Description: Accurately identifies risks and resolves problems. Uses the appropriate decision-making processes.	
Observable Behaviours	
1	Seeks accurate and adequate information from appropriate sources
2	Identifies and verifies what and why things have gone wrong
3	Employs proper problem-solving strategies
4	Perseveres in working through problems without reducing safety
5	Uses appropriate and timely decision-making processes
6	Identifies and considers options effectively
7	Monitors, reviews and adapts decisions as required
8	Identifies and manages risks and threats to the safety of the UAS and people effectively
9	Changes behaviour and responds as needed to deal with the demands of the changing situation

WORKLOAD MANAGEMENT

Workload Management (WLM)
Description: Manages available resources efficiently to prioritize and perform tasks in a timely manner under all circumstances.

Workload Management (WLM)	
Observable Behaviours	
1	Plans, prioritizes, and schedules tasks effectively
2	Manages time efficiently when carrying out tasks
3	Offers and accepts assistance, delegates when necessary and asks for help early
4	Reviews, monitors, and crosschecks actions conscientiously
5	Verifies that tasks are completed to the expected outcome
6	Manages and recovers from interruptions, distractions, variations and failures effectively

Annex A to Article 11

Rules for conducting a risk assessment

Due to the size of the AMC and GM for Article 11, it has been included as a set of Annexes to this document.

GM1 Article 11 Annex A – Guidance for the submission of compliance evidence to the CAA

CAA ORS9 Decision No. 46

1. Introduction

1.1 This annex is intended to serve as guidance to support an applicant with gathering, presenting, and retaining their compliance evidence as part of their UK SORA application. The term compliance evidence is used to emphasise the goal of providing evidence that demonstrates compliance to a regulation, requirement, or standard.

1.2 An applicant should consider what they are trying to demonstrate with their chosen compliance evidence. For example, if they are aiming to demonstrate compliance with a specific technical standard then the compliance evidence would likely be some form of technical data rather than an operations document. This is not to say that an operations document couldn't be used as evidence, but it would be unlikely that it is specific enough to be considered compliance evidence for a technical standard, and so, on its own, would be unlikely to be accepted as compliance with the overall requirement.

What is a compliance approach?

1.3 In this context a compliance approach is meant as a systematic approach used to ensure an applicant complies with the relevant regulation, requirement or standard. The UK SORA Application Service is designed to support applicants to submit their compliance approach and compliance evidence in a structured format.

What is compliance evidence?

1.4 Compliance evidence is the term used to describe a piece of evidence used to demonstrate compliance with a regulation, requirement or standard. Compliance evidence may take several forms such as:

i) Flight logs.

ii) Technical data sheet.

iii) Flight tests.

iv) Design information.

1.5 Evidence used to demonstrate compliance should be relevant to the intended regulation, requirement or standard i.e. if the compliance evidence is a section or paragraph within a document then that section must be clearly referenced rather than submitting the entire document as evidence. For example:

i) Acceptable: Ref: Technical Manual 7602, Section 7, page 16.

ii) Not Acceptable: Ref: Technical Manual 7602.

Collecting, Presenting and Storing Evidence

1.6 When collecting compliance evidence, it is crucial that all relevant information is included. Any form of compliance evidence submitted to the CAA must be in a legible and understandable format.

1.7 Compliance evidence must be stored for the duration of the authorisation and be available to CAA assessors upon request. Where compliance evidence contains personal data, t is recommended to follow UK Government advice on General Data Protection Regulation (GDPR).

1.8 For each requirement in UK SORA, the Applicant must present compliance evidence to the CAA as follows:

i) The applicant enters a compliance statement into the UK SORA Application Service. A compliance statement is a simple statement (a single sentence typically suffices) which describes the method through which the Applicant has complied with the requirement. For example:

1.9 Requirement (CAA): “Effects of impact dynamics and immediate post impact hazards, critical area or the combination of these results are reduced such that the risk to population is reduced by an approximate 1 order of magnitude (90%).”

(1) Compliance statement (Applicant): “Calculation of the UAS deceleration with parachute deployed combined with flight testing shows that the ground impact is reduced by 1 order of magnitude.”

ii) Provide compliance evidence: the physical report(s) that evidence the compliance statement has been achieved. For example:

(1) Parachute deployment analysis report no.XYZ.pdf

(2) Parachute deployment flight test report no.ABC.pdf

Using the UK SORA annexes

1.10 The CAA has developed a reference system for applicants to quickly identify requirements that are relevant to their application. Below is some guidance on how to use this system.

Table 14 - Example Requirements

Level of integrity

Criterion	Low (SAIL 2)	Medium (SAIL 3)	High (SAIL 4 to 6)
Technical issue with the UAS	OSO1.L.I	OSO1.L.I OSO1.M.I	OSO1.H.I

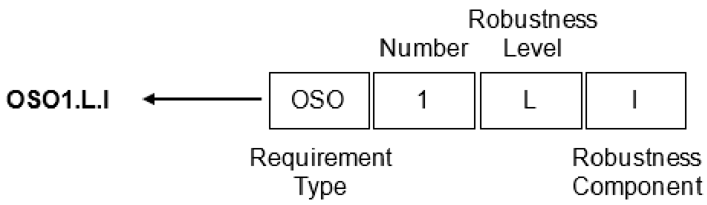
Level of assurance

Criterion	Low (SAIL 2)	Medium (SAIL 3)	High (SAIL 4 to 6)
Technical issue with the UAS	OSO1.L.A	OSO1.M.A OSO1.M.I	OSO1.H.A

Using requirement codes

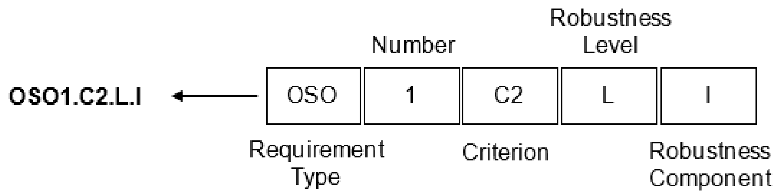
1.11 All UK SORA requirements have a requirement code, which may be used to find AMC and GM. Figure 7 shows an example of a requirement code for SAIL 2 at low integrity with a single criterion.

Figure 7 - Requirement codes single criterion



1.12 Some requirements have several criteria, this is displayed after the requirement number, prefixed by the letter C for example C2 shown below in figure 8.

Figure 8 - Requirement codes multiple criterion



Using the reference system

Integrity requirements

1.13 Requirement codes ending with the letter I (robustness component) represent integrity requirements and must be complied with. Example:

The applicant **must** meet the following requirements:

(a) Requirement 1.

(b) Requirement 2.

Assurance requirements

1.14 Requirement codes ending with the letter A represent assurance requirements and **must** be complied with. Example:

The Applicant must meet the following requirements:

(a) The Applicant must provide evidence of compliance with the Integrity requirements.

AMC

1.15 Requirement codes prefixed by the letters AMC may be used to demonstrate compliance with the requirement. **AMC.OSO1.L.I** relates to **Low Integrity**. Where AMC relates to a specific requirement or multiple requirements, the corresponding letter is used. For example:

(b) The standard 1234 may be used to demonstrate compliance with the requirement.

GM

1.16 Requirement codes prefixed by the letters GM explain how the applicant may comply and gives general guidance material relating to the overall requirement. **GM.OSO1.L.A** relates to **Low Assurance**. Where GM relates to a specific requirement or multiple requirements the corresponding robustness letter is used.

Additional Requirements

1.17 As the SAIL level increases the robustness level and the corresponding number of requirements may also increase. Using the tables provided, the applicant may identify additional requirements. In this example, SAIL 3 has medium integrity requirements **OSO1.M.I** in addition to low.

LEVEL of INTEGRITY
Medium (SAIL 3)
OSO1.L.I **OSO1.M.I**

1.18 Above the additional requirement details section, coloured boxes with the relevant codes display any **lower** robustness requirement for ease of reference. For example:

Lower robustness level requirements to be complied with:

- OSO1.L.I
- OSO1.L.A

1.19 Following the low robustness level requirements, additional requirements are listed in the same format as above.

1.20 Above the additional requirement details section, coloured boxes with the relevant codes display any lower robustness requirement for ease of reference. For example:

Lower robustness level requirements to be complied with:

- OSO1.L.I
- OSO1.L.A

1.21 Following the low robustness level requirements, additional requirements are listed in the same format as above.

Annex B to Article 11

Annex B – AMC1 Strategic Mitigations for Ground Risk

CAA ORS9 Decision No. 46

1. Introduction

1.1 Annex B provides the integrity and assurance requirements for the Applicant's proposed mitigations. The proposed mitigations are intended to reduce the intrinsic Ground Risk Class (iGRC) associated with a given operation. The identification and implementation of the mitigations are the responsibility of the Applicant.

1.2 A proposed mitigation may or may not have a positive effect on reducing the ground risk associated with the operation. In the case where a mitigation is available but does not reduce the ground risk, its level of integrity should be considered "None".

1.3 To achieve a given level of robustness, when more than one criterion exists for that level of robustness, all applicable criteria need to be met, unless specified otherwise.

1.4 If a criterion is not applicable to a mitigation, e.g. passive mitigations do not require training nor activation, the criterion may be ignored.

1.5 Annex B mitigations are primarily applied to the operational volume and ground risk buffer.

1.6 The GRC may not be lowered to a value less than the corresponding value for a controlled ground area.

1.7 A number of requirements, such as those labelled "Technical design", would typically require the support of the UAS or equipment Designer, unless they have already been complied with by the Designer through a SAIL mark certificate. See GM1 to Article 11(6) for further information on RAE-F and SAIL Mark.

1.8 The applicant may claim more points of GRC reduction than indicated in Step 3 of the UK SORA process, when the appropriate orders of magnitude of reduction of the risk to uninvolved people may be demonstrated. Any of these claims should be fulfilled to the high robustness level. For example, a reduction by 3 points to the final GRC may be granted by the CAA for an M2 mitigation if the Applicant may demonstrate a reduction of 3 orders of magnitude of the risk to uninvolved people. This would be achieved by showing a 99.9% reduction of the risk to uninvolved people in Criterion 1, with Criteria 2 and 3 complied with to a high robustness level.

M1A – Strategic mitigation – sheltering

AMC1 Article 11 Annex B. M1A Strategic mitigation – sheltering

CAA ORS9 Decision No. 46

M1A Sheltering – Level of integrity

Criterion	Low	Medium	High
Criterion 1 (Evaluation of people at risk)	M1A.C1.L.I	M1A.C1.L.I M1A.C1.M.I	Not applicable
Criterion 2 (Evaluation of penetration hazard)	M1A.C2.L.I	M1A.C2.L.I	Not applicable

M1A Sheltering – Level of assurance

Criterion	Low	Medium	High
Criterion 1 (Evaluation of people at risk)	M1A.C1.L.A	M1A.C1.L.A M1A.C1.M.A	Not applicable
Criterion 2 (Evaluation of penetration hazard)	M1A.C2.L.A	M1A.C2.L.A	Not applicable

Low level of robustness

M1A.C1.L.I

Criterion 1- Evaluation of people at risk

If the applicant claims a reduction in ground risk due to a sheltered operational environment, the applicant **must**:

(a) Only fly over operational environments which generally consist of structures providing shelter.

(b) Verify that they reasonably expect uninvolved people will be located under or inside a structure.

This mitigation may not be applied when only overflying open-air assemblies of people or areas with no shelter.

M1A.C2.L.I

Criterion 2 – Evaluation of penetration hazard

The applicant **must** use a UA that is not expected to penetrate structures and fatally injure people under the shelter.

M1A.C1.L.A

Criterion 1- Evaluation of people at risk

(a) The Applicant **must** provide evidence of compliance with the integrity requirements.

(b) The evidence should be in the form of a report that describes that the operation is in an environment that has structures providing shelter where people are generally expected to be, and the applicant does not fly over large open-air assemblies of people.

M1A.C2.L.A

Criterion 2 – Evaluation of penetration hazard

The applicant **must** submit a declaration of compliance that the UA used is under 25 kg MTOM.

OR

For UA with MTOM higher than 25 kg, the applicant **must** provide compliance evidence that the required level of integrity is achieved. This should be a report detailing testing, analysis, simulation, inspection, design review or through operational experience.

Medium level of robustness

Lower robustness level requirements to be complied with:

- **M1A.C1.L.I**
- **M1A.C2.L.I**

- **M1A.C1.L.A**
- **M1A.C2.L.A**

Additional requirements to be compiled with:

M1A.C1.M.I

Criterion 1- Evaluation of people at risk

(a) Same as low. In addition, the applicant **must** restrict operating times and demonstrate that an even higher proportion of uninvolved people are sheltered.

M1A.C2.M.I

Criterion 2 – Evaluation of penetration hazard

No additional requirements.

M1A.C1.M.A

Criterion 1- Evaluation of people at risk

(a) Same as Low. In addition, the applicant **must** have time-based restrictions in place and provide compliance evidence to support that a higher proportion of people are sheltered.

Medium robustness M1(A) mitigation may not be combined with M1(B) mitigations.

M1A.C2.M.A

Criterion 2 – Evaluation of penetration hazard

No additional requirements.

GM1 Article 11 Annex B. M1A Strategic mitigation – sheltering

CAA ORS9 Decision No. 46

GM.M1A

M1(A) mitigation relies on the fact that people spend on average very little time outdoors without protection from structures. Therefore, operators of sufficiently small UAS may expect that a large percentage of the population will be sheltered from potential impacts. For larger UAS, the effectiveness of this sheltering assumption must be demonstrated.

Time-based arguments, such as the claim that flying at night reduces risk because fewer people are outdoors, are not applicable at low robustness. However, these arguments are included at medium robustness.

Sheltering at low robustness is considered a generally applicable mitigation based on the environmental characteristics where the UAS is operated. This mitigation does not involve any additional operational restrictions. To avoid double counting, M1(A) medium robustness mitigations may not be combined with any M1(B) mitigations. In contrast, M1 (A) low robustness, which has no operational restrictions, may be combined with M1(B) mitigations.

GM.M1A.C1.L.I

(a) The consideration of this mitigation may vary based on local conditions. The intention is to estimate the proportion of people outside on average and not at a specific time of day or year. There will be times when at specific locations temporarily there are more people exposed, but it should be sufficient to expect that on average the proportion of people exposed outside is below 10%.

GM.M1A.C2.L.I

Guidance on how to evaluate sheltering effect can be found from:

(a) ASSURE UAS Ground Collision Severity Evaluation A4 report section "4.12. Structural Standards for Sheltering (KU)", pages 103 to 111, or

(b) MITRE presentation given during the UAS Technical Analysis and Applications Centre (TAAC) conference in 2016 titled ‘UAS EXCOM Science and Research Panel (SARP) 2016 TAAC Update’ - PR 16-3979.

In general, it may be expected that UAS weighing less than 25 kg are not able to penetrate buildings except in rare cases where the UAS speed or building materials are unusual (tents, glass roofs, etc).

GM.M1A.C1.L.A

(a) For example, a city or town consists generally of structures providing shelter. While it may also include areas that are not sheltered, the mitigation is expected to be provided in most of such cases.

M1B – Strategic mitigation using operational restrictions

AMC1 Article 11 Annex B. M1B Strategic mitigation using operational restrictions

CAA ORS9 Decision No. 46

M1B Operational restrictions – Level of integrity

Criterion	Low	Medium	High
Criterion 1 (Evaluation of people at risk)	Not applicable	M1B.C1.M.I	M1B.C1.M.I
Criterion 2 (Impact on at risk population)	Not applicable	M1B.C2.M.I	M1B.C2.M.I

Criterion	Low	Medium	High
			M1B.C2.H.I

M1B Operational restrictions – Level of assurance

Criterion	Low	Medium	High
Criterion 1 (Evaluation of people at risk)	Not applicable	M1B.C1.M.A	M1B.C1.M.A M1B.C1.H.I
Criterion 2 (Impact on at risk population)	Not applicable	M1B.C2.M.A	M1B.C2.M.A M1B.C2.H.I

Medium level of robustness

M1B.C1.M.I

Criterion 1- Evaluation of people at risk

The applicant **must** provide space-time based restrictions (e.g., flying over a market square when it is not crowded) to substantiate that the actual density of people during the operation is lower than the iGRC. This **must** be done by:

(a) An analysis or appraisal of characteristics of the location and time of operation.

And/or.

(b) Use of temporal density data (e.g., data from a supplemental data service provider) relevant for the proposed area. This may incorporate real time or historical data.

M1B.C2.M.I

Criterion 2 – Impact on at risk population

The at-risk population **must** be lowered by at least 1 iGRC population band (~90%) using one or more methods described in the Level of Integrity for Criterion 1 above.

M1B.C1.M.A

Criterion 1- Evaluation of people at risk

The applicant **must** provide compliance evidence of the data sources and processes used to claim lowering the density of population at risk.

M1B.C2.M.A

Criterion 2 – Impact of at-risk population

The applicant **must** provide compliance evidence that the required level of integrity is achieved. This is typically achieved by means of analysis, simulation, surveys or through operational experience.

High level of robustness

Lower robustness level requirements to be complied with:

- **M1B.C1.M.I**
- **M1B.C2.M.I**
- **M1B.C1.M.A**
- **M1B.C2.M.A**

Additional requirements to be compiled with:

M1B.C1.H.I

Criterion 1- Evaluation of people at risk

No additional requirements.

M1B.C2.H.I

Criterion 2 – Impact on population

The at-risk population **must** be lowered by at least 2 iGRC population bands (~99%) using one or more methods described in the Level of Integrity for Criterion 1 above.

M1B.C1.H.A

Criterion 1- Evaluation of people at risk

No additional requirements

M1B.C2.H.A

Criterion 2 – Impact on population

No additional requirements

GM1 Article 11 Annex B. M1B Strategic mitigation using operational restrictions

CAA ORS9 Decision No. 46

GM.M1B

M1(B) mitigations are intended to reduce the number of people at risk on the ground independently of sheltering. These mitigations are applied pre-flight.

GM.M1B.C1.M.I

Characteristics of the location should be understood as land use that relates to the presence of people, e.g., industrial area, urban park, or shopping centres. Time should be understood as time of day or day of the week that would influence the presence of people, e.g., weekend for industrial plants, night-time, time after opening hours of shops.

M1C – Tactical Mitigations – Ground observation

AMC1 Article 11 Annex B. M1C Tactical Mitigations – Ground observations

CAA ORS9 Decision No. 46

M1C Ground observations – Level of integrity

Criterion	Low	Medium	High
Criterion 1 (Procedures)	M1C.C1.L.I	Not applicable	Not applicable
Criterion 2 (Technical means)	M1C.C2.L.I	Not applicable	Not applicable

M1C Ground observations – Level of assurance

Criterion	Low	Medium	High
Criterion 1 (Procedures)	M1C.C1.L.A	Not applicable	Not applicable
Criterion 2 (Technical means)	M1C.C2.L.A	Not applicable	Not applicable

Low level of robustness

M1C.C1.L.I

Criterion 1- Procedures

(a) The applicant **must** implement a procedure for remote crew members to observe the overflown areas during the operation and identify area(s) of less risk on the ground.

(b) The remote pilot **must** reduce the number of people at risk by adjusting the flight path while the operation is ongoing (e.g., flying away from the area with a higher risk on the ground or overflying only the identified area(s) of less risk on the ground).

M1C.C2.L.I

Criterion 2 – Technical means

If the mitigation is achieved using technical means (e.g., camera(s) mounted on the UA or visual ground observers with radios/phones), these **must** provide data of sufficient quality allowing reliable detection of uninvolved people on the ground.

M1C.C1.L.A

Criterion 1- Procedures

(a) The Applicant **must** provide evidence of compliance with the integrity requirements. The procedure should include:

(1) A clear communication plan, which should use standard phraseology.

(2) Backup procedures in event of a technical issue.

M1C.C2.L.A

Criterion 2 – Technical means

The Applicant **must** provide evidence of compliance with the integrity requirements.

GM1 Article 11 Annex B. M1C Tactical Mitigations – Ground observation

CAA ORS9 Decision No. 46

GM.M1C

M1(C) mitigation is a tactical mitigation where the remote crew or the system may observe most of the overflown area(s), allowing the detection of uninvolved people in the operational area and manoeuvring the UA, so that the number of uninvolved people overflown during the operation is significantly reduced.

M2 – Effects of UA impact dynamics are reduced

AMC1 Article 11 Annex B. M2 Effects of UA impact dynamics are reduced

CAA ORS9 Decision No. 46

M2 Effects of UA impact dynamics are reduced – Level of integrity

Criterion	Low	Medium	High
Criterion 1 (Technical Design)	Not applicable	M2.C1.M.I	M2.C1.M.I M2.C1.H.I
Criterion 2 (Procedures)	Not applicable	M2.C2.M.I	M2.C2.M.I
Criterion 3 (Training)	Not applicable	M2.C3.M.I	M2.C3.M.I

M2 Effects of UA impact dynamics are reduced – Level of assurance

Criterion	Low	Medium	High
Criterion 1 (Technical Design)	Not applicable	M2.C1.M.A	M2.C1.H.A
Criterion 2 (Procedures)	Not applicable	M2.C2.M.A	M2.C2.M.A M2.C2.H.A
Criterion 3 (Training)	Not	M2.C3.M.A	M2.C3.M.A

Criterion	Low	Medium	High
	applicable		

Medium level of robustness

M2.C1.M.I

Criterion 1 – Technical design

(a) Effects of impact dynamics and immediate post-impact hazards, critical area, or the combination thereof, **must** be reduced such that the risk to uninvolved people is reduced by an approximate 1 order of magnitude (90%).

(b) In case of a failure that may lead to a crash, the UAS **must** contain all elements required for the activation of the mitigation.

(c) Any failure of the mitigation itself **must not** adversely affect the safety of the operation.

M2.C2.M.I

Criterion 2 – Procedures

Any equipment used to reduce the effect of the UA impact dynamics **must** be installed and maintained in accordance with the Designer's instructions.

M2.C3.M.I

Criterion 3 – Training

(a) When use of the mitigation requires action from the remote crew, then appropriate training **must** be provided for the remote crew by the operator.

(b) The operator **must** ensure that the personnel responsible (internal or external) for the installation and maintenance of the mitigation measures are qualified for the task.

M2.C1.M.A

Criterion 1 – Technical design

(a) The Applicant **must** provide evidence of compliance with the Integrity requirements.

(b) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

M2.C2.M.A

Criterion 2 – Procedures

(a) The installation and maintenance procedures **must** be developed to a standard or means of compliance acceptable to the CAA.

(b) The adequacy of the procedures **must** be demonstrated through either of the following methods:

(1) Dedicated flight test.

(2) Simulation, provided that the representativeness of the simulation is proven valid for the intended purpose with positive results.

(c) If (a), (b) and Integrity requirements are complied with through a SAIL mark certificate, the applicant **must** demonstrate that the procedures developed by the Designer in (a) are followed by the operator.

(d) The Applicant **must** provide evidence of compliance with the Integrity requirements.

M2.C3.M.A

<u>Criterion 3 – Training</u>

(a) The applicant **must** have developed a training syllabus which **must** be competency based.

(b) The operator **must** provide competency-based, theoretical, and practical training for the remote crew.

(c) Personnel responsible for installation and maintenance of the mitigation measures **must** have completed relevant training.

(d) The Applicant **must** provide evidence of compliance with the Integrity requirements.

AMC.M2.C1.M.A

<u>Criterion 1 – Technical design</u>

(a) A UAS with an MTOM less than or equal to 900g and a maximum speed of 19m/s may provide automatic compliance with the requirement.

AMC.M2.C2.M.A

<u>Criterion 2 – Procedures</u>

(b) The following standard may be used to demonstrate compliance with the requirement:

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

High level of robustness

Lower robustness level requirements to be complied with:

- **M2.C1.M.I**
- **M2.C2.M.I**
- **M2.C2.M.A**
- **M2.C3.M.I**
- **M2.C3.M.A**

Additional requirements to be compiled with:

M2.C1.H.I

Criterion 1 – Technical design

(a) Effects of impact dynamics and immediate post-impact hazards, critical area, or the combination thereof, **must** be reduced such that the risk to uninvolved people is reduced by an approximate 2 orders of magnitude (99%).

(b) The activation of the mitigation **must** be automated.

M2.C2.H.I

Criterion 2 – Procedures

No additional requirements.

M2.C3.H.I

Criterion 3 – Training

No additional requirements.

M2.C1.H.A

Criterion 1 – Technical design

The Integrity requirements **must** be complied with to a standard or means of compliance acceptable to the CAA.

M2.C2.H.A

Criterion 2 – Procedures

(a) The flight tests performed to validate the procedures **must** cover the entire flight envelope or be demonstrated to be conservative.

(b) If (a) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the flight envelope of the intended operation is the same as or contained within the flight envelope considered by the Designer.

M2.C3.H.A

<u>Criterion 3 – Training</u>

No additional requirement.

AMC.M2.C1.H.A

<u>Criterion 1 – Technical design</u>

The following standard may be used to demonstrate compliance with the requirement:

[Standard will be added later]

GM1 Article 11 Annex B. M2 Effects of UA impact dynamics are reduced

CAA ORS9 Decision No. 46

GM.M2

(a) M2 mitigation reduces the effect of ground impact after the control of the operation has been lost. This is achieved either through:

(1) Reducing the probability of lethality of the UA's impact, e.g. energy, impulse, energy transfer dynamics, etc., and/or,

(2) Reducing the size of the expected critical area as shown in the table below, e.g. with the use of parachutes, autorotation, frangibility, stalling the UA to slow the descent and increase the impact angle, etc.

The applicant should demonstrate a required total amount of reduction in either or both factors.

(b) The base assumption in SORA for UAS impact lethality before M2 mitigation is applied is that most impacts are lethal, with the following exceptions:

(1) Impacts from a glide of the UA with a characteristic dimension less than or equal to 1 m.

(2) Impacts from a slide of the UA with a total kinetic energy less than 290 Joules.

The critical area of impact is as defined in the table below, based on the maximum characteristic of the UA. Depending on whether the mitigation is passive, manually activated or automatically activated, the Applicant should provide correspondingly adequate evidence and procedures for a given level of robustness. Reduction of the inherent critical area of a UA by way of analysis is conducted as part of Step 2 of the SORA process and is not part of the M2 mitigation process.

(c) Critical area for each characteristic dimension:

Maximum characteristic dimension (m)	1	3	8	20	40
Critical area (m^2)	6.5s	65	650	6500	65,000

(d) Applicants demonstrating M2 mitigation by reduction of the critical area should use the above values as a baseline for comparison in their proposed mitigation. The Applicant may show a corrected critical area and matching population density, in which case the custom critical area value should be used as the baseline against which the mitigation is assessed, and the custom population density value should be used as a limitation in the operation.

GM.M2.C1.M.I

Criterion 1 – Technical design

(a) Examples of immediate post-impact hazards include fire or release of high energy parts.

The reduction in risk detailed here is equivalent to a “System Risk Ratio” which requires that the combination of functional performance (i.e. the reduction in risk when the mitigation functions as intended) and reliability (i.e. the probability that the mitigation functions as intended) meets the requirement.

Latest research on UAS impacts estimates injuries using the Abbreviated Injury Scale (AIS) developed for automotive impact tests and test dummies. An impact that has a 30% chance of causing an injury of AIS level 3 or greater is estimated to have a 10% probability of death.

The SORA methodology only considers fatalities and does not provide guidance on the injury levels or thresholds beyond which an injury should be considered as a fatality. Further Guidance on how to evaluate impact severity measurement may be found in the following documents:

- DOI 10.1007/s10439-017-1921-6 Ranges of Injury risk associated with impact from UAS.
- ASSURE A4 UAS Ground Collision Severity Evaluation
- ASSURE A14 UAS Ground Collision Severity Evaluation

(b) This excludes failures of the mitigation.

If the mitigation is the frangibility of the UAS structure, all elements required for the activation of it are inherently contained within the UAS.

No single failure should lead simultaneously to the loss of control of the operation and loss of the effectiveness of the M2 mitigation.

(c) This includes inadvertent activation of the mitigation.

GM.M2.C1.M.A

Criterion 1 – Technical design

(a) Compliance evidence is typically provided through testing, analysis, simulation, inspection, design review or through operational experience.

Although not required to achieve a medium level of robustness, the use of industry standards is encouraged when developing mitigations used to reduce the effect of ground impact, e.g. CEN prEN 4709-001, ASTM F3389/F3389M, ASTM F3322-18.

GM.M2.C2.M.A

Criterion 2 – Procedures

(a) Designer data is found on the SAIL mark certificate.

GM.M2.C1.H.I

Criterion 1 – Technical design

(a) No single failure should lead simultaneously to the loss of control of the operation and loss of the effectiveness of the M2 mitigation.

The applicant may still implement a manual activation function, additional to the automated function.

Annex C to Article 11

Annex C – GM1 Strategic Mitigation Collision Risk Assessment

CAA ORS9 Decision No. 46

Determining the final air risk class

1. Overview

1.1 The initial ARC is a generalised qualitative classification of a UAS operational collision risk before any strategic mitigations are applied. Strategic Mitigation consists of procedures and operational restrictions intended to control the crewed aircraft type, encounter rates or time of exposure prior to take-off. Strategic Mitigations may be used to adjust the final ARC into the residual ARC, which is then used to define Tactical Mitigation Performance Requirements (TMPR) and the Specific Assurance and Integrity Level (SAIL).

1.2 Strategic mitigations are broadly subdivided into two categories:

(a) **Mitigation by operational restriction**, which are mitigations that are controlled by the UAS operator, in that they are not reliant on the cooperation of other airspace users to implement an effective mitigation.

(b) **Mitigation by common rules and structures**, which are mitigations that rely on all aircraft within a certain class of airspace to follow the same structure and rules. All aircraft in the airspace must participate, with the specific ruleset defined by the CAA and / or the ANSP.

1.3 Both of these categories are discussed further below, followed by some generic guidelines on the use of strategic mitigations to reduce an initial ARC assignment to a residual ARC.

Strategic mitigation by operational restriction

1.4 Three types of operational strategic mitigations are considered, each discussed below.

1.5 **SM1 - Operational restriction by boundary** – Limiting the UAS BVLOS operation to a boundary limited volume enables the use of airspace characterisation (discussed further in Annex C paragraphs 1.30 to 1.35) to adjust the expectation of traffic types, density and encounter rates beyond that in the generalised flowchart. For example, the generalised Class G assumption that results in an initial ARC-c assignment is due to the unknown traffic density and the potential for many types of crewed aircraft to be encountered, including many types of GA, Helicopter Emergency Medical Service (HEMS), Police, SAR, military, pipeline / powerline survey aircraft, etc. However, it may be possible to demonstrate that a specific remote rural location has a significantly reduced traffic density and / or encounter type from the generalised Class G assumption, potentially supporting a reduction in the ARC.

1.6 **SM2 - Operational restriction by chronology** – Limiting the UAS BVLOS operation to specific times of the day provides a further opportunity for airspace characterisation (discussed further in Annex C paragraphs 1.30 to 1.35) to adjust the expectation of traffic type, density and encounter rates below that expected for the volume as a whole. For example, it may be possible to demonstrate a reduced number of GA VFR flights during the hours of darkness.

1.7 **SM3 - Operational restriction by time of exposure** – Accepting a higher operational risk only for a limited time. An example of this within crewed aviation is the Minimum Equipment List which allows in certain situations a commercial airline to fly for three to ten days with an inoperative Traffic Collision Avoidance System (TCAS). The safety argument is that three days is a very short exposure time compared to the total life-time risk exposure of the aircraft. This short time of elevated risk exposure is justified to allow for the aircraft to return to a location where proper equipage maintenance may take place. Appreciating this may be a difficult argument for the UAS operation to make, the operator is still free to pursue this line of reasoning for a reduction in collision risk by applying a time of exposure argument. The cumulative impact of such a mitigation must be considered.

Strategic mitigation by common rules and structure

1.8 Several types of operational strategic mitigations are considered, each discussed below.

1.9 **SM4 - Special Use Airspace (SUA)**, including:

1.10 Danger Area (DA) / Temporary Danger Area (TDA) – Airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times. This structure may be used to provide segregation within Class G airspace and in controlled airspace over the high seas. A TDA typically only lasts 6 months, although under certain circumstances this may be extended up to 12 months.

1.11 Temporary Segregated Area (TSA) – A TSA is a defined volume of airspace, temporarily segregated and allocated for the exclusive use of a particular user during a determined period of time and through which other traffic will not be allowed to transit. This structure may be used to provide segregation within UK controlled airspace.

1.12 Temporary Reserved Area (TRA) – A TRA is airspace that is temporarily reserved and allocated for the specific use of a particular user during a determined period of time and through which other traffic may or may not be allowed to transit in accordance with the air traffic management arrangements notified for that volume of airspace. The use of a TRA for UAS BVLOS is currently enabled by a CAA policy concept as the current approach for trialling a managed form of integration, based on a bespoke ruleset applied by a controlling ANSP, including the potential for equipment carriage, traffic types and traffic density restrictions.

1.13 **SM5 - Other airspace requirements**, including:

1.14 Transponder Mandatory Zone (TMZ) – A TMZ is airspace of defined dimensions wherein the carriage and operation of pressure-altitude reporting transponders is mandatory (unless operating in compliance with alternative provisions prescribed for that particular airspace by the TMZ Controlling authority that will achieve a cooperative electronic conspicuity environment). Deployment of a TMZ creates a ‘recognised traffic environment’, and assuming appropriate surveillance is available then operation within a TMZ removes non-cooperative traffic from the crewed aircraft encounter set that must be considered by a DAA capability. However, a TMZ alone does not alone require two-way radio communications, provide any control of traffic types or density or imply any form of UTM or air traffic service provision.

1.15 Radio Mandatory Zone (RMZ) – A RMZ is airspace of defined dimension where pilots are required to establish two-way radio communication prior to entry (unless in compliance with alternative provisions prescribed for that area). Operation within a RMZ enables real-time two-way interaction with other air traffic via the appropriate ANSP, which potentially enables strategic mitigation assuming appropriate support agreement from the appropriate ANSP.

1.16 All of the above airspace types are established in accordance with the requirements of the CAA’s Airspace Change Process contained within CAP 1616 and promulgated in the Aeronautical Information Publication (AIP). Where a temporary rather than permanent change to the notified airspace design is required, the procedure in should be followed.

1.17 **SM6 - Pre-agreement of any ANSP services to be used in-flight** – Several potential options for ANSP support are listed below, each of which require review and approval of operating procedures and any potential changes to the usual ANSP functional system:

1.18 Procedure based segregation – For example approving UAS BVLOS operation when it is known that other aircraft are not within the area.

1.19 A Basic Service – is a service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights. This may include weather information, changes of serviceability of facilities, conditions at aerodromes, general airspace activity information, and any other information likely to affect safety. The avoidance of other traffic is solely the pilot's responsibility. Basic Service relies on the pilot avoiding other traffic, unaided by controllers/ FISOs. It is essential that a pilot receiving this service remains alert to the fact that, unlike a Traffic Service and a Deconfliction Service, the provider of a Basic Service is not required to monitor the flight. For these reasons, a DAA system will be required, particularly if this is the sole strategic mitigation.

1.20 Traffic Information - is a surveillance-based service, where in addition to the provisions of a Basic Service, the controller provides specific surveillance derived traffic information to assist the pilot in avoiding other traffic. Controllers may provide headings and/or levels for the purposes of positioning and/or sequencing; however, the controller is not required to achieve deconfliction minima, and the pilot remains responsible for collision avoidance. For these reasons, a DAA system will be required, particularly if this is the sole strategic mitigation.

1.21 Deconfliction Service - is a surveillance-based service where, in addition to the provisions of a Basic Service, the controller will provide specific surveillance derived traffic information and issues headings and/or levels aimed at achieving planned deconfliction minima, or for positioning and/ or sequencing. However, the avoidance of other traffic is ultimately the pilot's responsibility. For these reasons, a DAA system will be required, particularly if this is the sole strategic mitigation. A Deconfliction Service will only be provided to flights under IFR outside controlled airspace, irrespective of meteorological conditions and, as IFR flight is currently only available to certified UAS, is mentioned for awareness of potential future use only.

1.22 Radar Control Service – is provided to all Instrument Flight Rules (IFR) flights in controlled airspace classes A to E. Radar Control Service is a service under which pilots follow mandatory instructions to enable the prescribed separation minima between Air Systems to be maintained. Such mandatory instructions will generally be associated with essential details of conflicting traffic. Pilots will not change heading or level without prior approval of the Radar Controller (except to ensure the safety of the aircraft). As IFR flight is currently not available to civil UAS, radar control service is mentioned for awareness of potential future use only.

1.23 **SM7 - Pre-agreement of any Unmanned Traffic Management (UTM) services to be used in-flight** – Several UTM operational concepts have been proposed with the objective to enable safe and efficient UAS operation within a volume of airspace. A UK CAA policy for UTM is currently under development, which may include one or more of the services listed below. Mitigation via UTM services ahead of CAA UTM policy adoption will be subject to CAA scrutiny on a case-by-case basis. Services that maybe considered include:

(i) Geo-consciousness service – Including provision of mapping data, aeronautical information, meteorological data, etc.

(ii) Common altitude reference provision – Ensuring that altitude or level information is in a format that is harmonised and compatible with existing altitude referencing methods.

(iii) Traffic information service – Using ground infrastructure to detect other air traffic and provide a known or recognised traffic environment as defined in CAP1430, *UK Air Traffic Management Vocabulary*.

1.24 Trajectory deconfliction service – Verifying that the 4D trajectory plans of all aircraft within the area are deconflicted to an appropriate separation minimum. Note that this is distinct from the use of flight plans within crewed aviation, which focus predominantly on airspace capacity and the workload limits of the air traffic controller who provides the required tactical separation and deconfliction services.

(i) Take-off approval service – Validating that an approved deconflicted 4D trajectory is still valid and it is safe to begin the flight.

(ii) Conformance monitoring & alerting service – Based on an approved deconflicted 4D trajectory.

(iii) Conflict monitoring and alerting service – Based on both a surveillance service and an approved deconflicted 4D trajectory.

1.25 Segregation, separation and / or deconfliction instruction or advice service – Using a surveillance capability to maintain separation minima and hence reduce the residual intruder encounter rate.

1.26 **SM8 - NOTAM of intended operation** – Note that while in some locations value may be gained from this approach it is not considered scalable for routine operations. Therefore, the use of NOTAMs may be limited to specific heights, locations or for new or novel operations.

1.27 **SM9 - Military low flying notification** – Military low flying occurs in most parts of the United Kingdom at any height up to 2,000 ft above the surface. However, the greatest concentration is between 250 ft and 500 ft and civil pilots are advised to avoid flying in that height band whenever possible. The Low-Level Civil Aircraft Notification Procedure (CANP) as described within the AIP ENR 1.10 FLIGHT PLANNING allows low level civil aerial operators to notify such activity to military low flying units. Before commencing any low flying sortie, military pilots receive a comprehensive brief on all factors likely to affect their flight, including relevant CANP details.

1.28 **SM10 - Outreach to local flying clubs and pilots** – Airspace characterisation also enables a local flying community in the region of the UAS operational area to be identified, and this may enable coordination and / or direct notification of the UAS operations and vice versa. For example, an agreement could be reached for local flyers to inform the UAS operator of upcoming periods of busier than usual activity, or vice versa.

Description of residual ARCs

1.29 In order to understand the value of different strategic mitigations, a description of the residual ARCs is required. In accordance with the wider SORA methodology, agreement of a residual ARC then results in the assignment of TMPRs that reduce any residual collision risk down to the appropriate target level of safety. Broad descriptions of each residual ARC are as follows:

1.30 **Residual ARC-a**: Encounter rate with other crewed air traffic demonstrated to be negligible, therefore DAA based tactical mitigation of the air risk is not required.

1.31 **Residual ARC-b**: Encounter rate with other crewed air traffic demonstrated to be low and exclusively Type-1 (refer to section 1.112(i) for definition), but not negligible. DAA based tactical mitigation is therefore required but must be supported by one or more additional mitigation layers.

1.32 **Residual ARC-c**: Predominately Type-1 traffic and negligible commercial air transport aircraft, with either an encounter rate that may not be demonstrated to be low enough for ARC-b, or additional supporting strategic mitigations are not available. DAA based tactical mitigation is therefore required and expected to be used routinely rather than occasionally.

1.33 **Residual ARC-d**: Predominately Type-2 traffic (refer to section 1.112(ii) for definition), therefore subject to the highest level of tactical mitigation due to highest severity consequence and highest safety standard airspace. Specific category operations likely to be exceptions (e.g., via certified DAA system) rather than the normal for this ARC.

Generic guidance on the use of strategic mitigations

1.34 This section provides some generic guidance on the application of the strategic mitigations discussed within paragraphs 1.1 to 1.14. To meet the expectations of the residual ARCs described above applicants are encouraged to assess and make use of these strategic mitigations, or others that may be available. However, each application will still be assessed on a case-by-case basis and may not result in credit being given in the form of a reduced residual ARC. Applicants must also consider making use of additional mitigations to further reduce the safety risk to a level that is "as low as reasonably practicable (ALARP).

1.35 Irrespective of the Air Risk Class (ARC), an applicant must initially consider the expected ruleset of the airspace, Section 6 Airspace Classification, proposing changes only if necessary, and with agreement of the ANSP and authority.

1.36 Regarding strategic mitigation by pre-agreement of the use of ANSP services (SM6), it is worth noting that several different levels of service are currently used by crewed aircraft. Within UK airspace the level of service is in accordance with the classification of the airspace. For uncontrolled airspace and for VFR traffic within Class E a range of Flight Information Services may be available as described within

CAP 774, including Basic, Traffic, Deconfliction and Procedural Services. ANSP services within both controlled and uncontrolled airspace typically fall into one of the following categories:

1.37 Separation or deconfliction services – These are used to provide structure to the traffic flow, hence reducing the crewed aircraft encounter rate to below the average traffic density of the operating area. Within crewed aviation an ANSP separation or deconfliction service is supported by a cockpit based ‘see-and-avoid’ layer and hence is not typically a single layer mitigation (unless operating under IMC). A UAS under a normal separation or deconfliction service would therefore generally be required to be supported by a tactical DAA capability, with the performance requirement defined by the encounter types and rates within the operating area.

1.38 Traffic Information services – These are typically used to alert a pilot to the presence of other aircraft, supporting visual acquisition (in support of visual deconfliction) rather than providing real-time intruder tracks for deconfliction. A traffic information service therefore typically only provides a secondary mitigation, alerting a remote pilot to potential traffic, and would therefore need to be supported by a tactical DAA capability, with the performance requirement defined by the encounter types and rates within the operating area.

1.39 It must also be noted that, dependent on the specific class of airspace and other services also being provided, the timeliness of an ANSP service may be affected by the current workload of the Air Traffic Controller or Flight Information Service Officer (FISO). Care must therefore be taken when utilising such services without the cockpit see-and-avoid layer upon which airspace safety is premised. Finally, instructions issued by controllers to pilots operating outside controlled airspace are not mandatory; however, the ATS rely upon pilot compliance with the specified terms and conditions so as to promote a safer operating environment for all airspace users.

1.40 Strategic mitigations suitable for residual ARC-a assignment are as follows:

(i) Segregated airspace, e.g., DA, TDA, TSA.

(ii) Atypical air environment.

1.41 Segregation by procedure. This is not the same as tactical ‘segregation’- i.e. instructions by the Air Traffic Service Unit, issued in order to provide this ‘segregation’ to the UAS. These procedures need to be agreed and promulgated before the operation takes place. An example of segregation by procedure, includes using appropriate operating area surveillance and / or contact requirements to enable UA landing ahead of entry by crewed aircraft into the operating area. Additional requirements may need to be met in order to use segregation by procedure, including requirements for the ANSP that may be triggered as a result of the specific procedure, for example, change of use of airspace..

1.42 However, it should be noted that segregation of UA from crewed aircraft is not considered to be a scalable solution, hence the strategic direction of the CAA, as set out within the Airspace Modernisation Strategy (AMS), is towards integration of UA with crewed traffic.

1.43 Strategic mitigations in support of residual ARC-b assignment include:

1.44 TRA Special Use Airspace, in accordance with CAA's current BVLOS airspace policy concept this airspace structure is currently required where a DAA capability is present, but the UAS is unable to fully comply within the accepted ruleset. Establishment of a TRA also enables use of a bespoke ruleset for all participants, e.g., requiring mandatory contact, carriage of EC, or potentially carriage of EC-In to support detection and avoidance of UAS with limited visual signature by crewed aircraft.

1.45 Restriction by boundary and / or chronology, using airspace characterisation to validate a default low encounter rate and the presence of only Type-1 traffic.

1.46 Density control of crewed traffic, allowing crewed aircraft encounters to be controlled to the required level, and limited to Type-1 only. Note that this may be enabled via either crewed aircraft access request (e.g., within a TRA) or an UAS Operating procedure that prohibits BVLOS flights when the traffic density is too high, which relies either on suitable surveillance or mandatory contact requirement ahead of entry, as potentially available within a CTR or TRA (assuming this is part of the bespoke ruleset).

1.47 Separation or deconfliction service, providing a level of structure to the traffic within the airspace to reduce the expected rate of crewed aircraft encounters below the mean for the area (which may already have been artificially reduced traffic density control).It may be argued that a structured/orderly flow of air traffic could reduce the encounter rate, compared to a ‘random’ flow of air traffic, outside such a structured environment.

1.48 Traffic information service, alerting the remote pilot to the presence of other aircraft, therefore providing a secondary mitigation and enhancement to self-separation.

1.49 Conflict alerting service, alerting the remote pilot to a potential hazard, therefore providing a secondary mitigation and enhancement to self-separation.

1.50 Promulgation of BVLOS UAS activity, for example via NOTAM, CANP and / or outreach to the local flying community, potentially reducing crewed aircraft encounter rate by increasing awareness of UAS and crewed aircraft activity within a specific region.

1.51 Depending on the specificities of the proposed operating area, one or more of the above mitigations may be required to achieve a residual ARC-b assignment. It should be noted that a residual ARC-b assignment provides a limited form of integration of UAS with crewed aircraft, relying on one or more accommodation measures as defined above. Such measures are required to justify a reduction in tactical mitigation performance requirement for DAA below that required for ARC-c, where DAA based tactical mitigation may be the sole replacement for cockpit based ‘see-and-avoid’.

1.52 Mitigations in support of residual ARC-c assignment (from initial ARC-d) are required to demonstrate the absence of both IFR traffic and Type-2 traffic. This may be achieved using an operational restriction by boundary and / or chronology supported by airspace characterisation. Dependent on the airspace classification some form of pre-agreement of ANSP support may also be required.

Airspace characterisation

1.53 Airspace characterisation data is expected to be used at several stages within the UK SORA air risk model. This section defines what is meant by airspace characterisation data, discusses different levels of data integrity, then provides some examples of the expected use.

1.54 Airspace characterisation data allows an applicant to account for local specificities in the proposed operating area, providing a level of granularity beyond the generalised air risk model. Examples of airspace characterisation data that support the UK SORA air risk assessment process include the following:

1.55 Types of aircraft, e.g., typical airspeeds & equipment carriage, potentially defined by different height bands.

1.56 Surveillance coverage, e.g., primary, secondary, ADS-B, multilateration, etc.

1.57 Traffic activity for each type, e.g., traffic movements, density of traffic in a given area, actual positions / paths, nominal encounter rates, e.g., total or per traffic type, airprox reports, TCAS events etc.

1.58 Given the potentially safety critical implications of the use of airspace characterisation data it is important to understand the associated level of integrity of the data source and any processing. The data integrity requirement may be expected to increase with the associated ARC. Three distinct data sources and associated levels of integrity are expected:

(i) ANSPs, based on actual movement numbers and primary and secondary radar data which can be expected to provide historical 4D trajectory information.

(ii) Crowd sourced organisation, such as OpenSky.

(iii) Qualitative local area surveys, e.g., via contacting the local flying communities and estimating typical traffic types, patterns and rates.

1.59 Example usage of airspace characterisation data within the air risk model includes:

(i) Initial Generalised ARC Flowchart guidance, e.g., demonstrating that a proposed operation avoids known IFR structures and / or known VFR traffic.

(ii) Local estimation of encounter types and rates, e.g., supporting a strategic mitigation of operational restriction by boundary, and / or chronology.

(iii) Definition of intruder aircraft encounter sets, used to navigate the air risk model and to assess tactical mitigations, e.g., DAA systems.

(iv) Quantitative cross check of proposed operation against the Target Level of Safety (TLOS). Quantitative methods are not directly considered within this initial version of the air risk model but will be included in a future update.

1.60 Airspace characterisation should also consider the impact of special events on routine traffic patterns. Such events can expect to be promulgated via NOTAM, but airspace characterisation may allow routine events to be identified in advance.

1.61 Finally, the Air Risk task force within the JARUS Safety and Risk Management group are currently developing an airspace risk characterisation document which will provide guidance for regulators, ANSPs and operators on methods for determining intrinsic air risk via airspace characterisation and encounter rate determination. It is expected that this document may be referenced for further information when available.

Annex D to Article 11

Annex D – GM1 Tactical Mitigation Performance Requirements (TMPR)

CAA ORS9 Decision No. 46

1. Introduction

1.1 The target audience for Annex D is the UAS operator who wishes to apply Tactical Mitigation Performance Requirement (TMPR), Robustness, Integrity, and Assurance Levels for their operation. Annex D provides the tactical mitigation(s) used to reduce the risk of a Mid-Air Collision (MAC). The TMPR is driven by the residual collision risk of the airspace. Some of these tactical mitigations may also provide a means of compliance with ICAO Annex 2 section 3.2, codified by the FAA in 14 CFR 91.113, “See & Avoid,” SERA 3201, and additional requirements by various states.

1.2 The Air Risk Model has been developed to provide a holistic method to assess the risk of an air encounter, and to mitigate the risk that an encounter develops in a Mid-Air Collision. The UK SORA Air Risk Model guides the operator, CAA, and/or Air Navigation Service Provider (ANSP) in determining whether an operation may be conducted in a safe manner. This Annex is not intended to be used as a checklist, nor does it provide answers to all the challenges of Detect and Avoid (DAA). The guidance allows an operator to determine and apply a suitable mitigation means to reduce the risk of a Mid-Air Collision (MAC) to an acceptable level. This guidance does not prescriptive requirements but rather objectives to be met at various levels of robustness.

Tactical Mitigations

1.3 Several tactical mitigation options are presented below:

1.4 **TM1 - Operations under VLOS / BVLOS-with-visual-mitigations** – Both VLOS and BVLOS-with-visual-mitigations, following current UK CAA regulations and guidance, are acceptable mitigations for air risk for all ARC levels. The operator is also advised to consider additional means to increase situational awareness with regard to air traffic operating in the vicinity of the operational volume, e.g., via additional tactical mitigations discussed below. In some situations, the CAA and/or ANSP may decide that VLOS does not provide sufficient mitigation for the air risk and may require compliance with additional rules and/or requirements. It is the operator's responsibility to comply with these rules and requirements. Further information on VLOS UAS operations above 400ft, within controlled airspace, may be found in AMC1 UAS.SPEC.040(1)(b).

1.5 **TM2 - Detect and Avoid (DAA) capability** – A UK CAA Policy Concept for the assurance of DAA capabilities is available in CAP3015. Any applicant wishing to use a DAA capability as a tactical air risk mitigation should contact the CAA via uksora@caa.co.uk to obtain further guidance on the review and approval process.

1.6 **TM3 – Carriage of EC out** - enhancing the detectability of the UA to other participants.

1.7 **TM4 - Monitoring VHF radio** - increasing the situation awareness of a UAS pilot of local air traffic. Note that this mitigation may require some degree of training to understand the monitored radio conversations.

1.8 **TM5 - Monitoring local cooperative traffic** - either via low-cost EC receivers or publicly available aircraft tracking applications to increase the situation awareness of an UAS pilot of local air traffic.

1.9 **TM6 - Anti-collision lighting or high visibility colours on the UA** - used to enhance the visual detectability of the UAS by the pilot of a conflicting crewed aircraft or any ground personnel.

1.10 **TM7 - Local area real-time weather monitoring** - helping to anticipate likelihood of unusual crewed-aircraft traffic patterns.

1.11 Depending on the specificities of the proposed operating area, one or more of the above mitigations may be required in addition to DAA requirements. The applicant is also encouraged to follow the As Low As Reasonably Practicable (ALARP) principle and apply more tactical mitigations than are required to meet the minimum requirement, if reasonably practicable to do so.

Annex E to Article 11

Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)

CAA ORS9 Decision No. 46

1. Introduction

1.1 Annex E provides Low/Medium/High assessment requirements for the integrity (i.e. the safety gain) and assurance (i.e. the method of proof) of the Operational Safety Objectives (OSO) to be complied with by an Applicant.

1.2 Where more than one criterion exists for a given level of robustness in an OSO, all the criteria need to be met at the required robustness level in order to comply with the OSO.

1.3 A number of OSOs propose an alternative Functional Test Based (FTB) approach to complying with the OSO criteria.

1.4 Where AMC or GM specifies a letter, it is applicable to the related requirement. E.g. GM.OSO3.L.I (a) is guidance material to the requirement OSO3.L.I (a).

1.5 The CAA will adopt standards to be used as AMC in the future and is actively working with standards bodies. The Applicant may propose AMC to certain requirements to the CAA. The Applicant may consult the following documents to identify standards that they wish to propose to the CAA as AMC:

(i) JARUS SORA 2.5 (where comments identify standards to be used as AMC).

(ii) SHEPHERD D2.1-D3.1 – Identification of satisfactory industry standards and justification for unacceptable industry standards.

(iii) SHEPHERD D2.2-D3.2 – Identification of satisfactory industry standards and justification for unacceptable industry standards.

1.6 The CAA has introduced two new policy concepts; CAP 722J - Recognised Assessment Entity for Flightworthiness (RAE(F)) and CAP 722K - SAIL Mark Policy.

1.7 The RAE(F) policy is intended for use by an entity that is, or wishes to be approved, as an RAE(F). An Applicant may use the services of an RAE(F) to demonstrate compliance with several UK SORA requirements. Full details of which UK SORA requirements may be met using an RAE(F) can be found in CAP 722J.

1.8 The SAIL Mark policy is intended for use by the Designer of an UAS and a RAE(F) to understand the requirements, administrative processes and guidance to enable the delivery of a Specific Assurance and Integrity Level (SAIL) Mark certificate for a UAS to be operated within the Specific Category in the United Kingdom.

OSO 1 - Ensure the UAS Operator is competent and/or proven

AMC1 to Article 11 Annex E Operational Safety Objective 1

CAA ORS9 Decision No. 46

OSO 1 – Ensure the operator is competent and/or proven.

Level of integrity

Criterion	Low (SAIL 2)	Medium (SAIL 3)	High (SAIL 4 to 6)
Technical issue with the UAS	OSO1.L.I	OSO1.L.I OSO1.M.I	OSO1.H.I

Level of assurance

Criterion	Low (SAIL 2)	Medium (SAIL 3)	High (SAIL 4 to 6)
Technical issue with the UAS	OSO1.L.A	OSO1.M.A	OSO1.H.A

Low level of robustness (SAIL 2)

OSO1.L.I

The applicant **must** have knowledge of the UAS and have the following operational procedures:

(a) UA checklists

(b) technical logbook for each UA

(c) flight crew currency and training log

(d) allocation of responsibilities prior to operating

OSO1.L.A

The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

Medium level of robustness (SAIL 3)

Lower robustness level requirements to be complied with:

- **OSO1.L.I**

The applicant **must** have the following additional procedures:

OSO1.M.I

(a) A method to continuously evaluate whether the operator is operating in accordance with the terms of their operational authorisation (OA) and check whether the mitigations proposed as part of the OA are still appropriate.

(b) Occurrence analysis procedures and reporting to the designer in case of design-related in-service events.

OSO1.M.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

AMC.OSO1.M.I

(b) UK Regulation (EU) 2019/947, AMC1 Article 19(2) Safety Information.

High level of robustness (SAIL 4 to 6)

Requirements to be complied with:

OSO1.H.I

The operator **must** have a safety management system in place in accordance with ICAO Annex 19 principles.

OSO1.H.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

GM1 Article 11 Annex E. Operational Safety Objective 1

CAA ORS9 Decision No. 46

GM.OSO1.L.I

(a) The applicant's UAS knowledge should include monitoring of any related airworthiness/safety directives or recommendations issued by National Aviation Authorities and designer recommendations (Service Bulletin, Service Information Letter, etc.). The UAS operator should produce checklists for every stage of the UAS operation to ensure the UAS is safe to be flown. In addition to standard operating procedures, checklists should be produced for contingency and emergency scenarios and maintenance. Checklists should be accessible to the flight crew and easy to use, to prevent human error. If the flight crew consists of only a single remote pilot, critical checklists must be memorised or made accessible in such a way that it does not detract them from operating the UAS in a safe and legal manner. Further guidance may be found by reviewing:

(1) CAP 676 Guidance on the Design, Presentation and Use of Emergency and Abnormal Checklists

(2) CAP 708, Guidance on the Design, Presentation and Use of Electronic Checklists

(b) A technical logbook should be held for each UAS. The technical logbook is used to record all pertinent information relating to the UAS, including operation activities, maintenance, repairs, and upgrades. The logbook should be kept secure and made available for inspection by the CAA for a period of at least three years.

(c) Flight crew currency should be monitored and maintained by the UAS operator. If a remote pilot falls out of currency, a procedure should be in place to regain currency in a safe environment, by practising flight skills for standard operating procedures and contingency and emergency scenarios. The amount of time for this training should, as a minimum, amount to the same amount of time that the remote pilot has lapsed (i.e. if a remote pilot lapses currency by 1 hour, the training flights should equate to 1 hour or more). Further guidance can be found in AMC/GM to Article 8.

The remote pilot should successfully complete this competence training before being tasked on a UAS operation. This competence training should be recorded in the UAS operator's training log. The training log should be used to record any training that the flight crew undertake, either through an RAE or other similar entity, external or internal training. The logbook should be kept secure and made available for inspection by the CAA. The logbook should be kept for a period of at least three years. The UAS operator is responsible for ensuring compliance with the relevant pilot training, competency and logging requirements in UK Reg (EU) 2019/947, OSO 9 and the Operational Authorisation.

(d) The UAS operator should choose a suitably qualified and competent flight crew prior to each UAS operation. The flight crew should be given a briefing by the remote pilot before the UAS operation commences, to ensure each member of the flight crew understand their role and responsibilities. Allocation of flight crew roles and responsibilities for each UAS operation should be recorded in the technical logbook and the flight crew flight logs. The UAS operator is responsible for ensuring that all nominated personnel are sufficiently competent to conduct the flight and ensuring that all nominated personnel are sufficiently briefed on the tasks that they are required to perform.

OSO 2 – UAS manufactured by competent and/or proven entity

AMC1 Article 11 Annex E. Operational Safety Objective 2

CAA ORS9 Decision No. 46

OSO 2 – UAS manufactured by competent and/or proven entity

Level of integrity

Criterion	Low (SAIL 3)	Medium (SAIL 4)	High (SAIL 5, 6)
Technical issue with the UAS	OSO2.L.I	OSO2.L.I OSO2.M.I	OSO2.L.I OSO2.M.I OSO2.H.I

Level of assurance

Criterion	Low (SAIL 3)	Medium (SAIL 4)	High (SAIL 5, 6)
Technical issue with the UAS	OSO2.L.A	OSO2.L.A OSO2.M.A	OSO2.L.A OSO2.M.A OSO2.H.A

Low level of robustness (SAIL 3)

OSO2.L.I

The manufacturing procedures **must** cover:

(a) The specifications of materials used.

(b) The processes necessary to allow for manufacturing repeatability and conformity within acceptable tolerances.

(c) Configuration control.

OSO2.L.A

(a) The manufacturing procedures **must** be developed to a standard or means of compliance acceptable to the CAA.

(b) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

AMC.OSO2.L.A

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

Medium level of robustness (SAIL 4)

Lower robustness level requirements to be complied with:

- **OSO2.L.I**
- **OSO2.L.A**

Additional requirements to be complied with:

OSO2.M.I

The manufacturing procedures **must** cover:

(a) The verification of incoming products, parts, materials, and equipment.

(b) Identification and traceability.

(c) In-process and final inspections, and testing.

(d) Control and calibration of tools.

(e) Handling and storage of all products.

(f) Handling of non-conforming items.

OSO2.M.A

The Applicant **must** provide evidence that each UAS is verified to have been manufactured in conformance to its design.

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

AMC.OSO2.M.I

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

AMC.OSO2.M.A

The Applicant may use a combination of methods such as (but not limited to) physical inspections and flight testing to demonstrate that each requirement listed in the design specification is satisfied by the finished UAS product.

High level of robustness (SAIL 5 and 6)

Lower robustness level requirements to be complied with:

- **OSO2.L.I**
- **OSO2.L.A**
- **OSO2.M.I**
- **OSO2.M.A**

Additional requirements to be complied with:

OSO2.H.I

The manufacturing procedures **must** cover:

(a) Personnel competence and qualifications.

(b) Supplier control.

OSO2.H.A

The manufacturing procedures and conformity of the UAS to its design **must** be recurrently verified through process or product audit.

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

AMC.OSO2.H.I

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

AMC.OSO2.H.A

An audit programme may be established and agreed between the Applicant and the CAA that will allow the CAA to obtain and assess the evidence of conformity during an audit. The frequency of audits may be agreed with the CAA as part of the audit programme.

OSO 3 – UAS maintained by competent and/or proven entity

AMC1 Article 11 Annex E. Operational Safety Objective 3

CAA ORS9 Decision No. 46

OSO 3 – UAS maintained by competent and/or proven entity

Level of integrity

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion	OSO3.L.I	OSO3.L.I OSO3.M.I	OSO3.L.I OSO3.M.I OSO3.H.I

Level of assurance

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion 1 (Procedure)	OSO3.C1.L.A	OSO3.C1.L.A OSO3.C1.M.A	OSO3.C1.L.A OSO3.C1.M.A OSO3.C1.H.A
Criterion 2 (Training)	OSO3.C2.L.A	OSO3.C2.L.A OSO3.C2.M.A	OSO3.C2.L.A OSO3.C2.M.A OSO3.C2.H.A

Low level of robustness (SAIL 1 and 2)

OSO3.L.I

(a) Operator maintenance requirements and maintenance instructions **must** be defined and adhered to.

(b) Maintenance requirements and instructions **must** include those developed by the UAS Designer where applicable.

(c) The maintenance Personnel **must** be competent and **must** have received an authorisation to carry out maintenance on the UAS.

OSO3.C1.L.A

Criterion 1 – Procedures

(a) The maintenance instructions **must** be documented.

(b) Any maintenance conducted on the UAS **must** be recorded in a maintenance log system.

(c) A list of maintenance Personnel authorised to carry out maintenance on the UAS **must** be established and kept up to date.

(d) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

OSO3.C2.L.A

Criterion 2 – Training

(a) A record of all relevant qualifications, experience and/or training completed by the maintenance staff **must** be established and kept up to date.

(b) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

AMC.OSO3.L.I

(b) The Operator may only use the UAS designer requirements and instructions, or may include additional requirements and instructions over and above those of the UAS Designer.

(c) The maintenance may be performed by an organisation other than the Operator (e.g. use of a third party).

Medium level of robustness (SAIL 3 and 4)

Lower robustness level requirements to be complied with:

- **OSO3.L.I**

- **OSO3.C1.L.A**
- **OSO3.C2.L.A**

Additional requirements to be compiled with:

OSO3.M.I

(a) A maintenance programme **must** be developed which includes scheduled preventative maintenance of the UAS, derived from the UAS Designer's scheduled maintenance requirements and adapted to the specificities of the intended operation.

(b) Maintenance and releases to service **must** be recorded in the maintenance log system.

(c) A maintenance release **must** be accomplished by Personnel that have received maintenance release authorisation for that UAS model.

OSO3.C1.M.A

<u>Criterion 1 – Procedures</u>

(a) The layout of the UAS maintenance programme **must** be developed to a standard or means of compliance acceptable to the CAA.

(b) A list of maintenance Personnel authorised to accomplish maintenance releases **must** be established and kept up to date.

(c) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

OSO3.C2.M.A

<u>Criterion 2 – Training</u>

(a) Initial training syllabus and training standard including theoretical/practical elements, duration, etc. **must** be defined and commensurate with the authorisation held by the maintenance staff.

(b) For staff holding an authorisation to release to service, the initial training **must** be specific to the UAS type.

(c) All maintenance staff **must** have undergone initial training.

(d) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

AMC.OSO3.M.I

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

High level of robustness (SAIL 5 and 6)

Lower robustness level requirements to be complied with:

- **OSO3.L.I**
- **OSO3.C1.L.A**
- **OSO3.C2.L.A**
- **OSO3.M.I**
- **OSO3.C1.M.A**
- **OSO3.C2.M.A**

Additional requirements to be compiled with:

OSO3.H.I

A maintenance procedure manual **must** be developed which:

(a) Provides information and procedures relevant to the UAS Operator maintenance facility, records, maintenance instructions, maintenance schedule, release to service, tools, material, components, and defect deferrals.

(b) Is followed by the maintenance personnel to carry out maintenance on the UAS.

OSO3.C1.H.A

Criterion 1 – Procedures

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

OSO3.C2.H.A

Criterion 2 – Training

Same as Medium. In addition:

(a) A programme for recurrent training of staff holding an authorization to release to service **must** be established; and

(b) This programme **must** be validated by a competent third party.

(c) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight. The CAA will validate continuing compliance through oversight.

GM1 Article 11 Annex E. Operational Safety Objective 3

CAA ORS9 Decision No. 46

GM.OSO3.L.I

(a) The maintenance requirements are the needs for maintenance on the UAS, e.g. inspection after hard landing, regular check of lighting system. The Operator ensures that these requirements are covered in the maintenance instructions.

The maintenance instructions are the information establishing how to carry out the needed maintenance or repairs. These instructions are followed by the maintenance staff while performing maintenance.

(b) The UAS Designer maintenance instructions are sometimes referred to as Instructions for Continued Airworthiness (ICA).

GM.OSO3.C1.L.A

Criterion 1 – Procedures

(a) The purpose of the maintenance log is to record all the maintenance performed on the UAS and the reason why it was performed, e.g. defects or malfunctions rectification, modification, scheduled maintenance, etc.

The maintenance log may be requested for inspection/audit by the CAA during oversight activities.

OSO 4 – UAS components are designed to an Airworthiness Standard

AMC1 Article 11 Annex E. Operational Safety Objective 4

CAA ORS9 Decision No. 46

OSO 4 – UAS components are designed to an Airworthiness Standard

Level of integrity

Criterion	Low (SAIL 4)	Medium (SAIL 5)	High (SAIL 6)
Criterion	OSO4.L.I	OSO4.M.I	OSO4.H.I
Alternative FTB method	OSO4.FT.L.I	Not applicable	Not applicable

Level of assurance

Criterion	Low (SAIL 4)	Medium (SAIL 5)	High (SAIL 6)
Criterion	OSO4.L.A	OSO4.M.A	OSO4.H.A
Alternative FTB method	OSO4.FT.L.A	Not applicable	Not applicable

Low level of robustness (SAIL 4)

OSO4.L.I

The UAS components essential to safe operations **must** be designed to an Airworthiness Design Standard considered adequate by the CAA and/or in accordance with a means of compliance acceptable to the CAA to contribute to the overall safety objective of 10^{-4}/FH for the loss of control of the operation.

OSO4.FT.L.I

The applicant **must** conduct at least 30,000 FTB flight hours meeting one of the set of conditions described in FTB policy.

OSO4.L.A

(a) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

(b) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

OSO4.FT.L.A

(a) The FTB flying hours **must** be conducted per a standard or means of compliance acceptable to the CAA.

(b) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

AMC.OSO4.L.I

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

AMC.OSO4.FT.L.A

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

Medium level of robustness (SAIL 5)

Lower robustness level requirements to be complied with:

• None

Additional requirements to be compiled with:

OSO4.M.I

The UAS components essential to safe operations **must** be designed to an Airworthiness Design Standard considered adequate by the CAA and/or in accordance with a means of compliance acceptable to the CAA to contribute to the overall safety objective of 10^{-5}/FH for the loss of control of the operation.

OSO4.M.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

High level of robustness (SAIL 6)

Lower robustness level requirements to be complied with:

• None

OSO4.H.I

The UAS components essential to safe operations **must** be designed to an Airworthiness Design Standard considered adequate by the CAA and/or in accordance with a means of compliance acceptable to the CAA to contribute to the overall safety objective of 10^{-6}/FH for the loss of control of the operation.

OSO4.H.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

GM1 Article 11 Annex E. Operational Safety Objective 4

CAA ORS9 Decision No. 46

GM.OSO4

(a) The UAS components essential to safe operations are those whose failure would significantly impair the capability of the Operator to meet the target level of safety for loss of control of the operation.

(b) Starting at SAIL 4, it is considered that the safety objective associated with the SAIL of the operation (e.g. probability of loss of control of the operation below 10^{-4}/FH for a SAIL 4 operation) may not be achieved without UAS components essential to safe operation being designed to an Airworthiness Design Standard, (unless a Functional Test Based (FTB) approach is chosen).

(c) OSO 4 does not duplicate requirements that are addressed by other design related OSOs. OSO 4 aims at ensuring that the UAS as a whole is designed according to an Airworthiness Design Standard (e.g. the design and construction, structure, flight performance are addressed by the standard), whereas other design related OSOs focus on specific systems or functionalities of the UAS and or specific technical disciplines:

(1) OSO 5 (system safety)

(2) OSO 6 (C3 Link)

(3) OSO 7 (UAS conformity check)

(4) OSO 13 (external services)

(5) OSO 18 (automatic protection of the flight envelope)

(6) OSO 20 (HMI)

(7) OSO 23, 24 (environmental conditions).

GM.OSO4.L.I

The Applicant is free to propose their own Airworthiness Design Standard(s) to the CAA. When aspects of an Airworthiness Design Standard are covered by an OSO (e.g. OSO 5), the OSO requirement takes precedence.

GM.OSO4.L.A

(a) Compliance evidence is typically provided through testing, analysis, simulation, inspection, design review or through operational experience.

OSO 5 – UAS is designed considering system safety and reliability

AMC1 Article 11 Annex E. Operational Safety Objective 5

CAA ORS9 Decision No. 46

OSO 5 – UAS is designed considering system safety and reliability

Level of integrity

Criterion	Low (SAIL 3)	Medium (SAIL 4)	High (SAIL 5, 6)
Criterion	OSO5.L.I	OSO5.L.I OSO5.M.I	OSO5.H.I

Level of assurance

Criterion	Low (SAIL 3)	Medium (SAIL 4)	High (SAIL 5, 6)
Criterion	OSO5.L.A	OSO5.L.A OSO5.M.A	OSO5.L.A OSO5.M.A OSO5.H.A

Low level of robustness (SAIL 3)

OSO5.L.I

The equipment, systems and installations **must** be designed to minimise hazards in the event of a probable failure of the UAS or of any external system supporting the operation.

OSO5.L.A

(a) A Functional Hazard Assessment and a design and installation appraisal **must** be used to demonstrate that hazards are minimized.

(b) If (a) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the external systems used for the intended operation have been considered by the Designer in their compliance to the requirements.

(c) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

AMC.OSO5.L.A

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

The design and installation appraisal may consist of a written justification which includes functional diagrams, describes how the system works and explains why the Integrity requirement is met.

Medium level of robustness (SAIL 4)

Lower robustness level requirements to be complied with:

- **OSO5.L.I**
- **OSO5.L.A**

Additional requirements to be compiled with:

OSO5.M.I

A strategy **must** be developed for the detection, alerting and management of any failure or combination thereof, which may lead to a hazard.

OSO5.M.A

(a) The safety assessment **must** be developed to a standard or means of compliance acceptable to the CAA.

(b) The strategy for detection of single failures of concern **must** include pre-flight checks.

(c) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

AMC.OSO5.M.A

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

High level of robustness (SAIL 5 and 6)

Lower robustness level requirements to be complied with:

- **OSO5.L.A**
- **OSO5.M.A**

Additional requirements to be compiled with:

OSO5.H.I

(a) A major failure condition **must** be no more frequent than Remote.

(b) A hazardous failure condition **must** be no more frequent than Extremely Remote.

(c) A catastrophic failure condition **must** be no more frequent than Extremely Improbable.

(d) A single failure **must not** result in a catastrophic failure condition.

(e) Software and airborne electronic hardware whose development errors could directly lead to a failure affecting the operation in such a way that it may be reasonably expected that a fatality will occur, **must** be developed to a standard or means of compliance acceptable to the CAA.

OSO5.H.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

GM1 Article 11 Annex E. Operational Safety Objective 5

CAA ORS9 Decision No. 46

GM.OSO5

(a) OSO 5 ensures that the contribution of the UAS and any external system supporting the operation to the loss of control of the operation inside the operational volume is commensurate with the acceptable level of risk associated with each SAIL. OSO 5 safety objectives are to be considered in conjunction with the containment safety requirements (Step 10) and, when applicable, the ground risk mitigation requirements (Annex B, and in particular M2 Criterion 1 requirements). In combination, these three sets of safety objectives ensure that whatever the SAIL of the operation, the Target Level of Safety (TLOS) is achieved and no single failure is expected to lead to a catastrophic effect.

(b) Note on SAIL 2 operations: some UAS designs may employ novel or complex features which have limited demonstrable operational history. If such features are identified by the CAA or Applicant, the Applicant may be required to comply with OSO 5 requirements at a low level of robustness.

GM.OSO5.L.I

The Integrity requirement correlates with the contribution of the UAS and external systems to the loss of control of the operation, thus the SAIL of the operation. As an example, at SAIL 3, the contribution of the UAS and external systems to the loss of control of the operation rate may be 10-4/FH, assuming a traditional 10% attribution to technical failures.

The term “hazard” should be interpreted as a failure condition which may lead to a major or hazardous event. Catastrophic events are excluded from SAIL 3 to 4 as the TLOS is considered to be met for SAIL 3 to 4 operations per the previous paragraph and, if applicable, Annex B M2 mitigation requirements.

A probable failure is anticipated to occur one or more times in the entire operational life of the UAS.

External systems supporting the UAS operation are defined as systems that are not an integral part of the UAS, but are used to for example:

- Launch / take-off the UAS.
- Undertake pre-flight checks.
- Support operations of the UA within the operational volume (e.g. GNSS, Satellite Systems, Air Traffic Management, UTM).

GM.OSO5.L.A

(a) When developing the Functional Hazard Assessment, the severity of failure conditions (e.g. no safety effect, minor, major, hazardous) should be determined in accordance with the definitions provided in JARUS AMC RPAS.1309 Issue 2.

(b) Designer data is found on the SAIL mark certificate.

GM.OSO5.H.I (a) (b) (c)

Safety objectives may be derived from JARUS AMC RPAS.1309 Issue 2 Table 3 depending on the UAS class.

GM.OSO5.H.I (e)

Development assurance levels for software and airborne electronic hardware may be derived from JARUS AMC RPAS.1309 Issue 2 Table 3 depending on the UAS class.

OSO 6 – C3 link characteristics

AMC1 Article 11 Annex E. Operational Safety Objective 6

CAA ORS9 Decision No. 46

OSO 6 – C3 link characteristics (e.g. performance spectrum use) are appropriate

Level of integrity

Criterion	Low (SAIL 2, 3)	Medium (SAIL 4)	High (SAIL 5, 6)
Technical issue with the UAS	OSO6.L.I	OSO6.L.I	OSO6.L.I

Criterion	Low (SAIL 2, 3)	Medium (SAIL 4)	High (SAIL 5, 6)
			OSO6.H.I

Level of assurance

Criterion	Low (SAIL 3)	Medium (SAIL 4)	High (SAIL 5, 6)
Technical issue with the UAS	OSO6.L.A	OSO6.M.A	OSO6.M.A OSO6.H.A

Low level of robustness (SAIL 2 and 3)

OSO6.L.I

(a) The performance, RF spectrum usage and environmental conditions for C3 links **must** be adequate to safely conduct the intended operation.

(b) The remote pilot **must** have the means to continuously monitor the C3 performance and to ensure that the performance continues to meet the operational requirements.

OSO6.L.A

The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.
AMC.OSO6.L.I

(a) The use of unlicensed frequency bands may be acceptable under certain conditions, such as:

(1) The Applicant demonstrates compliance with other applicable RF spectrum usage requirements. Further information on spectrum allocation can be found in Ofcom guidance. And,

(2) The Applicant provides evidence of the use of mechanisms to protect against interference (e.g. FHSS frequency deconfliction by procedure).

(b) This may be demonstrated by monitoring the C2 link signal strength and receiving an alert from the UAS HMI if the signal becomes too low (SAIL 2 and 3 only).

Medium level of robustness (SAIL 4)

Lower robustness level requirements to be complied with:

- **OSO6.L.I**

Additional requirements to be compiled with:

OSO6.M.I

No additional requirements.

OSO6.M.A

(a) The C3 link performance **must** be demonstrated per a standard or means of compliance acceptable to the CAA.

(b) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

AMC.OSO6.M.A

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

High level of robustness (SAIL 5 and 6)

Lower robustness level requirements to be complied with:

- **OSO6.L.I**
- **OSO6.M.A**

Additional requirements to be compiled with:

OSO6.H.I

Licensed frequency bands **must** be used for the C2 link.

OSO6.H.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

AMC.OSO6.H.I

Depending on the operation:

The use of non-aeronautical bands (e.g. licensed bands for cellular network) may be acceptable.

The use of bands allocated to the aeronautical mobile service for the use of C2 Link (e.g. 5030 – 5091 MHz) may be required. The use of FSS satellite links may be acceptable. The use of MSS satellite links and particularly AMS(R)S capacity may be required.

GM1 Article 11 Annex E. Operational Safety Objective 6

CAA ORS9 Decision No. 46

GM.OSO6

(a) In this OSO, the term “C3 link” encompasses:

(1) The Command and Control (C2) link, and

(2) Any communication link required for the safety of the flight.

(b) To correctly assess the integrity of this OSO, the applicant should identify:

(1) The C3 links performance requirements necessary for the intended operation.

(2) All C3 links, together with their actual performance and Radio Frequency (RF) spectrum usage.

The specification of performance and RF spectrum for a C2 Link is typically documented by the UAS designer in the UAS manual.

Main parameters associated with Required C2 Link Performance (RLP) and the performance parameters for other communication links (e.g. Required Communication Performance (RCP) for communication with ATC) include, but are not limited to the following:

(i) Transaction expiry time

(ii) Availability

(iii) Continuity

(iv) Integrity

The Applicant should refer to ICAO references for definitions, and to JARUS RPAS “Required C2 Link Performance” (RLP) concept.

(3) The RF spectrum usage requirements for the intended operation (including the need for authorization if required).

The UAS operator should ensure that the radio spectrum used for the C3 Link and for any payload communications complies with the relevant Ofcom requirements and that any licenses required for its operation have been obtained. The operator should ensure that the appropriate aircraft radio licence has been obtained for any transmitting radio equipment that is installed or carried on the aircraft, or that is used in connection with the conduct of the flight and that operates in an aeronautical band. There are no specific frequencies allocated for use by UAS in the UK, however the most used frequencies are 35 MHz, 2.4 GHz and 5.8 GHz.

35 MHz is a frequency designated for model aircraft use only, with the assumption that clubs and individuals will be operating in a known environment to strict channel allocation rules. It is therefore not considered to be a suitable frequency for more general UAS operations (i.e., not in a club environment).

2.4 GHz is an unlicenced band; although this is considered to be more robust to interference than 35 MHz, operators should act with appropriate caution in areas where it is expected that there will be a high degree of 2.4 GHz activity.

5.8 GHz is another unlicensed band. All operations of radio on a UAS including cellular and satellite communications requires registration with Ofcom.

(4) Environmental conditions that might affect the C3 links performance.

GM.OSO6.L.I

(b) The remote pilot should have continuous and timely access to the relevant C3 information that could affect the safety of flight.

GM.OSO6.M.I

Depending on the intended operation:

(a) The use of licensed frequency bands may be required by the CAA.

(b) The use of non-aeronautical bands (e.g. licensed bands for cellular network) may be acceptable.

GM.OSO6.H.I

The use of licensed frequency bands ensures a minimum level of performance and is not limited to aeronautical licensed frequency bands (e.g. licensed bands for cellular network). Nevertheless, some operations may require the use of bands allocated to the aeronautical mobile service for the use of C2 Link (e.g. 5030-5091 MHz) or MSS satellite link.

In any case, the use of licensed frequency bands requires authorisation.

OSO 7 – Conformity check of the UAS configuration

AMC1 Article 11 Annex E. Operational Safety Objective 7

CAA ORS9 Decision No. 46

OSO 7 – Conformity check of the UAS configuration

Level of integrity

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion	OSO7.L.I	OSO7.L.I	OSO7.L.I

Level of assurance

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion 1 (Procedures)	OSO7.C1.L.A	OSO7.C1.L.A OSO7.C1.M.A	OSO7.C1.L.A OSO7.C1.M.A OSO7.C1.H.A
Criterion 2 (Training)	OSO7.C2.L.A	OSO7.C2.M.A	OSO7.C2.M.A OSO7.C2.H.A

Low level of robustness (SAIL 1 and 2)

OSO7.L.I

Conformity check procedures **must** be developed which periodically ensures the following:

(a) The UAS intended to be used for the operation is in a condition for safe operation.

(b) The UAS configuration conforms to the UAS design data, including any design limitations, considered under the approved concept of operation.

OSO7.C1.L.A

Criterion 1 – Procedures

(a) The UAS conformity check procedure **must** include the UAS Designer instructions, if available.

(b) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

OSO7.C2.L.A

Criterion 2 – Training

(a) The remote crew **must** be trained to perform the UAS conformity check.

(b) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

Medium level of robustness (SAIL 3 and 4)

Lower robustness level requirements to be complied with:

- **OSO7.L.I**
- **OSO7.C1.L.A**

Additional requirements to be compiled with:

OSO7.M.I

No additional requirements.

OSO7.C1.M.A

Criterion 1 – Procedures

(a) The UAS conformity check procedures **must** make use of checklists.

(b) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

OSO7.C2.M.A

Criterion 2 – Training

(a) A training syllabus including a UAS conformity check procedure **must** be available.

(b) Evidence of theoretical and practical training **must** be available.

(c) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

High level of robustness (SAIL 5 and 6)

Lower robustness level requirements to be complied with:

- **OSO7.L.I**
- **OSO7.C1.M.A**
- **OSO7.C2.M.A**

Additional requirements to be compiled with:

OSO7.H.I

No additional requirements.

OSO7.C1.H.A

Criterion 1 – Procedures

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

OSO7.C2.H.A

Criterion 2 – Training

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

GM1 Article 11 Annex E. Operational Safety Objective 7

CAA ORS9 Decision No. 46

GM.OSO7

The intent of OSO 7 is that the Operator assures that the configuration of the UAS intended to be used for the operation conforms to the UAS design data considered under the SORA process. This OSO does not describe a pre- or post-flight inspection as part of normal operations, which is addressed in OSO 8.

GM.OSO7.C1.LA

(a) The periodicity of the conformity check should be included in the procedures.

(b) An example of design limitation is the maximum payload mass.

OSO 8 – Operational procedures are defined, validated and adhered to

AMC1 Article 11 Annex E. Operational Safety Objective 8

CAA ORS9 Decision No. 46

OSO 8 – Operational procedures are defined, validated and adhered to

Level of integrity

Criterion	Low (SAIL 1)	Medium (SAIL 2)	High (SAIL 3 to 6)
Criterion 1 (Procedures)	OSO8.C1.L.I	OSO8.C1.L.I	OSO8.C1.L.I
Criterion 2 (Human Error)	OSO8.C2.L.I	OSO8.C2.M.I	OSO8.C2.M.I OSO8.C3.H.I
Criterion 3 (Emergency Response Plan)	OSO8.C3.L.I	OSO8.C3.L.I	OSO8.C3.L.I

Level of assurance

Criterion	Low (SAIL 1)	Medium (SAIL 2)	High (SAIL 3 to 6)
Criterion 1 (Procedures)	OSO8.L.A	OSO8.M.A	OSO8.M.A OSO8.H.A
Criterion 2 (Human Error)	OSO8.L.A	OSO8.M.A	OSO8.M.A OSO8.H.A
Criterion 3 (Emergency Response Plan)	OSO8.L.A	OSO8.M.A	OSO8.M.A OSO8.H.A
FTB	OSO8.FT.L.A	OSO8.FT.L.A	OSO8.FT.L.A

Low level of robustness (SAIL I)

OSO8.C1.L.I

Criterion 1 – Procedures

Operational procedures appropriate for the proposed operation **must** be defined and **must** cover the following elements:

(a) Flight planning (to include multiple locations, if applicable).

(b) Pre and post-flight inspections.

(c) Procedures to evaluate environmental conditions before and during the mission (i.e. real-time evaluation) including assessment of meteorological conditions (METAR, TAF, etc.) with a simple recording system.

(d) Procedures to cope with unintended adverse environmental conditions (e.g. when ice is encountered during an operation not approved for icing conditions).

(e) Normal procedures.

(f) Contingency procedures (to cope with abnormal situations).

(g) Emergency procedures (to cope with emergency situations).

(h) Pre-flight procedures including briefing of any involved persons about the potential risks and actions to take in case of misbehaviour of the UA.

(i) Occurrence reporting procedures.

(j) Any relevant change management/modification procedures. Further information on change management within the context of a UK SORA based authorisation, can be found in CAP 722L.

If available, operational procedures provided by the UAS designer should be utilised.

OSO8.C2.L.I

Criterion 2 – Human Error

The operational procedures **must** provide:

(a) A clear distribution and assignment of tasks.

(b) A checklist to ensure staff are adequately performing assigned tasks.

OSO8.C3.L.I

Criterion 3 – Emergency Response Plan

The (ERP) **must**:

(a) Be suitable for the situations.

(b) Effectively mitigate all anticipated hazardous secondary effects after the initial crash.

(c) Clearly delineate Remote Crew member(s) duties during an emergency.

(d) Be easily accessible and practical to use.

(e) Contain a list of anticipated emergency situations with secondary effects.

(f) Contain procedures for each of the identified anticipated emergency (including criteria to identify each of these situations).

(g) List the relevant contacts (e.g. Air Traffic Control, police, fire brigade, first responders).

In addition, the Remote Crew **must** have received training and may execute the procedures effectively under stress.

OSO8.L.A

Criterion 1, 2, and 3

The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

OSO8.FT.L.A

Criterion 1, 2, and 3 using FTB method

FUNCTIONAL TEST-BASED METHODS (for SAILs up to IV included)

The applicant has evidence of FTB flight hours proportionate to the risk/SAIL of the operation meeting one of the set of conditions described in GM1 Article 11 Annex E. Functional test based (FTB) methodology which have been executed:

(a) Within the full operational scope/envelope intended by the UAS Operator, and

(b) Following the operational procedures referred to in the operational authorization, then the assurance that the operational procedures are adequate is met at the level corresponding to the SAIL being demonstrated by the functional test-based approach.

Medium level of robustness (SAIL 2)

Lower robustness level requirements to be complied with:

- **OSO8.C1.L.I**
- **OSO8.C3.L.I**

Additional requirements to be compiled with:

OSO8.C2.M.I

Criterion 2 – Human Error

The operational procedures **must** take human error into consideration.

OSO8.M.A

Criterion 1, 2, and 3.

(a) Operational procedures and ERP **must** be developed to standards considered adequate by the CAA and/or in accordance with a means of compliance acceptable to the CAA.

(b) Adequacy of the Contingency and Emergency procedures **must** be proven through:

(1) Dedicated flight tests.

(2) Simulation provided the simulation is proven valid for the intended purpose with positive results.

(c) The Applicant **must** provide evidence of compliance with the Integrity requirements.

OSO8.FT.M.A

No additional requirements.

High level of robustness (SAIL 3 to 6)

Lower robustness level requirements to be complied with:

- **OSO8.C1.L.I**

- **OSO8.C3.L.I**
- **OSO8.C2.M.I**
- **OSO8.M.A**

Additional requirements to be compiled with:

OSO8.C2.H.I

Criterion 2 – Human Error

Same as Medium. In addition, the Remote Crew **must** receive Crew Resource Management (CRM) training.

OSO8.H.A

Same as Medium. In addition:

(a) Flight tests performed to validate the procedures and checklists **must** cover the complete flight envelope or **must** be proven to be conservative.

(b) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

OSO8.FT.H.A

No addition requirements.

GM1 Article 11 Annex E. Operational Safety Objective 8

CAA ORS9 Decision No. 46

GM.OSO8

(a) Operational procedures address normal, abnormal, and emergency situations potentially resulting from technical issues with the UAS or external systems supporting UAS operation, human errors or critical environmental conditions.

(b) Standard Operating Procedures (SOP) are a set of instructions covering policies, procedures, and responsibilities set out by the applicant that supports operational personnel in ground and flight operations of the UA safely and consistently during normal situations.

(c) Contingency Procedures are designed to potentially prevent a significant future event (e.g. loss of control of the operation) that has an increased likelihood to occur due to the current abnormal state of the operation. These procedures should return the operation to a normal state and enable the return to using standard operating procedures or allow the safe cessation of the flight.

(d) Emergency Procedures are intended to mitigate the effect of failures that cause or lead to an emergency condition.

(e) The Emergency Response Plan (ERP) deals with the potential hazardous secondary or escalating effects after a loss of control of the operation (e.g., in the case of ground impact, mid-air collision or flyaway) and is decoupled from the Emergency Procedures, as it does not deal with the control of the UA.

GM.OSO8.C1.L.I

(a) A feasibility study shall initially be conducted as part of the flight planning to identify potential hazards. The feasibility study should comprise of the following:

(1) Identification of the Area of Operation (AOO), Take-Off and Landing Area (TOLA), holding/loiter areas and emergency landing areas

(2) Identification of the landowner for Take-Off and Landing (TOAL) and any permissions required

(3) Identification of the airspace, the likely amount of air traffic and any permissions required

(4) Identification of public access points

(5) On site hazards

(6) Offsite hazards

(7) Assessment of the proposed operational volume, to ensure the conditions of the SORA and the OA are met.

(8) Identification, and implementation of any procedures needed in relation to ANSP communication. Further information on these requirements can be found in AMC and GM to UAS.SPEC.040(1)(b).

(b) The UAS system shall be assembled and checked it is safe to be flown by the remote pilot. Materials to assist with this include the following:

(1) Manufacturer's guidance

(2) The user manuals for the UAS, payload and ancillary equipment

(3) In-house procedures and checklists

(c) The following weather conditions shall be checked before flight and monitored throughout the flight:

(1) Wind strength at the operating height

(2) Wind direction

(3) Urban effects (wind shear, vortices, and turbulence)

(4) Precipitation

(5) Visibility

(d) Reserved

(e) Reserved

(f) Reserved

(g) Reserved

(h) The emergency procedures should as a minimum include the following (where applicable):

(1) Abnormal environmental conditions - Visibility

(2) Abnormal environmental conditions - Wind

(3) Air incursion

(4) Air excursion

(5) Control signal loss

(6) Fire

(7) LOC

(8) GNSS signal loss

(9) Ground incursion

(10) Landing gear failure - Fixed wing

(11) Landing gear failure - Multirotor

(12) Loss of control

(13) Power loss - CU

(14) Power loss (partial)

(15) Power loss (full)

(16) Propulsion system loss (full or partial) - Fixed wing

(17) Propulsion system loss (full) - Multirotor

(18) Propulsion system loss (single motor)

(19) Propulsion system loss (multiple motors)

(20) Navigation light failure at night

(21) Pilot incapacitation

(22) Structural failure

(i) The following occurrences shall be reported:

(1) Technical failure:

(i) Technical failure during transfer to/from launch control/mission control stations

(ii) Functional failures

(iii) Loss of C2 Link

(iv) Loss of navigation function CU configuration changes/errors

(v) Loss of communication between remote pilot stations

(vi) Display failures

(vii) Structural failures that resulted in control difficulties or loss of the aircraft

(viii) Airspace infringement

(ix) Any technical failure that resulted in injury to a third party

(2) Human factors

(i) Human error during transfer to/from launch control/mission control stations

(ii) Functional failures of the UAS which led to loss of situational awareness

(iii) Mishandling by the pilot in command including mis-selection of flight parameters via the CU

(iv) Crew resource management failures / confusion

(v) Human errors

(vi) Pilot incapacitation

(vii) Any human error that resulted in injury to a third party

A full list of reportable occurrences can be found in UK Reg (EU) No 2015/1018 (the UK MOR Occurrences Regulation).

(3) Mandatory Occurrence Reporting Scheme (MORS).

All occurrences shall be reported as an MOR within 72 hours in accordance with UK Reg (EU) No 376/2014 (the UK Mandatory Occurrence Reporting Regulation).

MORs are submitted online via ECCAIRS2 web portal: https://aviationreporting.eu/

Any serious accident or incident must also be reported to the Air Accident Investigation Branch:

Air Accidents Investigation Branch

Farnborough House

Berkshire Copse Road

Aldershot HANTS

GU11 2HH

24 hour accident/incident reporting line: +44 (0) 1252 512299

Administration and general enquiries Tel: +44 (0) 1252 510300

Fax: +44 (0) 1252 376999

E-mail: enquiries@aaib.gov.uk

(4) Occurrence investigation.

In the event of an occurrence the UAS operator shall be informed immediately. A full investigation shall be conducted to find out what occurred and why. To aid the investigation, evidence shall be gathered in the form of:

(i) Photographs

(ii) Witness statements

(iii) Digital flight logs

(iv) Onsite paperwork, including the risk assessment

(v) Weather conditions at the time

(5) Occurrence outcome actions

(i) All flight crew will be debriefed about the occurrence to ascertain how and why it happened. The results of the investigation will form the basis of new procedures to prevent the same occurrence happening again. All flight crew will be informed of the investigation outcome and trained in any new procedures.

(j) An operator may wish to make changes to their operation during the course of an OA. These changes may be operational, or technical in nature. Some of these changes may be possible without requiring a new SORA. A change management/modification procedure should be set out to capture how these changes are assessed and logged. Further guidance can be found in CAP 722L.

GM.OSO8.C3.L.I

The Emergency Response Plan (ERP) should be used after an occurrence. The priorities are:

1. Protect uninvolved people
2. Protect property
3. Gather evidence
4. Submit an occurrence report
5. Conduct an investigation
6. Deliver outcome actions to prevent a repeat occurrence

OSO 9 – Remote crew trained and current

AMC1 Article 11 Annex E. Operational Safety Objective 9

CAA ORS9 Decision No. 46

OSO 9 – Remote crew trained and current

Level of integrity

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion 1 (Remote Pilot Competence)	OSO9.C1.L.I	OSO9.C1.L.I	OSO9.C1.L.I
Criterion 2 (Type Training)	OSO9.C2.L.I	OSO9.C2.L.I	OSO9.C2.L.I

Level of assurance

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion 1 (Remote Pilot Competence)	OSO9.C1.L.A	OSO9.C1.M.A	OSO9.C1.H.A
Criterion 2 (Type Training)	OSO9.C2.L.A	OSO9.C2.M.A	OSO9.C2.H.A

Low level of robustness (SAIL 1 and 2)

OSO9.C1.L.I

Criterion 1 – Remote Pilot Competence

(a) The remote pilot **must** have at least the following theoretical knowledge:

(1) Air law.

(2) Aircraft general knowledge.

(3) Human performance and limitations.

(4) Meteorology.

(5) Operational procedures including:

(i) Airspace

(ii) Navigation

(iii) Flight planning

(b) Other members of the flight crew **must** be competent for their assigned tasks

OSO9.C2.L.I

Criterion 2 – Type Training

A training programme **must** be developed by the operator. The training **must** be proportional to the risk of the operation but as a minimum **must** cover the following subjects:

(a) UA specific technical knowledge.

(b) Operator specific procedures including.

(1) Operational procedures and ERP.

(2) ERP.

(c) Use of external services, including service limitations and system recovery if any.

OSO9.C1.L.A

Criterion 1 – Remote Pilot Competence

The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA

OSO9.C2.L.A

Criterion 2 – Type Training

The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

AMC.OSO9.C1.L.I

(a) The remote pilot(s) hold a valid remote pilot competence certificate issued by a CAA approved Recognised Assessment Entity.

(b) The privileges and conditions of the certificate are sufficient for the proposed operation in accordance with UK Regulation (EU) 2019/947 Article 8 AMC(1).

AMC.OSO9.C2.L.I

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

Medium level of robustness (SAIL 3 and 4)

Lower robustness level requirements to be complied with:

- **OSO9.C1.L.I**
- **OSO9.C2.L.I**

Additional requirements to be compiled with:

OSO9.C1.M.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

OSO9.C2.M.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

High level of robustness (SAIL 5 and 6)

Lower robustness level requirements to be complied with:

- **OSO9.C1.L.I**
- **OSO9.C2.L.I**

Additional requirements to be compiled with:

OSO9.C1.H.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

OSO9.C2.H.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

GM1 Article 11 Annex E. Operational Safety Objective 9

CAA ORS9 Decision No. 46

GM.OSO9

OSO 9 is divided into two criteria for UK SORA to consider the remote pilot competence framework.

- C1 sets out how the applicant should demonstrate that remote pilots and crew are competent.
- C2 sets out how the applicant should demonstrate the operator has trained its flight crew on the specific UA type and the operator SOPs.

OSO 13 – External services supporting UAS operations are adequate for the operation

AMC1 Article 11 Annex E. Operational Safety Objective 13

CAA ORS9 Decision No. 46

OSO 13 – External services supporting UAS operations are adequate for the operation

Level of integrity

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3)	High (SAIL 4 to 6)
Criterion (Deterioration of external services supporting UAS operations)	OSO13.L.I	OSO13.L.I	OSO13.L.I

Level of assurance

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion (Deterioration of external services supporting UAS operations)	OSO13.L.A	OSO13.M.A	OSO13.M.A OSO13.H.A

Low level of robustness (SAIL 1 and 2)

OSO13.L.I

(a) The applicant **must** ensure that the level of performance for any externally provided service critical for the safety of the flight is adequate for the intended operation.

(b) If the externally provided service requires communication between the Operator and the Service Provider, the applicant **must** ensure there is effective communication to support the service provisions.

(c) Roles and responsibilities between the applicant and the external Service Provider **must** be defined.

OSO13.L.A

(a) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

(b) The supporting evidence **must** demonstrate that the required level of performance for any externally provided service required for the safety of the flight may be achieved for the full duration of the mission.

AMC.OSO13.L.A

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

Medium level of robustness (SAIL 3)

Lower robustness level requirements to be complied with:

- **OSO13.L.I**

OSO13.M.A

(a) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

(b) The applicant **must** have supporting evidence that the required level of performance for any externally provided service required for the safety of the flight may be achieved for the full duration of the mission.

High level of robustness (SAIL 4 to 6)

Lower robustness level requirements to be complied with:

- OSO13.L.I
- OSO13.M.A

OSO13.H.A

The evidence of the externally provided service performance is achieved through demonstrations.

(a) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

GM1 Article 11 Annex E. Operational Safety Objective 9

CAA ORS9 Decision No. 46

GM.OSO9

OSO 9 is divided into two criteria for UK SORA to consider the remote pilot competence framework.

- C1 sets out how the applicant should demonstrate that remote pilots and crew are competent.
- C2 sets out how the applicant should demonstrate the operator has trained its flight crew on the specific UA type and the operator SOPs.

OSO 16 – Multi crew coordination

AMC1 Article 11 Annex E. Operational Safety Objective 16

CAA ORS9 Decision No. 46

OSO 16 – Multi crew coordination

Level of integrity

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion 1 (Procedures)	OSO16.C1.L.I	OSO16.C1.L.I	OSO16.C1.L.I
Criterion 2 (Training)	OSO16.C2.L.I	OSO16.C2.L.I OSO16.C2.M.I	OSO16.C2.L.I OSO16.C2.M.I

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion 3 (Communication devices)	Not applicable	OSO16.C3.M.I	OSO16.C3.M.I OSO16.C3.H.I

Level of assurance

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion 1 (Procedures)	OSO16.C1.L.A	OSO16.C1.M.A	OSO16.C1.M.A OSO16.C1.H.A
Criterion 2 (Training)	OSO16.C2.L.A	OSO16.C2.M.A	OS16.C2.M.A
Criterion 3 (Communication devices)	Not applicable	OSO16.C3.M.A	OSO16.C3.M.A OSO16.C3.H.A
Alternative FTB method for Criterion 1	OSO16.FT.L.A	OSO16.FT.L.A	Not applicable

Low level of robustness (SAIL 1 and 2)

OSO16.C1.L.I

Criterion 1 – Procedures

(a) The applicant **must** develop procedure(s) to ensure coordination between the crew members and as a minimum cover:

(1) Definition of crew roles and responsibilities

(2) Assignment of tasks to the crew

(3) Communication plan, including the use of correct aviation phraseology between the remote crew members and third parties where applicable.

OSO16.C2.L.I

Criterion 2 – Training

The applicant **must** conduct Remote Crew training which covers multi crew coordination prior to operating.

OSO16.C1.L.A

Criterion 1 – Procedures

The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

The procedure does not need to conform to an industry standard accepted by the CAA, however, it is recommended.

OSO16.C2.L.A

Criterion 2 – Training

The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

The procedure does not need to conform to an industry standard accepted by the CAA, however, it is recommended.

OSO16.FT.L.A

Criterion 1 – Procedures

The applicant **must** provide evidence of FTB flight hours proportionate to the risk/SAIL of the operation meeting one of the set of conditions described in the FTB policy.

(a) Within the full operational scope/envelope of the intended operation, and

(b) Following the operational procedures referred to in the OA application.

Medium level of robustness (SAIL 3 and 4)

Lower robustness level requirements to be complied with:

- **OSO16.C1.L.I**
- **OSO16.C2.L.I**

Additional requirements to be compiled with:

OSO16.C1.M.I

Criterion 1 – Procedures

No additional requirements.

OSO16.C2.M.I

Criterion 2 – Training

(a) Same as Low. In addition, the Remote Crew **must** receive Crew Resource Management (CRM) training.

OSO16.C3.M.I

Criterion 3 – Communication devices

(a) The performance of communication devices **must** be adequate to safely conduct the intended operation.

(b) The remote crew **must** have the means to verify the performance of the communication devices at intervals deemed appropriate to ensure the performance continues to meet the operational requirements.

OSO16.C1.M.A

Criterion 1 – Procedures

The Applicant **must** provide evidence of compliance with Integrity requirements, which will be assessed by the CAA. The procedures **must** meet a standard an accepted by the CAA or AMC.

OSO16.C2.M.A

Criterion 2 – Training

The Applicant **must** provide evidence of compliance with Integrity requirements, which will be assessed by the CAA. The procedures **must** meet a standard accepted by the CAA or AMC.

OSO16.C3.M.A

Criterion 3 – Communication devices

(a) The Applicant **must** provide evidence of compliance with Integrity requirements, which will be assessed by the CAA.

(b) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

(c) If (a), (b) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the performance and limitations of the communication devices provided by the Designer are adequate for the intended operation.

OSO16.FT.M.A

Criterion 1 – Procedures

The Applicant **must** comply with the requirements of OSO16.FT.L.A.

High level of robustness (SAIL 5 and 6)

Lower robustness level requirements to be complied with:

- **OSO16.C1.L.I**
- **OSO16.C2.L.I**
- **OSO16.C1.M.A**
- **OSO16.C2.M.I**
- **OSO16.C2.M.A**
- **OSO16.C3.M.I**

- **OSO16.C3.M.A**

Additional requirements to be compiled with:

OSO16.C1.H.I

Criterion 1 – Procedures

No additional requirements.

OSO16.C2.H.I

Criterion 2 – Training

No additional requirements.

OSO16.C3.H.I

Criterion 3 – Communication devices

(a) The communication devices **must** have redundancy.

(b) The communication devices **must** be developed to a standard or means of compliance acceptable to the CAA.

OSO16.C1.H.A

Criterion 1 – Procedures

(a) The applicant **must** perform flight tests to validate that the procedures cover the complete flight envelope or are proven to be conservative.

(b) Evidence of the procedures, flight tests and simulations will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

OSO16.C2.H.A

Criterion 2 – Training

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

OSO16.C3.H.A

Criterion 3 – Communication devices

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

AMC.OSO16.C3.H.I (b)

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

GM1 Article 11 Annex E. Operational Safety Objective 16

CAA ORS9 Decision No. 46

GM.OSO16

This OSO is only applicable when multiple personnel are directly involved in the flight operation.

GM.OSO16.FT.L.A

The FTB method is an alternative means of compliance with OSO16 Criterion 1 (Procedures) assurance requirements.

Compliance with the requirement provides assurance that the operational procedures are adequate at the level corresponding to the SAIL being demonstrated by the FTB approach.

As an example, if the number of test cycles supporting the FTB flying hours is proportionate to the risk of a SAIL 3 operation (i.e. 3,000 FH), the assurance level for OSO16 Criterion 1 (Procedures) is satisfied at a medium level of robustness.

GM.OSO16.C3.M.A

Criterion 3 – Communication devices

(a) Compliance evidence is typically provided through testing, analysis, simulation, inspection, design review or through operational experience.

(b) Designer data is found on the SAIL mark certificate.

GM.OSO16.C3.H.I

(a) This implies the provision of an extra device to mitigate the risk of failure of the first device.

OSO 17 – Remote crew is fit to operate

AMC1 Article 11 Annex E. Operational Safety Objective 17

CAA ORS9 Decision No. 46

OSO 17 – Remote crew is fit to operate

Level of integrity

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion	OSO17.L.I	OSO17.L.I OSO17.M.I	OSO17.L.I OSO17.M.I OSO17.H.I

Level of assurance

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion	OSO17.L.A	OSO17.L.A OSO17.M.A	OSO17.L.A OSO17.M.A OSO17.H.A

Low level of robustness (SAIL 1 and 2)

OSO17.L.I

(a) The Applicant **must** have a policy defining the criteria and the means for the remote crew to declare themselves fit before starting their duty and report themselves unfit, if required, during their shift.

(b) Where the certificate of remote pilot competence for any crew member requires a formal medical certificate, the applicant **must** have a procedure to periodically check its validity.

OSO17.L.A

(a) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

AMC.OSO17.L.A

(a) A crew briefing including a record of an 'IMSAFE' check for all crew members is sufficient.

Medium level of robustness (SAIL 3 and 4)

Lower robustness level requirements to be complied with:

- **OSO17.L.I**
- **OSO17.L.A**

Additional requirements to be compiled with:

OSO17.M.I

(a) The maximum flight crew duty period and resting times for the remote crew **must** be defined by the applicant and adequate for the operation.

(b) The Operator defines requirements appropriate for the remote crew to operate the UAS.

OSO17.M.A

The Applicant **must** provide evidence of compliance with Integrity requirements which will be assessed by the CAA including:

(a) Remote crew duty, flight duty and the resting times policy is documented.

(b) Remote crew duty cycles are logged and cover at a minimum:

(1) when the remote crew member's duty day commences,

(2) when the remote crew members are free from duties,

(3) resting times within the duty cycle.

AMC.OSO17.M.A

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

High level of robustness (SAIL 5 and 6)

Lower robustness level requirements to be complied with:

- **OSO17.L.A**
- **OSO17.M.A**
- **OSO17.M.I**

Additional requirements to be compiled with:

OSO17.H.I

(a) The remote crew **must** be medically fit for their assigned duties.

(b) The applicant **must** have a Fatigue Risk Management System (FRMS) is in place to manage any escalation in duty/flight duty times.

OSO17.H.A

(a) The applicant **must** use a medical standard(s) considered adequate by the CAA and/or means of compliance acceptable to the CAA.

(b) The FRMS will be assessed by the CAA.

(c) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

GM1 Article 11 Annex E. Operational Safety Objective 17

CAA ORS9 Decision No. 46

GM.OSO17

For this assessment, the expression “fit to operate” should be interpreted as physically and mentally fit to perform duties and discharge responsibilities safely.

Fatigue and stress are contributory factors to human error. Therefore, to ensure vigilance is maintained at a satisfactory level of safety, consideration may be given to the following:

- Remote Crew workload and duty times
- Regular breaks
- Rest periods
- Handover/Take Over procedures
- Personal Protective Equipment (PPE)
- Workplace environment, including ergonomics of the workstation

GM.OSO17.L.I

The regulatory requirement is that remote pilots must not perform their duties under the influence of alcohol. [UAS.SPEC.060(1)(a)].

While no actual limits are specified, because of the more advanced nature of flying in the Specific category, and in particular the requirement to comply with the precise conditions of the operational authorisation, the limits prescribed for manned aviation in Railways and Transport Safety Act 2003 (RTSA 2003) Section 93 should be complied with.

Summary of alcohol limits set out within the RTSA 2003

Level of Alcohol	All UK Nations
Micrograms per 100 millilitres of breath	9
Micrograms per 100 millilitres of blood	20
Micrograms per 100 millilitres of urine	27

Personnel carrying out support functions that are directly related to the safe operation of the UA while in flight, such as unmanned aircraft observers, or airspace observers, should comply with the same limitations.

GM.OSO17.M.I

Fatigue and stress are contributory factors which are likely to increase the propensity for human error. Therefore, to ensure that vigilance is maintained at a satisfactory level in terms of safety, consideration should be given to the following:

- Crew duty times
- Regular breaks
- Rest periods and opportunity for napping during circadian low periods
- Health and Safety requirements
- Handover/Take Over procedures
- The crew responsibility and task/cognitive workload (including the potential for ‘boredom’)
- Ability to mitigate the effects from non-work areas (e.g. financial pressure causing anxiety)

The work regime across the crew should take this into account. Where required, an effective Fatigue Reporting System should be implemented within the organisation to increase awareness of fatigue or stress risks and mitigate them accordingly.

Further information to support Fatigue Management approaches for safety relevant workers can be found in the ICAO Fatigue Management guidance material (Doc. 9966).

OSO 18 – Automatic protection of the flight envelope from Human Errors

AMC1 Article 11 Annex E. Operational Safety Objective 18

CAA ORS9 Decision No. 46

OSO 18 – Automatic protection of the flight envelope from Human Error

Level of integrity

Criterion	Low (SAIL 3)	Medium (SAIL 4)	High (SAIL 5, 6)
Criterion	OSO18.L.I	OSO18.M.I	OSO18.M.I

Level of assurance

Criterion	Low (SAIL 3)	Medium (SAIL 4)	High (SAIL 5, 6)
Criterion	OSO18.L.A	OSO18.M.A	OSO18.M.A OSO18.H.A

Low level of robustness (SAIL 3)

OSO18.L.I

The UAS **must** include an automatic protection of the flight envelope function which prevents a single input from the remote pilot under normal operating conditions from:

(a) Causing the UA to exceed its flight envelope, or,

(b) Preventing the UA from recovering in a timely fashion.

OSO18.L.A

The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

AMC.OSO18.L.A

The automatic protection of the flight envelope may have been developed in-house or may be a commercial off-the-shelf equipment not designed to any specific standard.

Medium level of robustness (SAIL 4)

Lower robustness level requirements to be complied with:

- None

Additional requirements to be compiled with:

OSO18.M.I

The UAS **must** include an automatic protection of the flight envelope function which prevents a single or multiple inputs from the remote pilot under any operating conditions from:

(a) Causing the UA to exceed its flight envelope, or,

(b) Preventing the UA from recovering in a timely fashion.

OSO18.M.A

(a) The automatic protection of the flight envelope function **must** be developed to a standard or means of compliance acceptable to the CAA.

(b) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

AMC.OSO18.M.A

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

High level of robustness (SAIL 5 and 6)

Lower robustness level requirements to be complied with:

- **OSO18.M.A**
- **OSO18.M.I**

Additional requirements to be compiled with:

OSO18.H.I

No additional requirements.

OSO18.H.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

GM1 Article 11 Annex E. Operational Safety Objective 18

CAA ORS9 Decision No. 46

GM.OSO18

UA are designed with a flight envelope that describes their safe performance limits with regard to minimum and maximum operating speeds and operating structural strength.

Automatic protection of the flight envelope is intended to prevent the remote pilot from operating the UA outside its flight envelope. The Applicant may demonstrate that the remote pilot is not in the loop, in which case OSO 18 is not applicable.

The automatic protection function ensures that the UA is operated within an acceptable flight envelope margin even in the case of incorrect remote-pilot control input (human error).

UAS without automatic protection function are susceptible to incorrect remote-pilot control inputs which may result in the loss of the UA if the performance limits of the aircraft are exceeded.

Failures or development errors of the flight envelope protection function are addressed in OSO 5.

GM.OSO18.L.I

An input from the remote pilot causing the UA to exceed its flight envelope or preventing the UA from recovering from a flight envelope exceedance is considered an erroneous input caused by human error.

GM.OSO18.M.I

The multiple inputs should be considered as happening simultaneously or during the time period when the UA is recovering from the first input.

"Any operating conditions" means that both normal and abnormal (including emergency) operating conditions should be considered.

OSO 19 – Safe recovery from Human Error

AMC1 Article 11 Annex E. Operational Safety Objective 19

CAA ORS9 Decision No. 46

OSO 19 – Safe recovery from Human Error

Level of integrity

Criterion	Low (SAIL 3)	Medium (SAIL 4, 5)	High (SAIL 6)
Criterion	OSO19.L.I	OSO19.M.I	OSO19.M.I

Level of assurance

Criterion	Low (SAIL 3)	Medium (SAIL 4, 5)	High (SAIL 6)
Criterion	OSO19.L.A	OSO19.M.A	OSO19.H.A

Low level of robustness (SAIL 3)

OSO19.L.I

The systems detecting and/or recovering from human errors **must** be developed to industry's best practices.

OSO19.L.A

(a) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

(b) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

Medium level of robustness (SAIL 4 and 5)

Lower robustness level requirements to be complied with:

- **OSO19.L.A**

Additional requirements to be compiled with:

OSO19.M.I

The systems detecting and/or recovering from human errors **must** be developed to a standard or means of compliance acceptable to the CAA.

OSO19.M.A

(a) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

(b) Compliance evidence may include testing, analysis, simulation2 , inspection, design review or through operational experience.

High level of robustness (SAIL 6)

Lower robustness level requirements to be complied with:

- **OSO19.L.A**
- **OSO19.M.I**

Additional requirements to be compiled with:

OSO19.H.I

No additional requirements.

OSO19.H.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

OSO 20 – Human Factors evaluation

AMC1 Article 11 Annex E. Operational Safety Objective 20

CAA ORS9 Decision No. 46

OSO 20 – A Human Factors evaluation has been performed and the HMI found appropriate for the mission

Level of integrity

Criterion	Low (SAIL 2, 3)	Medium (SAIL 4, 5)	High (SAIL 6)
Criterion	OSO20.L.I	OSO20.L.I	OSO20.L.I OSO20.H.I

Level of assurance

Criterion	Low (SAIL 2, 3)	Medium (SAIL 4, 5)	High (SAIL 6)
Criterion	OSO20.L.A	OSO20.L.A OSO20.M.A	OSO20.M.A OSO20.H.A
Alternative FTB method	OSO20.FT.L.A	OSO20.FT.L.A (SAIL 4 only)	Not applicable

Low level of robustness (SAIL 2 and 3)

OSO20.L.I

(a) The UAS information and control interfaces **must** be clearly and succinctly presented and **must not** confuse, cause unreasonable fatigue, or contribute to remote crew error that could adversely affect the safety of the operation.

(b) If an electronic means is used to support the remote crew members in their role to maintain awareness of the position of the unmanned aircraft, its HMI:

(1) **Must** be sufficient to allow the remote crew members to determine the position of the UA during operation.

(2) **Must** not degrade the remote crew members' ability to scan the airspace visually where the UA is operating for any potential collision hazard.

(3) **Must** not degrade the remote crew members' ability to maintain effective communication with the remote pilot at all times.

OSO20.L.A

(a) The Applicant **must** conduct a human factors evaluation of the UAS to demonstrate that the HMI is appropriate for the mission.

(b) The HMI evaluation **must** be based on inspection or analysis.

(c) If (a), (b) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the HMI is appropriate for the intended operation.

(d) The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

OSO20.FT.L.A

The applicant **must** provide evidence of FTB flight hours proportionate to the risk/SAIL of the operation meeting one of the set of conditions described in the FTB policy.

(a) Within the full operational scope/envelope of the intended operation, and

(b) Following the operational procedures and the remote crew training referred to in the OA application.

AMC.OSO20.L.A

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

Medium level of robustness (SAIL 4 and 5)

Lower robustness level requirements to be complied with:

- **OSO20.L.I**

Additional requirements to be compiled with:

OSO20.M.I

No additional requirements.

OSO20.M.A

(a) The Applicant **must** conduct a human factors evaluation of the UAS to demonstrate that the HMI is appropriate for the mission.

(b) The HMI evaluation **must** be based on demonstrations or simulations.

(c) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

(d) If (a), (b), (c) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the HMI is appropriate for the intended operation.

(e) The Applicant **must** provide evidence of compliance with Integrity requirements, which will be assessed by the CAA.

OSO20.FT.M.A

The Applicant **must** comply with the requirements of OSO20FT.L.A (SAIL IV only).

AMC.OSO20.M.A

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

High level of robustness (SAIL 6)

Lower robustness level requirements to be complied with:

- **OSO20.L.I**
- **OSO20.M.A**

Additional requirements to be compiled with:

OSO20.H.I

The Human factors evaluation **must** include:

(a) An appraisal to verify that the remote crew workload remains acceptable in both normal and emergency situations.

(b) An appraisal of the efficiency of the emergency procedures in terms of efficacy of the actions and the expected potential latencies.

(c) An analysis to verify the correct prioritisation of alarms in an emergency situation.

OSO20.H.A

(a) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

(b) The CAA may request to witness the HMI evaluation.

GM1 Article 11 Annex E Operational Safety Objective 20

CAA ORS9 Decision No. 46

GM.OSO20.L.A (c)

This may take the form of a report explaining the rationale behind the choice of UAS and aspects of the HMI that make it suitable for the intended operation.

GM.OSO20.FT.L.A

The FTB method is an alternative means of compliance with OSO 20 assurance requirements.

Compliance with the requirement provides assurance that the operational procedures are adequate at the level corresponding to the SAIL being demonstrated by the FTB approach.

As an example, if the number of test cycles supporting the FTB flying hours is proportionate to the risk of a SAIL III operation (i.e. 3,000 FH), the assurance level for OSO 20 is satisfied at a low level of robustness.

GM.OSO20.M.A (d)

This may take the form of a report explaining the rationale behind the choice of UAS and aspects of the HMI that make it suitable for the intended operation.

GM.OSO20.H.I (c)

In an emergency situation, multiple failures may lead to multiple alarms that distract and prevent the remote pilot from determining the appropriate response. If this is the case, alarms of lesser importance might be minimised or ignored by design or procedure.

OSO 23 – Environmental conditions

AMC1 Article 11 Annex E. Operational Safety Objective 23

CAA ORS9 Decision No. 46

OSO 23 – Environmental conditions for safe operations defined, measurable and adhered to

Level of integrity

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion	OSO23.L.I	OSO23.L.I	OSO23.L.I

Level of assurance

Criterion	Low (SAIL 1, 2)	Medium (SAIL 3, 4)	High (SAIL 5, 6)
Criterion	OSO23.L.A	OSO23.M.A	OSO23.H.A

Low level of robustness (SAIL 1 and 2)

OSO23.L.I

(a) Environmental condition for safe operations **must** be defined and reflected in the flight manual or equivalent document.

(b) The defined environmental conditions **must** include those provided by the UAS Designer, if available.

OSO23.L.A

The Applicant **must** declare and provide evidence of compliance with the Integrity requirements. The detailed evidence of compliance may be assessed by the CAA.

Medium level of robustness (SAIL 3 and 4)

Lower robustness level requirements to be complied with:

- **OSO23.L.I**

Additional requirements to be compiled with:

OSO23.M.I

No additional requirements.

OSO23.M.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

High level of robustness (SAIL 5 and 6)

Lower robustness level requirements to be complied with:

- OSO23.L.I

Additional requirements to be compiled with:

OSO23.H.I

No additional requirements.

OSO23.H.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

GM1 Article 11 Annex E. Operational Safety Objective 23

CAA ORS9 Decision No. 46

GM.OSO23

Environmental conditions include meteorological conditions such as wind, rain, and icing, as well as external factors that may interfere with the performance of systems such as High-Intensity Radiated Field (HIRF).

OSO 24 – UAS designed and qualified for adverse conditions

AMC1 Article 11 Annex E. Operational Safety Objective 24

CAA ORS9 Decision No. 46

Level of integrity

Criterion	Not applicable	Medium (SAIL 3)	High (SAIL 4,5, 6)
Criterion	Not applicable	OSO24.M.I	OSO24.H.I

Level of assurance

Criterion	Not applicable	Medium (SAIL 3)	High (SAIL 4,5, 6)
Criterion	Not applicable	OSO24.M.A	OSO24.H.A
Alternative FTB method	Not applicable	OSO20.FT.M.A	OSO24.FT.M.A (SAIL IV only)

Medium level of robustness (SAIL 3)

OSO24.M.I

The UAS **must** be designed to perform as intended in the environmental conditions defined in the flight manual or equivalent document.

OSO24.M.A

(a) The Applicant **must** provide evidence of compliance with the Integrity requirements.

(b) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

(c) If (a), (b) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the environmental conditions of the intended operation have been considered by the Designer.

OSO24.FT.M.A

The applicant **must** provide evidence of FTB flight hours proportionate to the risk/SAIL of the operation, meeting one of the set of conditions described in the FTB policy.

(a) Within the full operational scope/envelope of the intended operation, and

(b) Following the operational procedures and the remote crew training referred to in the OA application.

High level of robustness (SAIL 4, 5 and 6)

Lower robustness level requirements to be complied with:

- None

Additional requirements to be compiled with:

OSO24.H.I

The UAS **must** be developed to a standard or means of compliance acceptable to the CAA.

OSO24.H.A

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

OSO24.FT.H.A

The Applicant **must** comply with the requirements of OSO24FT.M.A (SAIL 4 only).

AMC.OSO24.H.I

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

GM1 Article 11 Annex E. Operational Safety Objective 24

CAA ORS9 Decision No. 46

GM.OSO24

In order to comply with the integrity requirements of OSO24, the Applicant should determine:

- Credit may be taken for equipment's environmental qualification testing, e.g. by answering the following questions:
  - o Is a Declaration of Design and Performance (DDP) available to the Applicant, stating the environmental qualification levels to which the equipment was tested?
  - o Did the environmental qualification tests follow a standard considered adequate by the CAA (e.g. RTCA DO-160 "Environmental Conditions and Test Procedures for Airborne Equipment")?
  - o Are the environmental qualification tests appropriate and sufficient to cover all environmental conditions expected to be encountered during the operations?
  - o If the tests were not performed following a recognised standard, were the tests performed by an organisation or entity qualified or having experience in performing environmental type tests (e.g. RTCA DO-160)?
- Whether the suitability of the equipment to operate in the expected environmental conditions may be determined from either in-service experience or relevant test results?
- Any limitations which may affect the suitability of the equipment to operate in the expected environmental conditions.

The lowest integrity level should be considered where the UAS equipment only has achieved partial environmental qualification and/or a partial demonstration by similarity and/or where parts have no environmental qualification at all.

GM.OSO24.M.I

As an example, if a UAS is proposed to be operated in raining conditions, the UAS design is not required to comply with DO-160 waterproof requirements to demonstrate its suitability to operate in such conditions. The UAS may be operated in raining conditions, as long as they are representative of the environmental conditions which the UAS is designed for.

GM.OSO24.M.A

(a) Compliance evidence is typically provided through testing, analysis, simulation, inspection, design review or through operational experience.

(b) Designer data is found on the SAIL mark certificate.

GM.OSO.FT.24.M.A

The FTB method is an alternative means of compliance with OSO 24 assurance requirements.

Compliance with the requirement provides assurance that the operational procedures are adequate at the level corresponding to the SAIL being demonstrated by the FTB approach.

As an example, if the number of test cycles supporting the FTB flying hours is proportionate to the risk of a SAIL 3 operation (i.e. 3,000 FH), the assurance level for OSO 24 is satisfied at a medium level of robustness.

COR – Containment requirements

AMC1 Article 11 Annex E. Containment requirements

CAA ORS9 Decision No. 46

Level of integrity

Criterion	Low (SAIL 2, 3)	Medium (SAIL 4, 5)	High (SAIL 6)
Criterion 1 (Operational volume containment)	COR.C1.L.I	COR.C1.L.I	COR.C1.H.I
Criterion 2 (End of flight upon exit of the operational volume)	COR.C2.L.I	COR.C2.L.I	COR.C2.L.I
Criterion 3 (Definition of the ground risk buffer)	COR.C3.L.I	COR.C3.M.I	COR.C3.M.I
Criterion 4 (Ground risk buffer containment)	Not applicable	COR.C4.M.I	COR.C4.M.I

Level of assurance

Criterion	Low (SAIL 2, 3)	Medium (SAIL 4, 5)	High (SAIL 6)
Criterion 1 (Operational volume containment)	COR.C1.L.A	COR.C1.L.A COR.C1.M.A	COR.C1.M.A COR.C1.H.A
Criterion 2 (End of flight upon exit of the operational volume)	COR.C2.L.A	COR.C2.L.A COR.C2.M.A	COR.C2.M.A COR.C2.H.A
Criterion 3 (Definition of the ground risk buffer)	COR.C3.L.A	COR.C3.L.A COR.C3.M.A	COR.C3.M.A COR.C3.H.A
Criterion 4 (Ground risk buffer containment)	Not applicable	COR.C4.L.A	COR.C4.H.A

Criterion	Low (SAIL 2, 3)	Medium (SAIL 4, 5)	High (SAIL 6)
		COR.C4.M.A	

Low level of robustness (SAIL 2 and 3)

COR.C1.L.I

Criterion 1 – Operational volume containment

(a) No probable single failure of the UAS or any external system supporting the operation **must** lead to operation outside of the operational volume (qualitative approach), or,

(b) The probability of the failure condition "UA leaving the operational volume" **must** be less than 10-3/FH (quantitative approach).

COR.C2.L.I

Criterion 2 – End of flight upon exit of the operational volume

When the UA leaves the operational volume, an immediate end of the flight **must** be initiated through a combination of procedures and/or technical means.

COR.C3.L.I

Criterion 3 – Definition of the final ground risk buffer

A ground risk buffer **must** be defined which adheres at least to the 1:1 principle, unless the Applicant is able to demonstrate the applicability of a smaller buffer.

COR.C1.L.A

Criterion 1 – Operational volume containment

(a) The compliance evidence **must** at least include a design and installation appraisal which shows that:

(1) The design and installation features, including independence claims, comply with the low integrity requirements.

(2) Particular risks relevant to the intended operation have been addressed and do not violate any independence claim.

(b) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

(c) If (a), (b) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the following aspects considered by the Designer are relevant to the intended operation:

(1) External systems.

(2) The operational volume is the same as or contains the operational volume considered by the Designer.

(3) Particular risks.

(d) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

COR.C2.L.A

Criterion 2 – End of flight upon exit of the operational volume

(a) The adequacy of the procedures to initiate an immediate end of the flight **must** be tested.

(b) If (a) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the procedures developed by the Designer in (a) are followed by the Operator.

(c) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

(d) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

COR.C3.L.A

Criterion 3 – Definition of the final ground risk buffer

(a) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

(b) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

(c) If (a), (b) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the ground risk buffer is the same as or contains the ground risk buffer defined by the Designer.

AMC.COR.C3.L.I

Criterion 3 – Definition of the final ground risk buffer

A smaller than 1:1 ground risk buffer value may be demonstrated by the Applicant for a rotary wing UA using a ballistic methodology approach.

AMC.COR.C1.L.A

Criterion 1 – Operational volume containment

The design and installation appraisal may consist of a written justification which includes functional diagrams, describes how the system works and explains why the Integrity requirement is met.

Medium level of robustness

Lower robustness level requirements to be complied with:

- **COR.C1.L.I**
- **COR.C1.L.A**
- **COR.C2.L.I**
- **COR.C3.L.A**

Additional requirements to be compiled with:

COR.C1.M.I

Criterion 1 – Operational volume containment

No additional requirements.

COR.C2.M.I

Criterion 2 – End of flight upon exit of the operational volume

No additional requirements.

COR.C3.M.I

Criterion 3 – Definition of the final ground risk buffer

The ground risk buffer **must** be developed considering the following aspects:

(a) Probable single failures (including the projection of high energy parts such as rotors and propellers) which may lead to operation outside of the operational volume.

(b) Meteorological conditions.

(c) UA behaviour when activating a technical containment measure.

(d) UA performance.

COR.C4.M.I

Criterion 4 – Ground risk buffer containment

(a) No single failure of the UAS or any external system supporting the operation **must** lead to operation outside of the ground risk buffer.

(b) Software and airborne electronic hardware whose development errors could directly lead to operations outside of the ground risk buffer, **must** be developed to a standard or means of compliance acceptable to the CAA.

COR.C1.M.A

Criterion 1 – Operational volume containment

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

COR.C2.M.A

Criterion 2 – End of flight upon exit of the operational volume

(a) The adequacy of the procedures **must** be demonstrated through either of the following methods:

(1) Dedicated flight test.

(2) Simulation, provided that the simulation is proven valid for the intended purpose with positive results.

(b) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

(c) The Applicant must provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

If (a), (b) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the procedures developed by the Designer in (a) are followed by the Operator.

COR.C3.M.A

Criterion 3 – Definition of the final ground risk buffer

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

COR.C4.M.A

Criterion 4 – Ground risk buffer containment

(a) The compliance evidence **must** at least include a design and installation appraisal which shows that:

(1) The design and installation features, including independence claims, comply with the low integrity requirements.

(2) Particular risks relevant to the intended operation have been addressed and do not violate any independence claim.

(b) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

(c) If (a), (b) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the following aspects considered by the Designer are relevant to the intended operation:

(1) External systems.

(2) The operational volume is the same as or contains the operational volume considered by the Designer.

(3) The ground risk buffer is the same as or contains the ground risk buffer defined by the Designer.

(4) Particular risks.

(d) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

AMC.COR.C4.M.I

Criterion 4 – Ground risk buffer containment

(a) One of the following methods may be used to demonstrate compliance with the requirement:

(1) An independent flight termination system which initiates the end of the flight when exiting the operational volume.

(2) A secondary independent emergency flight control system which ends the flight in a controlled manner.

(3) A tether which prevents the UA from exiting the ground risk buffer.

(4) A fail-safe health monitoring system which is triggered in the event of a critical feature failure (e.g. navigation).

(b) "Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

AMC.COR.C4.M.A

Criterion 4 – Ground risk buffer containment

The design and installation appraisal may consist of a written justification which includes functional diagrams, describes how the system works and explains why the Integrity requirement is met.

High level of robustness

Lower robustness level requirements to be complied with:

- **COR.C1.L.A**
- **COR.C2.L.I**
- **COR.C2.M.A**
- **COR.C3.M.I**
- **COR.C3.L.A**
- **COR.C4.M.I**
- **COR.C4.M.A**

Additional requirements to be compiled with:

COR.C1.H.I

Criterion 1 – Operational volume containment

No remote single failure of the UAS or any external system supporting the operation **must** lead to operation outside of the operational volume (qualitative approach), or,

The probability of the failure condition “UA leaving the operational volume” **must** be less than 10^{-4}/FH (quantitative approach).

COR.C2.H.I

Criterion 2 – End of flight upon exit of the operational volume

No additional requirements.

COR.C3.H.I

Criterion 3 – Definition of the final ground risk buffer

No additional requirements.

COR.C4.H.I

Criterion 4 – Ground risk buffer containment

No additional requirements.

COR.C1.H.A

Criterion 1 – Operational volume containment

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

COR.C2.H.A

Criterion 2 – End of flight upon exit of the operational volume

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

COR.C3.H.A

Criterion 3 – Definition of the final ground risk buffer

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

COR.C4.H.A

Criterion 4 – Ground risk buffer containment

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

AMC.COR.C1.H.I

Criterion 1 – Operational volume containment

A tether which prevents the drone from exiting the operational volume may be used to demonstrate compliance with the requirement.

GM1 Article 11 Annex E. Containment requirements

CAA ORS9 Decision No. 46

GM.COR

Determination of containment requirements addresses the risk posed by an operational loss of control that may infringe on areas adjacent to the operational volume and buffers. The level of risk inherent to the adjacent area and adjacent airspace drives the level of containment robustness to be achieved by containment design features and operational procedures.

The following section provides the containment requirements for the following 3 levels of robustness: low, medium and high.

GM.COR.C1.L.I

Criterion 1 – Operational volume containment

A probable failure is anticipated to occur one or more times in the entire operational life of the UAS.

GM.COR.C3.L.I

Criterion 3 – Definition of the final ground risk buffer

The 1:1 principle refers to applying a ground risk buffer that is as wide as the maximum height of the operational volume.

The 1:1 rule may not be sufficient to meet the target level of safety for some UA configurations (e.g., fixed-wing UA, UA equipped with a parachute). In such cases, the CAA may require defining the ground risk buffer based on a ballistic methodology approach, a glide trajectory, representative flight tests, and/or a combination thereof.

GM.COR.C1.L.A

Criterion 1 – Operational volume containment

(a) Particular risks are physical risks/hazards which originate from a source external to the UAS. Particular risks are able to effect:

(1) Both UAS structures and systems.

(2) One or more UAS sections, and even the entire UAS.

(3) One or more aircraft functions.

(4) One or more aircraft systems.

(5) One or more aircraft system installations.

(b) In other words, a particular risk may violate an independence claim made in the design (e.g. through claiming separation or redundancy of 2 or more systems or functions), which would not be captured by a hazard assessment performed within the boundaries of the UAS.

(c) Examples of particular risks are: hail, ice, snow, bird strike, lightning strike, high intensity radiated fields (e.g. electro-magnetic interference). More details on particular risk may be found in SAE ARP4761A.

(d) If the design and installation appraisal is developed by the Designer, the Designer should develop a set of assumptions for the particular risks which the UAS is expected to be exposed to in the conditions in which the UAS will be cleared to operate. The Designer should then use these assumptions in their compliance evidence data.

(e) Designer data is found on the SAIL mark certificate.

(f) Compliance evidence is typically provided through testing, analysis, simulation, inspection, design review or through operational experience.

GM.COR.C2.L.A

Criterion 2 – End of flight upon exit of the operational volume

(b) Designer data is found on the SAIL mark certificate.

(c) Compliance evidence is typically provided through testing, analysis, simulation, inspection, design review or through operational experience.

GM.COR.C3.L.A

Criterion 3 – Definition of the final ground risk buffer

(a) Compliance evidence is typically provided through testing, analysis, simulation, inspection, design review or through operational experience.

(b) Designer data is found on the SAIL mark certificate.

GM.COR.C3.M.I

Criterion 3 – Definition of the final ground risk buffer

(a) A probable failure is anticipated to occur one or more times in the entire operational life of the UAS.

(b) One example of a meteorological condition is the maximum sustained wind.

GM.COR.C2.M.A

Criterion 2 – End of flight upon exit of the operational volume

Compliance evidence is typically provided through testing, analysis, simulation, inspection, design review or through operational experience.

(c) Designer data is found on the SAIL mark certificate.

GM.COR.C4.M.I

Criterion 4 – Ground risk buffer containment

(a) See GM.CORC1.L.A (a).

(b) Designer data is found on the SAIL mark certificate.

(c) Compliance evidence is typically provided through testing, analysis, simulation, inspection, design review or through operational experience.

GM.COR.C1.H.I

Criterion 1 – Operational volume containment

A remote failure is unlikely to occur in the entire operational life of a single UAS but is anticipated to occur several times when considering the total operational life of a number of UAS of that type.

The quantitative requirement to achieve a high level of integrity is a reduction by a factor of 10 of the likelihood of exiting the operational volume, when compared with the quantitative requirement to achieve a low or medium level of integrity.

COT – Containment requirements (Tethered operations)

AMC1 Article 11 Annex E. Containment requirements (tether)

CAA ORS9 Decision No. 46

Level of integrity

Criterion	Low (SAIL 2, 3)	Medium (SAIL 4, 5)	High (SAIL 6)
Criterion 1 (Technical design)	COT.C1.L.I	COT.C1.L.I	COT.C1.L.I
Criterion 2 (Procedures)	COT.C2.L.I	COT.C2.L.I	COT.C2.L.I

Level of assurance

Criterion	Low (SAIL 2, 3)	Medium (SAIL 4, 5)	High (SAIL 6)
Criterion 1 (Technical design)	COT.C1.L.A	COT.C1.L.A	COT.C1.L.A
Criterion 2 (Procedures)	COT.C2.L.A	COT.C2.M.A	COT.C2.M.A COT.C2.H.A

Low level of robustness

COT.C1.L.I

Criterion 1 – Technical design

(a) The length of the tether **must** be adequate to contain the UA within the operational volume.

(b) The strength of the line **must** be compatible with the ultimate loads during the operation.

(c) The strength of the tether attachment points **must** be compatible with the ultimate loads expected during the operation.

(d) It **must not** be possible for the tether to be cut by a rotating propeller.

COT.C2.L.I

Criterion 2 – Procedures

Procedures **must** be developed to install and periodically inspect the condition of the tether.

COT.C1.L.A

Criterion 1 – Technical design

(a) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA.

(b) Compliance evidence **must** include the tether material specifications.

(c) If compliance evidence is provided through simulation, the validity of the target environment used in the simulation **must** be justified.

(d) If (a), (b), (c) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that:

(1) The length of the tether is adequate to contain the UA within the intended operational volume.

(2) The ultimate loads considered by the Designer will not be exceeded during the intended operation.

COT.C2.L.A

Criterion 2 – Procedures

(a) The Applicant **must** provide evidence of compliance with Integrity requirements, which will be assessed by the CAA.

(b) If simulation is used to demonstrate the adequacy of the procedures, the simulation **must** be proven valid for the intended purpose with positive results.

(c) If (a), (b) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the procedures provided by the Designer are followed by the Operator.

Medium level of robustness

Lower robustness level requirements to be complied with:

- **COT.C1.L.I**
- **COT.C1.L.A**
- **COT.C2.L.I**
- **COT.C3.L.A**

Additional requirements to be compiled with:

COT.C1.M.I

Criterion 1 – Technical design

No additional requirements.

COT.C2.M.I

Criterion 2 – Procedures

No additional requirements.

COT.C1.M.A

Criterion 1 – Technical design

The Applicant **must** provide evidence of compliance with Integrity requirements, which will be assessed by the CAA.

COT.C2.M.A

Criterion 2 – Procedures

(a) The procedures **must** be developed to a standard or means of compliance acceptable to the CAA.

(b) The adequacy of the procedures **must** be demonstrated through either of the following methods:

(1) Dedicated flight test.

(2) Simulation, provided that the simulation is proven valid for the intended purpose with positive results.

(c) The Applicant **must** provide evidence of compliance with Integrity requirements, which will be assessed by the CAA.

AMC.COT.C2.M.A

Criterion 2 – Procedures

"Annex E – AMC 1 Integrity and assurance levels for the Operational Safety Objectives (OSO)" on page 310 paragraph 1.5 provides further information about proposing a standard as an AMC.

High level of robustness

Lower robustness level requirements to be complied with:

- **COT.C1.L.I**
- **COT.C1.L.A**
- **COT.C2.L.I**
- **COT.C2.L.A**
- **COT.C2.M.A**

Additional requirements to be compiled with:

COT.C1.H.I

Criterion 1 – Technical design

No additional requirements.

COT.C2.H.I

Criterion 2 – Procedures

No additional requirements.

COT.C1.H.A

Criterion 1 – Technical design

The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

COT.C2.H.A

Criterion 2 – Procedures

(a) The flight tests performed to validate the procedures **must** cover the entire flight envelope or be demonstrated to be conservative.

(b) If (a) and Integrity requirements are complied with through a SAIL mark certificate, the Applicant **must** demonstrate that the flight envelope of the intended operation is the same as or contained within the flight envelope considered by the Designer.

(c) The Applicant **must** provide evidence of compliance with the Integrity requirements, which will be assessed by the CAA. The CAA will validate continuing compliance through oversight.

GM1 Article 11 Annex E. Containment requirements (tether)

CAA ORS9 Decision No. 46

GM.COT

This section provides the containment requirements which address the specific use of a tether, for the following 3 levels of robustness: low, medium and high.

This section is an alternative to COT – Containment requirements.

GM.COT.C1.L.I

Criterion 1 – Technical design

(b) Ultimate loads are the maximum loads expected to be exerted by the UAS on the tether during the operation, including all possible nominal and failure scenarios, and multiplied by a safety factor of 1.5.

GM.COT.C2.L.I

Criterion 2 – Procedures

(a) Designer procedures should be followed by the Operator where available.

GM.COT.C1.L.A

Criterion 1 – Technical design

(a) Compliance evidence is typically provided through testing or operational experience.

(b) Designer data is found on the SAIL mark certificate.

GM.COT.C2.L.A

Criterion 2 – Procedures

(c) Designer data is found on the SAIL mark certificate.

GM.COT.C2.H.A

Criterion 2 – Procedures

(b) Designer data is found on the SAIL mark certificate.

GM1 Article 11 Annex E. Functional test based (FTB) methoology

CAA ORS9 Decision No. 46

GM.FTB

(a) The FTB methodology is used in the following situations:

(1) For the UAS Designer to conduct an FTB design appraisal, which demonstrates the UAS operational reliability.

(2) For the UAS Operator to take credit from the FTB design appraisal conducted by the UAS Designer to show compliance with the relevant OSOs. This has the benefit for the UAS Operator going through the OA process to provide automatic compliance with a number of OSOs, in particular when the Operator does not have a fully established relationship with the Designer or does not have access to the UAS design data.

(3) For the UAS Operator to demonstrate safe and successful operations over time in order to expand their operational approval, based on the concept of “reliability growth model”.

(4) The FTB methodology is not considered feasible for UAS operations with a SAIL above V.

These three approaches are detailed in the following sections.

(b) The UAS Designer may use the FTB methodology to conduct an FTB design appraisal, which demonstrates the UAS operational reliability. The following aspects should be considered in applying the FTB methodology:

(1) Functional testing should be conducted, which may be divided into two types:

(i) ‘Functional tests’ are operational test cycles that are fully representative of end-state operations, with test points that verify safe operation at the operational limits and corners of the UA envelope.

(ii) ‘Induced failure tests’, which typically address demand-based systems, i.e. systems that are not continuously active and are triggered only under certain failure conditions. These tests are required where functional tests alone are not sufficient to demonstrate operational reliability, e.g. to cover likely failures.

(c) Although ASTM F3478-20 is not an officially accepted standard, it provides useful guidance for the development and deployment of an FTB campaign. Topics discussed in ASTM F3478-20 include:

(1) Development of operational flight tests, as well as specific (ground) testing to verify underlying system parameters statistically, e.g. component and UA MTBF, operational hazard rates, parachute reliability. Both the UAS Designer and the competent authority need to understand the assumptions made when attributing a distribution type to a system parameter (e.g. exponential, normal, Weibull, gamma distributions).

(i) Any infringement or loss of control occurring during the test campaign will require a root cause analysis. If design modifications are necessary following the investigation, an analysis is performed to assess whether the FTB flying hours performed prior to the modification may still be considered valid. Some tests or the entire FTB campaign might have to be reconducted.

(ii) UAS Designers and competent authorities should be cognisant of the systems, such as software or airborne electronic hardware-based systems that do not allow accurate analysis under operational time or demand-based testing. These systems should use system-specific analyses (e.g. multiple condition/decision coverage, model checking, development assurance, design and analysis) appropriate to the SAIL level.

(d) The CAA may grant a specific flight test authorisation to conduct the functional and induced failure tests needed to complete the FTB campaign.

(e) The UAS Operator may take credit from the FTB design appraisal conducted by the UAS Designer to show compliance with the relevant OSOs. To do so, the following conditions need to be met:

(1) The functional tests performed by the Designer cover the full operational scope/envelope intended by the Operator.

(2) The functional tests performed by the Designer have been executed following the operational procedures and the remote crew training referred to in the operational authorisation, which meet the integrity assurance of the associated OSOs.

(3) The Operator’s maintenance instructions are established based on the Designer’s instructions and requirements which were used for maintenance, repair, or replacement of UAS sub-systems during the functional tests performed by the Designer.

(4) Any deviation in the UAS configuration from the configuration used by the Designer during the FTB campaign are confirmed by the Designer to not impair the validity of the FTB design appraisal.

(5) The minimum number of test cycles has been achieved for the corresponding SAIL, with no failure occurrence:

(i) 30 hours for SAIL 1;

(ii) 300 hours for SAIL 2;

(iii) 3000 hours for SAIL 3; and

(iv) 30000 hours for SAIL 4

Note: this allows achieving a factor of 95% confidence in the reliability of the operation per a binomial/Poisson distribution.

(6) The functional tests performed by the Designer have been executed by the Designer according to principles or standards considered adequate by the CAA, including the following:

(i) The functional tests have been executed using an acceptable sample size of UAS.

(ii) Safe life limits for UAS sub-systems sensitive to wear-out conditions based on the maximum cycles and hours demonstrated by one or more fleet leader UAS (i.e. the UAS with the longest time and/or cycles compared to other UAS used during the FTB campaign) have been derived by the Designer and captured in the FTB design appraisal limitations.

Note: induced failure tests may also help demonstrate compliance with the following OSOs:

(iii) OSO 5 and Containment requirements: safety and reliability / safe design (e.g. induced failure tests with no loss of control or containment as pass-fail criteria).

(iv) OSO 6: C3 link performance appropriate for the operation (e.g. if the distance from a C2 radio transmitter/receiver is a critical factor, then the demonstration of the maximum allowable range from the transmitter/receiver in the most likely worst-case conditions is needed).

(v) OSO 18: Automatic protection of the flight envelope from human errors.

(f) The UAS Operator may use the FTB methodology to demonstrate safe and successful operations over time in order to expand their operational approval, based on the concept of “reliability growth model”, as follows:

(1) The UAS Operator should operate with a low SAIL approval and then, through operational experience, gather sufficient operational data to justify an increase in the SAIL based upon the increase in operational reliability demonstrated. This approach is only valid under representative operating conditions, without requesting additional strategic or tactical mitigations.

(i) The CAA may accept accumulation of FTB hours between Operators if the UAS configuration, operational procedures, training, etc. are demonstrated to be equivalent.

(ii) This method does not cover expanded operating conditions, which would require additional testing and/or analysis to be performed by the UAS Designer.

(iii) As an example, the Operator may start operating with a SAIL 2 operational approval to fly over a population density of up to 500 people per km^2. As they demonstrate 3,000 hours of operation with no loss of control, they may be approved by the CAA to operate at SAIL 3 under the exact same operating conditions, with an allowable maximum population density increased to 5,000 people per km^2.

(iv) The UAS Operator should demonstrate that:

(A) the next population band does not introduce new hazards. If new hazards are introduced, they should be mitigated through test or analysis.

(B) The conditions listed in (e) have been met, in particular the minimum number of test cycles required for the desired SAIL per (e)(5).

(C) any UAS configuration differences compared to the initial configuration do not impair the validity of the argument.

Annex A to Article 16

UAS Operations in the Framework of Model Aircraft Clubs and Associations

Due to the size of the AMC and GM for Article 16, it has been included as an Annex to this document.

GM1 Article 16 Definition of a Model Aircraft

CAA ORS9 Decision No. 16

DEFINITION OF A MODEL AIRCRAFT

The CAA has adopted the following two definitions:

Model Aircraft – An UA used for sporting and recreational purposes, flown by direct control inputs made by the RP without any autonomous capability other than for flight stabilisation purposes.

Note:

> The definition of a model aircraft may include multi-rotor type 'drones'. Any UA being flown in accordance with the definition above is considered a model aircraft. The use of any automation, such as automatic flight modes which alter the position of the aircraft, places the operation outside the definition of a model aircraft, and therefore outside the scope of Article 16. The aircraft must be flown with direct control inputs from the RP.
>
> It is acknowledged that many UA have built in failsafe modes, which may be activated in some instances, for example- loss of control link. Activation of such a mode, although possibly automatic in nature, does not necessarily place the aircraft outside the scope of the definition of a model aircraft.

Large Model Aircraft – A model aircraft with a maximum take-off mass greater than 25kg.

GM2 Article 16 UAS Operations in the Framework of Model Aircraft Clubs and Associations

CAA ORS9 Decision No. 16

GENERAL

A model aircraft club or association may obtain an authorisation from the CAA that is valid for all their members to operate UA according to conditions and limitations tailored for the club or association.

The model aircraft club or association will submit the procedures that all members are required to follow to the CAA. When the CAA is satisfied with the procedures, organisational structure and management system of the model aircraft club or association, it may provide an authorisation that defines different limitations and conditions from those in the Open category. The authorisation will be limited to the operations conducted within the authorised club or association and within the United Kingdom.

The authorisation cannot exempt members of the club or association from the requirement to register in accordance with Article 14 of the UAS Regulation; however, the CAA may allow a model club or association to register their members on their behalf.

The authorisation may also include operations by persons who temporarily join in with the activities of the club or association (e.g., for leisure during holidays or for a contest), as long as the procedures provided by the club or association define conditions acceptable to the CAA.

An application from an association for an Article 16 authorisation must contain a suitable safety case, detailing each requested 'exclusion' from the Open category requirements, and why those exclusions are safe. The association must be able to demonstrate how it maintains oversight of its membership, and clubs, and must provide details of any competency scheme, safety reporting scheme, handbooks and guidelines and any other appropriate documentation.

GM3 Article 16 UAS Operations in the Framework of Model Aircraft Clubs and Associations

CAA ORS9 Decision No. 16

OPTIONS TO OPERATE A MODEL AIRCRAFT

Model flyers have the following options to conduct their operations:

- They may operate as members of a model club or association that has received an authorisation from the CAA, as defined in Article 16. In this case, they must comply with the procedures of the model club or association in accordance with the authorisation.

- In accordance with Article 15 (2) the UK may define zones where UAS are exempted from certain technical requirements, and/or where the operational limitations are extended, including mass or height limitations.

- The UAS may be operated in Subcategory A3, in which the following categories of UAS are allowed to fly according to the limitations and conditions defined in UAS.OPEN.040:

  o UAS that meet the requirements defined in Article 20(b); and

  o privately built UAS with MTOM of less than 25 kg.

- An Article 16 authorisation will set out conditions and limitations of any agreement between the association and the CAA, including any Operator registration data transfer, and the issuing of Open category pilot competence certificates on behalf of the CAA, where appropriate.

- Where necessary, a permission or exemption to the ANO necessary for the purpose of an Article 16 authorisation will be included as an annex to the Authorisation.

AMC1 Article 16(1) UAS Operations in the Framework of Model Aircraft Clubs and Associations

CAA ORS9 Decision No. 16

REQUEST BY A MODEL AIRCRAFT CLUB OR ASSOCIATION

An article 16 authorisation will be issued following application from a model aircraft club or association. The application needs to demonstrate to the CAA which parts of the regulation the association wishes to be excluded from, and the proposed scope of the model aircraft operations.

An application should be submitted via the UAS online form, and include a safety case, which outlines why each area of regulatory exclusion is safe, and what mitigations are applied.

An Article 16 authorisation will be issued for a period of 12 months, at which point the association may renew it.

REGISTRATION

An Article 16 authorisation may not exclude UAS Operators from the need to register with the CAA. AMC1 Article 16 (4) sets out the AMC for using the provision within the regulation to register members on their behalf, into the CAA registration system.

LARGE MODEL AIRCRAFT

The operation of large model aircraft is not normally automatically included within the scope of an Article 16 authorisation, and should be requested by the association on application.

An association may permit the operation of a large model aircraft, within the terms of the authorisation, if this has been included within the Article 16 authorisation, however the risk assessment within the Article 16 application will need to identify suitable mitigations. These need to include assessment of the design and construction of the aircraft, and assessment of pilot competence to fly it.

Once the UAS Operator of the large model aircraft holds a suitable certificate confirming the design and construction, and completion of a flight test programme, they may apply to their association for a permit to operate the large model aircraft.

The relevant pilot competence requirement shall be set out within the application for an Article 16 Authorisation, which will need to demonstrate the following:

- Basic flying competence;
- Theoretical knowledge, including regulatory requirements;
- Flying competence on the specific large model aircraft that the RP intends to fly. This should be assessed by the Association.

MODEL AIRCRAFT ASSOCIATION PERMITS

A system of permits may be included within the Article 16 authorisation, to enable the association to permit certain activity, by the association within the scope of the authorisation. The CAA will use this system of permits to allow certain activity to take place, following specific conditions set out within the authorisation, that requires additional oversight from the association.

Examples of such permits include a large model aircraft permit, model aircraft display permit and flight above 400ft permit. Associations should consider implementation of such a scheme, as part of a mitigation within their risk assessment for higher risk activities.

A description of the association procedures that would support such a scheme should be provided to the CAA on application for an Article 16 authorisation. These include:

- Process to assess an application from a club or individual within the association, for a permit
- Process to issue and revoke permits where safe, necessary and appropriate to do so

- Process to carry out suitable and sufficient oversight of activity permitted

FLIGHT ABOVE 400FT

If the association requests an exclusion from the 120m height limit applied in the Open category, then the operation of model aircraft may take place above 120m, either using:

- A ‘standing’ authorisation within the Article 16 authorisation, which allows regular flight above 400ft, within certain conditions. One such condition of this is a mass limit, set out within the article 16 authorisation. This mass limit is usually 7.5kg.

- A permit issued by the association for the routine operation of model aircraft above 400ft at a designated flying club. The association may issue a permit for routine flight above 400ft, to any suitable club which requests it, following successful completion of the association’s process.

- A model aircraft display permit, which may permit flight above 400ft for the purpose of a display event.

MODEL AIRCRAFT FLYING DISPLAYS

A model aircraft flying display is defined as: ‘Any flying activity deliberately performed, by model aircraft, for the purpose of providing an exhibition or entertainment at an advertised event’.

One condition of an Article 16 authorisation, is that a model aircraft flying display being organised within the limits of such an authorisation, is permitted by the association.

Model aircraft flying displays often involve flight of model aircraft above 400ft. There are mechanisms built into the Article 16 process, which may adjust the maximum height of 400ft, specifically for the purpose of a model aircraft flying display:

- For large model aircraft, within the large model aircraft permit; or

- For model aircraft less than 25kg, within the maximum height section of the Article 16 authorisation.

Both of these mechanisms are activated within the model aircraft flying display permit issued by the relevant association.

Operators of model aircraft being flown as part of a full-sized aircraft flying display, should read CAP 403, Chapter 17. These displays are subject to regulatory requirements, and the model aircraft elements of the display must be flown safely, in accordance with the display authorisation and CAP 403, and in accordance with the Article 16 authorisation and any necessary requirement to obtain a permit for the display.

Model aircraft operating in the Open or Specific category are excluded from the scope of ANO Article 86 (Flying Display) regulations, by the provisions of ANO Article 23, however any model aircraft operating as part of a display which is outside the limits of a suitable Article 16 Authorisation, or the Open category limits, must be authorised to do so within the Specific category.

Anyone wishing to undertake a model aircraft flying display should contact their relevant association for further advice. Only an association that is permitted to do so within their Article 16 Authorisation, may issue a permit for a model aircraft flying display.

Operators of any model aircraft operating outside an Article 16 Authorisation, and outside the limits of the Open category, must obtain an OA from the CAA for operating in the Specific category.

An Article 16 application will include within it any requirements relating to model aircraft displays, including the need for suitable risk assessments and the need to obtain any relevant airspace permission (such as FRZ permission from an aerodrome).

Model aircraft associations wishing to establish a risk assessment format for clubs to use as part of a model aircraft display plan, are encouraged to make reference to CAP 403, and SRG1303T.

THIRD COUNTRY OPERATORS WITHIN THE UK

Provisions for issuing an Article 16 Authorisation are made within this regulation, which (in its European form) has been implemented in all EU member states on 31 December 2020. As such, model aircraft operators from overseas may be able to operate in accordance with an Article 16 Authorisation issued by their own authority, within their own member state. Regulation EU 2019/947 (the current European Commission version) sets out within Article 16, paragraph 3, that such an authorisation is limited to the territory of the Member State in which it is issued.

RPs must meet the UK requirement for pilot competence, which is to hold a valid Flyer ID, in addition to any other competence requirement set out within the Article 16 authorisation.

The UK does not recognise UAS Operator registrations in third countries, and so the UAS Operator must comply with the UK registration requirements, set out in Article 14.

Third country model aircraft RPs and operators may operate within the limits of a UK CAA issued Article 16 Authorisation, with agreement from the relevant association. Any such operation must adhere to applicable UK regulations. Advice should be sought from the relevant association in the first instance.

UK OPERATORS IN THIRD COUNTRIES

Any UK RP and operator wishing to operate overseas must comply with the local regulations in place within the destination country. Any UK issued Article 16 Authorisation is only valid for use within the UK, and may not be used in any third country.

Currently no other countries recognise UK issued operator registrations, or pilot competence certificates.

GM1 Article 16(1) UAS Operations in the Framework of Model Aircraft Clubs and Associations

CAA ORS9 Decision No. 46

APPLICATION GUIDANCE

An application for an Article 16 authorisation will need to include a risk assessment. This should include the following (this list is not exhaustive):

- Description of the Association and its membership, including current total number of members;

- Description of flying activity, including locations and type of flying carried out;

- Description of competence and achievement schemes;

- Organisational structure, including organogram;

- Relevant procedures and processes within the association- including occurrence reporting and membership oversight;

- Description of which parts of the regulatory framework the association wishes to be excluded from. This should be included in a suitable tabular format, for example:

Article of Regulation	Requirement	Requested change	Reason	Supporting Evidence
Article 4 (1) (e)	*During flight, the UA is maintained within 120m from the closest point on the surface of the Earth.*	*During flight, the UA is maintained within 450m from the closest point on the surface of the Earth, for model aircraft with a mass less than 7.5kg.*	*Requirement to regularly fly above 120m for flight training and displays.*	*Risk assessment Volume 3*

- A safety case to provide evidence supporting the application. This should support any requests made in the table above.

Before submitting the application, the association should engage with the CAA RPAS and GA Unit to establish whether the Article 16 Authorisation is likely to be granted, and to answer any initial queries. Some basic feedback may be given at this stage, but a full review and feedback will not be given until the application is submitted.

Following submission of the application, an initial meeting will be arranged to discuss the application with the association, and once issued, regular meetings will be held with the association.

NOTIFICATION OF MODEL AIRCRAFT ACTIVITY TO OTHER AIRSPACE USERS

Consideration should be given to the need to notify other airspace users of model aircraft activity, when operating within the terms of an Article 16 authorisation. This should be identified at the time of application, during the risk assessment process.

Generally, this includes when operating above 400ft AGL as part of a display, or when operating a large model aircraft above 400ft.

Model aircraft operating within an aerodrome FRZ may be notified to other airspace users, via a NOTAM. This is at the discretion of the aerodrome ATS unit, and the recommendations set out in AIP section ENR 1.1 – 4.1.8.13.

Generally, a VLOS operation of a model aircraft does not require notification when above 400ft, when stated within the terms of the Article 16 authorisation and when outside controlled airspace.

The primary means of notification is via a NOTAM. A NOTAM highlights important operational information to pilots, which is checked as part of the brief before departure. NOTAMs are issued by the NOTAM office at NATS, and can be arranged by the CAA, individual operators, aerodromes or other agencies as necessary.

A NOTAM should be used to highlight unusual model aircraft activity to other pilots for awareness. This includes displays above 400ft, large model aircraft operating above 400ft and in some cases, when operating within an aerodrome FRZ. A NOTAM may be requested via the online form, available from the CAA website here , or for an aerodrome ATZ, by the aerodrome contacting the NOTAM office.

In general, a NOTAM should not be raised for an activity which is also notified within the AIP (section 5.5 (aerial sporting and recreational activities). However, it is acknowledged that some sites in some instances (large display events for example) may need additional notification, in order to improve their visibility to airspace users, particularly the VFR GA community. In this case, a NOTAM in addition to the AIP entry may be requested for ‘an intense area of model aircraft activity’. These should be requested when necessary via the online form, available here.

NOTIFICATION OF MODEL AIRCRAFT ACTIVITY TO THE ANSP

Model aircraft operations within controlled airspace, above 400ft, are expected to be considered within the Article 16 risk assessment. Compliance with procedures set out within the AIP is expected, and may form part of the air risk mitigations.

In this case, when a model aircraft operates above 400ft within controlled airspace, the UAS Operator should identify whether the portion of airspace requires a notification to the ATS unit responsible. This will be set out within the AIP, section ENR 2.1. This process is set out in GM1 UAS.SPEC.040(1)(b), and should be followed.

MILITARY LOW FLYING SYSTEM

The military operate a system of low flying routes throughout the UK, and frequently fly below 500ft, often to heights as low as 100ft. The vast majority of military low flying takes place between 250ft and 500ft, and usually on weekdays between 0700-2300 (GMT).

In order to assist deconfliction between low flying military aircraft and other civil airspace users, the low-level Civil Aircraft Notification Procedure (CANP) has been established to provide a means of notification to the low flying cell.

Model aircraft displays and any other intense model aircraft activity should be notified through the CANP process, by emailing the low flying booking cell. Contact details for the cell are published in the AIP, in section ENR 1.10 - 5.1.

Charts of the low flying system are available from the AIP (ENR 6-20 and 6-21), which show the tactical training areas, boundaries and areas of avoidance.

AMC1 Article 16(2)(b)(ii) Remote Pilot Competence

CAA ORS9 Decision No. 16

MINIMUM COMPETENCE REQUIRED TO OPERATE THE UAS SAFELY

There is no exclusion from the need to demonstrate basic Open category pilot competence, when operating under an Article 16 authorisation. As such, every RP is expected to hold (as a minimum) a ‘Flyer ID’. This may either be obtained through the CAA, or issued on the CAA’s behalf by the association.

The association shall identify additional pilot competence requirements, based on the scope of their application for an Article 16 authorisation. This pilot competence scheme shall be set out within the Article 16 application, including the syllabus, assessment criteria, currency requirements and how the scheme is administered.

The level of pilot competence required will be dependent on the risk of the operation, but will always be at a level that is equal to, or greater than the Open category pilot competence requirement set out in UAS.OPEN.020 (4) (b), and members will demonstrate this by holding a ‘Flyer ID’.

In order to meet the equivalent standard of the CAA Flyer ID test, the association pilot competence test must be comprised of at least 40 questions, which may be multiple choice. A verbal assessment of a selection of questions is not considered sufficient.

The pass mark shall be set by the association, but must be greater than 75%. The test may be ‘open book’, such that the candidate can make reference to copies of information material to support them during the exam, if the association decides that this is appropriate.

The subject areas to assess include:

- Aviation Safety
- Airspace restrictions
- Aviation regulation
- Human performance limitations
- Operational procedures
- Model aircraft general and technical knowledge
- Privacy and data protection
- Insurance
- Security

Some of these subjects may be of more relevance to some associations than others. The association should decide on the appropriate distribution of questions across these subject areas. If an association wishes to miss out an entire subject area, the reason for this must be detailed within the Article 16 application.

An association may wish to expand the selection of questions within the assessment, to cover a wider range of topics than is covered by the CAA DMARES test.

MODEL AIRCRAFT FLYING DISPLAY - PILOT COMPETENCE

Within the risk assessment for an Article 16 authorisation, if requesting the ability to permit model aircraft displays, the association should identify additional pilot competence and currency requirements.

In general, these include for the operation of large model aircraft within a display, or jet turbine powered model aircraft within a display. This is due to the large amount of kinetic energy carried by such aircraft, that may be transferred following a collision.

It is recommended that this includes additional training, and demonstration of currency – such as the flying of three complete display routines within the preceding 90 days of the event, one of which should have been flown within the preceding 30 days of the event- on an aircraft which is reasonably representative of the aircraft to be flown within the display- preferably on the same aircraft.

‘Reasonably representative’, in this context, refers to an aircraft of a similar mass, flying characteristics and type.

FLYER ID ISSUED ON BEHALF OF THE CAA

An association may apply for the scope of their Article 16 authorisation to enable them to issue a Flyer ID on behalf of the CAA, to their members. This means that their members do not need to read the CAA Drone Code and sit the CAA Flyer ID test, but that they may demonstrate competence through the association pilot competence scheme instead.

This Flyer ID is proof of competence to operate within the Open category, as well as forming part of the competence requirement to fly under the terms of the Article 16 authorisation.

A Flyer ID issued by the CAA following completion of a model aircraft association competence scheme, will last for 5 years, and may be renewed at any time during that period (after the first 11 months of validity).

The association will need to demonstrate that the training material and pilot competence test meets the requirements set out in UAS.OPEN.020(4)(b), and therefore is at least equivalent to the CAA Drone Code and Flyer ID test.

On application for an Article 16 Authorisation, the association will need to provide:

- A copy of all questions used in their pilot competence assessment;
- The procedures relating to the administration of the competence assessment;
    - o Exam conditions
    - o Pass mark
    - o Time limit
    - o Number of re-sits available
- The details of any practical assessment, if required;
- A copy of the training material used to support the competence scheme;

Upon request from the Association, the CAA will provide the Flyer ID to the Remote Pilot, and to the association, for each member who participates in the scheme.

The format of the Flyer ID will be identical to the format issued directly by the CAA to RPs, set out in section ‘AMC2 UAS.OPEN.020(4)(b) and UAS.OPEN.030(2)(a) and UAS.OPEN.040(3)‘ and the association may not alter the ID or the format of the ID.

AMC1 Article 16(2)(b)(iii) UAS Operations in the Framework of Model Aircraft Clubs and Associations

CAA ORS9 Decision No. 16

ACTION IN CASES OF OPERATIONS/FLIGHTS THAT EXCEED THE CONDITIONS AND LIMITATIONS DEFINED IN THE OPERATIONAL AUTHORISATION

When a model club or association is informed that a member has exceeded the conditions and limitations defined in the OA, appropriate measures will be taken, proportionate to the risk posed, and in line with the agreed association/club procedures. Considering the level of risk of harm, the model club or association decides whether the competent authority should be informed. In any case, occurrences that cause an injury to persons or where the safety of other aircraft was compromised, must be reported by the model club or association to the CAA.

AMC1 Article 16(4) Registration

CAA ORS9 Decision No. 16

REGISTER MEMBERS INTO THE CAA REGISTRATION SYSTEM ON THEIR BEHALF

A facility to register model aircraft member into the CAA Operator registration system may be provided, if this is requested by the model aircraft association in the application for an Article 16 authorisation.

The terms of use of this facility shall be set out within the Article 16 authorisation, and data exchange requirements will be agreed between the association and the CAA prior to issuing the Article 16 authorisation.

The CAA will provide the Operator ID to the UAS Operator, and to the association, for each member who participates in the scheme.

The format of the Operator ID will be identical to the format issued directly by the CAA to UAS Operators, set out in section AMC1 Article 14(6) and the association may not alter the ID or the format of the ID.